Future of Energy in South Africa

Stimulating Economic Growth, Development and Job Creation

George Njenga
Achieving a Balanced Energy Mix

Critical Elements to drive National dialogue

Environment
Technology
Job creation & Skills Development
Transformation – creating local wealth
Global Power Outlook

**World electrical generation by fuel (TWh in ’000s)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Renewables</th>
<th>Nuclear</th>
<th>Oil</th>
<th>Coal</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2025</td>
<td>7</td>
<td></td>
<td>11</td>
<td>7</td>
<td></td>
</tr>
</tbody>
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Source: GE Power Marketing

**INDUSTRY DYNAMICS**

**Fossil Fuels**
Remains 60%+ of industry and a must to stabilize the grids

**Renewables**
Fastest growing segment although still less than 50%

**Emerging Markets**
85% of electricity growth, each country with unique needs
So What is it with Coal?

**Positives**

- Abundant in South Africa
  - 7th ranked producer in the world
- Cheapest base load in local currency
  - no Forex exposure
  - Price stability
- Jobs and businesses creation
- Strong baseload on which our renewables rides today

**Negatives**

- Associated pollutants - Sox/Nox/Dust
- High Water usage
- High carbon density per unit of energy produced
Environmental Controls

LOWER ENVIRONMENTAL FOOTPRINT
500 GW eq. & 5000 industry systems

REDUCED COMPLIANCE COST
More than 90 years of experience

FLEXIBILITY & RELIABILITY
Innovation, flexibility & robustness

POLLUTANT REMOVAL RATES

- \( \text{SO}_x > 98\% \)
- \( \text{NO}_x \geq 95\% \)
- Particulates 99.9%

TECHNOLOGY READY TO RESPOND TO INCREASING ENVIRONMENTAL STANDARDS
Cleaner coal technologies for the past 100 years

- Supercritical: >221 bar/550°C/550°C
- Ultra-supercritical: >240 bar/593°C/593°C
- A-USC (SteamH): >320 bar/610°C/630°C

50% SteamH

NEW Available Today

Most efficient & flexible in operation

Coal Plant of the Future

What’s Next?
Manjung 4, Malaysia
TNB Janamanjung

10% higher efficiency than global average

97% availability rate (excluding planned outages)

>90% SO2 removal achieved with SWFGD

South-East Asia first 1000MW ultra-supercritical power plant
HASSYAN CLEAN COAL PROJECT
Dubai Electricity & Water Authority (DEWA) and ACWA Power Harbin Holding Company

Integrated Power Package
USC steam turbines, generators, boilers and environmental controls solutions supplied by GE

EPC Partnership with Harbin
builds on GE’s 20+ years of experience working with Chinese EPC companies

Equipment Manufacturing
in GE’s factories in Beijing and Wuhan

First ultra-supercritical coal-fired power plant in the Middle East

Steam Power Systems has accelerated the development of leading efficiency, lower emission technologies to deliver more value to customers.

- **Technology Advancements**
  - 1½ % points more efficient & 3% lower emissions compared to today’s best

- **PREDIX Digital Capabilities**
  - Delivers up to 1 ½% more power over the life of a plant

- **Environmental Controls**
  - Able to lower emissions by 70% more than the world’s most stringent emission standards

Driving towards $\geq 50\%$ efficiency
Discard Coal as Fuel Source using CFB Technology

South Africa

- Up to 3bn MT estimated
- Can produce up to 15GW for 25 years
- High efficiency combustion

SEWARD 2x292 MW CFB Plant in USA

Customer: Reliant Resources
Fuel: Discard coal (50% Ash)
Sulfur content: 2.75%
COD: 2004
Medupi & Kusile
Building great local communities and local partners.

~25,000
No. of jobs created in new build power projects

Trained over 300 students in engineering skills

250 direct employees
3,500 sub-contracted workers on-site
Skills Development & CSI Initiatives

POWERING AFRICA IS NOT ONE-SIZE-FITS-ALL

Kriel Graduate Trainees

CSI Initiatives

School Projects

Sibongi-ndawo Primary School
The winning equation

**SKILLS Development + JOBS creation**

- Meaningful local jobs
- Leveraging South Africa's abundance of resources

**ENERGY Production**

- Expand energy production and its diversity in terms of mix to ensure that energy supply is secure and industrialization really takes place.

**Socio-economic TRANSFORMATION**

- Wealth creation with strong Local black ownership
- Expanded Economy
- Supply chain localization
- Sustainability

Delivering more value for South Africa