FY-03-XLIX(49) – 119

"Impact of SCR Catalyst on Mercury Oxidation in Lignite-Fired Combustion Systems"

CONTRACTOR: Energy & Environmental Research Center
PRINCIPAL INVESTIGATOR: Jason Laumb

PARTICIPANTS

Sponsor	Cost Share
Basin Electric Power Cooperative	$6,000
Great River Energy	$6,000
Minnkota Power Cooperative	$6,000
Ottertail Power Company	$6,000
Montana Dakota Utilities Company	$6,000
DOE-NETL	$40,000
NDIC	$30,000
Total Cost	**$100,000**

Project Schedule - 10 Months

Contract Date – 6/24/03
Start Date – 7/1/03
Completion Date – 12/31/03
Extended Completion Date – 6/30/04

Project Deliverables

Contract Execution - 6/26/03 ✓
Quarterly Reports – 7/31/03 (✓)
1/31/04 (✓)-verbal
Draft Final Report: (✓)
Final Report – 6/30/04 (✓)

OBJECTIVE / STATEMENT OF WORK

The proposed project would conduct flue gas sampling measurements to determine the mercury oxidation across a selective catalytic reduction (SCR) catalyst ordinarily used for NOx reduction. The testing will be conducted at the lignite-fired Coyote Station, utilizing an existing project (FY00-XXXVI-100 "Evaluation of Potential SCR Catalyst Blinding During Coal Combustion) by adding mercury sampling and analysis to the test program. The mercury measurements will be conducted upstream and downstream of the slipstream SCR catalyst bed to determine if mercury oxidation occurs and to quantify long-term declining oxidation due to aging of the catalyst or due to lignite-derived flue gas contaminants.

STATUS

Testing at the Baldwin Station has been completed. The reactor at the Baldwin Station (Project LRC – 100) has been removed and shipped to EERC for routine maintenance prior to installation at the Coyote Station in May, 2003. Otter Tail Power has begun arrangements for installation of the slip-stream reactor. 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.

July 1 – Sept 31, 2003

The pilot-scale SCR was successfully installed at the Coyote Station. The unit seems to be plugging at a higher rate than either of the two previous installations (see Project LRC-100). Mercury sampling was conducted at the inlet and outlet of the SCR reactor. Without ammonia, 56% of the mercury exiting the reactor was elemental. With injection ammonia, 80% of the mercury exiting the reactor was in the elemental form. The inlet mercury at the inlet was on average 86% elemental. The SCR pressure drop after 421 hours of operation increased a higher rate compared to the Baldwin Station results.

Final Report. 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 NOx control. A paper describing the research and findings has been submitted for peer review and publication in *Fuel Processing Technology*