FY02-XLIV-112
MERCURY CONTROL OPTIONS EVALUATION, PHASE II STANTON STATION

CONTRACTOR: Great River Energy

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PARTICIPANTS

Sponsor	Cost Share
Great River Energy (EPRI TC)	$70,000
EPRI Mercury Research Fund	$50,000
Great River Energy (Additional Cash)	$10,000
Great River Energy (In-kind)	$10,000
ND Industrial Commission	$80,000
Total	**$220,000**

Project Schedule – 6 Months

Contract Date – 3/8/2002
Start Date – 4/1/02
Completion Date – 6/15/02

Project Deliverables

Initiate Project – 3/21/02 √
Start on-site test –4-21-02 √
Complete on-site test– 5/15/02 √
Final Report – 6/15/02 √

OBJECTIVE / STATEMENT OF WORK

The overall goal of this project is to evaluate mercury (Hg) emission control options at the Stanton Station. This grant request LRC-XLIV-F constitutes Phase II of the Industrial Commission grant FY01-XXXVII-103 "The Evaluation of Mercury Emissions and Control Options for Great River Energy", and has an objective similar to the Industrial Commission grant FY01-XXXVIII-105 "Pilot Scale Study of Mercury Oxidation Catalysts at Coal Creek Station, Underwood, North Dakota". The proposed work for this Phase II study will test a version of the MerCap concept (regenerable gold-plates) and will assess the potential to produce oxidized mercury by the addition of chemicals to coal feed or boiler. The MerCap technology was demonstrated during the earlier testing to effectively capture Hg in the flue gas stream, and the efficacy of the plate could be regained after regeneration of the test unit. The proposed project will entail longer term testing of the technology and will generate data for use in optimizing a pilot-scale test system. Chemical additives have been shown for non-lignite-fired units to oxidize Hg^{o} to Hg^{++}, which is generally more readily controlled by conventional air pollution control equipment. The proposed project will test the theory of whether chemicals can oxidize mercury from coal-fired units and will determine if the spray dryer and/or baghouse more readily captures the oxidized mercury.

The MerCap technology provides a unique solution to the problem of mercury emissions in that it is the only technology currently being investigated that will result in a separate waste stream of liquid mercury. Other technologies will result in the captured mercury being mixed with other by-products/waste streams (e.g., flyash), which could reduce the market value of the by-product or increase the disposal cost for the waste stream.

The chemical additives offer a potential, low-cost method for controlling emissions where by-product sales are not important. Further testing of chemical additives will be needed to assess the overall cost and operational impacts of the chemical additives to determine if this is a cost-effective alternative or supplement to sorbent injection.

STATUS

Tests were performed at Great River Energy's Stanton Station to evaluate the effect of chloride salt injection into the boiler on the speciation and fate of mercury across the spray dryer-baghouse. Chloride-containing salts were injected at varying feed rates into the Unit 10 boiler to evaluate the effect of chloride source (ie, type) on mercury oxidation and removal.

Project review meeting was held at the Stanton Station on April 17, 2002. Dr. Richard Carlson, URS and Dr. Ramsey Chang lead the discussion on results to date. Results on carbon injection (the first of four) indicate that mercury capture would not meet proposed standards. The carbon tested appears to lose reactivity in the spray dryer. In addition to the carbon adsorption tests, three chloride-alkali reactants will be injected above the burners in an effort to increase atomic chlorine content. Results to date with calcium chloride reactant did oxidize mercury. Results have not been made public to date. Additional laboratory work will be performed to examine and understand why the carbon loses its reactivity.

Summary results are:

- Addition of chloride salt types to the boiler increased chloride levels downstream of the air preheater. Up to 85% of the chloride converted to flue gas HCl.
- Mercury oxidation ranged from 40% up to 70%; some salt types showed no appreciable mercury oxidation. Some salts produced oxidized mercury, but no appreciable removal.
- Baghouse pressure drop requiring increased cleaning frequency was observed at temperature of 180 F; Increasing the baghouse temperature to about 188 F resulting in normal cleaning cycles.
- Some air heater plugging was observed with some salt types; long-term impacts of chemical addition on boiler slagging and corrosion are uncertain.

CONCLUSIONS

Overall, the results showed that the injection of chloride salt solutions into the boiler holds promise for converting elemental to oxidized mercury and improving mercury removal across the spray dryer-baghouse in ND lignite-fired units. However, it is not understood why different chloride salts oxidized mercury to different extents and why the removal of oxidized mercury across the spray-dryer baghouse varied for different salt types.