Reduction of Mercury Emissions Using Reburning

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Summary

GE Energy is developing a unique approach to reduce mercury (Hg) and nitrogen oxide (NO_x) emissions from coal-fired power plants that is anticipated to cost fifty-percent less than activated carbon injection; simultaneously reduce carbon monoxide (CO) emissions; and improve plant reliability and heat rate. The customizable approach leverages a broad portfolio of combustion modification and optimization technologies. In 2003, DOE NETL awarded GE Energy a project on field evaluation of Hg control using coal reburn. The technology evaluation is taking place at Western Kentucky Energy's Green Station Unit 2 located near Henderson, Kentucky. Green Unit 2 is 250 MWe, opposed wall-fired steam generator. The unit normally fires a blend of bituminous coals and is equipped with an Electrostatic Precipitator (ESP) and scrubber. In 2003, GE Energy retrofit Unit 2 with a combustion optimization system, incorporating a coal reburn system and boiler sensors to assist with loss on ignition (LOI) and CO.

The first round of emissions testing on Unit 2 was completed in October 2003. Testing demonstrated that without the reburn system in operation, Hg emissions were reduced by approximately 40% at the ESP outlet and approximately 70% at the stack. Following pilot-scale testing in GE's boiler simulation facility, Unit 2 showed good agreement with baseline field data suggesting that the pilot-scale combustor closely represented the thermal environment of Green Unit 2. When optimized reburning was introduced, pilot-scale tests showed over 90-percent Hg removal at the ESP.

In January 2004, GE completed a second round of mercury emissions testing in Unit 2 in conjunction with reburning optimization for NO_x control. During that time, Unit 2 was firing more reactive coal than it usually fires, resulting in lower LOIs than that previously observed. Goals of these tests were to measure mercury emissions while the system was optimized to minimize NO_x emissions and LOI. Mercury emissions were measured at the ESP inlet and outlet and at the stack using the Ontario Hydro method. The NO_x emissions measurements showed that NO_x was reduced from 0.45 lb/MBtu without reburning to 0.13 lb/MBtu with reburning. Because LOI in these tests was about the same as in baseline measurements, mercury removal efficiencies at ESP outlet did not exceed those measured in baseline tests.

A third round of mercury testing is planned. During these tests the reburning system will be operated at conditions that are anticipated to result in an LOI increase to 6-8-percent. Pilot-scale data suggest that considerably higher mercury removal at the ESP outlet can be expected at these conditions.