Coal Resources of Pakistan – An Overview

Presentation at SAARC Training Workshop
New Delhi – India, November 26, 2015
Pakistan’s coal potential estimated at 186 billion tons, more than known indigenous oil and gas reserves figures.

- Annual coal consumption (2013-14) is around 6.56 million tons.
- Domestic coal production is about 3.34 million tons per annum.
- Market price of domestic coal ranges from USD 40-120/ton, depending upon quality and demand.
- Coal contributes around 5.4% in the primary energy supplies mix.
- Coal based power generation is about 0.2%. 
Coal Field Locations

FIG. 1 MAP SHOWING THE LOCATIONS OF COAL FIELD AND COAL OCCURRENCES OF PAKISTAN

Coal Fields
1. Indus East
2. Sonda-Thatta-Jherruck - Ongar
3. Meting-Jhimpir
4. Lakhra
5. Badin
6. Thar (Northern & Southern)
7. Mach-Abegum
8. Pir Ismail Ziarat
9. Sor Range-Dighari
10. Khost-Sharig-Harnai
11. Duki
12. Chamalang
13. Makarwal-Kurd-Sho
14. Salt Range
15. Hangu
16. Cherat
17. Kotli
18. Dureji
19. Balgor
20. Johan
21. Margat
22. Kach
23. Badizai
24. Choi
25. Rashit

Geological Survey of Pakistan
2001

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## Coal Fields Quality

<table>
<thead>
<tr>
<th>Coal Field</th>
<th>Resources (Million tons)</th>
<th>Moist. %</th>
<th>V.M %</th>
<th>F.C%</th>
<th>Ash %</th>
<th>Sulphur %</th>
<th>H.V (Btu/lb)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thar</td>
<td>175,000</td>
<td>29.6-55.5</td>
<td>23.1-36.6</td>
<td>14.2-34</td>
<td>2.9-11.5</td>
<td>0.4-2.9</td>
<td>6,244-11,045</td>
<td>Under development</td>
</tr>
<tr>
<td>Sondha</td>
<td>3,700</td>
<td>22.6-48</td>
<td>16.1-36.9</td>
<td>8.9-31.6</td>
<td>2.7-52</td>
<td>0.2-15</td>
<td>8,878-13,555</td>
<td>Non-Developed</td>
</tr>
<tr>
<td>Jherruck</td>
<td>1,823</td>
<td>9-39.5</td>
<td>20-44.2</td>
<td>15-58.8</td>
<td>5-39</td>
<td>0.4-7.7</td>
<td>8,800-12,846</td>
<td>-do-</td>
</tr>
<tr>
<td>Lakhra</td>
<td>1,328</td>
<td>9.7-38.1</td>
<td>18.3-38.6</td>
<td>9.8-38.2</td>
<td>4.3-49</td>
<td>1.2-14.8</td>
<td>5,503-9,158</td>
<td>Developed</td>
</tr>
<tr>
<td>Sorange-Degari</td>
<td>50</td>
<td>3.9-18.9</td>
<td>20.7-37.5</td>
<td>41-50.8</td>
<td>4.9-17.2</td>
<td>0.6-5.5</td>
<td>11,245-13,900</td>
<td>-do-</td>
</tr>
<tr>
<td>Salt Range</td>
<td>213</td>
<td>3.2-10.8</td>
<td>21.5-38.8</td>
<td>25.7-44.8</td>
<td>12.3-44.2</td>
<td>2.6-10.7</td>
<td>9,472-15,801</td>
<td>-do-</td>
</tr>
<tr>
<td>Hangu-Orakzai</td>
<td>82</td>
<td>0.2-2.5</td>
<td>16.2-33.4</td>
<td>21.8-49.8</td>
<td>5.3-43.3</td>
<td>1.5-9.5</td>
<td>10,500-14149</td>
<td>-do-</td>
</tr>
<tr>
<td>Kotli</td>
<td>9</td>
<td>0.2-6</td>
<td>5.1-32</td>
<td>26.3-69.5</td>
<td>3.3-50</td>
<td>0.3-4.8</td>
<td>9,386-14,171</td>
<td>-do-</td>
</tr>
</tbody>
</table>

**Moist:** Moisture, **V.M:** Volatile Matter, **F.C:** Fixed Carbon, **H.V:** Heating Value
Mineral Policies/Laws

• National Mineral Policy -2013;
• Regulation of Mines & Oilfields and Mineral Development (Government Control) Act, 1948 and Mining Concession Rules framed there under by the provinces;
• The Sindh Coal Act, 2012;
• Mines Act 1923;
• Consolidated Mines Rules, 1952;
• Coal Mines Regulations, 1926;
Pakistan is signatory to number of international environmental agreements, therefore, local legislations and laws are legal binding to all investors. Few are listed below:

- Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention), 1972.
Mineral Titles

Mining Concession Rules provides the following mineral titles:

- **Reconnaissance License** - for one year not renewable
- **Exploration License** - for 3 years and extendable for 3 years
- **Mineral Deposit Retention License** – for 2 years extendable for 1 year on solid grounds
- **Mining Lease** – for 30 years extendable for next 10 years or life of mine

For Thar coal resources, Government of Sindh invites Expression of Interest from potential investors through International Competitive Bidding. Successful applicant is granted Exploration License for one year (extendable for 3 years) for preparation of bankable feasibility.
Why Coal is Essential?

- Pakistan is energy deficit country.

  - Power Outage per day : 6 – 12 hours / day
  - Supply Shortfall : 1100 – 6000 MW
  - Electrification Rate : 91.4%

- Rapid depletion of oil and gas reservoirs and rising oil import bill necessitates greater reliance on indigenous coal resources.

Thar Coal

- **Huge lignite resource:**
  - Measured Reserves: 7,025 Million Tons
  - Indicated Resources: 17,130 Million Tons
  - Inferred Resources: 38,650 Million Tons
  - Hypothetical Resource: 112,700 Million Ton

- Thar resources have the capacity to provide 100,000 MW electricity generation for centuries period.
- Special fiscal incentives & protections.
- GoP guarantees obligations of power purchaser.
- Most safe area of Pakistan.

**Salient Features:**

- Area of the field: 9000 sq. km.
- Distance from Karachi: 380 Km.
- Coal seam thickness: 0.2 -22.8m
- Coal seam depth: 114-203m
## Global Lignite Qualities

<table>
<thead>
<tr>
<th>Country</th>
<th>Moisture %</th>
<th>Ash %</th>
<th>Volatile Matter %</th>
<th>Sulphur %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>65.5</td>
<td>0.6</td>
<td>17.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Bosnia</td>
<td>51</td>
<td>2.0</td>
<td>30.3</td>
<td>0.05</td>
</tr>
<tr>
<td>Germany</td>
<td>55</td>
<td>10</td>
<td>19.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Greece</td>
<td>52</td>
<td>15.1</td>
<td>18.8</td>
<td>0.2</td>
</tr>
<tr>
<td>India</td>
<td>48</td>
<td>6.1</td>
<td>25.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Kosovo</td>
<td>51</td>
<td>15</td>
<td>20.8</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Pakistan (Thar)</td>
<td>46</td>
<td>7.0</td>
<td>28.0</td>
<td>0.7 - 1.1</td>
</tr>
<tr>
<td>Poland</td>
<td>52.8</td>
<td>9.8</td>
<td>20.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Serbia</td>
<td>45.5</td>
<td>17.0</td>
<td>22.5</td>
<td>0.49</td>
</tr>
<tr>
<td>Thailand</td>
<td>30-35</td>
<td>10-28</td>
<td>32</td>
<td>0.8-1.5</td>
</tr>
<tr>
<td>Turkey</td>
<td>50</td>
<td>16</td>
<td>22.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Country</td>
<td>Stripping Ratio (m3:t)</td>
<td>Heating Value (Btu/lb)</td>
<td>Electricity Gen. (MW)</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------</td>
<td>--------------------------------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>Neyvelli lignite, India</td>
<td>7:1</td>
<td>5200</td>
<td>2,740</td>
<td></td>
</tr>
<tr>
<td>Rhineland lignite</td>
<td>4.9:1</td>
<td>4,514 - 11054</td>
<td>10,289</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary lignite</td>
<td>52</td>
<td>9:1</td>
<td>3,035</td>
<td></td>
</tr>
<tr>
<td>Pakistan (Thar)</td>
<td>6:1</td>
<td>6200 - 11,000</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
General Geology of Thar

- Dune Sand
- Upper Aquifers & Silt Stone
- Middle Aquifers
- Lignite Bands & Main Lignite Seam
- Lower Aquifer
Cont:

GENERALISED CROSS-SECTION
THAR COALFIELD,
Reserves Credibility:
USGS; GSP; SCA
All studies confirmed presence of huge coal reserves.

Mining Feasibility:

- John T. Boyd
- RWE of Germany
- M/s Shenhua, China
- Sindh Engro Coal Mining Company
- Oracle Coalfields (UK)
- Sino-Sindh Resources (Pvt.) Ltd, China

Gasification Study:

Sasol Lurgi of South Africa proved that Thar coal can be gasified.
Development Challenges

**Technical:**

i) Multiple aquifers; and

ii) Lack of local expertise.

**Financial:**

i. Capital investment of about US$1.5 billion is required for coal mining project of 6 million tons/Year; and

ii. Absence of financial capability to develop large-scale mine.
Fiscal Incentives

- Thar coalfield declared as Special Economic Zone, and the projects declared as “Project of National Security”.
- 20% ($ based) IRR to firms which achieve Financial close before 31st December 2015 for Mining & Power Projects based on Indigenous coal.
- Zero % customs duties on import of coal mining equipment and machinery.
- Exemption on withholding tax to shareholders on dividend for initial 30 years.
- Exemption on withholding tax on procurement of goods and services during project construction and operations.
- Exemption for 30 years on other levies including special Excise Duty, Federal Excise Duty, WPPF and WWF.
Allocation of Coal Block in Thar

- Application to SCA
- Submission of Proposal with fess
- Evaluation Of Technical & Financial Strength
- Approval by TCEB
- Submission of Performance guarantee
- Issuance of EL BY DG (Licensing)
- Submission of Feasibility Study
- Approval of Feasibility by Panel
- Submission of Fess
- Issuance of Lease by GOS
- Land acquisition
- Financial Close
- Commercial Operations
**INFRASTRUCTURE**

**ROAD NETWORK:** 70 tons load carrying capacity metaled road up to Coal field area.

**COMMUNICATION:** Telephone & Internet communication through Optic fiber cable is available up to Thar Coalfield area.

**DRINKING WATER:** Reverse Osmosis Plants in Thar are available.

**RESCUE STATION:** Rescue Station at Thar coalfield has been constructed.

**LIBRARY:** A Coal library is situated at office of Sindh Coal Authority.

**THAR LODGE:** Thar Lodge at Islamkot with 20-bedded accommodation to facilitate investors has been constructed.

- Construction of transmission line, airport, heavy duty road, railway link and water for power plants are at different stages.
## Coal Based Power Generation

<table>
<thead>
<tr>
<th>Sponsor/Company Name</th>
<th>Location</th>
<th>Fuel</th>
<th>Gen. Capacity (MW)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakhra Power Plant, WAPDA</td>
<td>Khanote.</td>
<td>Lakhra Coal</td>
<td>150</td>
<td>Only one unit is operative and generating 30 MW.</td>
</tr>
<tr>
<td>Grange Power Limited</td>
<td>Arifwala.</td>
<td>Coal</td>
<td>163</td>
<td>Commissioned in 2019</td>
</tr>
<tr>
<td>Shanghai Electric</td>
<td>Thar Block-I.</td>
<td>Thar Coal</td>
<td>1320</td>
<td>LOI issued</td>
</tr>
<tr>
<td>Engro Powergen Thar Limited (EPL)</td>
<td>Thar Block-II.</td>
<td>Thar Coal</td>
<td>660</td>
<td>IA and PPA Signed on 4th May 2015</td>
</tr>
<tr>
<td>China Machinery Engineering Corporation</td>
<td>Salt Range, Punjab</td>
<td>Salt Range, Coal</td>
<td>300</td>
<td>LOI validity extended till 19-August-2015. NEPRA determined tariff</td>
</tr>
<tr>
<td>Sinohydro Resources Limited, China / Al Mirqab Capital, Qatar</td>
<td>Port Qasim, Karachi</td>
<td>Imported Coal</td>
<td>1,320</td>
<td>LOS Issued. IA, PPA Signed on 18th April 2015</td>
</tr>
<tr>
<td></td>
<td>Pakistan Power Park, Gadani</td>
<td>Imported Coal</td>
<td>6,600</td>
<td></td>
</tr>
<tr>
<td>Hub Power Company</td>
<td>HUB, Balochistan</td>
<td>Imported Coal</td>
<td>1320</td>
<td>LOI issued</td>
</tr>
<tr>
<td>Lucky Electric Power Company Limited</td>
<td>Port Qasim Karachi</td>
<td>Imported Coal</td>
<td>660</td>
<td>LOS Issued on 08-Jun-2015</td>
</tr>
<tr>
<td>Siddiqsons Limited</td>
<td>Port Qasim Karachi</td>
<td>Imported Coal</td>
<td>350</td>
<td>LOS Issued</td>
</tr>
<tr>
<td>Huaneng Shandong Ruyi (Pakistan) Energy (Pvt) Limited</td>
<td>Sahiwal</td>
<td>Imported Coal</td>
<td>1320</td>
<td>LOS Issued on 17th April 2015. IA, PPA signed</td>
</tr>
</tbody>
</table>

**Source:** Private Power & Infrastructure Board, Pakistan

**LOI:** Letter of Intent. **LOS:** Letter of Support. **IA:** Implementation Agreement. **PPA:** Power Purchase Agreement.
Investment Opportunities

• Coal Mining in Thar,

• Mine-mouth Power generation,

• Local manufacturing/assembling of coal mine machinery.
# Major Coal Companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Coalfield</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan Mineral Development Corporation</td>
<td>Lakhra, Sharig and Degari coalfields</td>
<td>Producing around 0.55 tons annually.</td>
</tr>
<tr>
<td>Punjab Mineral Development Corporation</td>
<td>Makerwall and Salt Range coalfields</td>
<td>Producing around 0.10 tons annually.</td>
</tr>
<tr>
<td>Lakhra Coal Development Company</td>
<td>Lakhra coalfield</td>
<td>Producing around 0.25 tons annually.</td>
</tr>
<tr>
<td>Sindh-Engro Mining Company</td>
<td>Thar (Block-II)</td>
<td>Overburden removal started.</td>
</tr>
<tr>
<td>Sindh Carbon Energy Limited</td>
<td>Thar (Block-VI)</td>
<td>Feasibility study and mine planning completed. Company is in litigation process.</td>
</tr>
<tr>
<td>Sino-Sindh Resources (Pvt.) Ltd. of China</td>
<td>Thar (Block-I)</td>
<td>Feasibility study completed. Planning for development.</td>
</tr>
<tr>
<td>Government of Pakistan, Planning Division</td>
<td>That (Block-V)</td>
<td>Pilot project for UCG. Procurement of gas purification and power generation plant are under process.</td>
</tr>
</tbody>
</table>
• Pakistan appears to be at the margin of possible CBM occurrences

• Most of the coalfields have apparently not reached the thermal gas generation threshold.

• Recent changes in the concept of CBM occurrences in low rank coal, similar to those in Pakistan indicate that the possibility of commercial CBM accumulation in Pakistan do exist, although potential is modest by global standard.

• There are three target area that warrant investigation for CBM

• Western Thar, the thrust and fold belt of Balochistan, Punjab,KP and Sindh and Indus Basin & adjoining areas.

• To date, the only desorption measurement were made on drill holes in Thar & Lakhra under joint GSP-USGS programme in 1992. However the results were not encouraging for CBM.
<table>
<thead>
<tr>
<th><strong>Contacts</strong></th>
<th><strong>Contacts</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ministry of Petroleum &amp; Natural Resources, Government of Pakistan, A-Block, Pak-Secretariat, Islamabad</strong> Tel: +(92-51)9211220,9203881 Fax: + (92-51) 9103998. <a href="http://www.mpnr.gov.pk">www.mpnr.gov.pk</a></td>
<td><strong>Geological Survey of Pakistan</strong> P.O Box No. 15Sariab Road, Quetta Tel: +(92-81) 9211032. <a href="http://www.gsp.gov.pk">www.gsp.gov.pk</a></td>
</tr>
<tr>
<td><strong>Energy Department (Coal Wing), Government of Sindh. Lackson Building No 3, 7th floor, Sarwar Shaheed Road, opp. Karachi Press Club, Karachi</strong> Tel: +(92-21)-99204605. <a href="http://www.sindhcoal.gos.pk">www.sindhcoal.gos.pk</a></td>
<td><strong>Department of Mines &amp; Minerals, Government of the Punjab, Rehman Arcade, 36-E Lower Mall, Near Civil Secretariat, Lahore.</strong> Tel: +(92-42) 99210616.</td>
</tr>
<tr>
<td><strong>Department of Minerals Development, Government of Khyber Pakhtunkhwa</strong> Near Judicial Complex, Peshawar. Tel: +(92-91) 9223553</td>
<td><strong>Department of Mines and Mineral Development, Government of Balochistan</strong> Block No. 3 1st Floor Civil Secretariat Quetta. Tel: +(92-81) 9201062</td>
</tr>
<tr>
<td><strong>Mineral, Production &amp; Livelihood Development Department, FATA Secretariat, Warsak Road, Peshawar</strong> Tel: +(92-91)-9218523</td>
<td><strong>Industries &amp; Minerals Development, Gilgit-Baltistan. Gilgit-Baltistan Secretariat, Khomer, Jutial Gilgit.</strong> Tel: +(92-5811) 920512</td>
</tr>
<tr>
<td><strong>Industries and Minerals Department Government of Azad Jammu &amp; Kashmir. Muzaffarabad</strong></td>
<td><strong>Sindh Engro Mining Company</strong> Tel: (92 21) 111 211 211 Engro Corporation Limited, 8th Floor, Harbor Front Building, Block 4, Clifton, Karachi</td>
</tr>
<tr>
<td><strong>Pakistan Mineral Development Corporation</strong> Tel: (92 51) 9258701-02 Address: PMDC 13-H/9, Islamabad URL: <a href="http://www.pmdc.gov.pk">www.pmdc.gov.pk</a></td>
<td><strong>Lakhra Coal Development Company</strong> Address: LCDC Bungalow No.C6-A, Block-F, Gulshan-e-Jamal, Rashid Minhas Road, Karachi Tel: (92 21) 99245232, 99245235-39</td>
</tr>
<tr>
<td><strong>Punjab Mineral Development Corporation</strong> 2nd Floor, Alfalah Building, Mall Raod Lahore. Tel: (92 42) 99205181 <a href="http://punjmin.com">http://punjmin.com</a></td>
<td><strong>Sino Carbon Energy Limited</strong> Tel: 44 (0) 207 317 4050 15 Hanover Square, Mayfair, London, W1S1HS. <a href="http://www.oraclecoalfields.com">www.oraclecoalfields.com</a></td>
</tr>
<tr>
<td><strong>Sino-Sindh Resources (Pvt.) Ltd. of China</strong></td>
<td></td>
</tr>
</tbody>
</table>
THANK YOU