MACTEC

engineering and constructing a better tomorrow

DATE: 6 February 2007

TO: Susan S.G. Wierman
Executive Director
Mid-Atlantic Regional Air Management Association, Inc.
711 W. 40th Street, Suite 312
Baltimore, MD 21211

FROM: Arthur Werner, MACTEC
William Hodan, MACTEC
MACTEC Project 827007G184

CONTRACT: PROP06RTPE-036 (Task 3)

SUBJECT: Technical Memorandum (Final): Methods for Evaluating Statutory Factors

This memorandum is essentially a draft of one chapter of the final report that will be prepared by MACTEC upon completion of this project. Additional revisions are anticipated as this project continues and more information is developed. The purpose of this memorandum is to describe the methodology that will be applied to evaluate control options for emission sources in mid-Atlantic North Eastern Class I areas for the purpose of assessing reasonable progress for regional haze. The methodology that will be used to evaluate reasonable progress is the statutory factor or four-factor analysis which consists of an assessment of costs, compliance timeframe, non-air quality environmental impacts, and remaining useful life for affected sources. Specifically, the four factor analysis will be applied to control options identified for the six source categories, 16 specific non-EGU sources and 30 specific EGU sources identified by MANE-VU.

Many of the methods used by MACTEC in developing the BART regional engineering analyses for the MRPO will be used for the reasonable progress analysis. The four reasonable progress factors are nearly identical to the CAA section 169A(g)(2) factors applicable to major stationary sources subject to BART. For the BART regional engineering analysis, MACTEC developed "model sources" to enable the development of representative estimates of control costs and emission reductions. MACTEC defined the physical characteristics of the model sources to reflect typical emission units found at each emission source type. MACTEC will employ a similar "model source" methodology to assess the four-factors for the general source categories. The source categories are based on the six source types with the largest regional haze impacts on mid-Atlantic north eastern Class I MANE-VU areas as determined from modeling conducted by NESCAUM. The six source categories are:

- SO_2 from coal and oil-fired Electric Generating Units (EGUs);
- SO_2 from point and area source industrial, commercial and institutional boilers;
- PM from residential wood combustion and open burning;
- SO_2 from the use of home heating oil;
- SO_2 from cement kilns; and
- SO_2 from lime kilns.

Model source scenarios representative of coal and oil-fired EGUs will be developed by surveying the size and types of boilers currently in use in MANE-VU, together with controls already in use at these facilities. One or two model sources for each fuel type will be defined based on capacity and/or firing configuration. The four factor analysis will then be applied to potential SO_2 control options for application with each of the model sources. For coal-fired EGUs, potential control options that will be investigated include post combustion flue gas desulfurization (FGD), fuel switching to lower sulfur containing coals, and fuel cleaning. For oil-fired EGUs, control options for oil-fired boilers include FGD and fuel switching. Other control options for EGUs will be considered as necessary. The process of developing model sources for the EGU source category will be conducted in parallel to the four factor analysis of control options for the individual EGUs identified in Task 2 because it is likely that there will be similarity between the applicable control devices and operating scenarios.

As with EGUs, model source development for point and area source industrial, commercial, and institutional boilers will be conducted in parallel to the four factor analysis of control options for the individual non-EGU facilities identified by MANE-VU. The difference between model source development for this category in comparison to the EGU source category, is that it will be necessary to develop more model source scenarios to represent the wide range of boiler sizes, configurations, and fuel types in use.

Model source scenarios for residential wood combustion and open burning will consist of application of less-polluting woodstove technology, adoption of good burning techniques, and reduction or elimination of open burning. The four factor analysis will be applied to these control scenarios.

Home heating oil is used by a large number of sources, particularly in the Northeast. Because of the large number of sources, economically feasible post-combustion control options cannot be applied to this type of source. Instead, control of this source can be affected by reducing the sulfur content of the heating oil, thereby reducing SO_2 emissions. MACTEC will investigate the feasibility of fuel sulfur content reduction for this source type.

Model source development for lime kilns and cement kilns will be conducted as a single category due to the similarity of the sources. As with EGUs and industrial, commercial, and institutional boilers, model source development and four factor analysis for this category will parallel that of the individual cement kiln sources that have been identified.

Although the use of model sources may be sufficient for the general source categories, the methodology for specific sources requires a case-by-case evaluation of the technical and economic feasibility of each control technology considering site-specific factors.

For EGUs, EPA used the Integrated Planning Model (IPM) to estimate which units will install controls at what costs and which units will buy credits. The RPOs also made some IPM runs last summer to determine which units will install controls to comply with the EPA CAIR rule. Parsed results which include modeled control scenarios for included EGUs are available on EPA's website and will be used to identify control options and costs for included EGUs. Some states, including Maryland have recently passed legislation similar to North Carolina's Clean Smokestacks Act that requires specific sources to install controls rather than buying credits. We will contact state permitting authorities to compile information on anticipated controls from new regulations, permits, enforcement actions, and company plans for specific EGUs.

MACTEC will work with MARAMA to obtain Title V permits and other available information for individual EGU and non-EGU facilities from state and local agencies. One focus of these contacts will be to determine facilities that have recently installed controls or have plans to install controls. The information made available will also help us to determine whether the facility can be further controlled. MACTEC will also contact individual facilities as needed to obtain any data that may be necessary for control design.

The following describes the four factor analysis that will be applied to control options selected for analysis both for model sources and individual sources. Certain aspects of the four factor analysis are less applicable for the model source analysis than for the individual source analysis because of available site-specific information.

1. Cost of compliance (unless control cost information is available from CAIR or CAIR+ analyses or from states):
    a. Identify design parameters for proposed controls; examples of design parameters for an SO_2 scrubber include the inlet gas flow rate and temperature, SO_2 concentration at the inlet, desired removal efficiency, density of the inlet gas, desired pollutant removal efficiency. Potential sources of design parameters include equipment vendors, background information documents used to support NSPS development, control technique guidelines documents, cost manuals developed by EPA, control data in trade publications, and engineering and performance test data.
    b. Develop cost estimates based on readily available published information (such as the *OAQPS Control Cost Manual*) or vendor data. Most of the cost analyses tools that are available (such as the EPA Control Cost Manual) are generally only good to within about 30 percent. This level of precision is sufficient for the reasonable progress analysis. Cost estimates will include capital costs associated with the purchase and installation of new equipment as well as annual recurring costs.
    c. Assess site-specific factors which can significantly impact the installed costs of pollution control equipment, especially for retrofits of existing equipment. Site-specific factors that can impact control costs include: site preparation work; site access for equipment delivery and erection; engineering costs to address piping and

ductwork tie-ins to existing equipment; auxiliary equipment needed to accommodate the new control system (e.g. blowers, heat exchangers, duct burners, or bypass stacks), and lost production due to process equipment down time while the new equipment is being installed.

d. Using the cost information together with emission reductions, the cost-effectiveness will be defined in terms of dollars per ton of emission reduction.

2. Time Necessary for Compliance:
   a. Assess the time frame to achieve the degree of improvement specified, considering the improvement expected at full implementation of a control measure compared to the incremental reduction achievable as a function of time (for example, diesel retrofits for non-road vehicles may take many years for full fleet turn over). This factor will consider availability, cost, and installation time of control equipment, as well as retrofit issues. Consult with vendors to determine typical time frames for installing control equipment, including time necessary for engineering design, financing, fabrication, installation, and testing of equipment.
   b. This factor will determine whether the control strategy could be fully implemented across the source category by 2018. If the control strategy cannot be fully implemented by 2018, emission reductions will be calculated based on the percentage of the source category that would be able to comply by 2018. In the case of individual sources, this parameter will be compiled based on estimates of control technology availability, availability of funds to implement the control, installation time, and retrofit issues.
3. Energy and Non-Air Impacts:
   a. Examine the energy impacts of each control technology to determine whether that technology results in any significant energy penalties or benefits.
   b. Evaluate non-air impacts, such as direct energy consumption, availability of fuels and the impact of fuel selection on cost (market factors), solid or hazardous waste generation and discharges of polluted water from a control device, and atmospheric deposition of pollutants to create or exacerbate impacts on land or in water.
   c. Evaluate other adverse environmental impacts such as noise levels.
   d. Assess secondary non-air benefits to the environment, such as a decrease in the nitrogen loading in nearby sensitive water bodies.
4. Remaining Useful Life of the Source:
   a. Identify age of affected equipment, average retirement rates for similar sources, and any site-specific factors that may influence the remaining useful life of the equipment. Some sources, particularly in the EGU category may come to the end of their useful lives during the 2008-2018 planning period. It is possible that some of these sources will continue to operate after that time regardless. MACTEC will investigate this potential problem as it pertains to add-on controls and emission reductions at these facilities.
   b. Determine whether the amortization of capital costs or calculation of annual operating costs would be affected by the remaining useful life.
   c. This factor may not be applicable for some source category analyses. MACTEC will assess applicability of this factor to each source. In cases for which this factor is not

applicable, MACTEC will provide an explanation indicating the reasons that the factor is not applicable.

The results of the four-factor analysis will aid states in determining additional controls that will be needed to achieve the 2018 reasonable progress goals toward natural background conditions and the degree of visibility improvement expected from the strategies identified. We will document the specific procedures and the recommended reasonable progress control levels and approaches recommended for each source for presentation to MARAMA.