

Plugging into source of the failures

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We now know that South Africa's security of electricity supply is inadequate. The Western Cape blackouts between November 2005 and March 2006, the national load-shedding on 18 January 2007, and numerous distribution failures, have caused costly damage to the economy and loss of welfare to electricity consumers.

The proximate causes of these failures are well understood. Reserve margins are too low and the supply/demand situation is too tight. During winter, when peak demand is at its highest, all available plant is being run to its maximum. In summer, when planned maintenance shutdowns are implemented, any excess demand for electricity or unplanned plant outages (beyond those for which contingencies exist) severely stress the system and can force rolling load-shedding.

Furthermore, there are parts of country where transmission capacity is insufficient to meet security standards. And the reliability of distribution networks in many municipal areas is threatened by inadequate maintenance and inadequate investment in system strengthening.

The root causes of these failures are sometimes misunderstood. Many have argued that electricity consumption and demand growth have been higher than expected because of higher economic growth rates. Let's look at the facts. Annual peak demand has grown on average by just over 3.6 % per annum since 2000. Current peak electricity demand is actually lower than that predicted in Eskom's Integrated Strategic Electricity Plans that were prepared in 2001, 2003 and 2005. Electricity forecasts have been reasonably accurate.

Furthermore, as far back as 1998, the Energy Policy White Paper warned of supply shortages around 2007. The claim that electricity demand has grown faster than predicted – and that this accounts for current supply deficits – is not supported by the data.

So what are the ultimate causes of recent supply failures? There are at least four main causes. *First, policy uncertainty between 1998 and 2004 inhibited and slowed investment.* During this time, consideration was given to breaking up Eskom and introducing competition and private investment. In 2001 Eskom was actually prohibited by government from building new generation capacity. Despite this embargo on Eskom, no concrete steps were taken for alternatives.

Investment planning and decision-making fell 18 months behind schedule. Some consequences of the delays are that the commissioning of base-load generating plant (in the form of return-to-service coal stations that were previously mothballed) and new

peaking plant (open-cycle gas-fired turbines) has been too late. In addition, policy uncertainty delayed the re-establishment of dedicated project teams and departments in Eskom to manage the new capacity expansion programs.

Second, poor coordination has caused further set backs. The lack of co-ordination and integration of the different electricity planning, investment decision-making, approval and procurement processes between Eskom, the National Energy Regulator (NERSA), the Department of Minerals and Energy (DME) and the Department of Public Enterprises (DPE) has created dangerous risks in terms of contradictory and badly-timed decisions being made, and procurement processes that might result in costly and late investments. An example is the delay in finalising the DME bids for private independent power plants.

Emerging risks are also evident in the licensing delays by NERSA and the legal requirement for ministerial approval for any deviation from the official NERSA electricity plan – which is already out of date.

Third, while there has been a great deal of planning, some of the earlier planning assumptions were wrong. The estimates for existing generation plant availability were too optimistic. It was assumed that municipalities would be able to contribute more generation capacity than is currently available. The assumed cost of un-served energy was unrealistically low. And planning was constrained by applying too low a reserve margin (10% compared to a more acceptable 15%). Together these faulty assumptions have resulted in planned capacity additions that are 18 months to two years too late.

Fourth, inadequate maintenance or negligence may have played a hand. An investigation by the National Energy Regulator concluded that (in the case of the Western Cape outages) there was negligence on the part of responsible Eskom personnel, maintenance procedures and remedial actions were inadequate, protection systems had been operated incorrectly and licence conditions as stipulated in the Grid Code were breached. Eskom disagrees with these findings but has not lodged any formal court appeal, as it is entitled to.

These root causes help explain how we have arrived at where we are today. What of the future? The national electricity/demand situation will remain extremely tight over the next five years and may continue to be so in the period after 2011 unless investment is accelerated. In the meantime, new peaking plant will provide the system operator with useful new resources. However, the urgent need is now for more base-load capacity.

Investment decisions are being taken, huge capital budgets are being allocated and every effort is being made by Eskom to ensure that plant will be built and commissioned on time. The constraint now is not a lack of planning or investment. The primary constraint is time and the risks that the global supply squeeze in critical power equipment and engineering capability will result in deadlines slipping. Further risks may arise from higher unplanned outages, higher demand growth, coal delivery constraints, problems in the fuel supply to the new peaking plant, delays in environmental approvals and transmission right-of-way expropriations and the ongoing scarcity of skills.

There is also a renewed focus in Eskom on maintenance and the security and quality of supply which appears to be bearing fruit: for example, the serious transmission failures of early 2006 have not been repeated. Nevertheless, serious challenges exist in strengthening the grid and capital refurbishment (including transformers) in high risk areas.

Probably, the most serious threat to the security of electricity supply in the future resides in the distribution sector. Policy uncertainty persists and there is still no clear road map to establishing the Regional Electricity Distributors (REDs). Unless remaining policy issues are resolved (including the question of local governments' constitutional rights over electricity reticulation) backlogs in maintenance and strengthening of distribution systems will continue to grow and the risks of supply failures will be exacerbated. Single- area distribution failures do not have the same impact as generation and transmission failures, but cumulatively they are eroding South Africa's ambition to lift economic growth rates and improve the welfare of its people.

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This article has examined the root causes of electricity supply failures. A second article will examine the adequacy of plans to restore supply security.