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Economic Research

13 February 2008

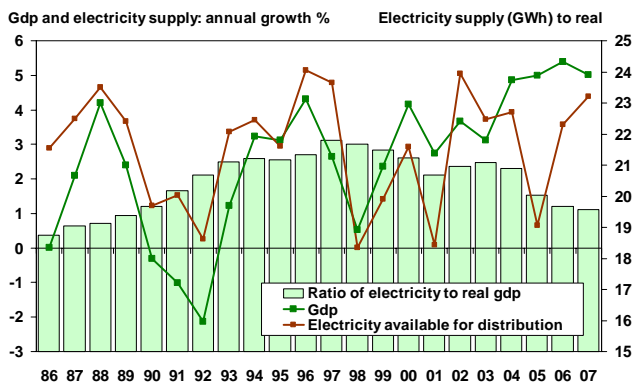
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THE ENERGY CONSTRAINT

The possibility of an energy constraint on economic growth emerging has been well documented for at least a decade, when a government White Paper famously noted that supply problems would emerge in 2007 unless new capacity was brought on stream. A policy hiatus has left capacity at much the same levels as it was in the late 1990s so there should therefore be little surprise that shortages have surfaced. However, the extent and timing of the problem that unfolded in January was unexpected. This article examines whether the constraint on available electricity supply will reduce South Africa's medium-term economic growth potential materially.

Graph 1: Gdp growth and electricity supply



The sudden collapse of electricity provision in the first few weeks of 2008 has cramped both the immediate economic growth outlook as well as the country's medium-term growth potential. From 10 January phased blackouts ('load shedding') initially inconvenienced consumers and small businesses, before escalating to enforced temporary shutdowns in key mining operations. The immediate cause of the crisis was a poorly maintained power-generating infrastructure working at close to full capacity, with uncharacteristically wet weather as well as coal supply and quality difficulties bringing problems to a head and culminating in massive breakdowns ('unscheduled

maintenance'). By 25 January these had resulted in over 5 000 MW or around 13% of the total theoretical capacity of 39 000 MW being lost. However, with planned maintenance this figure increased to around 8 700 MW or 22% of capacity. Against estimated demand of around 32 300 MW, this meant a shortfall of 2 000 MW or more and that something drastic had to be done.

The energy-intensive components of the mining sector were initially informed that electricity could not be guaranteed – for around a month – while electricity capacity was being restored to more normal levels. For safety reasons, this implied a complete shutdown of this important industry. Had this situation persisted, it would have proved extremely expensive for the sector as well as the economy. Mining accounts for around 7% of gdp directly and gold and platinum mining for about 50% of mining. Adding other energy-intensive mining operations pushes the proportion to at least 60%. This meant that in one month more than 0,4% of gdp and R13 billion worth of export revenue would have been lost directly. Of course, the indirect effects would have been significant, but harder to quantify. Many companies exist as suppliers to the mining industry and would have had to cut back or adapt. Wages and jobs would also have been under threat and negative sentiment would have led to further cutbacks in consumer spending.

Mines were then told that they could resume operations at 90% of their previous electricity usage. Government also announced rationing for other users, with cutbacks ranging from 5%, for agriculture, to 20% (for hotels, resorts, retail and conference centres). Industry and residences are to reduce usage by 10% and commercial, large offices, government and municipalities by 15%. These short-term emergency rationing measures at the time of writing are scheduled to last for two months while unscheduled and scheduled maintenance is completed ahead of the peak winter season. Peak demand during this period will rise by over 18% of current levels, implying that the reserve margin (the difference between the supply and demand at peak demand periods) will fall to below 5%, leaving no room for any error or maintenance at all. This margin compares with internationally accepted norms of around



MAKE THINGS HAPPEN

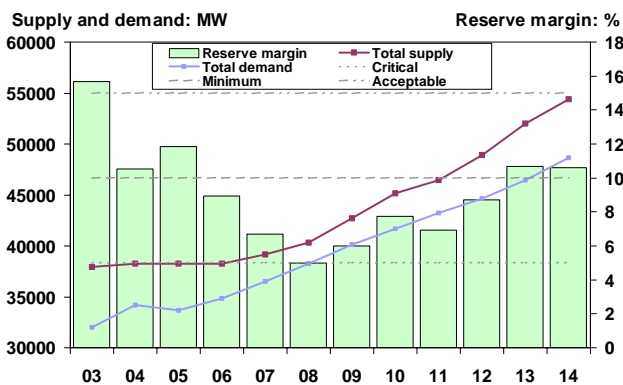
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15% and a more acceptable 20% for South Africa, given the age of the equipment and its state of repair. This implies that, unless full capacity is restored by winter, the country will suffer significant problems.

Beyond these very short-term emergency measures, government's main focus has been on demand-side management (DSM) or energy saving. These include some interesting measures such as the planned subsidisation of one million solar-powered geysers over three years, the replacement of incandescent light bulbs with compact fluorescent ones, smart metering and remote control of electricity usage at peak periods, increased usage of liquid petroleum gas for cooking and other uses and changing building regulations to ensure energy-saving technologies are used in new buildings.

The gaping hole in the plans so far is the lack of urgency or creativity on the supply side of the equation. Eskom has warned that its first new base load capacity will be ready only in 2012. Before that, some demothballing of old power stations, some expansion of gas turbine generation and limited planned co-generation will add modest amounts of capacity. This leaves the economy very vulnerable to the success of the demand management programme. Simply put, electricity consumption has to be restricted over at least the next three to five years. Unless energy can be rationed in a way that does not cramp growth or additional electricity can be sourced, economic growth will be constrained.

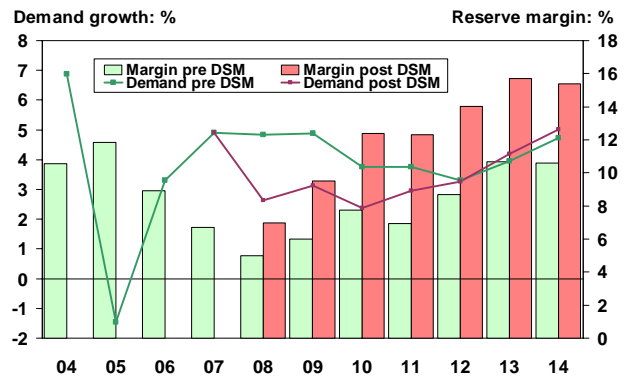
Graph 2: Projected electricity supply and demand



Graph 2 illustrates the effect of the supply crunch. Optimistically, supply will grow at around 5% per annum over the next three years (in the absence of any additional interventions) and growth in demand of just under 4,5% in response to economic growth of over 5% was anticipated. On the face of it, this appears manageable, but it implies that the reserve margin would have to stay at dangerously low levels of well below 10% over not only the short term, but even to 2012. This would probably result in continued unscheduled interruptions with damaging economic consequences and is therefore not a feasible option.

Government's plan focuses on reduced consumption

Graph 3: Effect of demand side management on the margin



The current plan is therefore to restrict demand so that the reserve margin can be restored to more acceptable levels. Graph 3 shows projected usage and the consequent margin before and after demand side management proposals are implemented. In the short term, growth in electricity consumption is restricted to around 2,7% compared with Eskom's pre-crisis demand estimates of closer to 5%. Over the three-year period consumption is held around 3%, again well below the 4% or so that might have occurred in an unrestricted environment. Even so, a reserve margin of over 10% is only restored in 2010.

The damage to the economy is potentially large

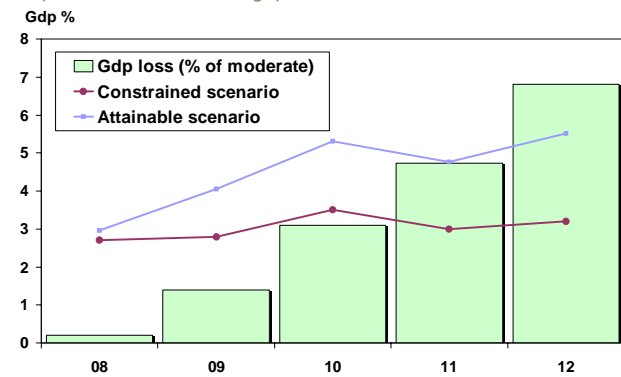
How damaging will this be for the economy? Simplistically, if economic growth of 5% leads to energy demand rising by 4%, it may imply that restricting electricity supply to 2,7% would constrain economic growth to under 3,5%. However, the relationship is more complicated, with the effects potentially being a lot more devastating or, alternatively, significantly less so. The damage caused in the short term by rationing is a relatively straightforward calculation of lost production and sales over the period. However, the longer-term effects depend crucially on confidence and, related to this, how the government manages the demand side management programme and the provision of new power generation. If confidence is restored quickly – not by rhetoric, but by concrete action – the damage to much-needed capital formation will be limited, essential foreign capital inflows will resume and negative indirect effects on the rand and interest rates will be contained.

Graph 4 illustrates the *potential* longer-term impact of an inadequate response. The first scenario (the attainable scenario) gives our current estimates of gdp growth over the next five years, taking into account the electricity constraint, but also the less favourable global environment over the next two years and the anticipated slowdown in consumer spending due to the current high interest rate environment in the short term. In the second – the

constrained scenario – these factors are also taken into account, but the electricity constraint is magnified by an inadequate or inappropriate response, reducing capital formation to just above replacement rates rather than allowing for additional capacity to be installed.

The initial losses in both scenarios are similar as they both assume some short-term damage resulting from rationing. However, the gap then begins to open on rising efficiency losses emanating from a misallocation of resources and insufficient capacity in key sectors. By 2012 the gap between potential gdp and the constrained outcome is a huge 6,8% or R166 billion in today's rands. The cumulative loss in gdp over the period is R377 billion, more than Eskom's expansion programme. On current elasticities, the government would lose around R100 billion in taxation revenue in the five-year period alone. All these losses would be compounded beyond this period because of the permanently lower base.

Graph 4: Potential loss of gdp due to the crisis



Properly targeted demand management crucial

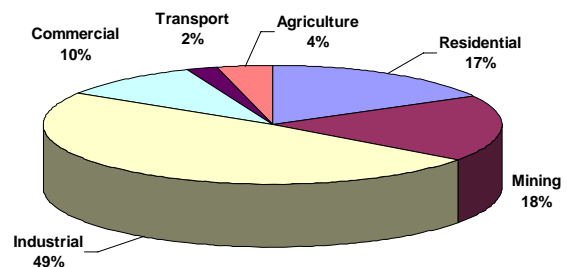
Clearly such losses are unacceptable. What separates the two scenarios? In the first, cutbacks on the demand side have to be targeted at areas where there has been unnecessary waste (possibly due to careless consumption resulting from the low electricity price) and therefore where interventions will not reduce the economy's productive capacity. As much of mining and industry have already been on energy efficiency programmes over the past few years, it is probable that forced reductions from current levels in these areas will have direct, negative and possibly non-linear effects. As recently seen, a reduction of 30% electricity provided to mining forced a total shutdown of production. The current 10% reduction will probably reduce output by considerably more than 10% as some 50% to 70% of energy consumed in deep mining is just for cooling and pumping. The remaining 50% is used for extraction, implying that a 10% overall cut in electricity is effectively a 20% cut on the production side.

In contrast, it is probable that households could make significant savings through relatively small behavioural adjustments rather than through any draconian measures.

For example, according to Eskom, some 30% to 50% of a typical household's electricity usage is on hot water geysers and, of this, savings of up to 50% can be made by improving insulation and adjusting the thermostat. Widespread use of gas and solar heating could take this proportion up significantly (to over 70%). With other, more modest savings on household appliance use the overall savings from this category of user could climb to 30%. As households make up over 17% of electricity consumption, it is quite possible that 5% – or half – of needed savings could come from this source. However, this is unlikely to happen just through appeals. A system of incentives and penalties (for peak-hour usage) needs to be set up quickly and implemented.

In summary, proper cost benefit analysis needs to be carried out to assess the impact of various demand side measures on the economy. It is quite possible that, done intelligently, the demand reductions could result in limited damage to growth and have the added advantage of increasing awareness of the environmental damage of wasteful consumption in the longer term. For a country that is 12th on the UN's top-30 list of carbon dioxide emitters – coming ahead of much larger economies such as France, Brazil and Spain – this would be a welcome development.

Graph 5: Share of electricity consumption



Supply side needs urgent private sector participation

The second distinguishing area between the two scenarios is on the supply side. This will be more important than the demand side in the medium term. Here the underlying problem has for a long time been a regulatory and legislative one. In the attainable scenario, the private sector is incentivised and encouraged to become a major part of the supply solution. At present the single-purchaser model is hampering this, where Eskom, the state monopoly and controller of the transmission grid, has to agree to price and long-term purchasing agreements with competitors. Eskom has been reluctant to sign deals that may raise its average long-term cost of energy even though the opportunity cost to the economy of not doing so is enormous and permanent as illustrated in graph 4.

As a result co-generation deals and alternative base load supplies that could have averted the current difficulties have been delayed.

In the medium to longer term the government needs to re-examine the structure of the energy sector to encourage more efficient providers to enter the market. Massive cost overruns and delays in the state sector need to be examined critically and a new, predictable and fair regulatory regime has to be instated to avoid the mistakes of the past. In the short term the state has to move swiftly to ensure that Eskom's management is incentivised to ensure energy security, rather than incentivised to make financial targets. This may also entail temporarily using more diesel-powered gas turbines to alleviate short-term peak pressures despite their expense at a company level (around 33 times more than coal-generated power).

It is also likely that significant savings could be made through better maintenance of the transmission and distribution networks. Deterioration in this infrastructure could again be related to mixed goals and improper incentivisation of management.

The good news is that, if the government makes the necessary changes to allow the private sector to compete fairly in the provision of electricity, quicker and more

creative solutions are likely to be found and the constraint on medium-term growth will be lifted.

Conclusion

The electricity crisis comes at an awkward time for an economy already burdened by higher interest rates and a slowing international economy. The potential impact extends well beyond the effect of a simple constraint on a vital input. It could damage consumer, business and foreign investor confidence, with deeper implications for potential gdp growth, the rand and interest rates. Fortunately, relatively small, but quick, interventions to influence the behaviour of all affected parties can make a massive difference to pushing the economy back onto a more favourable growth path.

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