Coal-To-Liquid (CTL) Jindal Project

JONA PILLAY
18th APRIL, 2012
World CTL Conference, Beijing
Agenda

• JSPL-Company Profile

• JSPL CTL Project Overview

• CTL – Indian Perspective

• CTL Process Brief

• CTL Project Characteristics

• JSPL CTL & CG Project Details

• JSPL Awards & Achievements

• Conclusions
Jindal Steel and Power (JSPL) – An Overview

- Leaders in Steel, Power, Mining, Coal to Liquid, Oil & Gas and Infrastructure.
- Presence In Asia, Europe, Africa, South America and Australia.
- Group Turnover US $ 12 billion.(O. P. Jindal Group)
- Market Capitalization of US $ 22.0 Billion (O. P. Jindal Group)

Projects under implementation:
- Worth ~$20 Billion in Steel, Hydro Power and Thermal Power sectors

Projects under planning:
- ~23.5 MTPA in Steel and Pelletisation units and ~5280 MW Power Plant
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Jindal CTL Project Overview

- Energy security through energy diversification
- 1 of only 2 CTL projects in India
- 80,000 Bbl/day
- One of the largest single investments in India.
- $10 billion (INS 50,000 crores) EPC Cost
- Allocation of coal block in Angul, Orissa. Estimated reserves of 1500 million tons
Agenda

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Why the interest in coal-to-liquid in India?

- Depleting crude oil reserves
- Volatile oil prices
- Dependence on imported oil (> 70% crude import in India)
- Extensive inferior grade coal reserves in India
- Conversion technology available
- Potential for poly-generation

Proven reserves (India):
Coal ~ 200 years
Oil ~ 20 years
Gas ~ 40 years

Source: Coal Conference Delhi, BP Statistical Review

Increased economic activities + lifestyle expectations = more energy needed

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Coal–To–Liquid (CTL) Process

Carbon rejection + H2 addition
Coal H/C ~ 0.5-0.8 → Transport Fuel H/C ~ 1.8-2.0

Primary Gasification reaction
\[ aC + bH_2O + cO_2 \rightarrow dCO + eH_2 + fCO_2 \]
Syngas composition depends on operating conditions and gasifier design

Basic Fischer-Tropsch reaction
\[ nCO + 2nH_2 \rightarrow (\text{-CH}_2\text{-})_n + nH_2O \]
Product slate determines FT catalyst type
Agenda

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CTL Project Characteristics

- **CAPEX**
  - ~120K-150K $/Barrel / Day
  - Viability hinges on capital cost
  - Cost is site and configuration specific

- **Complex**
  - Integration of multiple units
  - Massive infrastructure requirement

- **Schedule**
  - Extended
  - Limited Contractor availability

- **Technology**
  - Few Commercial Experiences
  - New developments and scale up risks

- **Economics**
  - Driven by worldwide energy price and energy security concerns
  - Environment is pivotal consideration
Proposed Site - CTL Project

Site Location advantage:
- Near Existing CG-DRI Plant
- Excellent connectivity to Rail and Road (NH)
- Near Mine and water source
- Port in vicinity

Challenges:
- Villages on Coal Block and Mine
Product slate: India Perspective

**Diesel**
- Premium quality CTL Diesel (High Cetane No., low sulphur)
- Strong growth in demand due to strong growth in commercial vehicles
- Deficit in Eastern States in 2020 and beyond

**Naphtha**
- Premium quality CTL Naphtha (paraffinic)
- Cracker grade Naphtha consumption to increase significantly on account of strong downstream demand of petro-chemicals

**Kero**
- Kerosene demand will reduce on account of substitution by electricity and gas
- -3% growth forecast to 2030

**ATF**
- ATF (Aviation Turbine Fuel) fetches higher price than diesel
- ATF demand to grow strongly due to increasing air passengers and air cargo traffic but India is net exporter of ATF

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Methodology to final choice of CTL technology value chain

CTL Technology value chain options

Balanced Scorecard

- Maturity of Technology
- Environment
- Financial
- Efficiency
- Operational Complexity

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<tr>
<th>Weight %</th>
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1. Final

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Ultra-Clean CTL Fuels
Aligned to future Bharat Stage specs

<table>
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<tr>
<th>Conventional Diesel</th>
<th>CTL Diesel</th>
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<tr>
<td>Conventional Diesel</td>
<td>CTL Diesel</td>
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<table>
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<tr>
<th>Parameter</th>
<th>BS IV / Euro IV</th>
<th>BS V / Euro V</th>
<th>CTL Diesel</th>
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<td>51</td>
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<tr>
<td>Sulphur</td>
<td>50ppm</td>
<td>10ppm</td>
<td>&lt;5ppm</td>
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<tr>
<td>Polycyclic Aromatics</td>
<td>11%</td>
<td>6%</td>
<td>&lt;1%</td>
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<tr>
<td>Distillation at 95%</td>
<td>360°C</td>
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<td>350-360°C</td>
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<tr>
<td>Emissions</td>
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<td></td>
<td>CTL Diesel relative to Conventional Diesel*</td>
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<tr>
<td>HC</td>
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<tr>
<td>CO</td>
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<tr>
<td>NOx</td>
<td>9% less</td>
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<tr>
<td>Particulates</td>
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</tbody>
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**Key Focus Areas**

- **Technology Selection**
  - In feasibility phase currently. Investment decision at end of Feasibility phase

- **Land Acquisition & Mining**
  - MoU with Govt
  - Prospecting license grant awaited (coal sample)

- **CO₂**
  - Understanding options for CO₂ minimisation and CO₂ management

- **Product Marketing Plan**
  - MOU’s with potential customers for product off take.

- **Supply Chain Plan**
  - SC assessment complete. Focus on managing key supply chain risks
**JSPL  CTL Project Challenges**

- **High Ash Coal**: 40-50% Ash in typical Indian coal
- **High Contaminants**: High Trace elements (Fluorides/Chlorides) in Indian coal
- **CO2 Management**: ~ 1 Ton CO2 / Barrel oil product
- **FT water treatment**: ~ 1.7 Ton / Ton of oil produced
- **ODC Equipment**: Logistics and fabrication
Setting up a well governed ecosystem for the CTL industry is a key enabler for its success.
JSPL Angul CG Project

**Objective**
Coal Gasification for DRI  
Total CAPEX ~ 500 Million USD

**Status**
Under Construction; Start up – End 2012  
(60% Mechanically Complete)

**Capacity**
225000 Nm3/Hr Syngas Production  
2.0 MTPA DRI capacity  
7 Lurgi Mark IV Gasifiers

**Housing**
Fully Integrated Township for employees

**CSR Activities**
R&R Colonies, School, Hospital etc
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Awards and Achievements

Awards

- Ranked 1st as Wealth Creator in India over ten years period - Business World November 2011
- JSPL ranked 3rd in the Metals Category of Business World's India's Most Respected Companies survey 2011
- Jindal Steel and Power Ltd. gets Forbes Asia’s ‘Fabulous 50’ international award 2011 & 2010
- JSPL Ranked 1131 by Forbes in 2009-10 (as against 1793 in FY09) in Global 2000 (World’s biggest listed companies list)
- JSPL won award for Organization with Innovative HR practices and Institution Building at 18th Global HR Excellence Awards at World HRD Congress 2011
- Received the CNBC’s Most Promising Entrant into the Big League at IBLA (Indian business Leaders Award) - 2009

Recognition

- Naveen Jindal has been ranked among the Top ten India Inc’s Most Powerful CEOs 2011 by Economic Times–Corporate Dossier in its annual survey.
- Naveen Jindal has won the Ernst and Young Entrepreneur of the Year award for 2010 for his significant contribution to the field of Energy and Infrastructure.
- University of Texas names School of Management after Mr. Naveen Jindal, he becomes the first alumni from India of an American University to have an educational institution named after him.

Achievements

- "2nd largest Value Creator in the World" - BCG, "Threading the Needle" - 2010 based on Total Shareholder Return (2005–2009) and 1st largest Value Creator in Global Mining Sector
- Production of 3.5 meter wide steel plates
- Manufacturer of longest rail of 121 meter length in the world
- Pioneered manufacture of hot rolled parallel flange beams and columns in medium and larger sizes
- Largest coal based sponge iron facility in the world
- First Company to produce power from waste heat recovery boiler from sponge iron
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Conclusions

• CTL is capital intensive but higher crude prices will make it economically viable

• CTL produces ultra clean transportation fuel with low emission.

• CO₂ management is a key focus area

• Few proven technologies. Due diligence needed to select proper value chain.

• Increasing material cost along with lack of critical process equipment fabricators and engineering skills may affect project cost.

• Government incentives crucial for the first CTL plant to reduce risk for investors and accelerate commercial deployment.
Thank you