Potential Areas for Technical Co-Operation in Underground Coal Mining

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Tata Group: Pioneers in nation building

Tata Steel
- a part of Tata Steel Group
- a part of Tata Group

Founder
Jamsetji Tata

Diversified yet a universal value system
- Trusteeship
- Integrity
- Respect for individuals
- Credibility
- Excellence

"In a free enterprise, the community is not just another stake holder in the business but in fact the very purpose of its existence."

Jamsetji Tata

First in India in many sectors

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Jamsetji Tata
Tata Steel Group: Global presence

- **UK & Ireland**
  - 4 Production facilities
  - 33 distribution centres

- **Netherlands**
  - 1 Production facility
  - 3 distribution centres

- **USA**
  - Distribution centres

- **EU (Excluding UK & Netherlands)**
  - 13 distribution centres
  - Major Production facilities

- **India**
  - Capacity: 9.7 mtpa
  - 22 distribution centres

- **Thailand**
  - 3 Production facilities
  - 3 distribution centres

- **Singapore**
  - 1 Production facility
  - 4 distribution centres

- **Capacity of 30 million tonnes**
- **Geographically wide spread** in 5 continents; Manufacturing units in 26 countries
- **Group revenue**: US $26 Billion; 85,000 employees representing > 20 nationalities
- **Wide variety of products**
- **Ranked 231 amongst the Fortune 500 companies** (2008)

*Products: Flat Steels, Long Steels, Wires, Tubes, Ferro Alloys, Special sections, Engineering products, Rolls, Refractory, Sponge Iron, Pig Iron, Specialty construction products, shipping, Port Operations*
The Jamshedpur Steel Plant is located within a radius of 200 kilometers from the mines.

<table>
<thead>
<tr>
<th>Location</th>
<th>Production (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Ore</td>
<td>18</td>
</tr>
<tr>
<td>Coal</td>
<td>8</td>
</tr>
<tr>
<td>Chromite</td>
<td>1.8</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Overview of International Raw Material projects

Canada Iron – DSO (Operating)
- TSG Holdings 80%, NML free carry 20% for up to first $300 million. (TSG Offtake – 100%)
- Reserve - 64mt (Upside potential)
- Planned Production - 4mtpa
- Prod. start - in Q4 FY’13 ramping up 4mtpa in FY14
- Key developments: Rail and port access under discussion

Canada – Taconite (FS)
- TSG option for [64%] share
- LabMag deposit located in Newfoundland & Labrador and the KéMag deposit in Quebec. Intended slurry line to port
- Resource approx 9000mt (Reserves 5,600mt)
- Feasibility study underway

Iron ore
Coal
Development
/Operating
PFS/FS

South Africa – Sedibeng Iron Ore (operating)
- TSG Holdings 64%
- Production – 0.35mt ramping up 1.5mtpa
- Reserve: 31mt (upside potential)
- TSL Investment till date: 5 Million USD
- Prod. start Dec 2011 full production FY15

UK – Margam (PFS)
- Exploration license over an area of 70 km²
- Deep underground coal just beside Port Talbot
- Inferred Resource ~ 300 million tons
- Low ash Hard coking coal
- Techno commercial study in progress

Australia - CDJV Coal (Operating)
- TSG Holdings – 5% (Vale is the lead operator)
- Reserve 48 mtpa
- Production-HCC & PCI- 3 mtpa (ROM)
- Challenging U/G mining conditions

Ivory Coast – Mt GAO (PFS)
- Joint Venture agreement for the development of Mt GAO Iron ore deposits in Ivory Coast
- Tata Steel shareholding 75%
- Prefeasibility study underway

Mozambique-Benga Coal (Final Stages of Development)
- JV with Rio Tinto at Project level (TSG stake – 35 %)
- Production- 5.3 Mtpa (ROM), Coking coal yield ~ 30 %
- Resource 600mt, (Reserve 311mt)
- First coal shipment started in June’12
- Logistics a major challenge to ramp up
Steel industry is an important contributor to India’s economy

Employment
Million personnel

- Direct: 5
- Indirect: 15
- Total: 20

Contribution to GDP
% -
- Contribution to GDP: 2%

Total capital employed
Billion INR

- 2008: 1,900
- 2009: 2,287
- 2010: 2,750
- 2011: 3,266

Income-tax contribution
Billion INR

- 2008: 67
- 2009: 84
- 2010: 75

Steel industry is 2nd highest contributor to excise revenues (8%) after oil and gas

India produced ~70 million MT of crude steel in 2011-12 and accounted for ~5% of the world crude steel production

Source: JPC report, World Steel Org, Steel Ministry, Economic Times
Steel demand in India is expected to remain high, derived by strong fundamentals

Per capita finished steel consumption 2011, Kg

- India: 55 Kg
- World: 215 Kg
- China: 460 Kg
- Japan: 506 Kg

Projected steel demand¹

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand (Million MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>70</td>
</tr>
<tr>
<td>2013 (E)</td>
<td>78</td>
</tr>
<tr>
<td>2017 (E)</td>
<td>115</td>
</tr>
</tbody>
</table>

Key observations

- Per capita consumption of steel in India is still very small compared to the world average or other developing / developed countries
- Small per capita consumption will be a major growth driver and India will need to add substantial steel capacity in coming years
- This capacity addition is expected to generate 3-4 millions jobs by the year 2017
- More than INR 1,500-2,000 Bn is expected to be invested in the steel sector over the next 6-7 years

1. Based on planning commission data
Source: Report of working group on steel industry, Ministry of Steel
Availability of iron ore and coking coal at competitive cost is a Critical Success Factor for Indian Steel Industry

Competitiveness of India on key inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Competitive position</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron-ore</td>
<td></td>
<td>Abundant domestic reserves of iron-ore</td>
</tr>
<tr>
<td>Coke/ Coal</td>
<td></td>
<td>Dependent on imports due to poor quality of domestic coal</td>
</tr>
<tr>
<td>Labor</td>
<td></td>
<td>Cheaper but low productivity semi skilled labor; skilled labor at par with other countries</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td>Electricity prices at par with international prices; captive coal power plants</td>
</tr>
<tr>
<td>Cost of Capital</td>
<td></td>
<td>Higher cost of capital than most other countries</td>
</tr>
</tbody>
</table>

1. Approximate cost for slab making in an emerging market
Source: Analyst reports
Overview of Coal Mining in India

- India has the 3rd largest resources of coal in the world

Sources: Coal Directory, Ministry of Coal website
Occurrence of Coal Resources (Depth Wise)

- Depth Wise Total Resources: 59%
- Coking Coal Resources (Depth Wise): 36%
- Non-Coking Coal Resources (Depth Wise): 62%

- 0-300 (m): 29%
- 300-600 (m): 7%
- 600-1200 (m): 5%
- 0-600 (m), Jharia: 2%

41% of the resources lie beyond a depth of 300 mts (upto 1200m)
## Overview of Coal Mining in India

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>CIL</td>
<td>473</td>
<td>397</td>
<td>38</td>
<td>436</td>
</tr>
<tr>
<td>SCCL</td>
<td>50</td>
<td>42</td>
<td>11</td>
<td>52</td>
</tr>
<tr>
<td>Others</td>
<td>38</td>
<td>49</td>
<td>2.5</td>
<td>51.5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>561</strong></td>
<td><strong>488</strong></td>
<td><strong>51.5</strong></td>
<td><strong>539.5</strong></td>
</tr>
</tbody>
</table>

It is the 3rd largest coal producer in the world with about 540 mill tons production in 2011-12. About 90% of production comes from O/C Mines whereas the resources below depth of 300m not amenable to O/C mining.

Sources: Coal Directory, India Infra research, Ministry of Coal website
Underground Coal Mining in India

- Max Production from single U/G mine is ~ 1 MTPA
- Urgent need to increase production from existing mines
- About 50 underground blocks allocated to various companies for mining & Most of the Coal Blocks planned to be auctioned by Ministry of Coal are underground coal blocks
  - Need for planning and design of the mines as well as technology to achieve high production
  - Rehabilitation & Resettlement and Environmental Challenges are comparatively less in U/G

<table>
<thead>
<tr>
<th>U/g Coal Mining Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of u/g coal mines operating</td>
</tr>
<tr>
<td>Production from u/g coal mines</td>
</tr>
<tr>
<td>Avg Production from each u/g mine</td>
</tr>
</tbody>
</table>
Coal Mining in India – Key Challenges

- Low production & productivity in U/g mines – Avg production of 0.3 MTPA for each mine
  - Need for Customised mechanization of the mines
- To achieve Global Standards of Safety
- Access to lower seams: faster shaft sinking through old workings
- Mine Ventilation & Strata Control issues due to increased depth of workings in U/g Mines
  - Need for design of better ventilation system, mine air cooling system, predictive models for strata control
- Indian Coals are high in Ash having poor washability
Opportunity & Potential Areas of Co-operation

- Exploration Services – mined out upper seams, old goaves, water logged workings
- Mine Design – Surface Features, Built Up areas
- Mine Development – Design and development of mine entries like shaft & inclines, suitable mining method, back filling
- Equipment Supply – Longwall packages, Continuous Miners, Road Headers, Man riding systems
- De gassing of coal seams prior to mining
- Coal Beneficiation
- Automation
- Training and Human Resource Development
Thank You