Gilberton Coal-to-Clean Fuels and Power Co-production Project

Benefits Presentation

Clean Coal Power Initiative - Round 1 -

Demonstration of an Integrated Gasification, Power, and Clean Fuels System

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Executive Summary

- Design, construct, and demonstrate the first power plant in the United States that will produce clean electric power, steam, and liquid fuels from coal waste by integrating coal gasification and FT synthesis
- FT Liquefaction Technology converts 4,700 tons/day of waste coal into 41 MWe and 5,000 barrels/day (bpd) of ultra-clean transportation fuels
Project Information

Plant, Fuel, Location, and Cost

- An integrated gasification power and clean fuels demonstration plant co-producing 41 MWe and 5,000 bpd of ultra-clean liquid transportation fuels using Shell gasification technology and SASOL’s FT liquefaction technology
- Reclaiming 1.4 million tons/year of anthracite coal waste (culm) as fuel to the gasifier
- Location: near Gilberton, PA
- Project cost: $612 million; DOE share: $100 million
Team Members

- **WMPI PTY, LLC**
  - Project and technology management
- **Nexant, Inc.**
  - An affiliate of Bechtel Corporation
- **Shell Global Solutions B.V., U.S.**
  - An international energy company with a major presence in coal gasification technology
- **Uhde GmbH.**
  - A global engineering company and authorized Shell gasification supplier and contractor
- **SASOL Technology Ltd.**
  - A world leader in FT liquefaction technology
Project Information (continued)

Gasification Process

- Integrated Gasification Combined Cycle (IGCC) capable of gasifying a wide variety of coal and other solid feeds (petroleum coke)
- State-of-the-art high pressure, oxygen-blown, entrained flow gasification technology
- Team members have commercial experience with the proven technology of IGCC power generation
Project Information (continued)

Fischer-Tropsch (FT) Liquefaction Technology

- Uses state-of-the-art SASOL slurry phase reactor technology
- Catalytic reaction with clean syngas (CO and H₂) to form a wide range of molecular weight hydrocarbons (wax and hydrocarbon condensate)
- High molecular weight wax will be upgraded with Chevron Lummus Global iso-cracking technology to produce ultra-clean diesel fuels
- Produces high quality, sulfur-free products
  - 1,300 bpd naphtha (as chemical feedstock)
  - 3,800 bpd diesel fuels (potentially jet fuel as well)
    - High cetane value (76 compared to 48 to 50 for conventional diesel)
    - Demonstrated emissions reduction
Project Information (continued)
Gasification FT Process Diagram
Project Information (continued)

Technology Advantages

- Integration of IGCC and FT technologies
- Can use a wide range of coal waste feedstocks
- Will produce ultra-clean (sulfur free) transportation fuels
- Very low emissions from plant
- Demonstrates potential for future CO$_2$ capture and sequestration
- Near-term product marketability
Estimated Benefits

Approach

- Forecast Market Penetration
- Quantify differences between deployment and non-deployment of these integrated technologies into marketplace
Estimated Benefits (continued)

Market Penetration Assumptions

- Annual Energy Outlook\(^1\) 2006 projects an increase of 1 million bpd of diesel production through 2020
- Assume that refinery capacity would need to be expanded to meet 50% of this increase (500,000 bpd)
- Potential exists for future construction of this technology nationwide to meet increasing diesel fuel demand

\(^1\)Published by the U.S. Department of Energy, Energy Information Administration, 2006
### Estimated Benefits (continued)

#### Environmental

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<thead>
<tr>
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<th>Culm Reclamation, tons/year</th>
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<tbody>
<tr>
<td>Before WMPI’s Gilberton Project</td>
<td>640,000</td>
</tr>
<tr>
<td>Net Increase in Culm Reclamation</td>
<td>1,360,000</td>
</tr>
<tr>
<td>After WMPI’s Gilberton Project</td>
<td>2,000,000</td>
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Total culm reclamation at Gilberton site is estimated to double from installation of Gilberton Coal-to-Clean Fuels and Power Co-production Project.
Estimated Benefits (continued)

Regional Benefits

- Development of an environmentally clean IGCC system co-producing clean fuels and power
- Creation of high quality jobs
- Local environmental benefits from waste coal reclamation
Estimated Benefits (continued)

National Benefits

- A successful demonstration of the Gilberton Coal-to-Clean Fuels and Power Co-production Project will:
  - Potentially lead to larger-scale commercial plants (10-fold increase in size)
  - Help reduce U.S. dependence on foreign oil
  - Tail pipe emissions are reduced by large-scale production and use of ultra-clean fuels
Estimated Benefits (continued)

National Benefits

- Attributes of ultra-clean diesel fuels:
  - High cetane number of 76 (compared to 48-50 for conventional diesel)
  - No sulfur, no aromatics, low in particulate and smoke emissions
  - Lower overall tail pipe emissions (compared to U.S. average diesel fuel)
    - 8% less NOx
    - 30% less particulate matter
    - 38% less hydrocarbons
    - 46% less CO

Note: Data is from a DOE-funded engine testing study conducted by SWRI
Conclusions

- Gilberton Coal-to-Clean Fuels and Power Co-production Project, when successfully completed, will benefit the Gilberton site and the Nation by converting waste coal into useful commodities. Additionally, the technology has the potential to achieve significant environmental benefits when commercialized.
Visit the NETL web site for information on all Power Plant Improvement Initiatives and Clean Coal Power Initiative projects

www.netl.doe.gov/technologies/coalpower/cctc