Excelsior Energy’s Mesaba Energy Project

Project Presentation

Clean Coal Power Initiative - Round 2 -

Next-generation Full-scale Integrated Gasification Combined Cycle (IGCC) Using ConocoPhillips’ E-gas™ Technology

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Mesaba Energy Project

- Next-generation utility-scale Integrated Gasification Combined Cycle (IGCC) using ConocoPhillips’ E-Gas™ carbonaceous solids gasification technology
- Demonstration to be built near Taconite in the Iron Range of Northern Minnesota.
- Achieving higher plant efficiencies and availability, lower emissions (including Hg), fuel flexibility and by-product marketability
- Total project cost: $1.97 billion (DOE share: $36 million)
- Projected to be operational in 2011, producing up to 600 MWe (net)
Background

- Mesaba Energy Project (Mesaba) is Phase I of a two-phase nominal 1200 MWe power complex
- The Mesaba project will improve commercial IGCC performance by drawing upon:
  - DOE-funded studies of potential performance and technology advancements
  - 1600 operational lessons learned from eight years of hands-on experience at the DOE CCT Wabash River Coal Gasification Repowering Project in Terre Haute, IN (Wabash River)
- Preferred Project Location – near Taconite, MN
  - About 70 miles northwest of Duluth
- Alternate Project Location – near Hoyt Lakes, MN
  - About 50 miles north of Duluth
Background (continued)

- Multiple feedstock options
- Transportation options
  - Ship
  - Truck
  - Rail
- Water access
  - Abandoned iron mine pits
- Team members include:
  - Excelsior Energy, Inc., an independent energy management company (Minnetonka, MN)
  - Fluor Enterprises (Aliso Viejo, CA)
  - ConocoPhillips (Houston, TX)
- Fuel
  - Sub-bituminous coal (Wyoming Powder River Basin)
  - Bituminous coal (Illinois Basin No. 6)
  - Petroleum coke blends
Unique Technology Aspects

- Enhanced/refined ConocoPhillips E-Gas™ carbonaceous solids gasification technology (based on success at Wabash River)
  - Full-Slurry Quench (FSQ) multiple-train gasifier system
  - Operational availability of about 90% or better (vs. 77% for Wabash River)

- Integrated Air Separation Unit (ASU) with Gas Turbine (first in U.S.)
  - Extract bleed air from gas turbine to reduce parasitic load of main air compressor in ASU
  - Recycle nitrogen from ASU and inject into gas turbine to reduce NOₓ and combustor flame temperature
Unique Technology Aspects (continued)

- **Environmental**
  - Demonstrate emission levels for criteria pollutants (SO$_2$, NO$_X$, CO$_2$, volatile organic compounds and particulate matter) and Hg equal to or below those now considered to represent the lowest emission rates for utility-scale, coal-based generation (using similar feedstocks)
  - Demonstrate CO$_2$ emissions 15% to 20% lower than the current average for U.S. coal-based power plants (using similar feedstocks)
  - Sequestration adaptable

- **Thermal Efficiency** – design heat rate of about 8,600 Btu/kW-hr (bituminous coal)
Project Schedule

- **Start**
  - 2006

- **NEPA Process**
  - NEPA Record of Decision expected 2007

- **Design**
  - Complete in 2008

- **Construction**
  - Expected to start in 2008, with a duration of 42 months

- **Operation**
  - Demonstration phase from 2011 to 2012

- **Completion**
  - Cooperative agreement end in 2012
Conclusions

- Will have the flexibility to process both high- and low-rank coals (and also petroleum coke, which may have a negative economic value in disposal costs) into a clean synthesis gas containing hydrogen

- CO₂ emissions
  - 15% to 20% lower than the current average for U.S. coal-based power plants (using similar feedstocks)
  - Sequestration adaptable with retrofit for capture if greenhouse gas reductions are imposed by future regulations

- Emissions equal to or below those now considered the lowest rates for utility-scale, coal-based generation (using similar feedstocks)
Conclusions (continued)

- Will help maintain the Nation’s abundant coal resources as a cornerstone of our future domestic energy portfolio for power generation
- Technological successes from the demonstration will further the President’s national environmental initiatives
  - Clear Skies
  - Global Climate Change
  - FutureGen
  - Hydrogen Economy
- Commercial reference plant for IGCC
  - Standard replicable design configuration
  - Sound basis for installed costs
  - Competitive commercial and regulatory framework