

Project CONDOR: MultiMedia MultiPollutant Initiative

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Summary

The existing fleet of coal-fired power plants is comprised of diverse technology designs spanning more than half a century. There has been a long-standing realization that pollution from power plants can have a significant negative environmental impact on local, regional, national and even global scale. Coal-fired power plants in the United States require vast amounts of coal. These plants tend to be large and are seldom idle. The enormity of the fuel requirements and associated pollution raise the visibility of these plants as a target for improvement.

Given this situation, the National Energy Technology Laboratory (NETL) has chosen to proactively assess the potential for power plant improvements in a holistic manner. The range of pollution emitted from individual plants is large, varying in intensity from one pollutant to another. Older plants tend to have fewer controls to mitigate the escape of unwanted pollution to air, water and land. Newer plants comply with modern standards for pollution control and yet are not immune from further consideration to reduce emissions during the life cycle of the plant.

Up to this point, the regulatory standards for pollutants have principally focused on one pollutant at a time. The standards typically evoke control technologies that are incremental in nature. The benefit of reduced emissions may not be “judged” adequate throughout the life of the power plant. Since the life of the power plant far exceeds the life of a standard, there exists an opportunity to consider the impact of improvement across the existing fleet throughout the life cycle of a power plant and the power plant system.

NETL will examine the interactions of various pollution control strategies in a phased approach. Phase I will depict the current state of existing power plants and baseline pending emission requirements. Phase I will develop a prototype model to examine the differences between an incremental control strategy and a comprehensive multi-pollutant-control strategy.

Models capable of estimating the impacts of control strategies on power plant improvement have been developed over the past decade. EIA has developed NEMS to forecast energy usage. DOE Office of Policy developed POEMS to examine impacts of electric utility deregulation and multi-pollutant control strategies. EPA developed IPM to assess incremental regulatory strategies and used this model to assist in their regulatory determination for coal-fired power plant mercury control. Although useful information can be obtained from these models, they fall short of the current initiative.

The Coal Optimization Near-term Development Options and Response (CONDOR) Project is a NETL initiative that will assess the long-term capability of coal-fired power generation. The project will identify research and development needs for maintaining and enhancing the performance of coal-fired power plants through the year 2020. Project CONDOR requires a fully functional suite of assessment tools that account for the current state of power plant configuration and associated emissions. Technology and strategies to maintain and improve the performance of each plant will be evaluated through reasonable scenarios that target performance-based enhancements for existing power plants.

Recently, a spreadsheet model supporting Project CONDOR was developed and incorporated algorithms for cost and performance of technologies to reduce emissions of SO₂, NO_x, and Hg for four time periods from 2000 to 2015. An inventory of coal-fired power plants, including data on capacity, generation, and fuel characteristics, as well as information on pollution control equipment has been incorporated into the spreadsheet model. The ultimate purpose of this model is to provide a flexible tool for assessing a wide variety of legislative/regulatory options for cleaning up existing coal fired power plants.

In this work, significant data gaps were observed in development of the algorithms for the model. Information on full-scale testing of control equipment was less than satisfactory. Also, details of the power plant configuration and performance of various components within the power plant were sketchy in several areas of the plant. To address data needs, NETL will pursue stakeholder input, targeting one or two Focus Group meetings over the next several months.