Analyses Related to the Impact of Air Quality Regulation on the Natural Gas Transmission Industry

Prepared for the INGAA Foundation, Inc., by:
Coerr Environmental
6320 Quadrangle Drive
Suite 320
Chapel Hill, N.C. 27514

F-9203

ANALYSES RELATED TO THE IMPACT OF AIR QUALITY REGULATIONS ON THE NATURAL GAS TRANSMISSION INDUSTRY

Prepared For:

The Interstate Natural Gas Association of America Foundation

Prepared By

Coerr Environmental
Suite 320, 6320 Quadrangle Drive
Chapel Hill, NC 27514
(919) 419-077

May 5, 1992

TABLE OF CONTENTS

I. INTRODUCTION 1

II. DETERMINATION OF BACT REQUIREMENTS FOR PSD PERMITS 3

A. Regulatory Situation 3

B. Key Issues 4

1. Content of the Proposed PSD BACT Rulemaking 4
2. Pressure For More Stringent Control of Transmission Engines 5

C. Action Areas 5

1. Review and Comment on the EPA PSD BACT Rulemaking 5
2. Clarification as to What Constitutes BACT for Gas Transmission Engines 5

III. CAA AMENDMENTS TITLE I: CONTROL OF NOx EMISSIONS 7

A. Regulatory Situation: Clean Air Act Amendments 7

1. General Information on Title I 7
2. Inclusion of NOx Emissions Controls 7
3. Required Stationary Source NOx Measures 8
4. Exemption of NOx Control Measures 9

B. Regulatory Situation: EPA Implementation Actions 11

1. The Title I General Preamble, Draft (1) 11
2. The SAI Study 12
3. The NAS Study 13
4. Title I General Preamble, Draft (2) 15
5. Alternative Control Technique (ACT) Documents 16

C. Issues and Implications 17

1. Increasing Profile of Stationary Source NO_x Controls 17
2. There are Significant Policy and Administrative Barriers to States Acquiring NO_x Exemptions 17
3. There are Significant Barriers to Third Party NO_x Petitions 18

TABLE OF CONTENTS - cont.

4. EPA Only Accepts UAM Photochemical Grid Modeling To Establish NO_x Sensitivity of Ozone Non Attainment Areas 18
5. States Are Now More Important in NO_x Control 18
6. There is Confusion As to What is RACT 19

D. Areas of Action 19

IV. CAA AMENDMENTS TITLE III: AIR TOXICS CATEGORY LISTING . . . 21

A. Regulatory Situation 21

1. General Information on Title III 21
2. EPA Source Category Listing Methodology 21

B. Key Issues and Implications 23

1. EPA Listed Poorly Characterized Source Categories 23
2. The EPA Listing Must Distinguish Between Major and Area Sources 24
3. EPA has Included Categories Without Data on the Amount of Toxic Emissions 24
4. EPA Did Not Base its Listing of Area Source Categories on a Finding of Threat 25
5. There are Errors in the Emissions Speciation Profile Process Used by EPA to Develop Source Category Listings 25
6. EPA Should Subcategorize and Separately Evaluate Natural Gas Combustion Source Categories 26

C. Areas of Action 26

BIBLIOGRAPHY 27

APPENDIX A: BACT "Top Down" Settlement Agreement
APPENDIX B: SAI Study (Title Page, Table of Contents, Summary)
APPENDIX C: NO_x section of second Draft Title I General Preamble

I. INTRODUCTION

This report presents the results of a program of analysis and study performed during 1991 on Clean Air Act regulations which impact the natural gas transmission industry. This program is sponsored by the Interstate Natural Gas Association of America Foundation. The objectives of this work program are to enhance understanding and response of the gas transmission industry to air regulatory issues which affect the installation and operation of gas transmission pipeline facilities.

The 1991 program of studies continues work initiated in 1990 on policy options for responding to EPA's "Top Down" policy for determining the best available control technology (BACT) in Prevention of Significant Deterioration (PSD) permits. The 1990 work was presented in the report, "Options for Addressing EPA's Best Available Control Technology Top Down Policy" issued in January 1991.

Since the issuance of the January 1991 report, two events significantly changed the direction of air regulatory analysis and study during the remainder of 1991. The first event was EPA's signature of a settlement agreement in the litigation brought by industry groups challenging the EPA Top Down policy. In this settlement EPA agreed to initiate formal regulatory procedures for establishing PSD BACT determinations. This had been one of the key objectives of the 1991 Report.

The second major event affecting the direction of air regulatory analysis in 1991 was the passage of the Clean Air Act Amendments of 1990. These amendments introduced significant new programs which affect the permitting of compression facilities in the gas transmission industry. The 1990 Amendments represented the first revision to the Clean Air Act since 1977, and occurred at a time when a large number of urban areas were designated non attainment for ozone (96), carbon monoxide (41), and particulate matter (73). If the timetable of the new Act were to be met, the Amendments would result in EPA's issuance of 55 major

rules and 30 regulatory guidance packages by November 1992, and the issuance of a total of 200 regulations overall. As a combustion fuel, the natural gas transmission industry is broadly effected by the Amendments. A positive effect comes from the potential of increased substitution of natural gas for coal or oil, both of which may be subject to more costly air pollution controls. A negative effect comes from the new imposition of emission controls for NO_x and air toxics, and a general increase in the cost and complexity of acquiring air permits for natural gas transmission facilities. A further negative effect comes from the increased uncertainty and cost of permitting which will be experienced by the end users of natural gas.

In view of EPA's agreement to issue a PSD rule for BACT determination and the advent of the Clean Air Act Amendments, the 1991 program of air regulatory analysis and study was directed at the following topics:

- Monitoring EPA's formal rule development process for PSD BACT determination;

- Review and analysis of the Title I and Title III provisions of the 1990 CAA Amendments;

- Review and analysis related to comment development for policy and regulatory documents issued by EPA to implement the Amendments.

The following sections of this report present detailed information about the 1991 program of air regulatory analysis and study. The format for these sections is to first describe the current regulatory situation, to then discuss key issues which affect the gas transmission industry, and to conclude with the listing of possible action areas.

II. Determination of BACT Requirements for PSD Permits

A. REGULATORY SITUATION

State air permits for major new sources or facility modifications in areas attaining the National Ambient Air Quality Standards are governed by EPA's Prevention of Significant Deterioration (PSD) regulations. One of the criteria for approval of a PSD permit is that it specify "best available control technology" (BACT). In 1988, EPA issued new guidance, by administrative memorandum, which required that states determine BACT by requiring the "top down" approach. Using this approach the applicant must first consider the most stringent available control technology, and either accept it or justify why it should not be adopted. The January 1991 INGAA Foundation report documented a number of objections to the EPA Top Down Policy. These objections included: the imposition of controls which have not been demonstrated to be technically reliable; the imposition of costly emissions reductions which have little effect on air quality; the possible exacerbation of other environmental problems by looking only at reducing the emissions of one pollutant; and eclipsing the states' responsibility to balance technical, economic, and other environmental goals in making BACT decisions.

Following EPA issuance of the Top Down policy, in the 1989 and 1990 period the American Paper Institute (API) and the National Forest Products Association (NFPA), the Alabama Power Company (APC), and the Utility Air Regulatory Group (UARG) filed petitions or complaints challenging EPA's imposition of this requirement without a formal rulemaking. During 1989 and early 1990 EPA appeared unwilling to negotiate the Top Down policy, but in September of 1990 the Agency decided to open settlement negotiations. Early in the negotiations EPA indicated a willingness to proceed with a formal rulemaking on PSD BACT determinations. A more difficult point of negotiation, however, was how BACT determinations would be made in the interim period before new regulations were established. A Settlement Agreement was signed on July 9, 1991, with the following key provisions:

1. EPA agreed to initiate formal rulemaking on how BACT determinations should be made, with a regulatory proposal to appear in the Federal Register within 180 days, followed by final action as expeditiously as possible.

2. In the interim period, existing PSD rules would remain in effect. Existing guidance to the states on BACT determinations would not be binding or have the effect of law.

The settlement deadline for EPA's proposal of new PSD BACT passed in December of 1991. In 1991 EPA prepared the proposed regulations and forwarded the regulatory package to the Office of Management and Budget for review. EPA is now waiting for OMB release of the new PSD BACT regulations. A copy of the settlement agreement regarding the determination of PSD BACT is included in Appendix A.

B. KEY ISSUES

1. Content of the Proposed PSD BACT Rulemaking

EPA's agreement to pursue formal rulemaking related to the determination of PSD BACT has the advantage of opening the process to external review and comment. The settlement agreement, however, made no reference to abandoning the Top Down approach to selecting BACT control technologies. It is possible that EPA could now propose to adopt as a rule the same BACT procedure which it pursued as an administrative policy. It is more likely, however, that EPA will propose some form of compromise which strengthens PSD BACT determinations without specifically mentioning a Top Down process.

2. Pressure For More Stringent Control of Transmission Engines

Whatever the resolution of the Top Down BACT policy, many of the elements of this policy are permanently part of the air permitting community. It is generally regarded as appropriate to force permit control technology improvements by review of what has been required elsewhere in the country, or in related industries. The gas transmission industry will continue to feel the pressure from permitting actions on similar compression turbines or reciprocating engines. Also, end uses of natural gas fuel burning equipment, such as cogeneration, will be impacted.

It is important to note that PSD BACT issues extend beyond NOx controls. In PSD permit review BACT analysis is performed for each significant regulated pollutant. Some state air pollution control agencies have required carbon monoxide (CO) catalysts on lean burn reciprocating engines. Carbon Monoxide controls may be becoming a second PSD BACT issue.

C. ACTION AREAS

1. Review and Comment on the EPA PSD BACT Rulemaking

When the EPA BACT proposed rule is published in the Federal Register, there will be an opportunity for submitting comments to EPA. At this opportunity the Gas Transmission Industry should be ready to analyze the proposed regulation and to submit comments. Some of the comment content can be drawn from the 1991 INGAA Foundation Report.

2. Clarification as to What Constitutes BACT for Gas Transmission Engines

In addition to responding to the EPA rulemaking, the gas transmission industry should continue efforts to communicate technical information about compressor engine applications to the air permitting community. For example, in 1991 two presentations were made to

EPA's NSR Workshop for state permitting officials. This type of presentation supports the industry's effort to differentiate the gas transmission engine applications from other applications where some emissions controls conditions are more viable. Other areas of activity include review of EPA's permitting clearinghouse information, and contribution of technical material to EPA's development of NO_x alternative control technique documents (ACTs) under Title I.

III. CAA AMENDMENTS TITLE I: CONTROL OF NO_x EMISSIONS

A. REGULATORY SITUATION: CLEAN AIR ACT AMENDMENTS

1. General Information on Title I

Title I of the Clean Air Act Amendments of 1990 set forth new EPA programs of emissions controls for geographical areas which are designated as not attaining the National Ambient Air Quality Standards (NAAQS). Title I is mainly focused on ozone and carbon monoxide attainment, and from the point of view of the natural gas transmission industry, the ozone requirements have the greatest potential impact. Title I classifies ozone nonattainment areas into categories based on severity of the ozone problem, and requires increasingly stringent state emissions control programs for each area category.

It is important to note that the Clean Air Act and the new Title I amendments establish the requirements for State air pollution control programs. The state programs are submitted to EPA for approval as State Implementation Plans (SIPS). Title I lists new requirements which are placed on the states, and which the states must incorporate into their SIPS in accordance with the schedule mandated by the Act. The actual impact of the CAA Amendments on the gas transmission industry will come secondarily when the provisions of state air laws and regulations come to bear on individual facilities.

2. Inclusion of NO_x Emissions Controls

The 1990 Amendments require, for the first time, that states control NO_x emissions from major stationary sources in ozone nonattainment areas. Section 182(f) states:

> The plan provisions required under this subpart for major stationary sources of volatile organic compounds shall also apply to major stationary sources...of oxides of nitrogen.

Until the passage of this requirement, EPA's ozone attainment program had for twenty years focused exclusively on reducing emissions of hydrocarbons. Although the science of ozone photochemistry is based on the reactions of hydrocarbon and nitrogen oxide precursors, the dominant regulatory view until the 1990 Amendments had been that the ambient concentration of hydrocarbons was the rate limiting factor in ozone formation. The possibility of incorporating NO_x controls into state ozone SIP strategies was suggested in EPA's post '87 ozone strategy issued in 1988. This suggestion, however, was only to allow the states discretion to use NO_x controls in addition to hydrocarbon controls, and stopped well short of considering mandatory controls for all areas. Mandatory across the board NO_x control measures were not part of the administration bill, and EPA appears to have been surprised by inclusion of mandatory VOC equivalent NO_x measures in the House bill and the final Act.

3. Required Stationary Source NO_x Measures

By virtue of Section 182(f) state ozone SIP programs are required to include measures for NO_x emissions reductions from stationary sources. In parallel with VOC requirements, "moderate", "serious", "severe", and "extreme" ozone nonattainment areas are now required to establish the following control or reporting measures.

- Application of Reasonably Available Control Measures (RACT) NO_x control technology for existing major sources;

- Application of Lowest Achievable Emissions Rate (LAER) NO_x control technology for new sources;

- Acquisition of emission offsets from other existing sources of NO_x emissions as a precondition to permitting new sources; and,

- Submission of emissions statements to the state by the owner or operator of a NO_x emissions source reporting actual emissions. These statements are to contain an accuracy certification.

The timetable in Title I of the Amendments requires that states submit SIP revisions containing RACT and New Source Review (NSR) Measures to EPA by November of 1992. As the SIP revisions must contain state regulations already passed by the states, this implies that the process of adopting state regulations must begin at least a year before the EPA deadline. The first emission statements are due to be submitted by facility owner/operators by November of 1993.

In addition to the direct NO_x control measures, Title I contains a number of other provisions which may impact gas transmission facilities. These provisions include:

- For areas classified as "serious" or above, states must submit SIPs in 1994 demonstrating projected attainment. In developing the demonstration SIPs states may find that additional NO_x control measures are required beyond RACT/LAER and offsets.

- In developing demonstration SIPs states may propose to EPA the substitution of NO_x controls for VOC controls. For "serious" ozone areas NO_x/VOC substitution may also be used after 1996 by states in meeting the Act's requirements for "reasonable further progress" emissions reductions.

4. Exemption of NO_x Control Measures

Section 182(f) established NO_x controls, but also sets up a discretionary mechanism to exempt or relax NO_x control measures. These provisions reflect the concern by the Congress, and

the Conference Committee in particular, about scientific uncertainty on when NO_x emissions reductions would be ineffective or even counterproductive.

The three paragraphs of Section 182(f) were intended to establish a way to avoid irrational imposition of full NO_x measures where they were not needed. The NO_x exemption or relaxation criteria in the Act is detailed in Tables 1 and 2. As shown in these tables, the first paragraph contemplates total NO_x exemptions as possible for either a source category or for a geographical nonattainment area. The second paragraph allows a graduated application of NO_x controls where EPA finds excess emissions reductions would occur.

Table 1. 182(f) NO_x REQUIREMENTS, PARAGRAPH(1)	
"The plan provisions required under this subpart for major sources of VOCs shall also apply to major sources of NO_x." This subsection shall not apply to:	
Exempt Category	If EPA Determines
NO_x SOURCES	NET AIR QUALITY BENEFITS ARE GREATER IN THE ABSENCE OF NO_x REDUCTIONS FROM SUCH SOURCES
NONATTAINMENT AREAS NOT IN TRANSPORT REGIONS	ADDITIONAL NO_x REDUCTIONS WOULD NOT CONTRIBUTE TO ATTAINMENT OF THE OZONE NAAQS IN SUCH AREA
NONATTAINMENT AREAS IN TRANSPORT REGIONS	ADDITIONAL REDUCTIONS WOULD NOT PRODUCE NET OZONE AIR QUALITY BENEFITS

Table 2. 182(f) NO_x REQUIREMENTS, PARAGRAPH (2)	
"If EPA determines that excess reductions in emissions of NO_x would be achieved under paragraph (1), EPA may limit the application of paragraph (1) to the extent necessary to avoid achieving such excess reductions."	
EXCESS REDUCTIONS IN EMISSIONS EXIST IF EPA DETERMINES:	
A.	NET AIR QUALITY BENEFITS ARE GREATER IN THE ABSENCE OF SUCH NO_x REDUCTIONS; OR,
B.	FOR NONATTAINMENT AREAS, NOT IN A TRANSPORT REGION, EMISSIONS REDUCTIONS WOULD NOT CONTRIBUTE TO ATTAINMENT OF THE NAAQS IN THAT AREA
C.	FOR NONATTAINMENT AREAS, IN A TRANSPORT REGION, EMISSIONS REDUCTIONS WOULD NOT PRODUCE NET AIR QUALITY BENEFITS IN SUCH REGION

B. REGULATORY SITUATION: EPA IMPLEMENTATION ACTIONS

The CAA Amendments require EPA to produce policy, regulatory, and technical guideline materials to implement the new provisions of the Act. This section describes the current situation for some of the main implementation packages that have been produced in 1991.

1. The Title I General Preamble, Draft (1)

In June of 1991 EPA issued a draft document titled, "General Preamble, Implementation of Title I, Clean Air Act Amendments of 1990. The stated purpose of the document was to "provide guidance to assist states in preparing new state implementation plans." The draft Preamble contained discussion material describing EPA's interpretation of the Amendments that would govern approval of SIPs. On June 25 and 26 EPA held a public meeting to

receive comments on the draft Preamble. At this meeting EPA provided a compilation of briefing charts titled,"Supplementary Materials" General Preamble Public Meeting.

As a part of its section on the requirements for ozone SIPS, the draft Preamble contained a section on the requirements for NO_x controls. This section proposed that states should proceed to submit SIPS containing NO_x measures, but noted other alternatives for delaying or exempting the imposition of NO_x measures, such as modeling for exclusion of NO_x sources. Following the public meeting, EPA accepted public comments on the draft Title I preamble. The INGAA/AGA Title I Task Group submitted comments to EPA on July 26, 1991.

2. The SAI Study

The problem in using the exemption provisions in Section 182(f), is that states do not have the time or technical resources needed to evaluate whether an ozone nonattainment area could qualify. State RACT regulations must be adopted and submitted to EPA by November, 1992, before nonattainment area modeling can be performed. To address the 182(f) problem, EPA moved to develop guidance to states and others regarding area or category NO_x exemptions. EPA/OAQPS issued a work assignment to Systems Applications International (SAI) to model the ozone effects of VOC and NO_x control strategies for three cities and to develop both a non modeling and a "screening mode" modeling procedure for classifying ozone nonattainment areas with regard to NO_x sensitivity.

The SAI study involved use of the Urban Airshed Model (UAM) to model three cities; Detroit, St. Louis, and Baton Rouge. The city selection was oriented to obtaining results for a spread of latitudes, rather than a variety of emissions inventory characteristics. The latitude affects the intensity of insolation in ozone photochemistry. The modeling analysis was single day simulations in a geographical scope of a 132 by 132 kilometer grid.

The UAM model was used by SAI in a "screening mode", which simplified the modeling exercise by using readily available emissions inventory and meteorological information. The

inventory data comes from data files collected for the National Acid Precipitation Assessment Program (NAPAP), rather than the inventory developed by the state air pollution control agencies. The meteorological data input is averaged meteorological data, in place of data developed from specific day ozone episode analysis. The simplification of the UAM process lowered the cost and shortened the schedule of the work assignment, but more importantly, simulated a possible economical and quick use of the UAM model for evaluation of the importance of NO_x emissions.

The INGAA/AGA Task Group representatives met with SAI on May 22, 1991, at the SAI offices located in Raleigh, North Carolina. SAI discussed several key parameters which would be involved in its study, including the characteristics of the area ozone design value, stationary source emissions, mobile source emissions, emission VOC/NO_x ratio, ambient measured VOC/NO_x ratio, latitude, and general meteorology. SAI stated that they were not optimistic that a reasonable inference technique could be developed based on the modeling of just three cities. They also indicated that because ozone photochemistry is episode specific, and non linear in response to various factors, there are real difficulties in attempting to generalize and transfer the results of modeling one city to another.

SAI completed its study in September of 1991. In spite of its efforts, both EPA and SAI concluded that a non modeling "look up table" method could not be developed for classification of ozone areas with regard to the impact of NO_x control measures. It was also concluded that the "screening mode" UAM analysis was also insufficient for use in NO_x classification of ozone areas. The summary and table of contents of the SAI study are found in Appendix B.

3. The NAS Study

Section 185B of the Clean Air Act Amendments of 1990 instructed EPA to conduct a study which included review of the role of NO_x in ozone formation. Section 185B states:

> The Administrator, in conjunction with the National Academy of Sciences, shall conduct a study on the role of ozone precursors in tropospheric ozone formation and control. The study shall examine the role of NO_x and VOC emission reduction, the extent to which NO_x reductions may contribute (or be counterproductive) to achievement in different attainment areas...

The section further stated that EPA was to complete this study and issue it for public comment by November of 1991, with a report to Congress to follow in February 1992.

This requirement demonstrated the concern of Congress about automatic implementation of NO_x measures. The 185B study was explicitly linked to EPA's determinations under Section 182(f) which states:

> The Administrator shall, in the Administrator's determinations, consider the study required under Section 185B.

Section 182(f) also stipulates that third party NO_x petitions can be submitted to EPA for consideration only after the 185B study is submitted to Congress.

Following passage of the 1990 Amendments, EPA indicated that the main portion of the 185B Study was being done by the National Academy of Science (NAS), and in fact EPA and others had initiated the NAS work before passage of the Act. EPA's plan was to receive the NAS study, add some of its own material, and issue the combined report as the 185B study.

While the Amendments required that the 185B study be issued for public comment in November 1991, in fact NAS did not issue its 400 page ozone study,"Rethinking the Ozone Problem in Urban and Regional Air Pollution" until December 1991. Chapter 11 of the NAS Report addressed the issue of the role of NO_x emissions in ozone formation and the effectiveness of NO_x control measures. The report noted that the impact on NO_x controls on ozone levels was complex, and could reduce ozone under some conditions. However, the

overall conclusion of the NAS report endorses widespread application on NO_x control measures:

> **FINDING:** State of the art air quality models and improved knowledge of the ambient concentrations of VOCs and NO_x indicate that NO_x control is necessary for effective reduction of ozone in many areas of the United States.

As of the end of April 1992 EPA has not issued the 185B Study for comment.

4. The Title I General Preamble, Draft (2)

In response to comments received on the first draft, and further agency analysis, EPA prepared a second draft of the Title I General Preamble. The agency completed work on this document on October 9, 1991, and submitted the new draft to the Office of Management and Budget (OMB) for review. EPA intended that the second draft would not be released until it was made final. However, in November 1991 the 400 page draft appeared in an EPA rulemaking docket, and was obtained as a public document by external parties. On Pages 174 to 189 second draft preamble discusses EPA's interpretation of Section 182(f) NOx requirements. The EPA NOx policy presented in the second draft preamble included:

- procedures for states or third parties to request exemptions;
- definitions of key concepts, such as "excess emissions", and "net air quality benefits"; and,
- possible deferments of NO_x measures for areas without previous photochemical grid modeling.

The second draft preamble section on NO_x requirements is included in Appendix C.

On April 16, 1992 EPA issued the Title I Preamble as a Federal Register Notice. Because of controversy surrounding the NOx exemption issue, EPA removed the NOx provisions from the final General Preamble. EPA has indicated that the NOx requirements/exemption material may be issued later this year as a separate Federal Register notice.

5. Alternative Control Technique (ACT) Documents

Section 183(c) of the 1990 Amendments provided that:

> Within 3 years...the Administrator shall issue technical documents which identify alternative controls for all categories of stationary sources of volatile organic compounds and oxides of nitrogen which emit or have the potential to emit 25 tons per year or more of such pollutant.

The NO_x sources identified by EPA as having emissions greater than 25 tons per year include natural gas fueled gas turbines, reciprocating engines, and process heaters. EPA has moved to prepare the NO_x ACT documents ahead of schedule in order to assist states in their development of NO_x control measures.

In July of 1991 EPA issued its draft ACT document on gas turbines, "Alternative Control Technology Document- Stationary Combustion Gas Turbines." This document was reviewed by the INGAA/AGA Task Group, and the group's comments on this draft were submitted to EPA on August 30, 1991. The Task Group also met with representatives of EPA to discuss the document on September 19, 1991. A key point made to EPA was that the ACT document should distinguish between various applications of similar engines. For example, controls which were feasible for a cogeneration turbine could not be assumed to function for a gas transmission turbine.

At the present time the INGAA/AGA Title I Task Group is preparing material to provide to MRI, an EPA contractor on the other two ACT documents involving reciprocating engines and process heaters.

C. ISSUES AND IMPLICATIONS

1. Increasing Profile of Stationary Source NO_x Controls

The advent of NO_x emissions control measures as a part of EPA's ozone strategy has dramatically increased the regulatory profile of large stationary NO_x sources. The ozone program represents EPA's most complex and most stringent air control program, the VOC portion of the ozone program has been evolving for twenty years. NO_x control has now been interjected into ozone planning.

2. There are Significant Policy and Administrative Barriers to States Acquiring NO_x Exemptions

As a practical matter, it appear virtually impossible at this time for a state to successfully acquire an EPA NO_x exemption or relaxation under the provisions of 182(f). The barriers to state action include:

- EPA has not issued Title I NOx guidance, and is not actively encouraging NO_x effectiveness evaluation or exemptions requests;

- States have a mandatory obligation to include NO_x measures in SIPs to be submitted to EPA by the November 1992 deadline. States do not have extra resources to do NO_x analyses, or the political strength to offend VOC sources by exempting NO_x.

- To date, most ozone modeling shows some form of benefit from NO_x controls. For example,

population exposure to ozone may increase even where NO_x controls result in decreases in ozone peaks.

3. There are Significant Barriers to Third Party NO_x Petitions

EPA concerns about NO_x analyses have principally been directed to the state air quality planning process, and there has been little thought about how to handle third party petitions. The Title I Preamble does state that EPA will forward such petitions to the state for review. It can be expected that the State response will strongly influence EPA's disposition of the petition. In any case no petition can be considered by EPA until the 185B study has been sent to Congress, which would place its consideration late in the state/EPA SIP development process. It is conceivable, however, that EPA could be compelled to approve a very narrow petition concerning one or a small number of sources in a limited area where strong net air quality benefits arguments could be made.

4. EPA Only Accepts UAM Photochemical Grid Modeling To Establish NO_x Sensitivity of Ozone Non Attainment Areas

The SAI study appeared to be EPA's last chance to establish some quick way for states to establish technically that an ozone area might qualify for a NO_x exemption. The failure of this study leaves states without an immediate method to support the effort to request an exemption from EPA. The NAS study also offered little specific guidance for individual ozone areas.

5. States are Now More Important in NO_x Control

There are a number of factors which have made states more important in NO_x control issues. The first is that Section 182(f) only contemplates NO_x exemptions in the context of specific State SIP approvals for ozone nonattainment areas. Even if the process for acquiring NO_x

exemptions were an easy one, it would have to be pursued separately for each ozone area. A second factor is that without the issuance of a Title I policy from EPA, states or associations of states, are proceeding to develop their own policies with regard to NO_x control. This is particularly true for the Northeast states which are developing NO_x policies through NESCAUM and the Northeast Regional Transport Area Commission.

6. There is Confusion As to What is RACT

The sudden inclusion of NO_x control in ozone planning has meant that control technology terminology that has been developed for VOCs is now being applied to NO_x. EPA, however, has had many years to work out RACT definitions for VOC sources, mainly through development of Control Technique Documents (CTGs). However, there are no CTGs for NO_x sources, and EPA has no plans to develop such documents. The Act did require ACT documents, but unlike CTGs the ACT document does not establish a presumptive technology level. The ACT documents simply describe various technologies without making any decision as to what is administratively to be considered "RACT" or "LAER".

D. AREAS OF ACTION

The first area for potential actions relates to the Title I NOx control issues in the regulatory and guidance process now underway at EPA. Items to monitor include:

- Possible EPA Title I NOx Guidance
- EPA's NO_x/VOC Trade-Off Guidance
- ACT Documents
- The 185B Report to Congress

The second area for potential actions relates to analysis of the administrative process related to 182(f) NO_x exemptions. Such work could be directed at development of the specific content which would need to be included in administrative petitions or legal actions related to a 182(f) petition.

A final area for potential action is review of the technical basis for establishing NO_x impacts on ozone levels. This should be done from the point of view of individual sources, source categories, stationary NO_x sources in general, as well as on a nonattainment area basis.

IV. CAA AMENDMENTS TITLE III: AIR TOXICS CATEGORY LISTING

A. REGULATORY SITUATION:

1. General Information on Title III

Section 112(c) of the amended Clean Air Act (CAA) requires EPA to publish, within one year of enactment, a list of categories and subcategories of major and area sources of 112(b) Hazardous Air Pollutants (HAPs). Such a listing is the initial step in EPA's process of setting emission standards for HAPs by category or subcategory. The promulgation of emission standards is to begin no later than two years after enactment (i.e., November 1992) with an initial group of 40 categories [Sec.112(e)(1)(A)].

EPA's "Preliminary Draft List of Categories, Subcategories under Section 112 of the Clean Air Act" was published in the Federal Register on June 21, 1991 (56 FR 28548). Ten categories on EPA's draft list are of interest to the natural gas industry. They are:

Industrial Reciprocating IC Engines
Industrial External Combustion Boilers
Institutional External Combustion Boilers
External Combustion Space Heaters
Industrial Electric Generation Turbines
Commercial / Institutional Turbines
Commercial Reciprocating IC Engines
Oil and Gas Steam Generation
Oil and Gas Production
Natural Gas Storage / Transmission

2. EPA Source Category Listing Methodology

While EPA may "distinguish among classes, types, and sizes of sources within a category or subcategory" in setting emission standards [Sec.112(d)(1)], the concern is that, as a practical

matter, there will ultimately be a single standard for each category or subcategory. Consequently, it is important to know what kind of sources are included in each listed category and the methodology utilized by EPA to develop the list.

Two informational meetings were held with EPA/OAQPS officials identified with the category listing project to clarify points of methodology. Also helpful was a document in preliminary draft, "Documentation for developing the source category listing," which was obtained from EPA. EPA's methodology for listing a source category is explained in detail for "Industrial Reciprocating IC Engines."

In establishing the categories EPA relied heavily on the National Emissions Data System (NEDS) database. It is from this database that Source Classification Codes (SCC) for each source are taken. For example, "Industrial Reciprocating IC Engines" SCC ranges identified are: 202001-202009, 202001-202010, 202003-202003, and 202003-202009. The following four sources were found under these SCC ranges:

Internal combustion-industrial-natural gas reciprocating (20200202)
Internal combustion-industrial-natural gas-cogeneration (20200204)
Internal combustion-industrial-propane-reciprocating (20201001)
Internal combustion-industrial-butane-reciprocating (20201002)

EPA assigned an emissions profile to each SCC code. This assignment is either "original" meaning an emissions profile was actually performed on the combustion products of this source or on the basis of "engineering judgment." The latter case applies to a source for which no emissions profile exists. In this instance EPA assigns to a source a profile which seems to be the closest match, also referred to as an emissions speciation profile. It is the speciation profile which is used to include a particular source as an emitter of HAPs. As might be expected, there are many more SCC codes than there are emissions profiles and, as a result, the same profile shows up repeatedly, having been assigned to many source types.

The emissions profile itself has its own derivation and EPA provides the original citation. For this first source category, "Industrial Reciprocating IC Engines," the profile assigned to all four of the above sources is:

"Internal combustion engine- natural gas (1001)"

which is found in Volume II of a report by Oliver and Peoples concerning the emissions inventory in the South Coast Air Basin in 1985. The original profile from this document has been located and reviewed. There is not absolute congruence between the profile as EPA restates it (e.g., weight percent for Methane and Ethane differ in the second decimal place), and the original reference. This raises the question of the degree of editorial freedom exercised by EPA in reporting the profiles.

The same analytic process was completed for each of the other 9 categories and is documented in the summary sheets. For a number of the sources identified within the remaining 9 categories, an emissions profile is cited from a 1978 document by Taback et al. This document was obtained and carefully reviewed. The reporting of speciation analyses in this reference differs radically from EPA's format and it is difficult to say with certainty which profile EPA is citing.

B. ISSUES AND IMPLICATIONS

1. EPA Listed Poorly Characterized Source Categories.

Section 112(c)(1) of the Act states that EPA shall publish:

...a list of all categories and subcategories of major sources and area sources...

This directive is not stated so broadly that EPA should undertake to list source categories which are only suspected to contain facilities which might meet the major and area source definitions

of Title III. Similarly, the Act does not require EPA to list categories for which there is hardly any information to evaluate whether facilities would meet the major source and area source definitions.

There are strong reasons to adhere to the instructions presented in Section 112(c). Listing categories for which inadequate information is known will waste EPA staff time, confuse EPA's priorities in establishing schedules for MACT standards, and cause unnecessary costs to be borne by a large number of industrial and commercial facilities. EPA should remove from the draft list those source categories using natural gas as a combustion fuel for which the Agency has insufficient information to determine whether the category meets either the major or area source definitions of Title III.

2. The EPA Listing Must Distinguish between Major and Area Sources.

Although Section 112(c) of the Act requests EPA to list both major and area sources, this section clearly indicates that major and area sources are defined and evaluated differently. The Act establishes that major sources are defined by the magnitude of annual emissions. Area source on the other hand can only be established by a finding of threat by the Administrator, a threat "warranting regulation." The ability of informed groups in the public to offer meaningful comments is inhibited because EPA has failed to distinguish the major or area source basis for including source categories in the draft listing.

3. EPA has Included Categories without Data on the Amount of Toxic Emissions.

EPA presented a listing of categories for which no technical data exists on the magnitude of emissions. Instead EPA has used an approach based on emissions speciation "profiles" which attribute the presence of Title III compounds to the source category. This procedure does not conform to the Act. The detection of a compound, or the assumption that a compound may be emitted, is not alone an adequate basis for including the source as a major source category for regulation. EPA should present additional information that the candidate category has emissions

which can be expected to trigger the Title III major source definition of 10 or 25 tons per year. The result of including any source category that emits any of the Title III compounds without regard to emission rates is to set EPA on a course to regulate every combustion source in the nation.

The issue of magnitude of emissions is particularly relevant to natural gas combustion, which tends to be very low in particulates, but which may result in trace emissions of Title III compounds. Such facilities are highly unlikely to emit ten tons of these trace combustion products. We have no studies which show that natural gas combustion source categories emit Title III compounds in amounts greater than the major source definition. EPA should remove from its draft listing all natural gas combustion sources for which EPA does not have supporting technical data indicating that typical facilities will exceed the major source definition.

4. EPA Did Not Base its Listing of Area Source Categories on a Finding of Threat.

The June 21, 1991, draft listing contains no information that EPA has met the criteria of the Act in listing area source categories. Again, EPA's failure to comply with the Act's directions will result in listing far more source categories than the Agency can handle. This is particularly the case for area sources which are notoriously difficult to regulate. EPA should reserve its capacities to address area source categories for which a specific finding of threat which warrants regulation has been made. As a gaseous fuel which is low in trace contaminants, natural gas area source categories should be removed from the list unless EPA presents, and receives comments on, a determination that the public is so threatened by such source that regulation is warranted.

5. There are Errors in the Emissions Speciation Profile Process Used by EPA to Develop Source Category Listings.

Even if the emissions speciation profile procedure used by EPA was conceptually sufficient to meet the requirements of Section 112(c), EPA has not adequately reviewed its databases on fuel

combustion sources to rely on its profiles. The principal error is that EPA has lumped together the profiles for a source category without regard for the fuel being used. We have reviewed the profiles and references provided as technical backup for the June 21 listing. There are numerous instances in which gas combustion facilities appear to be included because of a profile which used another fuel. For example, in listing Oil and Gas Steam Generation as a category, EPA relies largely on profile number 13501. This profile has as its reference a study of a facility burning residual oil.

6. EPA Should Subcategorize and Separately Evaluate Natural Gas Combustion Source Categories.

Many of the errors associated with the emission speciation process arise from combining profiles for a category without regard to the fuel used. We recommend that because the emissions from combustion sources are highly related to the fuel used, EPA subcategorize such categories by the fuel combusted. For example, natural gas combustion turbines, IC engines, and industrial/commercial boilers should be separate subcategories. EPA should evaluate whether such subcategories represent potential emissions to qualify as major sources, and not list these sources unless they can be expected to trigger the major source definition.

C. AREAS OF ACTION

The EPA final rule listing of air toxics categories has not yet been released. EPA has indicated that natural gas sources are not in the first group planned for regulatory development. When the final list is available it should be reviewed on the basis of the issues raised above. Administrative or legal action to remove certain gas sources may be warranted.

BIBLIOGRAPHY

Helms, G.T. "Regulatory Program Update: Title I and II of the 1990 Clean Air Act Amendments." Report presented at the Air and Waste Management Association USEPA Specialty Conference Course, Atlanta, Georgia, November 4, 1991.

National Research Council. *Rethinking the Ozone Problem in Urban and Regional Air Pollution.* Washington, D.C.: National Academy Press, 1991.

U.S. Environmental Protection Agency. *Clean Air Act Amendments of 1990: Summary of Key Titles.* November 1990.

U.S. Environmental Protection Agency. *Clean Air Act Amendments of 1990: Detailed Summary of Titles.* November 1990.

U.S. Environmental Protection Agency. *Implementation Strategy for the Clean Air Act Amendments of 1990.* January 1991.

U.S. Environmental Protection Agency. *Summary of Major Issues in the General Preamble for Title I - Ozone and Carbon Monoxide Issues.* June 1991.

U.S. Environmental Protection Agency. *General Preamble, Public Meeting for Title I, Supplementary Materials.* June 1991.

U.S. Environmental Protection Agency. *General Preamble, Implementation of Title I, Clean Air Act Amendments of 1990. Staff Working Draft.* October 1991.

U.S. Environmental Protection Agency. *Office of Air Quality Planning and Standards. Maps of Ozone and Carbon Monoxide Nonattainment Areas.* November 1991.

APPENDIX A: BACT "Top Down" Settlement Agreement

SETTLEMENT AGREEMENT

WHEREAS, on July 10, 1989, the American Paper Institute and the National Forest Products Association (collectively API) filed a petition for review of a May 12, 1989 letter by the Administrator of the United States Environmental Protection Agency (EPA) denying API's administrative petition regarding the "top-down" process for determining best available control technology (BACT) under the prevention of significant deterioration (PSD) provisions of the Clean Air Act (CAA), 42 U.S.C. § 7475. API v. Reilly, No. 89-1428 (D.C. Cir.).

WHEREAS, on July 11, 1989, Alabama Power Company, et al. (APC), filed a similar petition for review. APC v. Reilly, No. 89-1429 (D.C. Cir.). The two petitions for review were consolidated on December 14, 1989.

WHEREAS, on July 18, 1989, API filed a complaint concerning the "top-down" process for making BACT determinations. API v. Reilly, No. 89-2030 (D.D.C.).

WHEREAS, on February 1, 1990, the Utility Air Regulatory Group (UARG) submitted an administrative petition concerning EPA's policy and practice on BACT determinations.

WHEREAS, on July 13, 1990, API filed a petition for review of an EPA draft guidance document on BACT determinations. API v. Reilly, No. 90-1364 (D.C. Cir.).

WHEREAS, the parties wish to resolve and settle all five of the judicial and administrative matters listed above without further litigation.

NOW, THEREFORE, without admission of any issues of fact or law, or waiver of any claim or defense, either factual or legal, the parties agree as follows:

SPECIFIC PROVISIONS

1. EPA agrees to publish in the Federal Register, within one hundred eighty (180) days after all of the parties sign this settlement agreement, a proposed rule proposing to revise or clarify the regulations defining BACT (currently codified at 40 C.F.R. §§ 51.166(j), 52.21(j)), and proposing to revise or clarify how BACT determinations should be made.

2. EPA agrees to take final action on the proposed rule as expeditiously as practicable. Nothing in this settlement agreement shall be construed to waive or supersede any procedural or substantive requirements imposed by law.

3. (a) Until EPA takes final action on the proposed rule, the current PSD regulations, 40 C.F.R. Pts. 51-52, will remain in effect. BACT determinations made pursuant to these regulations will continue to be subject to judicial review on a case-by-case basis. Any EPA BACT policy statement or interpretation is intended only to guide the implementation of BACT under approved state new source review programs and is not intended to create binding legal rights or obligations and does not have the force and effect of law. 55 Fed. Reg. 23,547, 23,548 (June 11, 1990).

(b) In addition, if there are any significant questions regarding the application of the current regulations in specific cases, EPA will, upon written request, attempt to resolve any

disputes within the constraints of available resources and in the context of the specific facts of the case.

4. (a) (i) Upon the publication in the Federal Register of a proposed rule pursuant to Paragraph 1, API shall file a notice or stipulation of voluntary dismissal without prejudice pursuant to Fed. R. Civ. P. 41(a)(1) in API v. Reilly, No. 89-2030 (D.D.C.);

(ii) Upon the publication in the Federal Register of a proposed rule pursuant to Paragraph 1, API and APC shall file motions to stay the litigation in API v. Reilly, No. 90-1364 (D.C. Cir.), and API v. Reilly, No. 89-1428 and consolidated case (D.C. Cir.), pending completion of all the activities called for in this agreement;

(iii) Upon completion of all the activities called for in this agreement, API and APC shall file motions for voluntary dismissal pursuant to Fed. R. App. P. 42(b) in API v. Reilly, No. 90-1364 (D.C. Cir.), and API v. Reilly, No. 89-1428 and consolidated case (D.C. Cir.); and

(iv) Upon completion of all the activities called for in this agreement, UARG shall withdraw the February 1, 1990 administrative petition. In the interim, UARG shall take no action whatsoever to pursue the administrative petition, and EPA shall

be under no obligation to take action on the administrative petition.

(b) Each party shall bear its own costs, including attorneys' fees, in the underlying judicial or administrative matters.

5. The actions EPA agrees to undertake in this settlement agreement are not judicially enforceable. If EPA does not take final action on the proposed rule within one year after publication in the Federal Register, API's, APC's and UARG's sole remedy is to reopen or reactivate the underlying judicial or administrative matters.

6. The parties agree and acknowledge that final approval of this settlement agreement is subject to the requirements of section 113(g) of the CAA, as added by section 701 of the CAA Amendments of 1990. Pursuant to that provision, EPA shall publish notice of this settlement agreement in the Federal Register, the public shall have at least thirty (30) days to make comments, and the Administrator or Attorney General shall consider any comments in deciding whether to consent to this agreement.

GENERAL PROVISIONS

7. The parties may agree in writing to modify any provision of this settlement agreement.

8. It is the intent of the parties to this settlement agreement that the individual paragraphs of this agreement are severable, and should any paragraph of this agreement be declared

by a court of competent jurisdiction to be invalid, the remaining paragraphs of the agreement shall remain in full force and effect.

9. This is the entire settlement agreement between the parties with respect to the issues raised in the five judicial and administrative matters identified in Paragraph 4 above. All prior conversations, meetings, discussions, drafts and writings of any kind are specifically superceded by this settlement agreement and may not be used by the parties to vary or contest the terms of this agreement, or as evidence of the parties' intent in entering into this agreement.

10. This settlement agreement is being entered into so as to avoid further litigation. Nothing in this settlement agreement shall be construed to constitute an admission of any issue of fact, law or liability by any of the parties. Specifically, API, APC, and UARG do not waive any claims against EPA, and EPA does not waive any defenses to any claims by API, APC, and UARG.

11. Each party shall bear its own costs, including attorneys' fees, in monitoring, overseeing or implementing this settlement agreement, and in participating in the administrative proceedings contemplated by this agreement.

12. The individuals signing this settlement agreement on behalf of the parties hereby certify that they are authorized to bind the respective parties to the terms of this agreement.

//

DATE: July 9, 1991

Michael K. Glenn, Esq.
Porter, Wright, Morris & Arthur
1123 20th Street, N.W.
Washington D.C. 20036
(202) 778-3050

Attorney for API

DATE: July 9, 1991

Henry V. Nickel, Esq.
Hunton & Williams
2000 Pennsylvania Avenue, N.W.
Washington D.C. 20036
(202) 955-1500

Attorney for APC and UARG

DATE: 7/10/91

Scott A. Schachter
United States Department of Justice
Environment & Natural Resources Division
Environmental Defense Section
P.O. Box 23986
Washington D.C. 20026-3986
(202) 514-4632

Jill E. Grant
United States Environmental Protection Agency
Office of General Counsel (LE-132A)
401 M Street, S.W.
Washington D.C. 20460
(202) 245-4149

Attorneys for EPA

APPENDIX B: SAI Study (Title Page, Table of Contents, Summary)

Final Report

A SCREENING PROCEDURE FOR EVALUATING THE EFFECTS OF NITROGEN OXIDE EMISSIONS REDUCTIONS ON OZONE

SYSAPP-91/102

September 1991

SYSTEMS APPLICATIONS INTERNATIONAL

A Division of Clement International Corporation

Environmental and Health Sciences

Contents

Executive Summary 1

1. Introduction 1-1

2. Modeling Protocol 2-1

   UAM Modeling Region and Grid Specification 2-1

   Development of a Conceptual Model for Ozone Episodes 2-1

   UAM Input Preparation Procedures 2-2

   Assessment of Model Performance for the Base Case 2-4

   Analysis of the Effects of Nitrogen Oxide Emissions Controls on Ozone Air Quality 2-6

3. Application to Three Cities 3-1

   UAM Modeling Region and Grid Specification 3-1

   Development of Conceptual Meteorological Scenarios 3-3

   Preparation of Meteorological and Air Quality Inputs 3-3

   Emissions Inventory Development 3-7

   Results of the Base Case Simulations 3-12

4. Emissions Reduction Simulations 4-1

   Comparison of Base Case with 20% NO_x Reduction 4-3

5. Summary 5-1

   Overview of Methodology 5-1

   Summary of Results of Application to Three Cities 5-3

   Lookup Table Approach 5-10

   Validity of the UAM Screening Approach 5-19

6. References 6-1

Appendices:

A. 1996 Emissions Maps

B. Simulation Results: Hourly Surface Ozone Isopleths

EXECUTIVE SUMMARY

Unlike previous versions of the Clean Air Act (CAA), the 1990 amendments contain specific requirements for reductions in emissions from stationary sources of nitrogen oxides (NO_x) in order to attain the ozone National Ambient Air Quality Standard (NAAQS). Title I of the CAA generally requires sources of NO_x in ozone nonattainment areas to utilize Reasonable Available Control Technology (RACT) if their emissions exceed designated quantities. In this regard, NO_x RACT requirements are similar to those for sources of volatile organic compounds (VOC). In more seriously polluted areas States are subject to 3% per year net VOC emission reduction requirements after 1996. NO_x controls may be substituted for all or part of this VOC reduction if it can be shown that such a procedure is at least as effective in reducing ozone as the VOC reductions by themselves.

In the CAA amendments, Congress recognized that the effect of NO_x controls on ozone varies under different environmental conditions. Under some circumstances it is possible that controlling NO_x may detract from the effectiveness of VOC controls or have no effect. Therefore, safeguards built into the Act allow States to opt out of additional stationary source NO_x reductions under certain circumstances. To help States make such determinations, EPA intends to produce guidance by November 1991 for several purposes:

- to determine whether or not RACT and NSR are warranted on large sources of NO_x;
- to assist in formulation of control strategies simulated in attainment demonstrations needed for SIP revisions required in the 1993-1994 time frame; and
- to assist in determining whether it is appropriate to substitute NO_x for some or all of the 3% per year reduction in VOC emissions required in more seriously polluted areas after 1996.

The purpose of the work described in this report is to identify and apply an interim tool which EPA and State and local agencies can use to evaluate if NO_x control measures are likely to be beneficial for reaching attainment of the ozone NAAQS and for examining

whether it is appropriate to supplement or substitute for additional VOC controls with NO_x reductions after 1996. The legally permitted time frame in which decisions regarding NO_x RACT need to be made does not allow enough time for most of the affected states to perform any new detailed modeling analyses to ascertain the effects of NO_x controls on air quality and progress to attainment. In this report a method is described by which States can make these determinations quickly using a photochemical grid modeling approach that relies on routinely available data, hypothetical ozone episode conditions and emissions sensitivity simulations.

This method uses the Urban Airshed Model (UAM), exercised in a screening mode designed to reduce the level of effort and time required to perform the analysis. The primary differences between this screening approach and a detailed UAM modeling study are (1) the model inputs are developed quickly using national emissions data bases; (2) hypothetically developed meteorological episodes are modeled, as opposed to actual episodes, and no diagnostic analysis of the simulation results or comparison with measured data are performed; and (3) simulated emissions reductions are limited to across-the-board emissions reductions in the broad source groups of stationary point sources, stationary "area" sources and mobile sources. This approach does not allow determination of specific control strategies that will lead to attainment of the ozone NAAQS; rather, it is designed to ascertain whether or not NO_x emissions controls are likely to be beneficial or detrimental towards attainment of the ozone standard.

The UAM screening approach draws upon readily available national data bases for the development of the model inputs. The meteorological scenarios are arrived at through the development of a conceptual model of the meteorological conditions underlying high ozone events for the area under study. This conceptual meteorological model is developed through examination of climatological summaries and review of relevant previous climatological or modeling studies. Boundary conditions of ozone and ozone precursors are taken to be at background levels for areas not significantly affected by the transport of pollutants from a different region. Areas within transport regions need to consider not only the effects of pollutants transported from other areas but also the effects on downwind areas of the emissions control strategies being considered. This requires interfacing the UAM with a regional ozone model and is not addressed in this report.

It is recommended that at least three different conceptual meteorological scenarios be modeled in order to adequately characterize the effects of NO_x emissions controls on ozone air quality. Two or more scenarios should reflect typical conditions that lead to high ozone levels in the region of study. Other scenarios can represent infrequent meteorological events if these represent conditions that lead to exceedances of the ozone standard. These are particularly important to model if the relationship between the spatial configuration of sources and prevailing winds is influential with respect to the response of the system to NO_x controls.

The emissions are developed using the 1985 NAPAP emissions inventory, currently the best available national emissions inventory, and projected to the future year being modeled using Bureau of Economic Analysis growth factors and projected emissions controls developed by EPA for regional ozone modeling analyses. The mobile source emissions are developed using the most recent version of EPA's MOBILE4 model and biogenic emissions are estimated with EPA's Biogenic Emissions Inventory System.

The model inputs can be prepared using UAM model input preprocessors and Emissions Processing System. No detailed diagnostic analyses of the base case results are performed; however, the base case UAM simulation results are reviewed for reasonableness and the simulation can be repeated with revised inputs if necessary.

The effects of VOC and NO_x controls on ozone concentrations are investigated by performing a series of simulations with varying degrees of NO_x and VOC emissions reductions. The results of these simulations are analyzed to identify those NO_x and VOC emissions reduction levels that will be beneficial or detrimental to ozone air quality. Measures of ozone air quality that can be readily analyzed include peak hourly ozone, peak 8-hour average ozone, ozone areal coverage and measures of potential population exposure and risk.

It should be noted that this approach is sensitive to the levels of emissions in the projected emissions inventory. In the course of estimating the future effects of federally mandated controls, which require numerous VOC reductions, the effects of these controls could be overestimated. If this is the case, the resultant emissions VOC/NO_x ratio could be unrealistically low, which could potentially bias the outcome toward predicting a lesser benefit from NO_x reductions.

Application to Three Cities

The UAM screening methodology was applied to three cities: Baton Rouge, Louisiana; Detroit, Michigan; and St. Louis, Missouri. These three cities were selected for demonstration for several reasons: (1) they are classified as nonattainment areas for ozone; (2) their locations cover a broad range of latitude and therefore UV intensities; (3) transport of ozone and precursor pollutants is likely not the primary cause of ozone exceedances in these cities; (4) available emissions inventories in these cities indicate substantial contributions from stationary sources; and (5) the distribution of major emissions source groups (point, area, mobile and biogenic) is different for each of these cities.

A conceptual model of the meteorological conditions associated with ozone episodes was developed for each urban area. These conceptual models were based primarily on

previous ozone climatology studies and previous ozone modeling studies. Previous modeling studies of the Baton Rouge area indicated at least two distinct meteorological regimes associated with ozone episodes in this area. The first regime is characterized by northeasterly flow during the morning hours and southeasterly to southwesterly flow during the afternoon hours. The second regime is characterized by north to northwesterly flow throughout the day. Both regimes are also characterized by light winds, moderate to high surface temperatures and high relative humidity. Convective clouds may develop during the afternoon hours.

Meteorological conditions associated with ozone episodes in Detroit include light southeasterly to southwesterly winds, clear skies and high temperatures. Lake breezes along the shores of Lake Erie, Lake St. Claire and Lake Huron may also influence ozone episodes in this area. Similarly, ozone episodes in St. Louis are also associated with light winds, clear skies and high temperatures. The airflow is characterized by easterly to southwesterly winds.

Background concentrations of ozone and ozone precursors were assumed at the inflow boundaries of the modeling regions, since these cities are not significantly affected by transported pollutants from other regions. A two kilometer horizontal grid resolution was used for all simulations to minimize the effects of artificial dispersion of point source emissions.

For each of the cities modeled, a 1996 baseline emission inventory was projected, representing the Federal control measures mandated under the Clean Air Act Amendments of 1990 (CAAA). These inventories were based on the 1985 National Acid Precipitation Assessment Program (NAPAP) Emissions Inventory, the MOBILE4 mobile source emissions model and the Biogenic Emissions Preprocessor System.

The 1985 NAPAP area source emissions data were "grown" to 1996 levels by source category; point source emissions were projected by 2-digit Standard Industrial Classification code. The growth factors were based on the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) state-level projections of industrial activity and demographic parameters.

The mobile source emissions projections include the effects of fleet turnover, reduced fuel Reid vapor pressure (RVP) and more stringent control programs, as well as projec VMT growth. The basic exhaust emission rates used for onroad motor vehicles were based on the standards specified by the 1990 CAAA; the 1990 CAAA phase-in schedul for the new emissions standards was also used.

A 1996 baseline control scenario projection was made for each of the three cities reflecting emissions changes expected to result from implementation of the control

measures specified in the 1990 Clean Air Act Amendments. The control efficiencies for stationary sources were based primarily on information from the report Regional Ozone Modeling for Northeast Transport (ROMNET) (EPA-450/4-90-002). The VOC/NO_x anthropogenic emissions ratios for the 1996 projections are 0.85, 2.1 and 2.5 for Baton Rouge, Detroit and St. Louis, respectively, compared with 1985 emissions ratios of 1.3, 2.4 and 2.8 for the three cities. The projected NO_x RACT controls on point sources accounted for NO_x emissions reductions of approximately 15, 3 and 9 percent for Baton Rouge, Detroit and St. Louis, respectively. These projected additional NO_x RACT controls on point sources were not used for the St. Louis simulations; the VOC/NO_x ratio for the emissions inventory used in these simulations is 2.3.

The 1996 base case simulations of the two meteorological scenarios for Baton Rouge produced peak ozone reaching 95 and 125 ppb. The predicted peak ozone for the Detroit and St. Louis base case simulations were 145 and 127 ppb, respectively. A series of emissions reduction simulations were performed for each of the four meteorological scenarios developed, encompassing a range of reductions in NO_x and VOC anthropogenic emissions from the 1996 base case emissions for each city. The reductions were uniform across-the-board percentage reductions in each of the stationary area, point and mobile source groups. The regionwide peak ozone concentration resulting from these simulations are given in Tables 1 through 4.

From these results it is clear that both meteorology and emissions characteristics influence the effectiveness of NO_x reductions for reducing ozone concentrations. In Baton Rouge, the modeling results show that there can be some conditions under which NO_x reductions lead to reduced ozone concentrations and other conditions where the reverse is true. The simulations of the first Baton Rouge meteorological scenario indicate that NO_x reductions of 50 percent contribute to reduced ozone levels, but show little effect from NO_x reductions less than 50 percent. In contrast to this, the second Baton Rouge scenario exhibits ozone concentration increases with NO_x reductions up to 40 percent. These simulations of Baton Rouge demonstrate that meteorology can have a significant effect on the impacts of NO_x emissions reductions, and illustrate the importance of modeling more than one meteorological scenario.

The modeling results for Detroit and St. Louis show benefits from NO_x reductions at base case levels of VOC emissions and detriments from NO_x reductions when VOC is reduced by 80 percent. At the intermediate levels of VOC reductions, NO_x reductions lead to reduced ozone concentrations at higher VOC/NO_x ratios and increased ozone at lower VOC/NO_x ratios. The simulations for both Detroit and St. Louis indicate that NO_x reductions are beneficial at anthropogenic VOC/NO_x emissions ratios higher than about 1.4 for the meteorological scenarios modeled. However, additional scenarios need to be modeled to be able to form conclusions concerning the effectiveness of NO_x emissions reductions for these cities.

TABLE 1. BATON ROUGE UAM SIMULATION RESULTS FOR METEOROLOGICAL SCENARIO 1: REGIONWIDE PEAK HOURLY OZONE (PPB) AND PERCENT CHANGE FROM THE BASE CASE (IN PARENTHESES)

NO_x Emissions Reduction (%)	VOC Emissions Reduction (percent)					
	0	20	40	60	80	100
0	95 (0)	92 (-4)	87 (-9)	84 (-12)	82 (-14)	79 (-17)
15	96 (0)	92 (-3)	88 (-8)	84 (-12)	80 (-16)	79 (-17)
30	93 (-2)	91 (-4)	88 (-8)	84 (-12)	82 (-14)	80 (-16)
50	85 (-11)	84 (-12)	83 (-13)	81 (-15)	80 (-16)	79 (-17)

TABLE 2. BATON ROUGE UAM SIMULATION RESULTS FOR METEOROLOGICAL SCENARIO 2: REGIONWIDE PEAK HOURLY OZONE (PPB) AND PERCENT CHANGE FROM THE BASE CASE (IN PARENTHESES)

NO_x Emissions Reduction (%)	VOC Emissions Reduction (percent)				
	0	20	40	60	80
0	125 (0)	116 (-8)	107 (-15)	102 (-19)	96 (-23)
10	126 (0)	118 (-6)	108 (-14)	101 (-19)	96 (-23)
20	128 (2)	119 (-5)	110 (-12)	100 (-20)	95 (-24)
30	131 (5)	122 (-3)	112 (-11)	102 (-19)	97 (-23)
40	130 (4)	123 (-1)	118 (-6)	105 (-16)	97 (-22)

TABLE 3. DETROIT UAM SIMULATION RESULTS: REGIONWIDE PEAK HOURLY OZONE (PPB) AND PERCENT CHANGE FROM THE BASE CASE (IN PARENTHESES)

NO_x Emissions Reduction (%)	VOC Emissions Reduction(percent)				
	0	20	40	60	80
0	145 (0)	135 (-7)	118 (-19)	94 (-36)	86 (-41)
10	143 (-2)	135 (-7)	123 (-15)	103 (-29)	86 (-41)
20	139 (-5)	133 (-9)	124 (-14)	111 (-24)	90 (-38)
30	134 (-8)	129 (-12)	122 (-16)	113 (-22)	97 (-33)
40	132 (-9)	124 (-14)	118 (-19)	111 (-24)	101 (-31)

TABLE 4. ST. LOUIS UAM SIMULATION RESULTS: REGIONWIDE PEAK HOURLY OZONE (PPB) AND PERCENT CHANGE FROM THE BASE CASE (IN PARENTHESES)

NO_x Emissions Reduction (%)	VOC Emissions Reduction (percent)				
	0	20	40	60	80
0	127 (0)	120 (-5)	109 (-14)	95 (-25)	85 (-33)
10	125 (-1)	119 (-6)	112 (-12)	100 (-21)	87 (-31)
20	124 (-3)	117 (-8)	111 (-13)	103 (-19)	90 (-29)
30	121 (-5)	116 (-9)	109 (-14)	102 (-20)	91 (-28)
40	117 (-8)	113 (-11)	107 (-16)	100 (-21)	92 (-27)

Each of the four scenarios modeled is consistent with the general trend of NO_x emissions reductions leading to increases in ozone at lower VOC/NO_x ratios and to ozone reductions at higher VOC/NO_x ratios, although for the second Baton Rouge scenario, VOC/NO_x ratios high enough for NO_x reductions to result in ozone reductions were not simulated. For all four scenarios, combined VOC and NO_x emissions reductions lead to decreased peak ozone from the base cases.

Additional simulations were done reducing NO_x emissions from point sources only. Emissions of VOCs were maintained at base case levels and point source NO_x emissions were reduced by the same amounts (in tons) as the corresponding across-the-board reductions. Point source-only reductions were not simulated for the second Baton Rouge scenario. For each of these three scenarios, reductions of NO_x from point sources alone are less effective in reducing peak ozone than the same reductions from the point, area and mobile source groups combined.

Comparisons of VOC-only, NO_x-only and combined NO_x and VOC emissions reductions were made. The Baton Rouge results indicate that VOC reductions are most effective in reducing peak ozone (on a per ton basis), assuming that the projected VOC emissions reductions have been implemented. For Detroit and St. Louis, combined NO_x and VOC reductions lead to the lowest peak ozone.

The maximum 8-hour average surface-level ozone was also computed from the simulation results. The responses to emissions reductions of regionwide peak 8-hour concentrations are similar to the peak 1-hour results. A third scalar measure of predicted ozone, a measure of areal coverage of high ozone concentrations, was calculated for each simulation. This measure, referred to as ozone areal coverage, is the number of grid cell-hours (or km^2-hours) with ozone above a specified concentration cutoff, i.e., the sum over all simulated hours of the number of grid cells in which the predicted ozone concentration exceeds the cutoff value. Concentration cutoffs of 80, 100, 120 and 100 ppb for Baton Rouge scenarios 1 and 2, Detroit and St. Louis, respectively, were chosen to be significantly less than the peak predicted base case ozone values of 95, 125, 145 and 127 ppb. The results for predicted ozone areal coverage are different from the peak ozone results and NO_x emissions reductions have a more pronounced effect on this measure of air quality. Holding VOC emissions at the base case levels, NO_x reductions of 30 percent produce -50 and +17 percent changes in ozone areal coverage for the first and second Baton Rouge scenarios, -31 percent for Detroit and +13 percent for St. Louis. An analysis of the influence of the choice of concentration cutoff was performed, indicating that these ozone areal coverage results depend on the choice of cutoff and would be qualitatively different for some other choices of cutoffs.

Lookup Table Approach

An analysis was performed of the feasibility of using a lookup table approach to make preliminary determinations of whether implementation of NO_x RACT would delay attainment of the ozone NAAQS. The basis for such an approach would be derived from UAM modeling results for 10 urban areas, chosen to cover a range of characteristics representative of urban areas not modeled. These results would be organized in tabular form or as graphs of functional relationships, relating these results to selected parameters or surrogates that could be relatively easily calculated for other cities. Determinations for other urban areas could then, in some cases, be made by means of the lookup tables, by relating the characteristics of these (nonmodeled) areas to those of the areas for which modeling results are available.

The results of the modeling of three cities described in this report, in conjunction with a review of previously conducted ozone modeling studies, were used to explore the feasibility of this lookup table approach. Several measures of the effect of NO_x emissions reductions on ozone air quality were considered and two were selected for use in this analysis: the change in peak ozone and a measure of the relative effectiveness of NO_x emissions reductions as compared with VOC emissions reductions.

Based on a review of previous studies, several parameters were identified as region-specific factors that govern ozone formation. These include broad factors such as the local ozone climatology and the VOC and NO_x emissions density and distribution, and more specific factors, such as areal extent, population density, upwind boundary conditions, proximity to large bodies of water, latitude (which is related to solar radiation), land use and terrain characteristics. Characteristics of urban areas related to ozone formation potential initially considered for ascertaining the feasibility of the lookup table approach included (1) the RHC/NO_x total and anthropogenic-only emissions ratio, where RHC are the VOC emissions weighted by the reactivity of the Carbon Bond IV species classes; (2) the 1986 to 1988 ozone design value, a measure of the severity of the ozone problem in an area; (3) estimates of the typical ozone season 6 to 9 A.M. ambient NMOC/NO_x ratio; (4) the total population and population density of the area; and (5) the emissions source mix, i.e., the relative contributions of elevated point, low-level point, mobile, stationary area and biogenic emissions.

A review of previous ozone modeling studies indicates that for some areas NO_x control is beneficial for ozone attainment, for other areas NO_x control is detrimental and for still other areas the benefit/detriment is not clear cut. However, the response of ozone levels to reductions in NO_x and VOC emissions is city- and scenario-specific, being highly nonlinear and depending on many factors. It is not uncommon for additional NO_x emissions reductions to lead to decreased ozone levels in some parts of an urban area and increased ozone in others. The emissions reduction simulations for Baton Rouge show

that the relationship between the VOC/NO_x ratio and the effects of NO_x emissions reductions on peak ozone can be opposite for different meteorological scenarios for the same city.

Analysis of potential relationships between peak ozone and NO_x control effectiveness and the urban characteristics described above did not result in well-defined relationships. Due to the complexity of the process by which ozone is formed and the many factors involved, no clear, easily reached rules emerge from the current and previous work that would enable a lookup table approach to be used with the degree of confidence required for regulatory applications.

Equivalence of VOC and NO_x Emissions Reductions

A measure of the effectiveness (with respect to reduction of peak ozone) of NO_x emissions controls relative to VOC emissions controls is referred to in this report as the "NO_x control effectiveness" and is calculated as the ratio of the change in peak ozone per change in NO_x emissions to the change in peak ozone per change in VOC emissions, i.e.,

$$\mathscr{E} = [(P(N_1,V_0)-P(N_0,V_0))/(N_1-N_0)] \,/\, [(P(N_0,V_1)-P(N_0,V_0))/(V_1-V_0)]$$

where $P(N,V)$ is the simulated peak ozone given total anthropogenic NO_x emissions (N) and VOC emissions (V),
$N_1 = N_0 + \delta N$,
$V_1 = V_0 + \delta V$,
N_0 and V_0 are the levels of regional anthropogenic NO_x and VOC emissions totals at which NO_x control effectiveness is being evaluated, and δN and δV are incremental changes in NO_x and VOC emissions, respectively.

This is an approximation to the ratio of the partial derivatives of peak ozone with respect to NO_x and VOC, evaluated at (N_0,V_0). This measure has the property that it is positive when NO_x emissions reductions reduce peak ozone, zero when NO_x reductions have no effect on peak ozone and negative when NO_x reductions lead to increased peak ozone. When NO_x and VOC reductions have equivalent effects, this measure is 1; values between 0 and 1 are cases where both NO_x and VOC reduce ozone, but VOC control is more effective. When additional NO_x controls reduce peak ozone, this measure quantifie the effectiveness of the NO_x reductions by relating it to the effectiveness of VOC emissions reductions on a per ton basis. For example, if a 35 ton/day (tpd) reduction in NO_x emissions leads to a 6 percent reduction in peak ozone and a 70 tpd reduction in VOC emissions also leads to a 6 percent reduction in peak ozone, then the NO_x emission reductions are twice as effective as the VOC reductions, on a per ton basis, and the above measure equals 2.0.

The NO_x control effectiveness measure $\mathscr{E}$ could be used to evaluate options for substituting NO_x emissions reductions for VOC reductions, as it provides a means for assessing equivalent reductions of NO_x and VOC emissions. This measure was computed at several NO_x and VOC emissions levels for each of the four scenarios analyzed as part of this study.

Validity of the UAM Screening Approach

In view of the trend towards using more advanced air quality models and more detailed data bases in their application, a relevant question is whether the screening methodology described in this report is an adequate approach for determining the effects of NO_x controls on ozone air quality. This question is only partially addressed here. The screening approach does utilize less detailed data bases than that required for SIP modeling demonstrations. However, the objective of this approach is not to ascertain levels of emissions reductions required to achieve the ozone NAAQS, but rather to assess whether or not NO_x emissions controls are likely to be beneficial with respect to ozone air quality and attainment of the NAAQS.

The ready availability of reasonably complete and accurate data bases of emissions, land use data, census data, economic projections and meteorological data, combined with the current experience and knowledge of ozone climatology, should allow reasonably good screening-level model inputs to be prepared. Simulations performed with the Urban Airshed Model and such data bases should provide the spatial and temporal resolution required to quantify different measures of ozone air quality. However, it must be acknowledged that only a minimal examination of the validity of this screening approach has been possible thus far. Additional guidance is needed on how to use the results of this approach, in particular which NO_x and VOC emissions levels and which projection years to use to support NO_x RACT and NSR decisions.

APPENDIX C: NO_x section of second Draft Title I General Preamble

GENERAL PREAMBLE

IMPLEMENTATION OF TITLE I

CLEAN AIR ACT AMENDMENTS

OF 1990

STAFF WORKING DRAFT

11
10/[redacted]/91

PREDECISIONAL MATERIALS
DO NOT CITE OR QUOTE

gather data to support and to perform a grid modeling analysis. Thus, a reading of § 182(b), (c), and (j) implies that the requirement that multi-State moderate nonattainment areas perform grid modeling effectively extends for 1 year (from November 1993 to November 1994), the deadline for moderate multi-State areas to submit a SIP containing an attainment demonstration. Stated differently, the requirement for grid modeling imposed on multi-State moderate areas by § 182(j) supersedes the requirement to have the November 1993 SIP transmittal contain an attainment demonstration. Instead, for practical reasons, the requirement imposed by § 182(j) implies a need for a November 1994 SIP revision reflecting provisions needed to attain the NAAQS as determined through a grid modeling analysis.

The effect of this interpretation of § 182(b)(c) and (j) is that the timing for SIP submittals in moderate inter-State nonattainment areas is identical to that in serious nonattainment areas. That is, a SIP revision providing for 15 percent reduction in VOC emissions from 1990 through 1996 is due by November 1993. A second SIP revision containing necessary provisions to demonstrate attainment of the NAAQS is due in November 1994.

9. NO_x requirements. Section 182(f), NO_x Requirements, applies to marginal, moderate, serious, severe, and extreme ozone nonattainment areas and to any ozone transport region. This section reflects a new directive in the amended Act that NO_x reductions are required in ozone nonattainment areas, with certain exceptions. As a result, States are generally required

to apply the same requirements to major stationary sources of NO_x as are applied to major stationary sources of VOC. These requirements are described in Sections III.A.1.f, and III.A.2.f. Section 182(f) also specifies a process and conditions under which the NO_x controls would not be required.

In the process of adding these requirements, Congress recognized that NO_x reductions would help achieve ozone reductions in some ozone areas, but that "there are some instances in which NO_x reductions can be of little benefit in reducing ozone or can be counter-productive, due to the offsetting ability of NO_x to 'scavenge' (i.e., react with) ozone after it forms" (H.R. Rep. No. 490, 101st Congress, 2nd Sess., at 204). The Committee provided for additional review and study under § 185B "to serve as the basis for the various findings contemplated in the NO_x provisions" (H.R. Rep. 490 at 257). In discussing the new Title I NO_x provisions, the House Report also stated that the Committee "does not intend NO_x reductions for reduction's sake, but rather as a measure scaled to the value of reductions for achieving attainment in the particular ozone nonattainment area" (H.R. Rep. 490, at 257-58).

As a result, two actions are specified in the amended Act regarding the effect of NO_x reductions in ozone nonattainment areas. First, under § 185B, the Administrator, in conjunction with the National Academy of Sciences, is to conduct a study on the role of ozone precursors in tropospheric ozone formation which shall examine the role of NO_x and VOC emissions, the extent to which NO_x reductions may contribute or be counterproductive to

achieving attainment in different nonattainment areas, the sensitivity of ozone to the control of NO_x, the availability and extent of controls for NO_x, the role of biogenic VOC emissions, and the basic information required for air quality models. This study is to be completed and a draft report made available for a 30-day public comment period. A final report is to be submitted to Congress 3 months after the draft report becomes available. The EPA is to use all available information as well as develop additional information in conducting the study.

(2) A related action is required under § 182(c)(2)(C), NO_x Control. This section calls for the Administrator to issue by November 1991 guidance concerning the conditions under which NO_x control may be substituted for VOC control or may be combined with VOC control in order to maximize the reduction in ozone air pollution. This guidance is intended to govern the substitution of NO_x reductions for the required 3 percent per year VOC reductions beginning in November 1996 (§ 182[c][2][B]). In order to substitute NO_x reductions for VOC, the State must demonstrate to EPA that the NO_x reductions would result in reductions in ambient ozone concentrations at least equivalent to that which would result from the amount of VOC emission reductions otherwise required.

The objective of each of these actions is basically the same: to understand the effects of NO_x reductions on ozone concentrations under various conditions. As part of this effort, EPA is consulting with various interest groups, regulatory agencies, and the academic and regulated community. The EPA

intends to provide a draft guidance document at about the same time the draft § 185B report is made available to the public. The EPA guidance will further describe the technical procedure to (1) demonstrate whether or not NO_x reductions are beneficial and (2) follow in order to substitute NO_x reductions for VOC. A 30-day comment period will also be provided for comment on the EPA guidance. The final guidance will take the final § 185B report into consideration and will be issued soon after that report.

In accordance with the guidance issued by EPA, a State may demonstrate to the Administrator that an exemption from some or all NO_x requirements is justified. As specified in § 182(f), the EPA will make a formal determination on any State request when the Administrator approves a plan or plan revision. The EPA's decision will be based on the documentation provided by the State and application of the EPA guidance. The EPA encourages the States to consult with the EPA Regional Office during the development of the demonstration and plan revision to ensure that any exemption is likely to be approved and that any required rules can be adopted in a timely manner.

Section 182(f)(3) also provides that a person (including a State) may petition the Administrator for a NO_x exemption at any time after the final § 185B report is submitted to Congress. The petition may be for any nonattainment area or any ozone transport region. The EPA is required to grant or deny the petitions within 6 months. The EPA does not intend to delegate this authority to States. However, since there may be multiple

petitions for a given area and the SIP is primarily a State responsibility, EPA will require that a copy of any petition (other than from the State itself) be provided to the State and that the State be allowed a 3-month period to provide a recommendation to EPA regarding the area. The EPA's decision will be based on the documentation provided by the petitioner, the State's recommendation, and application of the EPA guidance.

If EPA grants a petition, these Federal NO_x requirements will no longer apply. However, States remain free to impose NO_x restrictions on other bases. For example, States may choose in certain circumstances to reduce NO_x emissions for purposes of ozone maintenance planning, visibility protection, PM-10 control strategy, acid deposition program or other environmental protection. If, however, the EPA finds that NO_x reductions are counterproductive to the extent that they interfere with ozone attainment, the State would have to justify how the SIP continues to be adequate for achieving ozone attainment given its NO_x reductions.

Section 182(f)(1) provides for an exemption from NO_x reduction requirements where any of the following tests is met: (1) in any area, the net air quality benefits are greater without NO_x reductions from specific sources; (2) in a nontransport region, NO_x reductions would not contribute to ozone attainment in the nonattainment area; or (3) in a transport region, NO_x reductions would not produce net ozone benefits in the transport region. Further, § 182(f)(2) allows a State (or petitioner) to demonstrate, using any of the above tests, that full application

of the RACT and NSR requirements would result in "excess reductions" in emissions of NO_x.

The effect of §.182(f)(2) is to provide the flexibility to tailor the scope of the NO_x NSR and RACT requirements to the extent they are demonstrated to result in excess reductions. For example, the demonstration might show that NO_x reductions are generally beneficial for a nonattainment area, but applying the RACT requirements to specific, existing sources leads to "excess" reductions; therefore, the requirements should not apply to those specific sources, while the requirements should apply in the rest of the nonattainment area. Similarly, this could result in the application of certain NSR offset requirements and/or the NO_x RACT requirements only to specific source categories in an area, when this limited scope of applicability is "necessary to avoid achieving excess reductions."

The § 182(f) exemption provisions center on the effect on ozone concentrations of emissions reductions. With respect to RACT, which involves emissions reductions from existing sources, this is a perfect fit. In the case of new sources, however, other factors must be considered. Even after the application of LAER, a major new or modified source will, standing alone, result in major increases in NO_x emissions. However, the NSR offset provisions would require the new source to obtain offsetting reductions from other sources so as to represent an overall net emissions reduction in the area.

To take into account the full impact of the NSR program, the term "NO_x reductions" must be carefully interpreted. When

comparing air quality impacts with and without "NO_x reductions," the analysis must consider emission levels projected to the attainment date (including emission increases due to major new or modified NOx sources). Thus, a moderate area would project such emissions to 1996. The exemption demonstration would utilize two basic scenarios: (1) NO_x NSR and RACT reductions were achieved by November 1992 and May 31, 1995, respectively (including "reductions" due to NO_x emission increases avoided by the NSR rule); and (2) no NO_x reductions resulting from NSR or RACT.

In applying the first test stated above, an exemption would be granted if NO_x reductions from specific sources were shown to be counter-productive overall, considering the net air quality benefits. The consideration of net air quality benefits should include consideration of (1) ozone exposure and risk analysis and (2) health and welfare effects; and should not be limited to consideration of effects occurring within the ozone measurement area or transport region. Congress specified that the first test established the higher hurdle; if reductions where shown merely to have no discernable effect, an exemption would not be granted under the first test.

For purposes of describing how EPA interprets the phrase "net air quality benefit," and certain terms included in the above paragraph, the following clarification is provided:

"Ozone exposure and risk analysis" includes, but is not limited to, such parameters as: (1) estimates of the number of persons exposed at various pollutant concentrations for specified periods of time, (2) acute and multi-hour ozone effects

(generally 1 to 8 hours exposures), (3) chronic ozone effects (single and multiple year exposures), and (4) daily peak ozone concentrations.

"Health and welfare effects" includes, but is not limited to: (1) attainment and maintenance of the NAAQS for ozone, nitrogen dioxide, and particulate matter, (2) visibility impairment, (3) acid deposition, (4) air toxics, and (5) protection of nutrient sensitive watersheds.

In contrast to the other § 182(f)(1) tests, the net air quality benefit test is not specifically limited to a nonattainment area or transport region. Thus, a very broad geographic area may be considered.

In determining a net air quality benefit under test 1, EPA will consider all applicable factors, primarily those noted above. However, it will be difficult to weigh acute versus chronic ozone effects or ozone versus acid deposition and arrive at a clear net benefit determination. In fact, Congress imposed a very high hurdle by specifying that the exemption for specific sources would not be granted unless the benefits were greater without NO_x reductions. The other tests do not impose this level of stringency. Therefore, EPA interprets this provision to allow an exemption only where there is clear and convincing evidence showing net benefit.

In showing this benefit, air quality dispersion modeling may not be applicable when comparing, for example, the visibility effects to the acid deposition or ozone effects. Air quality benefit is not a simple accounting of net reduction in any

pollutant since the effects are not directly comparable. As a result, the net air quality benefit determination must be made on a case-by-case basis.

The Act provides that EPA will make this determination with respect to "the sources" concerned when approving a SIP revision. This indicates that Congress contemplated this determination be applied to specific, existing sources, rather than as a new source provision. Thus, it is not appropriate to compare existing sources' effects without NO_x reductions versus the no build/no new sources case. The net benefit must compare existing sources with NO_x reductions versus those sources without NO_x reductions. If reductions were shown merely to have no discernible effect, an exemption would not be granted under the first test.

In applying the second test stated above for nontransport regions, an exemption would be granted where NO_x reductions would not contribute to ozone attainment in the nonattainment area. This test is based on the impact of NO_x reductions on attainment of the ozone NAAQS. If NO_x reductions have no discernible effect, an exemption could be granted.

For purposes of describing how EPA interprets the phrase "contribute to attainment of the national ambient air quality standard for ozone in the area", the following clarification is provided:

Consideration is directed at ozone attainment. In an ozone nonattainment area NO_x emissions may contribute to ozone exceedances under some meteorological conditions and not under

others. "Contribute to attainment" could be interpreted to mean contribute to attainment of (1) any ozone exceedance, (2) the majority of exceedances considered, or (3) the most severe exceedances. Because this is the only test which is not a net benefit test and since an area must attain under all meteorological conditions, EPA interprets this determination to be based on any ozone exceedance under a meteorological condition which may violate the ozone NAAQS. Thus, if NO_x reductions contribute to attainment of any such ozone exceedance, an exemption would not be justified. However, an area may still avoid NO_x reductions where it is demonstrated that control of the most severe and the majority of exceedances without NO_x reductions will provide for timely attainment throughout the area and, thus, the NO_x reductions are "excess reductions."

In contrast to the provision for transport regions, this test is limited to consideration of the effects of NO_x emissions within a single nonattainment area. However, States should consider imposition of NO_x requirements in order to avoid adverse impacts in downwind areas, either intra- or inter-State.

In applying the third test stated above for ozone transport regions, an exemption would be granted where NO_x reductions would not produce net ozone benefits in the transport region. This test is based on a net ozone benefit which requires consideration of ozone exposure and risk analysis (as defined above) on a regionwide basis. If NO_x reductions have no discernible effect, an exemption would be granted.

The Act does not clearly state whether or not portions of the transport regions that are attainment/unclassified can opt-out of the NO_x requirements. The § 182(f)(1)(b) exemption provision specifically applies only to nonattainment areas within a transport region. The § 182(f)(1) net air quality benefit test is available to any area; however, as noted previously it is a high hurdle and this is especially true in rural areas. Thus, while a severely polluted area might be able to avoid NO_x reductions, the Act could be interpreted to require NO_x reductions in the surrounding attainment area.

An alternative reading of the Act can be found under § 184(b)(2). This provision states that the attainment/unclassified portions of the transport region must meet "the requirements which would be applicable to major stationary sources if the area were classified as a moderate nonattainment area." Thus, the Act could be interpreted to provide the same § 182(f)(1)(B) exemption process for these attainment/unclassified areas, since they would be treated as moderate nonattainment.

It is unlikely that Congress intended more stringent requirements for the attainment/unclassified portions of the transport region than would apply to the more severely polluted portions. Therefore, EPA interprets the § 182(f)(1)(B) provision to apply to any portion of the transport region.

Further information on the procedures and tools available to determine where an exemption is justified will be provided in the EPA guidance mentioned above. In general, this demonstration

should include photochemical grid modeling analyses that consider various control strategies with and without NOx reductions. However, where such analyses are not currently available, a State may request an interim exemption as described below.

The EPA has determined that, as a technical matter, photochemical grid modeling is the most reliable tool to justify an exemption from the NO_x requirements. In making this determination, EPA explored other technical methods which would be less resource- and time-consuming than grid modeling, but none appears to provide as reliable a basis for demonstrating whether NO_x reductions would be beneficial or not.

The EPA believes that information based on past photochemical grid modeling, including consideration of the effects of NO_x reductions, is available for most ozone nonattainment areas. In general, these areas (which include the Northeast Transport Region and portions of California and the Southeast) will be deemed by EPA to have a sound basis by which to apply the NO_x exemption tests described in § 182(f). The EPA, therefore, expects these areas, in their November 1992 SIP revisions, to either submit their NO_x rules or demonstrate that they qualify for the NO_x exemption.

In other areas, where photochemical grid modeling either has not been utilized or, if utilized, has not considered the effects of NO_x reductions, additional time is needed to conduct such modeling. For example, time may be needed to establish and implement a modeling protocol and interpret the model results. Therefore, on an interim basis and subject to the conditions

described below, EPA will allow States to use alternative techniques to demonstrate in their November 1992 SIP revisions (11/92) that they qualify for an interim exemption from the § 182(f) NO_x requirements.

An interim exemption would be granted on the basis of a conditional finding by EPA that NO_x reductions are not beneficial in the subject ozone nonattainment area. This conditional finding would be based on documentation provided by the State in its November 1992 SIP revision which demonstrates (1) that photochemical grid modeling results are not available to demonstrate the effects of NO_x reductions, and (2) that, based on available knowledge, NO_x reductions are not likely to contribute to attainment in the area. In addition, the finding by EPA would only be made subject to the following conditions: (A) a State requesting an interim exemption must identify concrete photochemical grid modeling activities which are well underway, and (B) the State must commit in its November 1992 SIP revision to complete such photochemical grid modeling and, unless such modeling shows that a further exemption is warranted, adopt NO_x (NN) rules no later than November 1994. The EPA wishes to emphasize that the duration of the interim exemption is directly dependent on the completion of modeling which is sufficient to make a more reliable NO_x benefit determination. Therefore, States that can complete modeling in a timeframe shorter than November 1994 would be required to do so. The EPA will not, however, grant interim exemptions extending beyond November 1994.

Where a petition for an exemption (§ 182[f][1]) or excess reductions determination (§ 182[f][2]) is granted by EPA prior to adoption and submittal of the State's rules, the State may simply choose to not submit the rules. If a petition is granted after submittal of the rules, but prior to EPA approval, the State may choose to withdraw the rules and preclude further EPA action. In a case where a petition is granted ("exempted area") after EPA approves of the NO_x rules, the NO_x rules must continue to be implemented except as discussed below.

In an exempted area, the RACT and/or NSR rules may be rescinded at any time through a SIP revision, provided their rescission would not interfere with attainment or RFP (§ 110[l]). That is, an approved attainment demonstration might have relied on the NO_x NSR program to limit growth in NO_x emissions or an area may be relying on NO_x substitution after 1996 to meet its 3 percent RFP requirement. In such cases, a new attainment demonstration and/or RFP program would be necessary to show that the SIP is adequate without the NO_x requirements.

Following application of a photochemical grid model that is required for serious and above areas by November 1994, a State must select and adopt a control strategy that provides for attainment as expeditiously as practicable. This decision must be addressed by a State whether or not an area was exempted from the November 1992 submittal of NO_x RACT and/or NSR rules and may result in revision of the previously adopted rules. In some instances the NO_x RACT and NSR requirements already adopted may

The substitutions would be for VOC reductions required after November 1996. In accordance with guidance issued by EPA, a State may demonstrate to the Administrator that the NO_x substitution is justified. The EPA will make a formal determination on any State request when the Administrator approves a plan or plan revision. The EPA's decision will be based on the documentation provided by the State and application of the EPA guidance. The EPA encourages the States to consult with the EPA Regional Office during the development of the demonstration and plan revision to ensure that any exemption is approvable and that any required rules can be adopted in a timely manner.

B. CO

The 1990 CAAA create a new classification structure for CO nonattainment areas based on the severity of the nonattainment problem. For each area classified under this section, the attainment date shall be as expeditious as practicable, but no later than the date in the following table. The classification scheme is as follows:

Area classification	Design value, ppm	Primary standard attainment date
Moderate	9.1-16.4 ppm	December 31, 1995
Serious	16.5 and above	December 31, 2000

As provided in Part D Subpart 3, Emission Inventories, rules for I/M, NSR rules for areas with a design value greater than 12.7 ppm, and certain other planning or control measures are required within 2 years after enactment (November 15, 1992) for both previously and newly designated nonattainment areas. If an

need to be supplemented with additional or more advanced NO_x controls in order for the area to attain the NAAQS.

In other cases, an area initially exempted may choose, based on the new photochemical grid modeling results, to adopt certain NO_x reduction rules in order to attain and/or meet RFP requirements through NO_x substitution. The area would be removed from "exempt" status. Consequently, the area would have to adopt the NO_x RACT and NSR rules except to the extent modeling shows that the controls beyond those chosen are "excess reductions." Credit for NO_x substitution would be granted only if in accordance with the EPA guidance. In any event, these changes must be submitted as a SIP revision and must provide for attainment as expeditiously as practicable and meet RFP requirements.

Alternatively, for an area that adopted the NO_x RACT and NSR rules as required by § 182 (i.e., not exempt), a State may choose to revise some or all of those rules to require less (or no) NO_x stationary source controls. This action would be based on the application of a photochemical grid model showing that the subject NO_x controls result in excess emission reductions. (EKMA is not sufficiently precise for this purpose even for moderate areas.) The revisions must be submitted as a SIP revision and the SIP must demonstrate attainment as expeditiously as practicable.

Section 182(c)(2)(C), NO_x Control, provides that NO_x emission reductions may be substituted for required VOC reductions if there would be an equivalent reduction in ozone.