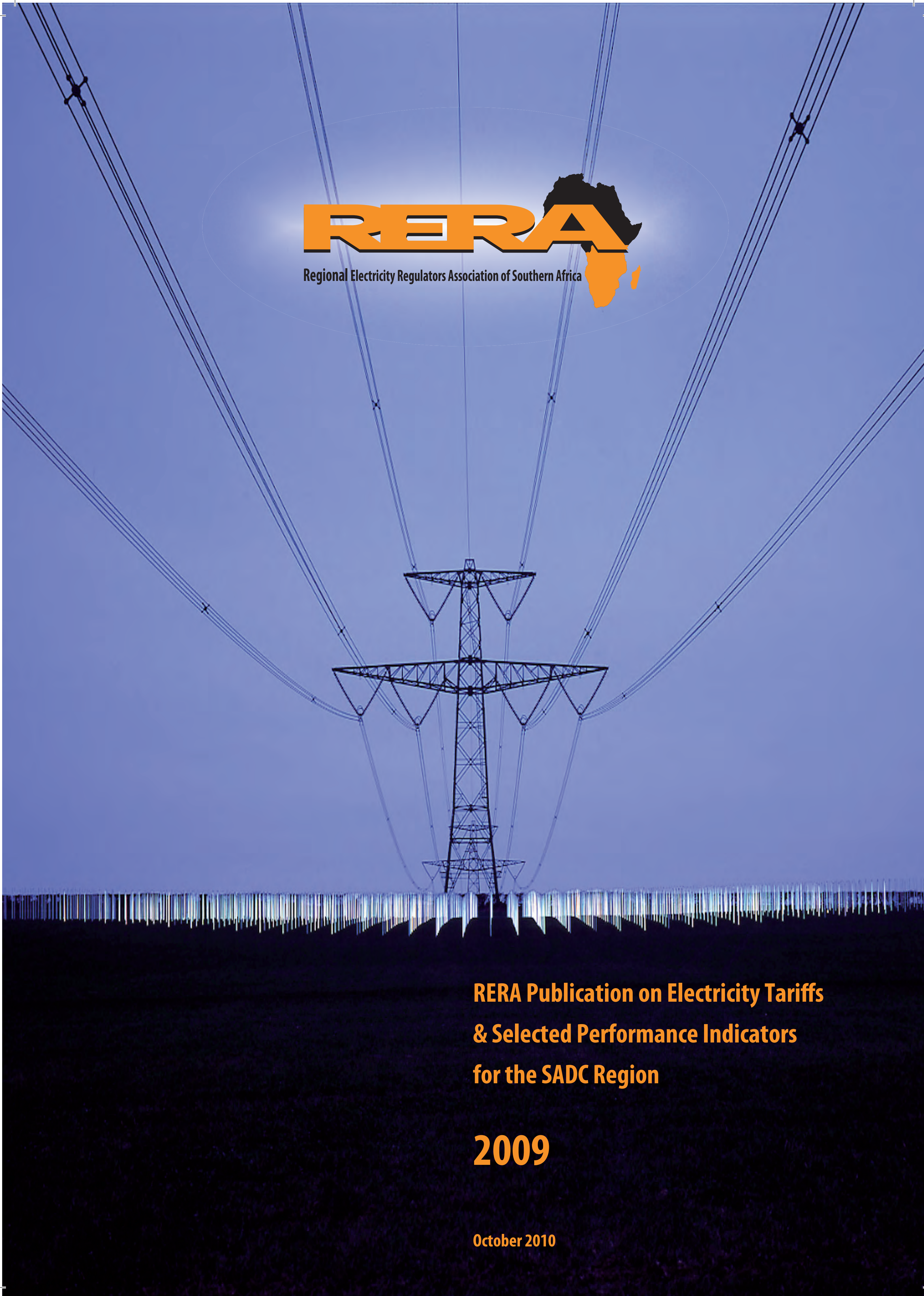

RERA

Regional Electricity Regulators Association of Southern Africa

RERA Publication on Electricity Tariffs & Selected Performance Indicators for the SADC Region

2009

October 2010

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Within the Southern Africa Development Community (SADC) region, the governments, regulators, utilities and developers have identified that problems exist in the enabling environment for attracting investments in the electricity supply industry (ESI). Prominent among the identified problems is that of electricity tariffs being unable to provide the right signals for promoting new investments and encouraging efficient use of electricity. To this end, the SADC Ministers responsible for energy made a decision to adopt the principle of cost reflective tariffs in the SADC region in July 2004 in Namibia. This decision was reaffirmed at the meeting of the Ministers held in Harare, Zimbabwe in April 2007. The decision of the Ministers was supported by a resolution of the SADC Council of Ministers in February 2008 in Lusaka, Zambia that countries within the region should endeavour to reach cost reflective tariffs within a period of 5 years.

In support of the implementation of the aforementioned ministerial decisions, the Southern African Power Pool (SAPP), with the support of the Development Bank of Southern Africa (DBSA), carried out a study to review electricity tariff setting principles and issues surrounding electricity tariffs and pricing in the SADC region. The recommendations of the study were presented and approved at the meeting of the SADC Ministers responsible for energy in Maputo, Mozambique in April 2009. In approving the study recommendations, the Ministers tasked the Regional Electricity Regulators Association of Southern Africa (RERA) to start producing an annual electricity tariff publication to highlight the movement towards cost reflective tariffs and provide a comparative analysis of tariffs in the SADC region.

This first Publication of the Regional Electricity Regulators Association of Southern Africa (RERA) on "Electricity Tariffs and Selected Performance Indicators in the Southern African Development Community (SADC) Region" is in response to the task given to the Association by the SADC Ministers responsible for energy. It is also an earnest attempt by RERA to address some of the challenges regarding the availability of timely, reliable and comprehensive information in the electricity supply industry (ESI). It covers not only the comparative analysis of the tariffs in the SADC region but also some selected performance indicators that are critical in decision making, monitoring and benchmarking.

This Publication will be one of RERA's annual flagship publications. Much as the Publication should serve as an in-depth analysis and synthesis of the tariffs and performance indicators, it may not be necessarily the case at this moment given the prevailing country differences in the understanding and working definitions of some of the parameters in the ESI. Nevertheless, RERA is confident that the publication will assist in bridging some of the information gaps and serve as an essential information aid on regional trends pertaining to ESI tariffs and performance for governments, regulators, utilities, non-governmental organizations, academia, investors and other interested parties. With the good support and responsiveness from the interested parties, RERA hopes to improve on the Publication in terms of its timely production, scope of coverage and in-depth analysis.

RERA would like to thank its Members and those of the Southern African Power Pool (SAPP) for their cooperation in providing the information used in the publication. RERA is also grateful to the Southern Africa Global Competitiveness Trade Hub, a USAID funded project, for supporting the development of a database that was used in production of the statistical information in this Publication.

Finally, special thanks go to Mrs. Helene Vosloo, Manager – Economic Regulation at the Electricity Control (ECB) of Namibia and Chairperson of the RERA Economic Regulation Subcommittee, and Uli von Seydlitz of EMCON Consulting Group Namibia, for diligently undertaking the tasks of reviewing, analysing and synthesising the information in this Publication.

Smunda S. Mokoena

RERA Chairperson & National Energy Regulator of South Africa (NERSA) Chief Executive Officer (CEO)

The South African Development Community (SADC) Ministers responsible for Energy established the Regional Electricity Regulators Association of Southern Africa (RERA) as a formal association of electricity regulators at a meeting in Maseru, Lesotho on 12 July 2002 and the Association was officially launched in Windhoek, Namibia on 26 September 2002. The Association was established in terms of the SADC Protocol on Energy (1996), the SADC Energy Co-operation Policy and Strategy (1996), the SADC Energy Sector Action Plan (1997), the SADC Energy Activity Plan (2000) and in pursuit of the broader initiative of the New Partnership for Africa's Development (NEPAD) and the African Energy Commission (AFREC).

RERA has the following three (3) strategic objectives:

i) **Capacity Building & Information Sharing**
Facilitate electricity regulatory capacity building among Members at both a national and regional level through information sharing and skills training.

ii) **Facilitation of ESI Policy, Legislation and Regulations**
Facilitate harmonized ESI policy, legislation and regulations for cross-border trading, focusing on terms and conditions for access to transmission capacity and cross-border tariffs.

iii) **Regional Regulatory Cooperation**
Deliberate and make recommendations on issues that affect the economic efficiency of electricity interconnections and electricity trade among members fall outside national jurisdiction, and to exercise such powers as may be conferred on RERA through the SADC Energy Protocol.

The Association strives to be a credible regulatory organisation with the following **Vision Statement:**

> **"To be a world class Association that ensures a consistent and harmonised regulatory framework in the energy sector within the SADC region"**

RERA endeavours to champion the cause of electricity regulators in realising the vision and its commitment is captured in the following **Mission Statement:**

> **"To facilitate harmonisation of regulatory policies, legislation, standards and practices and to be a platform for effective cooperation among energy regulators within the SADC region"**

Membership to RERA is open to the electricity regulatory bodies in each country within the SADC region. As at 31 December 2009, eleven (11) out of fifteen (15) countries in the SADC region had established regulatory authorities and the following nine (9) regulatory authorities were Members of the Association:

- Electricity Control Board (ECB) of Namibia
- Energy Regulation Board (ERB) of Zambia
- Energy & Water Utilities Regulatory Authority (EWURA) of Tanzania
- Institute for Electricity Sector Regulation (IRSE) of Angola
- Lesotho Electricity Authority (LEA)
- National Electricity Advisory Council (CNELEC) of Mozambique
- Malawi Energy Regulatory Authority (MERA)
- National Energy Regulator of South Africa (NERSA)
- Zimbabwe Electricity Regulatory Commission (ZERC)

In the Southern African Development Community Region (SADC), the availability of timely and reliable energy data in general and electricity tariffs data in particular remains a big challenge. As tasked by the SADC Ministers responsible for energy to bridge the information gap on electricity tariffs and selected performance indicators, a survey was carried our via a questionnaire distributed to all the fifteen (15) SADC countries. The following limitations were encountered and must be taken into account when reading this report:

- Only Namibia and South Africa have partially unbundled industries with many distributors. The data returned for these two countries is a mix of data from the main utility and other sources and is not entirely consistent with the other countries' data when it comes to customer and employee numbers which are not necessarily national totals.
- There were some challenges with economic data on Zimbabwe and it had to be omitted on most of the country charts displaying economic and/or financial data in this report because of the inadvertent distortions. Although Zimbabwe provided the information on most of the questions, the economic challenges that the country faced over the past few years would have made comparisons with other countries in the region difficult.
- The inflation, foreign exchange rate and GDP numbers provided by the survey respondents do not in all cases correspond to official national figures obtained from national statistics websites. This has not been corrected in all cases and may lead to some inaccuracies. However, everything possible has been done to use the correct data.
- The following countries did not submit any data: Madagascar, Mauritius and Malawi and the data received from the DRC was very limited and had to be omitted for some of the analysis.
- When information was omitted by respondents these countries were left out in that specific analysis.
- On a number of the figures one country is very dominant, overshadowing all others. In such cases an additional version of the figure is provided showing the same data without the dominant country.

The Publication is organised into three sections. Chapter 2 deals with the demographic information of the RERA member countries followed by some economic indicators for the different countries. Chapter 3 deals with the technical information and indicators for the relevant countries and Chapter 4 provides an overview of the tariffs for the different countries.

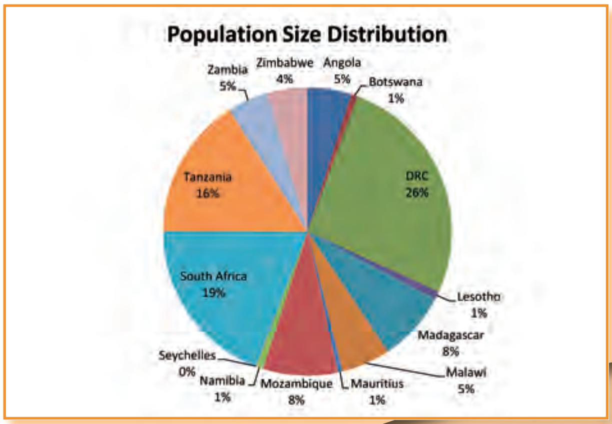


Figure 2-1: Population Size Distribution

The SADC region has a population of about 254,870,156[1] of which the largest populations are found in the DRC, South Africa and Tanzania. Twenty six (26%) percent of the total population of the region live in the DRC and 19% live in South Africa (Figure 2-1).

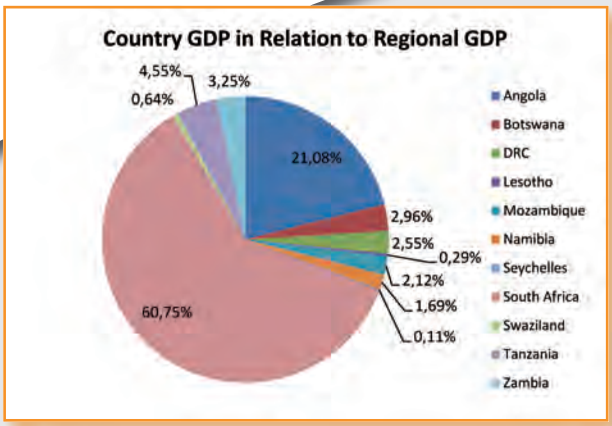


Figure 2-2: Country GDP as % of Regional GDP

In terms of the combined Gross Domestic Product (GDP) for Southern Africa, it was approximately $455.12 billion in 2008 (Figure 2-2). Individual national economies are structurally diverse and at varying stages of development. South Africa, the region's most developed economy, had a GDP of $276.49 billion, which constitutes about 60.75% of the regional GDP. Challenges of post-war disarmament and reconstruction (in Angola and DRC), and continuing internal political problems (Zimbabwe) have adversely affected economic performance in these states. The Zimbabwean economy has experienced a sharp deterioration over the past five years, with the economic situation reaching critical levels and inflation reaching millions of percentage points. The power-sharing government formed in February 2009 has led to some economic improvements, including the cessation of hyperinflation by eliminating the use of the Zimbabwe dollar and removing price controls. The economies of DRC and Angola have begun to experience GDP growth as peace agreements in both countries begin to take hold. A post war reconstruction boom and resettlement of displaced persons has led to high rates of growth in construction and agriculture but Angola's high growth rate in recent years was driven by its oil sector and high international oil prices. Oil production and its supporting activities contribute to about 85% of GDP. However, the economic decline in the world has had an adverse effect on most of the SADC countries especially on South Africa and those with their currencies linked to the South African Rand.
South Africa as the biggest country in terms of industry overpowers the SADC countries with its economy. It has the highest GDP as expressed in US$. Most of the other countries have more or less the same size of economies if expressed in US$ but the way that these economies are constituted differs.

[1] CIA World Factbook

Figure 2-3: Annual GDP Growth per Country

Most of the economies have shown a positive growth rate between 2005 and 2008 except for the Seychelles (Figure 2-3). The GDP grew in the Seychelles driven by tourism and a boom in tourism-related construction. The Seychelles Rupee was allowed to depreciate in 2006 after being overvalued for years and fell by 10% in the first 9 months of 2007. Despite these actions the Seychelles economy has struggled to maintain its gains and in 2008 suffered from food and oil price shocks, a foreign exchange shortage, high inflation, large financing gaps, and the global recession. Angola continues to show a high economic growth rate due to continued progress with respect to macroeconomic stability and reforms combined with rising commodity prices especially that of oil, contributed to the good performance.

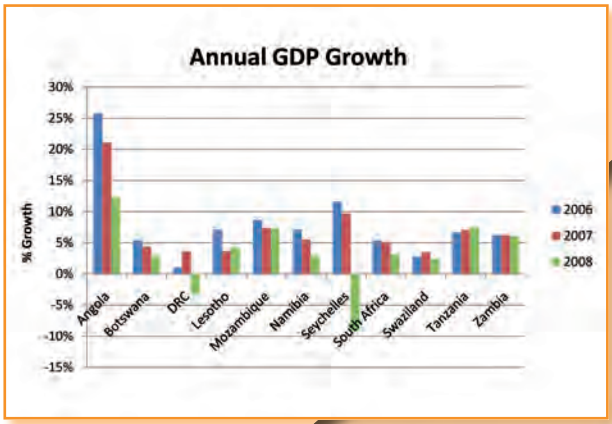
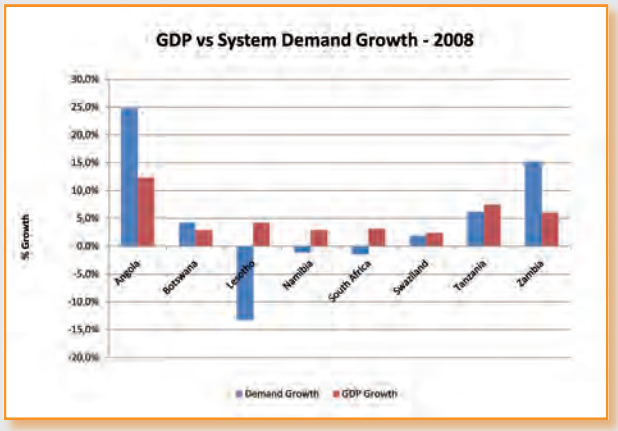


Figure 2-4:
GDP vs System Demand Growth per Country

In most developing economies the GDP growth rate is positively correlated to growth in electricity demand and in most SADC countries this statement holds true (Figure 2-4). However, due to the shortage of supply in the region since 2007 many of the countries experienced a decline in system demand growth. For those countries importing from ESKOM in South Africa this can be attributed to the fact that countries had to reduce their demand by at least 10%. This results in unusual developments where some countries have a stagnant or even declining system peak demand while still showing a positive GDP growth.



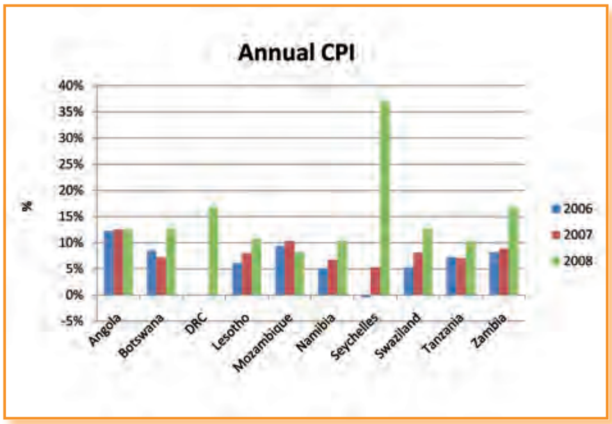
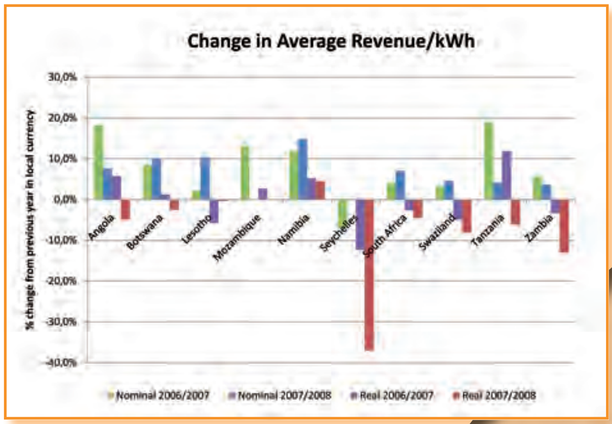


Figure 2-5: Annual CPI per Country

Overall inflation rates in the SADC countries tend to be high by world standards (Figure 2-5). According to the SADC Economic and Business Environment Outlook for 2007 Report regional inflation raised to 7.8 per cent in 2007, up from 6.5 per cent in 2006, largely as a result of strong domestic demand and high food and energy prices. Nonetheless, inflationary pressures were cushioned by bountiful food supplies in some Member States such as Malawi and monetary policies that have helped to check inflation expectations and the effects of higher oil prices such as in South Africa and Namibia. It is very clear that there were inflationary pressures in 2008 in all the SADC countries and inflation tends to be higher than in previous year especially in the Seychelles where inflation increased to over 35%.

Figure 2-6: Change in Average Revenue / kWh



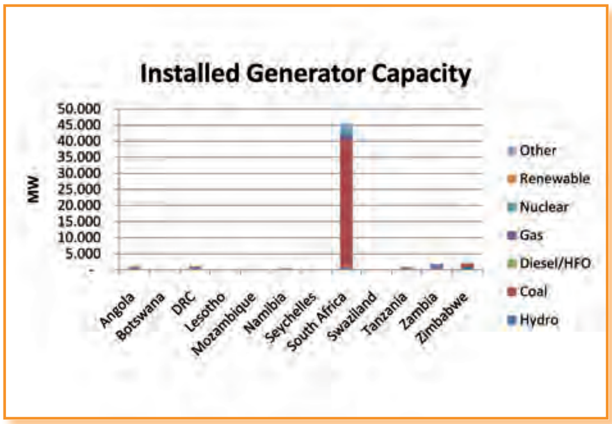
Although some countries allowed for a tariff increase in 2007, the increase in revenue is more a reflection of the increase in energy sales (Figure 2-6). When inflation started to rise very few of these increases were really enough to work against the high inflation rates. In most countries real revenue growth was negative and only in Angola, Botswana, Namibia and Tanzania had positive real growths in 2007. The real change in revenue indicates that tariff increases combined with growth in energy consumption in most countries were not high enough to lead to enough revenue in the short term to run the utilities effectively.

The energy growth rates and/or the allowed tariff increases in 2007 led the same trend in 2008. Only Namibia had a real revenue increase in 2008. Namibia has consistently received real tariff increases over the past years since 2003 and this can be seen from the change in real revenue/kWh in real terms.

It must be noted that the increases taken were not those provided by the countries but were calculated from the revenues and energy sales figures provided. It is therefore an increase of both units and price. This was necessitated by the fact that increases provided by the respondent countries varied over the period 2006-2008 and therefore could not be compared with each other.

In summary,

the economies in the region vary in size and composition. Electricity plays an increasingly important role in contributing to economic growth in the region and at the same time economic growth contributes to the increase in demand for electricity. This places additional pressure on utilities and governments to utilise scarce resources in the most efficient ways.



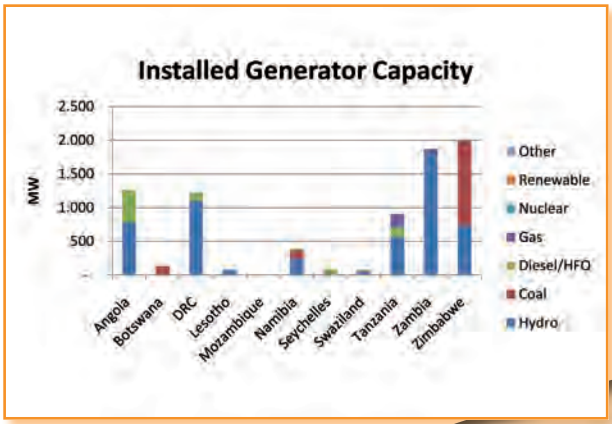
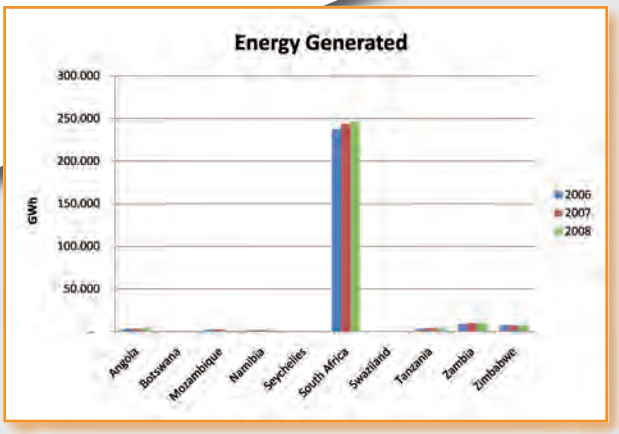


Figure 3-1: Generator Capacity by Type

The electricity value chain starts with the production of electricity in generating stations. In the Southern African region the vast majority of generation capacity is located in South Africa (Figure 3-1). This correlates with the fact that the South African economy dominates the region. Most of the generation capacity in South Africa is coal based while the other larger capacity countries rely largely on hydro generation.



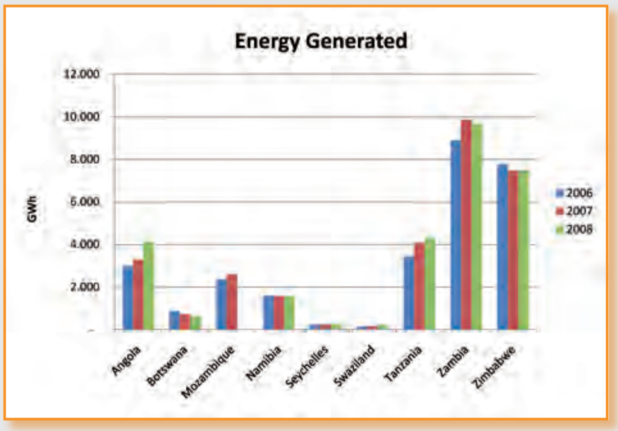


Figure 3-2: Energy Generated

South Africa is by far the most prominent country in terms of electricity generated followed by Zambia and Zimbabwe (Figure 3-2). Lesotho generates very little electricity as do Swaziland and the Seychelles. There is however a number of new projects planned all over the SADC region in all of the different countries. With the current energy shortage in the region, more and more countries are embarking on generation projects. Many countries are also putting programmes in places to invite private investment and the establishment of Independent Private Producers (IPPs).

Figure 3-3: System Maximum Demand

South Africa is also the largest consumer as illustrated in Figure 3-3 which shows the system peak demand and Figure 3-4 which shows energy sales by country. The only countries that stand out in terms of system demand besides South Africa are Zimbabwe and Zambia, with all remaining countries having a peak demand of around 500MW or less.

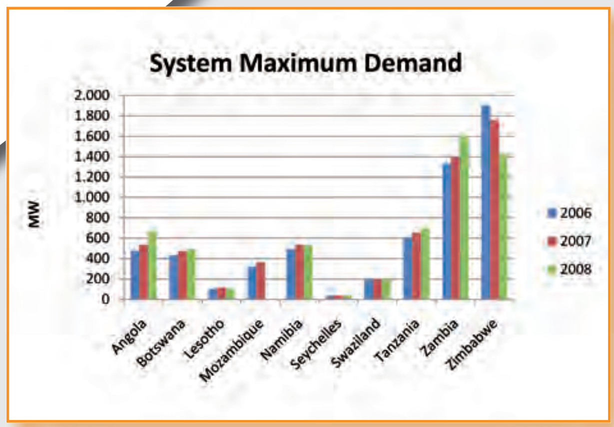
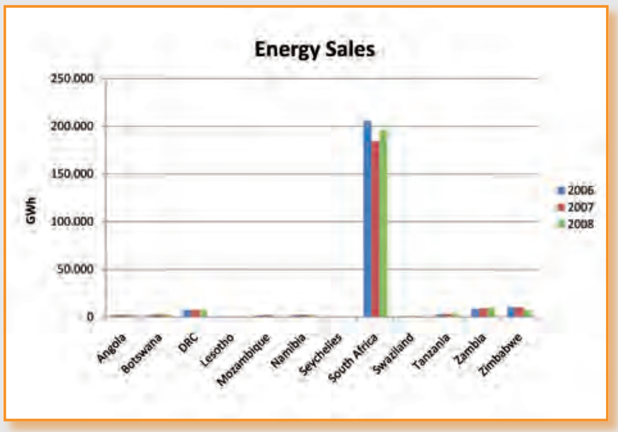
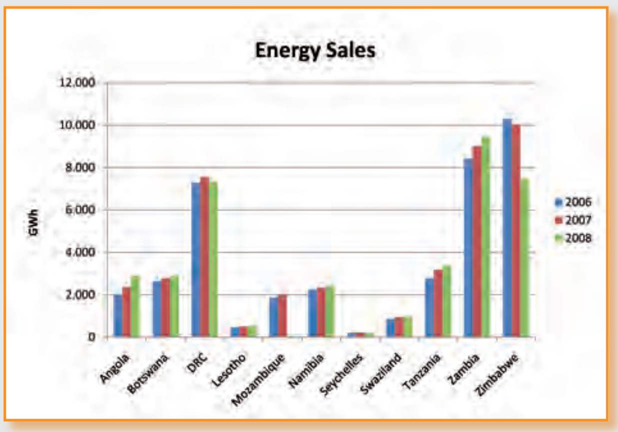


Figure 3-4: Energy Sales

In contrast to the system peak it is interesting to note that although South Africa again dominates the regional scene it is Zimbabwe, Zambia and DRC that stand out from the rest in terms of energy sold as shown in Figure 3-4.





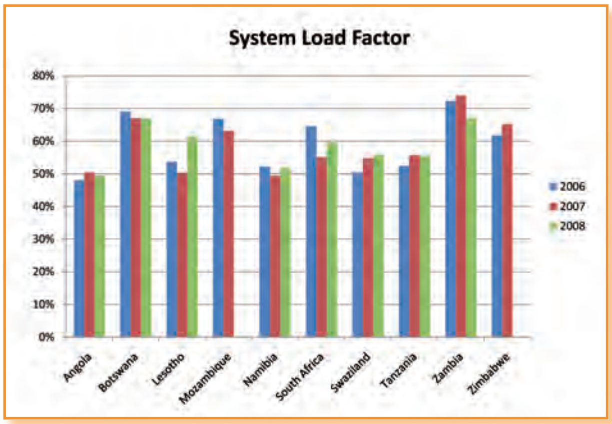


Figure 3-5: System Load Factor

All countries that provide information on both the system demand and energy sold have reasonable load factors, most around 50% or more. The system load factors in Figure 3-5 have been calculated from the system peak demand and energy sales stated by the respondents. Normally a higher load factor indicates a higher portion of industrial load on the system as opposed to residential load which tends to have a very low load factor. Most countries have a load factor between 50% and 60% which can be considered normal for countries with a mixed economy and substantial residential load in comparison to industrial load. For system efficiency one would like the system load factor to be as high as possible, but this is strongly influenced by the consumer profile, level and type of industrialisation as well as level of consumer awareness and demand side management implementation.

Figure 3-6: Number of Customers

South Africa has the most number of customers followed by Tanzania and Zimbabwe (Figure 3-6). In both Zambia and Zimbabwe the number of customers declined in 2009 whereas in the other countries the customer base either increased or stayed constant. The decline in customers could be attributed to the supply situation in these two countries and some other countries could soon be in the same situation with declining supply all over the SADC region and increasing energy pricing seen in some of the countries.

Figure 3-7: Customer Energy Density

The customer energy density in Figure 3-7 shows the overall average energy sold per customer per annum. This indicator is driven by a number of factors, the most prominent being the level of industrialisation (which increases the kWh/customer) and household electrification (which reduces the kWh/customer). Applying these two key factors may mean that in Tanzania consumption is dominated by residential and small business use while in South Africa the contribution from energy intensive business is much stronger despite the relatively high electrification rate.

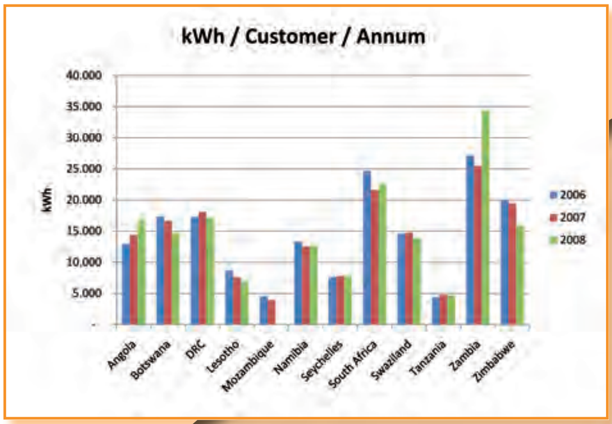


Figure 3-8: Customers / Employee

The ratio of customers per employee is a common performance indicator for the distribution and retail sector. What distorts the picture in Figure 3-8 is that the numbers given include varying degrees of generation and transmission employees which should not be counted in this equation. However, it is safe to assume that the vast majority of employees (with the possible exception of South Africa) will be employed in the distribution and retail sectors, limiting the distortions.

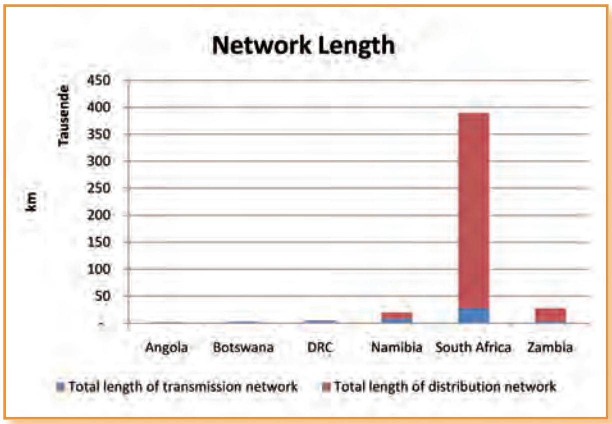
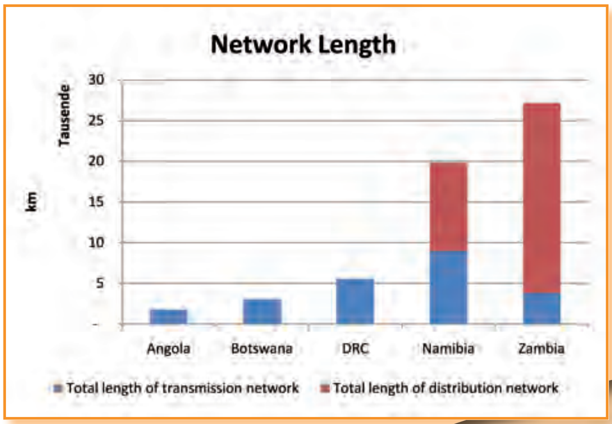


Figure 3-9: Network Length

Many countries did not provide network lengths, and many that did provide data only provided transmission network length. This is not surprising since most distribution networks are large and spread over large areas making them difficult to keep exact records of. The lengths provided are shown in Figure 3-9.



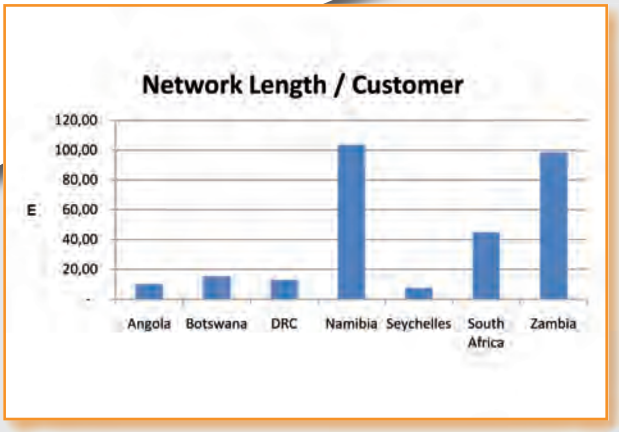
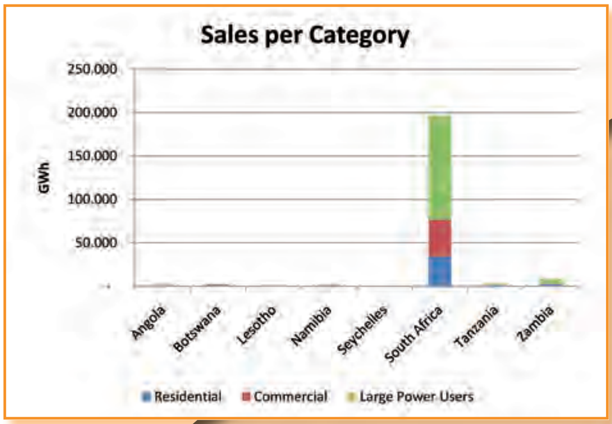


Figure 3-10: Network Length per Customer

Network length per customer is a key indicator for network density which drives a lot of the network cost per customer and has a profound influence on the cost of electricity in a country and this is shown in Figure 3-10. Namibia, South Africa and Zambia are the only countries that provided total network length. Not surprisingly Namibia with its very low population density has a high network length per customer while South Africa with its much higher population density has a much lower figure. However it is hoped to obtain better figures in the next survey since all figures seem low.

Figure 3-11: Sales per Category

Examining energy sales per customer category in Figure 3-11 reveals the different electricity consumption patterns in the respondent countries. In many countries large power users (customers who are on maximum demand metering) consume far more than half the total energy. In Lesotho this pattern seems quite extreme (i.e. very little residential and commercial consumption in relation to large power users) while in Tanzania almost half the energy is consumed by residential users. This cross-correlates with the previous finding that Tanzania has a very low annual kWh per customer.



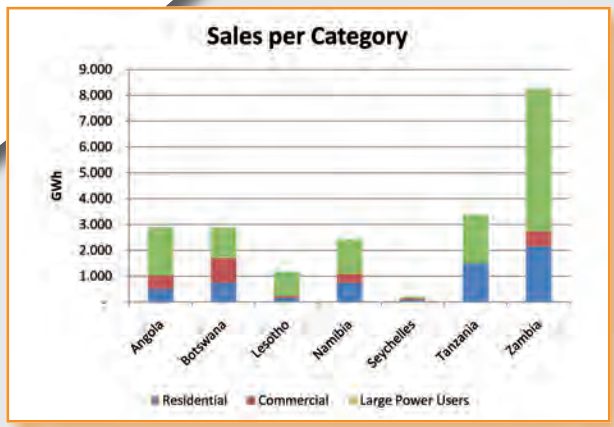


Figure 3-12: Distribution Losses

Distribution losses are given between 5% and over 30% in the worst case as shown in Figure 3-12. While the best cases of Lesotho and Botswana do not seem realistic most countries are between 10% and 20% which is normal for a mix of urban and rural distribution networks. Losses above 20% are normally indicative of significant problems in the sector, either due to inefficient networks (technical losses) or excessive electricity theft (non-technical losses).

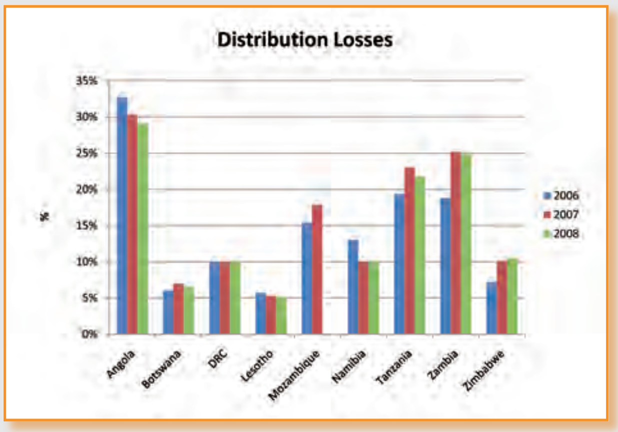
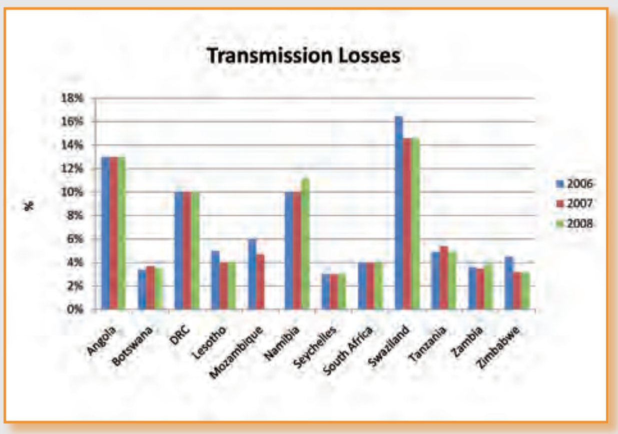


Figure 3-13: Transmission Losses

Transmission losses for most countries in Figure 3-13 are well under 10% which is normal. The Namibian transmission losses are very high due to a very long transmission network for relatively low load due to the extremely low population density of Namibia. Swaziland's high figure may be a case of misstatement – the figure provided may well be distribution losses (or total losses since Swaziland is a small country) and not transmission losses.



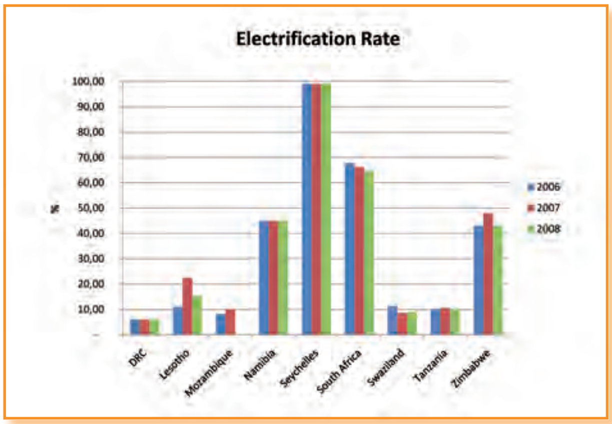


Figure 3-14:
Electrification Rate according to Survey Data

Electrification is a major topic in most countries in the region. Obtaining accurate electrification figures however is not easy since in many countries the population and average household sizes are not accurately known. Survey respondents were asked to state the country electrification rate (Figure 3-14). In parallel the total number of consumers was divided into the number of households derived by using population and average household size numbers from various sources. Discrepancies between the two sets of data may be due to many reasons, lack of accurate and current data probably being the most prominent.
From Figure 3-14, Seychelles clearly stands out with its 99% electrification rate. Of the other countries, South Africa has the highest rate, followed by Zimbabwe and Namibia. All other countries are at 20% or less, implying a huge burden of consumers waiting to be electrified. This underlines the importance of the grid versus off-grid electrification debates which will ultimately influence many of these households without electricity. Also when cross-referencing with the information provided on levies and taxes, many of the countries indicated that electricity prices include a levy for rural electrification.

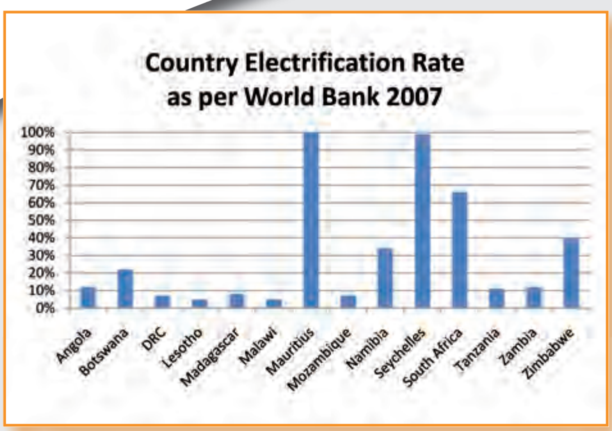
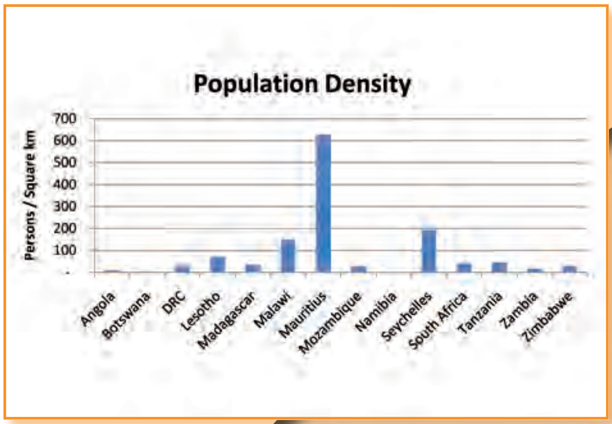


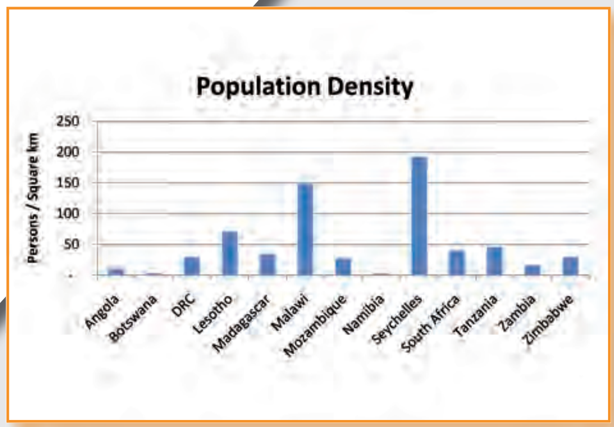
Figure 3-15:
Electrification Rate according to World Bank

Figure 3-15 provides electrification (access to electricity as % of population in 2007) data as per World Bank Public-Private Infrastructure Advisory Facility – Private Infrastructure Projects.

Figure 3-16: Population Density

Figure 3-16 shows population density per country. It has been included here to provide a basis for evaluating many of the other charts in the context of physical population density in the countries. While Mauritius has by far the highest density Botswana and Namibia have very low densities. One would expect this to have an effect on both losses (higher losses due to low density) and operational efficiency and cost (such as customers per employee – more employees needed to serve the customers in low density areas).





[2]

In summary the following observations are made:

- The regional electricity market is dominated by the magnitude of the South African system;
- Population densities and electrification rates vary dramatically;
- Most countries have very low electrification rates and thus great need for electrification;
- System load factor and population energy density vary significantly between the countries;
- Transmission and distribution losses are at normal levels in most countries when viewed in the context of energy densities and electrification rates;
- Customer/employee efficiency is well below normal international expectations for most countries which is partly related to low energy density and low electrification rates. This implies either higher operating costs or lower quality of supply and service or a combination of both when compared to most developed countries.

[2] Source of Data: CIA World Factbook accessed on the internet in March 2009/April 2010

In many SADC countries today electricity tariffs are not cost reflective. South Africa used to have excess supply and was a net exporter to many of the SADC countries. The energy supply situation in the SADC Region is facing an enormous challenge due to many reasons including (i) a lack of effective advance planning, (ii) an impressive growth in energy demand in many of the countries in the region, (iii) generally low tariff levels due to Eskom's past surplus capacity, and (iv) a sizable drop in Eskom's generation surplus over the last few years. These factors have put pressure on governments and regulators alike to increase electricity tariffs because there is a need for investment in electricity infrastructure but at the same time there is also a need for private sector participation in the electricity industry in the region. Without cost reflective electricity prices both these objectives will be hard to achieve.

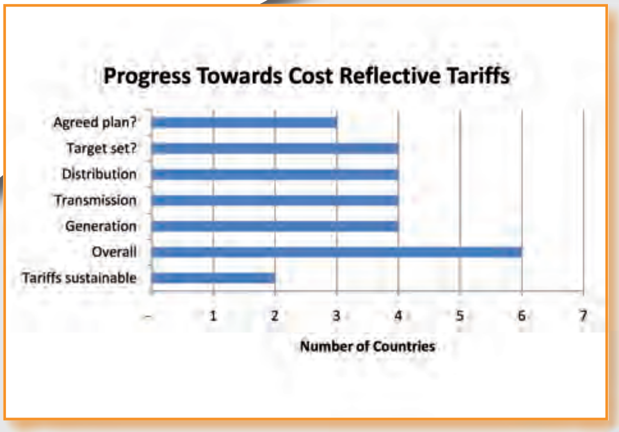


Figure 4-1:
Progress towards Cost Reflective Tariffs

Of the 12 member countries of SADC that responded to the questionnaire (Figure 4-1) six (6) have done cost of supply studies and determined what the cost reflective tariff levels should be. However, only two (2) countries (South Africa and Swaziland) indicated that the current tariff level are sustainable and provide the right signals for investment and the efficient use of electricity. In only three (3) countries a price path towards cost reflective tariffs has been approved namely Namibia, Zambia and Swaziland. It means that although some countries realise that there is a need to have cost reflective tariffs little or no concrete action has been taken to reach these.

What is of concern is that most SADC countries have only determined tariff levels for retail (i.e. end consumer price levels). Only four countries determined separate cost reflective levels for generation, transmission and distribution tariffs leaving the question of how accurate the cost of supply studies were in determining cost reflective tariffs.

Figure 4-2: Tariff Structures per Sector

As shown in Figure 4-2 two (2) countries have seperate generation tariffs (Namibia and South Africa) whereas only three (3) countries have seperate transmission tariffs (DRC, Namibia and South Africa) and almost all countries have retail tariffs. Four (4) countries indicated that they have seperate distribution tariffs (DRC, Namibia, Seychelles and South Africa) and four (4) indicated that they have seperate retail tariffs although this might be questionable (since the differentiation between distribution and retail as a concept has not been put into practice much). In most countries in Southern Africa the distribution and retail tariffs are combined.

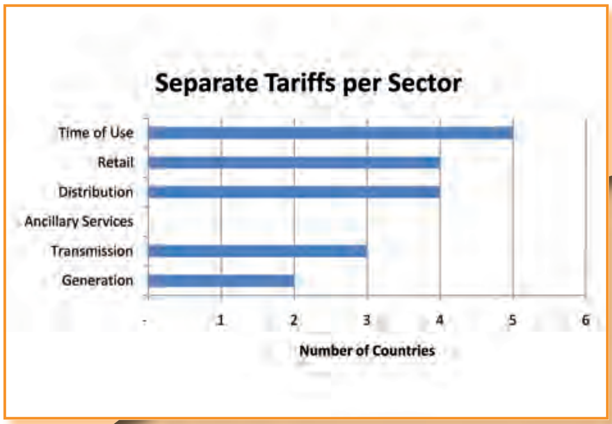


Figure 4-3: Subsidies

Almost all countries indicated that taxes and subsidies are allowed on the electricity tariffs. The taxes are mostly value added tax (VAT) and most of the levies are utilised for rural electrification (Figure 4-3). Subsidies on electricity are usually cross subsidisation amongst customer categories. Although a number of countries indicated that no subsidies exist in their tariffs there will always be some level of cross subsidisation among customer categories. In no country the utility was paying a subsidy to sectors outside electricity.

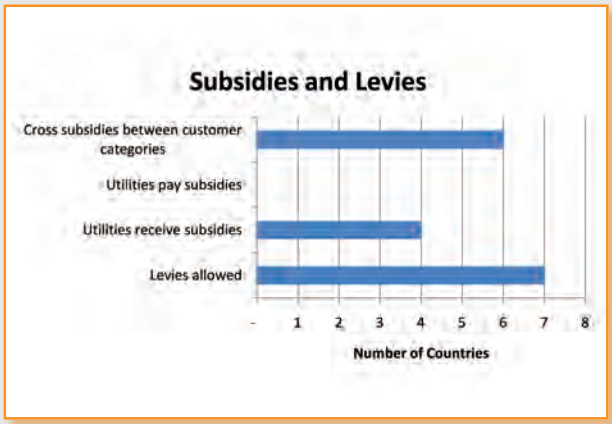
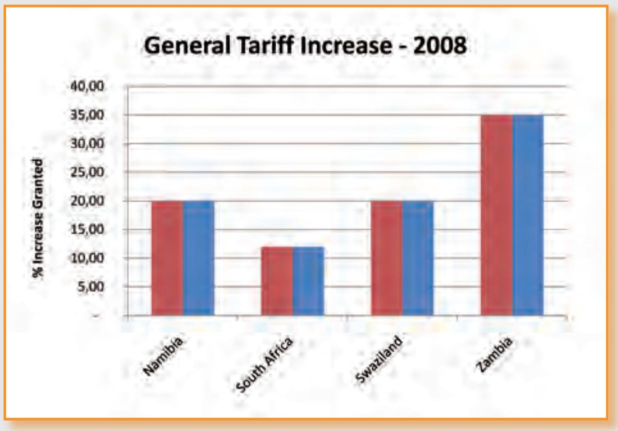


Figure 4-4: Last General Tariff Increase

Over the past three years (2005-2008) most of the countries granted the utilities substantial tariff increases (Figure 4-4) of between 11.5% (Botswana) and 27% (South Africa and Zambia). Unfortunately, the comparison of these tariff increases is very difficult because they were granted in different years. However, the countries that were granted tariff increase in 2008 were Namibia (20%), South Africa(12%), Swaziland (20%) and Zambia (35%).



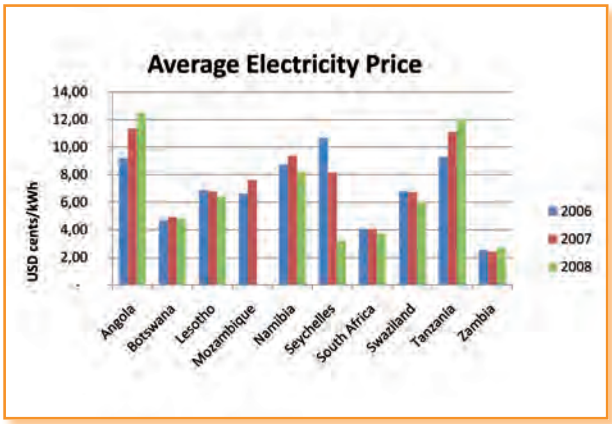


Figure 4-5: Average Electricity Prices

Currently Angola and Tanzania have the highest tariff in the region at 12.5USc/kWh and 12USc/kWh respectively. From Figure 4-5 it seems that in 2008 Zambia had the lowest electricity tariffs in the region at 2.7USc/kWh followed by the Seychelles (3.2USc/kWh) and South Africa (3.7USc/kWh).

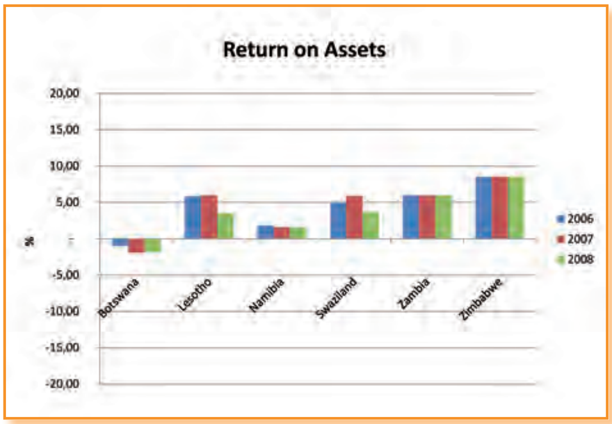


Figure 4-6: Return on Assets

Most countries in the region use a rate of return tariff methodology to determine the electricity tariffs although there are some differentiations in the way it is applied especially among those countries where there is not yet a regulator. Eleven out of the 15 SADC countries have Electricity/Energy Regulators. Since most of the electricity tariffs in the region are not yet cost reflective one would expect that the return on assets data (Figure 4-6) would reflect that the utilities are still earning negative or very low returns on assets.

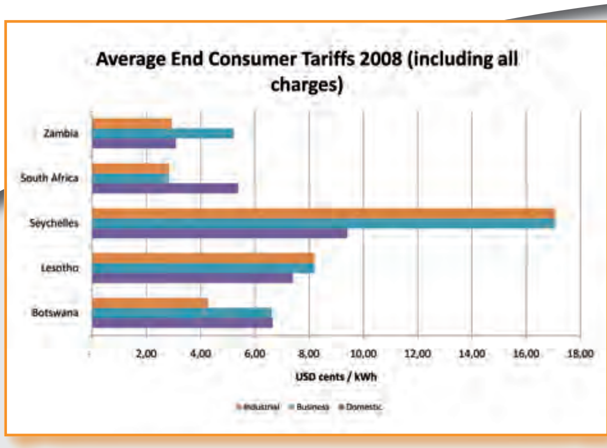


Figure 4-7: Average Retail Tariffs

Figure 4-7 depicts the average retail tariffs including all other charges in addition to the energy charge. This means the tariffs includes energy, demand and any other levies or taxes that might be added on top of the tariff expressed in USc/kWh charged to the end consumer. Amongst the tariff levels it is easy to depict the differences between the customer levels and the different cross subsidies between customer categories. The Seychelles has the highest tariff level amongst the respondents with a tariff of 17.06USc/kWh for industrial and business customers and 9.41USc/kWh for domestic customers.

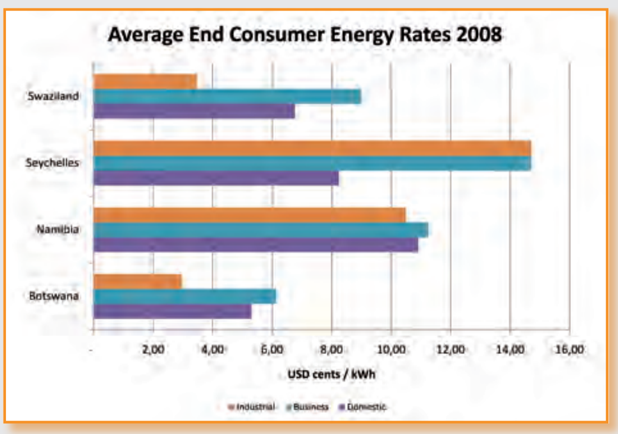


Figure 4-8: Average Retail Energy Rates

The average retail energy rates charged to the end consumer were highest in Seychelles and show the same pattern as for the average retail tariff including other charges (Figure 4-8). The energy tariffs charged in 2008 in Botswana and Swaziland show the same pattern and Namibia has the second highest energy charges of the respondents.

Figure 4-9: Average Tariffs by Sector

In all the countries that submitted information on the average sectoral tariffs the distribution tariffs were the highest in 2008 (Figure 4-9). South Africa had the lowest transmission tariffs and the Seychelles had the highest transmission tariffs. Generation tariffs in the Seychelles and Namibia were the lowest. It is expected that distribution tariffs will be the highest in South Africa and Namibia due to the fact that these tariffs are often used to balance the local authorities budgets by adding of a local authority surcharge to subsidise other municipal services.

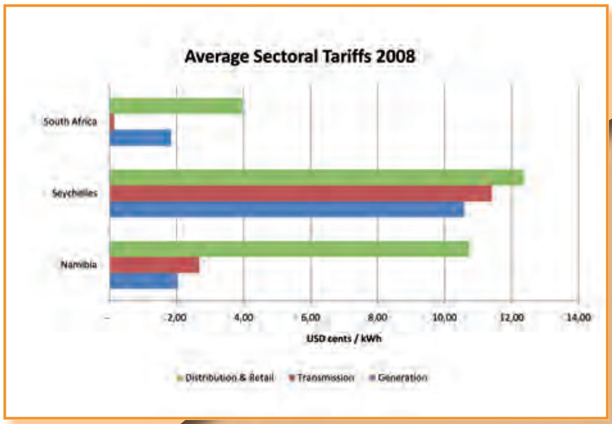
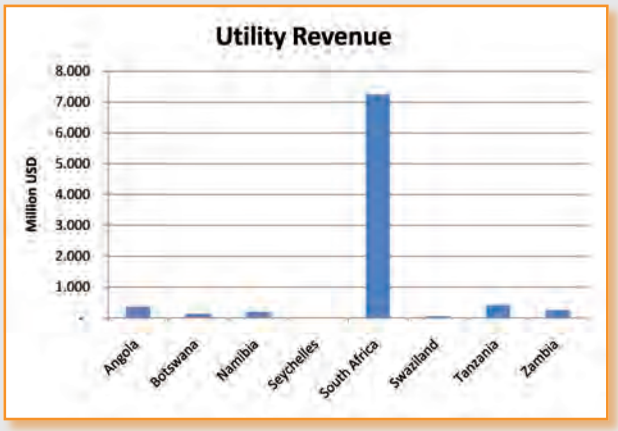
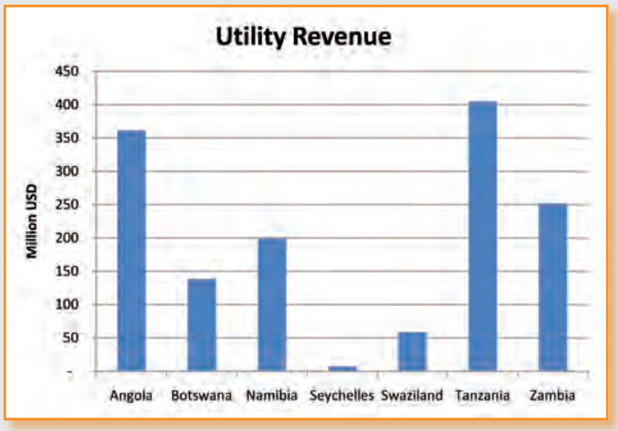


Figure 4-10: Utility Revenue

South Africa has the highest utility revenue (Figure 4-10). This is expected since ESKOM is the biggest utility in the region and in Africa. Tanesco has the second largest revenue followed by ENE in Angola and Zesco in Zambia. One should remember that all of these utilities are involved in generation, transmission, distribution and retail.

A number of countries have also embarked on the development of feed-in tariffs for renewable energy (REFIT). Feed in tariffs are often used to encourage the use of new energy technologies such as wind power, biomass, hydropower, geothermal power and solar photovoltaics. This type of tariff is also used if there is a shortage of energy to get renewable energy sources on board within short time periods. South Africa has recently developed REFIT tariffs and Namibia has also started with a study on the possible use of tariffs for renewable energy sources.





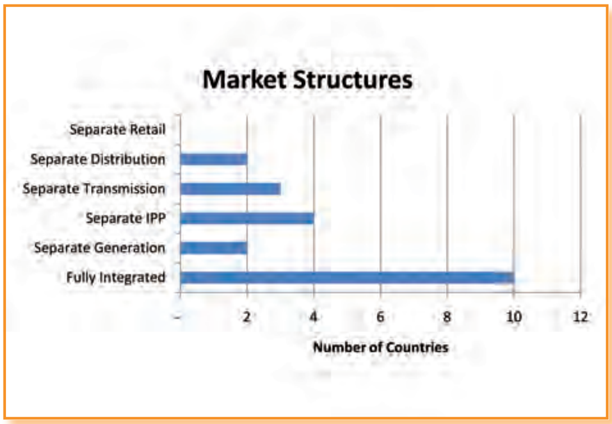


Figure 4-11:
Market Models used by SADC Countries

The countries in the region are using different market models (Figure 4-11). Most countries have integrated generation, transmission and distribution systems. Many countries have indicated different systems. Almost all of these systems are also integrated generation, transmission and distribution systems but they allow for separate Independent Power Producers (IPPs). Only two (2) countries have separate distribution (DRC and Namibia) , three (3) have separate transmission (DRC, Mozambique and Zambia)and four (4) have separate IPPs (DRC, Mozambique, Tanzania and Zambia).

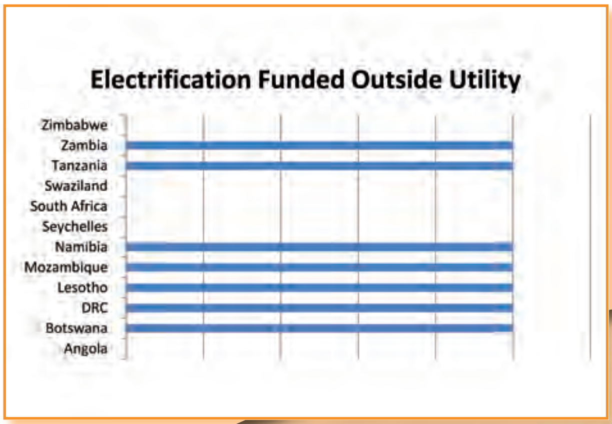


Figure 4-12: Electrification Funding

Of those countries who responded most indicated that rural electrification is funded outside the utility (Figure 4-12).

In conclusion,

most of the countries in the SADC region do not have cost reflective tariff structures or tariff levels and in many of these countries no decision has been taken as yet on how cost reflective tariff levels will be reached and over what time period. What is of more concern is the energy shortage in the region meaning that a lot of investment will have to be made over the next 10 years in generation capacity. This will be expensive and tariffs will therefore continue to increase over the next decade. However, over the last few years tariffs in the region have started to increase as supply has decreased and the need for new investment in generation, transmission and distribution is realised. Many countries have established regulators and a number of countries have experienced real price increases for the past number of years in order to reach cost reflective electricity tariffs.

Economic Indicators	2 008	Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
GDP	US$ Billions	95.95	13.46	11.59	1.31	9.65	7.70	0.52	276.49	2.93	20.72	14.80	-
GDP growth rate (annual)	%	12.30	2.90	(3.16)	4.20	7.30	2.90	(9.00)	3.10	2.40	7.46	6.00	(15.00)
Exchange rate (annual average)	Local Currency/US$	75.00	6.79	464.00	8.25	24.13	9.42	17.00	8.26	8.25	1 198.00	3 745.00	48 984 167.00
CPI - annual average rate	%	12.50	12.60	16.70	10.70	8.20	10.40	37.00	11.50	12.63	10.28	16.60	231 000 000.00
General Country Data	**2 008**	**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
Land surface area	sqkm	-	58 200	2 345 000	30 355	-	824 292	455	1 219 090 km2	17 200	879 151	752 618	390 757
Population	millions	-	2	65	2	-	2	0	48.7	1	40	13	16
Total number of households	number	-	-	11 990 389	470 482	-	447 059	20 933	13	212 403	8 175 287	-	511
Average household size	persons	-	5	5	4	-	5	4	4	5	5	5	6
Country Generator Data	**2 008**	**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
Total installed generator capacity	MW	1 264	132	2 442	72	-	393	92	45 521	70	1 006	1 872	1 890
Total operational generator capacity	MW	989	132	1 221	72	-	393	60	43 601	70	-	1 387	1 680
Total installed hydro generator capacity	MW	774	-	1 099	72	-	249	-	669	61	561	1 785	750
Total installed coal generator capacity	MW	-	132	-	-	-	120	-	39 582	-	-	-	1 240
Total installed diesel/HFO generator capacity	MW	490	-	122	-	-	24	80	-	9	154	7	-
Total installed gas turbine generator capacity	MW	-	-	-	-	-	-	-	1 735	-	189	80	-
Total installed nuclear generator capacity	MW	-	-	-	-	-	-	-	1 800	-	-	-	-
Total installed other renewable generator capacity	MW	-	-	-	-	-	-	-	130	-	-	-	-
Total installed other generator capacity	MW	-	-	-	-	-	-	-	1 589	-	-	-	-
Country Electricity Production and Sales Data	**2008**	**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
System maximum demand	MW	668	493	-	100	-	533	40	37 594	200	694	1 605	1 429
Energy generated	GWh	4 133	631	7 347 806	-	-	1 572	283	246 709	244	4 302	9 672	7 471
Imports	GWh	25	2 585	83	590	-	2 147	none	12 189	923	52	997	1 722
Total energy available	GWh	-	3 216	6 586	590	-	3 719	270	255 017	1 167	4 354	10 669	993
Exports	GWh	-	-	915	-	-	47	none	12 648	-	-	748	-
Total energy sales	GWh	2 893	2 889	7 348	536	-	2 417	232	196 069	977	3 366	9 440	7 476
Residential	GWh	514	745	-	162	-	742	78	34 677	-	1 489	2 161	2 282
Commercial	GWh	522	957	-	79	-	347	59	41 921	-	-	573	1 773
Large Power Users	GWh	1 857	1 186	-	909	-	1 328	64	119 470	-	1 877	5 505	3 421
Suppressed demand	GWh	-	2	-	-	-	-	-	-	-	-	-	-
System load factor	%	-	76.00	-	67.40	-	71.40	64.00	0.77	51.00	70.78	80.00	-
Transmission losses	%	13.00	3.50	10.00	4.00	-	11.11	3.00	3.95	14.60	4.90	3.84	3.10
Distribution losses	%	29.10	6.50	10.00	5.10	-	10.00	-	0.16	-	21.75	24.80	10.50

Country Utility, Customer and Financial Data	2008	Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
Total number of customers	*Number*	171 596	196 755	428 297	77 038	-	191 193	29 850	8 692 783	70 517	723 873	275 527	471 730
Number of residential consumers	*Number*	-	177 183	-	70 075	-	175 317	28 000	8 216 914	-	-	252 590	414 508
Number of commercial consumers (not demand metered)	*Number*	-	17 527	-	6 641	-	14 165	3 300	441 968	-	-	19 905	56 313
Number of large power users (demand metered)	*Number*	-	2 045	23	313	-	1 711	60	33 901	-	-	3 032	909
Total number of utility employees	*Number*	3 580	2 010	6 173	492	-	-	400	51 675	626	5 527	3 908	3 708
Total number of utility employees in GENERATION	*Number*	-	346	724	7	-	-	150	-	-	-	451	-
Total number of utility employees in TRANSMISSION	*Number*	-	155	498	50	-	-	50	-	93	-	213	281
Total number of utility employees in DISTRIBUTION & RETAIL	*Number*	-	1 056	3 202	104	-	669	200	31 543	-	-	2 695	3 427
Number of utility companies / organisations / licensees	*Number*	2	1	6	-	-	-	1	186	-	1	5	1
Total utility revenue from end consumers	*Local currency millions*	27 107	939	-	282	-	1 870	127	59 836	486	485 030	942 621	3 822 092 169
Revenue from residential consumers	*Local currency millions*	-	268	-	95	-	763	120	16 567	-	-	187 265	111 407 316
Revenue from commercial consumers (not demand metered)	*Local currency millions*	-	191	-	53	-	368	171	15 243	-	-	46 733	1 992 564 802
Revenue from large power users (demand metered)	*Local currency millions*	-	458	-	132	-	666	182	28 026	-	-	686 432	1 718 120 050
Total utility operational costs	*Local currency millions*	-	-	611 177 659	129	-	-	500	59 805	356	473 002	984 811	192 127 029
Total replacement value of network assets	*Local currency millions*	-	7 077	-	-	-	-	-	unknown	-	-	-	-
Total book value of network assets	*Local currency millions*	-	3 860	-	-	-	-	-	not available	-	-	1 640 172	-
Total length of transmission network	*km*	1 744	3 023	5 509	-	-	8 982	20	28 236	-	-	3 830	7 274
Total length of distribution network	*km*	-	-	-	-	-	10 823	200	361 547	-	-	23 319	104 062
National electrification rate	*%*	-	-	6	15	-	45	99	65	9	10	-	43
Total utility debtors days from end consumers	*days*	-	-	-	69	-	77	21	-	86	-	148	-
Utility rate of return on assets	*%*	-	-2	-75	4	-	2	none	-	4	-	6	9
Official bulk tariff increase	%	-	-	-	-	-	18	none	14	-	-	-	942
Official distribution tariff increase	%	-	-	-	-	-	20	none	12	20	-	35	942
Tariff Data	**2008**	**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
Average generation tariff	local currency / kWh	-	n/a	0.21	-	-	0.19	1.80	0.15	-	-	-	1 787 146.71
Average transmission tariff	local currency / kWh	-	n/a	0.05	-	-	0.25	1.94	0.01	-	-	-	-
Average distribution & retail tariff	local currency / kWh	2.64	n/a	0.98	-	-	1.01	2.10	0.33	-	-	-	3 136 442.47
National average retail tariff - energy only	local currency / kWh	-	-	-	-	-	-	2.10	not available	-	-	-	2 680 720.06
National average retail tariff - including other charges	local currency / kWh	-	0.32	-	0.49	-	-	2.55	0.31	-	-	105.98	3 082 828.07
Average domestic tariff - energy only	local currency / kWh	3.35	0.36	0.05	-	-	1.03	1.40	not available	0.56	-	-	48 818.65
Average domestic tariff - including other charges	local currency / kWh	-	0.45	-	0.61	-	-	1.60	0.44	-	-	115.42	56 141.45
Average business tariff - energy only	local currency / kWh	-	0.42	0.11	0.57	-	1.06	2.50	not available	0.74	-	-	888 141.10
Average business tariff - including other charges	local currency / kWh	-	0.45	-	0.68	-	-	2.90	0.23	-	-	195.60	1 074 650.73
Average industrial tariff - energy only	local currency / kWh	-	0.20	0.11	-	-	0.99	2.50	not available	0.29	-	-	532 027.09
Average industrial tariff - including other charges	local currency / kWh	-	0.29	-	0.68	-	-	2.90	0.23	-	-	109.68	643 752.78

System maximum demand MW		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	476	434	0	101	320	490	37	36 442	194	603	1 330	1 904
	2007	535	473	0	115	364	539	38	38 148	196	653	1 393	1 758
	2008	668	493	0	100	0	533	40	37 594	200	694	1 605	1 429

Energy Sales GWh		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	2 006	2 626	7 289	474	1 873	2 237	216	205 796	856	2 769	8 421	10 293
	2007	2 362	2 777	7 564	508	2 014	2 334	232	184 085	941	3 187	9 015	10 039
	2008	2 893	2 889	7 348	536	0	2 417	232	196 069	977	3 366	9 440	7 476

System Load Factor		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	48%	69%		54%	67%	52%		64%	50%	52%	72%	62%
	2007	50%	67%		50%	63%	49%		55%	55%	56%	74%	65%
	2008	49%	67%		61%		52%		60%	56%	55%	67%	

Average Price USDc/kWh		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	9.19	4.72		6.89	6.63	8.73	10.69	4.06	6.80	9.29	2.53	0.82
4	2007	11.36	4.92		6.77	7.62	9.37	8.16	4.05	6.74	11.10	2.41	1.76
	2008	12.50	4.79		6.38		8.22	3.21	3.69	6.03	12.03	2.67	1.04

kWh / customer / year		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	12 935	17 302	17 262	8 670	4 506	13 371	7 627	24 696	14 576	4 359	27 098	20 042
	2007	14 398	16 664	18 098	7 596	3 942	12 513	7 786	21 625	14 757	4 775	25 494	19 468
	2008	16 856	14 683	17 156	6 958		12 644	7 786	22 555	13 857	4 650	34 262	15 848

Customers/employee		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	46	73	68	106	129	119	71	191	88	136	82	135
	2007	46	83	67	132	154	144	75	182	97	142	98	147
	2008	48	98	69	157			75	168	113	131	71	127

Customers		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	155 114	151 800	422 253	54 612	415 667	167 291	28 320	8 333 004	58 716	635 310	310 760	513 562
	2007	164 054	166 651	417 965	66 838	510 848	186 481	29 849	8 512 629	63 798	667 490	353 619	515 657
	2008	171 596	196 755	428 297	77 038	0	191 193	29 850	8 692 783	70 517	723 873	275 527	471 730

Transmission losses		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	13%	3%	10%	5%	6%	10%	3%	4%	16%	5%	4%	5%
	2007	13%	4%	10%	4%	5%	10%	3%	4%	15%	5%	3%	3%
	2008	13%	4%	10%	4%	0%	11%	3%	4%	15%	5%	4%	3%

Distribution losses		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	33%	6%	10%	6%	15%	13%	0%	0%	0%	19%	19%	7%
	2007	30%	7%	10%	5%	18%	10%	0%	0%	0%	23%	25%	10%
	2008	29%	7%	10%	5%	0%	10%	0%	0%	0%	22%	25%	11%

Energy generated		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	2 982	866		-	2 355	1 606	252	237 132	156	3 435	8 894	7 778
	2007	3 293	726		-	2 605	1 576	241	243 492	173	4 076	9 864	7 464
	2008	4 133	631		-	-	1 572	283	246 709	244	4 302	9 672	7 471

Return on assets		Angola	Botswana	DRC	Lesotho	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	2006	na	(1.00)	(130.00)	5.82	-	1.80	none	-	4.90	-	6.00	8.51
	2007	na	(1.90)	(105.00)	6.00	-	1.60	none	-	5.90	-	6.00	8.51
	2008	-	(1.81)	(74.52)	3.52	-	1.60	none	-	3.70	-	6.00	8.51
Electrification rate		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2006	na	11.40	6.00	11.00	8.20	45.00	99.00	67.78	11.33	10.17	13.60	43.00
	2007	20.00	-	6.00	22.40	10.10	45.00	99.00	66.20	8.66	10.61	-	48.00
	2008	-	-	6.00	15.30	-	45.00	99.00	64.62	8.94	10.20	-	43.00
Operating cost USDc/ kWh		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2006	-	4.96		3.17	4.39	5.33	29.46	2.91	5.83	14.03	2.75	0.00
	2007	-	5.31		3.14	3.17	5.63	32.11	3.74	5.65	12.77	2.56	0.00
	2008	-	-	17 926.35	2.91		-	12.66	3.69	4.41	11.73	2.79	0.05
Energy Generated / Sold		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2006	1.49	0.33	-		1.26	0.72		1.15	0.18	1.24	1.06	0.76
	2007	1.39	0.26	-		1.29	0.68		1.32	0.18	1.28	1.09	0.74
	2008	1.43	0.22	-			0.65		1.26	0.25	1.28	1.02	1.00
Price increase nominal		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2007	18.2%	8.5%	29.5%	2.2%	13.0%	12.0%	-7.1%	3.9%	3.2%	18.9%	5.5%	
	2008	7.6%	10.1%		10.3%		14.8%	0.0%	7.0%	4.6%	4.1%	3.6%	
Price increase real		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2007	6%	1%	30%	-6%	3%	5%	-12%	-3%	-5%	12%	-3%	
	2008	-5%	-2%		0%		4%	-37%	-5%	-8%	-6%	-13%	
Energy Growth		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2007	17.7%	5.7%	3.8%	7.2%	7.5%	4.3%		-10.5%	10.0%	15.1%	7.1%	-2.5%
	2008	22.5%	4.0%	-2.9%	5.6%		3.6%		6.5%	3.8%	5.6%	4.7%	-25.5%
GDP Growth		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2007	21.1%	4.4%	3.6%	3.7%	7.4%	5.5%	9.7%	5.1%	3.5%	7.1%	6.2%	-12.6%
	2008	12.3%	2.9%	-3.2%	4.2%	7.3%	2.9%	-9.0%	3.1%	2.4%	7.5%	6.0%	-15.0%
GDP in US$		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2006	41.6	10.5	0.0	1.5	7.3	6.8	1.0	257.6	2.4	14.3	10.7	170.0
	2007	35.0	10.5	0.0	1.5	8.4	6.8	1.0	283.2	2.9	16.8	11.6	145.0
	2008	96.0	13.5	11.6	1.3	9.7	7.7	0.5	276.5	2.9	20.7	14.8	0.0
Annual GDP Growth Rate		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2006	26%	5%	1%	7%	9%	7%	12%	5%	3%	7%	6%	-5%
	2007	21%	4%	4%	4%	7%	6%	10%	5%	4%	7%	6%	-13%
	2008	12%	3%	-3%	4%	7%	3%	-9%	3%	2%	7%	6%	-15%
Annual CPI - Annual Average Rate		**Angola**	**Botswana**	**DRC**	**Lesotho**	**Mozambique**	**Namibia**	**Seychelles**	**South Africa**	**Swaziland**	**Tanzania**	**Zambia**	**Zimbabwe**
	2006	12%	9%	0%	6%	9%	5%	0%	5%	5%	7%	8%	
	2007	13%	7%	0%	8%	10%	7%	5%	7%	8%	7%	9%	
	2008	13%	13%	17%	11%	8%	10%	37%	12%	13%	10%	17%	

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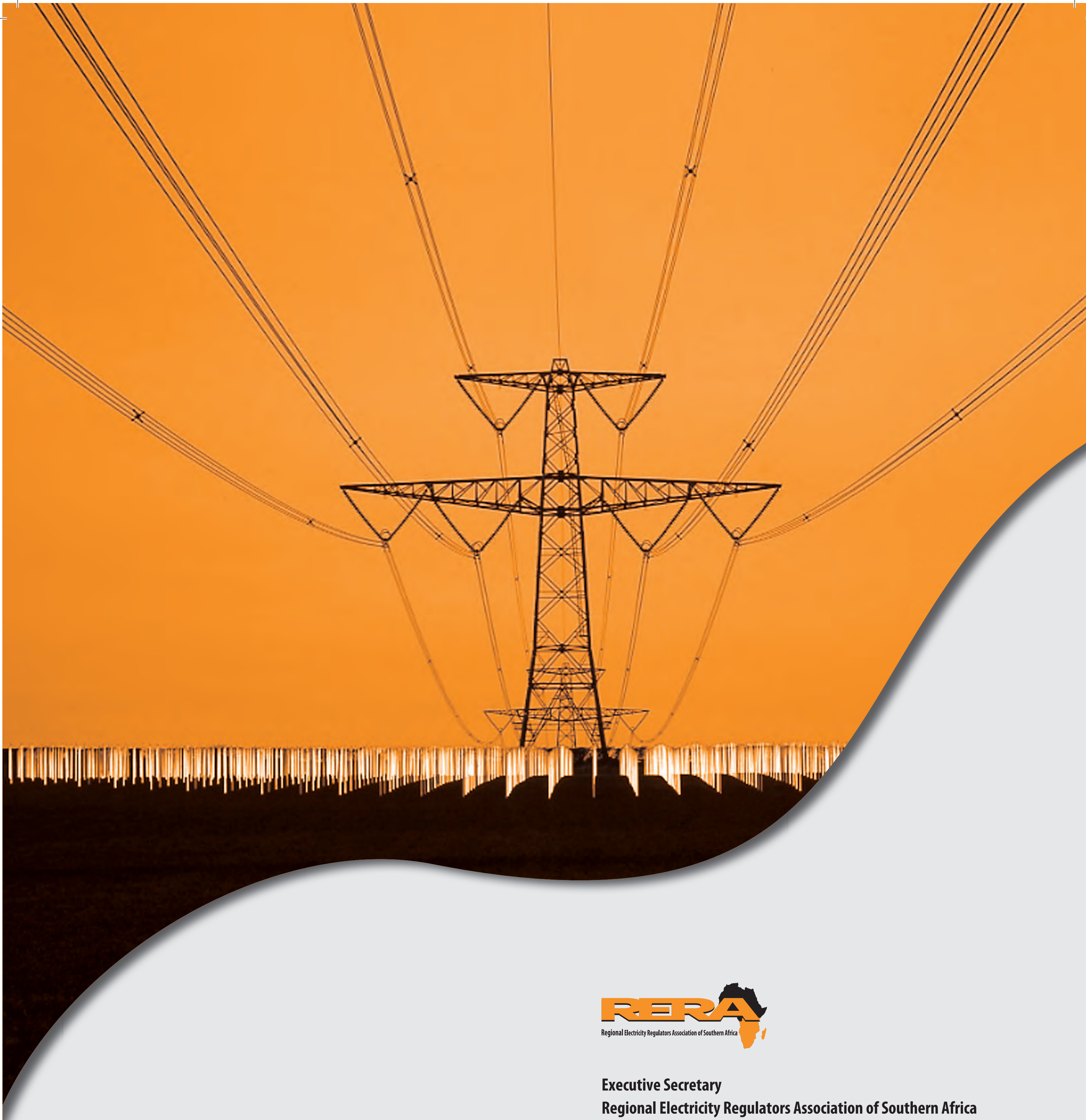

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