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MERCURY CONTROL OPTIONS EVALUATION AT COAL CREEK STATION, UNDERWOOD, ND & STANTON STATION, STANTON, ND

CONTRACTOR: Great River Energy w/ EPRI as subcontractor

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PARTICIPANTS

Sponsor	Cost Share
Great River Energy	$45,000 (cash)
GRE/EPRI TC	$50,000 (in-kind)
ND Industrial Commission	$95,000
Total	**$190,000**

Project Schedule – 14 months
Contract Date - 10/17/2000
Start Date – 10/17/2000
Completion Date – 12/15/2001

Project Deliverables
Draft Final Report – 6/2001 ✓
Final Report – 12/15/2001 ✓

OBJECTIVE / STATEMENT OF WORK

This project is a slipstream study of potential mercury emission reduction options at Great River Energy's (GRE's) Coal Creek Station (CCS) and Stanton Station (SS); both plants fire 100 percent North Dakota lignite coal. The goal of the project is to determine if cost-effective means are available to reduce mercury emissions from lignite-fired utilities.

The study will also test the feasibility of producing activated carbon from lignite. The activated carbon would then be tested to determine its mercury removal efficiency. Results from the testing will be compared with those for other sorbent materials.

This study will generate data that could prove useful in developing cost-effective, competitive options for reducing mercury emissions from lignite-fired utilities. The data could be useful in the development of air toxic control standards when EPA determines regulations are appropriate. Such data could include the feasibility of specific control options for controlling mercury emissions from lignite-fired utilities and the economics of specific control options.

STATUS

Some key findings of the study are:

- Nearly all the mercury (Hg) produced at the two lignite-fired units tested is in the elemental form.
- At CCS, little or no Hg is removed across the electro static precipitator (ESP). A small fraction (~10-30%) is oxidized and subsequently removed in the scrubber.
- At SS, little or no Hg is removed by the spray dryer or fabric filter.
- Mercury removal across the scrubber could be enhanced by increasing the fraction of oxidized mercury (Hg^{++})
- Hg^{++} was shown to be increased by commercially available Selective Catalytic Reduction catalysts and catalysts designed specifically for mercury oxidation.
- Activated carbon will effectively adsorb Hg from lignite-fired units given sufficient residence time. However, spray dryers appear to interfere with the ability for standard activated carbon to adsorb Hg. Iodine impregnated activated carbon shows good capacity to absorb Hg in these situations, but at a cost four times greater than for standard activated carbon.
- MerCap plates, specially formulated gold plates, are effective in removing Hg.

Some key questions that need to be determined are the long-term Hg removal efficiency and costs for the various Hg control options. Technically the following control options appear feasible:

- Oxidation of the elemental mercury (Hg^{o})
  A Hg oxidation catalyst can be used before the wet scrubbers to convert Hg^{o} to Hg^{++}. Hg^{++} can be removed by wet flue gas desulfurization (FGD) systems. The EPRI-developed Hg oxidation catalyst demonstrated effectiveness at oxidizing Hg^{o} in the lignite-derived flue gas at 370^{o}F.
- Sorbent Injection
  The residence tube data show that it is difficult to cost effectively achieve >50% in flight Hg removal with activated carbon injections. Carbon concentrations prior to the ESP or wet FGD of 15 to 20 lb/MMacf (pounds per million actual cubic feet) were required to achieve 50% Hg removal. However, the full extent of Hg removal within the ESP needs to be determined in full-scale systems as an additional 25% to 75% removal may be possible.
  Iodine impregnated carbon (15 micron mean size) injected at 3 lb/MMacf is needed to achieve 90% Hg removal with a spray dryer baghouse. A COHPAC baghouse installed after the ESP should work with sorbent injection to provide high mercury removal. However, the capital costs of installing a baghouse will be high.
- Absorption with MerCap plates
  MerCap plates may achieve 90% removal when placed in the ductwork downstream of an ESP or spray dryer Baghouse. MerCap is an EPRI patented concept that uses specially formulated gold-metal plates to absorb Hg from hot flue gas streams.