DOE/NETL's Updated Economic Analysis of Activated Carbon Injection for Mercury Control

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Abstract

Based on the results of Phase II full-scale field tests conducted by the U.S. Department of Energy's National Energy Technology Laboratory (DOE/NETL), this presentation provides an update to an April 2006 economic analysis of activated carbon injection (ACI) for mercury (Hg) control at coal-fired power plants. This update includes Hg control cost estimates for the six units included in the April 2006 analysis plus an additional six plants: DTE Energy's Monroe Station Unit 4, Great River Energy's Stanton Station Unit 1, Progress Energy's Lee Station Unit 1, PacifiCorp's Dave Johnston Unit 3, Basin Electric's Leland Olds Unit 1, and Reliant Energy's Portland Station Unit 1. Economic factors have also been updated to develop plant-specific estimates for the 20-year levelized costs for the incremental increase in cost of electricity (COE) and the incremental cost of mercury control on a current dollar basis. Results are grouped by the type of coal burned during Phase II full-scale field testing.

The Hg control costs, with an estimated accuracy of ± 30%, were derived for untreated ACI, brominated ACI, and conventional ACI coupled with the introduction of sorbent enhancement additives to the coal prior to combustion. The economic analyses were conducted on a plant-specific basis to yield the cost required to achieve low (50%), mid (70%), and high (80-90%) levels of Hg control "above and beyond" the baseline Hg removal. To calculate the ACI Hg capture, a data adjustment methodology was developed to account for baseline Hg capture and incorporate the long-term field testing results.

Mercury control costs via ACI were amortized on a current dollar basis. Using a 20-year book life, levelized costs for the incremental increase in COE, expressed in mills per kilowatt-hour (mills/kWh), and the incremental cost of Hg control ($/lb Hg removed) were calculated for each level of ACI Hg removal. For this analysis, the increase in COE varied from 0.15 mills/kWh to 4.67 mills/kWh. The incremental cost of mercury control ranged from $3,910/lb Hg removed to $179,000/lb Hg removed.

The Phase II field testing results are very encouraging both in terms of the level of Hg removal achieved and the cost of control on a mills/kWh and $/lb Hg removed basis. However, it must be kept in mind that the field tests still represent relatively short-term testing at optimum conditions. While such testing provides a sound basis for evaluating performance and cost, the limited duration of the testing does not allow for a comprehensive assessment of several key operational and balance-of-plant issues associated with Hg control via ACI. It should also be noted that the economic analyses represent "snapshots" in time based on the methodology used, assumptions made, and conditions that were specific to the time when DOE/NETL field testing occurred.