Coal-to-Liquids in Northern WV
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CONSOL Energy, Inc.

- Largest bituminous coal producer in the US with 65 million tons of production in 2008 and over 4 billion tons of reserves
- Owns 82% of CNX Gas which will produce over 70 Bcf of natural gas this year, primarily coal mine methane
- Owns 750 barges, 30 tow/harbor boats and a river terminal for transportation coal and other commodities on the upper Ohio River and tributaries
- Owns about 400,000 acres of real estate, a mining supply company and an export terminal in Baltimore
Why use coal to make chemicals and fuel?

- The margin between the prices of coal and transportation fuels/chemicals is increasing and coal prices are relatively stable compared to other fuels.
- 2/3 of US oil demand is imported; China and India demand increasing.
- No good substitutes for many chemicals and aviation fuel.

Fuel Price History and Futures Market

- Natural Gas @ Wheeling
- Crude Oil WTI
- Methanol @ Wheeling
- Mid Atlantic Wholesale Gasoline
- App. Coal NYMEX
- Ethanol @ Chicago
What is the true cost of fuel?

- Coal is the cheapest fuel for gasification including the costs of pollution and other externalities

**October 2008 Energy Cost Comparison**

100% Externalities at Cost or Market

<table>
<thead>
<tr>
<th></th>
<th>Market Price $/mm</th>
<th>SOx &amp; NOx</th>
<th>CO2 @ $50/t</th>
<th>Military</th>
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<tbody>
<tr>
<td>Crude Oil</td>
<td>12.00</td>
<td></td>
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<tr>
<td>Nat. Gas</td>
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<td>Coal Combustion w/ CCS</td>
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<tr>
<td>Coal Gasification w/ CCS</td>
<td>5.00</td>
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$/mm btu
What should carbon cost?

- There is a great difference between the damage costs, market prices and mitigation costs.

![The Cost of CO2e graph]

•Sources: Tol, R.S.J., 2002, 2005, 2006; Lomborg, 2007
Why is CONSOL Energy interested in CTL?

- Largest U.S. bituminous coal producer with over 4 billion tons of reserves
- Produces over 20 million tons of preparation plant tailings annually, containing 2,000 – 4,000 btu/lb, currently impounded but could be gasified
- Diversification into higher valued products; almost all production is now sold to utilities for power generation, the lowest valued use of coal other than steam production
Gasifier Technology Summary

Temperature increasing
Residence time decreasing
Methane decreasing
Product Choices

- Fischer Tropsch process invented in Germany in 1923
  - Supplied by Sasol, Rentech, Syntroleum and Shell
  - Makes diesel, naphtha and LPG

- Methanol

- Methanol to Gasoline
  - Supplied by Exxon/Mobil and Haldor Topsoe

- Substitute Natural Gas

- Ammonia/Urea
Economics of large plants

- Equity investors commonly demand at least a 20% return for CTL/CTG projects.
- Only 50 – 60% debt is generally available due to lack of EPC wraps.
- Need $80+ oil and $8+ gas long term to entice investment.
- Enhanced oil recovery with CO2 is necessary for most CTL and CTG projects.
CONSOL approach to CTL/CTG

- Industrial scale
  - Fixed or fluidized bed gasifiers fed by run-of-mine and waste coal from operating mines
  - Low CO2 gasification feeding methanol or urea plant
    - Urea would be sold to traditional utility customers or NOx reduction
  - Self financed if necessary

- Refinery scale
  - Partner with large chemical/oil company and government
  - Integrate coal reserve into project even if mine and plant are separated
  - Entrained flow - Fischer Tropsch or MTO/MTG
The Northern West Virginia Project

- CONSOL is re-evaluating the project based on recent trends in financing and commodity pricing.
- If feasible, the FEED study would commence early next year.
- If construction is approved by the CONSOL Board next year, the plant could be online in early 2012.
- As currently planned, the plant:
  - will employ 2 or 3 fixed or fluidized bed gasifiers, each sized at about 1,000 tons per day.
  - will consume about 900,000 tons per year of raw coal and 400,000 tons per year of waste fines.
  - will produce 1,000,000 tons of urea or 700,000 tons of methanol annually which will be transported by barge.
  - will cost about $850 million and occupy 65 acres.
  - will employ several hundred construction workers and about 60 permanent workers.