

Great River Energy Project

Project Presentation



Clean Coal Power Initiative - Round 1 -

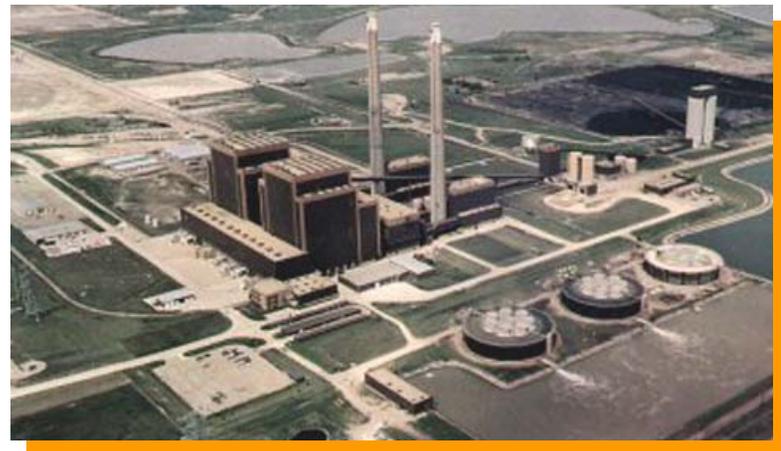
Demonstration of a Lignite
Fuel Enhancement System

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Great River Energy

- **Demonstration of a Lignite Fuel Enhancement System**
- **Applicable to power plants burning inherently high-moisture coals**
- **Achieving higher plant efficiencies, lower operating costs, and lower emissions**
- **Total project cost:
\$31.5 million
(DOE share: \$13.5 million)**



546 MWe Coal Creek Station Underwood, ND



Background

- **Great River Energy will demonstrate an approach to reduce moisture of lignite coal from 40% to 30% by using waste heat at the 546 MWe pulverized coal (PC) tangentially-fired boiler at Coal Creek Station**
- **Project Location: Great River Energy's Coal Creek Station, Unit 1, Underwood, ND**
- **Team members include:**
 - EPRI (Palo Alto, CA)
 - Lehigh University (Bethlehem, PA)
 - Barr Engineering (Minneapolis, MN)
 - Falkirk Mining Company (Underwood, ND)



Background (continued)

- **A two-phase implementation is planned**
 - First phase - Prototype lignite dryer to be developed for one pulverizer
 - Second phase - Full-scale, long-term testing on complete set of dryers needed for full-power operation of one 546 MWe unit at Coal Creek Station
- **Effect of incremental drying on plant performance and optimum operating conditions will be studied**
- **Fuel: North Dakota lignite & Powder River Basin sub-bituminous coal**



Unique Technology Aspects

- Uses waste heat from power plant condenser to increase heating value of lignite or sub-bituminous coals by partial drying
- Reduces plant heat rate
- Achieves a significant improvement (2.8% - 5.0%) in plant performance by removing about 25% of fuel moisture before coal combustion
- Reduces emissions of SO₂ by 25% and emissions of NO_x, Hg, CO₂ and ash by 7% at the Coal Creek Station by requiring less coal feed to produce same amount of electricity
- Reduces make-up water requirements



Project Schedule

- **Start**
 - July 2004
- **NEPA Process**
 - EA, FONSI signed January 16, 2004
- **Design**
 - Single Dryer: July 2004 to February 2005
 - Multiple Dryers: September 2006 to August 2007



Project Schedule (continued)

- **Construction**
 - Single Dryer: March 2005 to December 2005
 - Multiple Dryers: April 2007 to March 2008
- **Operation Starts**
 - Single Dryer: January 2006
 - Multiple Dryers: April 2008
- **Completion**
 - December 2008



Conclusions

- **This technology can increase cost-effectiveness of units burning high-moisture coals**
 - Plants burning high moisture coals make up more than one third of coal generating capacity in U.S.
 - 29 units burn lignite directly (15.3 GW)
 - 250 units burn Powder River Basin (PRB) coal (more than 100 GW)
- **Technology application will achieve 2.8% - 5% improvement in plant performance resulting in reduced emissions (25% less SO₂; 7% less Hg, CO₂, NO_x and ash at Coal Creek Station)**



Conclusions (continued)

- **A significant economic benefit resulting in a total annual savings @ \$0.70 per MWh:**
 - \$6 million for Coal Creek Station
 - \$84 million for all U.S. lignite-fired units
 - \$840 million for all PRB coal-fired units
- **An increased competitive position for lignite-fired power plants**
- **Lower O&M costs, increased generation capacity, less maintenance, better performance and increased reliability**
- **Increased value and use of nation's lignite and PRB reserves**

