Technical Support Document
For EPA's Multi-Pollutant Analysis

Feasibility of Installing Pollution Controls to Meet Phase I Requirements of Various Multi-Pollutant Legislative Proposals

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The EPA has conducted a comprehensive analysis of various multi-pollutant proposals that have been introduced in the Senate. The proposals are designed to reduce emissions from the power sector, and EPA has agreed to perform detailed modeling for five legislative proposals and to present that information along with modeling results of EPA's recent regulatory approach to reducing emissions from the power sector. The analysis is based on air quality, health benefits, and power sector modeling projections and estimates for each proposal for the years 2010, 2015, and 2020. The following proposals and regulations were analyzed:

1. The Clean Power Act (Jeffords, S.150 in 109^{th})
2. The Clean Air Planning Act (Carper, S.843 in 108^{th})
3. The Clear Skies Act of 2005 (Inhofe, S.131 in 109^{th})
4. The Clear Skies Act of 2003 (Inhofe, S.485 in 108^{th})
5. The Clear Skies Act of 2005 (Manager's Mark of S.131 in 109^{th})
6. The Clean Air Interstate Rule, The Clear Air Mercury Rule, and The Clean Air Visibility Rule (EPA promulgated rules, 2005)

This technical support document reports feasibility of installing pollution controls to meet the short-term requirements of various multi-pollutant legislative proposals and how this constraint is integrated into EPA's power sector model. The power sector model that EPA uses for both regulatory and legislative analytical support is the Integrated Planning Model (IPM), a dynamic linear programming model that can be used to examine air pollution control policies for sulfur dioxides (SO_2), nitrogen oxides (NO_x), mercury, and carbon dioxide (CO_2) throughout the contiguous U.S. for the entire power system. Documentation for IPM can be found at www.epa.gov/airmarkets/epa-ipm.

The feasibility of installing pollution controls to meet control requirements in the short-term is largely driven by the availability of boilermaker labor, a group of highly-skilled workers that are critical for installing pollution controls. Boilermakers are also necessary for plant repowerings, building new capacity, and other power sector engineering projects. EPA's research has found that this labor source is the major limiting factor in achieving the emission reduction requirements of various multi-pollutant proposals that were analyzed.

For the boilermaker estimates, EPA has used several factors that affect the availability of boilermakers, including the overall boilermaker population, the percent of boilermaker population available to work on retrofits, the average annual hours worked by a boilermakers, and duty rates (boilermaker-years/MW) for installing these retrofits. In addition, EPA has used construction schedule requirements necessary to install these retrofits.

EPA has held several discussions with the International Brotherhood of Boilermakers, the U.S. Bureau of Labor Statistics, and the National Association of Construction Boilermaker Employers to verify its assumptions on the boilermaker availability factors. In addition, EPA has solicited public comment (as part of the Clean Air Interstate Rule) on the assumptions used in the boilermaker analysis.

Based upon the availability of labor and issues concerning the timing of controls, a constraint is applied in 2010 to IPM in order to limit the amount of scrubbers for SO_2 removal and/or selective catalytic reduction technology (SCR) for NO_x removal that can be built to meet the requirements of any given multi-pollutant proposal. The amount of controls that can be built in 2010 are determined by the model itself based upon the amount of labor necessary to install SCR and scrubbers and the cap levels set forth in the scenario being analyzed. For a particular scenario, the amount of SCR and scrubbers that will be chosen is based upon what is most cost-effective given the nature of the particular proposal. This constraint is consistent with the constraint used in recent EPA rulemakings such as the Clean Air Interstate Rule and the Clean Air Mercury Rule.

It is important to note however, that EPA did not place additional constraints regarding boilermakers as part of this analysis (beyond the constraints previously mentioned). In other words, boilermakers are necessary for building new capacity and repowering existing electric capacity from one type of power to another (i.e., coal capacity to combined cycle gas capacity), but EPA did not factor additional demand for boilermakers resulting from new capacity and for installation of other pollution control devices, such as activated carbon injection (ACI) for mercury removal. There are several reasons EPA chose to perform the analysis without additional constraints. First, EPA had not developed constraints for other projects, such as coal to natural gas repowerings and ACI. Second, in the scenarios where these constraints would be at issue, placing constraints on projects such as coal to natural gas repowerings would have required additional constraints, such as constraints on new renewable and/or nuclear capacity or the ability to meet electrical demand requirements. Even though EPA believes that certain scenarios are not feasible by 2010, EPA also believes that the information from the analysis is more useful to decision-makers than running scenarios with additional constraints.

It should also be noted that while EPA's feasibility analysis focuses on boilermaker labor (because that was the limiting factor with respect to the installation of SCRs and scrubbers), other factors might be limiting with projects such as ACI and repowering. In other words, either engineering or project management could be a limiting factor.

The feasibility constraint is applied in 2010 to all proposals and assumes that legislation is passed by January 1, 2006, at which point sources will begin planning and installing controls. This allows four years to plan for the first phase requirements of each proposal. However, the first phase of some of the proposals begins prior to 2010, which raises additional concerns regarding both the availability of boilermakers in the short-term as well as the time required to install the necessary controls at multiple installations. In particular, four of the five legislative proposals have Phase I requirements that begin in either 2008 or 2009. Clear Skies 2005 (Inhofe), Clear Skies 2005 (Managers' Mark), and Clear Skies 2003 (Inhofe) all have Phase I requirements for NO_x that begin in 2008. The Clean Air Planning Act (Carper) has Phase I requirements for both SO_2 and NO_x beginning in 2009. To some extent, sources may have greater difficulty with installing pollution controls for SO_2 and/or NO_x removal in the short-term beyond what is applied to the power sector model used in the analyses.

For the multi-pollutant boilermaker availability analysis, it was assumed that a period of four years will be available for the conceptual design, engineering, procurement, fabrication, installation, and startup of the environmental control systems required for the various multi-pollutant proposals. In addition, the boilermaker availability factors used in this analysis are the same as those used for CAIR (http://www.epa.gov/cair/pdfs/finaltech05.pdf). As part of the CAIR activities, EPA conducted detailed investigations to verify these factors, including discussions with relevant organizations and review of available information from various sources, including the comments received on CAIR. The key factors used in the boilermaker availability analysis are as follows:

1. During the timeframe relevant to the construction of the required environmental control retrofits, the total membership of the International Brotherhood of Boilermakers will remain at the current level of 26,000 boilermakers. Of these, 35 percent of boilermakers will be available to work on these environmental controls.

2. Additional boilermakers will also be available from the non-union sources and Canada. Based on past experience, this availability is conservatively restricted to 1,000 Canadian boilermakers and non-union boilermakers making up 10 percent of the total required.

3. During the past few years, a substantial number of boilermakers were involved in the construction of new generation capacity, especially the gas-fired combined cycle plants. Since the future projections show fewer new plants being built, some of the boilermakers involved with constructing new plants will be available for building the control retrofits. The estimates for the resulting boilermaker availability are based on EIA projections for the new capacity buildup. If a particular multi-pollutant scenario requires new capacity in the short term to meet emission reduction requirements, the boilermaker limitation is not applied to these new builds.

4. The following factors representing boilermaker labor requirement for installing and/or constructing different types of environmental controls are used in the analysis:
   - 0.269 boilermaker year/MW of FGD scrubber
   - 0.343 boilermaker year/MW of SCR
   - 0.01 boilermaker year/MW of SNCR

5. The overall implementation period of four years used in this analysis allows for installation of environmental controls on multiple units at a single plant site. The average installation schedule requirements for SCR and FGD systems on a single unit are estimated to be 21 and 27 months, respectively. These requirements reflect the time required to engineer, procure, construct, and startup the equipment necessary for these systems.

   For each installation, the last three months of the schedule would involve a unit outage, including two months for outage construction and one month for startup activities. For plants installing controls on multiple units, these outages would be usually scheduled back-to-back for each unit, mainly to avoid losing too much generating capacity from each plant at one time. Therefore, installation of multiple-unit controls at a plant would add to the overall schedule requirements. For example, a plant installing FGD systems on two units would require a total of 30 months to complete FGD installation on both units. During the first 27 months, installation on the first unit would be completed, along with a portion of the work on the second unit. The outage construction and startup on the second unit would be completed in the last three months.

The above example shows that the available implementation period of four years would make it possible to add controls to a large number of units at a single plant site. Since the CAIR analysis showed that there were a maximum of six SCR and five FGD multiple-unit installations, the four-year implementation period would easily accommodate such a requirement.