BAYNES HYDROPOWER SCHEME ON THE LOWER CUNENE

June 2009
**Presentation Outline**

- Purpose of Previous Studies on Epupa/Baynes 1998.

- Current Situation.

- Generation options considered

- The Baynes Study 2008

- Technical detail of Baynes Alternatives
Purpose of previous studies on Epupa/Baynes 1998

- To find the most cost efficient option for self sufficiency of electricity supply to Namibia
- The governments of Angola and Namibia could not agree on which power station, Baynes or Epupa to develop.
- A 400 kV power line to SA was completed in October 2000 to cope with growing demand for electricity in Namibia since a favorable bi-lateral electricity import agreement was concluded with Eskom S A.
- This agreement however terminated in 2006.
Current situation

- Eskom SA cannot supply electricity to Namibia during all load periods anymore as a result of own lack of capacity.
- The cost of electricity, if supplied from Eskom, is very high during peaking and standard periods.
- Annual growth = 4.6% on energy while peak demand growth = 0.7%
- Namibia is presently importing ± 80% of energy consumed in some periods
- Price of electricity is expected to rise dramatically.
Energy Demand (GWh) Forecast

Medium Forecast
High Growth
Low Growth

3.8%
2.7%
1.6%
Maximum Demand/Supply Graph (MW) for Namibia
Ruacana Power Station is used to service peak demand during low flow periods in the Kunene River together with imports. If imports are not possible or insufficient, NamPower needs to run Van Eck and Paratus Power Stations at extremely high cost. To increase security of supply and self sufficiency to Namibia NamPower needs to develop a new power station.
Generation Options Considered

- Alternatives being considered by NamPower are:
  - Combined Cycle Gas-fired Power Station (Kudu) - 400 to 800 MW
  - Coal –fired Power Station at Walvis Bay - 400 MW
  - Diesel Peaking Station, Walvis Bay – ±50 MW
  - Lower Orange Small Hydro Stations - 108 MW
  - Renewable energy such as wind and solar power < 40 MW
  - Baynes Hydropower Station - 360 to 550 MW (50% to each country)

- Governments of Namibia and Angola decided to jointly have another look at Baynes as a Peaking Station
The PJTC appointed the Cunene Consortium to perform a techno-economic feasibility study on the Baynes Hydropower Project.

A company, Environmental Resource Management (ERM) was appointed to do a separate environmental assessment of the project.

Both studies are planned to be completed by end February 2010.

Public participation is a very important aspect of the study especially w.r.t. the directly affected parties living in the project area.
Technical details of Baynes Alternatives

- Site location of hydro sites in Lower Cunene
- Hydro Potential-Lower Cunene.
- Why Baynes Site?
- Baynes Alternative Dam Sites.
- Inundated Areas of the Dam Sites
Site Location

Baynes

Epupa
Hydro Potential – Lower Kunene

KUNENE RIVER
LONG TERM DEVELOPMENT

Epupa Falls
# HYDRO POTENTIAL-LOWER KUNENE RIVER

<table>
<thead>
<tr>
<th>NAME</th>
<th>OPERATING HEIGHT m</th>
<th>RESERVOIR CAPACITY Mm³</th>
<th>POTENTIAL CAPACITY MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALUEQUE</td>
<td>11</td>
<td>2500</td>
<td>0</td>
</tr>
<tr>
<td>JACAVALE - LUANDEGE</td>
<td>171</td>
<td>23</td>
<td>255</td>
</tr>
<tr>
<td>RUACANA</td>
<td>134</td>
<td>25</td>
<td>400</td>
</tr>
<tr>
<td>ZEBRA - ONDORUSO</td>
<td>65</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td>EPUPA</td>
<td>160</td>
<td>7800</td>
<td>330</td>
</tr>
<tr>
<td>BAYNES</td>
<td>125(200*)</td>
<td>410(2600*)</td>
<td>265(360*)</td>
</tr>
<tr>
<td>MARIEN</td>
<td>140</td>
<td>800</td>
<td>300</td>
</tr>
<tr>
<td>HARTMAN - MCHA</td>
<td>201</td>
<td>480</td>
<td>425</td>
</tr>
<tr>
<td>TOTAL LOWER CUNENE</td>
<td></td>
<td></td>
<td>2110</td>
</tr>
</tbody>
</table>
Why Baynes Site?

- Epupa site was not chosen this time due to environmental considerations.
- Both Angola and Namibia are keen to study the Baynes option due to its much smaller environmental impact and its suitability for peaking generation.
  - Too small storage volume for reliable base load generation
  - High Head
  - Suitable dam profile
  - Proximity to NamPower Grid
- Presently three site alternatives are being considered for dam levels 580, 560 and 520 maml respectively.
THE THREE ALTERNATIVE BAYNES DAM SITES
INUNDATED AREAS OF THE DAM SITES
Three Dam Site Alternatives
Three Dam Site Alternatives
Upstream Site “Em”
Downstream Site “Ej”
Thank you!