

FY00-XXXVI-100
EVALUATION OF POTENTIAL SCR CATALYST BLINDING
DURING COAL COMBUSTION

CONTRACTOR: Energy & Environmental Research Center

PRINCIPAL INVESTIGATOR: Steven A. Benson, Ph.D.
701-777-5177 (O)
701-777-5181 (FAX)
sbenson@undeerc.org

PARTICIPANTS

<u>Sponsors</u>	<u>Cost Share</u>
Department of Energy (EERC/JSR/DOE)	\$335,333
Industry:	\$240,000
Alliant Energy	
EPRI	
Otter Tail Power Company	
Dynergy Midwest Generation	
Ontario Power Generation	
Ameren UE	
ND Industrial Commission	<u>\$200,000</u>
Total Project Costs	\$775,333

Project Schedule – 30 Months

Contract Date – 3/17/2000
Start Date – 3/17/2000
Completion Date – 3/31/2003
Time Extension – 6-30-04

Project Deliverables

Status Reports – 12/31/00√
3/30/01√; 6/30/01√; 9/30/01√
12/30/01√; 3/30/02√; 6/30/02√
3/31/03√; 6/30/03 √ ; 9/30/03√
Final Report – 6/30/04_√__

OBJECTIVE / STATEMENT OF WORK

The primary goal of this project is to determine the potential of low-rank coal ash to cause blinding or masking of selective catalytic reduction (SCR) catalysts and to determine the degree of elemental mercury conversion across the catalyst. Specific objectives include: 1) identify candidate coals and blends for testing under bench-scale conditions; 2) conduct bench-scale testing to screen coals and identify key conditions for testing at the full scale; 3) design and construct a SCR slipstream test chamber for sampling at full-scale facilities; 4) conduct testing at full-scale facilities; 5) identify SCR blinding mechanisms, rates, and cleaning methods as well as mercury conversion efficiencies; 6) interpret data, prepare a report, and 7) conduct sponsor meetings to develop recommendation to extend catalyst life and efficiency.

STATUS

Installation at Baldwin Station – The report from Haldor Topsoe on the reactivity of the 2-month sample from Baldwin was received. The analysis showed no loss of activity. The 4-month sample was also removed. Similar sulfate-rich materials were observed as in the previous sample. The sample has been submitted to Haldor Topsoe for the same analysis.

Installation at Columbia Station – All of the reactor parts have been delivered and are approximately 60% installed. We are awaiting a permit from the Wisconsin DNR to finish the project. The DNR is well beyond the 45-day period in which they were supposed to respond to the request from Alliant Energy. We expect the DNR to act very soon.

Installation at Coyote Station – EERC personnel have been in contact with the people at Otter Tail Power to arrange for the installation of the nozzle at this plant. Bland flanges have been installed at the reactor inlet and outlet. The nozzle will be inserted when the reactor is ready to be installed. The reactor installation will be completed when the testing at the Baldwin Station is complete. The testing at Baldwin will be completed in mid July.

July 1 – September 30, 2002 Quarterly Report

Testing at the Baldwin Station was completed this quarter. The sample from this testing will be retrieved when the reactor is dismantled. Plans are being made to dismantle the reactor and move it to the Coyote Station in the next month. The reactivity testing on the 4-month sample should be received soon from Haldor Topsoe.

Columbia Station activities. The permit for the Wisconsin Department of Natural Resources was finally received late this quarter and installation of the reactor was completed.

Coyote Station activities. Otter Tail Power has begun arrangements for installation of the slipstream reactor. The reactor at the Baldwin Station will be moved to the Coyote Station during the first quarter of 2003.

Oct – Dec, 2002

The reactor at Baldwin will be moved to the Coyote Station during the next quarter. The installation at Columbia will also be completed.

The Coyote plant has a scheduled outage in March, 2003. The slipstream SCR test unit will be installed during the outage; testing will begin when the plant is put back in service. In addition to the objective of the SCR slipstream test program, an overlay project will address oxidation of elemental mercury to ionic mercury due to the SCR unit. Previous tests have shown significant reduction of the reaction in lignite-derive flue gas. The SCR catalyst have also been degraded. The overlay project will document these reactions over a six-month time frame.

Jan-Mar, 2003

The reactor at the Baldwin Station has been removed and shipped to EERC for routine maintenance prior to installation at the Coyote Station in May, 2003.

Installation of the reactor installed at the Columbia station has been completed and has logged 477 hours of on-line results. No major indications of plugging have been observed to date.

Summary: In August of 2003, a pilot-scale SCR reactor was installed at Coyote Station, a nominal 420-megawatt lignite-fired generating facility that is located near Beulah, North Dakota. The installation was in conjunction with a study entitled “Impact of SCR Catalyst on Mercury Oxidation in Lignite-Fired Combustion Systems” that is being conducted by the Energy and Environmental Research Center. One goal of the SCR project was to determine the ability of new and aged catalyst to oxidize mercury at full-scale power plants. The researchers have found that the SCR technology was not effective in oxidizing mercury and that the sulfation of calcium and sodium ash deposits foul the catalyst rendering the SCR technology ineffective for NO_x control. A paper describing the research and findings has been submitted for peer review and publication in *Fuel Processing Technology*.