Excelsior Energy's Mesaba Energy Project

Benefits 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

Outline

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  - Mesaba process configuration
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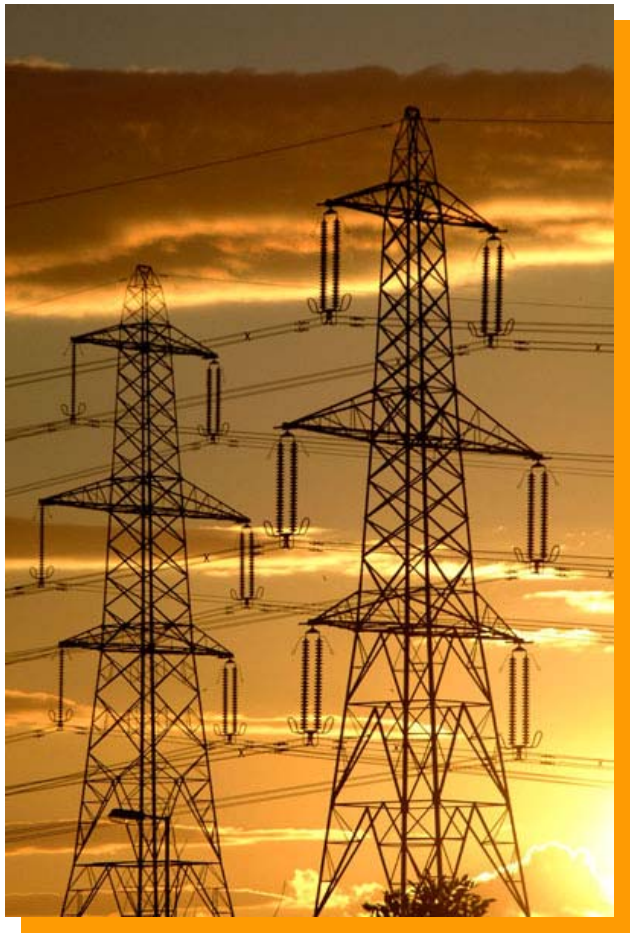

Outline (continued)

- **Estimated Benefits**
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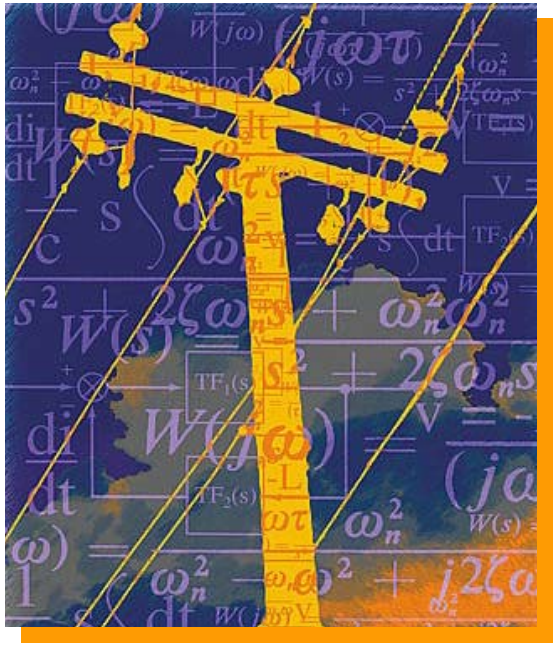


Executive Summary

- **Excelsior Energy's Mesaba Energy Project will utilize next-generation Integrated Gasification Combined Cycle (IGCC) technology to achieve higher plant efficiencies and availability, lower emissions (including Hg), and lower operating costs (fuel flexibility and by-product marketability)**
- **The facility will test the 1600 operational lessons learned from eight years of hands-on experience at the DOE Clean Coal Technology (CCT) Wabash Coal Gasification Repowering Project in Terre Haute, IN (Wabash River)**

Executive Summary (continued)

- The Mesaba Energy Project is the first phase (600 MWe) of a planned 2-phase operation that will also test multiple feedstocks
- Avoided emissions through use of Mesaba contribute to a cleaner environment
- Marketable by-products provide a potential positive annual cash flow stream at Mesaba

Project Information
Plant, Fuel, Cost, Schedule, and Location

- **Design, construction and operation of a new utility scale IGCC power plant using ConocoPhillips' E-Gas™ technology for coal gasification at the Mesaba Energy Project (Mesaba)**
- **Nominal plant generation capacity 600 MWe (net)**
- **Plant designed to be fuel flexible**
  - Base case fuel - bituminous coal (Illinois Basin No. 6)
  - Predominant case fuel - blended sub-bituminous coal (Powder River Basin) and petroleum coke
- **Total project cost: $1.97 billion (DOE share: $36 million)**
- **Schedule**
  - 2006 Project Start
  - 2006 to 2011 Construction
  - 2011 to 2012 Operations

Project Information (continued)
Plant, Fuel, Cost, Schedule, and Location

- **Preferred project location is West Range plant site**
  - Greenfield, land designated for auxiliary mining purposes
  - Iron Range near Taconite and Bovey, approximately 70 miles northwest of Duluth, MN
  - Remote location, near natural gas pipelines, high voltage transmission line corridors and viable rail service
- **Alternate project location is the East Range plant site**
  - Iron Range near Hoyt Lakes, approximately 50 miles north of Duluth, MN
  - Greenfield, former taconite mining operations are located nearby
  - Access to water and feed-stock transportation options

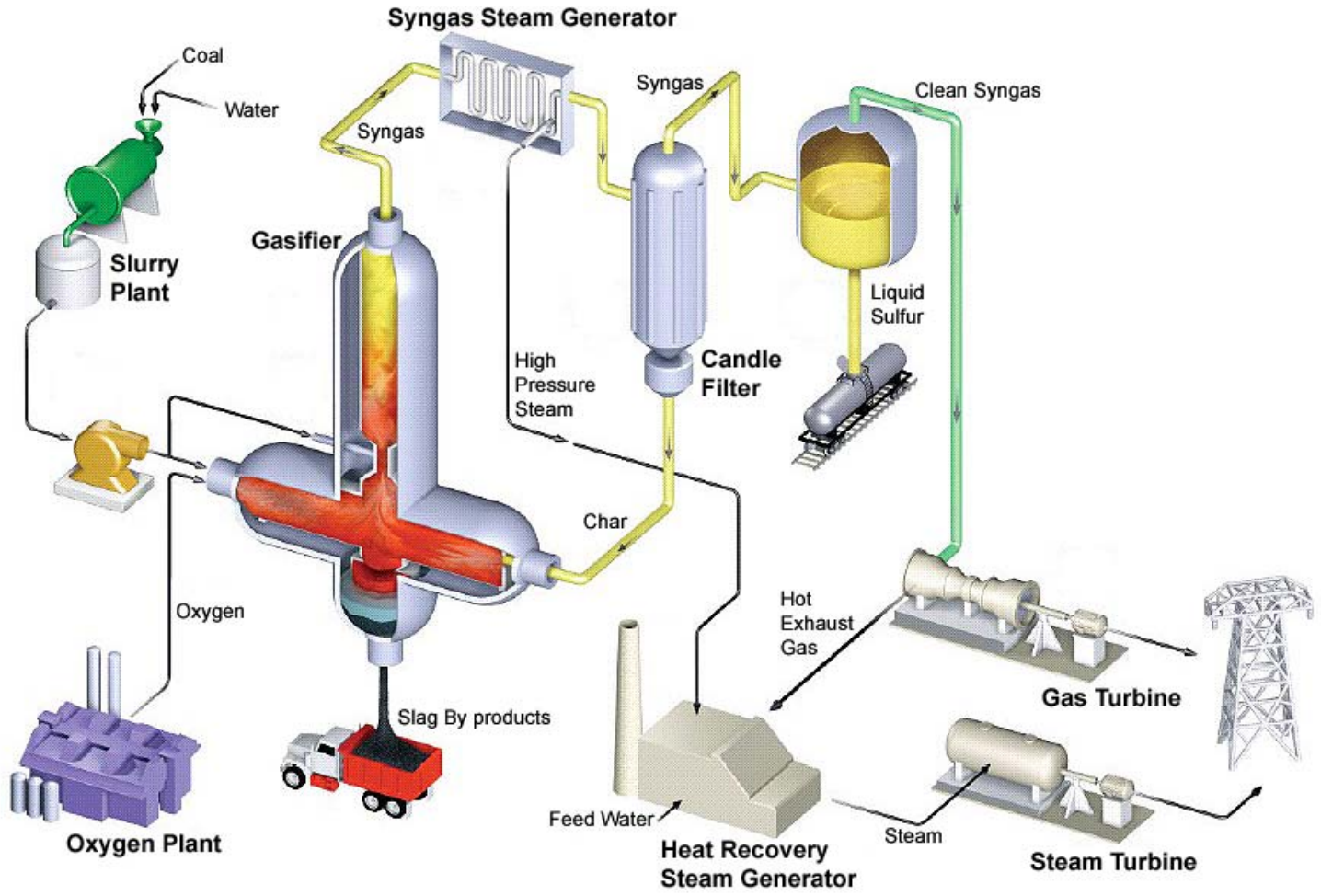
Project Information (continued)
Team Members

- **Excelsior Energy (Minnetonka, MN)**
  - Partner
- **Fluor Enterprises (Aliso Viejo, CA)**
  - Engineering, procurement and construction
- **ConocoPhillips (Houston, TX)**
  - Technology rights holder

Project Information (continued)
IGCC and ConocoPhillips E-Gas™ Process

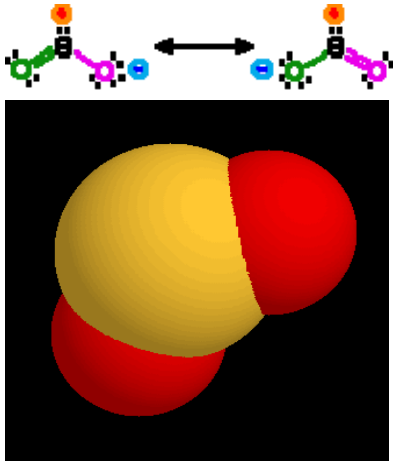
- **The Mesaba project will improve commercial scale IGCC performance as a result of:**
  - DOE funded investigations of potential performance and technological upgrades
  - 1600 operational lessons learned from the CCT Wabash River Coal Gasification Repowering Project in Terre Haute, IN (Wabash River)
  - Research and development efforts of the DOE team and the ConocoPhillips team

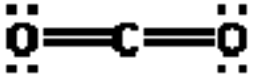
Project Information (continued)
Mesaba Process Configuration



Project Information (continued)
Air Emissions

- Greater than 90% Hg removal from coal input
- Better than 99% S removal when combusting bituminous coal, slightly less for sub-bituminous coal
- NO_x emissions reduced to 15 ppmvd @ 15% O_2
- Very low particulate matter emissions, i.e., on order of natural gas
- CO_2 emissions reduced by 15%
- CO_2 capture adaptable





Carbon Dioxide

Sulfur Dioxide

Nitrogen Oxide (NO)

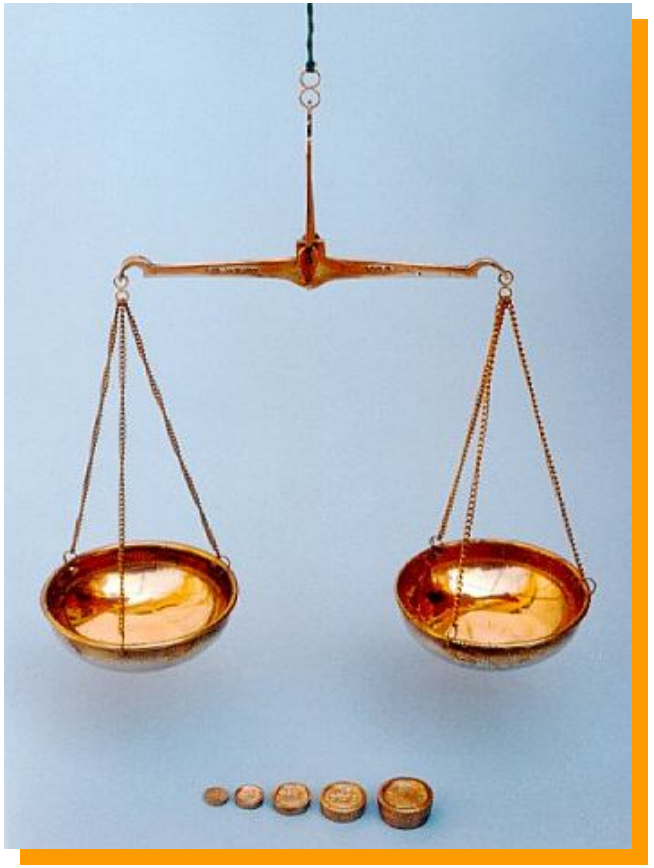
+

Nitrogen Dioxide (NO_2)

= Nitrogen Oxides (NO_X)

Estimated Benefits
Approach

- **Quantify emissions and those avoided emissions on an annual basis for Mesaba**
- **Compare emissions against those for other conventional coal-burning technologies**



Estimated Benefits (continued)
Annual Emissions Reductions

Air Emissions Avoided	100% Sub-Bituminous Coal (Tons/year)	100% Bituminous Coal (Tons/year)
Sulfur Dioxide (SO_2)	19,400	108,000
Nitrogen Oxides (NO_X)	2,400	3,300
Carbon Dioxide (CO_2)	850,000	750,000
Mercury (Hg)	0.12	0.16

Estimated Benefits (continued)

Coal-Fired Power Plant Emissions Comparison: 606 MWe (net) Basis, 90% Availability

Pollutant	Supercritical Pulverized Coal (Tons/year)	Pulverized Coal with ESP & FGD (Tons/year)	Circulating Fluidized Bed (Tons/year)	Mesaba IGCC (Tons/year)
SO_2	3,370	4,140	3,500	560
NO_x	1,470	1,820	1,860	1,300
Hg	0.4	0.1	0.1	0.013

Estimated Benefits (continued)

Coal-Fired Power Plant Emissions Comparison: 606 MWe (net) Basis, 90% Availability

Pollutant	Supercritical Pulverized Coal (Tons/year)	Pulverized Coal with ESP & FGD (Tons/year)	Circulating Fluidized Bed (Tons/year)	Mesaba IGCC (Tons/year)
>PM10	380	410	350	250
VOC	80	N/A	90	70
CO	2,530	2,270	2,560	760

Estimated Benefits (continued)
Combustion Utilization By-products

Marketable Combustion By-Products	100% Sub-Bituminous Coal (Tons/year)	100% Bituminous Coal (Tons/year)
Elemental Sulfur, TPY	9,700	54,000
Gasifier Slag, TPY	133,000	205,000

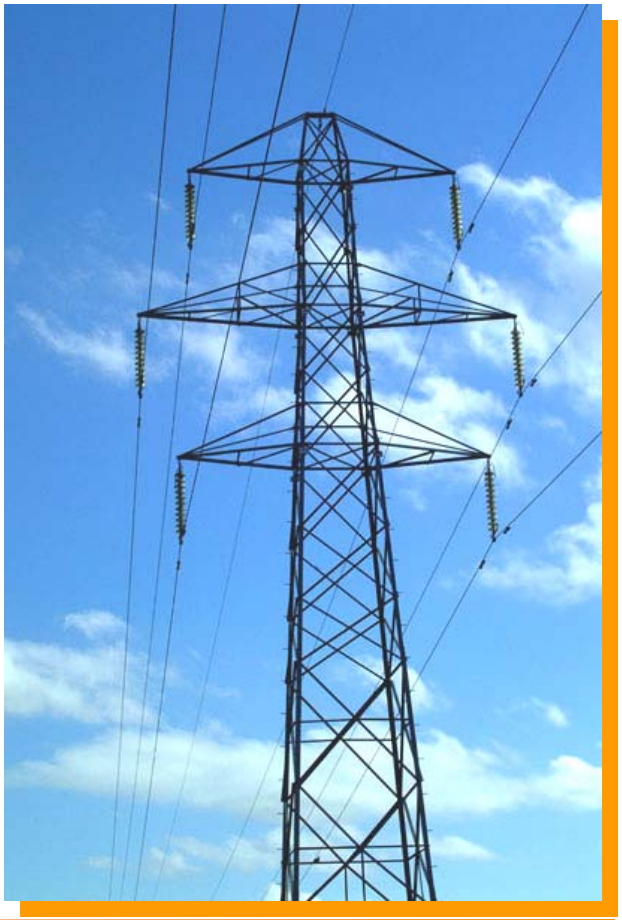
- A ready market exists for both by-products
- Existing transportation options provide cost effective access to these markets

Estimated Benefits (continued)
Regional

- **Reduced land disturbance**
  - Minimizes land and resource requirements
  - Recovered elemental sulfur and slag combustion utilization by-products offset both mining and landfill capacity for these materials
- **Reduced impact on local water sources**
  - Plant make-up water is readily available from existing abandoned mine pits
  - Zero liquid discharge system eliminates waste waters associated with contact cooling process

Estimated Benefits (continued)
Regional

- Remote location are not near major population center
- Both project locations zoned for industrial usage
- Construction employment could bring as many as 1000 temporary jobs
- Plant operation is anticipated to result in the addition of 300 to 400 permanent and support operations jobs to the area



Estimated Benefits (continued)
National

- **Will implement further refinements in IGCC, advancing the technology into mainstream national generation mix**
  - Largely eliminates the uncertainty of emerging regulatory programs associated with greenhouse gas emissions, Hg, and fine particulate matter that would otherwise complicate the permitting of a conventional coal fired power plant
  - Availability increases to 90%, up from 77% at Wabash River, resulting in a smaller construction footprint
  - Integrated Air Separation Unit with Gas Turbine (first in U.S.) increases technology efficiency and reduces auxiliary electrical load
  - Standard replicable design configuration with sound basis for installed costs provides pathway for similar installations
  - Flexibility to process both high- and low-rank coals (and petroleum coke, which may have a negative economic value) into a clean synthesis gas that contains hydrogen

Estimated Benefits (continued)
National

- **Reduced overall emissions, including CO_2**
- **Carbon capture adaptable**
- **Will utilize the Nation's abundant coal resources and increase energy security as a result**
- **Further the President's environmental initiatives for America:**
  - FutureGen
  - Hydrogen Economy

Conclusions

- **The Mesaba Project has excellent feedstock flexibility utilizing sub-bituminous and bituminous coal, as well as blends of sub-bituminous coal and petroleum coke**
- **Mesaba will establish a standard replicable design configuration for future commercialization**

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