INQUIRY INTO
THE NATIONAL ELECTRICITY SUPPLY SHORTAGE AND LOAD SHEDDING

REPORT BY THE ENERGY REGULATOR

12 May 2008
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1. Introduction

Modern economies are becoming increasingly dependent on reliable and secure electricity services. The substantial supply disruptions that struck South Africa from November 2007 to end of January 2008 demonstrated the fundamental importance of having adequate generating capacity for the efficient and secure operation of the electricity industry in South Africa. It also highlighted the entire power system vulnerability to generating unit failures and generation primary energy shortages. Eskom has since January 2006 been experiencing increasing difficulty in meeting customer demand. This situation deteriorated drastically in late 2007 and early 2008 and culminated in a situation where Eskom started shedding customer loads. The non-Eskom electricity distributors, in turn, were forced to shed load. The extent of the load shedding had a disruptive impact on business operations, traffic, industry, mining operations, commerce, hospitals, clinics, schools and other educational institutions, the civil service, domestic households and the daily lives of the South African public. This situation deteriorated to such an extent that the major mining groups shut down their operations on 24 January 2008 due to safety considerations.

In light of the above, the Energy Regulator decided that an inquiry be conducted in terms of sections 4(b) (ii) and 4(b)(iv) of the Electricity Regulation Act, 2006 (Act No. 4 of 2006) (“the Act”), into the national electricity supply shortage and the subsequent load shedding by Eskom and other licensees during the period 1 November 2007 to 31 January 2008.

The purpose of this inquiry is to inform the Energy Regulator of the reasons for the current electricity supply shortage resulting in the national load shedding of electricity and recommend measures to be adopted to mitigate against the electricity supply shortage and to reduce the adverse impact thereof.

The scope of the inquiry focuses specifically on events in the period 1 November 2007 to 31 January 2008.

2. Inquiry process and methodology

The Energy Regulator conducted the inquiry on a fast tracked project basis by establishing the Load Shedding Ad-Hoc Subcommittee of the Energy Regulator with its terms of reference comprising Mr. Thembani Bukula (Regulator Member primarily responsible for electricity regulation) (Chairperson) and Mr. Smunda Mokoena (Chief Executive Officer). The subcommittee established nine work streams with their terms of reference: load shedding, coordination and communication, supply-demand balance, primary energy, plant maintenance, legislation and licence conditions, Government’s National Electricity Emergency Programme, finance and economics, and communication strategy. The work
streams were responsible for analysing and reporting on specific outlined sections of the overall project. Eskom’s Recovery Plan was also analysed.

Seven stakeholder groups were identified: Eskom, other licensees, primary energy suppliers, regional electricity suppliers represented by the Southern African Power Pool (SAPP), organised business, organised labour, and electricity customers. Questionnaires were drawn up and distributed to each stakeholder group. Questionnaires were sent to 48 organisations of which 50% responded. Failure to respond was mainly in the residential customer sector and labour organisations. The information used in the inquiry was provided by 38% of the 48 organisations. While the responses were slow in terms of the inquiry timeframes, it was adequate to support the inquiry findings.

Primary records and data were provided by Eskom in about 100 information pieces which were analysed by NERSA in order to make its findings. Eskom provided information in three tranches in response to the original questionnaire and follow up questions. Each section of the report is structured into analysis, findings and recommendations sub-sections.

Eskom was given a draft copy of the report to respond to NERSA’s preliminary findings. Eskom’s response was received (refer to Appendix 1) and its comments were as far as possible addressed in the final report.

3. Industry Background

The electricity supply industry in South Africa comprises Eskom, a state owned enterprise that generates 92% of the electricity in South Africa. The other 8% comprises power imports (4.5%) and power generated by municipalities (0.5%), private generators (3%). Eskom imports 4.5% of the electricity supplied and exports 5.5% of the electricity sales in South Africa. Private generators include independent power producers and co-generation by industries such as Sasol and the sugar industry. Eskom is also the only national transmitter and system operator. Eskom distributes and retails 60% of electricity sales in South Africa, to 40% of the electricity customers. The remaining 40% electricity is sold to 60% of electricity customers by 184 licensed municipalities and a small number of private distributors.

The primary energy used for electricity generation includes coal, gas, nuclear, diesel, water, heavy oil, etc. This primary energy is provided by the private sector except for water. The major coal suppliers are: Anglo Coal SA, Rand Mines, Ingwe Coal Corporation, and Eyesizwe Coal. The coal suppliers operate the coal mines that are dedicated to supply the Eskom base-load power stations. Eskom receives 80% of its coal from dedicated/contracted pithead coal mines. The remaining 20% of coal requirements is purchased on short-term coal contracts and is transported to the power stations by road. In the three month period of
November 2007 to January 2008, 28.9 million tons of coal were received at Eskom power stations of which 78% was delivered by tied collieries, 19% was transported by road and 3% was transported by rail.

The users of electricity in South Africa comprise the following groupings:

<table>
<thead>
<tr>
<th>Customer group</th>
<th>Electricity consumption</th>
<th>Number of consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>17%</td>
<td>7.5 million</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3%</td>
<td>103 000</td>
</tr>
<tr>
<td>Commercial</td>
<td>13%</td>
<td>255 000</td>
</tr>
<tr>
<td>Mining</td>
<td>15%</td>
<td>1 100</td>
</tr>
<tr>
<td>Industry / Manufacturing</td>
<td>38%</td>
<td>33 000</td>
</tr>
<tr>
<td>Transport</td>
<td>3%</td>
<td>1 800</td>
</tr>
<tr>
<td>Exports¹</td>
<td>6%</td>
<td>7</td>
</tr>
<tr>
<td>Own use of distributors</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>7.9 million</td>
</tr>
</tbody>
</table>

**Table 1: South African Demand Profile²**

The generation capacity reserve margin was 25% in 2002. At the time government policy was to encourage private sector participation in electricity generation and a potential market for electricity generation was considered. In 2004, a policy decision was made that 70% of new electricity generating capacity would be commissioned by Eskom and the remaining 30% by independent power producers (IPPs). In 2006 the reserve margin was 16% and in 2008 it will be only 8% to 10% of peak demand.

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¹ Eskom imports 4.5% and exports 5.5% of the electricity of the electricity supplied in South Africa
² NERSA: Electricity Supply Statistics for South Africa - 2007
4. Events in the Inquiry Period

Load shedding was experienced during the months from November 2007 to January 2008. The high number of load shedding incidents in January attracted national attention.

There were five (5) load shedding incidents in November and four (4) in December arising mainly out of generation capacity shortages. In January fourteen (14) incidents occurred due to both energy and capacity constraints. The high frequency of load shedding in January was related to the increasing demand (about 3000MW) after the December holiday period and an increase in the unplanned outage rate as shown in Figure 1.

The lack of sufficient base-load plant for generation due to planned and unplanned outages of units and unplanned reductions in generation (load losses) resulted in the excessive operation of the expensive gas turbine plants even during off peak periods. The average fuel cost of operating gas turbines is 180 cents per kWh, well above Eskom’s average electricity selling price and about 10 cents per kWh average fuel cost of coal-fired generation. Gas turbines are used to keep supplies going as a last resort. The fuel oil used in the period of the inquiry exceeded the total fuel oil that would under normal circumstances be used in a calendar year.

5. Load Shedding

The measure of an adequate and secure power supply is the ability to continuously balance supply of power (generation) and demand for power (load). The balance is maintained by controlling the frequency to 50Hz. If demand exceeds generation the system slows down and the Eskom National Control Centre instructs power stations to increase generation from available plant. When there is no more available plant the system will slow down and eventually collapse unless the load is reduced. To do this the National Control Centre first requests the demand market participation (DMP) customers to reduce load by prearranged contractual amounts. If this is insufficient then they may interrupt load which is on an interruptible tariff. This is limited in duration and is normally used to recover from system incidents. Once all other options are fully utilised then manual load shedding is employed. The Eskom National Control Centre will then assess the shortfall and request the Eskom Regional Control Centres to reduce load according to a predefined proportion so that the impact is spread evenly throughout the country. They will also declare a Southern African Power Pool emergency so that those partners which have spare capacity can assist.

An insecure and inadequate power system implies that the supply-demand balance cannot be maintained on a continuous basis resulting in load shedding.
During the period from 01 November 2007 to 31 January 2008 South Africa experienced load shedding\(^3\) around the country mainly due to generating capacity and energy constraints experienced by Eskom. In January 2008 this increased in intensity as the outlook on the power system grew worse. This culminated in a letter sent out on 24 January 2008 by Eskom to customers declaring *force majeure* and requesting that they reduce load. This resulted in the much publicised mining industry close down when Eskom could not guarantee supply.

The November and December incidents were mainly caused by inadequate generating capacity resulting mainly from generator trips. The more severe load shedding incidents of up to 4000MW occurred on numerous occasions (17 days) in January as a result of both capacity and energy shortages. The extent of the capacity and energy constraints and the applicable reasons are discussed later in the report.

![Correlation between load shedding and unplanned outages (MW)](image)

**Figure 1 - Correlation between load shedding, load losses and unplanned outages (MW)\(^4\)**

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\(^3\) Also referred to as rolling blackouts because blocks of customer loads are removed (shed) to balance supply and demand.

\(^4\) Source NERSA: data provided by Eskom in response to inquiry
In Figure 1 the days on which load shedding occurred, the amount of load shedding and the Eskom generation capacity that was not available due to generation load losses and unplanned generation outages are shown. It can be seen that there was a good correlation between the amount of load shedding and the amount of generation load losses. In planning the amount of planned outages that may be allowed, Eskom provides a margin of 2000MW for unplanned events. The total unplanned events were well above this margin.

The load losses were as a result of low coal stockpile levels and high rainfall which resulted in coal handling problems at the mines and combustion problems at the power stations preventing the generating units from running at their maximum output (load losses). The load losses resulting from wet coal reached 3 000MW in some cases. This, combined with the large number of unplanned generator trips and high planned maintenance, provided the System Operator with no other realistic alternative but to shed load.

The system operator made extensive use of available emergency resources such as demand market participation (DMP), emergency generation\(^5\), Interruptible Load and the gas turbine generators to minimise the amount of load shed. Throughout the load shedding period, Eskom continued to both import and export power. On 24 January 2008, 1319MW was exported and 850MW was imported.

The analysis revealed the following:

- A large amount of generation capacity was not available due to a high level of unplanned outages of generating plant and load losses, thereby reducing the generation capacity available to meet the demand.

- The System Operator did use other emergency options, such as DMP, and interruptible loads extensively prior to load shedding, resulting in Eskom correctly declaring *force majeure* on 24 January 2008. At that stage the outlook to recover the generation load losses was negative and worsening with more rain forecast. The generation shortages had reached a level where the manual load shedding was so deep (4000MW) that the automatic under-frequency load shedding scheme was nullified\(^6\). This meant that a relatively small incident could have precipitated a system collapse.

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5 Emergency generation applies when generators are required to operate above their contracted output. *Emergency reserve* is typically made up from contracted interruptible load, gas turbines and emergency generation.

6 The underfrequency load shedding scheme protects the system against a frequency collapse which could result in the loss of all power stations and a system blackout. This scheme is set to remove certain blocks of load at predetermined system frequency levels. When these blocks of load are removed due to pre-emptive load shedding, the automatic u/f load shedding has no loads to remove.
Eskom continued to export power to the neighbouring countries in excess of its firm contractual requirements during the load shedding incidents. The firm contractual exports are for 554MW (excluding Mozal which is used as an interruptible load resource).

Eskom imports during the period amounted to 850MW from Cahorra Bassa.

Exports exceeded imports by 469MW during the critical period under review.

Load shedding was caused primarily by the large amount of megawatts lost due to unplanned outages of generating plant and load losses. The coal problems experienced were mainly due to poor quality, low stockpile levels and wet coal. The extensive use of the emergency resources helped limit the impact of the load shedding. More information needs to be provided by Eskom regarding the continued export of power to SAPP countries under system emergencies.

Since the regular national load shedding has been introduced, there have been major distribution system equipment problems in urban areas. There may be a causal linkage to the more frequent opening and closing of circuit breakers which under normal operating conditions have a low duty cycle. This will be further investigated.

The unserved energy in this period is represented graphically in Figure 2. This unserved energy includes all interventions by the Eskom National Control Centre to curtail the demand. Load shedding is only one of these interventions.

![Energy not supplied (Interrupted) MWh](figure2)

**Figure 2 - Unserved Energy in the period of the investigation**

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7 Source NERSA: data provided by Eskom in response to inquiry.
The economic impact of load shedding events is not readily available. However for generation capacity planning purposes the cost of not supplying electricity is deemed to be R75 per kWh\(^8\). This implies that the load shedding in the period cost the South African economy approximately R50 billion.

It is recommended that:

- Eskom, must as a priority, take action to reduce its unplanned outages and load losses to within the target 2000MW used in its operations planning;
- Eskom must ensure that coal deliveries and coal burn are matched and that there is adequate stock to carry power stations through periods of high rainfall and other unforeseen events (link to primary energy section).
- While understanding the obligation on Eskom to meet contractual requirements and the need for mutual co-operation with neighbouring countries as a major power importer, the decision to export power to neighbouring countries above the firm contractual levels during power system emergencies needs to be explained by Eskom and the way to deal with such situations should be included in the South African Grid Code.
- Eskom must consider the feasibility of other options such as relaxing the system frequency standard of 50Hz to a lower value in order to reduce the power consumption of motor loads as done in countries such as India, the use of voltage reductions (brownouts) to reduce the power consumption of resistive loads prior to load shedding.

### 6. Coordination and Communication

The Energy Regulator inquired into the effectiveness of Eskom and other electricity distributors’ communication and coordination with parties affected by the electricity supply shortage and load shedding. All sectors of the South African economy were affected by the load shedding. The disruption caught everyone unaware including the electricity distributors. Key large customers experienced work stoppages that resulted in losses amounting to billions of rands\(^9\). The commercial sector suffered losses too, but on a smaller scale.

\(^8\) In the NIRP 3 studies it is assumed that unserved energy imposes a cost of R75 per kWh on the macro economy.

\(^9\) No evidence was received in this regard, however based on the cost of unserved energy used for planning purposes in the NIRP studies, losses of R50 billion is estimated to have occurred.
Residential customers endured hardships that affected their daily household routines. The lack of operating traffic lights may have contributed to higher transport fuel consumption. This was not explored further during the inquiry.

In order to obtain information on how effectively the load shedding was managed, questionnaires were sent to three sets of respondents namely:

- Eskom
- Three metros (Cape Town, Ekurhuleni and City Power These were selected on their customer profile that suited the purpose of this Inquiry)
- All three (large, medium and residential) customer segments (again choosing three organisations to represent each segment).

The analysis of the responses from large, medium and small customers showed that load shedding to key large customers\(^{10}\) was done in consultation with each individual customer while other large customers’ claim their supply was interrupted arbitrarily without due regard to the consequences of this action. Collaboration between distribution licensees and customers was generally lacking. Other customers felt that the tariffs in place needed to be reviewed to reward energy efficiency measures to promote customers’ participation in these programmes. Customers complained that the load shedding schedules were not adhered to, resulting in more financial losses in their businesses. Some felt that NERSA needed to play a role that will avert incidents like load shedding in future.

The analysis revealed that even though planning and forecast of energy demand are routinely done by Eskom, the utility reacted as if it were caught unaware by the incidents. Eskom’s behaviour was initially reactionary\(^{11}\), however, it improved as time progressed. There were systems in place to ensure coordination and communication between Eskom and some licensees. Communication strategies were not in place. Distribution licensees indicate that these were in the process of being compiled. The lessons learnt from the Western Cape Koeberg outage incidents of 2006, such as using a co-ordination centre and liaison between Eskom and distributors, were not applied in the handling of the national load shedding.

The number of completed questionnaires received from residential customers was very small\(^{12}\) and thus the responses may not accurately reflect the views of the residential customer base in South Africa. However, the responses indicated that customers have a limited understanding of what is load shedding and why it is necessary. It appears that the information gleaned from the newspapers has not been that instrumental in increasing their understanding of load shedding.

\(^{10}\) Response from the Electricity Intensive User Group (EIUG) and Bayside smelter.

\(^{11}\) Eskom responded that they were aware of the approaching electricity shortage, but did not know when it would occur.

\(^{12}\) None of the three provincial consumer affairs offices responded and only one of the three business chambers responded.
There is a concern that the load shedding schedules which are put up on the websites and in the newspapers are unreliable. On the other hand residential customers appear to be tolerant of load shedding as long as they receive reliable and effective communication on the state of affairs.

The three metro licensees targeted for the inquiry acknowledged the need to communicate more effectively with one another and with Eskom during load shedding and restoration. The frequency and duration of the load shedding impacted licensees and their customers. Most have been caught unaware and had not had proper communication and co-ordination strategies in place at the start of the load shedding. The communication and co-ordination strategies have developed during the load shedding incidents through new experiences and complaints from customers. The responses from the licensees and customers clearly indicate that the communication and co-ordination of load shedding still needs further development in order to minimise the impact. Communication between Eskom and the municipal distribution licensees was inadequate. Timely communication to customers about drastic measures to be applied, like load shedding, would have averted the public concern caused by the current load shedding.

It was found that there is a need for more effective education and training of customers on load shedding and their role in coping with the electricity supply shortage. The information given to customers on load shedding is not comprehensive enough to help them understand the events that ultimately led to load shedding. The information disseminated is deemed to be inadequate. The response to-date from the distribution licensees has been reactive. According to Eskom’s eighteen month adequacy plan, there should have been a more proactive communication response to the load shedding. It seems that the residential customers are the least informed about load shedding and are thus the least able to plan effectively. Due to the small number of responses received from residential customers it was not clear as to whether some customers were interrupted more than others.

It is recommended that:

- A protocol for communicating emergencies timeously to the Energy Regulator needs to be urgently put in place between Eskom and the Energy Regulator.

- Communication processes and procedures between Eskom and the municipalities be re-assessed so as to minimise the impact on the end customer.

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13 Cape Town, Ekurhuleni and City Power
• Electricity distribution licensees are requested to develop communication strategies for each customer segment taking into consideration their daily routines.

• Electricity distribution licensees should collaborate with customers on contentious issues concerning load shedding to find the best possible solution in the circumstances.

• Electricity distribution licensees are required to give regular feedback to the public on the progress made and the demand reduction achieved (segment by segment) from the time the load shedding was implemented to date and beyond.

• Electricity distribution licensees should provide further education and training to all customers so that everyone assumes responsibility towards solving the problem.

7. Supply-Demand Balance

This section of the report assesses the demand and supply projections on a year-on-year basis and month-on-month basis with a specific focus on the period under inquiry. It also analyses the effectiveness and adequacy of Eskom’s plans to manage the electricity supply and demand balance, including the use of demand market participation (DMP), interruptible load (IL) contracts and energy efficiency and demand side management (EEDSM). The assessment is made against the National Integrated Resource Plan (NIRP) of the Energy Regulator. The third resource plan NIRP3, covering the period 2008 to 2026 is currently available in draft form.

The comparison of the demand projections of the National Integrated Resource Plans (NIRP) 2 and 3 (demand forecasts made in 2003 and 2006 respectively) with the actual demand experienced in the time period under inquiry indicate that the demand projections were, in most cases, within the expected accuracy as illustrated below:

<table>
<thead>
<tr>
<th></th>
<th>Nov-07</th>
<th>Dec-07</th>
<th>Jan-08</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MW</td>
<td>%</td>
<td>MW</td>
</tr>
<tr>
<td>Actual</td>
<td>32941</td>
<td>100%</td>
<td>31739</td>
</tr>
<tr>
<td>NIRP2 moderate forecast</td>
<td>32551</td>
<td>98.82%</td>
<td>35066</td>
</tr>
<tr>
<td>NIRP3 medium forecast</td>
<td>35513</td>
<td>107.81%</td>
<td>34144</td>
</tr>
</tbody>
</table>

Table 2: NIRP Forecast

14 Source NERSA: NIRP2 report, NIRP3 Stage 4 draft report and data provided by Eskom in response to inquiry
The monthly maximum demand for the 3-month period has been predicted within an accuracy of 1% to 7%. Both forecasts under consideration project close to or marginally higher than the recorded actual monthly maximum demand for that period.

The Energy Regulator's NIRP2, Government's Integrated Energy Plan\textsuperscript{15}, and Eskom's Integrated Strategic Electricity Plan (ISEP) had a shared view on the timing of new generation capacity. The execution of the plans did not go as planned due to delays experienced in implementation as is discussed below. Eskom's ISEP plans were based on lower economic growth of 2.4% in 2004. Eskom only adjusted its plans to 4% economic growth in 2006 and as a result the Eskom and country inertia of moving to the building of new generation capacity contributed to the implementation delays.

Regardless of the different underlying long-term economic growth assumptions of the NIRP2 and NIRP3 forecasts, the short-term demand projections of the two forecasts converge. That is a result of the NIRP2 assumptions for higher demand growth of about 4% per annum in the short-term aiming to cater for major industrial expansions.

The capacity requirements for demand growth of 4% are outlined in the reference case of the recent NIRP3 studies. The NIRP3 reference plan is premised on the Eskom build plan of 2005 which have subsequently experienced delays in the return to service of mothballed plant and in the construction of open-cycle gas-turbine plants. Regardless of the more optimistic assumptions of the NIRP3 reference case, the plan shows low reserve margins of 7-14% in the period 2007 – 2011 as well as a situation of un-served energy ranging from 0.5% to 2% of the monthly energy demand in the years 2007 and 2008. The loss of load hours for these years is about 700 hours per annum, a magnitude well above the targeted reliability level of 2.4 hours per annum or 24 hours in a 10-year period.

A comparison of the cumulative planned capacity additions in the short-term, according to the new build programme of Eskom of 22 February 2008, and the annual capacity requirements of NIRP3\textsuperscript{16} is illustrated in Figure 3. The graphs

\textsuperscript{15} INTEGRATED ENERGY PLAN FOR THE REPUBLIC OF SOUTH AFRICA, DEPARTMENT OF MINERALS AND ENERGY, 19 MARCH 2003. “According to the baseline simulated scenario (see anon), which assumes a 10% reserve margin, South Africa will be short on capacity by 2005-2007, unless demand side management or new plant is built. Assuming the 10% reserve margin on a gross capacity of 37 000MWe, the current net capacity is 33 300MWe, which is only 1 800MWe (that is the size of Koeberg) above the peak demand. Given the time to commission new plant, the current electricity generation system could soon be viewed as vulnerable.”

\textsuperscript{16} NIRP3 case with moderate demand forecast and 19% reserve margin. The results of the NIRP3, although developed under marginally favourable conditions, are a good predictor of the future and confirm the necessity of load shedding experienced in the period Nov 2007 – Jan 2008. NIRP3 reference case further illustrates the operational constraints of the system in the next few years before the optimum reserve margin of 19% is restored.
indicate that the capacity gap between the required build for a 19% reserve margin and Eskom’s latest assessment of achievable commissioning dates will continue to beyond 2016 should the demand continue to grow at 4% per annum.

Figure 3: Capacity Requirements and New Build Program

It must be noted that the NIRP3 required capacity is not achievable due to the commissioning lead times and slip that has already occurred. The current capacity does not provide the required reserve margin and due to the long lead times to build new capacity the reserve margin is only restored to an acceptable level by 2013. However, the Eskom build plan remains about 3000MW below the required capacity. This plan appears to be aligned with Eskom’s strategy of permanently removing 3000MW from the demand using the power conservation programme which is discussed later in the report.

It has to be further noted that Figure 3 includes only generation capacity. The analysis excludes the impact of the demand market participation (DMP) and the energy efficiency and demand side management (EEDSM) programme. These programmes are expected to reduce the demand by a minimum of 742MW which could be exceeded by effective implementation of the planned accelerated EEDSM programme. Expected cogeneration capacity being sourced by Eskom of at least 900MW could be commissioned in the period 2009 to 2012. Interruptible load is also not included in the reserve margin because of its very limited contractual availability in instances other than during very short (minutes) duration supply-demand imbalance.

17 The capacity shortfall refers to the amount by which Eskom’s installed generation capacity is expected to fall short of the achievable installed capacity of the NIRP3 reference case. Source NERSA: NIRP3 Stage 4 draft report and data provided by Eskom in response to inquiry
Further assessment of Eskom’s new build programme compared with the NIRP2 capacity requirements\(^\text{18}\) illustrates the substantial delays in some instances in the implementation of the plans.

<table>
<thead>
<tr>
<th>Station</th>
<th>Units</th>
<th>Unit Size MW</th>
<th>Total, MW</th>
<th>Planned March 2008</th>
<th>NIRP2 preferred Plan</th>
<th>Delay compared to NIRP2 preferred Plan, months</th>
<th>NIRP2 Plan 2 (most unfavourable conditions)</th>
<th>Delay compared to NIRP2 Plan 2, months</th>
<th>Notes</th>
<th>Estimated capacity shortage in 2008 versus NIRP2 preferred plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camden</td>
<td>8</td>
<td>180</td>
<td>1420</td>
<td>10-31-07</td>
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<td>Gourikwa</td>
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**Table 4: New Build Programme\(^\text{19}\)**

Most of the planned generation projects experienced slippage of a year on average. The main reasons provided by Eskom are:

- Delay in the EIA approval (Gas 1 project)
- Delay in finalisation of coal contracts and obtaining water licences (Medupi coal-fired project)
- Shortage of civil contracting capacity (Pumped storage project)
- Land acquisitions (various projects)

There were no tangible reasons given by Eskom for the long delays experienced in commissioning of the return to service plants.

On the basis of the above analysis and findings it was **decided** that the Energy Regulator:

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\(^{18}\) NIRP 2 preferred Plan 14 and Plan 2: the latter designed for the most unfavourable condition of higher demand growth and lower plant availability.

\(^{19}\) Source NERSA: NIRP2 report, NIRP3 Stage 4 draft report and data provided by Eskom in response to inquiry
a) Expedites implementation of the EEDSM programme by the revision of the current EEDSM framework and to provide for effective EEDSM in electricity distribution licence conditions and in price reviews.

b) Requests Eskom to provide reasons for the slippage of new and return to service plant commissioning dates, in particular those plants due for commissioning in 2008 and 2009 and inform Eskom about the consequences of non-compliance.

c) Requests Eskom to review and report on a regular basis on:

- progress in acceleration of the commissioning of the base-load power stations, including exploring the acceptance of delays in the construction of non base-load plants, and in particular pumped storage plants.
- Eskom’s medium term power purchase programme (MTPPP).
- The accommodation of primary energy constraints in its capacity planning process.

d) Supports Government’s efforts to fast track the approval processes that constrain the construction and commissioning of new generation plants (EIA, land expropriations, coal rights, water licences).

e) Investigates measures to hold Eskom and other generation licensees accountable to deliver against the plans and feasibility studies submitted to the Energy Regulator in support of their licence applications.

8. Primary Energy

This section investigates the contribution of fuel constraints on the load shedding and the impact that the electricity supply shortage has on primary energy (fuel and water) consumption and supply.

It was found that during the inquiry period Eskom’s coal stocks continued with a declining trend that started in March 2007. In the six (6) week period from 20 December 2007 to 31 January 2008, coal stocks held at stations declined drastically by 2 million tons – from 6 million tons to 4 million tons. This drop of 2 million tons is equivalent to twelve (12) days of coal burn (generation). Actual and planned stock levels are shown in Figure 4. Eskom does not have an overall stock target, but a target per power station. The minimum is a 20-day coal
stockpile. The unexpected low stock levels in December contributed largely to the load losses experienced in the inquiry period. The actual coal stock at month end is shown in Figure 4. It can be seen that from August 2007 the total coal stock declined to below 20 days. The 2007 coal procurement plan, however expected coal stock to increase to above fifty (50) days at the time.

Figure 4 also shows the planned stock levels from its 2005 five-year plan that was used for the MYPD price determination. The continuous trend of over forecasting stock levels and over projecting stock levels is an indication of inadequacies in Eskom’s generation production planning and coal acquisition planning process. The reason for being so far off target must lie in using unrealistic targets and not being held accountable for missing those targets. Even over very short projection periods large projection errors are evident.

The reasons for the sudden stock decline in December are that firstly coal deliveries from short-term contracted mines stopped during the holiday season and secondly that Eskom tied collieries operated on skeleton staff. The situation was aggravated by heavy rains in the period making it difficult to get coal from the mines to stations causing unplanned plant outages and load losses. Another contributing factor was that the available coal-fired plant burned more coal than expected, because it had to operate at inefficient emergency loading levels due to the general plant shortage in the period. The daily coal delivery, burn and

Figure 4: Coal Stock – days burn

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20 Eskom Annual Report for 2006
21 Source NERSA: data provided by Eskom in response to inquiry and for MYPD price increase.
stock levels for the period 1 October 2007 to 31 January 2008 are shown in Figure 5.

![Figure 5– Total daily coal delivery, burn and stock level – 1 Oct. 2007 to 31 January 2008](image)

Road haulage of coal to meet the requirements of power stations is not suitable to supplement the contracted coal that is available from tied collieries. As is evident in Figure 5, both the tied collieries and the road haulage underperformed dramatically over the Christmas holiday period.

Downward accounting adjustments to correct the difference between the physical stock volume and the accounting stock volume were made at Hendrina (170kt) and Arnot (100kt) at the end of October and during the course of November. While the adjustments amounted to only 4% of the total stock, and Eskom deemed it as not material, the adjustments were of significant magnitude for the particular stations, being 47% for Hendrina and 36% for the Arnot stock. In the case of Hendrina small stock adjustments were attributed to corrections for moisture content. The large stock write offs must be further investigated and reported on by Eskom as there could be a variety of reasons for such adjustments.

There was also an element of complacency on the side of Eskom management in not replenishing coal stockpiles timeously. One of the reasons given by Eskom for the rapid decline in coal stock was that: “Eskom was not able to absorb cost overruns without incurring a loss. Eskom therefore found it difficult to procure

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22 Source NERSA: Data provided by Eskom.
23 The accounting stock can differ from the physical stock for a number of reasons, because the coal burn is not measured directly, but calculated based on the thermal efficiency performance of the power station and the calorific value of the coal.
coal at these prices taking into account the impact on finances”. Eskom further
states that: “at the end of August the stock days were comfortable and the plans
indicated that stock levels would increase. Stock levels reduced since August
due to a higher demand, plant technical performance, coal qualities, wet coal and
logistics. The high coal prices made it difficult to procure coal on the open market
without compromising the financial position.”

Eskom’s response to correct the coal stock situation has been to approve the
purchase of 45 million ton of coal (equivalent to six (6) months coal burn) to
replenish stocks. To achieve this, coal supplies are diverted from export mines
to satisfy Eskom’s requirements. The coal suppliers see the foregoing of foreign
exchange as “crisis management in its worse form” (response from coal
suppliers).

The contracted coal at Eskom dedicated collieries is below the coal requirements
of the power stations due to the high power station load factors that have to be
maintained at present while the generation reserve margin is below the norm.
About 25% of coal requirements are transported to the power stations over an
inadequate road system. Any coal from the tied collieries in addition to the
contractual maximums would thus be of great benefit. During the inquiry it was
found that certain mines (Arnot and Tutuka) produce far below their contracted
production levels. At other collieries (Kendal, Kriel, Lethabo, Matimba, and
Matla) the planned production for 2007/8 is above the contractual levels,
however only two of these collieries (Kriel and Matimba) is projected to achieve
the planned production.

The petroleum industry expressed concern about the impact that the high usage
of gas turbine generation during the power shortage has on the demand for
diesel. Diesel supply is constrained by limited import infrastructure, refinery
capacity and pipeline capacity.

The risks associated with the supply and costs of nuclear fuel to Eskom’s current
nuclear power station (Koeberg) are at present well managed and mitigated for
in the medium term, i.e. until about 2012.24

From the analysis of the information provided by Eskom and others, it is
concluded that:

• It is apparent from Figure 4 that coal requirement forecasting is unrealistic
  and systematic errors are made in the process. Forecasts regarding stock
  replenishment tend to be optimistic and may have contributed to the inaction
  by management to approve the purchase of coal timeously.

The coal procurement strategy has deficiencies because the contracted coal of tied collieries falls short of requirements and does not take the varying operating environment to which power stations are exposed into account. The coal stock decline was worsened by the impact of the December holiday season when some mines closed down and others operated only on skeleton staff.

Coal contract management appears to be deficient:

a. At Arnot and Tutuka the planned colliery production (in Eskom’s plans) is far below the contractual capacity of the collieries.

b. At most power stations the mine deliveries for the year are below the planned deliveries for the year;

c. At all power stations the planned colliery production is below the requirements of the power stations.

d. The write off of large percentages of coal stock at Arnot and Hendrina power stations are a further indication that there are deficiencies in the control of coal deliveries (volume and quality), accounting for coal usage and management of coal contracts (weighing and sampling).

The coal transport infrastructure cannot manage the increased rate of imports required and is unreliable.

Eskom’s financial position was a constraining factor to taking decisive action to manage the coal stocks. The inaction has been a major contributing factor to the load shedding which had a major impact on the economy and lead to emergency purchases of coal at high cost to Eskom and a loss of foreign exchange from international coal exports.

The coal suppliers are of the opinion that the coal quality being received by Eskom from short term sources does not match the coal quality for which the stations are designed. This in turn impacts the efficiency and reliability of the power stations.

Eskom has not been able to maintain the coal stock levels stated and approved in the first Multi-Year Price Determination (MYPD1)

Coal shortages contributed to a greater extent to the load losses during this period

There was a decline of 2 million tons in the coal stockpiles in December.

There appears to be a conflict between Eskom’s business objectives and its reason of existence: the supply of electricity. This observation must be addressed with the shareholder and the necessary changes must be made to Eskom’s shareholder compact to prioritise security of electricity supply.

It was decided that the Energy Regulator requests Eskom to:

- Expedite its plans to improve the coal transport logistics.
Review its short-term coal procurement strategy to meet the immediate requirements of the power stations in the face of the inadequate coal transport infrastructure and the expected high power station load factors— a minimum of twenty (20) coal stockpile days at each power station should be made a licence condition.

Ensure that procurement of coal during the holiday seasons does not result in the coal stockpile days falling below the 20-day limit.

Critically review its system of coal requirements planning and the allocation of accountabilities for factors which result in major volume, mix and price variances.

Ensure that coal logistics and coal contract management are improved as soon as possible.

Report to the Energy Regulator its process for determining coal burn and for making coal stock adjustments at power stations and the action taken to hold power station management accountable to manage coal stock. Reporting on coal stock write-off per power station must be considered as a licensing condition because it is a good indicator of effective power station and primary energy management.

The Energy Regulator recommends that national Government:

- Develops a national strategy for the acquisition and management of coal to ensure security of supply.
- Develops a policy that may override Eskom’s commercial decisions in order to avoid national crises.

Further, it is recommended that an investigation into Eskom’s primary energy (in particular coal) planning and procurement be conducted.

9. Plant Maintenance

The impact of generation plant maintenance by Eskom and other licensees on the supply-demand balance was investigated with specific reference to planned and unplanned maintenance. The investigation firstly considered the loading profiles of all power stations, the planned maintenance philosophy of Eskom, the plant refurbishment and engineering modification philosophy and the maintenance resourcing strategy. The investigation further considered the operational planning process and the scheduling of planned maintenance outages to ensure that sufficient plant remain in service to meet the demand, cater for unplanned outages and provide sufficient operating reserve to balance supply and demand. Plant performance indicators were reviewed and benchmarked against international best practices and Eskom’s plans to improve
generation plant availability was assessed. The availability and performance of non-Eskom generation plant was included in the assessment.

The investigation revealed that the 18 month rolling operations plan of February 2007 scheduled about 2000MW more planned maintenance for January 2008 than what the operating reserve requirement would allow, when using a moderate 2000MW allowance for unplanned outages and plant load losses. In the period of the inquiry the actual unplanned outages experienced were abnormally high, regularly exceeding 4000MW in January 2008, which required pre-emptive load shedding to protect the power system integrity.

Although planned maintenance in the period was rescheduled in an attempt to manage the capacity shortages, this could have occurred much earlier. This is considered to be due to the conflicting requirements of supplying the demand (system operations) and maintaining plant (generation) being internalised in Eskom. The System Operator is accountable for the availability of adequate generation plant to have sufficient operating reserve available to operate the power system reliably. The System Operator, however, appears to accept the planned maintenance schedule of the Generation Division, despite its own forecasts that inadequate operating reserve will be available.

The 2008 operational plan shows that a much tighter supply-demand balance is expected this year, even with a moderate unplanned outage allowance. This is evident from the data graphed in Figure 6 below. The red line “capacity minus planned outages (PO)” exceeds the capacity available for planned maintenance throughout the year.

![Figure 6: Eskom Capacity Balance](source=NERSA: data provided by Eskom in response to inquiry)

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25 Source NERSA: data provided by Eskom in response to inquiry
In order for Eskom to supply the 2008 demand for electricity reliably with sufficient operating reserve to manage the power system, almost half the planned maintenance outages would have to be deferred (with possible negative longer-term consequences on reliability) or demand has to be reduced by between 2000MW and 3000MW.

It was found that the reasons for the generation capacity deficiency in the inquiry period are:

- The low reserve margin giving less than the required room to perform planned maintenance and to cope with operational events such as unplanned outages, load losses, and coal shortages;
- The abnormally high unplanned outage and load losses experienced in the period which, in turn, resulted in a shortage of base-load capacity;
- Inconsistent coal quality and wet coal leading to uncontrollable combustion, higher component wear, and coal handling problems causing load losses and plant failure were a contributing factor.
- Coal deficiency also led to considerable load losses (max of 3 600MW on 24 January 2008)

With regard to the management of generation plant availability it was found that:

- Eskom's generation plant performance deteriorated significantly after August 2007;
- Eskom's maintenance philosophy is constrained by the available opportunities to shutdown plant for planned maintenance;
- The Eskom plant maintenance philosophy is based on risk evaluation;
- Decisions to move planned outages outside of the envelope of the maintenance philosophy are referred to various Technical Committees for recommendations and influence;
- After all optimisation efforts have been completed the plan is finalized for implementation.

Eskom has a high vacancy rate of critical scarce skills at power stations (1 500 vacancies out of 3200 positions). This has lead to increased stress on the staff. Levels of experience in maintenance, engineering and management are insufficient to meet the operational demands. Eskom subsidiaries such as ROTEK and the original equipment manufacturers (OEMs) are used in specialised areas of plant maintenance. Eskom uses its own group insurance company to cover plant failures - this removes an element of external oversight over the quality of plant maintenance. Eskom has an eleven (11) point plan to
increase the availability of generation capacity. The worldwide demand for scarce skills is impacting on Eskom’s need for skilled staff and the external support that Eskom depends on. Part of organised labour considers labour policies to be a contributing reason for highly competent staff members leaving Eskom. This leads to a lack of people with the necessary experience and a lack of artisans capable of performing the duties required of them.

Eskom adopted the 90/7/3 operating philosophy in the early 1990s when there was a large reserve margin on the system. There is a deteriorating trend of the 12-month moving average (MA) plant performance indicators (85.3/8.3/6.3 in January 2008). Eskom is no longer achieving the target of 90% plant availability due to the declining reserve margin placing greater demands on all the generation plant. Eskom resets its indicators every year and may be losing focus of the longer-term performance trends. The monthly plant availability rate, planned outage rate and unplanned outage rate over the past 24 months and the 12-month moving average indicator of Eskom’s total fleet of power stations is shown in the figure below.

![Generation Plant Performance](image)

**Figure 7: Generation Plant Performance**

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26 With the 90/7/3 philosophy, the average plant availability is maintained by allowing 7% of the capacity to be out of service for planned maintenance and 3% of the capacity is targeted to be out of service for unplanned outages.

27 Source NERSA: data provided by Eskom in response to inquiry.
Figure 7 clearly indicates that Eskom has been operating at below the 90% generator availability target.

The reasons for unplanned outages, frequency of occurrence and the % capability loss in the period are shown in Figure 8. It can be seen that the highest number of incidents is due to boiler tube leaks. Tube leaks occur more frequently when plant is operated at emergency generation levels and when the abrasiveness of coal is high. Tube leaks contributed more than 20% to the unplanned capability loss in the period.

Wet and poor quality coal resulted in load losses, preventing generators reaching their full output and accounted for 9% of the capability loss. The non-availability of coal resulted in a further 6% of the unplanned outages. Unavailability of gas turbines due to lack of fuel occurred on seven occasions, but had only a small impact on the unplanned outage rate.

Figure 8 – Reasons and contribution of unplanned outages and load losses in the period

Regarding planned maintenance it was found that:

28 Source Eskom: data provided by Eskom in response to inquiry
• The planned outage rate (POR) is increasing despite a decreasing reserve margin due to long duration outages for comprehensive mid-life refurbishment (E.g. Arnot capacity increase programme – 3.5 month outage duration per unit);

• Planned outages were the largest category of outages in the period under review;

• The financial plans, resource plans and operational plans to perform engineering and refurbishment work appears un-coordinated;

• The “space” to accommodate planned maintenance is severely restricted\(^\text{29}\) for the next 5-years and requires appropriate strategies such as minimum time rather than minimum cost outages, deferment of all but the essential outages; and the basing of business plans on this strategy.

The projected station life times of up to 60 years for coal-fired power stations is long by international standards. Apart from maintenance cost, environmental constraints and fuel availability may become limiting factors. The load profile in the latter years of a station’s life would also be expected to change. These factors have to be taken into account by the capacity and primary energy planners. The prudence of this projected plant life and its impact on primary energy resources and refurbishment has to be assessed by the Energy Regulator. This may also have licensing implications.

Regarding the impact of planned and unplanned maintenance on the supply/demand balance it was found that:

• There was a shortage of base-load capacity during the period of the inquiry resulting in very high load factors on peaking plant, in particular, the Eskom gas turbines.

• The loading analysis highlighted the limitations of pumped storage generation plant under conditions of capacity shortages.

• While the design intent of pumped storage is that low cost surplus generation should be used in off-peak periods to replenish the upper reservoirs, gas turbines were in operation for 20% of the pumping time and for 70% of the pumping time. Majuba, a station which imports all its coal at high cost, was participating.

• Non-Eskom generation had particularly low availability and made an insignificant contribution during the period under investigation.

\[^{29}\] The low reserve margin is a certainty over the next 5-years. There is a probability that the proposed power conservation programme will increase the space available for planned maintenance. It would be prudent to carefully plan and prioritise the planned maintenance in this period.
With regard to operations planning it was found that:

- Operational planning is crucial for the reliable operation of the power system. This is even more so during periods of low reserve margin when there is a lower margin for error.

- Generation outages are planned on site but scheduled centrally in Generation head office to ensure coordination across the system.

- The responsibility and authority to balance electricity plant requirements with consumer supply requirements is a key aspect mentioned in the recommendations.

- The internalising of Grid Code contraventions within Eskom, the balance of power between the Eskom Generation Division and the System Operator as well as the role, if any, of the Energy Regulator and the speed at which the Energy Regulator can respond to such matters needs attention.

Further, generation plant availability is not coordinated on a national basis. Non-Eskom generation was mainly not available during the period in which Eskom experienced the unprecedented load losses. Consideration must be given to the national co-ordination of all plant availability in the current and future situation of inadequate reserve margins. It would be appropriate to address these aspects in the Grid Code. Such co-ordination, for example, takes place amongst oil industry players for the co-ordination of liquid fuels availability.

It was decided that:

- The criteria for operational and outage planning to be agreed and incorporated into the Grid Code to have a common understanding of expectations and to guide the System Operators and the generation licensees (Eskom and other licensees) in meeting these expectations.

- The Grid Code requirements for the operation of gas turbines during long-term periods of electricity supply shortage to be reviewed.

- The industry reporting requirements should be reviewed to ensure that action is taken timeously to not breach supply security. Checks and balances must be developed to prevent Eskom from internalizing events of national importance. Consideration must also be given to oblige managerial
ringfencing\textsuperscript{30} of Eskom’s licensed entities. The role of the System Operator as custodian of system security must be enforced by the Energy Regulator.

- Eskom to develop and provide to the Energy Regulator a plant management strategy to cope with the low reserve margins in the next five years. Only statutory planned work should be scheduled in next five years bearing in mind the age of the fleet and the potential need for major refurbishment to maintain plant integrity. A review of refurbishment plans should be undertaken to focus on minimum time outages.

- Eskom to prioritise planned maintenance for 2008/9 to establish contingency plans for deferring planned maintenance outages when required and share these plans with the Energy Regulator.

- The availability of all licensed generating plant around the country should ideally be centrally co-ordinated.

- Innovative ideas are required to rebuild Eskom’s scarce skills base and retain the current skills base.

Further, it is recommended that an investigation be conducted into the availability, adequacy optimum utilisation of Eskom’s generation plant in view of the mid-life of these plants.

\section*{10. Legislation and Licence Conditions}

The purpose of this part of the report is to review legislation, licence conditions, Grid Code, standards and codes of practice used to regulate the electricity supply industry in view of the existing electricity supply shortage in South Africa, and make recommendations and proposals for amendments if necessary. Part of this exercise was also intended to assess whether there were any possible breaches of legislation, licence conditions, Grid Code and other applicable standards and codes during the load shedding that was conducted by Eskom and other licensees between November 2007 and January 2008.

The approach used was firstly to conduct an assessment of all licences issued by the Energy Regulator to determine whether these are fully aligned with the requirements of the Act. An international benchmark study was conducted to determine norms and practices of other regulators and utilities that experienced extended periods of electricity supply shortage. Subsequent to this, a review of legislation, codes of practice and licence conditions was performed, deficiencies were identified and recommendations were made for amendments of these. The

\textsuperscript{30} The NERSA licence conditions require that the accounts of the licensed businesses in Eskom be ringfenced, however Eskom retains the right to organisationally restructure itself.
A review was done concurrently with the assessment to determine whether there were any breaches of licence conditions by Eskom and other licensees.

On the assessment of the licences, it was found that only the Generation licence is well aligned with the Act. However, the Transmission licence and the South African Grid Code are drafted in the context of a competitive electricity market that was never introduced. Despite there being a scope for improving NERSA’s licences, the gaps that were identified did not have an impact on the load shedding.

The load shedding in circumstances other than short term emergencies could be regarded as the temporary cutting off of paying customers which is not allowed by the Act, without a specific agreement with the customer. The Energy Regulator is still investigating whether load curtailment without an agreement with the customers is a legal recourse. Regulations to enable the rationing of power to customers have been drafted by the Department of Minerals and Energy. The alternative is to use conservation tariffs reflecting the high cost of operating gas turbines at the high end of a large customer’s previous consumption to encourage voluntary load reduction and energy conservation. With a uniform customer class such as residential consumers, the conservation rates would apply to the average consumption of the customer class. This has the benefit that low volume users would not be penalised.

The preliminary findings are that there were no breaches of legislation, licence conditions, Grid Code and National Rationalised Standards (NRS 047-Quality of Service & NRS 048-Quality of Supply). One of the main reasons for this was because these codes of practice together with the legislation and licences do not have compliance criteria for pre-emptive load shedding and how this load shedding should be implemented, the Grid Code and NRS standards focus more on electricity supply shortages of a short-term nature and using under frequency load shedding as a defence against system disturbances. However, there is a need for legal implications of load curtailment without agreement with the customer to be further investigated.

Gaps were identified in the legislation, licence conditions and codes of practice for compliance monitoring and enforcement with regard to low reserve margins and pre-emptive load shedding as done by Eskom.

Due to the gaps that were identified on the codes of practice, legislation and licence conditions, it is rather difficult to monitor and enforce compliance by the licensee with regard to pre-emptive load shedding as done by Eskom, as a result there are a number of recommended amendments that are proposed.
It was decided that:

- Compliance criteria on how pre-emptive load shedding should be implemented must be developed and incorporated into the Grid Code and NRS standards;
- Eskom’s transmission licence must be re-drafted in the context of Eskom being the single buyer.
- The legal implications of load curtailment without agreement with the customer must be further investigated.
- The necessary regulations and tariffs must be established to provide a legal framework under which supply and demand can be balanced over the next five years of low reserve margin.

11. Government’s National Electricity Emergency Programme (GNEEP)

With the existing electricity emergency declared by government, there is a collective effort from various industry stakeholders to contribute to the efforts of alleviating the adverse effects of electricity supply shortage and load shedding. The Government’s National Electricity Emergency Programme (GNEEP) section of the report aims to understand government’s objectives in the programme and identify areas where the Energy Regulator can make relevant contributions – within the context of its mandate outlined in the Act.

The energy and capacity power shortages can be explained by a number of occurrences that the country’s power sector has faced, such as the reserve margin for generation capacity declining to between 8% and 10% (lower than the 15% international standard and the 19% reserve margin adopted for South Africa\(^{31}\)), strained generation assets, insufficient time to carry out maintenance work and more extensive load shedding.

Government initiated a National Electricity Emergency Programme in a bid to, amongst other things, mitigate the potential threats to industry and the economy as a whole. It has been acknowledged that the current situation is very likely to persist until new base-load stations are built and are operational, thus reinforcing the need for mitigation measures for the interim period. An emergency task team, referred to as the National Electricity Response Team (NERT)\(^{32}\), which is

\(^{31}\) Department of Minerals and Energy, Energy Security Master Plan – Electricity 2007-2025

\(^{32}\) Stakeholders include; inter alia DPE, BUSA, National Treasury, NERSA, Eskom, SALGA, DTI, organised labour and the Presidency
led by the Department of Minerals and Energy (DME), has been established to lead the Emergency Programme. It is recognised that other energy supply sectors are likely to be stressed in the future and that some of these solutions may be applicable to these as well.

Prior to the establishment of NERT, Government had formed the Forum for Energy Executives (FEE), comprising of the Directors-General of the Departments of Minerals and Energy (co-chair), of Public Enterprises (co-chair), of Provincial and Local Government, of Environment and Tourism, and Chief Executive Officers of the following state-owned enterprises and public entities: Eskom, NERSA, National Nuclear Regulator (NNR), Central Energy Fund (CEF) and EDI Holdings. The main purpose of FEE is to coordinate government’s efforts to address policy issues and constraints relating to new generation capacity with a view to fast tracking the build programme. FEE reports to an Inter-Ministerial Committee (IMC). The relation between FEE and NERT is not clear at this stage.

The approach and methodology used for this section involved monitoring developments of the different NERT working groups to identify where support will be required from the Energy Regulator:

- Investigating ways to incorporate the GNEEP requirements into NERSA rules, directives and licence conditions;
- Analysing the proposed regulations by DME and proceed accordingly in the implementation process;
- Investigating incentives for ensuring compliance with power conservation targets as stipulated in the GNEEP requirements; and
- Ensuring NERSA’s participation in the reduction of electricity consumption by analysing consumption trends within the building and identifying areas of potential reduction.

NERT established six (6) Working Groups viz.:

- DSM Implementation Coordination;
- Funding of the emergency programme;
- Communication;
- Regulatory frameworks and tariffs;
- Cogeneration and markets; and
- Economic impact analysis.
NERSA is represented in the working groups and chairs the working group for regulatory frameworks and tariffs.

The Emergency Programme proposes short-term interventions to deal with the energy situation which include co-generation, energy efficiency and demand side management. More particularly, a **System Stabilisation Programme** was formulated, with the goal of providing the required 3000MW of capacity to restore the reserve margin to 15% and mitigate load shedding.

The specific role of the Energy Regulator can best be summarised in the following ways:

- Providing input into the development of regulations for power conservation.
- Developing rules, directives and or licence conditions to facilitate power conservation
- Continued NERSA participation in the NERT work groups and continuous evaluation and recommendations on the Energy Regulator’s role in the GNEEP
- Strategy to enforce and monitor compliance with GNEEP requirements
- Approval of tariffs to enable EEDSM;
- Monitoring of Eskom’s coal supply planning and implementation;
- Monitoring of Eskom’s supply-demand balance planning and power station production planning;
- Monitoring Eskom’s new built programme

The Energy Regulator is already equipped with a well developed compliance management framework, which can be applied in executing its identified role in providing a strategy to enforce and monitor compliance with GNEEP requirements.

Lessons learnt from international experience of how countries handled power shortages was also researched and analysed. Based on this research and some of the analysis it is **recommended** that:

- The Government’s National Electricity Emergency Programme, including the PCP, should be coordinated and lead by a centralised high-level government unit with authority to take action.
- The role of Eskom is clarified in the Government’s National Electricity Emergency Programme considering that Eskom is to focus, among others, on returning the system to normality and on its new generation build programme.
- Government further explores the funding of the accelerated energy efficiency and demand-side management (EEDSM).
- There needs to be strong emphasis on encouraging the efficient use of energy by all sectors of the economy.
- Since the GNEEP and new generation build programme are ongoing processes NERSA's active participation in the Forum for Energy Executives (FEE) and the National Electricity Response Team (NERT) work groups, as well as any other arising initiatives, be sustained for as long as necessary, provided there are enough resources to do that. Relationship between FEE and NERT must be clarified.
- The procurement of new private generation capacity (IPPs and co-generation) be managed and coordinated centrally by a professional entity independent from Eskom.

12. **Eskom Recovery Plan**

The Eskom recovery plan plans to address the electricity supply shortage is divided into three phases, as depicted in Figure 8. Each phase has a demand side target and a supply side recovery programme. Details of each phase are provided below.
The first phase is a stabilisation programme. The focus of this period is to achieve a 4000MW reduction by the end of February 2008. This would be achieved by: reducing coal related load losses on generation plant to manageable levels; containing the unplanned outages (including the technical load losses) to manageable levels; sustaining the 10% load reduction on key industrial customers; and implementing a 10% reduction on embedded large power users, metros and municipalities.

The second phase is the launch of a power conservation programme (PCP) on 1 July 2008. The PCP programme has a strong element of power rationing. It would be a continuation of the 10% voluntary curtailment and include preemptive load shedding as required to meet the target. Stakeholder endorsement and active participation would be essential. 1 200MW would be required from the industrial sector and 1800MW from municipality customers.

During this phase attention will be given to maintenance and improvement of the generation plant performance.

In the third phase the aim is to reduce electricity consumption by 20,000 GWh (3 000MW) so as to raise the generation reserve margin to 15%. During this phase supply side interventions such as Eskom’s invitation of bids from IPPs and co-generators, coal stockpile recovery, demand side management interventions and power buy-back will be pursued.

The merits and demerits of the proposed initiatives are still being debated inside and outside Eskom and in the NERT forums.

The Eskom recovery plan uses both supply-side and demand-side initiatives to address the problem of the imbalance between supply and demand.

The supply side focus areas are:

- Eskom IPP and co-generation bids: Eskom has recently published a request for bids of any power plants with capacity above 5 MW to 1000MW. This forms part of Eskom acting as the Single Buyer Model that Cabinet approved in 2007. Eskom has also called for Co-generation bids which are expected to be awarded in September 2008.

- Eskom coal stock recovery: Eskom has embarked on an emergency coal purchasing plan to return its coal stock to a level of 20 days burn.

33 Department of Information, National Response to South Africa’s Electricity Shortage. www.info.gov.za (January 2008)
Unplanned generation plant outages and load losses: Eskom plans to reduce the unplanned outage rate to be within the reserve margin allowance. Eskom has established an 11 point strategy in this regard.

The role of the Energy Regulator in support of the supply side initiatives are:

- Having a licensing regime in place that can cope with the expected high volume of IPP and co-generation bid applications.

- In the single buyer environment the need for and format of a suitable cost recovery mechanism (CRM) and the rules for dispatching these power plants vis-à-vis Eskom plants has to be developed and agreed on.

- The financial impact of the coal stock recovery, the rate of stockpile building and the strategy for managing coal stock and purchases must be considered by the Energy Regulator as it impacts the reliability and security of electricity supply and has a major impact on the coal market. This in turn has an impact on Eskom’s cost of coal burns and the determination of Eskom’s revenue requirement.

- The Energy Regulator has to monitor Eskom’s achievement of its plant performance improvement objective.

The demand side focus areas are:

- Accelerated EEDSM: the objectives are to roll out energy efficiency and demand side management interventions to achieve a saving of 180MW in three months after order placement and 800MW after 6 months. Projects include the roll-out of 18 million CFLs by August 2008; efficient shower heads; subsidizing gas stoves.

- Power Buyback: Eskom aims to pay certain customers to reduce their demand. This means that Eskom will be buying back the power they would normally sell to the customer. The power buyback’s objective is to obtain 2 000MW to 3 000MW from energy intensive users.

- Power Conservation Programme (PCP): The supply-demand balance is expected to remain tight despite the relief of 1200MW from industrial customers who had to cut back by 10% initially. The targeted 1 800MW from commercial and residential customers has yielded little results thus far.

The role of the Energy Regulator in support of the demand side initiatives are:

- To continue monitoring the effectiveness of the EEDSM program. The monitoring and evaluation of the MW power savings achieved are important in this regard, so is the assessment of the sustainability of the
MW power savings. The current MYPD revenue control mechanism incentivises Eskom to roll out EEDSM and reward Eskom R3.5 million per MW saving achieved.

- To discuss the power conservation and power buyback programme with Eskom to assess the impact of these initiative on Eskom’s cost and revenue.

It is too early in the process to judge the effectiveness of the recovery plan.

It was decided that:

- The Energy Regulator be regularly appraised of progress with the development and implementation of the recovery plans;

- That the Energy Regulator participates in the debates at government forums and with stakeholders in order to be prepared to facilitate the implementation of the recovery plans.

- The Energy Regulator must engage electricity users in order to have a balanced view from all stakeholders.

13. Finance and Economics

Current industry frameworks were not designed for a situation of electricity supply shortage; they were developed for the period when South Africa had excess capacity. The structure of electricity tariffs is one such area. Internationally, in situations of power and electricity shortage inclining block rate tariffs, time-of-use rates for small electricity users and real time pricing systems proved successful in assisting with energy conservation. In view of the above a review of the National Electricity Tariff Guideline is necessary to allow tariff structures such as Inclining block rate tariffs, and real time pricing.

The power conservation programme (PCP) requires that electricity demand be reduced throughout the day. Because there is a shortage of base-load capacity, it is essential that the demand profile to which the peaking and emergency generation plant do not get distorted by customer behaviour. In addition, the peak demand must be reduced by about 3000MW to cope with the low reserve margin. The lower sales volume together with the rising primary energy costs would result in increasing electricity prices in the medium to long-term.

In its price increase application of 18 March 2008, Eskom has indicated that in the next five years it would be required to expand its capital assets by R343 billion and that its balance sheet will be under stress to fund this level of expansion. Though Eskom has not included the capital funding in its application, the increase applied for is 60% in nominal terms which only includes increased
primary energy costs and an acceleration of demand side management expenses. Since another process has been established for the review of Eskom price increase applications, no conclusions are reached here until the finalisation of the review work by the Energy Regulator on the multi-year price determination (MYPD).

NERSA is in the process of completing the third national integrated resource plan (NIRP3). Eskom’s price increase requirement is far above that which is predicted by the modelling of electricity production cost in the NIRP3 base case studies. The results of these studies indicate that while the reserve margin is being restored the national generation capacity build programme has to provide for both the re-establishment of the required capacity reserve margin and for the growth in demand. During this period the average annual cost of electricity production is expected to increase by up to 10% above the inflation rate. After the reserve margin has been re-established, the average electricity production cost is expected to increase by up to 5% above the inflation rate.

The marginal or avoided cost of generation (averaged over all hours of the year) is expected to be up to four times the average production cost (averaged over all hours of the year) over the next five years of capacity shortage. After the 5 year window, the ratio of marginal cost to average cost declines sharply to about twice the average cost. By 2026, the marginal cost is at a level of 1.5 times the average cost of production.

The current situation facing the country of electricity supply shortages and the consequent load shedding is having a negative effect on the economy. This will particularly affect sectors that are the primary drivers of growth, namely consumption expenditure, infrastructure investment and government expenditure.

Despite the fact that most of the financial implications of load shedding on industries and the economy as a whole cannot be accurately quantified at this stage the cost of unserved energy (CUE) is estimated at about R50bn. Reduced economic activity will have a negative impact on output levels and ultimately on GDP.

Households have also endured an unquantified impact from the disruptions in energy supply. It is through changes in unemployment and poverty levels that the socio-economic impact of load shedding can be gauged. The trend in economic growth is predicted to decline during 2008, with improvement expected to only be evident in the first half of 2009, providing supply disruptions are minimised.

The electricity supply shortage must be limited to avoid any further negative impact on the South African economy. Demand side management interventions are costly to the economy and must be incentivised through well structured conservation tariffs. There is a risk that threats of increasing the average price of electricity to encourage energy efficiency are not well received by the public on whose co-operation the industry depends. The alternative argument is that avoiding facing up to the need for efficient use of energy resources will be even more costly in the long run. Consumers do need to be made aware that the era of relatively cheap electrical energy is coming to an end, and that inefficient
consumption patterns of the past will be increasingly difficult to maintain into the future. All South Africans will need to take ownership of personal resource efficiency as a way of life.

Based on the above it is **recommended** that:-

- New tariff structures such as residential inclining block rate tariffs and real time pricing must be included in the National Retail Tariff Guidelines for implementation by electricity distribution licensees. It is also necessary for consultation with customers to take place prior to the finalization of any new tariff structures.
- The implementation of tariff structures that incentivises energy savings be fast-tracked taking into account the current electricity supply shortage situation in the country;
- Differences between the future price path obtained from the results of the current modelling of the national integrated resource plan (NIRP3) and Eskom’s projected price path and revenue requirement must be reconciled and debated to establish a sound basis for the modelling and evaluation of electricity prices in South Africa. An independent modelling of the price path must be undertaken by the Energy Regulator.
14. Main Findings and Conclusions

The analysis resulted in the following findings and conclusions:

- Previous load forecasts had anticipated the current growth rate. The implementation of measures to provide for the growth has been inadequate and slow. In particular, there have been delays in returning the mothballed generation plant to service and the implementation of energy efficiency and demand management initiatives remain behind targets.

- The implementation of the co-generation programme has also experienced delays.

- Eskom’s maintenance strategy has resulted in the reduction of generation plant availability to below the 90% target as agreed upon with the Energy Regulator.

- Eskom’s new build programme is experiencing slippage of at least a year caused by delays in, amongst others, the completion of environmental impact assessments (EIA); shortage of civil contracting capacity, delays with land acquisition, delays in finalising coal contracts and obtaining water licences for the new coal-fired power stations.

- High unplanned maintenance and load losses combined with the usual high planned maintenance of generating units during the period resulted in reduced generating capacity being available in the period covered by the enquiry.

- Coal stockpiles were allowed to decline to unacceptably low levels after August 2007 and there was a reluctance to obtain supplementary coal due to its high cost and its impact on Eskom’s financial position. Poor coal quality, wet coal and low stockpile levels contributed to the unplanned generation plant outages and load losses in the period.

- Poor coal planning and procurement by Eskom led to low coal stockpile levels. Eskom failed to notify the Energy Regulator of the deteriorating coal situation.

- The System Operator used all available emergency resources such as operating the coal-fired generation at emergency levels, obtaining assistance from customers via the demand participation (DMP) mechanism, invoking the conditions of interruptible load contracts, and operating gas turbines before resorting to load shedding.
• Eskom exports of power (excluding Mozal) to neighbouring countries during the load shedding exceeded its firm contractual obligations. Eskom must provide information regarding circumstances under which it (Eskom) can overlook the firm supply contracts.

• Licensees and customers were caught unawares of the electricity shortage and subsequent load shedding that would be experienced, hence the communication and co-ordination between licensees and customers was not as desired.

• The current regulations, procedures, licence conditions and industry codes do not make provision for long periods (months) of supply-demand imbalance.

• The Government National Electricity Emergency Programme (GNEEP) is addressing the electricity supply shortage with the support of the industry. Eskom’s role in the emergency programme must be clarified.

• The impact of the events has been that there is a major increase in Eskom’s primary energy cost, because the gas turbines were required to operate at very high load factors and Eskom embarked on the purchase of 45 millions ton of high cost coal to rebuild stockpiles. These actions places further strain on an already constrained liquid fuel industry.

• High level institutional capacity with authority to act must be consolidated in government to address GNEEP while procurement of new private generation capacity (IPPs) must be managed and coordinated centrally by a professional entity independent from Eskom.

Further investigation is required in the following areas:

• The legal status of the MYPD insofar as the obligations on Eskom to maintain coal stockpiles and reporting to NERSA.

• Whether some findings constitute a breach of legislation or licence conditions.

• Legal implications of load curtailment without the agreement from customers.

• Whether there is a causal link between national load shedding and the recent failures of distribution plant in the Nelson Mandela Metro and the Ekurhuleni Metro.
• The continued export of power to SAPP countries under system emergencies.

• Changes required to Eskom’s shareholder compact to prioritise security of electricity supply above Eskom’s commercial decisions in order to avoid national crises.

Further investigation is also **recommended** in the following areas:

• Primary energy procurement and management and in particular coal management in Eskom.

• The availability, adequacy and optimum utilisation of Eskom’s generation plant in emergency and in view of the mid-life of these plants.

A complete list of all the regulatory/operational and policy related recommendations is provided in **Appendix 2** and **Appendix 3** respectively.
Appendix 1: Eskom’s initial comments

Eskom initial comments on the NERSA First Draft Report – 15 April 2008

1. COMMUNICATION ABOUT THE CAPACITY SHORTAGES

As a result of its planning process, Eskom identified the need to build additional generation and transmission capacity some time ago and this need for additional capacity was reflected in its Integrated Strategic Electricity Plan (ISEP). ISEP was shared with various stakeholders at the time through discussions. Government policy at the time was to encourage the introduction of independent power producers and Eskom therefore did not get approval to proceed with building new capacity. This has been acknowledged by government. A copy of the media report confirming this position can be made available.

Unfortunately the private sector did not invest in generation capacity. Consequently, Eskom’s reserve margin has been steadily decreasing. The reserve margin in 2002 was 25%, in 2006 16% and in 2008, 8% to 10%. Eskom received the mandate to build power stations only in 2004 and since then Eskom has been building new capacity as fast as possible.

The capacity shortages were foreseen. However, Eskom could not predict the precise timing of the events leading to load shedding.

2. RESERVE MARGIN

The report by NERSA does not adequately deal with the decline in the reserve margin which is the major contributing factor to load shedding. The impact of the low reserve margin is to increase the risk of any unforeseen events resulting in load shedding. Problems (such as wet coal) that would previously have had little or no impact on supply due to adequate reserves, now result in major consequences for customers.

In the short term, the only viable option to improve the reserve margin is by reducing the load through initiatives such as power rationing.

3. COAL

The statement “there was also an element of complacency on the side of Eskom management in not replenishing coal stockpiles in good time" is not correct. Stockpile levels were regularly monitored and corrective actions were planned and replanned. The situation was exacerbated by the coal producers’ focus on exports, resulting in their contractual deliveries being on the lower limit of the contractual specifications, and the weather.

Eskom procures approximately 76% of its coal requirement from long term contracts and relies on the balance from the short term market. With the current market dynamics and lack of investment by mining houses, Eskom
finds it difficult to procure coal from the short term market. Coal costs have increased substantially since 2006 and it became increasingly difficult for Eskom to absorb these increases taking into account the capping of its revenue. NERSA’s willingness to review the situation is encouraging.

Coal logistics is a concern and Eskom is considering possible solutions. A comprehensive solution however, will take a long time to implement and Eskom will have to rely partly on road transport for the delivery of coal for the foreseeable future.

The statement that Eskom’s business objective is in conflict with the supply of electricity is not understood. It is also important that the information obtained to draw this conclusion should be an official Eskom position and not the anecdotal view of a particular employee. In particular the conflict referred to is an inappropriate conclusion. Eskom’s business is to provide electricity in the most efficient manner. In this regard, Eskom’s interests coincide with the national interest to ensure adequacy of supply and a predictable price path. However, Eskom cannot operate in an unsustainable manner as this would be prejudicial to Eskom and the country as a whole. Our prudent business decisions take into account financial consequences but must also balance security of supply, technical, social, economic and environmental considerations. Therefore there is no conflict with Eskom’s business objectives. The issue is that in order for Eskom to be sustainable, Eskom’s financial decisions need to be fundable (e.g. in terms of a pass-through of prudently incurred costs), failing which, there would be adverse consequences for Eskom and the economy generally in the long-term.

It is true that foreign exchange will be lost by diverting coal from export collieries to Eskom but the majority of export coal is not suitable for Eskom’s plant and will thus not be affected.

4. MAINTENANCE / SYSTEM OPERATION

Eskom disagrees with NERSA’s statement that up to 60 years life for coal-fired power stations long by international standards. Internationally there is strong evidence that stations can last as much as 60 years but it depends on the economics of the plant and coal supply. Eskom therefore disagrees with NERSA’S conclusion in this regard.

Eskom does not use an availability of 90% for long term planning but only for its own Generation aspiration. Long term planning is based on a much lower availability taking into account all the risks.

The inadequate reserve margin forced System Operations to allow more scheduled generation maintenance than what the operating reserve requirement allowed for. The only decision was on the timing, and it is generally acknowledged that less hardship would be caused in summer should the risks materialise. Even if System Operations was completely independent, it is plausible that the same decisions would have been taken as this decision was not based on the failure to interrogate the plans of the Generation division or one party being overridden by the other.
Regarding the recommendations about relaxing frequency and voltage control:
- During the various incidents, there were several periods where the frequency was relaxed but not to the extent found in India and some other countries. However, there are major risks and disadvantages with this approach.
- Work is being done on investigating the impact of reducing voltage levels at certain supply points but there is a danger of cascading voltage collapse in certain areas after an incident.

Regarding the specific Section 9 recommendations:

**Bullet 1:** When there is an insufficient reserve margin, there is risk that criteria for outage planning are either never agreed or not workable.

**Bullet 4:** Eskom has responded to the impact of extremely low reserve margins by establishing an Outage Review Committee which reviews in detail the potential impact of each outage and the potential to delay or cancel.

With regard to the proposal that only statutory maintenance be done in the future, it is our considered view that this would lead to the total collapse of plant availability within a very short time period. During the period of low reserve margin predictability of the system is important and reducing planned maintenance would increase unpredictability, in fact necessitating a higher reserve margin. Load reduction through load shedding or power conservation programs is required.

**Bullet 5:** The solution is not to defer outages but rather creating the space to do outages and to choose the right outages to ensure that plant performance improves and enable plant to run at appropriate load factors for the primary energy supply chains taking into account design limitations.

5. **BUILD PROGRAMME**

Delivery of the new generating capacity is a top Eskom priority. Much has already been achieved, for example the new OCGTs and the RTS capacity commissioned.

The reasons for the delays in the RTS and new plant are mostly out of Eskom’s control and are further explained in Annexure 2, which includes a comprehensive update on the Eskom Build Programme.

6. **ELECTRICITY EXPORTS**

Eskom continues to manage our exports and imports according to the SAPP rules, our contracts and the load shedding requirements. Most contracts are not firm contracts and these contracts will also be subject to the Power Conservation Programme. It is important that Eskom honours its contractual obligations in the region.
During the period of surplus energy Eskom, supported by the Government, entered into contracts for the supply of electricity with neighbouring countries but significantly with key industrial customers that operate plant across the borders of South Africa. Eskom also entered into several contracts for the importation of electricity making the net export position small. Eskom will remain a net exporter for the foreseeable future until more capacity is installed across the borders. These customers and utilities are also impacted by load shedding and the demand reduction program.

Table 1 and the text of section 5 of the NERSA draft report should reflect imports as well for completeness.

7. GENERAL

The sources of the tables and figures are not mentioned or acknowledged.
Appendix 2: List of Regulatory/Operational Recommendations and Decisions

The following is a complete list of regulatory/operational recommendations and decisions by the Energy Regulator.

1. Load Shedding

   It is recommended that:

   - Eskom, must as a priority, take action to reduce its unplanned outages and load losses to within the target 2000MW used in its operations planning;
   - Eskom must ensure that coal deliveries and coal burn are matched and that there is adequate stock to carry power stations through periods of high rainfall and other unforeseen events (link to primary energy section).
   - While understanding the obligation on Eskom to meet contractual requirements and the need for mutual co-operation with neighbouring countries as a major power importer, the decision to export power to neighbouring countries above the firm contractual levels during power system emergencies needs to be explained by Eskom and the way to deal with such situations should be included in the South African Grid Code.
   - Eskom must consider the feasibility of other options such as relaxing the system frequency standard of 50Hz to a lower value in order to reduce the power consumption of motor loads as done in countries such as India, the use of voltage reductions (brownouts) to reduce the power consumption of resistive loads prior to load shedding.

2. Coordination and Communication

   It is recommended that:

   - A protocol for communicating emergencies timeously to the Energy Regulator needs to be urgently put in place between Eskom and the Energy Regulator.
   - Communication processes and procedures between Eskom and the municipalities be re-assessed so as to minimise the impact on the end customer.
• Electricity distribution licensees are requested to develop communication strategies for each customer segment taking into consideration their daily routines.

• Electricity distribution licensees should collaborate with customers on contentious issues concerning load shedding to find the best possible solution in the circumstances.

• Electricity distribution licensees are required to give regular feedback to the public on the progress made and the demand reduction achieved (segment by segment) from the time the load shedding was implemented to date and beyond.

• Electricity distribution licensees should provide further education and training to all customers so that everyone assumes responsibility towards solving the problem.

3. Supply-demand Balance

It was decided that the Energy Regulator:

• Expedites implementation of the EEDSM programme by the revision of the current EEDSM framework and to provide for effective EEDSM in electricity distribution licence conditions and in price reviews.

• Requests Eskom to provide reasons for the slippage of new and return to service plant commissioning dates, in particular those plants due for commissioning in 2008 and 2009 and inform Eskom about the consequences of non-compliance.

• Requests Eskom to review and report on a regular basis on:
  
  o Progress in acceleration of the commissioning of the base-load power stations, including exploring the acceptance of delays in the construction of non base-load plants, and in particular pumped storage plants.

  o Eskom’s medium term power purchase programme (MTPPP).

  o The accommodation of primary energy constraints in its capacity planning process.

• Supports Government’s efforts to fast track the approval processes that constrain the construction and commissioning of new generation plants (EIA, land expropriations, coal rights, water licences).
• Investigates measures to hold Eskom and other generation licensees accountable to deliver against the plans and feasibility studies submitted to the Energy Regulator in support of their licence applications.

4. Primary Energy

It was decided that the Energy Regulator requests Eskom to:

• Expedite its plans to improve the coal transport logistics.

• Review its short-term coal procurement strategy to meet the immediate requirements of the power stations in the face of the inadequate coal transport infrastructure and the expected high power station load factors— a minimum of twenty (20) coal stockpile days at each power station should be made a licence condition.

• Ensure that procurement of coal during the holiday seasons does not result in the coal stockpile days falling below the 20-day limit.

• Critically review its system of coal requirements planning and the allocation of accountabilities for factors which result in major volume, mix and price variances.

• Ensure that coal logistics and coal contract management are improved as soon as possible

• Report to the Energy Regulator its process for determining coal burn and for making coal stock adjustments at power stations and the action taken to hold power station management accountable to manage coal stock. Reporting on coal stock write-off per power station must be considered as a licensing condition because it is a good indicator of effective power station and primary energy management.

5. Plant Maintenance

It was decided that:

• The criteria for operational and outage planning to be agreed and incorporated into the Grid Code to have a common understanding of expectations and to guide the System Operators and the generation licensees (Eskom and other licensees) in meeting these expectations.

• The Grid Code requirements for the operation of gas turbines during long-term periods of electricity supply shortage to be reviewed.

• The industry reporting requirements should be reviewed to ensure that action is taken timeously to not breach supply security. Checks and
balances must be developed to prevent Eskom from internalizing events of national importance. Consideration must also be given to oblige managerial ringfencing of Eskom’s licensed entities. The role of the System Operator as custodian of system security must be enforced by the Energy Regulator.

- Eskom to develop and provide to the Energy Regulator a plant management strategy to cope with the low reserve margins in the next five years. Only statutory planned work should be scheduled in next five years bearing in mind the age of the fleet and the potential need for major refurbishment to maintain plant integrity. A review of refurbishment plans should be undertaken to focus on minimum time outages.

- Eskom to prioritise planned maintenance for 2008/9 to establish contingency plans for deferring planned maintenance outages when required and share these plans with the Energy Regulator.

- The availability of all licensed generating plant around the country should be centrally co-ordinated.

- Innovative ideas are required to rebuild Eskom’s scarce skills base and retain the current skills base.

6. Legislation and Licence Conditions

It was decided that:

- Compliance criteria on how pre-emptive load shedding should be implemented must be developed and incorporated into the Grid Code and NRS standards;

- Eskom’s transmission licence must be re-drafted in the context of Eskom being the single buyer.

- The legal implications of load curtailment without agreement with the customer must be further investigated.

- The necessary Regulations and Tariffs must be established to provide a legal framework under which supply and demand can be balanced over the next five years of low reserve margin.
7. GNEEP

It is recommended that:

- The Government’s National Electricity Emergency Programme (GNEEP), including the PCP, should be coordinated and lead by a centralised high-level government unit with authority to take action,
- The role of Eskom is clarified in the Government’s National Electricity Emergency Programme considering that Eskom is to focus, among others, on returning the system to normality and on its new generation build programme.
- Government further explores the funding of the accelerated DSM,
- There needs to be strong emphasis on encouraging the efficient use of energy by all sectors of the economy.
- Since the GNEEP and new generation build programme are ongoing processes NERSA’s active participation in Forum for Energy Executives (FEE) and the National Electricity Response Team (NERT) work groups, as well as any other arising initiatives, be sustained for as long as necessary, provided there are enough resources to do that. Relationship between FEE and NERT must be clarified. and
- The procurement of new private generation capacity (IPPs and co-generation) be managed and coordinated centrally by a professional entity independent from Eskom.

8. Eskom Recovery Plan

It was decided that:

- The Energy Regulator be regularly appraised of progress with the implementation of the recovery plans;
- That NERSA participates in the debates at government forums and with stakeholders in order to be prepared to facilitate the implementation of the recovery plans.
- The Energy Regulator must engage electricity users in order to have a balanced view from all stakeholders.
9. Finance and Economics

It is recommended that:

- New tariff structures such as residential inclining block rate tariffs and real time pricing must be included in the National Retail Tariff Guidelines for implementation by electricity distribution licensees. It is also necessary for consultation with customers to take place prior to the finalization of any new tariff structures.

- The implementation tariff structures that incentivises energy savings be fast-tracked taking into account the current electricity supply shortage situation in the country;

- Differences between the future price path obtained from the results of the current modelling of the national integrated resource plan (NIRP3) and Eskom’s projected price path and revenue requirement must be reconciled and debated to establish a sound basis for the modelling and evaluation of electricity prices in South Africa. An independent modelling of the price path must be undertaken by the Energy Regulator.
Appendix 3: Key Policy Recommendations and Further Investigations

The following is a list of policy recommendations:

- The Government’s National Electricity Emergency Programme, including the PCP, should be coordinated and lead by a centralised high-level government unit with authority to take action.

- The procurement of new private generation capacity (IPPs and co-generation) be managed and coordinated centrally by a professional entity independent from Eskom.

- The need for a national strategy to be developed by Government for the acquisition and management of coal to ensure security of supply.

- National Government to consider a policy that will balance Eskom’s commercial decisions and the national security of electricity supply in order to avoid national crises.

- The role of Eskom is clarified in the Government’s National Electricity Emergency Programme considering that Eskom is to focus, among others, on returning the system to normality and on its new generation build programme.

- Government further explores the funding of the accelerated energy efficiency and demand-side management (EEDSM).

- Government clarifies the relationship between Forum for Energy Executives (FEE) and the National Electricity Response Team (NERT).

Further investigation is also recommended in the following areas:

- Primary energy procurement and management and in particular coal management in Eskom.

- The availability, adequacy and optimum utilisation of Eskom’s generation plant in emergency and in view of the mid-life of these plants.