Transforming the Energy Supply Industry

With the spectre of a return to the devastating, rolling load-shedding seen in 2008 across South Africa, it is a fortuitous time to revisit the progress made towards the transformation and liberalisation of the electricity sector in South Africa. What progress, if any, has been made in light of the sobering electricity shortage in the country and its impact on the growth of the economy?

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Eskom is responsible for the generation of approximately 95% of electricity consumed in South Africa; the remainder is made up by imports, municipal generation and Independent Power Producers (IPPs). Eskom is the exclusive transmission licensee and is responsible for all transmitted electricity. The responsibility for distribution is shared between Eskom, the municipalities and a number of other licensed distributors. Eskom is the vertically integrated (Generation, Transmission and Distribution) South African electricity public utility and electricity generation monopoly, established in 1923 as the Electricity Supply Commission (ESCOM) by the government of South Africa in terms of the Electricity Act (1922). Eskom is the largest producer of electricity in Africa. It is among the top seven utilities in the world in terms of generation capacity, and among the top nine utilities in terms of revenue.

It is clear that Eskom is the lifeblood of economic growth in South Africa and any transformation or transition from the current monopolistic market to a free market system is likely to be both complex and risky. At a fundamental level the purpose for transformation would be simply to provide a reliable and a cost effective energy supply. While the debate rages as to the appropriate structure such a transformation might lead to, experience has shown that effective structures are more a product of the socio-political and economic environment, than specific models of success. Transformation in South Africa, however, is too often seen through a normative economic lens, but the ongoing electricity supply shortage provides an opportunity to assess the transformative effects of the crisis on the Electricity Supply Industry through the supply-demand perspective.

The publication of the Department of Energy's Integrated Resource Plan (IRP) in May 2011 provides the clearest insight into the shifts made in the demand side and illuminates some of the changes and opportunities in the shifting supply side environment. The importance of private sector players in the form of IPPs in meeting South Africa's future electricity demand is highlighted in both Eskom's revenue application for the second Multi-Year Price Determination (MYPD2) and in the IRP. The IRP recognises the important capacity contribution that IPPs can make both within the renewable and non-renewable generation sectors. More specifically, the Medium-Term Risk Mitigation Plan (MTRM Plan), which forms an integral part of the IRP in addressing the anticipated electricity supply shortfall in the immediate medium term (2011 to 2016), places substantial emphasis on

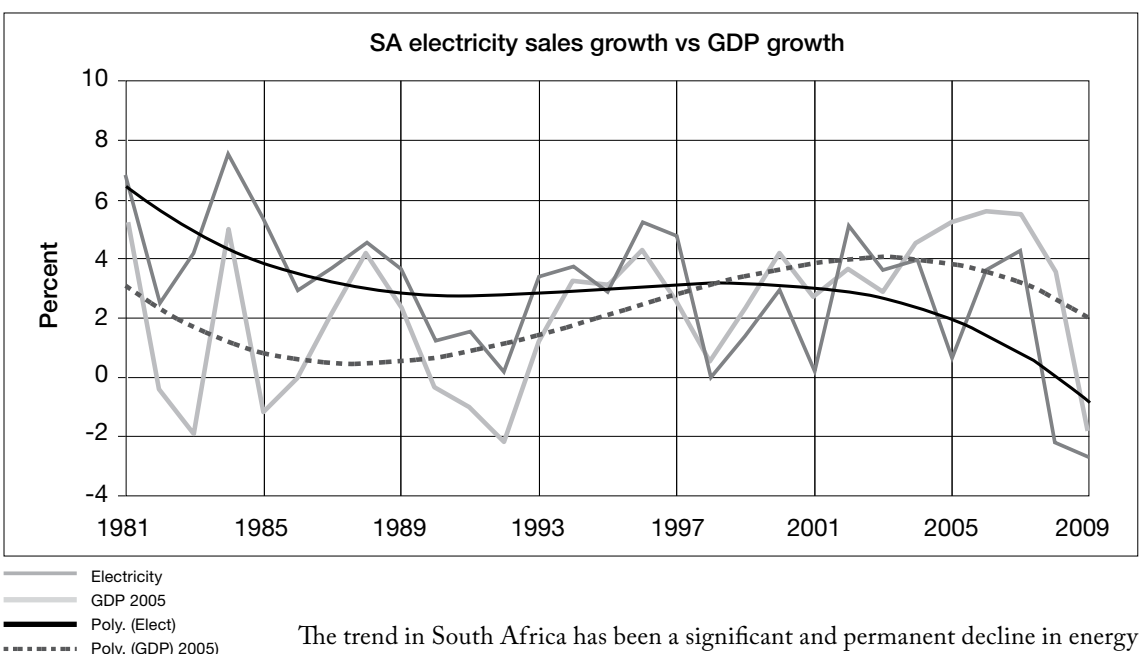
renewable, co-generation, own generation and IPP projects to mitigate the risks of extensive load shedding as a mechanism of last resort during the ongoing energy shortage.

The Changing Profile of Electricity Demand

South Africa is a developing country with significant heavy industry and extractive industry components to the economy. This places it high in international rankings of energy intensity. Energy intensity refers to the ratio of aggregate energy use to Gross Domestic Product (GDP)[1]. In determining the future national demand, one of the crucial parameters in the IRP is determining the energy intensity ratio, which coupled with forecast economic growth, provides a forecast for the expected energy demand. This ratio provides a significant insight into the structure of the economy as well as the energy demand profiles of sectors of the economy. Changes in this ratio are influenced by changes in the structure of the economy as well as by changes in sectorial energy demands.

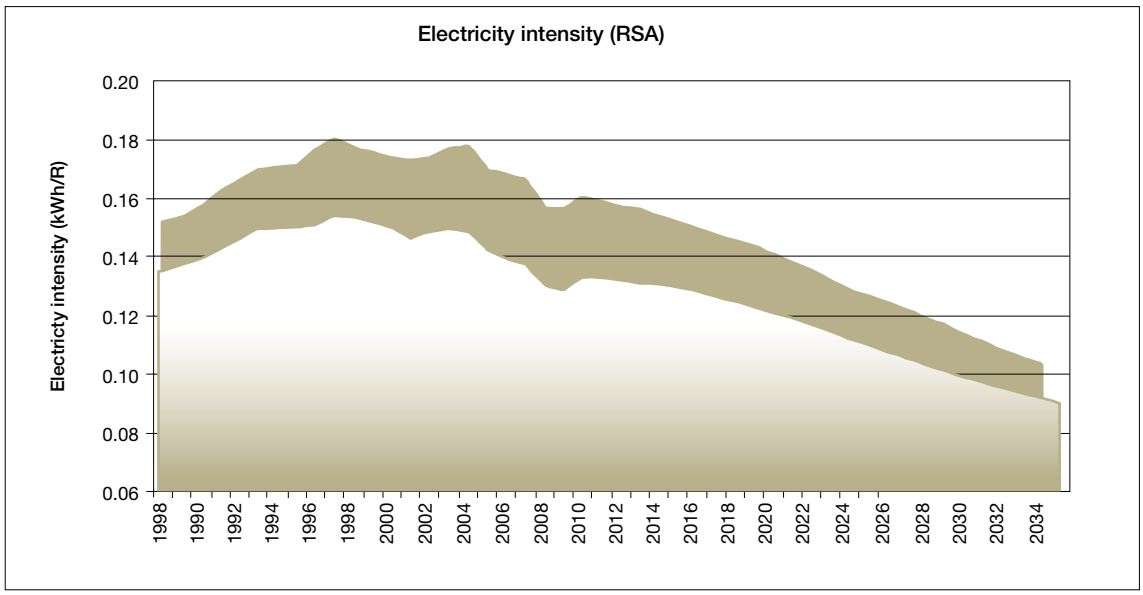
Globally, energy intensity is decreasing steadily, with the amount of energy used per unit of GDP declining by an average of 1.6% per annum from 1990 to 2008[2]. The South African energy intensity data is more remarkable. The relationship between GDP growth and energy consumption is illustrated in the figure below:

Figure 1: Relationship between Energy Sales and GDP[3]



The trend in South Africa has been a significant and permanent decline in energy intensity of the economy. This is borne out by the transition from the primary (energy intense) to the tertiary sector (less energy intense).

Figure 2: Energy Intensity of South Africa historical and forecast (Eskom)

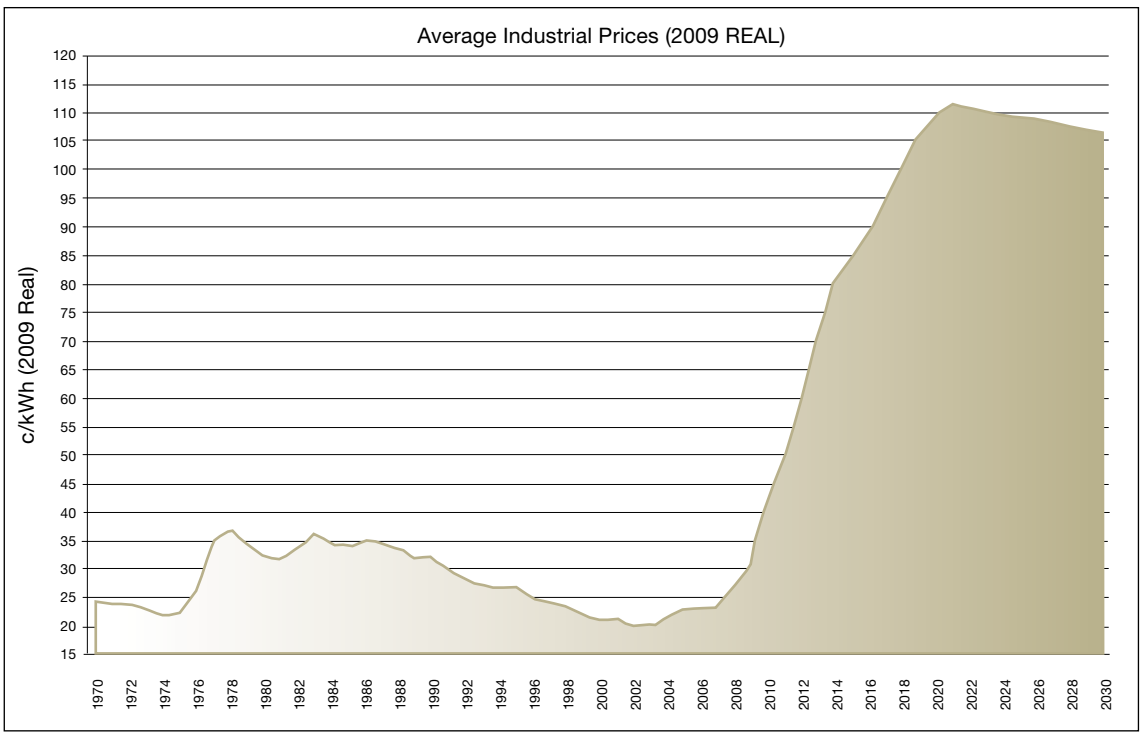


These trends illustrate the transformation of the South African economy from the energy intense primary sectors to the less intense sectors, and provide additional benefits like:

- Delaying the investment required to build new capacity for the production of usable energy, such as power stations or refineries;
- Reducing of the carbon intensity of the economy, with an associated reduction in any additional burden of carbon pricing on society, and significant benefits for the mitigation of climate change;
- Improving air quality and reduced water usage, with benefits for health, biodiversity and climate change adaptation efforts;
- Enhancing economic competitiveness for industry, as a result of enhanced production methods and reduced exposure to fuel price volatility and rising energy prices;
- Lowering carbon intensity for national exports, with benefits for access to environmentally sensitive market segments and retailers; and
- Improving power generation and transmission system efficiencies, resulting in reduced fuel input requirements and atmospheric emissions, as well as lowered water usage.

The fracture in the relationship between energy demand and GDP growth not only reflects the shift in the South African economy, it is also a consequence of the steep increases in electricity pricing seen since 2008. The figure below represents the Real (2009) Average Industrial Tariff:

Figure 3: Real (2009) Average Industrial Prices (Historical and Forecast)[4]



While the increases in prices provide a market-based signal to private generators to invest, it is potentially a double-edged sword. The rising prices create incentives for private generators to invest in generation assets, but it also creates incentives for large industrial users to invest in their own generation, and seek opportunities for transforming waste into energy through processes like co-generation.

Dangers of Demand Reduction

Economic efficiency is best served if prices reflect the cost of supply. This principle is also an objective of the South African Electricity Pricing Policy, but needs to be considered in light of other policy objectives to assist the poor through the subsidisation of electricity. Electricity prices are complex and contain many cost components, but in essence it consists of variable costs (the cost of the energy consumed), fixed costs (the cost of the network and metering infrastructure to deliver the energy) and the levies and taxes imposed.

The electrification and rural subsidy of 4.53c/kWh (in 2011) is an explicit subsidy shown transparently on the tariff schedules of the large energy users[5]. Additionally the introduction of inclining block tariffs, in the domestic sector, is causing a significant revenue loss and this is being reclaimed by additional increases to energy rates in industrial tariffs. This hidden subsidy started at 4.6% in 2010 and grew to 7.2% with the 2011 increases. A further 4% is expected in April 2012, so that the total subsidy to the poor will grow to 19% of industrial electricity tariffs. This is clearly not sustainable in an era where energy intensive industries are at risk of becoming uncompetitive, given the NERSA approved average electricity price increases and the possibility of further above inflation increases in the next Multi-Year Pricing Determination.

These pressures increase the likelihood of the large users investing in private generation. The national risk is, however, that due to the fact that about two thirds of electricity sales in South Africa are to industrial users, and only about one sixth to domestic users, the subsidies recovered from industrial users are significant and, on average, result in a price reduction of six times the level of the subsidy at the domestic end. The move towards private generation, therefore, would threaten these subsidies and make electricity unaffordable for other sectors of the economy.

Supply Side Perspective

The majority of all power generation projects throughout Africa have been financed by the public sector, supported by developmental loans. However, influenced by reforms across the globe and in response to insufficient public funds for new generation as well as decades of poor performance by state-run utilities, many African countries began to consider a new model for their electricity generation systems. Most of these countries, including South Africa, adopted plans to either unbundle their power systems and introduce private or have private power producers participate in the market, and thus create competition and foster private investment. IPPs were considered a quick and relatively easy solution to persistent supply constraints and provide investment into infrastructure without incurring additional fiscal burdens. While not universally successful, there are some useful insights that can be gained from specific research carried out on a range of IPP projects and market reforms in different markets. This research is summarised in a World Bank[6] study on variations to the standard "single buyer model" and in an energy policy paper published by Katharine Nawaal Gratwick and Professor Anton Eberhard (Graduate School of Business, University of Cape Town)[7].

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The South African Government has already engaged in a series of far-reaching interventions in the electricity sector since mid-1998. First, it adopted the White Paper on Energy in 1998 which provided, among other things, for the restructuring of the electricity sector and the introduction of the Independent Power Producers (IPPs) in the electricity generation sector.

The second key policy intervention was the commercialisation of Eskom in 2001; Eskom was expected to be self-sufficient. The adoption of the Electricity Pricing Policy (EPP) in 2008 was meant to ensure that Eskom recovered all its costs incurred in the generation, transmission and distribution of electricity through tariffs. This intervention has had a significant impact on tariffs and subsequently the demand profile.

In 2011 the Cabinet approved the draft legislation for the establishment of an Independent System and Market Operator (ISMO) Bill. The ISMO is expected to plan for generation expansion, procure independent power, enter into power purchasing agreements and manage the electricity transmission assets. These are the functions currently performed by Eskom. ISMO is meant to facilitate the introduction of private players in the electricity generation sector through the establishment of a non-conflicted buyer and dispatcher of power.

The decision to establish the ISMO is based on the assumption that there would be an upsurge in the investment by IPPs in the electricity generation sector post the publication of the IRP2010. However, Government made the same assumption after the adoption of Energy White Paper in 1998, which provided for the introduction of IPPs and committed almost 30% of new generation to IPPs. This assumption that IPPs would invest in the sector and the fact that the requisite investment in generation was not made neither by Eskom nor the Government, resulted initially in decreasing tariffs. However, the country now struggles with a significant energy shortfall and steeply rising costs to meet the current generation build programme.

The reality is that IPPs did not invest in the electricity generation sector because they did not find the price of electricity appealing. However, the increasing electricity tariffs now make increasingly more commercial sense – witnessed by large users looking to develop "own generation" options and external investors who are drawn to a market where they can compete with Eskom on the marginal cost of new generation.

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In light of these changes, some of the pertinent aspects of the World Bank's empirical study of the deployment of various forms of the Single Buyer Model (of which the ISMO Bill is an example) around the world in the last 15 years provides some useful background and insights. The Single Buyer Model was introduced as an initial step in power sector reform, starting in the United States, with the objective of increasing competition at the wholesale level and promoting co-generation opportunities. Following this, a similar model was adopted in the developing world, but with the main objective of attracting new private sector investment in generation, primarily where countries faced serious energy shortages. The Single Buyer Model allowed many developing countries to achieve remarkable success in attracting private capital into distressed power sectors, and thereby help relieve power shortages and support economic growth. Despite these early successes, the model did, however, fall short of expectations in many respects. It created a series of unanticipated problems, including high tariffs and stranded investments. There were also concerns around a lack of transparency and accountability, which in some cases exacerbated the problem of corruption. Moreover, because of the inflexibility of the contractual arrangements put in place, the model served to impede rather than promote competition and the advancement of power sector reforms.

The Emergence of a New Hybrid Model

Not surprisingly, the conclusions and recommendations emanating from the World Bank Report are fairly well aligned with similar analysis conducted in South Africa, at the University of Cape Town for developing markets. Both World Bank and University of Cape Town research acknowledge the way in which developing countries follow the lead of more industrialised countries in changing their power sectors to unbundle the electricity industries and introduce competition and private sector participation. They further noted that this often resulted in the prescriptive application of a so-called "standard market model" and theoretical framework, but that after an extended period, the new industry

model was not fully established in most developing countries. Rather than seeing the establishment of a classic single buyer model, it appears that in many markets a hybrid market model has emerged. Under this hybrid model large, state-owned utilities have retained significant, if not dominant, market share, but co-exist with IPPs that invest and operate on the back of long term contracts.

This hybrid model is characterised by several forms of IPPs:

- Non-utility generation for own-use on site;
- Non-utility generation for own-use across the transmission network;
- Non-utility generation for sale to the single buyer; and
- Non-utility generation bilateral trading (willing buyer-willing seller model).

The regulatory and normative response to liberalisation of the generation in South Africa focuses purely on non-utility generation for sale to the single buyer. The ISMO Bill and the draft New Generation Regulations do not address the other forms of non-Eskom generation.

This lack of regulatory clarity and the co-existence of public and the private sector players understandably gives rise to new planning, procurement and contracting challenges, which if not specifically addressed, will frustrate further investment in new power generation capacity. Indeed, there is already significant evidence that investment in much needed new capacity is lagging and that these delays are in part due to the new challenges of these hybrid markets neither being recognised nor being tackled explicitly.

The strategic and regulatory vacuum the IPPs find themselves in undermines the principle of fair and equitable treatment of all generation sources and hamper investment as private players perceive they are competing unfairly with the incumbent state-owned utility that effectively retains the upper hand. However, positive interaction between Eskom, NERSA, the Department of Energy and IPPs will hopefully address the range of unintentional but inequitable policies, rules and tariffs which discriminate against private power producers gaining access to the transmission and distribution infrastructures. The question facing South Africa's regulators and policy-makers, however, is will the regulatory processes be overtaken by the pressures on the demand side for reliable and inexpensive energy?

NOTES

1 http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/isd-ms2001economicB.htm
2 http://www.wec-indicators.enerdata.eu/
3 Eskom System Operator IRP Demand Forecast Report IRP 2010
4 IRP 2010, Frost & Sullivan Affordable Price Path Study, Energy Intensive User Group Analysis
5 http://www.eskom.co.za/content/Tariff%20Book%202010_11~1.pdf
6 Beatriz Arizu, Defne Gencer and Luiz Maurer "Centralized Purchasing Arrangements: International Practices and Lessons earned on Variations to the Single Buyer Model", World Bank (2006).
7 Gratwick, K.N., Eberhard, A. "Demise of the standard model for power sector reform and the emergence of hybrid power markets. Energy Policy (2008), doi:10.1016/j.enpol.2008.07.021"