# 8

# Electricity

## Introduction

Electricity plays a significant role in the betterment of human life. Apart from its social benefits, electricity is also a driving factor in the economy. Its usage ranges from communication and transportation to production.

*Electricity plays a significant role in the betterment of human life*

Local government plays an important role in the electricity industry in South Africa. Schedule 4B of the Constitution lists electricity and gas reticulation as a local government responsibility. Section 153 of the Constitution places the responsibility on municipalities to ensure the provision of services (which includes electricity reticulation) to communities in a sustainable manner as well as promote economic and social development. Electricity is an important funding source for local government, particularly for larger urban municipalities.

*Municipalities are required to provide electricity reticulation services to their communities in a sustainable manner*

Substantial investments are currently being made in the South African electricity industry, together with the restructuring programme which is addressing the current emergency in electricity supply.

This chapter gives an overview of:

- current and future developments in the electricity supply industry
- the current composition of the electricity distribution sector
- electrification and free basic electricity
- municipal and municipal entity electricity budgets
- factors influencing the efficient provision of the electricity distribution function.

## Current and future developments in the electricity supply industry

Electricity provision consists of three phases namely, generation, transmission and distribution. Generation is the process by which electricity is produced; transmission is the transportation of electricity that has been generated in power stations to local networks for distribution via high voltage, long distance power lines to the load centres and distribution is the actual delivery of electricity to end consumers. Electricity generation and transmission together constitute electricity supply and in South Africa this is largely the function of Eskom (in some cases, municipalities have their own generation capacity, but this is on a limited scale). The distribution function is shared between municipalities and Eskom.

### Current and future developments in generation

*Coal remains the biggest source for electricity generation in South Africa*

Africa only produces a small percentage (3 per cent) of total world electricity generated. South Africa generates around two-thirds of this amount, making it the largest supplier of electricity on the African continent. South Africa is particularly reliant on coal for electricity generation, where close to 90 per cent of all electricity in South Africa is generated using fossil energy/coal. This is because of South Africa's large deposits of coal, which provide a comparative advantage in coal production. And it is the main reason that the average selling price of electricity has been one of the lowest in the world. Nevertheless, Eskom is currently exploring alternatives to the heavy reliance on coal for generating electricity, including hydro power and nuclear energy.

Of all the energy sources available for electricity generation, burning coal is one of the most hazardous to the environment. It is estimated that coal-based electricity generation accounts for 40 per cent of carbon dioxide emissions into the atmosphere. In most countries, environmental taxes are usually applied directly on electricity generation and to a lesser extent electricity consumption and emissions. Several countries have implemented environmental taxes on electricity, including several EU countries, India and Zambia.

*Government has proposed a 2 cent/kWh tax on the sale of electricity from non-renewable sources*

An electricity levy to support energy efficiency was announced in the 2008 Budget Review. Government proposes to impose a 2 cent/kWh (kilowatt-hour) tax on the sale of electricity generated from non-renewable sources by the producers/generators of electricity, to be collected at source. This measure will serve the dual purpose of helping to manage the current supply shortages and protecting the environment. It is expected to raise about R4 billion annually. The introduction of this tax will be complemented by incentives that encourage firms to behave in a more environmentally responsible way. Tax incentives to encourage the uptake and development of renewable energy, such as accelerated depreciation allowances, are already in place and could be developed further.

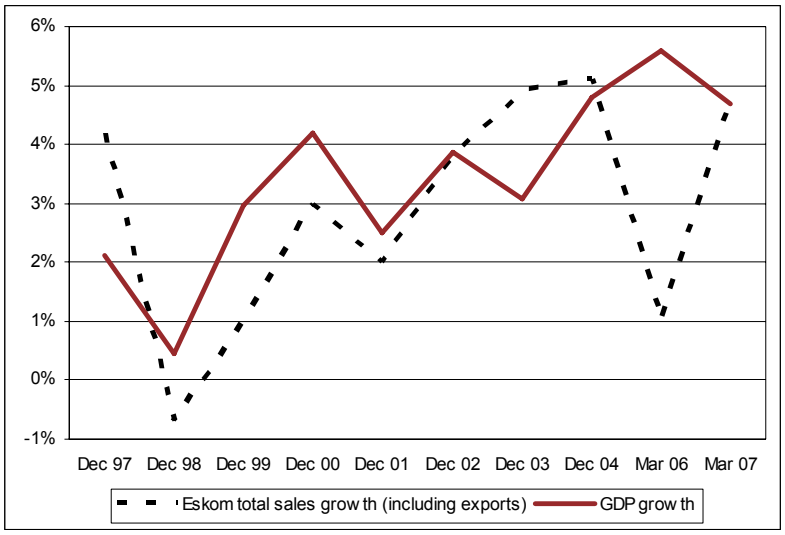
## Trends in demand for electricity

Between 1970 and 2000, electricity supply in South Africa exceeded electricity demand, which led to the mothballing of several power stations in the late 1980s and early 1990s. These included three stations in Mpumalanga - Komati in Middelburg, Camden in Ermelo and Grootvlei in Balfour. They are currently being re-commissioned to meet the country's energy demands, which have been growing since 2000.

*Electricity demand/usage increases with economic activity*

In the last few years the demand for electricity has increased significantly. The positive economic growth that South Africa has experienced is undoubtedly one of the factors contributing to this increased demand. Figure 8.1 compares the growth rate of South Africa's gross domestic product (GDP) with the growth in Eskom's sales (which is a good proxy for electricity demand). There is a close correlation between overall growth in the economy and Eskom's total sales.

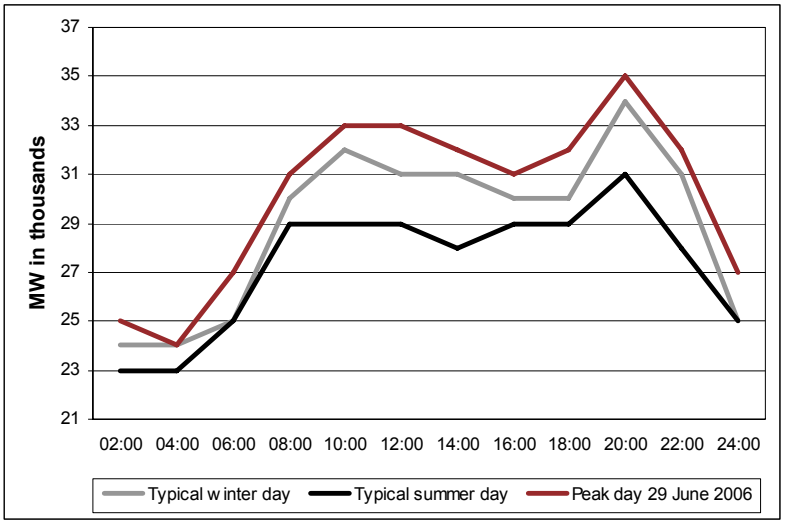
**Figure 8.1 Real GDP growth versus Eskom sales (GWh) growth, December 1997 – March 2007**




*Source: Eskom, Annual Report, 2007*

In determining energy demands/requirements, seasonal differences and daily peaks in electricity usage need to be taken into account. Figure 8.2 shows that electricity demand in South Africa varies over a 24-hour day, as well as in summer and winter. Between 7am and 5pm there is a constant demand for electricity. The small dip at around 12pm to 1pm is probably due to the decreased use of equipment during lunchtime. Demand peaks at the end of the working day, between 6pm and 9pm, when electricity consumption is at its maximum in the form of lighting, stoves and television. In terms of seasons, there is an approximate increase of 2000MW in usage in the winter months between June and August.

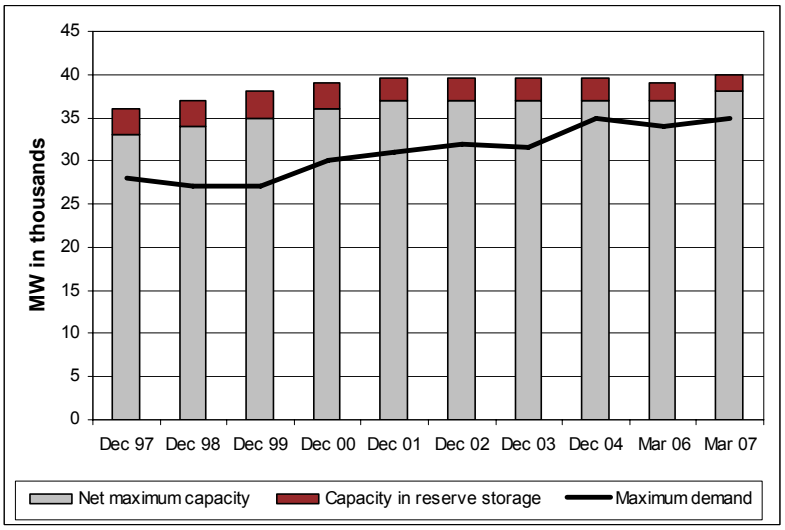
**Figure 8.2 Electricity demand patterns**




*Source: Eskom, Annual Report, 2007*

South Africa's estimated existing capacity is around 43 000MW, with maximum demand peaking at 38 000MW. In the last few years, maximum demand for electricity has tended to be just below maximum capacity, which led to the supply constraints experienced in 2007 and a critical shortage of supply in 2008. Figure 8.3 illustrates Eskom's generation plant capacity and maximum demand over the last decade.

**Figure 8.3 Generation plant capacity and maximum demand, December 1997 – March 2007**




*Source: Eskom, Annual Report, 2007*

When it comes to managing electricity capacity challenges, South Africa can learn from experiences elsewhere. For example, Brazil presents a major success story of controlling electricity demand. When the country suffered serious droughts in 2001, hydropower generation capacity fell. The Brazilian government initiated demand management strategies, which included a successful electricity rationing programme that was driven by incentives for electricity saving and

penalties for excessive use. This system, implemented in conjunction with a number of other structural and legal reforms, facilitated a positive response from consumers, resulting in a decrease in electricity demand. Since the proposed reforms, Brazilian electricity demand has remained constant at a lower level.

### Government's response to the current situation

Government has recognised that a multi-pronged approach is required to address the current situation. Priority will be given not only to the building of new power generation capacity (through Eskom and independent power producers (IPPs)), but also to finding effective demand side management strategies.

*Government has urged all South Africans to save more energy*

At a joint sitting of Parliament in January 2008, the Minister of Minerals and Energy made a plea to all South Africans to support government in dealing with the problem. Government has since put together a national electricity emergency programme, which deals with the management of the situation on both the supply and demand side. Demand side strategies include the use of energy efficiency technologies (such as solar heating panels), voluntary reduction of electricity consumption (with government having set a target of a 10 per cent reduction in electricity usage for the residential sector) and load shedding. At times when use is dangerously high, Eskom transmits messages on evening television to warn users to cut down on their usage, to avoid load shedding. Load shedding is applied as a last resort to prevent a collapse of the national electricity supply system. Electricity efficiency regulations will be introduced by national government during 2008.

#### Implementing demand side management strategies in the local government sphere

The City of Johannesburg has plans to make some 745MW of electricity available to the national grid over the next 18 months through supply side and demand side interventions at a cost of around R617 million. The City of Johannesburg's rollout plan includes:

- Supplying 300 000 households with energy efficient light bulbs over a six-month period at a cost of R15 million. The light bulb initiative would offer up to 45MW in electricity savings.
- Installing remote geyser controls at a cost of R270 million, to be implemented at 200 000 households over 18 months, offering a power saving from 150MW to 300MW during peak times.
- Using solar power for traffic lights that will cost from R100 million to R280 million to install and which could take 100MW off the grid in a year.
- Installing some 10 000 solar water heating units. The metro is looking to partner with Eskom and the Development Bank of Southern Africa for this initiative, which would save about 30MW, at a cost of R12 million to the municipality.

In addition to initiatives centred around curbing demand, the metro has also been working to boost power supplies by recommissioning old gas turbines that have been lying idle at sites in Fordsburg, Kaserne and Cottesloe. This project will cost R40 million and would add up to 120MW to the national power grid. Either City Power or Eskom would also enter into a new power purchase agreement with the private owners of Kelvin power station, near Sebenza. The plan is to boost Kelvin's generation output to 500MW by 2013, which would be significantly greater than the current output of 120MW to 150MW.

*Source: Extracts from an article by Matthew Hill that appeared in Engineering News – 28 February 2008*

*Municipalities are to play a crucial role in government's demand-side management initiative*

Municipalities are required to participate in the electricity demand-side management initiative by ensuring that there is more efficient (reduced) electricity consumption within their jurisdictions. Meeting the nationally defined target of 10 per cent decrease in electricity usage would result in a fall in electricity sales and hence revenue for local government, as municipalities derive surcharges on electricity sales. Also, additional costs would be incurred in implementing energy saving initiatives, such as implementing the use of energy saving light bulbs (CFLs), solar geysers and smart meters with ripple control features. Municipalities will also be required to make various adjustments and improvements to existing electricity distribution systems to cope with switching-off systems (partially or fully) where scheduled load shedding is being carried out. In order to implement this initiative, municipalities could be required to make appropriate adjustments to their budgets to cater for these costs.

*The 2008 Budget Review announced an electricity levy to support improved energy efficiency*

R2 billion will be set aside through the fiscus over the next three years to support programmes aimed at encouraging the more efficient use of electricity, generation from renewable sources, installation of electricity-saving devices and co-generation projects. To give content to these proposals, allocations for this year will be included in the adjustments budget.

### Funding the generation investment programme

*Electricity users and not the fiscus, should fund the costs of electricity supply*

Government policy has always been that electricity users should bear the costs of its supply, with capital financed through retained earnings and debt on market-related terms. Public expenditure on electrification has been explicitly targeted at subsidising the extension of supply to low-income consumers and not at providing finance for the utility itself. Eskom's tariffs are subject to an independent regulator, the National Energy Regulator of South Africa (NERSA).

Eskom will direct substantial investments towards the build programme over the next few years. In addition to the R17 billion that it invested in infrastructure in 2007, the utility will accelerate its investment plan to ease the current capacity constraints. This is set to run from 2009 until 2013 and will cost an estimated R343 billion.

Eskom will direct nearly three-quarters of the R343 billion investment programme towards building generation capacity. This will involve not only building new coal-fired power stations, but also exploring hydroelectric, gas and, in particular, nuclear options. It is estimated that close to 20 000MW will be generated by new nuclear plants. Eskom forecasts that by 2014, South Africa will have enough electricity generation capacity to meet its reserve capacity targets.

*The 2008 Budget provides for R60 billion over the next three years to support the financing of Eskom's investment programme*

Eskom's balance sheet is expected to come under some pressure due to the utility's build programme. The 2008 Budget provides for a R60 billion loan over the next three years to support the financing of Eskom's capital investment programme on terms structured to meet its cash flow requirements. Currently, the release of funds to Eskom is structured as follows: R10 billion in 2008/09, R20 billion in 2009/10 and the remaining R30 billion in 2010/11. These amounts could be supplemented either by guarantees or other assistance should the need arise.

In addition to the build programme, a number of factors will impact on electricity prices in future. These include increases in the price of materials used in the production process of electricity, necessary reforms for making the price of electricity to the consumer more cost-effective and factoring in environmental taxes intended to introduce more efficient electricity use.

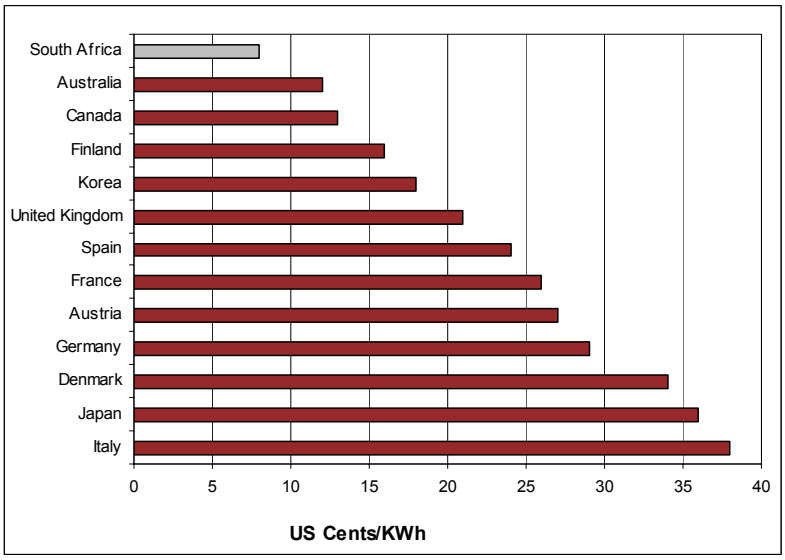
## Current and future developments in tariffs/pricing of electricity generation

*Reforms to the current generation tariff are therefore required which will facilitate the entry of new participants in the generation sector*

During the 1980s and 1990s, Eskom's tariff was steadily reduced in real terms, which means that electricity prices in South Africa are now far lower than in any other comparable countries and well below full economic cost. Reforms to the current generation tariff are therefore required so that electricity prices are based on marginal costs rather than historical costs, which will facilitate the entry of new participants in the generation sector.

Figure 8.4 illustrates the difference in prices for electricity between South Africa and a sample of developed countries. For 1999, South Africa has the cheapest electricity, at around 8 cents (US) per kWH.

**Figure 8.4 Comparison of prices from a sample of countries**




*Source: Energy Supply Association of Australia, 1999*

*To cater for the additional revenue requirement, NERSA approved a 14.2 per cent tariff increase for 2008/09*

NERSA considered Eskom's application for a rule change to the multi-year price determination for 2008/09. In December 2007 the regulator agreed that, based on Eskom's capital financing needs, the utility be allowed to recover the following additional revenue during 2008/09. Based on tariff sales of 201 503GWh, the average tariff would be 22.61 cents per kWh, which is a 14.2 per cent increase on the expected average tariff per kWh for 2008/09.

Eskom has made a follow-up application to NERSA for a further electricity price increase in 2008/09, to take into account full primary energy pass through and recovery of demand-side management costs over the period. Given that the additional approved revenues will be

recovered in the period 1 July 2008 to 31 March 2009, the regulator made the following ruling on this matter on 18 June 2008:

- an average additional increase of 20 per cent for Eskom's non-municipal customers as the "original" 14.2 per cent increase had already been implemented (or a total increase of 34.2 per cent)
- an average increase of 35.9 per cent for licensed distributors at municipal level
- increases to poor residential customers be limited to 14.2 per cent.

Any amendment to Eskom's tariff will have implications for municipalities as their bulk price will need to be readjusted accordingly. Following the tabling of Eskom's additional price increase for 2008/09 in Parliament, the Minister of Finance, given the nature of the current crisis in electricity supply, exempted municipalities, municipal entities and Eskom from the provisions of the Municipal Finance Management Act (2003) (MFMA) that prohibit mid-year tariff adjustments by municipalities to enable them to factor this additional electricity bulk price increase into their 2008/09 budgets. To further facilitate the process, NERSA has allowed municipalities who have had tariff approval from the Regulator prior to end of June 2008 for the 2008/09 financial year and who have then applied the calculated municipal guideline of 20.6 per cent to these approved tariffs (i.e. treated this additional increase as a pass through), will not be required to re-apply to NERSA for a further approval of tariffs.

### Developments in electricity transmission

*Eskom owns the South African transmission network system*

Electricity transmission is the transportation of electricity that has been generated in power stations to local networks for distribution via high voltage (above 132kV), long distance power lines. The South African transmission network/system is owned by Eskom and consists of transmission lines and wires that extend throughout the country as well as neighbouring countries in Southern Africa.

Although transmission networks usually sell electricity to distribution systems, certain customers that require large amounts of electricity are connected directly to transmission lines. Most of the power for transmission lines is generated in and around the Mpumalanga province. This is due to large deposits of coal in this area. Electricity therefore needs to travel long distances via transmission grids to reach customers in coastal regions such as KwaZulu-Natal, Western Cape and Eastern Cape. Municipalities that are further from the grid will be more exposed to electricity outages due to transmission failures. Upgrading transmission grids and networks is an urgent part of Eskom's investment initiatives.

## Current composition of the electricity distribution sector

The current arrangements in the electricity distribution industry are the result of its historical development. Before 1994, municipalities

distributed electricity in historically white areas, while Eskom covered historically black townships and some of the former so-called homelands.

*Electricity reticulation means the trading or distribution of electricity and services associated with it*

The Electricity Regulation Amendment Act (2007), which was enacted in January 2008, has clarified the role of local government in relation to electricity reticulation. Electricity reticulation means the trading or distribution of electricity and includes all associated services. An electricity distribution system means a power system that operates at or below 132kV.

The constitutionally mandated responsibility in relation to electricity reticulation has therefore been clarified as "providing electricity to all electricity customers served on a power system of 132kV". A large range of customers are served on a 132kV power system, including poor households that receive free basic electricity as well as large industrial customers where electricity is used as part of their production processes.

Table 8.1 shows that the mining and manufacturing sectors have the fewest customers (less than 0.5 per cent) yet combined they use over half of the country's electricity. Although the domestic sector makes up the majority of electricity customers (just below 95 per cent), it uses only 16.8 per cent of electricity.

**Table 8.1 Electricity sales by category for Eskom and municipalities, 2004**

| Category | Average sales price (c/kWh) | Number of customers | % of total | MWh sales | % of total |
|---|---|---|---|---|---|
| Domestic | 28.82 | 7 196 667 | 94.3% | 35 081 031 | 16.8% |
| Agriculture | 31.13 | 102 811 | 1.3% | 4 996 532 | 2.4% |
| Mining | 15.37 | 1 944 | 0.0% | 33 321 422 | 16.0% |
| Manufacturing | 18.31 | 31 373 | 0.4% | 79 299 454 | 38.0% |
| Commercial | 28.45 | 256 111 | 3.4% | 23 634 351 | 11.3% |
| Transport | 22.13 | 1 059 | 0.0% | 5 576 224 | 2.7% |
| General | 23.45 | 42 101 | 0.6% | 26 701 791 | 12.8% |
| **Total** | **21.82** | **7 632 066** | **100.0%** | **208 610 805** | **100.0%** |

*Source: National Electricity Regulator of South Africa, Electricity supply statistics for South Africa, 2004*

*Municipalities have more customers but more sales are attributed to Eskom*

Table 8.2 shows the breakdown of total sales and total customers of Eskom and municipalities. Although municipalities have more customers, more sales are attributed to Eskom. This is indicative of the fact that they serve different electricity customers - Eskom sells approximately 35MWh per customer compared to municipalities, which sell an average of 21MWh per customer. Although municipalities have just below 90 per cent of industrial (manufacturing and mining) customers, Eskom derives more sales from this sector, i.e. 71 per cent. This suggests that Eskom's industrial customers are larger and use more electricity than the smaller businesses that get their electricity from municipalities. Conversely, although Eskom and municipalities have a similar number of residential customers, municipalities sell much more electricity to this sector, suggesting that municipalities provide electricity to both low use (generally poor) and high use (generally non-poor) residential customers, while Eskom has more customers in the low use category. This is partially explained by the fact that Eskom has had to undertake electrification of many of the more sparsely situated electrification

customers in rural areas, whereas most urban residential customers are situated in areas falling under municipal provision.

**Table 8.2 Electricity customers and sales for Eskom and municipalities, 2004**

| Category | Estimated number of customers | | | | Estimated sales per category (MWh) | | | |
|---|---|---|---|---|---|---|---|---|
| | Eskom | Municipalities and other | % | Total | Eskom | Municipalities and other | % | Total |
| Domestic | 3 475 330 | 3 721 337 | 92.4% | **7 196 667** | 8 099 000 | 26 982 031 | 32.6% | **35 081 031** |
| Agriculture | 80 131 | 22 680 | 0.6% | **102 811** | 4 426 000 | 570 532 | 0.7% | **4 996 532** |
| Mining | 1 124 | 820 | 0.0% | **1 944** | 33 042 000 | 279 422 | 0.3% | **33 321 422** |
| Manufacturing | 3 019 | 28 354 | 0.7% | **31 373** | 56 698 000 | 22 601 454 | 27.3% | **79 299 454** |
| Commercial | 42 620 | 213 491 | 5.3% | **256 111** | 7 162 000 | 16 472 351 | 19.9% | **23 634 351** |
| Transport | 511 | 548 | 0.0% | **1 059** | 3 188 000 | 2 388 224 | 2.9% | **5 576 224** |
| General | 1 208 | 40 893 | 1.0% | **42 101** | 13 211 200 | 13 490 591 | 16.3% | **26 701 791** |
| **Total** | **3 603 943** | **4 028 123** | **100.0%** | **7 632 066** | **125 826 200** | **82 784 605** | **100.0%** | **208 610 805** |

*Source: National Electricity Regulator of South Africa, Electricity supply statistics for South Africa, 2004*

## Electrification and free basic electricity

### Progress with the rollout of electrification

*Government has prioritised both the provision of infrastructure and free basic electricity to the poor*

The electricity distribution sector is still faced with service delivery challenges despite the significant progress made in the rolling out of services since 1994. Government has prioritised not only the rollout of infrastructure necessary for providing services but also providing free basic services to the poor. Government is committed to eliminating electrification backlogs by 2012.

Government currently funds electrification through:

- grants to municipalities and Eskom, to help them tackle electrification backlogs of permanently occupied residential dwellings
- the installation of bulk infrastructure
- the rehabilitation and refurbishment of electricity infrastructure to improve the quality of supply.

Through the integrated national electrification programme (INEP), capital grants amounting to R595.6 million will be made available to municipalities in 2008/09 (compared to R467.8 million in 2007/08) and will increase to R897 million in 2009/10 and R950.8 million in 2010/11. Capital grants amounting to R1.1 billion will be made available to Eskom in 2008/09, which will increase to R1.4 billion in 2009/10 and R1.6 billion in 2010/11. The larger proportion of the grant is allocated to Eskom due to its focus in the more rural sparsely populated areas of the country, where the average cost per connection is higher. Therefore, a total amount of R1.7 billion will be allocated to municipalities and Eskom during 2008/09 which will increase to R2.3 billion in 2009/10. This amounts to a real growth rate of 26 per cent over the period.

Table 8.3 illustrates the per capita municipal electricity operating and capital expenditure and per capita operating and infrastructure grants received for electricity spending from the fiscus. Electricity

expenditure by municipalities includes the purchase of bulk electricity and investment in electricity assets while grants for electricity flow through the electricity component of the local government equitable share (LGES) as well as the integrated national electricity programme (INEP) infrastructure grant. Operating and capital expenditure per capita considerably exceeds the grants received for the service in metros and the 21 secondary cities. These municipalities have a greater potential to cross-subsidise households due to the larger income they receive from providing the electricity service and they have more borrowing capacity to fund infrastructure investments compared to the rest of municipalities. Smaller municipalities are more reliant on transfers for providing the electricity service as these municipalities have a smaller income base and thus less scope for cross-subsidising.

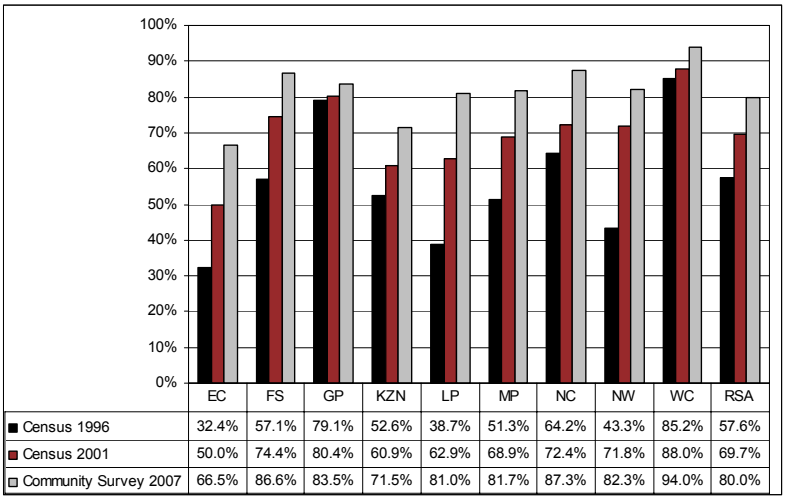
**Table 8.3 Electricity expenditure and grants per capita**

| | Bulk purchases per capita | LGES per capita | Difference | Capital expenditure per capita | INEP per capita | Difference |
|---|---|---|---|---|---|---|
| Category A (Metros) | 571 | 166 | 405 | 166 | 9 | 157 |
| Category B (Locals) | 172 | 216 | -44 | 48 | 8 | 40 |
| Category C (Districts) | 1 | – | 1 | 1 | – | 1 |

*Source: National Treasury local government database*

Figure 8.5 illustrates the increased levels of access to electricity used for lighting per household between 1996 and 2007.

**Figure 8.5 Percentage of households using electricity for lighting by province, 1996 – 2007**




| | EC | FS | GP | KZN | LP | MP | NC | NW | WC | RSA |
|---|---|---|---|---|---|---|---|---|---|---|
| Census 1996 | 32.4% | 57.1% | 79.1% | 52.6% | 38.7% | 51.3% | 64.2% | 43.3% | 85.2% | 57.6% |
| Census 2001 | 50.0% | 74.4% | 80.4% | 60.9% | 62.9% | 68.9% | 72.4% | 71.8% | 88.0% | 69.7% |
| Community Survey 2007 | 66.5% | 86.6% | 83.5% | 71.5% | 81.0% | 81.7% | 87.3% | 82.3% | 94.0% | 80.0% |

*Source: Stats SA, Census 1996, Census 2001 and Community Survey 2007*

*Access to electricity has increased*

It is evident that access to electricity has increased over the 11-year period. Although progress varies per province, it is evident that the country as a whole has been extremely successful in increasing and improving service delivery in relation to electricity. Factors impeding the rollout of the electrification programme include increased costs of raw materials, scarcity of engineering skills and the higher costs of rolling out infrastructure in rural areas due to longer distances.

## Progress with the rollout of free basic electricity

*50kWh per month per household is sufficient for basic domestic functions*

The electrification programme is supported by government's programme to provide free basic electricity/energy to poor households. The free basic electricity allocation of 50kWh per month per household is sufficient for basic functions, such as basic cooking, lighting and ironing.

Municipalities have applied different free basic electricity/energy approaches. One is a blanket approach, which involves providing the stated amount of free basic electricity to all households having access to infrastructure, the other is a targeted approach, which involves distinguishing between different types of households and providing free basic electricity to the identified poor only (applied in the City of Cape Town and the City of Tshwane (from July 2007)). Municipalities develop indigent registers to assist them in applying the targeted approach.

*Eskom is largely responsible for providing electricity in rural areas*

Table 8.4 compares consumers receiving free basic electricity from municipalities per province for 2005 and 2006. Predominantly rural provinces, such as Eastern Cape, KwaZulu-Natal and Limpopo, may have underestimated figures as Eskom is largely responsible for providing electricity in rural areas. By 2006 Eskom had provided free basic electricity to 1 254 199 households. Eskom's ability to roll out free basic electricity is based on the funding it receives from municipalities to carry out this process on the municipalities' behalf.

**Table 8.4 Consumer units receiving free basic electricity services from municipalities, 2005 and 2006**

| | 2005 | | | 2006 | | |
|---|---|---|---|---|---|---|
| | Number of consumer units receiving basic electricity services | Free basic electricity services | | Number of consumer units receiving basic electricity services | Free basic electricity services | |
| Province | | Number of consumer units | % | | Number of consumer units | % |
| Eastern Cape | 682 105 | 251 946 | 36.9% | 780 208 | 305 245 | 39.1% |
| Free State | 528 110 | 361 306 | 68.4% | 559 492 | 396 086 | 70.8% |
| Gauteng | 1 403 713 | 1 239 487 | 88.3% | 1 674 008 | 1 398 011 | 83.5% |
| KwaZulu-Natal | 1 086 056 | 135 883 | 12.5% | 1 155 798 | 137 371 | 11.9% |
| Limpopo | 670 111 | 113 674 | 17.0% | 706 359 | 155 853 | 22.1% |
| Mpumalanga | 498 901 | 149 215 | 29.9% | 545 829 | 215 123 | 39.4% |
| Northern Cape | 155 140 | 58 936 | 38.0% | 168 432 | 67 040 | 39.8% |
| North West | 459 128 | 100 748 | 21.9% | 516 002 | 112 733 | 21.8% |
| Western Cape | 1 063 861 | 587 350 | 55.2% | 1 112 570 | 569 973 | 51.2% |
| **Total** | **6 547 125** | **2 998 545** | **45.8%** | **7 218 698** | **3 357 435** | **46.5%** |

*Source: Stats SA, Non-financial census of municipalities for the year ended 30 June 2006*

In 2006, about 360 000 more households had access to free basic electricity from municipalities than in 2005. However, in three provinces (Western Cape, Gauteng and North West) access to free basic electricity decreased in percentage terms. This is most likely due to municipalities changing their existing free basic electricity policies from the blanket approach to the targeted approach.

Funding for free basic electricity is supported by allocations from the local government equitable share. As the local government equitable share is an unconditional grant and intended to supplement own

resources of municipalities (i.e. property rates, user charges/tariffs and surpluses), there are no conditions placed on municipalities with regard to allocating specific portions of the allocation towards the funding of free basic services, including free basic electricity. Municipalities accordingly fund their free basic services/electricity programmes in terms of priorities (as stated in their integrated development plans) and available resources (own resources and equitable share).

Other approaches that municipalities apply for funding free basic electricity include cross-subsidies between customers (where some customer groups subsidise poorer households), most often through block tariffs (where a prescribed amount is provided for free and these costs are recouped in tariffs that are applicable when use exceeds this amount).

*The free basic electricity programme caters for alternative sources of energy*

The Department of Minerals and Energy has recently extended its free basic electricity programme to include alternative sources such as paraffin, coal, liquefied petroleum gas (LPG) and bio-ethanol gel. Free basic alternative energy is intended to provide indigent households with alternative energy where electricity is not available.

## Municipal and municipal entity electricity budgets

### Overall municipal electricity budgets

**Table 8.5 Electricity expenditure by category of municipality, 2003/04 – 2009/10**

| R million | 2003/04 | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 |
|---|---|---|---|---|---|---|---|
| | Outcome | | | Outcome | Medium-term estimates | | |
| **Operating expenditure** | | | | | | | |
| Category A (Metros) | 7 970 | 8 608 | 9 425 | 9 695 | 10 884 | 11 614 | 12 485 |
| Category B (Locals) | 4 440 | 4 725 | 5 065 | 5 414 | 5 855 | 6 002 | 6 333 |
| *Secondary cities* | *2 616* | *2 827* | *2 991* | *3 171* | *3 426* | *3 495* | *3 679* |
| *Remainder* | *1 824* | *1 899* | *2 075* | *2 244* | *2 430* | *2 507* | *2 653* |
| Category C (Districts) | 4 | 5 | 10 | 20 | 29 | 31 | 33 |
| **Subtotal operating** | **12 414** | **13 338** | **14 501** | **15 129** | **16 769** | **17 647** | **18 851** |
| **Capital expenditure** | | | | | | | |
| Category A (Metros) | 1 179 | 1 167 | 1 680 | 1 914 | 2 385 | 2 391 | 2 303 |
| Category B (Locals) | 569 | 673 | 817 | 1 217 | 1 600 | 1 565 | 1 484 |
| *Secondary cities* | *263* | *342* | *402* | *505* | *722* | *732* | *725* |
| *Remainder* | *307* | *331* | *415* | *712* | *878* | *832* | *759* |
| Category C (Districts) | 54 | 12 | 28 | 22 | 113 | 19 | 14 |
| **Subtotal capital** | **1 802** | **1 853** | **2 526** | **3 153** | **4 099** | **3 975** | **3 801** |
| **Total** | | | | | | | |
| Category A (Metros) | 9 148 | 9 775 | 11 106 | 11 609 | 13 269 | 14 005 | 14 788 |
| Category B (Locals) | 5 009 | 5 399 | 5 882 | 6 632 | 7 455 | 7 567 | 7 817 |
| *Secondary cities* | 2 879 | 3 169 | 3 393 | 3 676 | 4 148 | 4 228 | 4 404 |
| *Remainder* | 2 131 | 2 230 | 2 490 | 2 956 | 3 308 | 3 339 | 3 412 |
| Category C (Districts) | 58 | 17 | 38 | 42 | 143 | 50 | 47 |
| **Total** | **14 216** | **15 191** | **17 026** | **18 282** | **20 867** | **21 621** | **22 652** |

*Source: National Treasury local government database*

Electricity is an important municipal function that makes up 20 per cent of total municipal revenue budgets in 2007/08. Table 8.5 shows that most electricity expenditure (both operating and capital) takes place in metros and large urban municipalities. In 2006/07, over four-fifths of electricity expenditure took place in the 27 municipalities with the largest budgets.

*An appropriate balance be struck between investing in new versus old infrastructure*

In 2006/07, electricity operating expenditure made up 83 per cent of total electricity budgets and electricity infrastructure expenditure, 17 per cent. Current trends in municipalities indicate that most municipalities primarily focus on investing in new electrification infrastructure to extend the provision of the service and make only limited contributions towards the repair, replacement and upgrading of existing infrastructure. As the lack of proper and timeous maintenance of infrastructure could impact on the reliability of supply, it is accordingly important that an appropriate balance be struck between investing in new versus old infrastructure.

The operating expenditure is primarily the cost of bulk electricity purchase and does not necessarily include staff and other costs associated with this service. It is therefore difficult to assess the extent to which municipalities profit from their electricity function.

### Electricity budget of two municipal entities

*Most municipalities are still to introduce ring-fenced electricity budgets*

The recently enacted Electricity Regulation Amendment Act (2007) will require municipalities to prepare ring-fenced electricity budgets in future. Most municipalities have, however, not yet fully ring-fenced their electricity operations to generate separate budgets, this means they have not incorporated the electricity related departments into one entity/company with its own administration and functions (such as City Power and Centlec, which are discussed below). Nevertheless, municipalities are intending to spend R21.6 billion on electricity in 2008/09 compared to the R14.2 billion spent in 2003/04. Making electricity a ring-fenced service will bring about institutional efficiencies that will yield many benefits, including a more correctly costed service and tariff setting that is more appropriately aligned with the actual cost of providing the service.

Table 8.6 provides an analysis of current practices in City Power and Centlec, illustrating some of the current electricity tariff and surcharge practices in municipalities. The City of Johannesburg established the Johannesburg City Power municipal entity in 2001 and the Mangaung municipality established the Centlec municipal entity in 2002.

The table clearly shows the difference in size of the two entities. City Power's income and expenditure is almost nine times that of Centlec, which points to the range in different municipal distributors. The Community Survey 2007 results show that 3 888 180 people reside in the City of Johannesburg and 752 906 people in Mangaung municipality. City Power provides electricity to approximately 300 000 customers in its area of provision (which makes up only a proportion of overall electricity provided in Johannesburg as Eskom also provides electricity to large numbers of customers in certain areas of Johannesburg), while Centlec provides to 159 000 customers, of which 4 400 are business customers.

**Table 8.6 Budgets of two municipal entities focused on electricity provision, 2006/07 – 2009/10**

| R million | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2006/07 | 2007/08 | 2008/09 | 2009/10 |
|---|---|---|---|---|---|---|---|---|
| | City Power (Johannesburg) | | | | Centlec (Mangaung) | | | |
| Income | 4 100 | 4 519 | 4 936 | 5 379 | 558 | 628 | 662 | 699 |
| Expenditure | 4 035 | 4 374 | 4 718 | 5 042 | 461 | 511 | 525 | 558 |
| **Income:** | | | | | | | | |
| User charges for services | 3 898 | 4 312 | 4 706 | 5 126 | 514 | 552 | 580 | 606 |
| Other income | 202 | 207 | 230 | 253 | 44 | 76 | 82 | 93 |
| **Total operating income** | **4 100** | **4 519** | **4 936** | **5 379** | **558** | **628** | **662** | **699** |
| **Expenditure:** | | | | | | | | |
| Employee Costs - wages and salaries | 328 | 355 | 379 | 396 | 67 | 64 | 67 | 70 |
| Employee Costs - social contributions | 76 | 88 | 94 | 98 | 11 | 12 | 12 | 13 |
| Bad debts | 152 | 152 | 166 | 181 | 1 | 1 | 1 | 1 |
| Depreciation | 225 | 212 | 249 | 179 | 28 | 44 | 45 | 48 |
| Repairs and maintenance | 122 | 129 | 136 | 145 | 9 | 17 | 18 | 18 |
| Interest expense - external borrowings | – | – | – | – | – | – | – | – |
| Bulk purchases | 2 418 | 2 678 | 2 891 | 3 207 | 306 | 331 | 346 | 362 |
| Own generation | – | – | – | – | – | – | – | – |
| Contracted services | 225 | 265 | 278 | 290 | 12 | 10 | 1 | 11 |
| General expenses - other | 110 | 151 | 158 | 165 | 27 | 33 | 35 | 36 |
| **Direct operating expenditure** | **3 657** | **4 030** | **4 352** | **4 662** | **461** | **511** | **525** | **558** |
| Internal transfers | 378 | 344 | 365 | 379 | – | – | – | – |
| Contributions to municipality | – | – | – | – | – | – | – | – |
| Internal charges | – | – | – | – | – | – | – | – |
| **Total operating expenditure** | **4 035** | **4 374** | **4 718** | **5 042** | **461** | **511** | **525** | **558** |
| **Surplus / deficit (-)** | **65** | **145** | **218** | **337** | **96** | **116** | **137** | **140** |

*Source: Municipal budgets documentation*

Between 2006/07 and 2009/10, total electricity expenditure for City Power is projected to increase from R4 billion to R5 billion for City Power and from R461 million to R558 million for Centlec. As bulk electricity purchases make up a large proportion of this expenditure (70 per cent), the price changes from Eskom would need to be factored into these entities' budget projections.

Both entities are expected to run at a surplus over the four year period, on average R191.1 million for City Power and R122.5 million for Centlec. The surplus suggests that these funds could be and probably are used to fund other municipal activities or functions. The future sustainability of these surplus levels could, however, be influenced by increased costs to purchase bulk electricity (making electricity tariffs affordable to customers could mean that municipalities have to absorb some of these increases). Another factor affecting future sustainability of surplus levels is the reforms to surcharges on municipal services, where certain municipalities will be required to reduce electricity surcharges to affordable levels when the norms and standards on surcharges on municipal services are introduced in terms of the Municipal Fiscal Powers and Functions Act (2007).

### Centlec's achievements

Ever since its establishment as a corporate entity of Mangaung local municipality, Centlec has grown from power to power as an electricity distributing entity in Free State. Centlec is assisting smaller local municipalities in building capacity, including Naledi, Mohokare and Kopanong. Eskom employees are also offered training at Centlec.

In 2006, Business Initiative Development (BID), a world recognised company for the provision of quality services, awarded Centlec a golden award for their progress and quality of service delivery in electricity distribution. Centlec was rewarded again by BID when it received a platinum award for customer service in October 2007.

*Source: Extracts from The Weekly (Free State newspaper): 31 October 2007 – 7 November 2007*

## Factors influencing the efficient provision of the electricity distribution function

*Various factors impact on the ability of municipalities to render the electricity distribution function*

A range of external and internal factors impact on the ability of municipalities to render the electricity distribution function. In relation to the internal factors, if municipalities are proactive there can be substantial spinoffs. These include investing appropriately in the maintenance of existing electricity infrastructure (in addition to rolling out new infrastructure) and setting electricity tariffs to appropriately cater for all related costs. These issues are discussed below.

### Maintenance of existing infrastructure

In addition to appropriately investing in new electricity infrastructure, municipalities should also make appropriate funds available for the maintenance and refurbishment of existing assets in order to ensure reliable service provision.

*Technical problems and power outages are mostly due to failures in existing distribution lines and networks*

In recent years, some municipalities have experienced technical problems and power outages due to failures in existing distribution lines and networks, rather than a failure in Eskom supply. Older networks are being increasingly damaged by supply disruptions, leading to more frequent distribution failures.

### Factors contributing to the current state of municipal infrastructure

EDI Holdings Company, which was established by the national Department of Minerals and Energy to facilitate the restructuring of the electricity distribution industry in South Africa, has indicated that, according to its research findings, a backlog of approximately R5 billion in infrastructure investment has developed over the last 10 years.

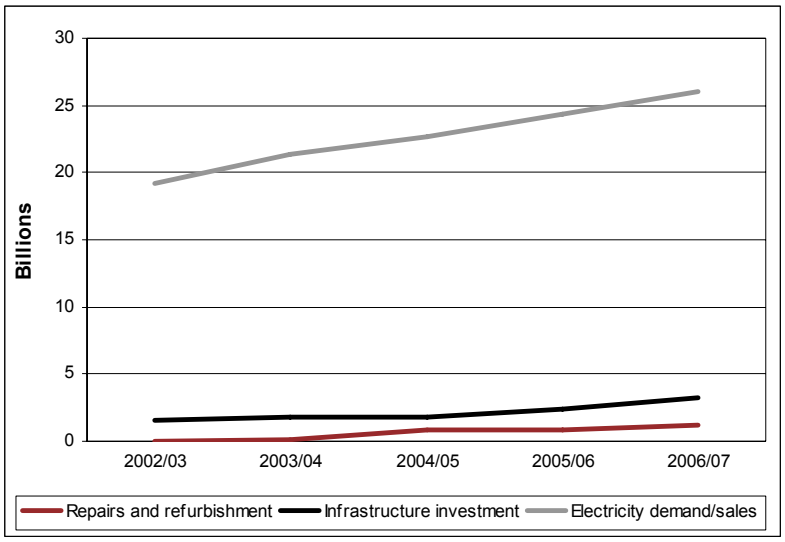
NERSA has indicated that some of the reasons for the current state of municipal distribution infrastructure are:

- Most equipment is ageing, its unreliability is increasing as is the cost of repair and it needs to be replaced.
- Most equipment is overloaded, due to unplanned-for development in its area.
- Few municipalities have adequate planned or preventative maintenance programmes.
- Few municipalities have infrastructure asset databases, many rely on their corporate memory for their maintenance strategy, few have contingency arrangements and many lack adequate stocks of suitable spare parts.
- Insufficient provision has been made for refurbishment of networks. Practice has in many cases been to rely on the overdesign of the past, but that capacity has now been eroded.

*Growth in electrification does not correspond with the growth in electricity demand*

Figure 8.6 shows the growth trends in municipal electricity sales (which is a good proxy for demand in electricity), total investment in electricity and spending on repairs and maintenance of existing electricity infrastructure. Investment in new and existing electricity infrastructure could be lagging behind as growth in electrification does not correspond with the growth in electricity demand. The trends in investment are becoming flatter, while demand is steadily increasing.

**Figure 8.6 Electricity demand and investment, 2002/03 – 2006/07**




*Source: National Treasury local government database*

NERSA has recommended that when municipalities determine their electricity tariffs for 2008/09, the revenue requirement should be inclusive of a 5 per cent provision for maintenance, refurbishment and recapitalisation and a 7 per cent provision towards capital charges. In 2006/07, metros spent close to 7 per cent of their total capital budget on repairs and refurbishments on existing electricity infrastructure. The City of Johannesburg and the City of Cape Town, combined, spent approximately R1.6 billion on repairs and refurbishment to existing electricity infrastructure between 2004/05 and 2006/07. This investment will have long-term benefits as well maintained systems will ensure more reliable electricity supply. Outages resulting from insufficient maintenance will be less frequent.

## Addressing non-technical electricity losses

Another way for municipalities to ensure that electricity services are provided more efficiently is taking appropriate measures to counter electricity losses. The process of distribution from municipalities to customers results in several technical and non-technical losses. The national average of electricity losses is 15 per cent for municipal distributors. This amounts to roughly R4 billion in electricity losses from total municipal electricity sales in the country.

*While technical losses are largely unavoidable, non-technical losses are more of a concern*

Certain technical losses are inevitable during the transmission process. Technical losses should ideally not exceed an average 3.5 per cent for the transmission networks and 6.5 per cent for distribution networks. This figure varies, depending on the circumstances, such as the distance the electricity needs to be transported and the extent to which the electricity needs to be converted from higher to lower voltages and *vice versa*, in order to adapt to the specific lines. Electricity losses give an indication of the need to repair and refurbish existing lines in order to make them more efficient.

Non-technical losses are more of a concern - these losses can be attributed to illegal connections, tampering and incorrect billing. According to NERSAs pricing guidelines, electricity losses in excess of the 6.5 per cent allowed for technical reasons are excessive and need to be addressed as a matter of urgency by municipal distributors.

### Improved regulation of the electricity reticulation function

*The Electricity Regulation Amendment Act places certain responsibilities on municipalities in relation to electricity reticulation*

The Electricity Regulation Act (2006) deals with the regulation of the whole electricity chain, excepting electricity reticulation. But the recently enacted Electricity Regulation Amendment Act (2007) fills this gap by addressing the regulation of electricity reticulation services. The act places certain responsibilities on municipalities in executing their executive authority in relation to the provision of the electricity reticulation service. In terms of the Act, a municipality must:

- comply with all technical and operational requirements for electricity networks determined by the regulator
- progressively ensure access to at least basic reticulation services through appropriate investments in its electricity infrastructure
- provide basic reticulation services free of charge or at a minimum cost to certain classes of end-users within its available resources
- ensure sustainable reticulation services through effective and efficient management and adherence to national norms and standards
- execute its reticulation function in accordance with national energy policies
- keep separate financial statements, including a balance sheet of the reticulation business.

Section 160(2)(c) of the Constitution stipulates that it is the responsibility of the municipal council to impose rates and tariffs (including electricity reticulation tariffs) and that this cannot be delegated to any other body or institution. Although the important role of the regulator (NERSA) is acknowledged, it is important that its activities do not infringe on the constitutional mandate of local government in relation to electricity reticulation services.

Further legislative reforms are under way to make electricity tariff and surcharge setting processes more efficient and transparent. The Municipal Fiscal Powers and Functions Act (2007) makes provision for the introduction of compulsory norms and standards on municipal surcharges, including electricity reticulation. The Act defines a base tariff as "the fees necessary to cover the actual cost associated with rendering a municipal service" and a surcharge as "a charge in excess of the municipal base tariff that a municipality may impose on fees for a municipal service provided by or on behalf of a municipality, in terms of section 229(1)(a) of the Constitution".

*Further legislative reforms are under way to make electricity tariff and surcharge setting processes more efficient and transparent*

National Treasury aims to introduce regulations on electricity surcharges from 2010/11. When these are in place, NERSA will be responsible for regulating the base tariff and National Treasury will regulate the electricity surcharge. In the interim, the regulator will still prescribe electricity tariffs inclusive of the surcharge.

In addition, the Department of Minerals and Energy has initiated a process for developing a pricing policy framework for the electricity industry. The policy is intended to:

- introduce transparency in pricing and tariffs (including making existing cross-subsidies more transparent)
- define accurately and distinctively the roles of the several stakeholders consequently introducing efficiency in the pricing procedures and to prevent duplication of tasks
- introduce norms and standards in pricing principles
- resolve any current or apparent conflicts.

### Progress in the reform of South Africa's electricity distribution industry

As discussed earlier, the current electricity distribution industry is not uniform and is characterised by a small number of very large distributors (Eskom Distribution and the 12 largest municipalities) and a large number of very small distributors. This has led to various problems in the industry, including the inability of the smaller distributors to achieve economies of scale, skills and specialisation.

The restructuring of the electricity distribution industry has been the subject of considerable debate since at least 1988. More recently EDI Holdings Company has been established to facilitate the restructuring process. The challenge is to merge the distribution structures of Eskom and municipalities into the REDs without compromising the provision of electricity or adversely affecting municipal finances. The restructuring also needs to avoid introducing undue risks for Eskom, so that it is able to maintain its current credit profile, which is needed to facilitate the required capital investment in additional generation capacity.

The six RED boundaries were drawn to provide for a balance of customers in terms of the type (domestic/industrial) and location (rural/urban/metro). Each of the six REDs is to be anchored around one of the metros, which would then be required to subsidise

*Each of the six REDs is to be anchored around one of the metros*

electricity provision in the surrounding poorer municipalities. RED1 will be anchored in the City of Cape Town (although RED1 was established as a pilot in 1 July 2005, it has since been disbanded), RED2 in the Ekurhuleni municipality, RED3 in Nelson Mandela Bay municipality, RED4 in the City of Johannesburg, RED5 in eThekwini municipality and RED6 in the City of Tshwane.

Concerns have been raised that the pace of the EDI restructuring process is too slow and that it has resulted in some operational practices being applied by electricity distributors which have led to inefficiencies in the sector, as their future role in the electricity distribution function has not yet been clarified. This could be one of the reasons that municipalities have been reluctant to invest in the maintenance and refurbishment of electricity infrastructure.

National government has acknowledged this concern and is currently dealing with some of the outstanding EDI policy and legislative issues, including:

- an asset transfer framework for transferring Eskom's and municipal assets to the REDs
- a compensation framework (compensation does not refer to cash but the number of shares to be allocated to Eskom and each municipality in a RED)
- dealing with key industrial customers
- format of a service delivery agreement between municipalities and a RED
- addressing any possible financial and other risks for Eskom and municipalities.

## Conclusion

The correlation between electricity and economic growth is apparent and electricity's importance in the growth process and its ability to better the lives of people cannot be denied.

The South African electricity industry is going through a very important phase in its development. Although South Africa is currently facing a number of challenges with regard to security of supply, government is committed towards making substantial investments over the next few years to enable the building of appropriate generation capacity for future years. This will be complemented by initiatives on the demand-side to bring down existing energy consumption levels (and maintaining long-term sustainable levels of consumption). Alternative sources of energy, such as solar panels, are also an important development.

Despite current problems facing the sector, the Community Survey 2007 does show that great strides have been made in providing basic electricity services to the majority of South Africans and making a better life for all.