Energy Strategy

INTRODUCTION

The importance of the energy sector to regional socio-economic development and attainment of the Millennium Development Goals (MDGs) cannot be over-emphasized. The African continent with 13.8% of the world’s population consumes 6% energy and generates 3% in the form of electricity. The per capita energy consumption is only 0.6MWh compared to the world average of 2.6MWh, despite the abundant resources on the continent.

According to a report by the World Energy Council on ‘Energy Policy Scenarios to 2050’ published in 2007, there are enough energy resources around the world to satisfy the energy demand over the next 40 years plus, however, the challenge is how to get the energy resources and services from where they are produced to where they are needed the most. The irony of this statement is how the world currently is scrambling for commercial energy resources and is concerned with rising prices and unavailability of conventional energy. The SADC region in particular is currently facing significant challenges where electricity brownouts and blackouts are being experienced resulting in power cuts and load shedding in almost all the member state countries. The region is experiencing a shortfall in the supply of peaking power required to meet the daily (morning and evenings) and seasonal (winter) peaks when most power is required on the network. Over the past few years, very limited generation has come on stream and no new power stations have been constructed over the past 30 years. In addition, the required levels of investment for new generation have not materialized. It is therefore urgent for the region to address the peaking capacity deficit and for the DBSA to review its investment strategy in this sector.

This strategy focuses on the electricity sub-sector which generally tends to make the greatest impact on industrialization and development of the economy. It is also ranked highly as the most desirable form of energy for domestic households.

The major reasons for the diminishing generation capacity is primarily due to an increase in electricity demand; unexpected high industrial growth; economic expansion; high growth in population; and uneconomic tariffs that do not support the capital and operational cost for investment in power generation. Additional factors include the lack of capital injection into new generation projects by both the public and private sector. Power shortages have impacted most countries at varying degrees but more prominently in Botswana, Namibia, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.

Previous power system studies projected a capacity deficit for peaking power of about 5,000MW by 2008 and an energy shortfall for base-load generation by the year 2010. The base-load generation is the power used throughout the day on a constant basis. Most of the
power utilities in the region, collectively prioritized both national and regional projects to address the problem but did not receive the political will and financial support for implementation.

Generally, the region is facing acute challenges in the availability of commercial energy as a shortfall was also predicted for natural gas in 2008 and the world prices of liquid fuels have reached an all time peak well over US$100 per barrel. The approved DBSA Energy Sector Strategy basically recommended the strengthening of regional co-operation paying specific attention to the electricity sub-sector which has the greatest potential to significantly impact on regional economic development as well as improving the lives of the poorest of the poor in the region. Interconnectivity and trade in electricity, oil and natural gas through grid connections and pipeline development provide opportunities for sharing resources, creating economies of scale and realizing significant savings on investments.

The strategy also addressed the need to develop alternative sources of energy such as nuclear, new and renewable energy in order to diversify energy options and investigate benign and environmentally-friendly sources of energy. Capacity building and institutional strengthening of various energy institutions was deemed to be necessary to ensure sustainability of the infrastructure developed. In addition, the need to create innovative financial instruments in support of appropriate technologies.

OVERVIEW OF THE SADC ENERGY SECTOR

The region is bestowed with abundant resources of energy in the form of coal, hydro, natural gas, oil, solar, wind, biomass and nuclear (most of these resources are found in abundance only in South Africa). Their distribution across the region is highly uneven, hydro resources are in the north while coal resources are mainly in the central and southern part of the region. This provides a good generation mix that mitigates drought and countries can share in the resulting benefit. A breakdown of the SADC regional electricity generation sources shows that: coal contributes 74.3%, hydro 20.1%, nuclear 4% and gas/diesel 1.6%. The region has adequate fuel supply (coal reserves) to cover the lifetime of all existing fossil plants as well as that of future generation for several decades.

Over 60% of the SADC population depends on biomass energy comprising of wood fuel, charcoal, animal and crop residue, etc thus contributing to deforestation, environmental degradation and negative health impacts. Continuing poverty and the high cost of accessing modern forms of energy are some of the factors that confine rural and urban populations to the use of biomass. However, commercial forms of energy producing electricity are considered to be the most critical to the realization of major economic development even though the projects are large, capital-intensive and with long lead times. Overall, the level of
access to electricity is very low for a region of approximately 250 million people it averages between 20-30% for urban consumers and 5-10% for rural consumers, although the demand for power in SADC is increasing at an average rate of 3-4% per annum.

The impact of high world oil prices on the SADC energy sector has been significant particularly in the transport economy and power sector, rising oil prices have greatly influenced the choice of least cost power generation options. There has been a shift from oil and gas-fired generation to coal-fired supply, encouraging greater usage of the abundant coal resources in an environmentally sustainable way. In addition, there are challenges with regards to the availability of liquid fuels and in particular limited refinery capacity as well as the infrastructure for transportation and distribution.

POLICY ENVIRONMENT
The energy sector in each country in the region is governed by a number of Acts, Bills and Charters that have been enacted by Government to guide the sector, primarily, the Electricity Act, Renewable Energy Act, Bill for Liquid Fuels and Pipelines.

Reforms in the power sector have resulted in restructuring of the electricity supply industry (ESI) in order to encourage a competitive market and provide customers with choice whilst providing a safe and reliable quality of supply. With reforms, the region experienced economic liberalization, commercialisation, unbundling of state-owned monopolies and public utilities as well as opportunities for private sector participation in the sector. On the ground this resulted in unbundling of generation, transmission and distribution in the electricity sector including the introduction of independent power producers (IPPs), as well as an increase the number of stakeholders in other sub-sectors, i.e. liquid fuels and renewable energy.

The SADC Energy Protocol provides for accelerated reforms in the energy sector with reforms bordering around the broad governance of the sector. The Protocol also promotes private sector participation and encourages the SADC member states to create an enabling environment for private investment.

SOUTH AFRICA’S DOMINANCE
Overview
South Africa (SA) has the largest economy in the region with an installed electrical capacity of over 43,000MW. SA produces over 80% of the regions power supply with predominantly coal-fired generation. SA also represents the largest market for electricity, natural gas and liquid fuels. Clean hydroelectric imports are from Mozambique (1,400MW) and the DRC (100MW). The current electricity growth rate is over 4% and the level of access to electricity is now about 73%. 
Role of Eskom

The national power utility, Eskom plays a major role in regional power trading and dominates the power generation market. SA is also experiencing power shortages as predicted for 2008 and will require approximately 1,500MW per annum over the next 5 years. A shortfall in base-load generation capacity is predicted for 2010 together with the rest of the region. Given that the main driver of electricity demand is GDP growth, a central forecast of GDP growth in the range of 3-5% over the next 20 years is likely to lead to an electricity demand projection of 3-4% per annum. However, if the power sector is to meet governments GDP growth target of 6% per annum by 2010, then power requirements will have to increase by over 2,000MW per annum.

The current decline in capacity has resulted in load shedding on both industrial and domestic consumers. During the recent power cuts, the power system experienced capacity shortfalls of up to 4,000MW also due to plant under maintenance. The power utility’s low reserve margin (5-8%) provides limited opportunities for maintenance and power stations are run at maximum rating inducing high stress levels on equipment. In order to reduce demand and manage the peak load, Eskom has embarked on demand side management (DSM) arrangements with large industry to curtail 10% of their peak load, also encouraging domestic customers to reduce their load and reduce exports by 10%. Load shedding is used as the last resort after running all available generation plants, soliciting customer participation to reduce load, operating the pumped storage schemes, as well as the expensive gas turbines and then the interruptible supply contracts with industry. Diversification of energy resources has become important and the use of alterative sources of energy is being encouraged such as wind energy, solar water geysers, solar powered traffic lights and the use of energy efficient light bulbs i.e. compact fluorescent lights (CFLs), although the use of CFLs raises environmental concerns regarding their disposal due to possibilities of mercury poisoning.

New Build Programme

Government has taken the decision that Eskom will build approximately 70% of new capacity required in South Africa and the balance will be built by independent power producers (IPPs). IPPs are expected to invest about R9 billion against Eskom’s R343 billion new build programme over the next 5 years. Eskom has issued a tender for supply of co-generation for IPPs to initially supply 900MW between 2009 and 2012, but this will depend on whether the projects can meet the proposed programme and upon agreement of feed-in tariffs with Eskom. The tender process is underway and is expected to conclude by mid-2008.

In February 2008, the Minister of Finance announced in his Budget Speech that government would provide Eskom with a R6 billion loan towards the new build programme. The loan earmarks about 73% for generation and the balance for transmission and distribution. The new build programme includes the return-to-service of previously mothballed power plants,
Camden, Grootvlei and Komati which will add a combined 3,677MW of generating capacity by 2011. Additional generation plants include two new coal-fired stations i.e. Medupi in Lephalale and Bravo in Witbank, each with a capacity of approximately 4,500MW at a cost of 80 billion each. Other generating plant will be in the form of nuclear power, combined cycle gas turbine (CCGT) and a new pumped storage scheme (Braamhoek). Already two CCGT plants generating 1,050MW were commissioned at Atlantis and Mossel Bay in May 2007.

In order to augment the diminishing peak load capacity in South Africa, the Government through the Department of Minerals and Energy (DME) has initiated two projects put out to private tender. The independent power producers (IPPs) will install two open-cycle gas turbines (OCGT) in KwaZulu Natal (KZN) and Port Elizabeth to deliver 1,050MW by 2008. So far the DBSA is in the process of providing support for the equity participation of the Broad Based Black Economic Empowerment (BBBEE) partners led by AES (USA) and will also consider participation in the senior debt financing.

Electricity Prices and Regulation
The National Energy Regulator of South Africa (NERSA) was established in 2005 and regulates electricity, gas and liquid pipelines. Regulation includes the issuing of generation licenses and leveling the playing field in the energy sector, by guarding against monopolies. South Africa's electricity prices are among the cheapest in the world and are below the long-run marginal cost (LRMC) of production. Eskom's prices are regulated at average cost based on historic book valued assets, a low weighted average cost of capital (WACC) and low dividend requirement. In December 2007, Eskom applied for an 18.7% tariff increase and NERSA only approved a 14.2% tariff increase for the 2008/09 financial year, after weighing Eskom’s plans for expanding power supply and the likely impact of any increase on inflation and affordability for consumers. The regulator took note of concerns on the possible impact of the Eskom price increase on the economy, especially on the poor, but took the view that the long-run benefits to the economy far outweighed the short-term fears.

Restructuring of the Distribution Industry
Restructuring of the distribution industry has paved the way for the establishment of Regional Electricity Distributors (REDs) which consolidates the functions of over 200 municipalities together with the distribution departments of Eskom into 6 major companies or REDs country-wide. Progress on REDs has been slow with many challenges primarily due to constitutional and other legal blockages including resistance from both Eskom and the municipalities. This has resulted in a deteriorating performance of the distribution infrastructure with maintenance being neglected.

Liquid Fuels Industry
SA is a net importer of liquid fuels and natural gas. In 2004, the country produced 7% of its total liquid fuel requirement from the Oribi, Oryx and Sable fields. Imports constituted 80% from the Middle East (Iran and Saudi Arabia) and 13% from other African countries (Angola and Nigeria).

The demand for liquid fuels in South Africa is increasing and concern arises over the infrastructure capacity for refinement and distribution. In 2005, SA refining capacity amounted to about 19% of Africa's refining capacity at 0.56 million barrels per day (mb/d). SA has 4 refineries (Sapref, Enref, Natref and Capref) and 3 synthetic fuel plants. Sapref in Durban is owned by Shell and BP and is the largest crude-oil refinery producing 35% of the country's requirements. Crude-oil is refined into petrol, diesel, jet fuel, lubricating oil, liquefied petroleum gas (LPG), paraffin, solvents, bitumen, marine fuel oil and chemical feed-stocks. The bulk fuel products are transported by underground pipelines to storage upgrading facilities in the Durban harbour and then distributed country-wide by road and rail.

Natural Gas Market
The amount of natural gas available comprises 0.7% of the country's energy resources. PetroSA operates the only off-shore gas fields in production with an estimated 1 trillion cubic feet (tcf) for the production of liquid fuels at its refinery in Mossel Bay since 1992. SA also has sizeable reserves of coal-bed methane of about 3tcf located in the Waterberg and Perdekop region, however, these have not been exploited. Sasol Gas markets and distributes both hydrogen-rich and methane-rich gas produced from Sasolburg and Secunda. The company delivers gas via a 1,550km pipeline to more than 500 industrial customers throughout the country. Sasol also imports gas from the Pande and Temane gas-fields in Mozambique via an 865km pipeline to Secunda. This line has been operational since 2004 and the DBSA contributed towards its development.

DEVELOPMENTS ON INGA HYDRO RESOURCE
Inga in the Democratic Republic of Congo (DRC) is one of the largest hydroelectrical resources in the world with a potential of over 100,000MW can light up the African continent and west Europe. However, significant resources and serious co-ordination is required to harness this resource. The World Bank is currently conducting feasibility studies on the rehabilitation of Inga 1 and 2 power stations. The project involves the rehabilitation of four power generation units, construction of a transmission line between Inga power station and Kinshasa town, as well as the rehabilitation of the distribution network in Kinshasa. The estimated cost of the project is about US$430 million. The whole program has been delayed and is now subject to cost overruns. A Canadian company, MagEnergy is rehabilitating four units at Inga 2 for an estimated cost of US$100 million. MagEnergy is also interested in financing the transmission line between Inga and Pointe Noire. A Chinese company, CMIC
has also indicated interest in financing the transmission line between Inga and Kinshasa. New generation from Inga 3 of about 3,500MW has been dedicated to the WESTCOR project which involves five countries, namely: Angola, Botswana, DRC, Namibia and South Africa. SNC Lavalin, a Canadian consulting firm intends to conduct feasibility studies around Inga 3. The DBSA and other financiers have been approached by the Central African Power Pool (CAPP) to assist with feasibility studies on the Inga-Cabinda-Pointe Noire transmission line. Very recently, the World Energy Council (WEC) has become involved in the Inga debacle and is now facilitating the formation of a new project company “PROCOM” to spearhead developments around the Inga site.

**SUMMARY OF KEY CHALLENGES**

Despite the broad range of funding available from the various financial institutions such as the DFI’s, IFI’s and donor agencies; the growing demand for energy services; evidence of credible off-takers for power; and the changing regulatory environment, a large number of projects have still not materialized. Energy sector projects tend to have a very long lead times averaging 4-5 years for preparation and development, and 5-10 years for implementation depending on the size and nature of the project. Major reasons for declining investment flows also include:

- Pessimism about emerging markets, in particular perceptions associated with wars and political unrest.
- Heavy political presence and public sector involvement.
- Reduced investments from the traditional multilateral funding agencies.
- Lack of project development from feasibility to bankability.
- No new capital for new power generation.
- Lack of project sponsors and developers including changes in their strategies and profiles.
- Conflicting vested interest, as in the case of Inga with a wide range of interested parties.
- Disappointing returns from some projects.
- Tariff-setting that is not cost-effective to attract new investment.
- Legal and regulatory framework for private participation not in place.
- Projects have not been packaged well to be bankable.