State of the Power System Quarterly Update

‘Pre-Winter’

Brian Dames
Chief Executive

25 February 2014
Key messages

- The system remains tight
  - The lights are being kept on at a high cost
  - Three power emergency declarations were raised this summer, the first in November 2013
  - Rotational load shedding was avoided due to the reductions in demand achieved by customers
- It will remain tight up to the end of Summer and throughout Winter, until the build programme delivers new capacity.
- As in 2013 maintenance will continue throughout the year and this could potentially increase the level of constraint.
- It remains important for customers to maintain or achieve 10% electricity savings especially in the commercial, industrial and residential sectors.
- Government officials, Eskom and large customers continue to meet weekly to manage the situation and collaborate on solutions.
- The build programme to bring online additional electricity capacity is making progress.
Electricity usage in Summer and Winter…

Sept-March – Spring/Summer ‘Live Lightly’
- Table Mountain profile
- Constrained all day incl. from 5 - 9pm
- Air-conditioning, geysers & pool pumps primarily impact demand
- Commercial, agricultural & residential customers can make the biggest difference

April-Aug – Autumn/Winter ‘Beat the Peak’
- Peak profile
- Constrained from 5pm – 9pm
- Electrical heating, geysers, & pool pumps primarily impact demand
- Residential customers can make the biggest difference as demand increases in the evenings

Summer & Winter load profiles
- Winter Peak Profile
- Summer flat (Table Mountain profile)
Key messages

Summer Overview

Winter Prognosis

Conclusion
Summer Overview: leading up to the first system emergency

- This was a difficult Summer. Open cycle gas turbines and reduction by contracted industrial customers were used to meet demand, at a high cost.

- Koeberg Unit 1 was on a planned re-fuel shutdown over this period. We could not tolerate changes to the planned outage program of our nuclear unit, despite the additional increase in the use of emergency reserves.

- A number of events within the national diesel fuel industry in November 2013 and increased usage resulted in reduced diesel availability, adding pressure on the availability of emergency reserves.

- This resulted in the first System Emergency being declared on 19 November 2013 and lifted on 21 November 2013 - a difficult but necessary decision, to avoid a total electricity system collapse.

- Increased Emergency Demand Market Participation and an Energy Buy-Back of up to 1 000MW was requested to supplement depleted emergency reserves.

- Supply levers such as the short-term IPP program expired at the end of December 2013, creating further pressure for 2014.
In the week leading up to the 20th of February, there was an increase in unplanned outages and the imports from Cahora Bassa were reduced due to a conductor failure.

This required the various emergency reserves and the pumped-storage schemes to be used extensively.

A system emergency was declared for the evening peak of the 20th of February in line with the normal regulatory protocols due to possible risks that could have materialized.

We saw nearly 1 000MW of reductions from all the customers (industrial, commercial and residential). Eskom also secured up to 280MW from those IPPs on the Short-Term Power Purchase Programme.

A system emergency was declared for the evening peak of the 21st of February as the emergency reserves and dam levels were still at very low levels.

The situation recovered over the weekend as imports were restored and 6 generation units returned to service.

Despite the Emergency Declaration no rotational load shedding was done thanks to immediate demand reduction by customers.
A significant level of planned maintenance was conducted this Summer compared to previous years.

The tight system in January resulted in short-term delays in the maintenance programme, impacting the longer-term programme leading into Winter.
Generation challenges

- The **Duvha coal conveyor belt** that transports coal from the adjacent mine to the power station was damaged in December – resulting in significant coal supply challenges for the station, requiring output reduction and additional OCGT usage, thus limiting the opportunity for additional maintenance (short-term outages). Coal is temporarily being transported by trucks as a contingency.

- Increased boiler tube leaks were the prime reason behind generator outages. Outage slips and extensions have taken much longer than initially planned due to the state of the plant when opened up for inspection as well as some performance issues in execution.

- Partial output reduction continued to be a challenge. Hot days impacted the ability of some power stations, particularly Matimba, to generate at full output. This design issue had up to 1 000 MW impact at Matimba alone.
During the day, load was on average 500 MW higher than last year due to the absence of energy buybacks in 2014 and the end of the short-term IPP programme.

Despite the increased maintenance, this demand has been supplied though the extensive use of the OCGTs and increased levels of Demand Market Participation.
A Megawatt of power produced by an OCGT plant costs approximately 16 to 18 times more (dependent on oil prices) than the equivalent produced by a coal-fired power station.
- Tight system leading to emergency being declared on 19 November 2013 as well as 20 and 21 February 2014.

- Response by key industrial customers and the general public resulted in emergency being lifted earlier than planned on 21 November 2013.

- Improved response by key industrial customers and the general public resulted in the system being managed back into Orange on 20 and 21 February 2014 and assisted with meeting the demand.
While there was adequate reserve available throughout the day, there was very little reserve available at peaks.

The relative reserve levels available during the day are lower in summer.
Coal stocks at sufficient levels

- Coal stock days are above the expected level of 42 days, with December ending on 48 days.
- Stock days at power stations that are highly dependent on road deliveries like Camden, Grootvlei, Komati and Tutuka have dropped below alarm levels in December mainly due to mine and road deliveries stoppages over the festive period.
- Duvha Power Station stock days have also dropped due to a section of the conveyor that was damaged in a fire.

**Actual Stock days F2008, F2012, F2013 vs YTD Actual  F2014**
Since inception in 2004, the IDM programme has established capacity (megawatts) equivalent to that of an average power station.
Cross-border imports and exports

- Trading power with our neighbouring countries provides mutual benefit
  - Export power brings in additional revenue and ensures regional stability
  - Importing power assists with SA’s national capacity constraints
- During time of constraints these arrangements allow us to import more than we export, thereby assisting South Africa to manage its security of supply.
- Imports include up to 1 500MW from Cahora Bassa and up to 107MW from Aggreko in Mozambique.
- Export contracts with utilities are either firm or un-firm and range in total between 1 000MW and 1 800MW dependent on the national system status.
- Regular exports are made to Lesotho (firm), Swaziland (firm), Botswana (firm and un-firm contracts) and Namibia (un-firm) and three end-use customers.
- Infrequent exports are made to Zimbabwe or Zambia when surplus is available.
Cross-border impact during an emergency

During Eskom system emergencies the following applies to exports:

- All non-firm energy supplies are reduced to zero,
- All firm energy supplies are reduced by 10%,
- Trading Partners are required to enforce the 10% reduction on their customer base,
- Trading Partners are required to utilize all their own generation capacity to the maximum,
- Energy which may inadvertently be drawn out of the Eskom system is charged at emergency generation rates,
- The interruptibility of the specific customer agreements is activated by National Control as the system requires it.
Outlook for pre-winter

- The **system remains tight in the next few months leading into Winter**. The demand forecast assumes standard summer and winter temperatures.

- On the supply-side:
  - **Maintenance will continue at high levels** based on the generation sustainability strategy and to comply with legislation. Planned outages vary between 5GW and 6GW up to April 2014, thereafter between 4GW and 5GW and by June will ramp down between 2GW and 1.5GW
  - Koeberg Unit 2 (900 MW) will be taken off load for planned refuelling at the end of March 2014
  - Positively, Cahora Bassa is back at full capacity – 1 500MW and is expected to remain at this level
  - Projected unplanned allowance of 6 500MW for the period January to March 2014 and 4 500MW for the period April to June 2014 is expected, resulting in an increased usage of OCGTs
  - The utilisation of pre-commercial output from renewable IPPs is being investigated
Supply-side: Renewable IPPs gain momentum

- The Department of Energy introduced three bid windows for the Renewable Independent Power Purchase Programme
- Of the 19 Renewable IPPs connected to the grid, 3 projects (99 MW) have achieved their contractual Commercial Operation Date (COD) and 8 projects are generating Early Operating Energy. Expect the last project of Bid Window 1 by no later than the first half of 2015

<table>
<thead>
<tr>
<th>Bid</th>
<th>Date</th>
<th>MW</th>
<th>Power Purchase Agreements</th>
<th>Type of Technology</th>
<th>Status</th>
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<tr>
<td>1</td>
<td>5 Nov. 2012</td>
<td>1416</td>
<td>28</td>
<td>Wind, Solar PV, Solar CSP</td>
<td>- 19 of 28 connected</td>
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<td></td>
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<td>- 3 projects achieved COD; 8 projects in Early Operating</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Last plant commercial expected by Feb 2015</td>
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<td>2</td>
<td>9 May 2013</td>
<td>1044</td>
<td>19</td>
<td>Wind, Solar PV, Solar CSP, Landfill &amp; Biomass</td>
<td>- Progressing well</td>
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<td>3</td>
<td>Bid Window 3 still to be concluded</td>
<td>17 bidders for 1456 MW - Wind, Solar PV, Solar CSP, Landfill and Biomass technology</td>
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Outlook for pre-winter continued

Demand-side

• 10% saving across all customer sectors is critical until an energy conservation scheme or similar is introduced as a safety net.

• Customers are asked to manage and cut all electricity wastage. As we head into winter, please remember that less is more. The less electricity you use, the more electricity will be available to go around.

Demand management continues to work. We have achieved cumulative savings of 35 TWh since 2005.
Projected Pre-winter system outlook

With the maintenance that needs to be done, and the available capacity, the system will remain tight with an increased use of OCGTs.

Supply and demand-side levers are required to improve the picture.

Because this shows the picture including OCGTs, it must be noted that the Red indicates a severely constrained system with no reserves.

Decision on license agreements on Kriel PS expected in the latter part of March 2014.

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Continued Progress with New Build …

- Eskom is **committed to completing the new build programme** and has put the necessary resources in place to do so

- Work has resumed at Ingula pumped-storage scheme after the safety incident

- Medupi and Kusile continue to demonstrate world-class safety performance (0.1 loss time incident rate). Medupi’s first unit is still expected to be synchronised in the second half of 2014 and Kusile’s first unit following a year thereafter.

- The technical C&I issues at both Kusile and Medupi are being addressed with the on-boarding of Siemens.
Continued Progress with New Build

- Three of the 50 wind-turbines at Sere PS are complete and the station’s 100MW is expected to be commissioned by 2014/2015

- Transmission power line construction is progressing well, major sections of the power grid (Western Cape, Limpopo and Gauteng), have been strengthened, although challenges still remain in terms of servitude acquisition.
How to Live Lightly and Beat the Peak

• Saving electricity reduces pressure on the grid and cuts your electricity bill and South Africa’s carbon emissions

• The power system remains vulnerable all day during Summer

1. **Use air-conditioning efficiently**
   - Set air-conditioning at 23 degrees
   - Close windows and doors to optimize air-conditioning
   - Switch off 30 minutes before leaving the office

2. **Continue to switch off all geysers and pool pumps from 5pm to 9pm**

3. **As we approach winter, use alternatives to electrical heating**

4. **Switch off all non-essential lighting and appliances**

5. **Respond to the Power Alert and Power Bulletin radio messages** by switching off all appliances that are not being used
Key messages

Summer Overview

Pre-Winter Prognosis

Conclusion
Conclusion

• The system remains tight going into Winter, and will remain so for the next few years until the build programme is completed.

• With the projected demand and current trends in plant performance, extensive and expensive use of OCGTs is anticipated, resulting in limited operating reserves to deal with volatility in demand or generation performance.

• We call on all customers, particularly the municipalities and the commercial sectors, to manage and cut out all electricity wastage. The industrial and commercial sector can make significant contributions particularly in large office blocks and shopping centres.

• If this is done, it will ensure a stable power system and reduced costs.

• We thank all our customers who continue to assist by reducing consumption.
Thank you