Medium Term Scenarios for Electricity Supply/Demand Balance

62nd AMEU CONVENTION

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In recent years, South Africa’s electricity supply system has come under severe pressure:

- Due to limited new generation capacity, the power system reserve margin has reduced to unacceptable levels.
- The availability of generation plant has reduced because of the requirement to run them harder and the lack of space for essential maintenance.
- The power system will remain under pressure until new baseload power stations come on line.

The recent economic slowdown has provided temporary relief by reducing consumption:

- However electricity demand has recovered to 2008 levels.
• There is no clear industry acceptance on the extent of the problem
  
  • There still seems be some level of apathy amongst key stakeholders
  
  • Lack of urgency from policy/decision makers to deal with the problem
  
  • New Inter Ministerial Committee structure may be better equipped to deal with the challenges
  
  • Joint Emergency Response and Business Continuity technical task team set up recently between business/industry/Eskom/DoE to support IMC. A report has been produced to discuss with key stakeholders
SUPPLY VS DEMAND ANALYSIS
Key Assumptions - Demand

• The demand projection **excludes the effects of**:
  - Demand Side Management
  - Co-Generation
  - Solar Water Heating

• **Price elasticity** will have a delayed impact on demand which will not significantly reduce demand over the critical next 3 years

• Demand is based on a **GDP ranging from 3 to 5%** for the period 2010 to 2014

• There is an additional **recovery** of demand in 2010 due to smelters ramping up to full capacity after the economic recession

• Unconstrained growth allowed for **new connections ≥20 MVA**
## Key Assumptions - Supply

<table>
<thead>
<tr>
<th>ESKOM Build</th>
<th>Country Options</th>
<th>Total New Build</th>
<th>System Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grootvlei</td>
<td>Komati</td>
<td>Medupi</td>
<td>Kusile</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>570</td>
<td>202</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>380</td>
<td>303</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
<td>404</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>0</td>
<td>738</td>
</tr>
<tr>
<td>2013</td>
<td>0</td>
<td>0</td>
<td>738</td>
</tr>
<tr>
<td>2014</td>
<td>0</td>
<td>0</td>
<td>1476</td>
</tr>
</tbody>
</table>

- Base Load Coal Energy Availability Factor: Scenario’s of 86% and 84%
- Expensive Base Load Station Load Factor: 50%
- Open Cycle Gas Turbines Gross Load Factor: 6%
- Energy Utilisation Factor: 95%
### Energy Supply /Demand Balance on 86% and 84% EAF with Alcan excluded

The diagram illustrates the energy supply and demand balance for different scenarios, including original and revised forecasts for both 86% and 84% electric arc furnace (EAF) with Alcan excluded. The key data points are as follows:

- **Forecast Energy Demand (Alcan excluded)**
  - 2010: 249.61 TWh
  - 2011: 257.35 TWh
  - 2012: 263.74 TWh
  - 2013: 271.14 TWh
  - 2014: 277.72 TWh

- **Forecast Energy Demand (Alcan excluded, SWH included)**
  - 2010: 249.59 TWh
  - 2011: 256.40 TWh
  - 2012: 261.38 TWh
  - 2013: 266.96 TWh
  - 2014: 270.97 TWh

- **Forecast Energy Demand (Alcan excluded, 5 yr DSM included)**
  - 2010: 249.59 TWh
  - 2011: 256.40 TWh
  - 2012: 261.38 TWh
  - 2013: 266.96 TWh
  - 2014: 270.97 TWh

- **Original MYPD 86EAF Supply**
  - 2010: 257.46 TWh
  - 2011: 263.60 TWh
  - 2012: 265.73 TWh
  - 2013: 280.61 TWh
  - 2014: 296.10 TWh

- **Revised MYPD 86EAF Supply**
  - 2010: 257.23 TWh
  - 2011: 262.58 TWh
  - 2012: 264.53 TWh
  - 2013: 273.71 TWh
  - 2014: 290.28 TWh

- **Revised MYPD 84EAF Supply**
  - 2010: 254.92 TWh
  - 2011: 258.58 TWh
  - 2012: 259.87 TWh
  - 2013: 270.06 TWh
  - 2014: 285.08 TWh

*Multi-Year Price Determination, December 2009*
Additional contingencies to MYPD2 Baseline

- Demand Management solutions need to provide **sufficient contingency** in the supply / demand forecast to **mitigate risk** associated with:
  - Reduced **performance levels of current generation plant**
  - Possible delays in the **delivery of the new large power stations** (Medupi & Kusile)
  - Higher than anticipated **demand**
  - Possible delays in the **delivery of non-Eskom generation** options

- In addition, the contingency will ensure **opportunities** for:
  - Additional **space for maintenance** of generation plant
  - Minimising the overall **cost to the consumer** by avoiding excessive usage of OCGT’s
  - Growth in electricity consumption, including large new projects

- Although there is a current **5TWh annual energy surplus**, the system remains “tight”. It will therefore be appropriate to ensure that this “buffer” be maintained and planned for into the future
The following are key supply and demand assumptions that on aggregate will ensure sufficient contingency – over and above what was allowed for in the MYPD2:

- Allow for extended delivery dates of Eskom base load stations: assume delivery dates of 2013 and 2015 for Medupi and Kusile respectively.
- Plan for an energy availability factor of 84% (rather than 86%) to allow for sufficient space for maintenance.
- Apart from MTPPP, exclude all other non-Eskom generation options in the period until 2014.
- Postponement of the 1020MW DoE OCGT from 2012 to 2014.
- The MYPD2 sales assumptions allow for sufficient contingency and remains as-is.
- Maintaining the current 5TWh annual energy buffer into the future.

Sufficient contingency will reduce the risk and build buffer to manage future pressure on the power system.
Defining the Problem
Quantification of the Energy Gap

**MYPD2**

- **Demand:** Reference
- **Supply:** 84% EAF

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap</td>
<td>-4.5</td>
<td>0</td>
<td>5.6</td>
<td>3.1</td>
<td>-5.3</td>
</tr>
</tbody>
</table>

**Additional Contingencies**

- **Demand:** Reference
- **Supply:** 84% EAF Delay

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap</td>
<td>-4.3</td>
<td>1.3</td>
<td>9.6</td>
<td>9.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Buffer +</td>
<td>0.7</td>
<td>6.3</td>
<td>14.6</td>
<td>14.5</td>
<td>9.4</td>
</tr>
</tbody>
</table>

**Initial Gap (TWh)**

- 2010: -4.5
- 2011: 0
- 2012: 5.6
- 2013: 3.1
- 2014: -5.3

**Energy Gap**

- 2010: -4.3
- 2011: 1.3
- 2012: 9.6
- 2013: 9.5
- 2014: 4.4

+ Buffer
Defining the Problem
Nature of the problem: Energy vs Demand

Energy Availability rather than Capacity is the challenge!
Energy vs Demand

Eskom Power System Hourly Demand

Very flat profile during the day indicating energy rather than peak demand problem (Tuesdays selected)

Note: Winter profile is more peaky
National Implications if the Gap is not closed

- The electricity supply system will be under severe pressure, posing a risk to **Security of Supply**

- Using open cycle gas turbines to mitigate the risk is expensive, ultimately increasing the **price of electricity**

- It will **not be possible to connect large expansions**, negatively affecting economic development

- South Africa’s **sustainability, reputation** and **competitiveness** will be negatively affected

- Pressure to **reduce supply to neighbouring countries** could have negative political implications

- Further **reputational damage** to government and the electricity industry
Proposed Solutions to close the GAP

• Most Supply-side solutions are being pursued, but they are
  • Too late
  • Expensive
  • Not enough money allowed for in the approval of Eskom’s price application (MYPD2)

• Demand-side solutions are more readily available in the
  • Short term
  • Less expensive
  • Strong business case

• Strong case for both as they complement each other
Emergency Response and Business Continuity Plan

Special Task Team – Mandate & Constitution

June 2010

Supported by EON Consulting
# Suite of Energy & Demand Related Solutions

<table>
<thead>
<tr>
<th>Options</th>
<th>Savings : Energy</th>
<th>Savings : Demand</th>
<th>Easy Implementation</th>
<th>Bankability</th>
<th>Economic Implications</th>
<th>Eskom Control</th>
<th>Cost to Eskom</th>
<th>External Dependencies</th>
<th>Risks</th>
<th>Focus</th>
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<td>Mass Market DSM</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>Energy Efficiency and behavioural change initiatives provide deep energy solutions</td>
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<td>Individualised Customer Energy Management</td>
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<td>DSM (Solar Water Heating)</td>
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<td>●</td>
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<td>Communications (incl Power Alert)</td>
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<td>Internal Energy Efficiency</td>
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<td>Demand Market Participation</td>
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<td>●</td>
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<td>●</td>
<td>Predominantly Demand Response initiatives with secondary energy efficiency benefits</td>
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<td>Utility Load Manager</td>
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<td>Advanced Metering Infrastructure</td>
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<td>●</td>
<td>●</td>
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<tr>
<td>ECS : Energy Conservation Scheme</td>
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<td>●</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Risk Mitigation solution</td>
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</tbody>
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- **●**: Favourable
- **●**: Problematic/Negative Impact
- **●**: Intermediate

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If all the Demand related solutions are successful, there will still be a remaining gap over the next 3 to 5 years.

The only remaining workable solution that has the ability to close the gap with the least impact on the economy, is the Energy Conservation Scheme (ECS).

The ECS will provide the appropriate pricing signal for investment in energy efficiency and supply options with customers, such as co-generation, self generation and renewable generation.

The introduction of ECS is receiving increasing support in Industry and Government.
Key Messages

• South Africa has moved from a period of abundant, cheap electricity to a situation of looming shortages of supply and rising electricity prices.

• The shortage of electricity will probably last for at least 5 years and urgent decisions need to be taken to address this potential crisis.

• All generation options have largely been identified and are expensive, however need to be pursued for MT and LT solutions.

• Demand management options, specifically energy conservation and efficiency is the least cost, best environmentally friendly short term solution to address a number of challenges facing South Africa:
  • Creation of space for generation maintenance and new connections
  • More time available for new generation decisions
  • Positive impact to contain electricity price increases
  • Positive impact on the environment

• The introduction of the Energy Conservation Scheme is essential and hopefully imminent.

• All South Africans need to focus on energy efficiency to contribute to the solution.
Thank you

“The cheapest kWh is the one that you don’t use!”