

Excelsior Energy's Mesaba Energy Project

Project Presentation



Clean Coal Power Initiative - Round 2 -

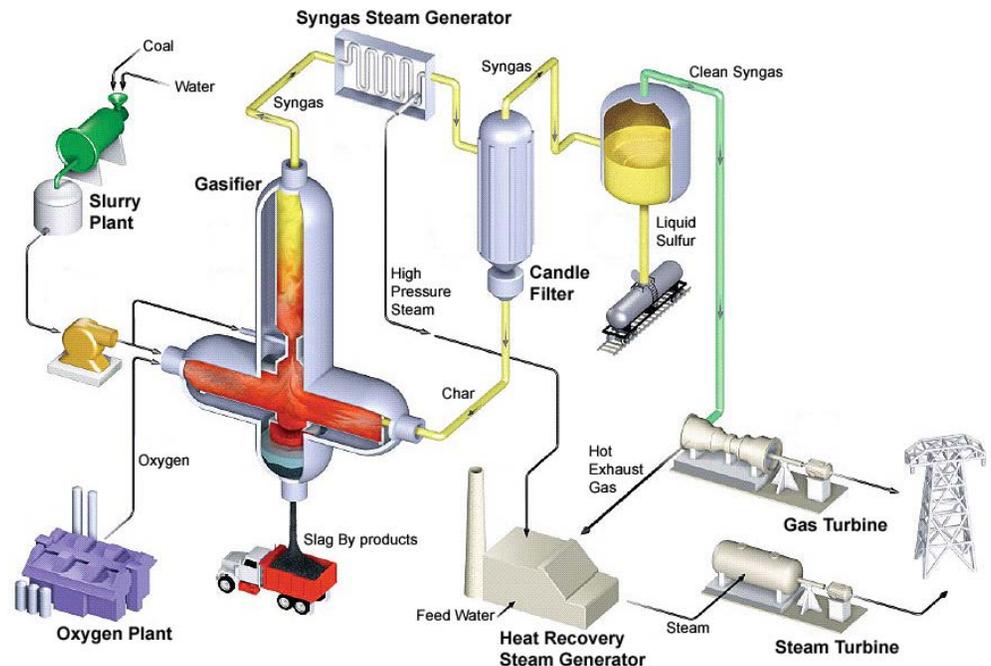
Next-generation Full-scale
Integrated Gasification
Combined Cycle (IGCC)
Using ConocoPhillips'
E-gas™ Technology

Jason Lewis – Environmental and Industrial Division
National Energy Technology Laboratory



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 NO_x 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

