

Great River Energy Project

Benefits Presentation



Clean Coal Power Initiative - Round 1 -

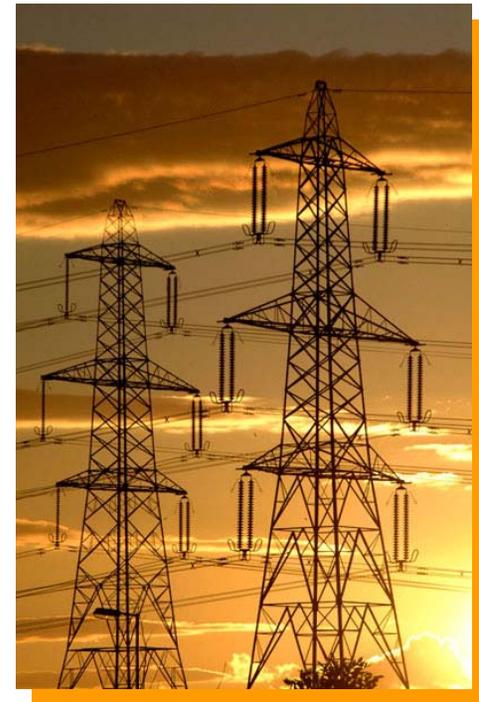
Demonstration of a Lignite
Fuel Enhancement System

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Outline

- **Executive Summary**
- **Project Information**
 - Plant, fuel, location, cost, and schedule
 - Team members
 - Process
 - Advantages
 - Performance
 - Unique contribution



Outline (continued)

- **Estimated Benefits**
 - Approach
 - Market penetration assumptions
 - Pollutant reductions
 - Total emissions
 - Capital cost
 - Regional benefits
 - National benefits
- **Conclusions**



Executive Summary

- **Waste heat from the plant, which burns lignite, will be channeled through the dryer to remove almost 25% of the lignite's moisture before the fuel is fed into a power plant boiler**
- **Successful commercial application of the Lignite Fuel Enhancement System in the United States would significantly reduce emissions**
 - 6,890 tons per year of NO_x
 - 18,360 tons per year of SO₂
 - 7,084,810 tons per year of CO₂
 - 9,340 tons per year of particulates
 - 297 pounds per year of mercury
- **Power companies could save as much as \$55 million by using the Lignite Fuel Enhancement System**



Project Information

Plant, Fuel, Location, Cost, and Schedule

- A 546 MWe demonstration of the Lignite Fuel Enhancement System
- Installed on a PC Boiler with a tangential firing configuration
- Location: Underwood, ND
- Project cost: \$31.5 million;
DOE share: \$13.5 million
- Schedule:
 - 2004 Project Start
 - 2006 to 2007 Construction
 - 2008 Completion



Project Information (continued)

Team Members

- EPRI (Palo Alto, CA)
- Lehigh University (Bethlehem, PA)
- Barr Engineering (Minneapolis, MN)
- Falkirk Mining Company
(Underwood, ND)



Project Information (continued)

Advantages

- Reduces plant heat rate
- Reduces fuel and maintenance costs
- Has potential to increase plant generating capacity
- Reduces emissions of SO₂, NO_x, CO₂, Hg, and particulate matter
- Reduces make-up water requirements



Project Information (continued)

Performance

- Overall performance improves by 5%
- Cost of generation reduces by \$0.70/MWh (\$3 Million per year)
- Less duct erosion and maintenance cost
- Reduction in fan and mill power
- Increased reliability: fewer outages
- 7% reduction in NO_x, CO₂, Hg, and particulate matter
- 25% reduction in SO₂ emissions



Project Information (continued)

Unique Contributions

- **Drying not integrated with plant heat cycle**
- **Total emissions from Coal Creek are from the NETL Coal Power Data Base**



Estimated Benefits

Approach

- Forecast market penetration
- Quantify differences between performance of conventional power plant with and without Lignite Fuel Enhancement System being demonstrated
 - Pollutant emissions, tons per year
 - Operating costs



Estimated Benefits (continued)

Market Penetration Assumptions

- **Individual boilers most likely to install the Lignite Fuel Enhancement System were selected from NETL Coal Power Data Base and UDI data**
- **These target boilers were selected based on the use of lignite, subbituminous coal, or a blend of the two**
- **100,162 MWe of total market potential**



Estimated Benefits (continued)

National Pollutant Reductions from Commercialization

Pollutant	Emission Reduction ¹ , tons/year	Current Emissions From all Coal-fired Boilers in the United States ² , tons/year
NO _x	6,890	4,611,940
SO ₂	18,360	10,773,220
CO ₂	7,084,810	2,133,109,930
Particulate Matter	9,340	522,360
Mercury	0.15	48.6



¹ Basis: 10.0 GWe market penetration
² Source: NETL Coal Power Data Base

Estimated Benefits (continued)

Total Emissions at Coal Creek

Pollutant	Annual Emission Reduction
NO _x	376 tons
SO ₂	3,580 tons
CO ₂	386,860 tons
Particulate Matter	510 tons
Mercury	16.2 pounds

Total Emissions at the Coal Creek Plant are estimated to decrease by 7% to 25% due to the installation of the Lignite Fuel Enhancement System



Estimated Benefits (continued)

Capital Cost

- **The Lignite Fuel Enhancement System is estimated to save about \$3 million in annual operating cost**
- **Additional benefits include**
 - Lower maintenance costs
 - Higher availability
 - Potential to increase capacity by 14 MWe
 - Reduced ductwork erosion
 - Lower parasitic power



546 MWe Coal Creek Station Underwood, ND



Estimated Benefits (continued)

Capital Cost

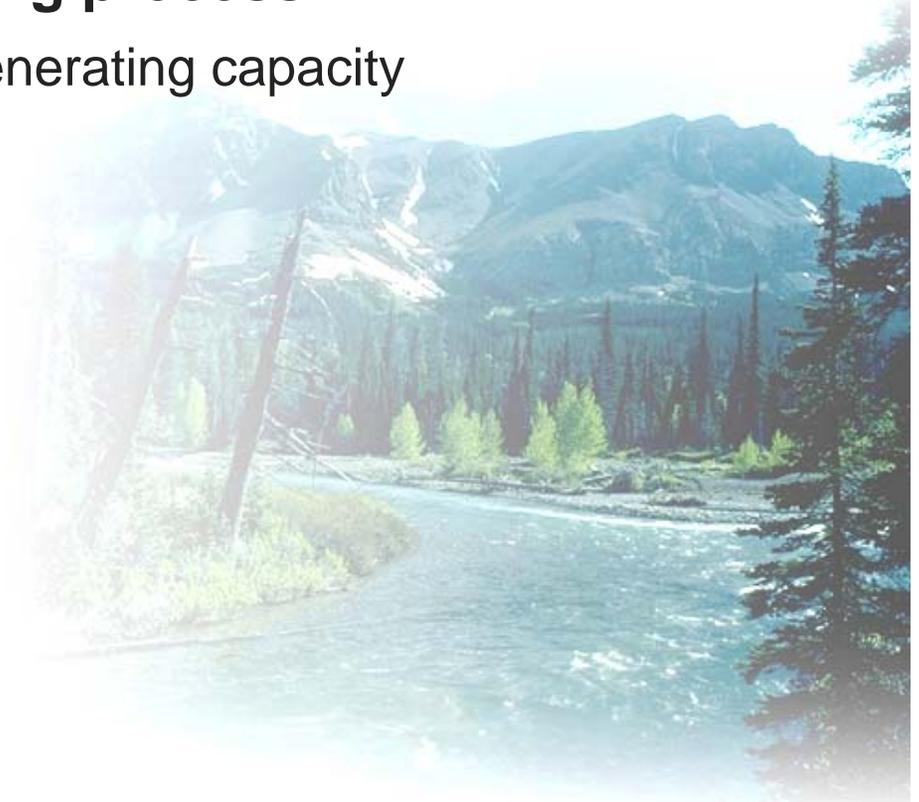
- For this analysis, the lower operating cost is due to decreased coal demand at a given power output and reduced parasitic power demands
- Participants data used to quantify savings



Estimated Benefits (continued)

Regional Benefits

- **Western power plants, burning high-moisture sub-bituminous Powder River Basin coals will also benefit from the drying process**
 - Improving efficiency and generating capacity
 - Reducing air pollutants



Estimated Benefits (continued)

National Benefits



- **Lignite Fuel Enhancement System could save \$55 million annually in operating costs when installed on 10 GWe of existing power plants burning high-moisture coals**
- **The 279 units that burn these types of coal currently account for nearly one-third of the electric power generated from coal in the United States, and more than 100 GWe**



Conclusions

- **Power generation units that burn lignite or high-moisture, sub-bituminous coals, such as Powder River Basin coal, can expect**
 - Improvement in overall generating capacity, meaning power will be produced more efficiently with a lower volume of fuel
 - Higher efficiency rates translate into reduced air pollutants and greenhouse gases



**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

