

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

Benefits Presentation



Clean Coal Power Initiative - Round 1 -

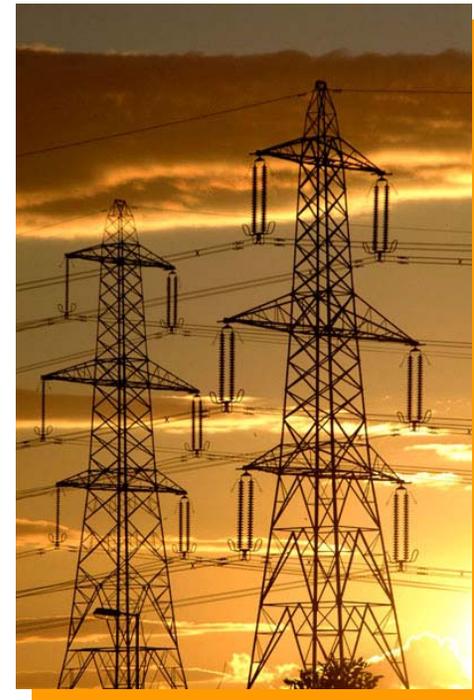
Demonstration of an Integrated
Gasification, Power, and Clean
Fuels System

Diane Revay Madden – Major Projects Division
National Energy Technology Laboratory



Outline

- **Executive Summary**
- **Project Information**
 - Plant, fuel, location, and cost
 - Team members
 - Gasification Process
 - Fischer-Tropsch (FT) Liquefaction Technology
 - Gasification/FT Process Diagram
 - Technology advantages
- **Estimated Benefits**
 - Approach
 - Market penetration assumptions
 - Environmental
 - Regional benefits
 - National benefits
- **Conclusions**



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



Project Information (continued)

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)

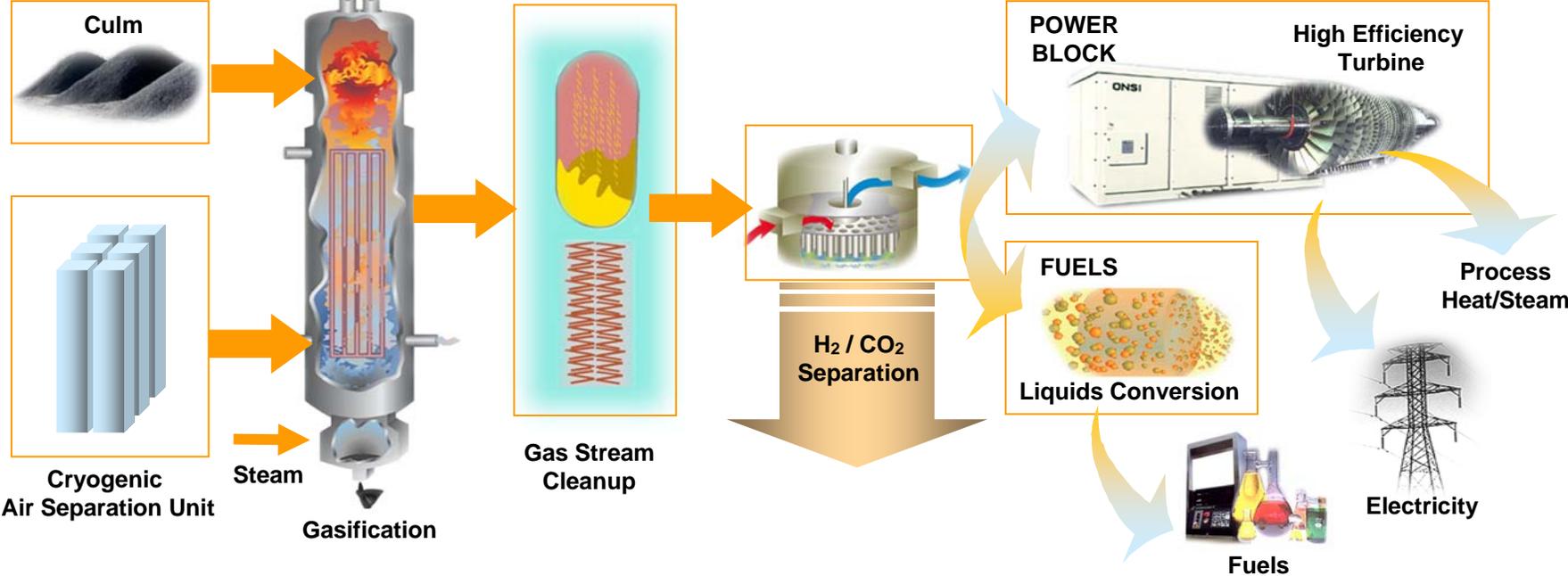
Fischer-Tropsch (FT) Liquefaction Technology

- **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 CO₂ 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 Outlook¹ 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**

¹Published by the U.S. Department of Energy, Energy Information Administration, 2006



Estimated Benefits (continued)

Environmental

	Culm Reclamation, tons/year
Before WMPI's Gilberton Project	640,000
Net Increase in Culm Reclamation	1,360,000
After WMPI's Gilberton Project	2,000,000

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 NO_x
 - 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

