GUIDELINE FOR DETERMINING THE APPLICABILITY OF NITROGEN OXIDES REQUIREMENTS UNDER SECTION 182(f)

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CHAPTER 1

INTRODUCTION

1.1 General

The Clean Air Act (CAA), as amended in 1990, includes new provisions in section 182(f) to control emissions of nitrogen oxides (NOx) in certain ozone nonattainment areas and ozone transport regions. Section 182(f) also specifies circumstances under which the new NOx requirements would be limited or would not apply. This document describes EPA's preliminary views on how EPA should interpret section 182(f) and the circumstances under which EPA would determine that the new NOx requirements would be limited or would not apply.

Although this document includes various statements that States or petitioners must take certain actions, these statements are guidance made pursuant to EPA's preliminary interpretations, and thus do not bind the States and the public as a matter of law. The EPA's interpretation of the section 182(f) provisions will provide a basis for subsequent EPA approval or disapproval of requests for exemption from the new NOx requirements. While this document contains guidance on the interpretation of the section 182(f) provisions, unique circumstances or as yet unrecognized issues are likely to cause case-by-case exceptions to arise. The EPA intends to provide the public with an opportunity to comment on any exemption requests received by the Agency.

1.2 Nitrogen Oxides Supplement to the General Preamble for Implementation of Title I of the Clean Air Act

The new NOx requirements, which are summarized below, are described in detail in EPA's Nitrogen Oxides Supplement to the General Preamble for Implementation of Title I of the Clean Air Act. This guidance was published in the Federal Register on November 25, 1992 (57 FR 55620).

Section 182(f) requires States to apply the same requirements to major stationary sources of NO_X as are applied to major stationary sources of volatile organic compounds (VOC). The new NOx requirements are reasonably available control technology (RACT) and new source review (NSR). These requirements apply to major stationary sources in certain areas that are designated nonattainment for the ozone national ambient air quality standard (NAAQS) and in an ozone transport region.

The RACT requirements are in section 182(b)(2). This section requires RACT for major NOx stationary sources in ozone nonattainment areas classified moderate and above as well as in an ozone transport region. States are required to submit regulations for RACT by November 15, 1992 and sources are required to achieve compliance with RACT by May 31, 1995. The EPA has defined RACT as the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility (44 FR 53762; September 17, 1979).

The NSR requirements are in section 182(a)(2)(C). This section requires States to adopt revised NSR regulations in ozone nonattainment areas classified marginal and above as well as within an ozone transport region. States are required to submit regulations for NSR by November 15, 1992. NSR provisions require major new or modified stationary sources to comply with control technology that represents the lowest achievable emission rate and requires the sources to obtain emission offsets.

The RACT and NSR requirements for major sources in attainment/unclassified portions of the northeast ozone transport region originate in section 184(b)(2).

1.3 Section 185B Report

Under section 185B, the Administrator, in conjunction with the National Academy of Sciences (NAS), conducted a study on the role of ozone precursors in tropospheric ozone formation. The section 185B study must examined 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. The EPA announced in the February 26, 1993 Federal Register a 30-day public comment period on the draft section 185B report. The final report was submitted to Congress on July 30, 1993. The National Research Council announced the completion of the December 1991 NAS report, Rethinking the Ozone Problem in Urban and Regional Air Pollution. The final section 185B report incorporates this NAS report along with a recent EPA report addressing the availability and extent of NOx controls. In addition, the section 185B report also provides EPA perspectives on key ozone control strategy issues addressed by the National Research Council, emphasizing the NOx issues as directed by section 185B.

In making a determination under section 182(f) that the NOx requirements do not apply, or may be limited, the EPA must consider the section 185B study. This section 182(f) document includes consideration of EPA's section 185B report to Congress, including the December 1991 NAS report.

1.4 Application of Section 182(f) Requirements

Section 182(f)(1) provides that the new NOx requirements shall not apply if the Administrator determines that any one of the following tests is met:

(1) in any area, the net air quality benefits are greater in the absence of NO_X reductions from the sources concerned;

(2) in nonattainment areas not within an ozone transport region, additional NO_X reductions would not contribute to ozone attainment in the area; or

(3) in nonattainment areas within an ozone transport region, additional NO_X reductions would not produce net ozone air quality benefits in the transport region.

Further, section 182(f)(2) states that the application of the new NOx requirements may be limited to the extent necessary to avoid excess reductions of NOx as determined by applying tests similar to tests (1)-(3) above.

As described in this document, the "net air quality benefits" test and the "excess emissions" provision may be applied in an ozone transport region or outside the transport region; the "contribute to attainment" test may only be applied outside of an ozone transport region; and the "net ozone benefits" test may only be applied within an ozone transport region. Where any one of the tests is met (even if another test is failed), the section 182(f) NOx requirements would not apply or, under the excess reductions provision, a portion of these requirements would not apply.

CHAPTER 2

ADMINISTRATIVE PROCEDURES

2.1 Processing with the State Implementation Plan (SIP) Revision

A State may, at any time, demonstrate to the Administrator that the new NOx requirements should not apply. For example, a State may submit a demonstration under section 182(f) along with, or as a revision to, the SIP at the time the NOx RACT rules are due; or a State may choose to submit the section 182(f) demonstration at a later date along with or as part of a separate SIP revision. The State's demonstration is not required to be a SIP revision itself.

The EPA will approve or disapprove the State's demonstration when the Administrator approves a plan or plan revision. The EPA will consider the section 185B report and will base its decision on the demonstration and supporting information provided by the State. Such demonstration and information should be in sufficient detail for EPA to determine that the exemption request is consistent with the guidance contained in this section 182(f) document. The EPA encourages the States to consult with the appropriate EPA Regional Office during the development of the documentation. This is necessary to ensure that the documentation provided by the State is likely to be approved and that any required rules can be adopted in a timely manner. NOx RACT and/or NSR rules that have been submitted or were previously approved by EPA would continue to be processed for approval or continue to be enforced while EPA considered the section 182(f) demonstration.

2.2 Petition

Section 182(f)(3) provides that a person (including a State) may petition the Administrator for a NO_X exemption at any time after the final section 185B report is submitted to Congress. The petition may be made with respect to any nonattainment area or any ozone transport region. The EPA must grant or deny a petition within 6 months after its filing.

Since an individual petition is likely to affect the SIP planning process which is primarily a State responsibility, EPA believes it is reasonable to require the petitioner to provide a copy of the petition and demonstration to the State or States which have jurisdiction over the source or sources covered by the petition at the same time it is submitted to the Administrator (where a petition under section 182(f)(3) is being submitted by a person other than the State itself). Where additional States may

be affected by the petition, the State receiving the petition should coordinate with the other States as necessary. In some cases there may be multiple petitions for a given area. In other cases a single petition may have multi-State implications. Shortly after EPA receives a petition, the Agency will announce its receipt and availability for public review in the Federal Register. The EPA will provide the State(s) a 3-month period to make a recommendation to EPA regarding the petition. This 3-month period will run concurrently with the 6-month review period required under section 182(f)(3). The petitioner should submit the petition and demonstration to the Administrator through the appropriate EPA Regional Office.

The EPA encourages any petitioner to consult with the State air quality agency and the appropriate EPA Regional Office during the development of a section 182(f) demonstration. This is necessary to ensure that the documentation provided (1) meets EPA guidance, (2) does not conflict with similar analyses by the State, and (3) is likely to be accepted by the State and EPA. The EPA's decision to grant or deny a petition will include consideration of the section 185B report and will be based on the demonstration provided by the petitioner, the State's recommendation, and the provisions of section 182(f). As noted above, this document sets forth EPA's preliminary interpretations of the section 182(f) provisions.

The EPA will provide notice of its final action on a petition and the rationale for that action in a letter to the petitioner within the 6 month period. In addition, EPA will publish a notice describing the petition and EPA's determination in the Federal Register. If EPA denies a petition, the petitioner may supplement or revise the original petition at a later date. Any revised petition would begin a new 6 month period.

If EPA grants a petition, the section 182(f) NO_X requirements or portions of those requirements, would no longer apply to those sources or areas, as described in EPA's approval action. However, States remain free to adopt NO_X restrictions for other reasons. For example, a State may determine that NOx reductions are needed for purposes of ozone maintenance planning, ozone attainment in separate downwind nonattainment areas, visibility protection, PM-10 control strategy, acid deposition program or other environmental protection. The EPA could approve certain NOx restrictions in a SIP revision despite granting a petition under section 182(f), so long as the NOx restrictions would not interfere with meeting any applicable requirement concerning attainment and reasonable further progress or any other applicable requirement of the CAA [see section 110(l)].

Section 182(f)(3) states that a person may petition the Administrator for a determination under section 182(f) at any time after the final report under section 185B is submitted to Congress. The final section 185B report was sent to Congress by the Administrator on July 30, 1993. Section 182(f)(3) also requires the Administrator to grant or deny such a petition within 6 months after its filing with EPA.

CHAPTER 3

NET AIR QUALITY BENEFIT

3.1 Demonstration

This demonstration applies to specific sources in an ozone nonattainment area or in an ozone transport region. It must show that NO_X reductions from the sources seeking the exemption would be counter-productive overall, considering the net air quality benefits. Congress specified in this "test" for specific sources a higher hurdle than in the other tests for areawide exemptions: the demonstration must show a beneficial impact from the avoidance of the NOx controls.

The procedure for this test is to first project areawide baseline conditions that may be expected at the attainment deadline (section 8.3). Then, analyses are conducted for 2 scenarios (section 3.4): with and without NOx reductions at the sources concerned. As described in section 8.2, multi-year analyses may also be conducted.

3.2 Factors

Unlike the tests described in chapters 4 and 5, the CAA does not limit this test to consideration of ozone impacts. Instead, this test is based on a broader set of air quality impacts considered in the CAA. There are many air quality impacts explicitly addressed in the CAA, both health and welfare related, that may be directly or indirectly related to NOx emissions. These impacts include ozone, nitrogen dioxide, and particulate matter formation, visibility impairment, acid deposition, air toxics formation, and nitrogen deposition in nutrient-sensitive areas.

Due to the number and variety of impacts, it is generally impractical or impossible to compare effects quantitatively from one of these factors to those from another factor or among several factors. For example, there is no readily available scale to use to compare nitrogen dioxide impacts with acid deposition impacts and/or visibility impacts. Thus, in order to describe a method for determining the "net air quality benefit," a distinction must be made regarding which of the many factors can and should be analyzed.

The EPA has concluded that the factors considered for the purposes of section 182(f) must be consistent with the requirements of the CAA. Thus, although "air quality impacts" could potentially be defined in a very broad manner, EPA has

concluded that the air quality impacts considered under section 182(f) must related directly to goals, standards, or mandates that are explicitly addressed in the CAA. Therefore, the test for net air quality benefits must assure that a decision to grant an exemption would not interfere with the achievement of the specific programs or goals mandated in the CAA.

The primary test should be the effect the exemption would have on attainment of the primary NAAQS for the criteria pollutants. The primary NAAQS are set by the Administrator to assure protection of the public health with an "adequate margin of safety;" EPA has, thus, concluded that this test should focus specifically on the effect of an exemption on the numbers of exceedances of the primary NAAQS. A petitioner should model the "NOx control" vs. "no NOx control" scenarios to assess the impact the NOx controls would have on the numbers of exceedances of the primary NAAQS, as described elsewhere in this document.

Secondary tests, as needed, can extend to the (qualitative or quantitative) consideration of other air quality impacts that are explicitly recognized in the CAA. These could include, for example, the welfare effects which EPA has considered and deemed necessary to protect against in setting secondary NAAQS for the criteria pollutants. A petitioner could also consider any other air quality effects that are explicitly addressed in the CAA through goals, standards or mandates, for example, visibility or air toxics emissions.

The CAA requires the NAAQS to be attained as expeditiously as practicable and the CAA includes deadlines for rule adoption, submittal of control strategies, and attainment of the primary national ambient air quality standards (NAAQS). Thus, the impacts on attainment of the primary NAAQS must be a primary concern to this net air quality benefit test. In contrast, impacts on nutrient-sensitive areas is an important environmental issue that is addressed in the CAA, but does not have the same detailed set of requirements and deadlines stated in the CAA as do the NAAQS; thus, it should generally be a secondary concern to this net air quality benefit test. Further, EPA is not aware of any conflicts between the section 182(f) exemption and the requirements of section 407, concerning acid deposition, that might be considered in this analysis; i.e., granting a section 182(f) exemption would not relieve, conflict with, or otherwise affect a source's obligation or ability to achieve NOx reductions consistent with the section 407 requirements. In cases where NOx reductions from a utility subject to section 407 would be counterproductive to the net air quality benefit, EPA encourages the State and utility to use the emission averaging provisions of section 407 to achieve the required NOx reductions at a location

where they are not counterproductive to the net air quality benefit. If any statutory conflicts are documented, they could be considered on a case-by-case basis.

In all cases, the method for consideration of the net benefits must be related primarily to "air quality" since section 182(f) specifically requires a determination of the "air quality" benefits. Thus, simpler tests, such as a "net emissions" test, should not be relied upon since changes in emissions are not necessarily directly related to changes in air quality. In general, air quality impacts can be best determined by use of air quality dispersion models. However, at the present time, there are no EPA-recommended air quality dispersion models for simulation of nitrate (particulate) formation or comparison among ozone, nitrogen dioxide, and/or PM-10 NAAQS impacts in a single nonattainment area.

In order to use air quality dispersion modeling whenever possible and to avoid conflicts with other requirements of the CAA, the methods described below should be used to determine the net air quality benefit over an appropriate geographic area (see section 3.3) which includes the ozone nonattainment areas encompassing or nearby the sources concerned. These methods include a primary consideration of the primary NAAQS air quality benefits and secondary consideration of other air quality benefits.

Ozone Nonattainment Areas

For areas that are nonattainment only for ozone, the effects of NOx reductions on ozone concentrations should be quantified with currently available air quality modeling techniques (see chapter 7). The net air quality benefit should be based on a comparison of the geographic area exposed to concentrations above the ozone NAAQS with and without NOx reductions from the sources concerned.

Where Urban Airshed Model (UAM) results are available, population exposure to concentrations above or near the NAAQS may be used instead of the geographic area exposure factor. The Regional Oxidant Model (ROM) results for NOx reduction scenarios over major emissions/population centers should not be used quantitatively for population exposure analyses. This is because ROM results have their largest associated uncertainties in areas where there is an inhomogeneous mix of emissions from major sources. Since such areas also tend to have greatest populations, use of the ROM, by itself, to estimate population exposure may have considerable associated uncertainty.

It is important to note that EPA believes that photochemical grid models such as UAM and ROM are not sufficient to assess incremental changes to areawide ozone concentrations from emissions reductions at a single or group of small sources. Emission changes should amount to some significant fraction of base emissions before modeling results with ROM or UAM can be interpreted with sufficient confidence that the results are not lost in the noise of the model and the input data.

The EPA has reservations with respect to modeling NOx reductions at a single source or group of sources unless the modeling includes at least 10% of the domain-wide emissions. Thus, this exemption analysis is appropriate for groups of large emitters or for consideration of entire source categories, rather than emission reductions at a single or group of small sources. However, EPA will consider on a case-by-case basis an analysis that considers less than a 10% change in the domain-wide emissions. In such cases, the analysis of a small portion of the emissions would show only a small difference in ozone concentration, if any, between the with NOx and without NOx scenarios, and, therefore, consideration of secondary factors (described below) is particularly important in order to show a net air quality benefit.

In some cases, the amount of emission reductions assumed in the modeling analysis could be very large; thus, there may be cases where the analysis does not result in any values above the NAAQS for any pollutant and, thus, there would not be a comparison of area or population exposed. This could occur even though the difference in ozone concentration between the two scenarios is large. In such cases, the petitioner should look to the factors considered in the secondary test, such as welfare effects or other air quality effects addressed by the CAA.

Areas Nonattainment for Both Ozone and Nitrogen Dioxide

For areas that are nonattainment for both ozone and nitrogen dioxide, NOx reductions clearly are needed to provide for attainment of the nitrogen dioxide standard, while either NOx or VOC reductions (or both) might best provide for attainment of the ozone standard. In such cases EPA would not make a finding of a net air quality benefit since the CAA requires the NAAQS for nitrogen dioxide to be met as expeditiously as practicable.

Areas Nonattainment for Both Ozone and PM-10

For areas that are nonattainment for both ozone and PM-10, a determination is first needed if the secondary nitrates formed from NOx emissions contribute significantly to the PM-10 NAAQS

violation(s) in the specific nonattainment area. This significance determination is needed since, especially in the eastern United States, EPA expects that the nitrate portion of measured PM-10 will be found to be insignificant in many cases. Where sufficient and reliable data exist to determine the nitrate contribution to ambient PM-10 concentrations, this determination may be limited to those NOx emissions sources subject to the section 182(f) requirements. Where the contribution is insignificant (see below), then the net air quality determination should be based primarily on the ozone impacts. Where the contribution is significant, EPA would not make a finding of a net air quality benefit since the CAA requires the NAAQS for PM-10 to be met as expeditiously as practicable. For this purpose, EPA intends to use its definition of a significant contribution to a PM-10 nonattainment area which is 1.0 microgram per cubic meter (nitrate and associated materials) for the annual standard and 5 micrograms per cubic meter for the 24-hour standard (40 CFR 51.165).

Areas Nonattainment for Ozone and Carbon Monoxide, Lead or Sulfur Dioxide

For carbon monoxide, lead, and sulfur dioxide, EPA is not aware of any significant impacts from NOx reductions. Therefore, the net air quality benefits determination should be primarily based on the ozone modeling analysis described above for areas nonattainment for only ozone.

As noted above, equal consideration of all NOx impacts is generally impractical in this net air quality benefit test because of the lack of scales to compare the impacts among the various factors. Nevertheless, additional factors explicitly addressed in the CAA such as those listed below must be considered at least on a qualitative basis in addition to any information developed from the NAAQS analyses. Consideration of the factors below is especially important in cases where the analyses on the NAAQS pollutants cannot clearly determine the net air quality benefit. In any case, EPA believes the amended CAA places a substantial burden on the applicant to provide a clear showing that NOx reductions would be counterproductive overall, considering the net air quality benefits. Additional factors to determine net air quality benefit may include but are not limited to:

1. Effects associated with long-term exposures to plants, animals, and materials.

2. Visibility impairment, long-term and episodic acid deposition, air toxics, and deposition of nitrogen in

nutrient-sensitive watersheds.

3.3 Geographic Scope

In contrast to the other section 182(f) tests, the net air quality benefit test is not specifically limited to an ozone nonattainment area or ozone transport region and may be directed at a specific set of sources. Thus, a very broad geographic area should be considered. The area may, in some cases, extend beyond an ozone nonattainment area or ozone transport region. In addition, the area must not be so small that downwind impacts from NOx emissions are not fully considered. Sufficient area is needed to allow for completion and consideration of the various chemical transformations of NOx and interaction with other pollutants. At a minimum, the geographic area should include the ozone nonattainment area(s) encompassing or nearby the sources concerned. For example, petitioning sources located in attainment portions of the ozone transport region should analyze their impact on nearby nonattainment areas and should consider other factors, such as visibility impacts throughout the surrounding area.

3.4 Scenarios

Section 182(f) states, for this test, that EPA must determine that the net air quality benefits are greater in "the absence of reductions of oxides of nitrogen from the sources concerned." The procedure for this test is to first project areawide baseline emissions that may be expected at the attainment deadline (see sections 3.3 and 8.3). (As described in section 8.3, multi-year analyses may also be conducted.) Second, the projected baseline emissions are held constant, except for the subject individual sources. Then, the air quality analyses are conducted for these two scenarios:

1. the projected baseline emissions of VOC and NOx (without NOx reductions from the sources concerned) and

2. the projected baseline emissions of VOC and NOx emissions including NOx reductions at all emission sources subject to the NOx NSR and RACT provisions of section 182(f).

With respect to new major sources, the two scenarios should take into account application of the section 182(f) NSR requirements as described in section 8.5.

3.5 Sources

For this net air quality benefit test, the CAA refers to "reductions of oxides of nitrogen from the sources concerned." For purposes of this analysis, "the sources concerned" are defined as the sources that would be exempted from the section 182(f) NOx requirements by the petition or State request. The sources concerned may be identified in any of the following ways: (1) specific individual sources, (2) one or more source categories, or (3) a geographic area containing a group of sources. As described in section 3.4, the sources concerned must be analyzed together with other NOx and VOC sources in the area; these other NOx sources should take into account application of the section 182(f) RACT and NSR requirements (as part of the areawide baseline conditions expected at the attainment deadline year) since those NOx reductions are not the subject of the exemption request.

CHAPTER 4

CONTRIBUTE TO ATTAINMENT

4.1 Demonstration

This demonstration applies only to ozone nonattainment areas that are not within an ozone transport region. The demonstration must show that additional NOx reductions would not contribute to ozone attainment in the area.

The procedure for this test is to utilize a photochemical grid model (see chapter 7) to simulate several episode cases over the nonattainment area under conditions that may be expected at the attainment deadline (see section 8.2) considering three emission reduction scenarios (see section 8.3): (1) substantial VOC reductions; (2) substantial NOx reductions; and (3) both the VOC and NOx reductions. If the areawide predicted maximum 1-hour ozone concentration for each day modeled under scenario (1) is less than or equal to that from scenarios (2) and (3) for the same day, then the test is passed and the section 182(f) requirements would not apply.

4.2 Episodes to Consider

In most ozone nonattainment areas it is likely that portions of the area would benefit from NOx reductions and other portions would not for each modeled day. The EPA believes it is appropriate to focus this analysis on the areawide maximum 1-hour predicted ozone concentration since this value is critical to the attainment demonstration. In contrast, it should not be necessary to examine the maximum 1-hour ozone concentrations at each point modeled in the area since these points are not necessarily important to development of the attainment demonstration and since this is the only one of the section 182(f) tests which is not keyed to net benefits.

In certain ozone nonattainment areas it is possible that NOx emission reductions may help to reduce the areawide maximum predicted ozone concentration under some meteorological conditions but not under others. The phrase "would not contribute to attainment" could be interpreted to mean that NOx emission reductions would not help reduce (1) any areawide maximum 1-hour predicted ozone concentration, (2) the majority of areawide maximum 1-hour predicted ozone concentrations, or (3) the most severe areawide maximum 1-hour predicted ozone concentration.

The EPA believes that the "majority" option is not

appropriate since this is the only one of the section 182(f) tests which is not keyed to net benefits. Furthermore, (1) an area may need to demonstrate attainment under multiple meteorological conditions, (2) generally a small number of episodes will be modeled and (3) the NAAQS is based on multiple exceedances rather than a single, most severe value. For the above reasons, EPA believes this determination should be based on each areawide maximum 1-hour predicted ozone concentration modeled in accordance with this guidance (chapter 7). Thus, all of the areawide maximum 1-hour predicted ozone concentrations modeled must be greater with NOx reductions at the sources concerned than without the reductions, or no exemption would be granted. An area is not required to model all past exceedances; only those episodes selected for modeling in accordance with EPA guidance (chapter 7) need to be considered.

4.3 Geographic Scope

This demonstration focuses on attainment of the ozone NAAQS "in the area." The EPA interprets this to mean, at a minimum, in the nonattainment area. In contrast to the provision for transport regions, which is likely to consider several attainment and nonattainment areas in the section 182(f) analysis, this demonstration is limited to consideration of the effects in a single nonattainment area due to NO_X emissions reductions from sources in the same nonattainment area. However, since the effects of an attainment strategy may extend beyond the designated nonattainment area and since photochemical grid modeling is necessary for this demonstration and is likely to use a modeling domain larger than the nonattainment area, EPA encourages States/petitioners to include consideration of the entire modeling domain.

States should consider imposition of the NOx requirements if needed to avoid adverse impacts in downwind areas, either intra- or inter-State. States need to consider such impacts since they are ultimately responsible for achieving attainment in all portions of their State (see generally section 110) and for ensuring that emissions originating in their State do not contribute significantly to nonattainment in, or interfere with maintenance by, any other State [see section 110(a)(2)(D)(i)(I)].

4.4 Applicability to Areas Requesting Redesignation to Attainment

In some cases, an ozone nonattainment area might attain the ozone standard, as demonstrated by 3 years of adequate monitoring data, without having implemented the section 182(f) NOx provisions over that 3-year period. Where the State submits a

request for redesignation to attainment along with necessary supporting documentation and where NOx RACT and NSR requirements were not implemented over that 3-year period, it is clear that the section 182(f) language is met since "additional reductions of oxides of nitrogen would not contribute to attainment." That is, since attainment has already occurred, additional NOx reductions could not improve the area's attainment status and, therefore, the section 182(f) demonstration could be approved. Additional guidance on this subject is contained in a September 17, 1993 memorandum from Michael Shapiro to the EPA Regional Offices regarding requests for redesignation to attainment.

The section 182(f) demonstration would not be approved if there is evidence, such as photochemical grid modeling, showing that the NOx exemption would interfere with attainment or maintenance in downwind areas. As noted above, section 110 prohibits such impacts.

CHAPTER 5

NET OZONE AIR QUALITY BENEFIT

5.1 Demonstration

This demonstration applies in an ozone transport region. It must show that additional NO_X reductions would not produce net ozone benefits in the transport region. In this test the net benefit must be demonstrated on a regionwide basis. Regionwide includes all portions of the ozone transport region in which impacts from NOx emissions from the area seeking the exemption can be determined by the photochemical grid model.

The procedure for this test is to utilize a photochemical grid model (see chapter 7) to simulate conditions that may be expected at the attainment deadline (see section 8.3) considering three emission reduction scenarios (section 8.4): (1) substantial (se section 8.4) VOC reductions; (2) substantial NOx reductions; and (3) both the VOC and NOx reductions. The net ozone benefit may be determined by comparing the ozone concentrations modeled in scenario (1) with results modeled from scenarios (2) and (3). If the exposure to ozone concentrations from scenario (1) is less than or equal to the exposure to ozone concentrations from scenarios (2) and (3), then the section 182(f) net ozone benefits demonstration could be approved. As described in section 8.3, multi-year analyses may also be conducted.

5.2 Factors

The ozone NAAQS is set at 0.12 parts per million (ppm). In defining "net ozone benefit," however, EPA recognized that various forms of expression could be considered with respect to ozone impacts. These forms include the 1-hour 0.12 ppm NAAQS, a 1-hour value less than 0.12 ppm, an 8-hour value set lower than 0.12 ppm, and a seasonal value set lower than the 0.12 ppm value. However, ozone concentrations with different averaging periods and values cannot readily be compared to each other. For example, it is difficult to compare a set of 1-hour ozone peak concentrations above 0.12 ppm against a set of 8-hour ozone peak concentrations above 0.06 and determine which results are more beneficial.

The EPA believes it is reasonable to focus the net ozone benefits test on the 1-hour 0.12 ppm ozone NAAQS, where possible for the following reasons: (1) the 0.12 ppm ozone NAAQS has been set by the Administrator as the level necessary to protect the most sensitive individuals from adverse health effects with an

"adequate margin of safety;" (2) ozone concentrations with different averaging periods and values cannot readily be compared to each other, (3) the purpose of the various section 182 provisions is primarily to attain the ozone NAAQS, and (4) it is important for this guidance document to avoid any conflicts (as noted in chapter 3) with the section 182 requirements. Therefore, the averaging time to be used should be the one-hour daily maximum ozone concentration and the analysis should focus on values above the 0.12 ppm NAAQS level. Specifically, the net ozone benefits test focuses on the total geographic area exposed to ozone concentrations above the 0.12 ppm NAAQS level.

Where Urban Airshed Model (UAM) results are available, population exposure to concentrations above or near the ozone NAAQS may be used, instead of the geographic area exposure factor. The Regional Oxidant Model (ROM) results for NOx reduction scenarios over major emissions/population centers should not be used quantitatively for population exposure analyses. This is because ROM results have their largest associated uncertainties in areas where there is an inhomogeneous mix of emissions from major sources. Since such areas also tend to have greatest populations, use of the ROM, by itself, to estimate population exposure may have considerable associated uncertainty.

Depending on the amount of NOx and VOC reductions selected for each scenario, the model results in some cases might show all scenarios to be below the 0.12 ppm ozone NAAQS level. In such cases some might argue that there is no ozone benefit and, thus, the NOx requirements should not apply. The EPA does not agree with such an interpretation because the CAA specifies "net ozone" rather than "ozone attainment" for this test. In fact, a "net" ozone test is necessary to integrate the benefits and disbenefits of NOx reductions that are likely to vary from grid to grid in a given analysis area. That is, NOx reductions may reduce hourly ozone concentrations in some locations and increase hourly ozone concentrations in other locations within the same modeling domain. Therefore, a broader factor is needed than the areawide 0.12 ppm where the modeled scenarios show all values below the ozone NAAQS.

Consideration of ozone air quality impacts other than the primary NAAQS values is appropriate as a secondary factor. Thus, values such as the following are appropriate for consideration where no conclusion can be drawn through the above analysis based on the ozone NAAQS values: effects associated with long-term exposures to ecosystems, crops, animals, and materials.

5.3 Attainment/Unclassified Portions

The section 182(f)(1)(B) demonstration explicitly refers to nonattainment areas within an ozone transport region. The CAA does not clearly state whether or not portions of ozone transport regions that are attainment/unclassified can make the net ozone benefit demonstration. The section 182(f)(1) net air quality benefit test is available to any area; however, as noted previously it is a higher hurdle. Thus, while a severely polluted area might be able to demonstrate that NO_X reductions do not apply because the "net ozone benefits" test is satisfied, the CAA could be interpreted to require NO_X reductions in the surrounding attainment area because that area cannot meet the same test. It is unlikely that Congress intended such a result.

An alternative reading of the CAA can be found through section 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 CAA could be interpreted to provide the same section 182(f)(1)(B) demonstration process for these attainment/unclassified areas, since they should be treated as moderate nonattainment areas for the purpose of applying the section 182(f) requirements and moderate nonattainment areas in the transport region are eligible to meet the "net ozone benefits" test.

Even without that language, EPA would be inclined to allow an attainment/unclassified area in a transport region to satisfy the "net ozone benefits" test. It would be absurd, and therefore it is unlikely that Congress intended to apply more stringent requirements in the attainment/unclassified portions of the transport region than would apply to the more severely polluted portions. Congress apparently did not intend any lesser requirements to apply in the attainment/unclassified portions of the transport region. The EPA believes that it is appropriate to extend the section 182(f) provision beyond the boundaries of a nonattainment area into adjacent attainment/unclassified areas which are part of the same section 182(f) demonstration. Thus, where a State/petitioner demonstrates that NOx reductions would not produce net ozone benefits in the transport region, then the section 182(f) NOx requirements would not apply to those sources or areas as described in EPA's approval action. Such a demonstration must include all portions of the ozone transport region in which impacts from NOx emissions from the area seeking the exemption can be determined by the photochemical grid model.

CHAPTER 6

EXCESS EMISSIONS REDUCTIONS

6.1 General

Section 182(f)(2) provides the flexibility to limit the scope of the NOx NSR and RACT requirements. Application of the NOx NSR and/or RACT requirements can be limited to the extent that any portion of those reductions are demonstrated to result in "excess reductions." The tests for demonstrating excess reductions are generally the same as in section 182(f)(1): net air quality benefit, contribute to attainment and net ozone benefit. However, in this case, the demonstration must show that a portion of the otherwise required NOx reductions are either counterproductive to the net air quality, do not contribute to attainment, or do not provide a net ozone benefit [depending on the section 182(f) test applied].

As described below, for the contribute to attainment or net ozone tests, the excess reductions test must show that certain NOx reductions are in excess of the reductions specified in either the attainment demonstration required by section 182 and contained in the approved SIP or an attainment demonstration adopted by the State to meet the section 182 attainment demonstration requirement and submitted to EPA for approval. The excess emission reductions may be described, for example, as (1) an areawide across-the-board tonnage reduction; (2) emissions attributed to specific sources; or (3) emissions from a geographic portion of the nonattainment or transport area.

6.2 Demonstration

The "contribute to attainment" and "net ozone benefit" tests described in chapters 4 and 5 both require an areawide or regional analysis. In such areawide/regional analyses, NOx emission reductions at a large number of sources are considered. These analyses are appropriate to determine in a directional manner whether or not NOx reductions are expected to be beneficial with respect to the air quality in the area/region. The analyses described in chapters 4 and 5 may be less precise than an attainment demonstration required under section 182(c).

The EPA believes that the excess reductions provision requires a more precise analysis; specifically an analysis which is based on the attainment demonstration. That is, the excess reductions provision must be more than a directional finding on an areawide basis. Under the excess reductions provision, an analysis is needed to show that a specific portion of the total

areawide NOx emissions is not beneficial under one of the three tests. Thus, individual or groups of sources may petition to show that, while NOx reductions may be beneficial directionally in the area, NOx reductions from their specific sources are not beneficial and, thus, should be exempt from the NOx requirements.

Without providing some constraints in this guidance document, the excess reductions provisions could undermine the section 182(f) requirements, since each individual emission source could theoretically petition for an exemption with the argument that their small contribution to the overall ozone problem is inconsequential. Such a petition might be considered consistent with the analyses required in chapters 4 and 5, since an exemption may be granted where the modeled NOx reductions show no impact on ozone concentrations. Certainly, if EPA allowed very small amounts of NOx reductions to be modeled individually, this interpretation would create a significant loophole. Congress would not have intended, and therefore EPA does not accept the argument, that the owner/operator of one car or one small boiler can be excused from the CAA requirements because their emissions, viewed alone, are small. Considered together with other small contributions, the emissions may be important to attainment. That is, emissions from one car or one commercial boiler would not change the areawide ozone concentration, yet together with other cars or boilers, they may be critical to the area's attainment strategy. Furthermore, as previously described in this document, ozone air quality models should not be applied solely to determine the incremental effect of small sources as such emissions could be lost in the noise of the air quality model and emissions inventory uncertainties when considered alone.

For the above reasons, EPA has determined that the excess reductions demonstration for the "contribute to attainment" or "net ozone benefits" tests must be tied to the area's SIP attainment demonstration. Thus, this test must show that the excess reductions are reductions in excess of those specified in the attainment demonstration required by section 182 and either contained in the approved SIP or as adopted by the State to meet the section 182 attainment demonstration requirement and submitted to EPA for approval. This tie to the attainment demonstration assures that an excess reductions petition would not arbitrarily be based on small emissions and would not undermine the State's control strategy.

In contrast, the "net air quality benefit" test discussed in chapter 3 is intended to address an individual or small number of sources and already has an adequate constraint. The net air quality benefit test requires a showing that NOx reductions specifically from the sources concerned are counterproductive.

The net air quality benefit test imposes a higher hurdle than the other two tests and EPA believes this higher hurdle is adequate for purposes of the excess emissions test as well.

CHAPTER 7

MODELING TECHNIQUES

7.1 Photochemical Grid Modeling

As described in chapters 3-6, photochemical grid modeling is generally needed to document cases where NOx reductions are counterproductive to net air quality (chapter 3), do not contribute to attainment (chapter 4), do not show a net ozone benefit (chapter 5), or include excess reductions (chapter 6). As described below, the Urban Airshed Model (UAM) or, in an ozone transport region, the Regional Oxidant Model (ROM) are acceptable models for these purposes.

The EPA investigated the feasibility and acceptability of applying relatively inexpensive screening techniques to evaluate if NOx control measures are likely to be beneficial with respect to attainment of the ozone NAAQS (Langstaff and Scheffe, 1991). However, EPA determined that, as a technical matter, photochemical grid modeling is the only reliable tool to justify an areawide exemption from the NOx requirements.

The EPA's reliance on photochemical grid models is supported by the recently published findings of the NAS on tropospheric ozone (December 1991). The NAS report concluded that three-dimensional or grid-based ozone air quality models are currently the best available models for representing the chemical and physical processes of ozone formation. The report provides a list of such models (Table 10-1), including UAM and ROM. The NAS report also states that "ROM is the only regional model available for assessment of control strategies for urban and rural ozone in the eastern United States" (page 365).

The 1990 CAA requires the use of gridded models in many ozone nonattainment areas. In 1990, EPA released an updated version of the UAM, reflecting numerous advances in photochemistry and numerical solution techniques which emerged during the 1980s. An extensive multi-volume UAM User's Manual was prepared to facilitate operation of the UAM. Guidance on regulatory application of the UAM was completed in July 1991. Several efforts are underway to improve pre- and post-processing UAM capabilities and train the States in applying the model.

The EPA encourages applications of advanced modeling methods where they are found to be more appropriate. Such methods may be acceptable on a case-by-case basis after (1) preparation of a modeling protocol, (2) proper testing and evaluation, and (3) approval by the appropriate EPA Regional Office.

Less sophisticated models, such as EKMA, lack the detailed treatment/consideration of physical orientation of NOx sources and dispersion of their plumes. Further, since trajectory models only address a limited number of trajectories, they cannot assess whether NOx control contributes to attainment at all locations in an ozone nonattainment area. Therefore, such models are insufficient and not acceptable for the section 182(f) demonstration.

7.2 Urban Airshed Model

UAM results are acceptable for the purpose of the section 182(f) demonstrations. Application of UAM should be consistent with techniques specified in the EPA "Guideline on Air Quality Models (Revised)." Further, application of UAM should also be consistent with procedures contained in the EPA "Guideline for Regulatory Application of the Urban Airshed Model" (July 1991). Thus, episode selection for the section 182(f) demonstration should be consistent with the UAM guidance for SIP attainment demonstrations. An assessment of the model's performance and a copy of the modeling protocol should be included in the analysis for informational purposes.

7.3 Regional Scale Modeling

In an ozone transport region, the net ozone benefits test should be met by use of regional scale modeling. Regional scale modeling is needed since the section 182(f) language explicitly refers to net ozone benefits "in such region." Regionwide or regional scale modeling includes all portions of the ozone transport region in which impacts from NOx emissions from the area seeking the exemption can be determined by the photochemical grid model. Prior to the availability of ROM and/or UAM results supporting the section 182(c) attainment demonstrations, the EPA's "Regional Ozone Modeling for Northeast Transport" study (June 1991) is an acceptable basis for this demonstration. When more recent ROM and/or UAM regionwide studies for the Northeast Ozone Transport Region have been completed and are available, they must be used for any section 182(f) demonstration.

Where UAM studies have been completed and are available, ROM results are acceptable for evaluating effects outside of the UAM modeling domains established pursuant to attainment demonstration requirements for section 182. Thus, ROM results are acceptable for evaluating effects in portions of a transport region outside of the UAM modeling domain for the purpose of a section 182(f) demonstration. It is not appropriate, however, to use ROM to assess the effects in an individual city outside of any UAM domain. ROM is most suitable for assessing composite impacts

over large areas (which may include individual cities) where UAM results are unavailable. Results of available ROM applications are archived on the EPA's Gridded Model Information Support System (GMISS).

7.4 Model Results and SIP Interface

Where a petition for an exemption [section 182(f)(1)] or excess reductions determination [section 182(f)(2)] is granted by EPA prior to adoption and submittal of the State's rules, the State may simply choose not to submit the NOx rules. If a petition is granted after submittal of the NOx 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 SIP would need to be modified through a SIP revision to rescind the NO_X rules provided such rescission would not interfere with attainment or reasonable further progress [section 110(l)].

Following application of a photochemical grid model that is required for serious and above areas to support the attainment demonstrations due by November 1994, a State must select and adopt a control strategy that provides for attainment as expeditiously as practicable, but no later than the date prescribed in section 181. 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 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 reasonable further progress requirements through NO_X substitution. The area would be removed from "exempt" status since NOx reductions were subsequently found to be beneficial in their ozone attainment plan. 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" (chapter 6) or are counterproductive to the net air quality (chapter 3). 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 reasonable further progress requirements.

Alternatively, for an area that adopted the NO_X RACT and NSR rules as required by section 182 (i.e., not exempt), a State may choose to revise some or all of those rules to require less 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, as determined using the section 182(f) tests set forth at the beginning of this section. The revisions must be submitted as a SIP revision and the SIP must demonstrate attainment as expeditiously as practicable.

7.5 Other Analytical Techniques

Guidelines on analytical techniques for assessing other air quality impact factors, such as acid deposition, population exposure or visibility, are not readily available. Therefore, EPA encourages petitioners to consult with the State and EPA Regional Office to agree on an acceptable methodology on a case-by-case basis.

CHAPTER 8

EMISSIONS ANALYSIS

8.1 General

As described in chapters 3-6, photochemical grid modeling is needed to document cases where NOx reductions are counterproductive to net air quality (chapter 3), do not contribute to attainment (chapter 4), do not show a net ozone benefit (chapter 5), or include excess reductions (chapter 6). Application of these models requires the use of a representative emissions inventory. This chapter describes the emission inventory requirements for the various section 182(f) demonstrations.

8.2 Biogenic Volatile Organic Compound (VOC) Emissions

The NAS report states that, in some cases, "without control of NOx emissions, this VOC background should be able to generate ozone concentrations that exceed the NAAQS concentration of 120 ppb" (page 244). Biogenic emissions can influence both the nature (i.e., VOC or NOx) and extent of required emissions controls. Therefore, inclusion of biogenic emissions are necessary inputs to model applications which assess the roles of VOC and NOx in ozone formation for purposes of section 182(f). In estimating biogenic emissions, the most recent version of the Biogenic Emissions Inventory System (BEIS) (available through the EPA Regional Offices) should be used.

8.3 Years to Analyze

In general, the purpose of the section 182(f) requirements for NOx is related to attainment of the ozone standard. This suggests an analysis that is focussed on the time that attainment of that standard is required. In addition, other sections of the CAA require moderate and above ozone nonattainment areas to develop modeling analyses which demonstrate attainment by the appropriate statutory deadline; to the extent that such modeling analyses are already underway, they could be useful for the section 182(f) demonstration also.

Considering these points, EPA believes that the 182(f) demonstrations should, at a minimum, reflect conditions expected at the time the subject area is required to attain the ozone standard. For example, in a serious ozone nonattainment area, the year would be 1999. As described in section 8.5, the conditions should also be consistent with assumptions contained in the SIP. Thus, base year emissions would be projected to the

year reflecting the attainment deadline and would include growth in VOC and NOx emissions as well as CAA-mandated VOC emission reductions. Specific emission scenarios with and without NOx reductions would be built upon this projected emissions baseline as described elsewhere in this document. In addition, as described later in this section, multi-year analyses may also be conducted.

In an ozone transport region, a section 182(f) demonstration would likely cover an area which includes ozone nonattainment areas of more than one classification, and thus more than one attainment deadline. For example, a metropolitan area may have a higher classification than a nearby rural nonattainment area. For these areas, it is possible that NOx reductions may be beneficial to attainment in the near term with respect to the rural nonattainment area (and lesser classification deadline) but, at the same time or in a longer timeframe, NOx reductions might be shown to be not beneficial when considering the area as a whole (since NOx reductions are generally expected to be more beneficial in rural areas). In order to determine whether the NOx reduction requirements should apply, EPA believes that, at a minimum, the section 182(f) demonstration should reflect conditions expected at the latest attainment deadline for the area as a whole. In addition, States should consider imposition of the NOx requirements if needed to avoid adverse impacts in downwind areas, either intra- or inter-State. States need to consider such impacts since they are ultimately responsible to provide for attainment in all portions of their State and must not contribute significantly to nonattainment in, or interfere with maintenance by, any other State.

Alternatively, the State/petitioner may include a multi-year analysis in its section 182(f) demonstration. This is appropriate for areas demonstrating either a net air quality benefit or a net ozone benefit. In these demonstrations, the analysis may include periodic assessments of the effects of NOx reductions and integrate those effects to arrive at a finding on whether or not NOx reductions are beneficial. For example, an area may develop geographic area exposure analyses for each year or for every third year up to the attainment year and assess the overall impact of NOx reductions from that information.

8.4 Scenarios to Compare

For the contribute to attainment and net ozone benefit tests, the projected emissions should, at a minimum, consider three scenarios which vary emission reductions from anthropogenic sources: (1) substantial VOC reductions; (2) similar NOx reductions; and (3) both the VOC and NOx reductions. Total

emissions to model include both anthropogenic and biogenic emissions.

In contrast to the net air quality demonstration (chapter 3) which focuses on the scenario "in the absence of reductions of oxides of nitrogen from the sources concerned," the contribute to attainment and net ozone benefit demonstrations concern an unspecified "additional reductions" of NOx. Thus, while the net air quality benefit test must focus on NOx reductions due to NSR and RACT, the other demonstrations may more broadly consider NOx reductions, including reductions that employ advanced control technology (i.e., beyond RACT). The application of the VOC and NOx reductions should be as source category specific as possible, rather than across-the-board, in order for the results to be most useful.

In the first scenario the demonstration should use the VOC reductions needed to attain (demonstrated by EKMA or UAM analyses). Alternatively, if the attainment demonstration has not been completed, the demonstration may use some other substantial VOC reduction. Reductions associated with attainment are appropriate for the reasons described above. In any case, the VOC reductions should be substantial and documented as reasonable to expect for the area due to the CAA requirements. For example, a minimum of a 40% anthropogenic VOC reduction areawide from the 1990 emission inventory may be reasonable to expect for serious areas, considering motor vehicle emission controls, inspection/maintenance, reasonable further progress and other CAA requirements.

In the second scenario, NOx reductions should be modeled without any VOC reductions above the attainment year baseline. The level of NOx reductions should reflect the same percent reduction of anthropogenic VOC emissions in scenario (1) above. It is important to model this case since NOx reductions, instead of additional VOC reductions, may show a clearer benefit.

In the third scenario, a similar level of NOx reductions would be modeled along with the level of VOC reductions chosen. That is, if a 40% VOC reduction is chosen in scenario (1), then the model for scenario (3) would simulate a 40% VOC reduction and approximately a 40% NOx reduction. It would be inappropriate to select a high level of VOC reductions and a low level of NOx reductions since this could artificially favor a finding that NOx reductions are not beneficial; the two levels should be similar.

8.5 Consistency with the SIP

Any section 182(f) demonstration must include a showing that the exemption request uses assumptions that are consistent with

requirements of the SIP and the CAA. It is possible that a petition could demonstrate that, under some circumstances, NOx reductions are not needed to attain the ozone standard. However, unless the State actually adopts those particular circumstances into its SIP, there is no assurance that the petition's analysis is valid. That is, if the assumptions contained in the petitioner's demonstration are not valid, the conclusions are similarly not valid and EPA would not approve the petition. The section 182(f) petition process should not undermine the State's implementation plan. The petition should reflect measures consistent with mandatory CAA requirements, federally-approved SIP requirements, and recent SIP revisions adopted by the State and submitted to EPA for approval. The EPA encourages petitioners to coordinate these analyses with the appropriate State(s) as they are being developed.

8.6 New Source Review

The section 182(f) exemption provisions center on the effect on ozone concentrations due to NOx emission reductions. With respect to RACT, which involves emissions reductions from existing sources, this is a perfect fit. In the case of new or modified sources, however, other factors should be considered. Even after the application of on-site controls appropriate for a major new or modified source, the source will, considered alone, result in major increases in NOx emissions. However, the NSR offset provisions would require the new source to obtain emission reductions from other sources so as offset any emissions increase associated with the new source.

To take into account the full impact of the NSR program, the term "NOx reductions" must be carefully interpreted. When considering the air quality impacts in chapters 3-6 of this document "with NOx reductions" or with "substantial NOx reductions," the analysis should reflect a zero emissions increase from stationary sources after November 15, 1992 due to the NSR offset requirement; when considering the "without" NOx reductions scenarios, the analysis should include NOx emission increases after November 15, 1992 due to new or modified stationary sources of NOx, many of which would be subject to the best available control technology requirement through the prevention of significant deterioration program, but not to offsets.