FIELD TESTING OF ACTIVATED CARBON INJECTION OPTIONS FOR MERCURY CONTROL AT TXU'S BIG BROWN STATION

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Summary for the 2006 Mercury Meeting Presentation

BACKGROUND

The primary objective of this project is to evaluate the long-term feasibility of using activated carbon injection (ACI) options to effectively reduce mercury emissions from Texas electric generation plants in which a blend of lignite and subbituminous coals is fired. Plants that burn a high percentage of Texas lignite present a challenge for mercury control because the mercury content is relatively high and it typically has low chlorine levels and can therefore emit high percentages of elemental mercury.

The test unit, TXU's Big Brown Station, is located in Freestone County, Texas, and is comprised of two identical 600 MW units, Units 1 and 2. Testing was performed on Unit 2 which has a tangentially fired, supercritical boiler with low NO_x burners. No SO_2 control is employed. Particulate control is accomplished with four parallel cold-side electrostatic precipitator (ESPs) followed by four high air-to-cloth baghouses (COHPAC configuration). Big Brown typically burns a blend of locally mined Texas lignite and Powder River Basin (PRB) coal that is described as a 70%–30% blend of lignite–PRB, respectively.

Mercury control testing was performed on one-quarter of Unit 2 by injecting sorbent downstream of the ESP into one of the four COHPAC modules, FF 2-4. This configuration is patented by Electric Power Research Institute (EPRI) and is referred to as TOXECON™ in the United States. Three sorbent-based technologies were evaluated at Big Brown: injection of activated carbon (DARCO Hg®), enhanced activated carbon, and activated carbon with an additive SEA4. The enhanced activated carbon was produced from DARCO Hg® by the Energy & Environmental Research Center (EERC) using a proprietary process, and the additive SEA4 is a proprietary technology of the EERC.

FIELD TESTING

Field testing began in January 2006 and continued through March. Baseline sampling indicated that there was no significant native Hg capture across FF 2-4. Parametric testing with the three technologies revealed that the enhanced AC provided the best balance of maximizing Hg removal and minimizing the total quantity of injected sorbent. With the enhanced AC, 70% capture across FF 2-4 could be achieved with an injection of approximately 1.0 to 1.5 lb/Macf and 90% capture could be reached with approximately 2.5 lb/Macf. In comparison, 70% capture with standard ACI required an injection of around 3 lb/Macf and over 6 lb/Macf for 90% capture.

After parametric testing, a monthlong test at constant control conditions was conducted to obtain data regarding long-term mercury control performance and balance of plant (BOP) effects. The enhanced AC technology was selected for the monthlong test based on findings from the parametric screening. The average monthlong Hg removal exceeded the target goal of 55%; however, a significant amount of variability was observed during the test and Hg removal was at times substantially higher and lower than the target value.

OBSERVED BALANCE OF PLANT EFFECTS

A noticeable increase in baghouse pressure drop trends was observed during the course of parametric and monthlong testing. Analysis of pre- and post-test bag samples indicated an increase in residual drag during the period of sorbent injection testing that was unexpected based on the amount of sorbent injected and reported experience from Alabama Power's Gaston plant. The residual drag had reached a point where TXU was not confident in FF 2-4's performance for the upcoming summer season; therefore, the plant initiated a full bag replacement of FF 2-4 in May 2006. During the bag change, it was discovered that two of the eight hoppers on FF 2-4 were plugged and filled with ash. In these two hoppers, unusual deposits were found mixed with the loose ash, which was reported to be very hot and smoldering.

An ongoing investigation seeks to explain the mercury removal variations and the root causes for the observed balance of plant effects. This presentation will provide a summary of the accomplishments of this project and an update of recent progress.