The Greening of Energy –
Eskom’s role in the Renewables Industry in South Africa
Contents

1 Background and Eskom at a glance

2 Eskom’s strategy and aspirations on Renewables

3 Eskom’s role in the current IPP process

4 Next key milestones
Eskom is committed to move to a lower emitting and lower water use energy mix and to improve energy efficiency in its own operations and those of its customers and stakeholders.

Eskom is clear that it cannot meet the future electricity demand needs of the country on its own and welcomes the involvement of the private sector to support it in meeting the future needs of South Africa.

The solutions to meet the future needs must look at regional options (Central and Southern Africa), distributed generation closer to the customers, ensure that the tariff trajectory is affordable and support the aspirations of Government policy on job creation and local supplier development.

Important decisions on the implementation of the Integrated Resource Plan have to be made to continue the momentum of the current renewable energy IPP procurement programme and Eskom’s new build programme.
Energy Production in South Africa

- Coal fired: 92.5%
- Gas turbine: 0.1%
- Hydroelectric: 0.5%
- Nuclear: 5.7%
- Pumped Storage: 1.2%

South Africa heavily relies on coal, followed by Nuclear.
# Eskom at a glance

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
<th>Nominal capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal-fired</td>
<td>13 stations</td>
<td>37 745MW</td>
</tr>
<tr>
<td>Gas/liquid fuel turbine</td>
<td>4 stations</td>
<td>2 426MW</td>
</tr>
<tr>
<td>Hydroelectric</td>
<td>6 stations</td>
<td>661MW</td>
</tr>
<tr>
<td>Pumped storage</td>
<td>2 stations</td>
<td>1 400MW</td>
</tr>
<tr>
<td>Nuclear</td>
<td>1 station</td>
<td>1 910MW</td>
</tr>
<tr>
<td>Wind energy</td>
<td>1 station</td>
<td>3MW</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>27 stations</td>
<td>44 145MW</td>
</tr>
</tbody>
</table>

## Utility and country

- **Total electricity produced (TWh):** 237

## Electricity generation mix:

- **Coal-fired power stations (%):** 92.8
- **Renewables (%):** 0.8
- **Pumped storage and other (%):** 1.2
- **Gas (%):** 0.1
- **Nuclear (%):** 5.1

## Environmental performance

- **Water usage [L/kWh SO]:** 1.35
- **CO₂ [kg/kWh SO]:** 0.99
- **Particulate emissions [g/kWh SO]:** 0.33
- **SO₂ emissions [g/kWh SO]:** 7.75
- **NOₓ [g/kWh]:** 4.18
## Eskom at a glance

<table>
<thead>
<tr>
<th>Station</th>
<th>Location</th>
<th>Nominal capacity MW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas/liquid fuel turbine stations (4)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acacia</td>
<td>Cape Town</td>
<td>171</td>
</tr>
<tr>
<td>Ankerlig</td>
<td>Atlantis</td>
<td>1 338</td>
</tr>
<tr>
<td>Gourikwa</td>
<td>Mossel Bay</td>
<td>746</td>
</tr>
<tr>
<td>Port Rex</td>
<td>East London</td>
<td>171</td>
</tr>
<tr>
<td><strong>Hydroelectric stations (6)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colley Wobbles</td>
<td>Mbashe River</td>
<td>42</td>
</tr>
<tr>
<td>First Falls</td>
<td>Umtata River</td>
<td>6</td>
</tr>
<tr>
<td>Gariep</td>
<td>Norvalspont</td>
<td>360</td>
</tr>
<tr>
<td>Ncora</td>
<td>Ncora River</td>
<td>2</td>
</tr>
<tr>
<td>Second Falls</td>
<td>Umtata River</td>
<td>11</td>
</tr>
<tr>
<td>Vanderkloof</td>
<td>Petrusville</td>
<td>240</td>
</tr>
</tbody>
</table>
## Eskom at a glance

<table>
<thead>
<tr>
<th>Station</th>
<th>Location</th>
<th>Nominal capacity MW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pumped-storage (2)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drakensberg</td>
<td>Bergville</td>
<td>1 000</td>
</tr>
<tr>
<td>Palmiet</td>
<td>Grabouw</td>
<td>400</td>
</tr>
<tr>
<td><strong>Wind energy (1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klipheuwel</td>
<td>Klipheuwel</td>
<td>3</td>
</tr>
<tr>
<td><strong>Nuclear (1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koeberg</td>
<td>Melkbosstrand</td>
<td>1 910</td>
</tr>
</tbody>
</table>
The gap between demand and supply requires vast investments in power generation capacity: To meet the demand, Eskom total generating capacity has to increase to 70 000 MW by 2025.
IRP 2010 Capacity allocations under policy adjusted scenario, places a strong emphasis on renewable energy in the new capacity allocation.

The country will be faced with shortages until 2015 with the peak being a 9 TWh shortage in 2012.

Energy share in 2010: Σ = 260 TWh
- Coal: 90%
- Nuclear: 5%
- Hydro: 5%
- Gas - CCGT: 0%
- Peak - OCGT: < 0.1%
- Renewables: 0%

Energy share in 2030: Σ = 454 TWh
- Coal: 65%
- Nuclear: 20%
- Hydro: 5%
- Gas - CCGT: 1%
- Peak - OCGT: < 0.1%
- Renewables: 9%

Source IRP 2010
Integrated Resource Plan

Is a “living” plan, which will be updated on an on-going basis to reflect the changing needs of South Africa and respond to changes in our economic, social and technological environment.

This is the first IRP that government directed and it seeks to **find a balance** between competing government objectives:

- **Affordability**
- **Reducing carbon emissions** (*Towards a Green Economy*)
- **Water conservation**
- **Localization and**, 
- **Regional development**
IRP reduces carbon intensity by ~34% while coal and nuclear is still the backbone of the energy supply.

**Power supply sources**

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal</th>
<th>CCGT</th>
<th>OCGT</th>
<th>CCGT/OCGT</th>
<th>Nuclear</th>
<th>Wind</th>
<th>Hydro</th>
<th>PV</th>
<th>CSP</th>
<th>Wind CSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>2030</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

**Energy mix**

- Electric energy supplied in TWh p.a.
- Carbon free TWh’s in 2030 (34%)
- Renewable TWh’s in 2030 (14%)
- Electric energy supplied in TWh p.a.

- CO₂ intensity:
  - 912 g/kWh
  - 600 g/kWh
  - -34%
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Eskom is fully supportive of renewable energy generation in South Africa

Developing renewable energy in South Africa is important
  • Reduce CO₂-emissions
  • Mitigate climate change
  • Diversify energy sources

Government has taken several important steps to drive renewables deployment
  • Large portion of IRP allocated to renewables
  • Renewable Energy Purchase programme introduced

South Africa has abundant resources (especially for solar)
  • Average solar radiation of about 2,300 kWh/m²/year
  • Large areas in the cape with average wind speeds of more than 6 m/s

Eskom facilitates the deployment of renewable energy and the ramp up of a renewable energy industry in South Africa
Very high solar irradiation in South Africa excellent for Solar Technologies

Solar irradiation in South Africa ...

... as compared to Germany, where residential grid parity will be reached soon

SOURCE: Joint Research Center of the European Commission; PVGIS; BCG analysis
We aim to contribute to a cleaner, more sustainable energy future for South Africa

Addressing climate change requires addressing both supply and demand factors in the energy sector

Reduce carbon intensity of energy supply

One key lever is to increase the share of renewable energy and nuclear in the overall energy mix

- Concentrated Solar Power
- Photovoltaic
- Wind

Reduce demand through more efficient energy use

Eskom is also driving a number of demand side management initiatives

- Solar water heaters
  - Often 30-40% of electricity is used for water heating, which can be saved with solar water heaters
- Energy efficiency program
  - Installation of energy efficient equipment e.g. compact fluorescent lights bulbs.
- Industrial demand side management
  - Energy auditing & optimizations for industrial clients
Eskom has a long history with renewable energy...

- **1873**: At the Pilgrim’s Rest gold mines, 2 small hydro generators were used to power the first electrified railway.
- **1923**: The government of South Africa announced the launch of the Electricity Supply Commission (Eskom).
- **1927**: The Sabie River hydro station came into commercial operation. This was the first hydro station designed by Eskom engineers.
- **1967**: Cahora Bassa hydro power station on the Zambezi river intended to supply power to South Africa.
- **1971**: Gariep (formerly Hendrik Verwoerd) hydro power station started feeding into Eskom’s transmission system (380MW).
- **1977**: The Vanderkloof hydro power station commissioned (240MW).
- **1987**: Eskom renamed Eskom.
- **1995**: Stirling Dish was installed at DBSA.
- **2002**: R&D wind energy facility at Klipheuwel in the Western Cape (3 MW).

**SOURCE**: Eskom history, company information
While awaiting for an IRP allocation from DoE, Eskom is already delivering first projects for the country.

**Sere Wind Farm**

**Description**
- 100 MW Wind farm being constructed in Western Cape region
- ~50 turbines of 2 MW each
- Scheduled completion in 2013

**Summary**
- Wind is recognised as the most proven renewables technology worldwide
- ~220,000t CO2 saved per year based on 0.9t CO2 /MWh

**PV at Eskom sites**

**Description**
- Installation of photovoltaic systems at Eskom sites
- Initial installation of one hectare per site at two sites adding 1 MWp of capacity in 2011

**Summary**
- PV is zero emissions technology
- PV does not require water during the power production cycle
- PV is a well-established, safe technology
- PV can be installed quickly at plant site

**CSP demo plant**

**Description**
- World’s largest 100 MWe Concentrating Solar Power plant with molten salt for energy storage is being developed for construction near Upington.

**Summary**
- Plant required to investigate CSP technology in South Africa
- Vital to Eskom’s carbon footprint reduction/ low carbon growth strategy

*Eskom is currently discussing its role regarding developing, operating and maintaining renewables assets, driving local industry development and developing local skills with the key relevant players.*
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**Eskom’s role**

Eskom has focused on three main areas to ensure it supports the Renewable Energy IPP Procurement Process:

### Role as Single Buyer and Governance
- Ringfenced System and Market Operator unit set up to act as Single Buyer and Wholesaler.
- Eskom fast tracked internal governance processes and the team has a mandate in which it can operate for the initial Renewable Energy IPP programme.

### Grid Connection and Customer Service
- Dedicated Grid Access unit set up in the Customer Services Division as one stop contact for connection queries.
- Ongoing customer services around network connection quality will be provided from this unit.
- Extensive network analysis to understand connection possibilities and limitations.

### Grid Operations
- Technical teams sent to other countries to understand best practice.
- At current levels of penetration, there should be relatively small impact and it will be used as a learning opportunity.
- Over time it is anticipated that higher levels of operating reserves will be required and this will be analysed.
- Transparency on forecasting and dispatch will become important.
## Eskom plays a significant role for renewable energy IPPs in South Africa

**Process undergone by all IPPs**

<table>
<thead>
<tr>
<th>Renewable IPP</th>
<th>Allocation of renewable energy capacity</th>
<th>PPAs</th>
<th>Grid connections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Who leads</strong></td>
<td><strong>DoE</strong></td>
<td><strong>DoE</strong></td>
<td><strong>Eskom – Buyer’s Office</strong></td>
</tr>
<tr>
<td><strong>Eskom’s role</strong></td>
<td>No role played – no influence</td>
<td>Make information concerning current and future grid capacity publically available</td>
<td>Eskom signs PPAs for all capacity allocated and make payment to IPPs, recovering costs through tariffs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>System operator provides information of grid capacity and stability to DoE to assess the impact of renewable energy on grid stability</td>
<td></td>
</tr>
</tbody>
</table>

**Eskom does not influence or have access to the process of PPA allocation within the country. The role-playing entities are ring-fenced from each other.**
Submit questions for clarification or enquiries on grid connection to the network owner (Eskom or the municipality)

- Eskom grid access process on [www.eskom.co.za](http://www.eskom.co.za) or e-mail [GridAccessUnit@eskom.co.za](mailto:GridAccessUnit@eskom.co.za)
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What are the next key milestones?

- Financial closure of Round 1 of the procurement programme.
- Connecting the first IPPs within the contracted time periods.
- Allocation of new capacity to Eskom and future IPP procurement programmes to provide certainty.
- Eskom’s MYPD3 process to ensure the tariff trajectory supports the aspirations of cleaner and affordable electricity capacity growth.
Please partner with us

- Embrace energy saving as a national culture, joining the global journey towards a sustainable future

- 49M campaign aims to create a culture of energy efficiency in SA

- Remember the three Ps: save power, save your pocket and save our planet. If you’re not using it, switch it off!
THANK YOU