Eskom’s performance in international perspective: governance, institutional and pricing reforms

David Newbery, University of Cambridge

CDE Workshop on the SA electricity crisis

5 May 2008, Johannesburg

http://www.electricitypolicy.org.uk
The South African electricity crisis

- Energy White Paper 1996
  - presented 1998
  - forecast shortage 2007 unless new capacity ordered by 1999
- blackouts in 2007 winter
- major blackouts in (off-peak) summer 2008
  - large impact on mineral production, foreign confidence
Electricity blackouts: bogus arguments

Electricity demand was higher than expected

Eskom long term sales forecast track record
Blackouts: ultimate causes (1)

Insufficient generating capacity

- Eskom’s investment programme 4 years behind
  - Moratorium from 2001-2004
  - New build programme has slipped
- DME contracting of IPPs unsuccessful
Ideally need 20% reserve margin to cater for planned maintenance, unplanned outages and system stability
Blackouts: ultimate causes (2)

Eskom unable to keep its existing generators working adequately

<table>
<thead>
<tr>
<th>Plant Availability</th>
<th>Planned Maintenance</th>
<th>Unplanned Outages</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 : 7 : 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>86 : 9 : 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76 : 10 : 14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Negligence in coal contracting
Equipment and maintenance failures
Example: 28 January 2008

<table>
<thead>
<tr>
<th>Description</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eskom capacity + imports</td>
<td>39 855</td>
</tr>
<tr>
<td>Operating reserves</td>
<td>1 800</td>
</tr>
<tr>
<td>Planned maintenance</td>
<td>3 715</td>
</tr>
<tr>
<td>Breakdowns (e.g. boiler tube ruptures, etc)</td>
<td>4 235</td>
</tr>
<tr>
<td>Reduction in capacity (e.g. wet or insuff coal)</td>
<td>2 694</td>
</tr>
<tr>
<td>Total capacity available for supply</td>
<td>27 411</td>
</tr>
<tr>
<td>Expected demand</td>
<td>32 000</td>
</tr>
</tbody>
</table>

Consequence: massive load-shedding
diamond, gold and platinum mines shut down

What are root causes?
Systemic management and governance failures?
Reserve margins based on Eskom capacity expansion plans only

Reserve margins will fall dangerously if no IPPs, cogen or savings

Reserve margin %

Year

Eskom’s new build programme has slipped
Reserve margins: Eskom + energy efficiency + cogen + IPPs

With imports

With 3000 MW cogen plus 3500 MW IPPs

Target

Eskom + 3600MW energy efficiency

Eskom investing as fast as it can, but now also needs imports, IPPs, Co-Gen and...
The stalled reform discussion

- Reform discussions ignore pricing
- International experience
- Requirements for liberalisation
- Costs and pricing
- Reforms and governance
Reform discussions post 1994

• SOEs increasingly criticised for inefficiency
  – Particularly for investment
• SA Debate on reform starts – conferences, reports, models,…..
• Eskom Conference 3-5 April 2000
  – presents international experience
=> Consensus model – liberalise, unbundle, encourage new IPPs, privatise, regulate …

But pricing issue neglected
Eskom Productivity 1979-2006

GWh/employee

GWh produced/employee
GWh sold/employee
Customers/Employee RHS

Johannesburg 5 May 2008

David Newbery

2008

12
Eskom's average selling price deflated by CPI

Average selling price: ZA cents/kWh (2005 CPI prices)
Selling price in US (2005) cents RHS


Graph shows the trend of Eskom's average selling price and the selling price in US dollars from 1979 to 2005, deflated by the CPI.
The UK experience

• Britain restructured from a position of high prices and spare capacity
• England (+Wales) unbundled: restructuring worth 6% permanent fall in cost
  = 100% on sale value; consumers lose, buyers gain
=> Large investment in new generation E&W
• Scotland - unrestructured, no net social gain
Real GB electricity and fuel costs 1990-2007

- Electricity
- Coal + EUA cost
- Gas + EUA cost
- Coal HHI

**Graph Details:**
- **Y-axis:** £(2006)/MWh
- **X-axis:** Time periods from Q3 1990 to Q3 2006
- **Legend:**
  - Orange line: Electricity cost
  - Black line: Coal + EUA cost
  - Yellow line: Gas + EUA cost
  - Red line: Coal HHI

**Key Events:**
- **1993:** Significant rise in coal + EUA cost
- **1994:** Peak in coal HHI
- **1995:** Reduction in gas + EUA cost
- **1996:** Decline in electricity cost
- **1997:** Increase in coalition
- **1998:** Profit maximising
- **1999:** Price control
- **2000:** NETA
- **2001:** Plant withdrawal
- **2002:** Restraint
- **2003:** Profit maximising
- **2004:** Coal HHI
- **2005:** Plant withdrawal
- **2006:** Coal HHI

**Sources:**
- Data from J Bower and C Humphries
Requirements for liberalisation

• Enough generation stations for competition
• Investors need assurance that price = LRMC when new capacity needed
• Confidence that markets allow scarcity pricing and control of market power is justified
  – challenging for regulators & competition authorities
• Financially viable distribution companies
• Credible regulation for wires, access
Requirements in South Africa

• remunerative pricing to reward investors
• timely, efficient procurement of generation
  – planning, contracting, dispute resolution
• efficient pricing to guide energy intensive investments (e.g. aluminium)
• incentives for availability and reliability
  – to hire the right staff
  – to ensure they work effectively
  – to deliver quality of service
Energy and capital costs 2006

Variable costs: Coal  US$1-5/MWhe
LNG: $56/MWhe, distillate in CCGT $77/MWhe, in OCGT = $130/MWhe (at $7/mmBTU for gas, oil $61/bbl)
Peak price (Megaflex) = $63/MWh
What has happened since 2006?

Source: IHS Inc. and Cambridge Energy Research Associates
Energy costs 2008

- Oil now $100+/bbl
- LNG: $12-13/mmBTU? = $100/MWhe
- distillate in CCGT $140/MWhe?
- distillate in OCGT = $230/MWhe
- T&D losses at peak amplify these
Eskom’s asset values (2006)

= 60 ZAR bn historic cost
= 130 ZAR bn inflation adjusted
Optimal Deprival Value > 330 ZAR bn (?)
  of which generation > 200+ ZAR bn (?)
Economic return < 2.3% on ODV

Suggests serious under-pricing
Approaches to pricing

• ODV value + WACC of 8% prices should increase 60% from 170 to 270 ZAR/MWh
  – Still 3rd cheapest of 14 countries at $40/MWh
  – and this excludes any CO₂ cost
• Generation LRMC > 250 ZAR/MWh (2006)
  + T&D = 320 ZAR/MWh ($48)
• Capacity price: VOLL x LOLP
• SRMC = marginal fuel cost + capacity price
Pricing

• Efficient pricing for marginal demand
  => PPA contracts new energy-intensive users
  – benchmark against IPP PPAs
  – High value exporters to face LRMC/SRMC
  – Other customers offered old contract to 80% of 2007 demand, above that at LRMC/SRMC
  – raise peak prices, energy prices relative to fixed charges, shift to locational pricing?

_Eskom should be a cash cow, not a hungry dog_
Reform priorities

- Under-pricing deters liberalisation
- Investment requires Eskom’s full attention
  - the unbundled model would not work now
  - timely decisions about IPPs required
  - and improving availability, reliability
- Active efforts on cogen, DSM, etc needed
- Resolve uncertainties in distribution
Institutional reform options

- Create Single Buyer (SB) office in Eskom?
- Planning transferred to SB subject to scrutiny by stakeholders?
- Commercialise stations
  - with PPA and availability (capacity) payments?
- Medium term: Single Buyer separated
- SB tenders for new capacity, approval subject to transparency and scrutiny
Conclusions

• Eskom has been adept during the transition
  – in electrification, securing political support, improving performance
  – in setting challenging standards for Muni Discos
  – but performance now slipping

• Requirements: 1) raise (marginal) prices to LRMC
  2) finance and deliver efficient investment and performance in all segments
  3) Reduce demand, increase supply (e.g. cogen)

• Regulation & governance:
  – clarify responsibilities for investment, pricing, IPPs
Eskom’s performance in international perspective: governance, institutional and pricing reforms

David Newbery, University of Cambridge

CDE Workshop on the SA electricity crisis

5 May 2008, Johannesburg

http://www.electricitypolicy.org.uk