PERSPECTIVE DEVELOPMENT OF VIETNAM COAL INDUSTRY

CLEAN COAL DAY IN JAPAN 2011
20th Anniversary
Tokyo Sep. 6th, 2011

CEO Le Minh Chuan
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1. Introduction to VINACOMIN

- The coal mining industry is one of the important economic sectors of Vietnam and has over 170 years of history. Experiencing periods of up and down, Vietnam's coal industry has been thriving in 1995 since the Vietnam Coal Corporation was established.

- VINACOMIN was formerly the Vietnam Coal Corporation and merged the Vietnam Mineral Corporation in 2005. VINACOMIN is one of 11 economic Groups in Vietnam, 100% state owned, plays an important role in national strategies to ensure effective exploitation of mineral resources.

- as a Group comprises of 93 companies, of which 20 branch units, 23 subsidiaries wholly owned by VINACOMIN (5 Holding Corp.), 5 Non productive members, 35 JSC and 10 JV company).

- has Equity of US$ 1.26 billion; Capital Asset: US$ 1.66 billion; and revenues of US$ 4.3 billion in 2010;

- is the dominant coal producer in Vietnam with output accounting for over 95% of total coal production, supplying anthracite and semi-anthracite coal for power generation and industrial uses both domestically and globally;

- with a labor force of 134,000 employees.
2. Current state of Coal Sector

- VINACOMIN operates 54 coal mines with total current capacity of 47mn.t/year
- 5 big opencast mines with capacity more than 2 mn.t/year, 15 open pits with annual capacity from 100 to 700 thousand tons each and some smaller coal sites with capacity below 100 thousand t/year. Coal produced from opencast mines comprises main part of coal production, accounting for 55% of the total volume.
- There are 30 underground coal mines under operation, of which 9 mines have output of more than 1.0 million tons/year, others have annual capacity less than 1 mn.t/year. There are smaller mines that have no chance for introduction of mechanized mining technology.
- 3 washing plants: Hòn Gai (2,0 mn.t/year); Cửa Ông (10,0 mn.t/year) and Vàng Danh (3,0 mn.t/year).
- Coal exploitation in 2010 is 47 mn.t of raw coal, equivalent to 43 mn.t of salable coal. Domestic sale comprise 57% of total.
## Coal exploitation in period 2006÷2010

<table>
<thead>
<tr>
<th>Chữ tiêu</th>
<th>Unit</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Raw coal</td>
<td>mn.t</td>
<td>40.757</td>
<td>45.494</td>
<td>44.724</td>
<td>45.946</td>
<td>46.985</td>
</tr>
<tr>
<td>Others</td>
<td>mn.t</td>
<td>1.554</td>
<td>2.387</td>
<td>1.839</td>
<td>2.016</td>
<td>0.498</td>
</tr>
<tr>
<td>Ratio of opencast output</td>
<td>%</td>
<td>60.0</td>
<td>58.9</td>
<td>56.6</td>
<td>56.1</td>
<td>56.5</td>
</tr>
<tr>
<td><strong>2</strong> Overburden removal</td>
<td>mn m³</td>
<td>192.991</td>
<td>210.588</td>
<td>216.381</td>
<td>208.73</td>
<td>228.81</td>
</tr>
<tr>
<td>Stripping ratio</td>
<td>m³/t</td>
<td>7.89</td>
<td>7.86</td>
<td>8.54</td>
<td>8.10</td>
<td>8.49</td>
</tr>
<tr>
<td><strong>3</strong> Tunnel drivage volume</td>
<td>10³ m</td>
<td>363.9</td>
<td>274.75</td>
<td>280.50</td>
<td>318.92</td>
<td>348.76</td>
</tr>
<tr>
<td>Drivage per 10³ t of coal</td>
<td>m/10³ t</td>
<td>22.3</td>
<td>14.7</td>
<td>14.5</td>
<td>15.8</td>
<td>17.1</td>
</tr>
<tr>
<td><strong>4</strong> Salable coal quantity</td>
<td>mn.t</td>
<td>37.011</td>
<td>42.183</td>
<td>38.612</td>
<td>43.025</td>
<td>43.086</td>
</tr>
</tbody>
</table>
Overburden Removal (stripping ratio m³/t)
Technology for underground coal mines

1. Khe Cham; 2 Vang Danh VINAALTA; 3. KDT-1 Vang Danh; 4. Mao Khe: 2ANSH
3. Overview of Export Sales

2010 Exports Volume by Country
(> 30 countries)

- China 77%
- Japan 8%
- Korea 9%
- Others 6%
- Europe 0%

Exports (Million Tonne)

2003 2004 2005 2006 2007 2008 2009 2010

Exports Volume by Country:

- China
- Japan
- Korea
- Thailand
- Brazil
- Western Europe

China
Japan
Korea
Thailand
Brazil
Western Europe
4. Coal Resource Potential

- Total coal resources until 1st Jan, 2011: 48.7 billion tons in which measured & indicated reserves (categories A+B+C₁) 2.75 bn. tons account for 6%; inferred (C₂) & prognostic resources (P): 94%.
  + in Quang Ninh area: 8.8 billion tons (anthracite);
  + in Red River Delta coal basin (Hung Yen, Thai Binh): about 37.8 billion tons (sub-bituminous).
  + Some anthracite & fat coal deposits in the North and peat in Mekong river delta.
5. Coal Demand

• Power demand:
  Until 2015: based on updated information on power projects
  Period 2016-2020: increase 10.7%/year
  Period 2021-2030: increase 7.6%/year
# Coal supply/demand balance in base scenario

*(million tons)*

<table>
<thead>
<tr>
<th>Year</th>
<th>2011</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total coal supply</td>
<td>44</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>2. Total coal demand</td>
<td>27</td>
<td>46-58</td>
<td>75-106</td>
</tr>
<tr>
<td>Other demand</td>
<td>16</td>
<td>18-26</td>
<td>22-34</td>
</tr>
<tr>
<td>Coal for power</td>
<td>11</td>
<td>28-32</td>
<td>53-72</td>
</tr>
<tr>
<td>- Domestic</td>
<td>11</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>- Imported <em>(min/max)</em></td>
<td>3-6</td>
<td>21-40</td>
<td></td>
</tr>
</tbody>
</table>

Source: Energy Institute, Ministry of Industry and Trade
Coal Demand by Categories

- Consumption in Vietnam:
  - Lump No.2b (Q=7400 kcal/kg) for production of chemicals, fertilizer;
  - fines No.8 (Q=7400 kcal/kg) for cement;
  - fines No.9b (Q=6700 kcal/kg) and No10 (5700-6000 kcal/kg), for power, fertilizer;
  - fines No.11 (Q=4900 kcal/kg) for construction materials;
  - fines No.12 (industry standards Q=3200-4500 kcal/kg) for power plants using low quality coal: Hai Phong, Quang Ninh, Cam Pha.

- As statistics for 3 years 2008-2010, coals (VN standards) comprise of 89%, in which, lump coal (Q=7400-8200 kcal/kg): 6%, fines coal with higher grade (fines No.7, 8, 9a Q=6500-7200 kcal/kg): 23%, fines coal of medium grade (fines No.9b, 10, 11 Q=5200-6200 kcal/kg): 60% and coal of low grade (Industry standards): 11%.

- Domestic anthracite for power generation is at maximum about 60% of total.
6. Coal Development Plan

Production Targets in Master Plan for Coal

Salable Coal

(High level including coal from Red River Delta basin)

- 2011: 44 million tons
- 2015: 55 million tons
- 2020: 60 million tons
- 2025: 65 - 70 million tons
- 2030: 65 - 75 million tons
Construction of new coal mines

- **Open-cut coal mines to be closed in period 2011-2030**: 19 mines with capacity 11 mn.t/y; Thus, in the future, the coal mining activities of Vietnam's coal industry are mainly underground coal mining; gradually stop open-cast mining. The share of underground coal mining will increase from 45% in 2011 to 60% (2015), 75% (2020) and 80% (2030).

- To achieve the objectives set out in the Plan, VINACOMIN has to solve pressing issues as:
  - Stepping up the searching, exploration and increasing resources, verified coal reserves to ensure as planned and sustainable development.
  - Maintaining and enhance appropriate output of existing mines, descending the open-cast mines, while building new mines, focusing on investment in deep mines with high production. To meet the coal demand of the economy, VINACOMIN shall invest 19 new mines with total production of 31 million tons/year according to the development plan of Vietnam’s coal industry in period from 2015 to 2025.
  - For the Red River delta, this is the high potential coal basin, but this is also the cultivation area in Vietnam. Moreover, the geological condition is very complicated; mining technologies still meet difficulties. In the short term, VINACOMIN shall promote technological research (coal gasification and conventional coal mining technology) and prepare investment of trial mining in some coal mines. Striving for putting number of coal mines in operation including mines in Hung Yen, Thai Binh... after 2020.
  - Planning investment of advanced mine technical infrastructure such as: Planning the centralized preparation plants with flexible processing line; planning discharge which most effective utilization of waste dumps; planning conveyer system, transportation line, coal port; minimize the negative impacts of mining activities on the environment...
7. Clean Coal

- VINACOMIN promotes technological research, coal processing toward to diversification of products, creating clean products, environment-friendly, particularly for coal gasification and coal liquification to enhance the value and using value of coal specifically as:
  - Raising awareness about clean coal technology by training staffs in coal and electricity industries from 1998 under the cooperative programs with NEDO and JICA (exploration, coal processing, coal using, power plants, chemical...)
  - Building power plants using FBC/CFBC technology, low-grade coal for the purpose of reducing SO2, NO2 and increase the performance. Set up ESP electrostatic filter at the plants such as Na Duong, Cao Ngan and Cam Pha...
  - Performing GAP program for environmental protection of preparation plant to treat the waste sludge that supported by JCOAL (Cua Ong coal preparation plants have increased the recovery of 4%, reduction of waste water into the environment and regenerative cycling...).
  - Manufacturing, testing and trial burn water coal fuel from Vietnam anthracite coal (fines coal and processed mud). The process of successful test showed that Vietnam anthracite coal with ash content of 30% 40% can be used to produce water coal fuel and stable combustion with temperature from 850 to 1200°C, little amount of suspended solid wastes and high effective combustion.
  - Improving the quality of magnetite ore powder in Trai Cau and Sinh Quyen for coal preparation. Building technological line and magnetite production facilities with a capacity of 1 ton of magnetite product/hour, equivalent to the quality of imported magnetite
  - Trial study formative coke from mixture of anthracite coal in Quang Ninh and fat coal which using organic binders by mixed method in industrial furnaces to cater for the metallurgical industry and chemical.
8. Ports and importing coal

- VINACOMIN was assigned by the Government as playing the leading role for importing coal supply to the market. VINACOMIN has expanded cooperation with foreign coal producers and has contacted with number of partners and customers to import coal.

- The Government has assigned VINACOMIN to make the plan of constructing port with capable of receiving vessels of more than 100,000 tons. Currently, VINACOMIN is supported by JICA and selected Sumitomo Corp as F/S Consultant for coal transshipment port project. The expected port's location:
  - In the East of Mekong River Delta, establishing the port as the terminal structure, offshore floating storage of Hau river. The transportation plan is the vessel anchors at offshore storage, mobile port, coal unloaded and transferred to small vehicles (marine barges, ships under 5,000 DWT) to transport coal to the thermal power centers or on inventory at Kim Son (Tra Vinh).
  - In the West of Mekong River Delta can build the transshipment clue port in Nam Du islands (Kien Giang);
  - The land port can be in Vinh Tan (Binh Thuan) using the 10,000–30,000 DWT vessels to take coal from Quang Ninh, the 90,000–100,000 DWT vessels to import coal from Australia, Indonesia ...

- EVN, PV, VINACOMIN are carrying out survey, financial arrangement, for construction of local coal terminal for each power complex in the Southern part of Vietnam.
Conclusions

• Vietnam needs to increase production of coal while the infrastructure, technology and management skills are limited; VINACOMIN is a state owned enterprise leading in coal mining in Vietnam and currently having the big mining projects such as mining anthracite coal in Quang Ninh, sub-bituminous coal in the Red River Delta and construction of mine infrastructure;
• The policy for application of clean coal technology in Vietnam has became urgent and getting the attention of the Government for the sustainable development and environment-friendly. Processing and use of coal are placed in the orientation of clean coal technology application; however the applied results are still limited especially in technology.
• VINACOMIN is ready to cooperate with organizations and institutions worldwide to develop her mineral industries in a sustainable manner, friendly to environment, with safety, making contribution to the economy development and stability in the region./.
Thank you!