

FINAL WORK PLAN

**Assessing Reasonable Progress for Regional Haze
In the Mid-Atlantic North Eastern Class I Areas**

Prepared for:

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Submitted by



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INTRODUCTION

MACTEC Federal Programs, Inc. is submitting this Final Work Plan to the Mid-Atlantic Regional Air Management Association, Inc., (MARAMA) to prepare technical support documents to help assess reasonable progress for addressing regional haze in Class I areas of New Jersey, Vermont, New Hampshire, and Maine and to help assess reasonable progress in Class I areas outside the MANE-VU region affected by emissions from the region. Specifically, the technical support documents will (1) identify priority source categories and control options for analysis, (2) develop a methodology for addressing the four reasonable progress factors required by Section 169A of the Clean Air Act, and (3) apply the methodology for each control measure to each source category. This information will be used by the MANE-VU states to support the development of State Implementation Plans for regional haze.

Dr. Arthur Werner will serve as the Project Manager. He has managed emissions assessments and control technology evaluations for electric generating units, NSPS and NESHAP development, PM_{2.5} emissions measurements, and the NARSTO emissions inventory assessment. Ed Sabo will serve as technical advisor. Mr. Sabo managed both the OTC and MRPO control measures projects, and prepared the 2009/2018 emission forecasts for the point source sector for both MANE-VU and VISTAS. William Barnard will provide assistance in developing the methodology for conducting appropriate economic and engineering analyses of the four factors. Dr. Kenneth Meardon and Charles Hester have extensive experience evaluating energy and non-air impacts through their work in developing NSPS and NESHAP standards for EPA. Supporting these senior staff members will be Lori Cress, Bernd Haneke, and William Hodan who are experienced in control technology assessments and standards impact analyses.

TECHNICAL PLAN

Our technical plan is based on our experience in identifying and evaluating control measures for the OTC and MRPO, our understanding of the requirements specified in the RFP, and our understanding of the expectations set forth in EPA's *Draft Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program, November 28, 2005*. Additionally, discussions of the goals of this project were reviewed in a conference call kick-off meeting on January 5, 2007. The kick-off meeting served to provide additional detail concerning the goals of the workgroup, and MACTEC has incorporated the knowledge gained from that kick-off meeting in this work plan.

MACTEC will provide technical support in examining the four factors needed to determine reasonable progress for regional haze for the initial implementation period (i.e., by 2018). This examination will focus on the Class I areas in New Jersey (Brigantine Wilderness Area), Vermont (Lye Brook), New Hampshire (Presidential Range/Dry River Wilderness and Great Gulf Wilderness), and Maine (Acadia National Park, Roosevelt/Campobello International Park, and Moosehorn Wilderness Area). In addition, the effect on emissions from the MANE-VU region on Class I areas in Virginia (Shenandoah and James River Face) and West Virginia (Dolly Sods) will be addressed.

Task 1 – Kick-off Meeting and Preparation of Final Work Plan

After contract award on January 5, 2007, MACTEC held an internal kick-off meeting with project personnel to clarify scope, schedule, budget, roles and responsibilities, and areas of uncertainty. MACTEC obtained and reviewed existing information, including available guidance documents (*Draft Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program*, November 28, 2005, *Additional Regional Haze Questions*, August 3, 2006, *Approaches for Meeting Reasonable Progress for Visibility at Northern Class I Areas*, Draft, September 29, 2005, *Regional Haze and Visibility in the Northeast and Mid-Atlantic States*, February 2002, *Trajectory Analysis of Potential Source Regions* February 2002, *Review of STM and Monitoring Data* March 2003, *A Year in Review* December 2004, *Contributions to Regional Haze in Northeast and Mid-Atlantic United States* August 2006, *Reasonable Progress Goals* May 2006, *OTC Control Measures Summary Sheets* 2006, *Assessment of Control Technology Options for BART-Eligible Sources* March 2005, *Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region* Draft October 2006, *MANE-VU Open Burning in Residential Areas. Emissions Inventory Development Report* January 2004, *Controlling Fine Particulate Matter Under the Clean Air Act: A Menu of Options* March 2006, and *LADCO White Papers* 2005-2006).

MACTEC participated in a kick-off teleconference with the MARAMA Project Manager and technical support committee on January 5, 2007. The kick-off teleconference reviewed the scope of work in the RFP, MACTEC's proposal, and discussed the schedule for this project.

Information collected during the kick-off teleconference call is being used to prepare this Draft Final Work Plan (with technical activities, schedule, and deliverables) within two weeks of contract award. We will provide the Draft Final Work Plan to the Project Manager and technical support committee (TSC) for review and comment (allowing a one week comment period). Upon receipt and evaluation of all comments, we will finalize the Work Plan, which will guide all future technical activities. One electronic copy of the work plan (in Word and PDF) will be delivered to the MARAMA Project Manager and the TSC.

Task 2 – Summarize and Define Appropriate Emission Control Scenarios

MANE-VU has analyzed the contribution of source categories and specific sources that contribute to visibility impairment on average and best/worst days in Class I areas. A list of preliminary source categories for further analysis was presented in the RFP for this project. Also a preliminary list of individual facilities for analysis has been assembled from a modeling analysis. Additional refinement of the modeling of contributions from individual facilities is expected to be completed early in this project, and the results will be used to develop the final list of facilities for control scenario analysis. The preliminary list of source categories and facilities consist of the following:

(a) Source Categories

- Electric Generating Units
- Industrial, Commercial, and Institutional Boilers
- Residential Wood Combustion and Open Burning

- Home Heating Oil
- Cement Kilns
- Lime Kilns
- Smelters
- Other major sources of sulfate and/or wood smoke, (*Note: Sources of organic carbon were excluded from this analysis because sources of organic carbon are dominated by natural sources. Sources of ammonia were excluded from this analysis because sulfate, organic carbon, and wood smoke are believed to be the dominant visibility impairing pollutants in the region.*)

(b) Sources – 30 to 50 individual sources

The priority individual facilities will be determined by MARAMA and the TSC, based on 2002 base year emissions, information on expected future year emissions, proximity to Class I areas, Q/d values, and visibility impacts (based on source apportionment modeling).

MACTEC will build a summary of work completed previously and under this contract pertaining to selection of source categories and individual sources. Information from documents referred to in Task 1 of this work plan together with new information discussed in workgroup teleconferences will be used to develop the summary.

MACTEC will define appropriate emission control scenarios for the designated source categories and individual facilities. It was noted in the kick-off meeting for this project that in addition to the source categories listed in the RFP, MACTEC should review the categories being analyzed by VISTAS and LADCO and recommend any other source categories should be included in the analyses. It was also noted in the kick-off meeting that a cost analysis of decreasing the sulfur content of fuels to 500 and 15 ppm be completed as part of this task.

The geographic scope of the category-level strategies and the specific sources to be examined will be determined by MARAMA and the TSC. Preliminary information suggests that sources in the following states are important contributors to visibility impairment in the northern Class I areas: West Virginia, Ohio, Pennsylvania, Kentucky, Indiana, New York, Virginia, North Carolina, Illinois, Georgia, Missouri, New Jersey, Tennessee, Maryland, and Eastern Canada. Additional source apportionment analyses are underway to provide further contribution information.

Once the source categories and specific sources have been identified, the next step is to determine the emission reductions expected from “on-the-books” State, federal, and local control measures that can be expected from the identified sources or source categories. This information will be obtained by comparing the baseline 2002 RPO emission inventories and the 2018 RPO projection emission inventories. Some additional analyses may be needed to isolate additional emission reductions due to BART requirements. Also, MACTEC will coordinate with the MARAMA TSC with respect to obtaining data for sources in Eastern Canada.

The third step under this task is to identify the suite of options to obtain further reductions from these sources. MACTEC will identify appropriate emission control options for priority source

categories and 30 to 50 individual facilities. General data regarding control options will be developed based on the following information sources:

- LADCO's existing White Papers and BART regional engineering analyses for source categories prepared by MACTEC;
- OTC's Control Measure Summary Sheets for specific source categories prepared by MACTEC;
- EPA's *AirControlNET Version 4.1 Documentation Report*, September, 2005;
- STAPPA/ALAPCO's *Controlling Fine Particulate Matter Under the Clean Air Act: A Menu of Options*, March 2006;
- NESCAUM's *Assessment of Control Technology Options for BART-Eligible Sources: Steam Electric Boilers, Industrial Boilers, Cement Plants, and Pulp and Paper Facilities*, March 2005;
- European Commission reports such as *Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques in the Cement and Lime Manufacturing Industries* and similar publications for other source sectors;
- Discussions with State agencies regarding control options for similar types of sources resulting from BACT, RACT, MACT, BART, and other regulatory control programs;
- Other relevant publications.

With respect to identifying emission control options for the 30-50 individual facilities, it is necessary to know what (if any) existing controls are in place, and whether the individual sources have made commitments to install control equipment in the future resulting from new regulatory programs, NSR review, BART requirements, or enforcement actions. MACTEC will identify existing pollution control systems by obtaining and reviewing each facility's Title V permit. Information about future planned control systems will be obtained from State representatives. The level of detailed analysis for individual facilities will be constrained by available funds and time constraints.

Since some of the individual facilities are located outside of the MARAMA or MANE-VU regions (i.e., Ohio, Kentucky, Indiana, Illinois, Georgia, Missouri, Tennessee, and Eastern Canada.), MACTEC will work with the TSC to establish a protocol for communicating with representatives from these jurisdictions. MACTEC suggests that MARAMA make the initial contacts with other RPOs (CENRAP, MRPO, and VISTAS) and appropriate Canadian representatives to inform them of this project and to request their assistance in supplying source-specific data to MACTEC. We would like to work with a single point of contact at each of these agencies to help us obtain information about existing control systems and information about future planned control systems.

The deliverable for this task will be a draft and final memorandum on control scenarios and a PowerPoint presentation summarizing this work. The memorandum will include a narrative discussion of the process used by MANE-VU to identify the sources and source categories to be included in the analysis. The memorandum will also contain two sets of spreadsheets (one for the general source categories and one for the specific facilities) summarizing preliminary information about the emissions and control options for the sources and source categories. A conceptual design for summarizing the control options for the general source categories is as follows:

Source Categories

Source Category	Existing Requirements	Baseline Emissions (tpy)	Control Option	Percent Reduction	Ton per year Reduction	Cost Effectiveness (\$/ton)
ICI Boilers	State Reg. xxx	10,000	LNB/FGR	40	4,000	1,500 – 3,000
			SNCR	60	6,000	2,500 – 5,000
			SCR	80	8,000	3,500 – 7,500

A conceptual design for summarizing the control options for the specific facilities is as follows:

Specific Facilities

Facility	Existing Control Requirement	Baseline Emissions (tpy)	Control Option	Percent Reduction	Ton per year Reduction	Cost Effectiveness (\$/ton)
Facility A – Unit 1 249 mmBtu/hr coal-fired boiler	SO ₂ limit of 2 lb/mmBtu	10,000	Coal with sulfur below approx. 1%	50	5,000	1,000 – 2,000
			Sorbent Injection	60	6,000	2,500 – 4,000
			Post-combustion control	95	9,500	3,500 – 10,000

Task 3 – Define Methods for Evaluating Statutory Factors

Under this task, MACTEC will develop a methodology for conducting appropriate economic and engineering analyses to assess the costs, compliance timeframe, energy and non-air quality environmental impacts, and remaining useful life for affected sources. It is our understanding that the MRPO has initiated a project to develop a methodology for their Northern Class I areas. Other RPOs may have also initiated development of their own methodologies for the four-factor analysis. MACTEC will contact VISTAS and MRPO to determine whether any work completed by those RPOs could be transferable or helpful in developing a methodology for MANE-VU’s use.

Also, many of the methods used by MACTEC in developing the BART regional engineering analyses for the MRPO may be transferable 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.

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 EGU’s, 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. MACTEC has the results of those runs in house. MANE-VU has recently completed new IPM runs for a proposed CAIR+ program with lower caps than the EPA CAIR rule. We will obtain these CAIR+ IPM runs and compare the CAIR+ results to the CAIR results. 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.

We will use the following methodology for the specific facilities.

- (a) Cost of compliance (unless control cost information is available from CAIR or CAIR+ analyses or from States):
 - 1) Identify design parameters for proposed controls; examples of design parameters include type of sorbent and pressure drop in a wet scrubber, or ammonia to NOx molar ratio in SCR; 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.
 - 2) 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.
 - 3) 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.

(b) Time Necessary for Compliance:

- 1) 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). 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.

(c) Energy and Non-Air Impacts:

- 1) Examine the energy impacts of each control technology to determine whether that technology results in any significant energy penalties or benefits.
- 2) Evaluate non-air impacts, such as 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 .
- 3) Evaluate other adverse environmental impacts such as noise levels.
- 4) Assess secondary non-air benefits to the environment, such as a decrease in the nitrogen loading in nearby sensitive water bodies.

(d) Remaining Useful Life of the Source:

- 1) 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.
- 2) Determine whether the amortization of capital costs or calculation of annual operating costs would be affected by the remaining useful life.

MACTEC will prepare a Technical Memorandum that fully describes the input data requirements, sources of data (e.g., publications, state agency files, vendors, and individual facilities), calculations, and reporting of results for each of the four factors. The Technical Memorandum will be sent to the MARAMA Project Manager and the TSC. MACTEC suggests that a teleconference (or small informal workshop with key participants) be held to discuss the methodology and the feasibility of implementing the methodology within the budget and time constraints of this contract. MACTEC will make modifications to the methodology based on the review and comments from the MARAMA Project Manager and the TSC.

Task 4 – Apply Methodology for the Four-Factor Analysis

MACTEC will use the methodology developed in Task 3 to assess reasonable progress for the general source categories as well as the source specific analysis for 30 to 50 sources. We will document the specific procedures and the recommended reasonable progress control levels and approaches recommended for each source for presentation to MARAMA. We will develop charts displaying the following information for each ranked alternative:

- Expected emission rate (tons per year, pounds per hour);

- Emissions performance level (e.g., percent pollutant removed, emissions per unit product, lb/MMbtu, ppm);
- Expected emissions reductions (tons per year);
- Costs of compliance -- total annualized costs (\$), cost effectiveness (\$/ton), and incremental cost effectiveness (\$/ton);
- Energy impacts (indicate any significant energy benefits or disadvantages);
- Non-air quality environmental impacts (includes any significant or unusual other media impacts, e.g., water or solid waste), both positive and negative; and
- Modeled visibility impacts (to be provided by NESCAUM).

This information will assist the States in determining what emission reductions are needed in order to achieve the uniform rate of progress towards natural background conditions and the degree of visibility improvement expected from the strategies identified.

Task 5 – Prepare Technical Documentation and Report

The purpose of this task is to prepare the final project deliverables. These include the following:

- Fifteen copies of the draft final technical report including responses to comments on previous technical memoranda;
- A PowerPoint presentation summarizing the methods used in the project and the results. MACTEC will attend two meetings to present the report and respond to questions;
- Fifteen hard copies of the final technical report, a camera-ready copy of the report, electronic files in PDF and Word format, and 15 data CDs. The report will address comments on the draft final report;
- A PowerPoint presentation summarizing the methods used in the project and the results. MACTEC will attend a meeting to present the report and respond to questions.

We will prepare both paper copies and an electronic copy of the final deliverables to MARAMA.

SCHEDULE AND DELIVERABLES SUMMARY

Table 1 summarizes the interim and final deliverables to be prepared, and provides a planned schedule for completing the project. The period of performance is approximately six months.

Table 1 – Schedule and Deliverables

Task	Deliverable	Draft Deliverable	State Comments	Final Deliverable	Assistance Needed From MARAMA/States
		Due Date	Due Date	Due Date	
1	Kick-off Conference Call	January 5, 2007			TOC participation on the Kick-off Conference Call
	Work Plan	January 19, 2007	January 26, 2007	January 31, 2007	Feedback on the Draft Final Work Plan
	Teleconference	TBD			TOC participation on the call
	Monthly Progress Reports	TBD			
2	Tech. Memo #1- Control Scenarios	January 19, 2007	January 26, 2007	January 31, 2007	Feedback on Draft Tech. Memo #1
3	Tech. Memo #2 – Methods for Evaluation	January 26, 2007	February 2, 2007	February 7, 2007	Feedback on Draft Tech. Memo #2
	Teleconference	TBD			TOC participation on the call
4	Tech. Memo #3 – Statutory Factors	February 15, 2007	February 22, 2007	February 27, 2007	Feedback on Draft Tech. Memo #3
5	Final Report and Presentation	March 30, 2007	April 6, 2007	May 31, 2007	Feedback on draft final report
	Attend a consultation meeting	TBD			Attend, present, and respond to comments at consultation meetings
	Attend a consultation meeting	TBD			Attend, present, and respond to comments at consultation meetings
	Attend a consultation meeting	TBD			Attend, present, and respond to comments at consultation meetings