Thar Coal – Key To Pakistan’s Energy Security

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Mission to EU

on behalf of
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Sindh Engro Coal Mining Company

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Pakistan Growing Energy Needs

With growing population and urbanization, Pakistan would need six times more energy than what it is has installed now by 2030 - **The Govt. of Pakistan has rated energy as key national issue**

- **Kwh/Capita**
  - Egypt: 1,743
  - Vietnam: 1,073
  - India: 684
  - Indonesia: 680
  - Philippines: 647
  - Sri Lanka: 490
  - Pakistan: 449

Pakistan has the lowest KWh/Capita when compared to countries with similar GDP/PPP.

- **Urbanization Rate**
  - IND: 2.4%
  - LKA: 1.3%

- **Urban Population**
  - IND: 32%
  - LKA: 15%

- **Capacity (MW)**
  - 20,213 MW
  - Current installed capacity

- **CAGR in electricity increase from 2014**
  - 35%

**Source:** world bank, NTDC

**IND:** India, **LKA:** Sri Lanka

**2.7%**

**Urbanization Rate**
- IND: 2.4%
- LKA: 1.3%

**36%**

**Urban Population**
- IND: 32%
- LKA: 15%
Pakistan is currently relying heavily on Thermal power and within it a major chunk from imported oil. When compared to other countries in the region, Pakistan dependence on indigenous resource has depleted over the years. Above all it does not utilize its indigenous coal at all.

### Electricity generation source wise 2013

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydel</td>
<td>3%</td>
</tr>
<tr>
<td>Thermal</td>
<td>68%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0%</td>
</tr>
<tr>
<td>Wind</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Break down of Thermal energy

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>43%</td>
</tr>
<tr>
<td>Oil</td>
<td>57%</td>
</tr>
<tr>
<td>Coal</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Historical Trend – Energy Mix

<table>
<thead>
<tr>
<th>Year</th>
<th>Hydel</th>
<th>Gas</th>
<th>Imported Oil</th>
<th>Indigenous Coal</th>
<th>Nuclear &amp; Imported Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>60%</td>
<td>38%</td>
<td>22%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>1990</td>
<td>45%</td>
<td>32%</td>
<td>29%</td>
<td>29%</td>
<td>1%</td>
</tr>
<tr>
<td>2000</td>
<td>29%</td>
<td>30%</td>
<td>40%</td>
<td>29%</td>
<td>21%</td>
</tr>
<tr>
<td>2013</td>
<td>29%</td>
<td>29%</td>
<td>39%</td>
<td>29%</td>
<td>26%</td>
</tr>
<tr>
<td>2025</td>
<td>26%</td>
<td>21%</td>
<td>50%</td>
<td>29%</td>
<td>21%</td>
</tr>
</tbody>
</table>

- Indigenous Fuel mix is loosing significance in Power Generation Mix
- Rising prices of imported fuels coupled with sector’s inability to transfer its cost of production to Consumers has given rise to serious solvency issues for Electrical Utilities and OMCs (known as “Circular Debt”)

Pakistan electricity problems are mainly due to Less Generation Capacity and Wrong Fuel Mix
## Existing Fuel Options for Govt. of Pakistan

### Tariff for various fuels for initial 1-10 years

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Thar Coal (3960MW)</th>
<th>Thar Coal (660MW)</th>
<th>Imported Coal at Port</th>
<th>Imported Coal at Sahiwal</th>
<th>LNG Plant in Punjab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>660MW</td>
<td>3690MW</td>
<td>660MW</td>
<td>660MW</td>
<td>660MW</td>
</tr>
<tr>
<td>Debt</td>
<td>Foreign</td>
<td>Foreign</td>
<td>Foreign</td>
<td>Foreign</td>
<td>Foreign</td>
</tr>
<tr>
<td>Tariff Period</td>
<td>1 – 10 years</td>
<td>1 – 10 years</td>
<td>1 – 10 years</td>
<td>1 – 10 years</td>
<td>1 – 10 years</td>
</tr>
<tr>
<td>Fuel Cost (USc/kWh)</td>
<td>2.10</td>
<td>1.46</td>
<td>4.56</td>
<td>4.56</td>
<td>8.82</td>
</tr>
<tr>
<td>CPP (USc/kWh)</td>
<td>7.33</td>
<td>6.89</td>
<td>4.21</td>
<td>4.21</td>
<td>2.96</td>
</tr>
<tr>
<td>Jetty (USc/kWh)</td>
<td>-</td>
<td>-</td>
<td>0.36</td>
<td>0.36</td>
<td>2.72</td>
</tr>
<tr>
<td>Railway (USc/kWh)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.51</td>
</tr>
<tr>
<td>Total Tariff (USc/kWh)</td>
<td>9.43</td>
<td>8.36</td>
<td>9.13</td>
<td>11.64</td>
<td>14.50</td>
</tr>
<tr>
<td>Transmission Cost (USc/kWh)</td>
<td>1.00</td>
<td>0.70</td>
<td>1.00</td>
<td>0.20</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Source: GoP
### Pros and Cons of Various Fuel Options for Pakistan

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Thar Coal</th>
<th>Imported Coal at Port</th>
<th>Imported Coal at Sahiwal</th>
<th>Imported Coal Upcountry</th>
<th>LNG</th>
<th>Wind/Solar</th>
<th>Hydel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff Saving</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Import Bill Saving</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Chances to come online by end 2017/early 2018</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>Available in peak hours during summers</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Technical viability for Grid</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Limited</td>
</tr>
</tbody>
</table>

- Energy mix with 39% Imported RFO is **neither sustainable nor affordable**
- Hydel generation, though economical will take time & requires substantial capital investment
Globally, coal remains the fuel of choice for power generation

More importantly, Coal based power generation is driven by Indigenous Coal

- More than 80% of coal used by China, USA, India and Germany is indigenous assuring
- Out of 7bt coal production, just 1bt crosses borders - Preferred use of coal is for indigenous consumption

Despite having World’s 7th largest coal reserves, Pakistan only produces 0.1% of its energy through coal

Source: IEA, Electricity Information
Thar Lignite – 94% of Pakistan’s Total Coal Reserves

Thar Desert contains the world’s 7th largest coal reserves:

175 Billion Ton
Total Thar Coal Reserve

50 Billion TOE
More than Saudi Arabia & Iranian Oil Reserves

2000 TCF
68 Times higher than Pakistan’s total gas reserves

Location of Thar Coal Field

Source:: GSP data/report – Energy equivalent is based on Shenhua report/RWE
Thar Lignite – Comparison with other World Lignites

- Thar Coal fields can be compared to many operating Open Pit Mines of the World - Thar has comparatively higher heating value, lower sulphur & lower ash contents than other operational mines in the world:

- Stripping Ratio and Heating Value of Thar Block II is feasible for successful Mine Operation

- Thar Lignite can be utilized in Power Plants both at mine mouth as well as suitable locations like Jamshoro as lignite can be transported as being practised in places like India, China & Germany

- RWE Study confirms Thar Lignite can be transported safely via road / rail

**Comparison of Thar Block II with Other International Mines**

<table>
<thead>
<tr>
<th>Deposit</th>
<th>Heating Value (Net) (KCal/kg)</th>
<th>Sulfur (%)</th>
<th>Ash (%)</th>
<th>Moisture (%)</th>
<th>Stripping Ratio (m³/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thar Block II</td>
<td>2770</td>
<td>1.07</td>
<td>7.8</td>
<td>47.46</td>
<td>6.6</td>
</tr>
<tr>
<td>Gujarat, India</td>
<td>2600-3000</td>
<td>3.4-5.9</td>
<td>9-12</td>
<td>38-40</td>
<td>9 – 14</td>
</tr>
<tr>
<td>Hambach, Germany</td>
<td>1911-2747</td>
<td>0.2–0.4</td>
<td>2-5</td>
<td>48-52</td>
<td>6.3</td>
</tr>
<tr>
<td>Maritza East - Bulgaria</td>
<td>1550</td>
<td>4.5</td>
<td>19-35</td>
<td>54</td>
<td>1.7</td>
</tr>
</tbody>
</table>

- By using properly designed de-sulfurizers and ash removal units, Thar coal can produce cheap electricity while meeting the most stringent international environmental standards

**THAR COAL QUALITY AND ECONOMICS COMPARES FAVORABLY WITH OTHER LIGNITE MINES AROUND THE WORLD**
Why Investment in Thar Coal is attractive?

- Sovereign guarantee from Government of Pakistan
- Guaranteed USD 20% IRR on the project
- Part of China-Pakistan Economic Corridor (CPEC)
- Exemption from taxation and levies, custom/import duty
- Backed by best corporate houses
- Project of “National Importance” by the Government
- Govt investing more than USD 1 Bn on Infrastructure for Thar
Sindh Engro Coal Mining Company

SECMC was formed in 2009 as a public-private partnership between Govt. of Sindh (2\textsuperscript{nd} Largest Province by population of Pakistan) and Engro Powergen Ltd. – a subsidiary of Engro Corp. through ICB with the objective of undertaking coal mining and associated power project at Thar Block-II

**Vision**

“Energizing Pakistan through world-class mining in Thar while ensuring prosperity to its communities”

**Investors in Mining Project:**

- **Govt. of Sindh**
  - 2\textsuperscript{nd} Largest Province by Population in Pakistan
  - 51\% shareholder in SECMC

- **Engro & Affiliates**
  - Business include fertilizers, foods, chemicals storage, trading, power generation and petrochemicals.
  - Investment of USD ~2B over last five years

- **House of Habib**
  - Businesses range from automobiles, buildings, banking, computers, chemicals; group has equity and technical collaborations with British, Japanese and Norwegian companies

- **HUBCO**
  - Largest Independent Power Producer (IPP)
  - First private sector infrastructure project in Pakistan

- **Habib Bank Ltd.**
  - Largest private sector bank
  - Customer base exceeding five million relationships
  - Presence in 25 countries

- **Chinese Investors**
Business Plan – Phase I

**Mining Project under SECMC**
- Set-up an initial open cast mine of 3.8 Mt/a (02x330 MW equivalent)
- Construction Period - 38-42 Months
- Total Project Cost ~ US$ 845Mn

**Power Project under EPTL**
- 02x 330 MW units - Sub-critical Mine Mouth Power Plants on Thar Lignite
- Construction Period – 38-42 Months
- Total Project Cost ~ US$ 1.1 Bn

*With investment of ~USD 2 Bn, this is Pakistan’s biggest project in terms of investment being taken up by the private sector*
SECMC Grand Plan

SECMC will execute the project in three phases. In the first phase 02x 330 MW sub critical plants will be established - Work on Phase I has already started with major milestones completed.

**Total Mining Capacity:**
22 MT/ annum

**Power Generation Capacity:**
3,960 MW

### Phase I (Started)
- Mining: 3.8 Mt/a
- Power: 2 x 330 MW
- Technology: Sub Critical
- Construction: 42 months
- Open cast mine in Thar coal Block II which can produce 3.8 MT/a of coal
- Build two 330 MW mine mouth power plant with a distance of 5KM from the mine
- Company responsible for setting up the power plant is Engro Powrgen Thar Ltd
- Financial Close expected by Dec. 2015

### Phase II
- Mining: 6.5 Mt/a
- Power: 1 x 330 MW + 0.8 Mt/a for Janmshoro
- Technology: Sub Critical
- SECMM to provide coal for further two power plants in addition to its own
- Mine to be further expanded to cater 6.5 MT/a
- Thar & Hubco have signed an options agreement for coal
- Opportunity exist for minority stake with Hubco and Thar
- Majority shareholding can also be explored

### Subsequent Phases
- Mining: 22 MT/a
- Power: 4 x 660 MW
- Technology: Super Critical
- Mine to be established to its potential
- Setup additional four power plants of 660 MW.
- Structuring and other technical will be done after the construction of Phase I
After completing all technical, commercial, environmental and regulatory requirements, project team is now at an advanced stage of financing.

- Top Local banks have already signed CTA for a loan of USD 500 M for the mining project.
- Principal approval given on Power Plant loan by Chinese banks.
- Team is set to achieve Financial Closure by end 2015.
- Power supply will start by end of 2018.

*Thar Coal Project will be a game-changer for the Country!*
Role of Government in Thar Coal Development

- Govt of Sindh has been a key enabler for Thar Project in the following roles
  - Equity Contribution of USD120 Million
  - Backup guarantor for Sovereign guarantee of USD 700 Million
  - Infra-structure support of USD 550 Million

- Govt of Pakistan has been instrumental for Thar Projects in following roles
  - Issuance of a Sovereign Guarantee for the Mining Project of SECMC
  - Inclusion in CPEC highest Priority projects
  - Assistance in getting requisite framework from Sino-sure
  - Special ECC incentive policy for Thar
  - Inclusion of Thar in Power Policy

*Both GOS & GOP are strongly supporting Thar Project*
Prime Minister Nawaz Sharif along with former President Asif Zardari performed ground-breaking for this mega project on 31st Jan 2014

Political leadership of Pakistan has reached consensus to jointly support Thar Coal Project and has declared it a “Project of National Importance”

Thar Coal Mining & Power Project is part of the China-Pakistan Economic Corridor (CPEC)

Project is being done with Local and Chinese funding
Mining Activity at Site

- Work for overburden removal in Thar Block II started with local contractors in mid 2014
- 3.5 Million Cubic Meter Overburden already removed
Environment Consideration

- Environment & Social Impact Assessment study for Mining and 2x330MW Power Plant Project has been completed which included:
  - Environmental Impact of Projects & Mitigation measures
  - Baseline Stakeholder Consultation & Socio-economic Impact assessment
  - Overall Environmental Management Plan

- The ESIA fully complies with the national environmental regulations (NEQs) and best industry practice (IFC guidelines)

- Public hearings were conducted, subsequent to which NOC was issued by SEPA for Mining and Power Plant Projects

- Environmental management costs have been accounted for in the cost model which include:
  - Drinking water provision
  - Vulture conservation and
  - Environmental management system

ENVIRONMENTAL STUDIES INDICATE THERE ARE NO SIGNIFICANT OR UNMANAGEABLE ENVIRONMENTAL IMPACTS DUE TO COAL MINING & POWER PLANT PROJECT IN THAR BLOCK-II
Land

- All land required for the Mining & Power projects have been acquired
- Govt of Sindh played key role in Land Acquisition on fast-track basis

Resettlement

- Mine area is inhabited by 06 villages with an estimated population of 7,000 people
- Only 2 villages will need to be relocated ‘Senhri Dars’ (125 Households) in Year 2025 and Thahriyo Halepota (200 Households) in Year 2035
- Resettlement Framework Policy developed by Govt based on WB & IFC Guidelines
- SECMC Resettlement Action Plan approved
Promise of Thar Coal - Price Forecast

USD/MMbtu has been used for comparison basis as it is the most accurate way of comparing coals of different heating values and qualities.

CERA Imported Coal Price Forecast – (CIF - Karachi)

Thar Coal Price with expanding mine

3.8 Mt/a (660MW)

7.6 Mt/a (1320MW)

14.8 Mt/a (2640MW)

22.0 Mt/a (3960MW)

No. of Years from start of Physical Work

Thar Coal - 7.6 Expansion
Imported Coal at Port - July 2015
Imported Coal at Port - Jan 2015
Conclusion

- Thar Coal is the fuel of Choice for Pakistan
  - Financial Close of the Thar Coal Mining & Power Project is expected by Dec 2015
  - First units of electricity expected by 2018 from Thar
  - SECMC plans to expand mine to support 3,960MW in the next 10 years
  - Thar project has been declared as Project of National Importance by GoP and is in the top priority list of projects in CPEC (China-Pakistan Economic Corridor)
  - Thar truly is the most viable power generation option for Pakistan offering cheap & reliable power while saving precious foreign exchange