Africa’s power crisis: and power shortages in South Africa

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Prof Anton Eberhard
Management Program in Infrastructure Reform and Regulation

Africa’s power crisis

• Inadequate generation capacity
  – third of South Asia
  – tenth of Latin America
• Low access
• High costs
• Poor reliability

Only region in the world where per capita installed generating capacity is actually falling

48 Sub-Saharan counties have total of only 68 GW equivalent to Spain!
Without South Africa total drops to 28 GW
Power crisis now extends down to South Africa

- Major blackouts late 2007 and early 2008
- Forced closure of mines in January
- Extensive period of power rationing
- Reduced output, exports, jobs
- GDP growth has more than halved

Causes of the blackouts in South Africa

1. Insufficient generating capacity
   - Eskom’s investment programme 4 years behind
     - Government moratorium from 2001-2004
     - New build programme has slipped
   - Contracting of IPPs unsuccessful

2. Plant breakdowns / coal supply problems
   - Plant run harder
   - Failures in maintenance, systems, management & governance
Electricity demand and supply capacity

Ideally need 15-20% reserve margin to cater for auxiliary power and system stability (1800MW) planned maintenance and unplanned outages (2000MW)

Government & Eskom’s response plan

1. Restore coal stockpiles
2. Improve generation plant availability
3. Eskom’s investment programme
4. Co-gen
5. New IPP window
6. Power conservation and DSM

Supported by electricity price increases
Eskom’s investment program vs projected demand (MW)

Capacity runs out: IPPs, Cogen & DSM essential

4% p.a. growth projection

Actual demand

Coal 3 before 1st nuclear?

Eskom existing Gx

Eskom’s investment program vs demand (MW)

power rationing and conservation

2% p.a. growth projection

3% p.a. growth projection


Actual demand 4% p.a. growth projection Capacity runs out: IPPs, Cogen & DSM essential Coal 3 before 1st nuclear? Eskom existing Gx
Eskom’s investment program vs demand (MW)

- 7-13% reserve margin
- 17-25% reserve margin

With power conservation & lower demand growth

Cogen and IPP investments still needed

Cogen prospects in South Africa

- Eskom wanted at least 900MW
- Strong expressions of interest (5000MW?)
- Actual bids for only a few hundred MW
- Many industries now primarily concerned about their own security of supply
- Price certainty in parallel IPP bid framework more attractive

Important lessons around improving bidding and contracting framework and creating greater certainty for investors
IPP prospects in South Africa

- Two major disappointments
  - DME negotiations break down with preferred bidder AES for 1000MW of OCGTs
  - Cross-border Botswana Mmamabula coal IPP unable to reach closure
- Unfortunately reinforces government view that private sector not interested in investing
  - but more than 40 IPPs across Africa
- Eskom running further IPP bids
  - Medium term power purchase programme
  - Base load IPP programme
- Also discussions on cross border projects continue cf. Mozambique, etc (need for utility investments in Tx)

Eskom Cogen and IPP terms

<table>
<thead>
<tr>
<th></th>
<th>Cogen</th>
<th>Medium Term IPPs</th>
<th>Base load IPPs</th>
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<tbody>
<tr>
<td>Latest CoD</td>
<td>2012</td>
<td>2012</td>
<td>2016</td>
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<tr>
<td>PPA duration</td>
<td>7-25 yrs</td>
<td>ends 2018</td>
<td>TBD</td>
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<td>PPA payments</td>
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<td>energy only</td>
<td>capacity &amp; energy</td>
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<td>PPA prices</td>
<td>early completion incentive tapering to LRMC</td>
<td>Rand 0.65-1.05 tapering to LRMC</td>
<td>LRMC</td>
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<td>PPA currency</td>
<td>rands</td>
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<tr>
<td>Fuel costs</td>
<td>No fuel cost pass thro</td>
<td>No fuel cost pass thro</td>
<td>TBD</td>
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<tr>
<td>Technology</td>
<td>Cogen &gt;1 MW</td>
<td>5 - 1000 MW</td>
<td>&gt; 400 MW</td>
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<tr>
<td>Total to be contracted</td>
<td>900 MW</td>
<td>TBD</td>
<td>at least 2100 MW</td>
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<td>Dispatch</td>
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<td>central dispatch</td>
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Power conservation: huge potential

<table>
<thead>
<tr>
<th>Country</th>
<th>kWh/GDP (constant 2000 US$)</th>
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<tbody>
<tr>
<td>Germany</td>
<td></td>
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<tr>
<td>Mexico</td>
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<tr>
<td>Russia</td>
<td>2.00</td>
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16th most electricity intensive economy in the world

Power conservation prospects

- Huge potential
- But mixed signals and poor execution
- Load curtailment is disproportionately borne by mining and large industrials
- Load-shedding is least economically efficient mechanism for dealing with power scarcities
- How quickly & effectively will a market-based power rationing scheme be introduced?
  - Initially 250 large customers (>25 GWh – 50% total) – voluntary
  - Regulations and rules still being prepared for mandatory scheme with options for penalties & incentives
- Will price increases induce necessary savings?

Price elasticity of -0.2?
10% price increase results in 2% demand reduction
30% price increase results in 6% demand reduction
Steep electricity prices increases now inevitable

- Current Gx electricity prices less than half the cost of new base-load Gx plant
- 27.5% increase this year
- 20% + increases in ensuing years will see electricity prices more than double
- Surest way of inducing electricity savings
- In long run creates a more certain environment for cogen and IPP investments

Will the lights stay on? Depends on........

1. Restoring an acceptable reserve margin
   - Eskom investments on time
   - Price increases plus an effective market-based energy efficiency programme to reduce demand
   - Timely & sufficient contracting of Cogen & IPPs

2. Keeping Eskom’s kit running
   - More robust coal contracting
   - Achieving at least 86% availability / 9% planned maintenance & less than 5% unplanned outages

3. Maintaining reliable networks
   - Adequate investment in human & physical capital
   - Certainty in distribution restructuring

Government & Eskom on a learning curve around contracting private sector (IPPs, cogen, PCP) but now have to accelerate these programmes to restore supply security
The Management Programme in Infrastructure Reform & Regulation (MIR) aims to deepen knowledge and capacity to manage the reform and regulation of the electricity, gas, telecommunications, water and transport industries in support of sustainable development.

Prof Anton Eberhard
University of Cape Town

Leading change in emerging markets