Energy Intensive Users: South Africa's energy needs

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"At the height of his career as a scientist I called him back to South Africa where, as Prime Minister after the first World War, I wanted him back as scientific and technical adviser to the Government, and ultimately to head a public utility corporation for generating electrical power on a nation-wide non-profit basis. To this appeal he responded and in due course became chairman of ESCOM, the Electricity Supply Commission, which is today supplying South African industry and other users with probably as cheap power as is to be found anywhere in the world".[1]

It is December 1948, and these words are from Jan Smuts, twice Prime Minister of the Union of South Africa, in his foreword to the book *"South African Heritage"*, a biography of HJ van der Bijl by his long-time assistant Alice Jacobs.

Why is this quote relevant in an era when South Africa is facing challenges of energy security, a low carbon future, energy hungry industry, and an increase in unemployment and poverty that could be the spark in the proverbial powder keg?

South Africa's Energy Mix

Since the rolling blackouts of 2008, South Africa's energy mix has not changed much, and negligible capacity has been added. Therefore, I will refer to the energy mix as presented to industry in 2007 during a discussion regarding the Energy Conservation Scheme that was planned.[2]

29% of South Africa's energy is provided by electricity. Installed capacity is around 39GW, of which 80% is coal fired. Eskom imports about 1.5GW from Cahora Basa Hydroelectric Dam in Mozambique. The largest 138 customers consume 40% of the available electricity. The largest 40 000 customers consume about 75% of electricity, while 8 million customers consume about 25% of electricity.[3]

Eskom Plant Statistics

In 1999 the reserve margin was 27%, and by 2007 it had decreased to 5%. The power stations had to produce much more by 2007, with the load factor increasing from 61% in 1999 to 74% in 2007. During the same period, plant unavailability doubled from 2.4% to 5%.[4]

Eskom has to force energy intensive users to cut back on electricity demand. This has a negative effect on output, GDP, the tax base, job creation and industry's ability to plan for expansion.

It is difficult to analyse the reserve margin from 2008 to 2012, as Eskom is under severe pressure to keep the lights on and is cutting back supply to industry to ensure this. Eskom is using a combination of the Demand Market Participation Programme, utilising its peaking gas turbines at an extremely high cost of around R4.50/kWh, and its interruptible contracts with some large energy intensive users to balance the supply and demand and avert the need for load shedding. In January 2012 it came close to rolling blackouts, with Eskom losing the supply from Cahora Basa for a period of time. The forecast operating reserve margin for the evening peak period was minus 2400MW. To ensure a safe operating reserve margin, Eskom has to force energy intensive users to cut back on electricity demand. This has a negative effect on output, GDP, the tax base, job creation and industry's ability to plan for expansion. The country's reserve margin is thus largely managed by managing the quantity of un-served energy, with a massive impact on the economy.

Certainty in an Uncertain Environment

Industry requires some degree of certainty in the uncertain trading environment that exists globally today. The effects of the credit crunch of 2008 as well as the uncertainty about the Euro crisis, adds to an environment where business would rather look after its balance sheet and especially its cash reserves, than make investments to expand its business. If insecurity like the availability of something as basic as reliable electricity is added to the existing uncertainty, it becomes fatal for new investments and therefore economic expansion.

The Electricity Supply Industry 1920 to 1996

After Dr. van der Bijl responded to Jan Smuts' call, he formed ESCOM, ISCOR and the IDC and was almost single handedly responsible for leading the industrialisation of South Africa. Van der Bijl could only achieve this because Jan Smuts as a leader had the vision, knew who had the relevant competency and drive, appointed him, empowered him and stepped aside to ensure that he could carry out the job efficiently and effectively.

ESCOM (later named Eskom) was formed as a non-profit company owned by the state but managed on sound business principles. It played a key role in the electrification and industrialisation of South Africa. Eskom has been the largest player in the South African electricity supply industry since its inception in the 1920s.

By the mid 1950s Eskom was in the process of building three power stations at any one time. Between 1980 and 2000 a total of ten power stations were built and commissioned, including seven coal fired power stations, one nuclear power station and two pump storage stations. The total capacity added during this twenty year period was 30 100 MWe. During this period, a core body of knowledge, skills and

experience was built up in the country. Eskom was known globally for its large scale power stations, excellent skills base and efficient operations.

By the mid 1980s international sanctions started to be effective and South Africa's economy began to falter. By 1988/89 the reserve margin was more than 15%. Eskom was looking for more customers and started various programmes to expand its customer base. This included the Agrelek programme which encouraged farmers to farm with electricity. And the 'Electricity for all' programme focused on electrification for that part of the population that did not have access to electricity. The largest new customer was, however, the Bay Side Aluminium Smelter built in Richards Bay during the early 1990s. Electricity was sold to them at a special tariff for a period of 15 years, after which the tariff would return to a normal industrial tariff. The Aluminium Industry recognised the opportunity, and the Hillside Smelter followed in the mid 1990s, and the Mozal Smelter followed in the late 1990s/early 2000s.

With the demise of apartheid in 1994, the government focused its efforts on normalising society through various programmes, including Black Economic Empowerment (BEE), Employment Equity (EE) and the Reconstruction and Development Programme (RDP). The latter included the expansion of the 'Electricity for all' programme. International sanctions ended and the South African economy started to grow steadily.

By 1996, Eskom envisaged that the South African electricity supply industry would migrate towards a competitive market arrangement. The leadership at Eskom was ahead of its time and implemented what was called an "experimental wholesale power pool", modelled on the United Kingdom's wholesale market. Eskom wanted to be ready for this move by experimenting with the system in a less abrasive environment than real competition[5]. The internal Eskom Power Pool was implemented on 1 January 1996, with trading rules based on the United Kingdom market. The demand side was represented by an hourly load forecast. The wholesale model market could have been a suitable starting point when introducing non-Eskom generation into the mix, but events subsequently overtook the exercise.[6]

The good work that was undertaken to separate the different businesses in Eskom was undone, and the experimental power pool eroded to become a centrally planned generator scheduling tool as a result of the re-integration exercise.

Different Agendas

By 2004 the planned move to a wholesale-market model in South Africa was abandoned, and Eskom was re-integrated to become one entity again. The good work that was undertaken to separate the different businesses in Eskom was undone, and the experimental power pool eroded to become a centrally planned generator scheduling tool as a result of the re-integration exercise.[7]

This all happened against the backdrop of the Energy White Paper of 1998. The White Paper stated that, to ensure success of the electricity supply industry as a whole, government should consider various developments namely:

- Giving customers the right to choose their electricity supplier;
- Introducing competition into the industry, especially the generation sector;
- Permitting open, non-discriminatory access to the transmission system; and
- Encouraging private sector participation in the industry.

This intent is now prescribed by the Electricity Regulation Act No. 4 of 2006. It is thus clear from Government that there is intent for policy design support of a wholesale market with multiple providers of electricity.[8]

It seems that during the period 1996 to 2007 Eskom and Government were working against each other, which led to the lost decade.

The Lost Decade

A decade was lost where Eskom did not have a mandate from Government to build more power stations. During this period no alternatives were put into place by Government, the policy and regulatory environment had not yet been developed, and the uncertainty of this environment led to no significant investments by Independent Power Producers (IPPs). Eskom tested the market with its Multi-Site Coal-Base Load Programme, but this led to nothing but wasted efforts from IPPs. Eskom launched the Pilot National Co-generation Programme in 2007. IPPs and industry players could develop co-generation projects of about 3000 MW and could have the capacity commissioned by 2010/2011. The process was very trying and nothing has come of it. Independent Power South Africa (IPSA) took a bold step and built a small co-generation plant in Newcastle. Eskom ensured that, even during the rolling blackouts of early 2008, it did not buy electricity from this plant. It was clear that Eskom was intent on keeping private players out of the electricity supply industry, but at the same time government was not successful in creating an environment independent from Eskom to bring in private players.

It is an irony that one of the core values of the founder of Eskom was seemingly ignored by Eskom during this lost decade. The fundamental principle of Van der Bijl's life was "the greatest and noblest function of science and engineering is to raise the standard of living of the human being"[9]. It seems that the leadership during this stage was not interested in raising the standard of living of human beings.

Reality Setting in

The far reaching effects of the 2008 rolling blackouts made Government take notice of the reality of Eskom protecting its own market space. President Zuma's Government formed the Department of Energy (DoE), unbundling it from the Department of Minerals and Energy. Energy policy was now the DoE's responsibility. Eskom now reported to the Department of Public Enterprises, and some independence was created. During this period, industry associations like the South African Independent Power Producers Association, the South African Wind Energy Association, the South African Solar Thermal and Electricity Association and the South African Photovoltaic Industry Association were formed. All role players became engaged to ensure that the electricity supply industry has a future.

Long Awaited Breakthroughs

The DoE, in alliance with industry and Eskom in 2010, introduced the Integrated Resource Plan (IRP). This bold plan, which balances the supply industry with various demand forecasts, included about 19GW of renewable energy in a 20 year electricity plan. The IRP has been accepted by all role players, although not without criticism from various sectors. The biggest questions are the affordability of electricity and the ever relevant debate regarding renewable energy versus base-load electricity. However, the IRP was a breakthrough in terms of creating certainty and establishing a task team-comprising Government, the National Energy Regulator of South Africa (NERSA), industry and Eskom- that has one goal national interest.

This led to the next step, namely, the Independent Power Producer Procurement Programme. The DoE, in close cooperation with National Treasury coupled with a healthy debate with industry and NERSA, designed for the procurement of 3725 MW of renewable electricity. The process was not without controversy, but it is clear from the outcome of the first procurement window that Government is sticking to its action plan. The programme should ensure a large, world-class renewable energy sector in South Africa. It should also lead to further black economic empowerment, the empowerment of local communities, job creation, skills development and an expanded manufacturing sector.

The Current Reality

The current reality is that South Africa has lost a decade of planning for new electricity infrastructure. During the same period industry lost the opportunity to plan vital expansions of their businesses in a global arena, where China and India's growth demands massive volumes of minerals that South Africa could supply if the infrastructure and electricity were in place.

The Eskom build programme is behind schedule. The first renewable energy from the Independent Power Producer Procurement Programme will only come on line by mid 2012. At the same time, the co-generation opportunities in South Africa are not being developed. Taking into account that it is the cheapest electricity that could be supplied from new power stations, that it is carbon neutral and that it is perfectly related to demand from energy intensive users, it is definitely not a feather in South Africa's cap that it has not been developed.

The policy and regulatory environment is not in place yet, and various parts of existing and new legislation are not yet aligned.

The Future

The electricity supply industry in South Africa is beyond its darkest hour. With good leadership at all levels of Government and industry at large, the electricity supply industry can play a vital role in creating the platform for economic growth, job creation and poverty alleviation.

The focus should be on ensuring the success of the Independent Power Producer Procurement Programme and on finalising outstanding legislation. Furthermore, it is imperative to unbundle Eskom into a generation company on the one hand and a transmission and distribution company on the other. It could still be state-owned but should be managed in such a way to ensure that there is no conflict of interest and that IPPs can enter the field without fear of an uneven playing field.

Conclusion

The South African electricity supply industry needs leaders of the mettle of Jan Smuts and Hendrik van der Bijl.

To ensure that South Africa is successful, we will need political leaders who have a vision, who know who has the relevant competency, who empower that competence, and who steps aside to ensure that the player are able to execute the job efficiently and effectively.

On the other hand, in an environment lacking clear leadership combined with a culture where incompetence is rewarded and where political meddling is part of everyday life, engineers and technocrats cannot be successful in realising the founder of Eskom's fundamental principle, namely "the greatest and noblest function of science and engineering is to raise the standard of living of the human being".

NOTES

1 Jacobs, A. (1948). South African Heritage. Pietermaritzburg: Shuter & Shooter.
2 Lakmeeharan, K. and Visagie, C. (2008). Setting the Scene for the Power Conservation Programme Debate. October 23.
3 Ibid.
4 Ibid.
5 Kruger, F. (2010). The South African Wholesale Market for Electricity: Requirements for Renewable Energy Uptake. The Sustainable Energy Resource Handbook: The Essential Guide, 1:31-38.
6 Ibid.
7 Ibid.
8 Ibid.
9 Jacobs, A. (1948). South African Heritage. Pietermaritzburg: Shuter & Shooter.