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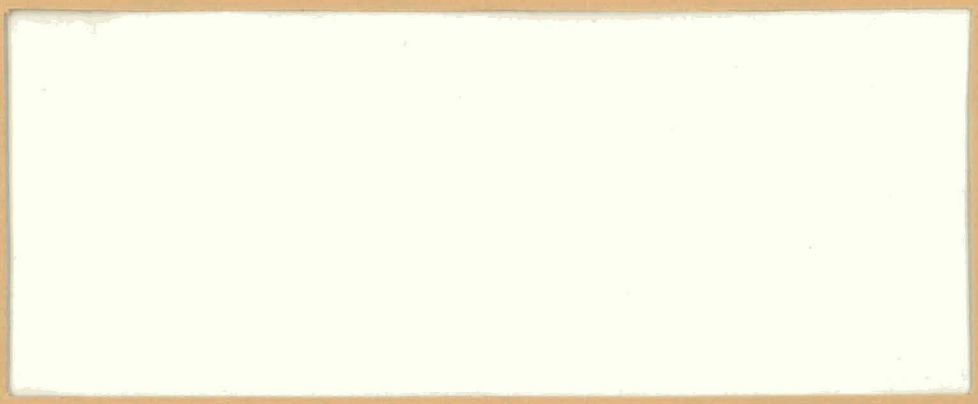

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Energy and Environmental Systems Division

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ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60439

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NONATTAINMENT OF NATIONAL AMBIENT AIR QUALITY STANDARDS: IMPLICATIONS FOR ENERGY POLICY

by

D.B. Garvey, D.G. Streets, R.G. Kotecki, and M. Senew

Integrated Assessments and Policy Evaluations Group
Energy and Environmental Systems Division

October 1979

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U.S. DEPARTMENT OF ENERGY
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PREFACE

The 1977 Clean Air Act Amendments and subsequent EPA regulations set rigorous requirements intended to clean up the air in nonattainment areas, or areas of the country where the National Ambient Air Quality Standards are being exceeded. This report examines those rigorous requirements in light of national energy policies to increase the use of coal and decrease dependence on oil.

The objectives of this study were to characterize nonattainment areas; examine nonattainment regulations, including the role of sanctions; review attainment strategies prepared by the states; review emission limitations to be required for major sources in nonattainment areas; and assess the national impact of regulations for nonattainment areas on energy production and development.

Major funding for this project was provided by the Policy Analysis Division of the Office of Technology Impacts (DOE/EV), with additional support from the Environmental Impacts Division of OTI. Project direction was provided by David Litvin and Doug Carter of PAD/OTI and John Wilson of EID/OTI. Additional contributions to the report were provided by Prof. W. Vivian, Institute of Public Policy Studies, University of Michigan, and B. Bernholtz and W. Hall, summer student interns from the University of Michigan.

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LIST OF ABBREVIATIONS

AQCR:	air quality control region
AQMA:	air quality maintenance area
BACT:	best available control technology
Btu:	British thermal unit
CAAA:	Clean Air Act Amendments
CO:	carbon monoxide
DOE:	Department of Energy
EIA:	Energy Information Administration
EPA:	Environmental Protection Agency
ESECA:	Energy Supply and Environment Coordination Act
ESP:	electrostatic precipitator
FBC:	fluidized-bed combustion
FGD:	flue-gas desulfurization
FMVECP:	Federal Motor Vehicle Emission Control Program
FPC:	Federal Power Commission
GNP:	gross national product
GW:	gigawatt (10^9 watts)
HC:	hydrocarbons
J:	joule
LAER:	lowest achievable emission rate
MM:	one million (10^6)
MW:	megawatt (10^6)
m:	meter
μg:	microgram (10^{-6} gram)
NAAQS:	National Ambient Air Quality Standards
NADB:	National Aerometric Data Bank
NEDS:	National Emissions Data System
ng:	nanogram (10^{-9} gram)
NO_x:	nitrogen oxides
NSPS:	New Source Performance Standards
O_x:	photochemical oxidants (O_3 = ozone)
ORSAM:	Oak Ridge Spatial Analysis Model
PIES:	Project Independence Evaluation System

LIST OF ABBREVIATIONS (cont'd.)

ppm:	parts per million
RACT:	reasonably available control technology
RIIA:	Regional Issue Identification and Analysis
SAMWG:	Standard Air Monitoring Work Group
SAROAD:	Storage and Retrieval of Aerometric Data
SIP:	State Implementation Plan
SLAMS:	State and Local Air Monitoring Stations
SMSA:	Standard Metropolitan Statistical Area
SNG:	substitute natural gas
SO_2:	sulfur dioxide
SRC:	solvent refined coal
TSP:	total suspended particulates
VOC:	volatile organic compounds

EXECUTIVE SUMMARY

ES.1 BACKGROUND

The 1977 Amendments to the Clean Air Act provide a comprehensive scheme for air quality management across the nation, covering areas where the air is currently cleaner than the levels set by the National Ambient Air Quality Standards (NAAQS), under the requirements for the Prevention of Significant Deterioration, and areas where the air is dirtier than the standards (so-called nonattainment areas). The legislation required states to submit revised cleanup plans -- State Implementation Plans (SIP) -- outlining procedures for achieving the standards by December 1982 (with possible extensions to December 1987 for carbon monoxide and ozone). The deadline for the submittal of the plans to EPA was set at January 1, 1979, with July 1, 1979, set as the deadline for an EPA-approved plan to be in effect. Severe sanctions -- a ban on new growth and the withholding of federal funds for highway construction and sewage treatment plants -- were to be placed on any state failing to have a revised plan approved by the July 1 deadline.

Many states missed the deadline for SIP submittal -- in fact, only one state had an approved plan in effect on July 1, 1979. Nevertheless, no funds have been withheld, and no source has been denied a construction permit because a state lacked an approved SIP. Permits continue to be processed, with either approval or actual construction conditional on a revised SIP. EPA has developed various new approaches to the SIP approval procedure, accepting and approving partial SIPs that cover only some of a state's nonattainment areas and approving SIPs conditionally, with an understanding that the state will correct minor deficiencies. As a result of these mitigating actions by EPA, sanctions authorized by the 1977 Amendments are likely to be applied only to limited areas in states that have failed to make a "good faith effort" to comply with the regulations.

Sanctions and SIP deadlines are only a short-term aspect of the nonattainment problem. Longer-term problems will arise from the regulatory requirements for new sources, the emission limitations for new and existing sources necessary to achieve attainment, and the possibility that some areas will continue to exceed the standards. This report examines nonattainment and the potential effect of these longer-term problems on national energy

policy from three directions: a review of the attainment strategies of the states, as contained in the revised SIPs; an analysis of the emission limitations that have been required on major sources of total suspended particulates (TSP), sulfur dioxide (SO_2), and nitrogen oxides (NO_x) in nonattainment areas; and a national assessment of possible constraints due to nonattainment areas on projected energy growth and fuel use.

ES.2 NONATTAINMENT PROBLEMS AND ATTAINMENT STRATEGIES

In preparing SIPs, states typically designated a nonattainment area as small as could be justified around monitors recording violations. This was generally true for all pollutants except ozone, where county-level designations were typical. Although the states designated small sub-county areas as nonattainment, maps of these areas were available only as hand-drawn submittals in an SIP. The areas were not standard, i.e., on county lines, but were drawn using highways, streets, and/or townships as boundaries. County-level maps may distort the identification of possible problem areas, with too large an area assumed to be subject to a potential ban on the construction of new sources or to constraints on the siting of new major sources. In the western U.S., where counties are extremely large in comparison to the rest of the country, the overstatement of county-level maps is even more serious. Consequently, this project undertook the task of providing a computerized set of maps of nonattainment areas as designated by the states. A sample of these maps is provided in Sec. 4.

ES.2.1 Extent of Nonattainment

Violations of the oxidant (O_x) standard are the most pervasive problem in the U.S., with the entire Northeast and parts of the Midwest designated as nonattainment. Particulate (TSP) nonattainment is nearly as extensive as oxidant nonattainment, with violations occurring in many heavily industrialized areas in the Midwest and East. Although the western U.S. contains numerous TSP nonattainment areas, many of these may be redesignated as attainment if violations can be shown to be the result of rural fugitive dust.* (According to EPA policy, particulate matter in rural areas, in the

*A recent federal court decision (Alabama Power vs. EPA) may alter this fugitive dust exemption.

absence of man-made sources, is typically airborne native soil, not contaminated by industrial pollutants and thus not appropriate for regulation under standards designed to prevent adverse health effects.) There are few SO_2 nonattainment areas in comparison to those for TSP and O_x, and they tend to be clustered in heavily industrialized Ohio and western Pennsylvania. Sulfur dioxide nonattainment areas in the western part of the U.S. are typically the result of the emissions from nonferrous smelters. (Primary nonferrous smelters can apply for exemptions from emission limitations, postponing the need to achieve any SIP requirements through January 1988, according to Section 119 of the 1977 Clean Air Act Amendments.)

Carbon monoxide (CO) nonattainment is limited to urban areas, reflecting the fact that transportation produces the major part (80%) of the pollutant. Nitrogen oxide nonattainment is currently limited to three urban areas -- Chicago, Denver, and Los Angeles/San Diego. The rest of the country has been designated as unclassified/attainment, reflecting the lack of valid monitoring data and the fact that the only current NAAQS for NO_x is a relatively easily attainable annual standard. There are a significant number of unclassified areas for all pollutants -- these areas cannot be considered to be in attainment, but rather to be of unknown status. The preconstruction monitoring requirements of a PSD permit will certainly contribute to the available air quality data and may turn up more nonattainment areas.

Attainment strategies for SO_2, TSP, and NO_x nonattainment areas (those most likely to constrain new coal combustion sources) are summarized in the following section. The report does not address CO or O_x attainment strategies.

ES.2.2 SO_2 Attainment Strategies

Sulfur dioxide nonattainment areas are usually the result of a few local stationary sources, frequently out of compliance with existing SIP limitations. The SO_2 attainment strategies of the revised SIPs call for:

- Bringing stationary sources that are currently out of compliance into compliance with emission limitations outlined in the current (pre-revision) SIP. This strategy is typical of the states in the Midwest.
- Continuing use of lower sulfur oil in the Northeast and Middle Atlantic states.

- Indicating that emission limitations for smelters are needed to bring an area into attainment, but not addressing the impact of an exemption order (Arizona, Utah, Montana, Nevada, and New Mexico).
- Increasing the stringency of emission limitations for large stationary sources (already subject to SIP limits) is not a typical strategy.
- Relying on the new source review procedure outlined by the 1977 Amendments and EPA regulations for sources sited in nonattainment areas to maintain reasonable further progress toward attainment.

ES 2.3 TSP Attainment Strategies

In contrast to those for SO_2, nonattainment areas for TSP are widespread, and the causes of the air pollutants are both source-specific and area-wide. The "traditional" sources of particulates are stack and fugitive process emissions from fuel combustion, solid waste disposal, and industrial processes. In many urban nonattainment areas, controls on traditional sources will not be adequate to attain the standards (particularly the secondary standards), since "nontraditional" sources (resuspended road dust, construction and demolition dust, tire particles, etc.) are significant contributors to particulate levels (as high as 50% in Connecticut).

TSP nonattainment is more pervasive than SO_2 and is the result of emissions from many more sources. Attainment strategies are more complicated, and attainment will be more difficult to achieve. The typical TSP source is sufficiently small that many emitters will fall below new source review size (and LAER requirements) under the latest definition of a major source as one with 100 tons per year of emissions, after controls are applied. This may hamper attainment unless states review smaller sources. In most areas, large traditional sources are already controlled; the many remaining uncontrolled sources are much smaller. However, attainment strategies still focus on the large sources first, even if this means efforts to control fugitive process emissions. Only then are controls for smaller sources and nontraditional sources discussed, but controls on nontraditional sources are not well defined. The strategies include:

- Redesignating rural areas as attainment, based on the EPA rural fugitive dust policy.
- Drawing nonattainment areas as small as possible around monitors recording violations.

- Retaining current SIP emission limitations on particulate matter from stacks.
- Requiring reasonably available control technology (RACT) on fugitive industrial emissions.
- Planning to develop control strategies for nontraditional sources of fugitive dust in urban areas (such as street sweeping, washing construction truck tires).
- Asking for an 18-month extension for submittal of a revised SIP for the secondary standards.

ES.2.4 NO_x Attainment Strategies

NO_x nonattainment is currently limited to three urban areas, with the rest of the country designated as attainment/unclassified. A short-term standard and additional monitoring data may result in more nonattainment areas. The NO_x attainment strategies are:

- Relying on the increasing motor vehicle controls required to attain the O_x and CO standards (such as the Federal Motor Vehicle Emission Control Program) to also reduce NO_x.
- Planning to study the possibilities of controls on stationary sources of NO_x (industrial and utility boilers).

ES.2.5 Growth Allowance

According to the 1977 Amendments, states could choose between two approaches for permitting new sources to locate in a nonattainment area: (1) provide an emissions growth allowance by requiring the cleaning up of existing sources to achieve more than just attainment, or (2) adopting the EPA emission offset policy. Under the first option, (the so-called "accommodative SIP"), the state essentially provides offsets for the new sources, while, under the second option, the source owner must obtain the offsets. Approximately half of the states submitting revised SIPs expect to use EPA's emission offset policy, one-quarter will use an emission growth allowance (with source-by-source offsets as a backup, in case the growth allowance proves to be inadequate), and the remaining quarter have not determined a policy. (The latter category contains states with few nonattainment areas.) Those states with growth allowances have usually not quantified them, nor provided any solution to the problem of allocating them other than first-come, first-served.

ES.2.6 Emission Limitations

Existing sources of emissions in nonattainment areas are required to use "reasonably available control technology" (RACT), while new sources must meet the "lowest achievable emission rate" (LAER). RACT requirements vary from state to state and even between localities within a state, depending on the severity of nonattainment, on the emission reductions needed to achieve attainment, and on the development plans of the state. LAER is defined as the lowest emission rate achieved in practice by the source category or the lowest emission rate in any SIP for that source category, whichever is more stringent. LAER is intended to be "technology forcing", with little consideration to be given to economic or energy costs.

LAER is to be determined by the state agency on a case-by-case basis, although EPA has issued limited guidance. EPA has published LAER guidelines for 19 major source categories, but these are largely a summary of existing (frequently outdated) control technique documents. EPA also established a clearinghouse for completed BACT/LAER determinations to assist state and local agencies and to aid in achieving a national consistency in control technology decisions (BACT indicates "best available control technology" for emissions). The clearinghouse is not an ongoing activity, however, and most of the determinations recorded are one to two years old.

The net result has been an extraordinary degree of uncertainty about LAER on the part of officials in air pollution control agencies and the owners of proposed new sources. What is an emission rate that is "achieved in practice"? How transferable is a technology between types of sources? How much regional consistency is possible (or even desirable)? How much consideration should be given to cost? Some general remarks on the problems and inconsistencies of emission limitations are:

- SIP emission limitations are not "typical" for similar sources in different states. Instead they reflect the emission reduction necessary to allow prediction of attainment for each individual nonattainment area.
- BACT and LAER determinations are supposed to be based on a consistent methodology (according to EPA), but little effort has been made to achieve such consistency.

- LAER determinations, in accordance with the statutory requirement, are to be the lowest emission rate achieved in practice in the country. Beyond an initial compilation of determinations, state and local agencies are being left on their own to find out what has been achieved elsewhere.
- Based on a review of BACT and LAER in EPA's clearinghouse, there appears to be little or no consistency between determinations. LAER is not necessarily more stringent than BACT. For coal-fired utility boilers, in fact, BACT and LAER are both similar to the revised NSPS.
- The most stringent LAER determination discovered for a coal-fired utility boiler was 0.072 lb SO_2/MM Btu, achieved by a 94% efficient scrubber on low-sulfur coal.

ES.3 NATIONAL ASSESSMENT

ES.3.1 Methodology

As described in Sec. 6, a national analysis was conducted, examining the potential constraints, at the county level, on the siting of new fossil fuel-fired utility powerplants and on the increased use of coal and oil in the industrial sector. The analysis should be viewed as a screening procedure, serving to highlight potential problem areas. The assumptions of the analysis result in a "worst case" scenario, in which sites (in general) are those that would have been selected without consideration of air quality, emission limitations are based on SIPs previous to the required 1979 revisions, and there is no cleanup of existing process sources of emissions. With these caveats, however, the results are valid and informative as an assessment of the impacts of nonattainment at the national level.

ES.3.2 Results

The projected siting of coal-fired utilities coming on line between 1983 and 1990 was compared with the patterns of both existing and projected nonattainment areas. Six percent of a total capacity of 77.1 GW is projected to be located in counties currently violating primary NAAQS for SO_2. Only 1% is projected to be located in counties in violation of primary NAAQS for SO_2 in the year 1990. Constraints due to SO_2 nonattainment for utility plants are therefore expected to be almost nonexistent. Only 7% of the new utility capacity will be located in existing TSP nonattainment counties, and 9% in

projected nonattainment areas, in 1990. Looking at the overall constraints on utility siting that might arise because of either pollutant, 9% of the expected capacity will be sited in existing nonattainment areas, and 10% in projected nonattainment areas. Approximately 52% of new utility capacity will be sited in areas that currently have no SO_2 air quality data. This reflects the expectation that new utility plants will be located away from urban centers, in areas where the air quality is relatively good or where there are relatively few monitors.

Projected constraints on industrial coal use are greater than those on utility coal use, because of the expected proximity of new industrial sources to existing nonattainment areas. A set of 69 counties was selected for analysis on the basis of increased industrial coal use (more than 2×10^{12} Btu) between 1985 and 1990. (In contrast, the utility analysis examined all the counties with projected utility siting.) In the 69 counties, approximately 19% of new industrial activity is projected to be in existing SO_2 nonattainment areas and 10% in projected SO_2 nonattainment areas. Approximately 61% of the new coal use is projected to be in existing TSP nonattainment areas and 63% in projected TSP nonattainment areas. The combined constraints on industrial coal use are that 65% of projected industrial capacity is expected to be sited in existing nonattainment areas and 66% in projected nonattainment areas. If the sample counties are assumed to be the only counties constrained by nonattainment (not an unreasonable assumption, since increases in industrial fuel use will be low in other cases), then the overall constraints are reduced. Five percent of increased coal use in industries is projected to be constrained in 1990 by SO_2 nonattainment and 30% by TSP nonattainment. Because this new fuel use is projected for industrial areas where monitors already exist, very little increase is in counties with no air quality data (14% for SO_2, none for TSP).

The SO_2 emissions from industrial oil use are a third possible source of constraints on energy use that might arise out of nonattainment regulations. (Particulate emissions from oil combustion are sufficiently low that no serious constraints will arise from TSP nonattainment.) Of the total increase in oil use, 12% is projected for counties expected to be in nonattainment in 1990 for SO_2.

With respect to severity of constraints, geographical patterns of constrained counties, and potential mitigating strategies, the following points can be made:

- The most severe constraints could be on the siting of new coal-fired utility power plants along the Ohio River.
- Other major constraints on utility siting could be in counties close to several urban centers: Buffalo, New York City, Tampa, Cincinnati, and Kansas City.
- In some counties, the assimilation of projected utility capacity will depend on SIP cleanup of existing process sources.
- Industrial coal use may be seriously constrained in many urban locations because of TSP nonattainment: Los Angeles, Denver, Chicago, St. Louis, Cleveland, Pittsburgh, Houston, Salt Lake City, Kansas City, and Detroit. Severity of the impact will depend on the stringency and the enforcement of SIP limitations on process and area sources.
- Constraints on industrial coal use because of SO_2 nonattainment may be less widespread than those arising from TSP nonattainment, but potentially more severe due to scarcity of offsets. Industrial development in the Chicago/Gary area may have such problems. Other specific industrial facilities, such as smelters in Salt Lake City and refineries in Yellowstone, Montana, will have to reduce process emissions sufficiently to allow for growth.
- Industrial oil use may be constrained in a few areas because of SO_2 nonattainment. In particular, the addition of oil-burning industrial facilities and expansion of refineries in the state of Washington, and industrial growth in Chicago, Gary, and Minneapolis, may be constrained. Again, SIP reductions in process emissions may mitigate the problems in other areas.
- The Gulf Coast and South Central region -- comprising the states of Texas, Louisiana, Arkansas, and Oklahoma -- may have general problems due to increases in oil consumption and a shift from oil and gas to coal.

ES.4 CONCLUSIONS

Nonattainment problems and attainment strategies may affect some aspects of a national energy policy intended to decrease dependence on oil and increase the burning of coal.

ES.4.1 Conversion of Existing Sources to Coal

- The strategies of many eastern states for maintenance of the SO_2 standard may hamper a conversion policy. The northeastern and Middle Atlantic states (and specific areas of the Midwest, such as Chicago) had achieved attainment of the standards before the 1977 Amendments by switching from coal to less polluting fuels (low-sulfur oil or gas) in major emission sources.
- A number of states currently have regulations that place an upper limit on the sulfur content of the fuel that can be burned in the state. (Connecticut, for example, enforces a 0.5% sulfur limit for all fuels, essentially precluding the use of coal without post-combustion cleanup.) These standards may be more stringent than necessary to attain and maintain the NAAQS.
- Conversion of major emission sources to coal might exacerbate the TSP nonattainment problem of many urban areas in the East and Midwest, depending on the emission limits required. Unless converting plants use BACT, the emission rate of particulates will be much higher for coal than for the oil currently used in these areas.
- Regulations may affect conversion to coal, since conversions in nonattainment areas may be exempted from the requirement of LAER and offsets, but the increased emissions must be counted against an emissions growth allowance (if the SIP provided one). If no offsets are achieved and no growth allowance is available, EPA has determined that no other new sources of the nonattainment pollutant may be permitted until existing sources are controlled further and reasonable further progress toward attainment is restored.

ES.4.2 New Coal-Fired Combustion Facilities

Constraints on the siting of new coal-fired facilities from SO_2 nonattainment should be limited:

- SIPs suggest that bringing out-of-compliance sources into compliance should result in attainment of SO_2 standards.
- The national assessment projects that less than 1% of new utilities and 5% of new industrial coal capacity will be sited in SO_2 nonattainment areas in 1990.
- Approximately 52% of new utility capacity coming on line between 1983 and 1990 will be sited in areas that have no current SO_2 air quality data (these are likely to be PSD areas).

- Both the SIPs and the assessment assume compliance with emission limitations by major point sources of SO_2. On the basis of past experience with noncompliance and delayed compliance, this assumption may be unrealistic.

Constraints on new coal-fired facilities from TSP nonattainment may be more significant:

- TSP nonattainment is widespread, with many small sources contributing to the pollutant load.
- SIPs for urban areas indicate a need to control fugitive process emissions and road dust from "nontraditional" sources in order to achieve attainment.
- The national analysis projects that 9% of new coal-fired utilities and 30% of new industrial coal use will be sited in TSP nonattainment areas in 1990.
- The definition of a major source as one emitting 100 tons per year, after controls, will mean that many smaller TSP sources will not be subject to EPA's New Source Review requirements. Unless states review smaller sources, TSP attainment may be more difficult to achieve.

Constraints on new coal-fired facilities due to NO_x nonattainment are not addressed in the national assessment. There are only three areas currently in violation of the standards, and state attainment strategies rely on controls on motor vehicles. If EPA sets a short-term standard, and if the collection of valid monitoring data is undertaken, NO_x nonattainment may become a more serious consideration for new sources (especially since current control technology is capable of only limited emission reduction).

ES.4.3 Introduction of Advanced Coal-Combustion Technologies

The potential exists for using low-polluting advanced energy technologies in place of conventional combustion systems, either retrofit or for new facilities, in nonattainment areas. Many advanced energy technologies have lower emissions of a given pollutant than conventional systems with add-on emission control devices. For example:

- Fluidized-bed combustion and use of solvent-refined coal can approach the sulfur-removal capabilities of scrubbers on conventional boilers.

- Secondary environmental impacts may be lower for advanced technologies than for conventional systems with add-on controls.
- The combustion of substitute natural gas (SNG) from coal results in comparatively low emissions of SO_2, NO_x and particulates.

ES.5 UNRESOLVED ISSUES

The current situation is sufficiently unclear, and future developments are sufficiently uncertain, that there remain a number of unresolved questions:

- What will be included in the final rules EPA promulgates in response to the court's decision in the case of Alabama Power vs. EPA? In particular, how will a major source be defined? Will contemporaneous reductions and the bubble concept (i.e., regulating a facility as a unified source, as opposed to regulating emissions stack by stack) be retained? How will fugitive dust be treated?
- What will the final, approved SIPs contain? Will sanctions have any significant effect in any areas?
- Will the states achieve the projected "reasonable further progress" toward attainment? If not, will another round of revised SIPs be required?
- What will happen in areas currently designated as unclassified? Given the large number of these areas for NO_x, will NO_x nonattainment become a more widespread problem? Will preconstruction monitoring under PSD turn up more nonattainment areas?
- What will be the effect on energy development (especially coal use) of attainment strategies based on the use of clean fuel?
- What will be the impact of new NAAQS (such as a short-term NO_x standard) on nonattainment? Will new nonattainment areas result?
- How will growth allowances be allocated? Will they be adequate for projected growth and development?

NONATTAINMENT OF NATIONAL AMBIENT AIR QUALITY STANDARDS: IMPLICATIONS FOR ENERGY POLICY

by

D.B. Garvey, D.G. Streets, R. Kotecki, and M. Senew

ABSTRACT

In accordance with the 1977 Clean Air Act Amendments, EPA established regulations governing new and existing sources of emissions in areas where the NAAQS are being exceeded. These requirements may constrain the implementation of a national energy policy to increase the use of coal in utilities and industries. The states designated the nonattainment areas and prepared State Implementation Plans, outlining strategies for attaining the standards by the deadline of December 31, 1982. This report contains maps of nonattainment areas for all pollutants and summaries of the attainment strategies for those pollutants most likely to affect fossil-fueled energy development--SO_2, TSP, and NO_x. The review of SIPs indicates that attainment of SO_2 standards should be relatively easy. Attainment of TSP standards may be more difficult since point sources are already well controlled and further reductions in emissions will require controls on fugitive sources. NO_x nonattainment is currently limited to three small areas. The report also contains an examination of emission limitations in nonattainment areas and a national assessment of the potential constraints of nonattainment on energy development in 1985-1990. The assessment concludes that constraints on projected new coal-fired utilities should not be significant. Constraints on expanded industrial coal use from TSP nonattainment may be significant but the effects of SO_2 nonattainment should be limited.

1 INTRODUCTION

The actions that must be taken to achieve national air quality goals, as prescribed by federal clean air legislation and subsequent regulations promulgated by the Environmental Protection Agency, may have significant impacts on the future siting and emission control requirements for all new major facilities, on future patterns of nationwide fuel use, and on the success of a national energy policy designed to increase the use of coal in both the utility and industrial sectors of the economy. Since the most recent additions to the Clean Air Act were passed by Congress in August 1977, attention has focused on the implications of various portions of the legislation for economic growth and development in general, and on the possible conflicts that

might arise between energy policy goals and environmental policies for the maintenance and improvement of national air quality.

The 1977 Amendments to the Clean Air Act[1] provided a comprehensive scheme for air quality management across the nation, covering areas where the air is currently cleaner than the levels set by the National Ambient Air Quality Standards (NAAQS) under the requirements for the Prevention of Significant Deterioration and areas where the air was dirtier than the standards (nonattainment areas). Those sections of the Amendments, and subsequent EPA regulations, governing nonattainment areas have been of particular interest to energy policy makers. The legislation required states to submit revised cleanup plans (State Implementation Plans or SIPs) outlining procedures for achieving the standards by December 1982 (with possible extensions to December 1987 for carbon monoxide and oxidants.) The deadline for the submittal of the plans to EPA was set at January 1, 1979, with July 1, 1979, set as the deadline for an EPA-approved plan to be in effect. Severe sanctions -- a ban on construction of new sources of emissions and a limit on federal funds for highway construction and sewage treatment plants -- were to be placed on any state failing to have a revised plan approved by the July 1 deadline.

The possibility of a ban on the construction of new major emitting facilities in nonattainment areas clearly would affect energy production and development as well as all other new major economic activity. Numerous states missed the deadline for SIP submittal and, in fact, only Wyoming had an approved plan in effect on July 1. As this report examines in Secs. 2 and 3, legal sanctions were technically imposed as of July 1, 1979, on any state without an approved SIP, but the construction of new facilities has not yet been halted; nor does it appear likely that any severe legal sanctions on growth will occur. EPA had developed various administrative approaches to approval of SIP revisions, designed to mitigate the economic disruption that would have followed the unrestricted imposition of a ban on the construction of new sources. Not only have EPA's measures limited the impact of the sanction, but this aspect of policies for nonattainment areas is really of short-term concern, limited in time until states have submitted SIPs, and limited in area to nonattainment portions of states with late SIP submittals.

The July 1, 1979, deadline and the threat of sanctions may have been the more dramatic and immediate causes of concern over constraints on

energy production and development of nonattainment regulations. Nevertheless, other aspects of those regulations have the potential for longer-term, far more serious consequences for energy policy, possibly restricting the future increase in the use of coal and constraining the siting and expansion of fossil-fueled power plants and industrial boilers. Existing stationary sources (both industrial and utility) will be required to reduce emissions to levels determined by the states to be necessary to achieve the NAAQS by the statutory deadlines. Attempts to site new major emitting facilities in a nonattainment area will face stringent requirements for emission limitation. The controls needed to achieve those emission reductions may have significant costs and may affect patterns of fuel use. In addition, the levels of emission limitation required may affect the competitive position and commercial feasibility of new coal-combustion energy technologies. Moreover, available sites for new facilities may be limited in urban, industrialized areas where the NAAQS are being seriously violated. In the latter case, even if a new source meets stringent emission limitations, nonattainment regulations may require the additional cleanup of existing sources of emissions to more than offset the new emissions.

The longer-term consequences of nonattainment regulations for energy policy are examined in the remainder of this report. Section 4 describes the review procedures for new sources contained in the revised SIPs and discusses the possible energy policy implications of trends in state strategies for the attainment of the standards. Section 5 examines possible emission reduction requirements in nonattainment areas, and Sec. 6 provides a national assessment of the possible constraints arising from nonattainment on the siting of new fossil-fueled utilities and on the increased use of coal in industrial boilers.

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2 LEGISLATIVE AND REGULATORY BACKGROUND

2.1 NONATTAINMENT STATUS

Under the Clean Air Act Amendments (CAAA) of 1970,[2] the Environmental Protection Agency (EPA) promulgated primary and secondary National Ambient Air Quality Standards (NAAQS) for six pollutants (carbon monoxide, hydrocarbons, nitrogen oxides, particulate matter, photochemical oxidants, and sulfur dioxide) to protect public health and welfare. The maximum permissible concentrations of these pollutants are shown in Table 2.1. Each state was required to develop and submit to EPA for approval a State Implementation Plan (SIP) for achieving and maintaining the primary NAAQS by July 1975 (or mid-1977, in some cases), and the secondary standards within a reasonable time.

Table 2.1. National Ambient Air Quality Standards (NAAQS)

Pollutant	Time Period and Standard	Maximum Permissible Concentration, $\mu g/m^3$
Total Suspended Particulates (TSP)	Annual, Secondary	60
	Annual, Primary[a]	75
	24-hour, Secondary[b]	150
	24-hour, Primary	260
Sulfur oxides (measured as SO_2)	Annual, Primary	80
	24-hour, Primary	365
	3-hour, Secondary	1300
Carbon monoxide (CO)	1-hour, Primary	40
	8-hour, Primary	10
Oxidants/Ozone (O_x/O_3)	1-hour, Primary	235
Nitrogen dioxide (NO_2)	Annual, Primary, Secondary	100
Hydrocarbons (HC)	3-hour, Primary, Secondary[c]	235
Lead	3-month, Primary, Secondary	1.5

[a]Primary: to protect public health.

[b]Secondary: to protect public welfare.

[c]The hydrocarbon standard does not have to be met if the oxidant standard is met.

In regulations promulgated in 1971,[3] EPA stated that an adequate SIP should include a program of preconstruction review of new emission sources or modifications of existing sources, to prevent construction that would "interfere with the attainment or maintenance of a NAAQS."[4] This is known as the New Source Review Policy. The meaning of the phrase "to interfere with attainment" was not clarified, and was not an issue, until it became clear in 1975-76 that the statutory deadline for attainment of the standards would not be met in a large number of areas, particularly major urban centers. The consequences of such nonattainment were not clear. One interpretation suggested that the SIP regulations precluded any new construction or expansion of pollution sources in areas that were in violation of an applicable NAAQS.

The issue of pollution growth in nonattainment areas came to the attention of Congress during efforts to revise the 1970 Amendments. In 1976, the report accompanying the Senate bill,[5] for example, stated that:

> The Clean Air Act prohibits the addition of any emissions of an air pollutant in any air quality control region or portion thereof where an ambient air quality standard for that pollutant has not been attained...
>
> The Committee [on Public Works] is aware, however, that many metropolitan areas, including those where industrial development is most likely to take place, lie within [AQCRs] where ambient air quality standards have not been attained and are not likely to be attained for some time in the future...
>
> ...Since the Act currently would not allow for the construction of any facility which increased emissions in the region so as to prevent attainment or maintenance of a standard for the pollutant in question, the bill provides an exception to allow greater flexibility in the administration of the Act and opportunity for growth of national industrial capability.

Similarly, the report on the House bill[6] stated that:

> Under the existing Clean Air Act, no new emission source may be constructed in an area which is already exceeding the [NAAQS]... . Thus, in many regions that have not yet reached the national ambient standards, growth could be curtailed altogether.
>
> In order to permit flexibility so that an immediate growth ban would not be required in these major metropolitan regions the Committee adopted this section.

The 1976 Amendments were not passed and the problem of emission growth in nonattainment areas was not resolved. It was evident, however, that Congress intended to allow some growth in nonattainment areas under certain conditions.

2.2 THE EMISSION OFFSET POLICY

It was with this background that EPA issued an "Interpretative Ruling for Implementation of the Requirements of 40CFR51.18"[7] on December 21, 1976. This ruling, which later became known as the Emission Offset Policy, made it possible for states to permit sources to locate or expand in nonattainment areas. Although construction that would interfere with the attainment or maintenance of any NAAQS was still prohibited, the ruling provided that construction of new or modified sources in accordance with certain stringent conditions would not constitute an interference and hence was not prohibited by the law.

Under the Interpretative Ruling, all new or modified sources were divided into two categories: major sources and nonmajor sources.* A "major source" was defined as any new "structure, building, facility, installation, or operation (or combination thereof) for which the allowable emission rate is equal to or greater than 100 tons per year for sulfur dioxide, nitrogen oxides, particulate matter, or nonmethane hydrocarbons (HC) or 1000 tons per year for carbon monoxide." A "major modification" was defined as a modification or series of modifications to any existing structure, building, etc., which increased the source's allowable emission rate by the above amounts. Under the ruling, a nonmajor source could locate or expand in a nonattainment area as long as it could demonstrate that it would meet all applicable emission requirements in the SIP; major sources whose allowable emissions would exacerbate an existing violation of a NAAQS were required to meet the following four conditions:

1. The source was to achieve the lowest achievable emission rate (LAER) as specified by the state for each type of source. The LAER specified was to be the most stringent emission limitation in any SIP or the lowest emission

*Designation of a source as major or a reference to a major source is pollutant specific. Technically, it is not correct to simply refer to a source as a "major source;" rather, it should be a "major source of HC" or a "major source of SO_2 or TSP" and so on. A source may be a major source of one or more pollutants but a nonmajor source of the other pollutants.

rate achieved in practice for such a source. LAER determinations were to be made on a case-by-case basis.

2. The source owner or operator was required to certify that all existing sources which it owned or controlled and which were located in the same Air Quality Control Region as the proposed source were in compliance with all applicable SIP requirements or any enforcement orders to which they were subject.

3. Emission reductions were to be obtained from existing sources in the area of the proposed source to more than offset the increase in allowable emissions expected to result from the proposed source. The offset should be sufficient to represent "reasonable progress" towards attainment of the applicable NAAQS. "Reasonable progress" was not defined in the ruling, but it was stated that as long as the offset was greater than one-for-one and the other conditions were met, the EPA would not question the state's determination of what constituted reasonable progress. Offsets could be obtained from existing sources controlled by the proposed source owner (internal offsets) or from third-party sources (external offsets), and they had to be legally binding on all affected parties. Only intra-pollutant offsets were acceptable (i.e., new emissions of SO_2 must be offset by SO_2 reductions).

4. The offset obtained under condition 3 must provide a net air quality benefit to the area affected by the proposed source.

The Clean Air Act Amendments passed in August 1977 affirmed EPA's approach to the siting of new sources in nonattainment areas, stating that the emission offset policy would remain in effect until July 1, 1979, when revised SIPs would be required. The 1977 legislation, however, altered the definition of a major source to be one with potential (presumably uncontrolled) emissions exceeding 100 tons per year of a criteria pollutant (except carbon monoxide, of which 1000 tons per year was allowed). EPA subsequently revised the emission offset policy (on January 16, 1979)[8] to conform to this definition, noting that potential emissions were considered to be emissions without any control equipment. Concerned that this definition of major source would bring a great number of sources under review, EPA introduced a "two-tiered" review procedure. Sources with potential emissions greater than 100 tons per year were to be reviewed for SIP and NSPS limitations, and if the source would emit less than 50 tons per year (or 1000 lb per day or 100 lb per hour) when controlled to SIP/NSPS levels, no further permit review would be required. Sources with allowable emissions greater than the 50/1000/100 level would be subject to all the emission offset requirements (i.e., LAER; other-

owned sources in compliance; greater than 1:1 offsets; and demonstration of net air quality benefit in the nonattainment area). This definition of major source and establishment of a "two-tiered" review made new source reviews for nonattainment areas consistent with the procedure already established by EPA for clean-air areas in the regulations covering Prevention of Significant Deterioration.

A recent preliminary court decision (Alabama Power vs. EPA)[9] has invalidated EPA's definition of a major source for a PSD review and (by implication) the definition for a nonattainment review. The court stated that potential to emit must be calculated on the basis of the full design capacity of the facility and "the design capacity of the facility takes into account not only its maximum productive capacity, but also the design control on emissions." Furthermore, the court ruled that EPA overstepped its administrative power in exempting sources of less than 50 tons per year of emissions from full new source review. EPA proposed revisions to both its PSD and nonattainment definitions of a major source on September 5, 1979.[10] (See Sec. 2.4 for a fuller description of these proposed rules).

The revised emission offset policy recognized that not only sources within a nonattainment area, but sources locating or expanding outside a nonattainment area, might have an impact on the air quality within the nonattainment area. If the source's allowable emissions are projected to be greater than the 50/1000/100 limit, air quality modeling must be used to estimate the impact. If the impact within the nonattainment area exceeded the "significance" levels shown in Table 2.2, the source would be subject to all requirements of the ruling, except that emission offsets would be limited to the amount needed to offset the significant impact.

Table 2.2 Significance Levels for Nonattainment Review

	Significance Levels ($\mu g/m^3$) For Specified Averaging Time				
Pollutant	Annual	24-Hour	8-Hour	3-Hour	1-Hour
Sulfur dioxide	1.0	5	-	25	-
Total suspended particulates	1.0	5	-	-	-
Nitrogen oxides	1.0	-	-	-	-
Carbon monoxide	-	-	0.5	-	2

Certain sources were eligible for exemption from the offset policy: temporary sources, pilot plants, sources ordered to convert by a federal coal conversion order or a natural gas curtailment order, and sources that converted to coal if, prior to December 21, 1976 (the date of the original EPA Interpretative Ruling), the source had been able to use an alternative fuel. The justification for the latter exemption is that such a conversion is not a major modification. However, any increase in emissions from the converted source would not be exempt and could add to the violations of the standard.

The emission offset policy, as revised in 1979, will still play a role in nonattainment areas. The 1977 Amendments indicated that such a policy could be included in a revised SIP. In addition, if areas are subsequently determined to be in nonattainment, a state would be required to submit a revised SIP within nine months. During the SIP preparation time, the emission offset policy would be in effect. The offset policy is also to be applicable to sources in one state that contribute to a violation of a NAAQS within another state.

2.3 THE CLEAN AIR ACT AMENDMENTS OF 1977

The 1977 CAAA viewed the emission offset policy only as a temporary solution to the problem of construction of new emission sources in nonattainment areas. States were required to submit revised SIPs for nonattainment areas by January 1, 1979, outlining plans and legally enforceable procedures for achieving the attainment of the NAAQS by a new deadline -- December 31, 1982 (with a possible 5-year extension until December 31, 1987, for oxidants and carbon monoxide). If the revised SIPs were not approved by EPA by July 1, 1979, no major source was to be constructed or modified in the nonattainment area.

According to legislation, a revised SIP should include the following general provisions, relative to major sources of emissions:

1. Implement all "reasonably available control measures" on existing sources as expeditiously as practicable.

2. Obtain "reasonable further progress" until all "reasonably available control measures" have been implemented. The former phrase is defined as "annual incremental reduction in emissions of the applicable pollutant (including substantial reduction in the early years following approval or promulgation of the revised SIP and

regular reductions thereafter) which are sufficient... to provide for attainment of the applicable NAAQS by 1982 (or 1987 for CO and O_x in some cases)".

3. Identify the amount of pollution growth that the state intends to permit in each nonattainment area, and quantify the amount of emissions (of any pollutant for which an area is nonattainment) that will be allowed to result from new major sources.

4. Require a permit program for the review and control of the construction and operation of major sources seeking to locate or expand in nonattainment areas. Such sources must be denied permits to construct and operate unless, at a minimum, they meet a number of conditions that parallel the major conditions of EPA's emission offset policy. First, the proposed source must meet LAER. Second, the source owner must demonstrate that all major sources in the state that he controls are in compliance, or on a schedule for compliance, with all applicable requirements of the law. Third, the state must determine either that by the start-up date of the proposed source, the total allowable emissions in the area will have been reduced so as to represent "reasonable further progress," or that the proposed source's emissions will not cause or contribute to emission levels that exceed the emissions growth allowance.

In contrast to the EPA emission offset policy, which requires case-by-case offsets, the 1977 Amendments allowed the states to provide a growth allowance, consistent with the objective of reasonable further progress. Individual sources that fall within that allowance need not obtain an offset. In effect, the states are allowed to obtain emission reductions from existing sources and "bank" those reductions for future use by new sources.

The Amendments outlined a number of other requirements for revised SIPs, including the need for transportation control measures in areas where an extension of the deadline for attaining the oxidant and carbon monoxide standards has been requested. EPA interpreted the legislative requirements for SIPs, promulgating "Criteria for Proposing Approval of Nonattainment Area Implementation Plan Revisions" in May 1978. These criteria, and other aspects of EPA's implementation of nonattainment policy, will be examined in Sec. 3.

2.4 DEFINITIONS AND PROPOSED RULES OF SEPTEMBER 5, 1979

On June 18, 1979, the District of Columbia Court of Appeals issued a decision on a suit brought by a number of industries and other interests concerning the validity of EPA's final PSD regulations. The court's decision in Alabama Power vs. EPA[9] was a summary per curiam opinion, issued before the final ruling, so that EPA could begin to revise regulations as soon as possible. Although the only rules reviewed in the case were those for PSD areas, the court noted that the decision had implications for regulations governing nonattainment areas. Consequently, EPA included certain changes in nonattainment rules in a Federal Register proposal dated September 5, 1979 (44FR51924).

The rules issued September 5 were only proposed rules, with a comment period set to end November 5, 1979. EPA planned to promulgate final regulations within 90 days of the issuance of the final opinion of the court. In the interim, the existing rules for PSD, nonattainment areas, and revised SIPs will continue to apply. The following discussion examines only those portions of the rules concerning nonattainment areas.

2.4.1 Definition of Major Source

A major source is still defined as one with the potential to emit more than 100 tons per year of a criteria pollutant. The definition of "potential to emit" has been proposed as the capability, at maximum design capacity, to emit a pollutant after the application of air pollution controls. In calculating annual emission potential, EPA has proposed using the maximum annual rated capacity of a source (24 hours-a-day, 365 days-a-year operation), with consideration given to any enforceable permit conditions on the type of materials to be burned or processed.

2.4.2 Definition of Major Modification

A major modification was defined by the court as any change in a major source that would result in any net increase in emissions after installation of control equipment or internal offsets. This is in contrast to previous regulations, which required review of only those modifications resulting in more than 100 tons per year of emissions. The court appeared to state that any net increase in the emissions of any air pollutant should make a modification subject to review. EPA, however, determined that review would be limited

to net increases of only those pollutants for which the source was already considered to be major. (It is possible that this limitation on pollutants may be subject to challenge in the courts). EPA also proposed certain "de minimis" levels in the September 5 document -- only net increases above the levels shown in Table 2.3 would be reviewed.

Under the proposed regulations, a modified source could reduce emissions internally to offset the increased emissions from a modification and thus be reviewed only when a net increase in emissions resulted. These "contemporaneous reductions" are based on a bubble concept of a facility, and appear to be the same as "internal offsets" under an emission offset policy. (The bubble concept treats an entire facility as a single source, rather than regulating emissions stack by stack.) The use of a bubble approach is available only if a state has an approved, revised SIP in effect for nonattainment areas, with the SIP emission limitation used as a baseline for calculating emission reductions. If the emission offset policy is in effect (i.e., the area has become nonattainment and the state is preparing a SIP) or if a revised SIP has not been approved, any modification would be subject to review, regardless of offsetting emission reductions elsewhere in the facility. EPA did, however, suggest that another approach to contemporaneous reductions when a revised SIP was not in effect might be possible -- instead of a ban on the bubble, emission-offset credit could be given for emission

Table 2.3. De Minimis Emission Rates for Criteria Pollutants

Pollutant	Emission Rate (tons per year)
Carbon monoxide	100
Nitrogen dioxide	10
Particulate matter	10
Sulfur dioxide	10
Ozone precursors (volatile organic compounds)	10
Lead	1

reductions below the level that would have been required if reasonably available control technology (RACT) had been applied. EPA requested comments on this "RACT/Bubble" approach, but proposed the ban on internal offsets in areas without approved revised SIPs.

Modifications will also be considered major (and subject to review) if cumulative net increases in potential emissions of a pollutant for which an area is nonattainment exceed (in total) the 100-tons-per-year threshold. Increases will be accumulated from December 21, 1976 (the date of the initial promulgation of the emission offset policy). Net increases will be accumulated, and credit will thus be given to "contemporaneous reductions" in emissions.

2.4.3 Fugitive Emissions

The court held that fugitive emissions (i.e., those that do not come from a stack or a vent) would not be included in the determination of potential emissions, unless EPA made a specific rule. EPA, therefore, listed those sources (including fossil-fueled boilers, steam electric plants, and coal-cleaning plants) for which fugitive emissions were to be taken into account in determining potential emissions.

In addition, the court declared that EPA's definition of fugitive dust as "particulate matter composed of soil which is uncontaminated by pollutants resulting from industrial activity" was incorrect, and that fugitive dust was instead fugitive emissions (i.e., not from a stack) of particulate matter. Consequently, EPA deleted the definition of fugitive dust from both PSD and nonattainment regulations. The impact of this deletion on the current EPA policy that allows an area to exempt rural fugitive dust in the determination of nonattainment status is unclear. EPA officials have commented that the policy should not be affected. If the policy is changed, however, the consequences could be serious, since many states used the fugitive dust exemption in their revised SIPs for TSP nonattainment areas.

2.4.4 Two-Tiered Review

The change in the definition of major source and major modification will result in far fewer small sources being reviewed. Since the justification for the two-tiered review has been removed, EPA proposed to eliminate the distinction, in accordance with the court's decision.

2.4.5 Preconstruction Notice

The owner or operator of a new source or modification that is not major is required to submit a preconstruction notice to the permitting authority, rather than an application for a permit to construct. The notice would cover the controls to be used to bring the new source under the 100-ton-per-year limit; the contemporaneous reductions achieved by the modified source; or the emission reductions achieved that the source wished to "bank" for future offset credit.

2.4.6 Geographic Applicability

The proposed rules would apply nonattainment new source review regulations to major sources seeking to locate throughout an area designated as nonattainment. Under current rules, a source could demonstrate that it was locating in a clean portion of a nonattainment area and be reviewed under PSD provisions.

According to the court, sources being sited in nonattainment areas are not to be subject to review for their impact on the air quality of an adjacent PSD area. EPA has filed a petition for reconsideration of this restriction on PSD review, arguing that Congress intended significant deterioration to be prevented in clean-air areas regardless of where the source of the deterioration was located. A source being sited in a nonattainment area from which it would have an adverse impact on a PSD area in another state would, however, be subject to both PSD and nonattainment regulations.

In the proposed ruling, EPA discussed the possibility of altering the current applicability of nonattainment requirements (including offsets) to sources being sited in PSD areas. EPA suggested that these requirements might be limited to sources locating either inside a designated nonattainment area or where an actual violation is recorded. This suggestion, however, was not incorporated into the proposed rules.

2.4.7 Applicability to Pollutants

The application of either PSD or nonattainment regulation will still be determined on a pollutant-specific basis. As a result of the court decision, however, a source subject to PSD review must apply best available control

technology (BACT) to all pollutants regulated under the Clean Air Act (including hazardous pollutants, such as asbestos or beryllium). In a nonattainment area, only emissions of the nonattainment pollutant are to be subject to review for lowest achievable emission rate (LAER). There is no requirement that a source subject to nonattainment regulations be reviewed for all regulated pollutants that it emits.

2.4.8 Transition Period

The court stayed the effect of the Alabama Power decision until its final opinion is issued. EPA plans to promulgate final regulations as soon as possible thereafter. In the interim, however, the existing regulations are still in effect, with permits reviewed and SIPs approved (or disapproved) in accordance with current rules. However, the final version of the proposed rules may be less restrictive than the existing regulations (for example, the definition of major source). Permits that were issued under the more stringent rules could be rescinded, but any rescission in a nonattainment area must be accompanied by a formal SIP revision to adjust the attainment strategy.

3 EPA'S IMPLEMENTATION OF NONATTAINMENT REQUIREMENTS*

3.1 NONATTAINMENT AREA DESIGNATIONS

The Clean Air Act Amendments of 1977 (Section 107(d)) required each state to submit to EPA, within 120 days of the enactment of the law, a list showing the attainment status, as of August 7, 1977, of all areas within each state. The Amendments required EPA to promulgate the state lists, with any necessary changes, within 60 days after submittal. On March 3, 1978,[11] EPA promulgated Attainment Status Designations in the Federal Register, based either on state submittals or on determinations by the EPA Regional office. These designations have been subsequently revised and modified on the basis of new air quality data. EPA did not establish any specific schedule for revising Section 107 designations, noting that "the designations are dynamic and designation changes are to be made whenever new and relevant information is brought to the attention of the State (or EPA if the State does not act.)"[12]

EPA has stated that the nonattainment designations are only important for focusing attention on problem areas, rather than for defining the attainment/nonattainment status of any particular area. If an area is designated attainment, the preconstruction monitoring requirement under PSD provisions will provide one year of air quality data; similarly, if an area is designated nonattainment, the required air quality impact analysis would provide information. The final designation of areas will thus occur as individual permit applications are submitted. EPA's argument, however, fails to note that these nonattainment designations <u>are</u> significant in that they determine the areas for which revised SIPs are required.

3.1.1 <u>EPA's Policy on Designations</u>

The 1977 CAAA required that designations be based on the air quality as of August 7, 1977. EPA, recognizing that data would not be uniformly available for that specific and recent a date, instead required that the states use the most recent four quarters of monitoring data available. If those data indicated no violations, then the previous four quarters were to

*See Appendix A for a list of EPA's policy guidances on revised SIPs for nonattainment areas.

be examined to avoid basing an attainment designation on anomalous conditions. If monitoring data were not available, air dispersion modeling could be used to evaluate air quality. If there were a conflict between monitoring data and modeling results, EPA advised using monitored values. Areas could be classified, in regard to TSP and SO_2, as nonattainment for primary standards, nonattainment for secondary standards, unclassified, or attainment; and in regard to NO_x, CO, and O_x, as nonattainment or attainment. Areas clearly showing attainment or nonattainment were to be classified as such; areas with limited data could be designated as unclassified.

In a series of questions and answers prepared by EPA's Control Programs Operations Branch[12] to assist the regional offices in the evaluation of state designations, a number of interesting points were brought up:

> Q. If the last four quarters of sampling were shown to be abnormal in terms of frequency and magnitude of violations, would previous data be accepted as the basis for not declaring nonattainment status at this time?
>
> A. Both the long term trend and specific data points given by the four quarter analysis should be examined. If there is a discrepancy between the two, the State should make a judgement as to which is the most valid indicator. Rationale utilized in making this judgement should be provided to EPA. As a practical guide, data significantly impacted by rare meteorological conditions (for example, the recent Northwest drought) may be considered abnormal and thus be discounted for these determinations.
>
> Q. Will EPA accept a designation of attainment for an area with a monitor showing recent violations due to a temporary situation such as construction?
>
> A. Yes, if a history of attainment can be shown and if the temporary activity is demonstrated to be responsible for the violation.
>
> Q. Is it necessary to designate an area as nonattainment if the source of the violation is known and regulatory measures are underway?
>
> A. Yes, if the data are available and valid. The area of nonattainment can be made small in these situations.
>
> Q. Is the boundary of a nonattainment area best determined by the "contour" around areas experiencing ambient violations or by the location of sources that contribute to these violations?
>
> A. Nonattainment areas are in general defined by ambient violations. It appears that sufficient flexibility exists to allow States to include an additional area around the

actual nonattainment area to make new sources located immediately adjacent to the problem areas subject to offset requirements.

Q. Is it true that if a monitor is properly sited, i.e., influenced by a significant stationary source, then the area of the nonattainment designation should be as small as possible, so as to reflect only the impact of a nearby source?

A. Yes. The nonattainment area may be as small as possible as long as it covers the whole area of the source's impact.

Q. Should monitors that are improperly sited, according to EPA criteria, and hence could be unduly influenced by resuspended street dust, be ignored in establishing the attainment status of an area?

A. No. It is not current Agency policy that only those monitoring sites which meet SAMWG guidelines be used for both SIP development and Section 107 designation purposes. EPA's proposed guidance states that there are situations in which data from existing monitors located in the "unacceptable" zone may still be useful. For sites not located within the proposed guidelines, an evaluation is needed to determine the roadway influence. This evaluation is then used to decide if the roadway influence is significant enough to warrant relocation of the monitor. If relocation is necessary, the monitor must be within the immediate vicinity of the original location such that the new site meets the proposed guidelines. The area is presumed to be nonattainment until such time as data from the relocated station indicate otherwise.(Ref. 12, p.4)

3.1.2 Monitoring Guidance

The last question refers to a proposed guidance on monitoring that was promulgated as a final rule in May 1979.[13] The rules are intended to carry out a mandate in Section 319 of the 1977 Clean Air Act Amendments to establish a uniform national air monitoring network. States will be required to follow uniform criteria in setting up State and Local Air Monitoring Stations (SLAMS). SLAMS actually will be the existing monitor network, with certain modifications designed to achieve uniformity. The rules also call for quality assurance of the data by detailing calibration and adjustment techniques. It does seem that an effort to oversee the quality of monitoring data is long overdue, given the level of regulatory requirements that are based on those data.

3.1.3 Tall Stacks

An area could be designated as nonattainment even though monitoring data indicated attainment, if it was determined that a source was using a supplementary, noncontinuous system of control or an improperly tall stack. Air quality near a source may be better than the standards because the tall stack disperses the pollutants further. The 1977 Amendments (Section 123) specifically limited the emission control credit from stacks and other dispersion techniques. EPA proposed rules in January 1979[14] to limit emission credit to that height which is consistent with good engineering practice, or only such height as is necessary to prevent atmospheric downwash, eddies, and wakes in the immediate vicinity of the source.

3.1.4 Fugitive Dust

Areas where recorded violations of the particulate standard could be shown to be the result of rural fugitive dust could claim attainment status, according to an EPA memo of October 1977.[15] The Control Programs Operation Branch questions and answers on the fugitive dust policy[12] clarified the ruling:

> Q. For purposes of defining nonattainment areas for TSP, what is rural fugitive dust?
>
> A. The state may subtract both the impact of industrial sources located within an area and the normal ambient background level. The remainder may be considered "rural fugitive dust" in nonurban areas.
>
> Q. Windblown particulates need not be counted against nonattainment in rural areas but all particulates must be counted in urban areas. What is a rural area?
>
> A. Significant flexibility is allowed in this determination. Generally, Regional Offices have been using 25,000 population as the cut point between an urban setting and a rural situation. However, for the purposes of implementing the fugitive dust policy, rural areas are determined by the following criteria: (1) the lack of major industrial development or absence of significant industrial particulate emissions; and (2) low urbanized populations.
>
> Q. If an area influenced by fugitive dust is designated as a nonattainment area due to point source emissions, does the control strategy analysis have to include fugitive dust controls?

A. Yes, fugitive dust may only be discounted in accordance with the fugitive dust policy paper. An area which cannot be classified as attainment through the discounting of fugitive dust cannot subsequently discount fugitive dust sources in developing control strategies, assuming, of course, that point source controls alone will not be sufficient to attain the ambient standards.(Ref. 12, p.7)

In proposed rules for PSD areas, published in the Federal Register on September 5 (see Section 2.4), EPA suggested deleting the definition of "fugitive dust" from the existing PSD rules in accordance with a court order. Although it has been questioned whether this deletion would affect the nonattainment fugitive dust exemption, EPA officials believe that the current policy for nonattainment areas will not be changed.

3.2 SIP REQUIREMENTS

On February 24, 1978,[16] the EPA Administration sent a memorandum to the regional offices, summarizing the elements a revised SIP for a nonattainment area must contain in order to be approved. This memo was subsequently published in the Federal Register (May 19, 1978)[17] for public information.

SIP revisions were divided into two general categories:

- Those that provide for attainment of the primary NAAQS for all criteria pollutants by December 31, 1982.
- Those that provide for the attainment of the primary standards for sulfur dioxide, nitrogen oxides, and particulate matter by December 31, 1982, but indicate that despite the use of all reasonably available control measures for mobile and stationary sources of carbon monoxide and/or oxidants, the standards for those two pollutants cannot be attained by the end of 1982. These SIPS must provide for attainment of the the latter standards by no later than December 31, 1987.

3.2.1 General Requirements

All revised SIPs are to contain:

- A definition of the geographic extent of the nonattainment area to be covered in the SIP.
- An accurate, comprehensive, and current (1977) inventory of existing emissions.

- A determination of the level of control needed for attainment by 1982 (including growth), using an EPA-approved air quality model.
- Adoption in legally enforceable form of all the measures needed to achieve attainment or, if adoption is not possible by 1979, a schedule for such adoption.*
- Emission reduction estimates for each adopted (or scheduled) control measure.
- A provision of reasonable further progress toward attainment, defined as annual incremental reductions in total emissions (from both new and old sources) to achieve attainment by the prescribed date. Reasonable further progress is to be determined by dividing the total emission reduction needed to attain the standard by the number of years between 1979 and either 1982 or 1987. Emission reductions between August 7, 1977, and December 31, 1979, are to be considered as being achieved in 1979.
- The identification and quantification of an emissions growth allowance to be allowed to result from new (or modified) stationary sources, or an emissions offset regulation to allow for major new sources. Growth rates of emissions from mobile and minor stationary sources are to be included in the determination of a growth allowance. A system of monitoring the growth rates must also be provided.
- Provision for annual reporting on reasonable further progress, summarizing emissions growth from new sources and reductions from existing sources.
- A permit procedure for new sources, to comply with Section 193 of the 1977 Amendments.
- A commitment of manpower and resources needed to implement the SIP, including written evidence of budget support from the state or local government.
- Evidence of consultation with the public and local government.
- Evidence that the SIP was adopted by the state only after public notice and hearings.

The new source review procedure of the 1977 Clean Air Act Amendments would require several other conditions, similar to those of EPA's emission offset policy:

- Reasonable further progress toward attainment must be ensured.

*Such control measures are to be based on reasonably available control technology (RACT).

- Emissions from the proposed source must not cause or contribute to violations of the emissions growth allowance.
- The new source must meet the lowest achievable emission rate.
- All other major sources owned or operated by the applicant must be in compliance or on a schedule for compliance.

3.2.2 SIPs Containing Extensions

All SIPs providing for attainment of the carbon monoxide and/or oxidant standards later than December 31, 1982, must also contain:

- A program requiring an examination of alternative sites, sizes, and emission controls, and a cost-benefit analysis before any permit for a new source is issued.
- An inspection/maintenance program for mobile sources, or a schedule endorsed by the Governor for the adoption and implementation of such a program. The program must be implemented "as expeditiously as possible," but no later than 1982 for a centralized state-run system or 1981 for a private-garage system.
- "A commitment by the responsible government official" to expand and improve public transportation.
- Commitment to use available funds to expand and improve public transportation.

3.2.3 Pollutant-Specific Requirements

- Sulfur dioxide: The SIP must contain all the necessary emission limitations and procedures to achieve attainment; mere schedules for the adoption of such limitations will not be acceptable.
- Nitrogen oxides: The SIP can contain either the necessary emission limitations or a schedule.
- Particulate matter (TSP): Emission limitations or procedures for traditional sources (i.e., both stack and fugitive emissions from stationary sources) must be included in the SIP. If the control of nontraditional sources (e.g., urban fugitive dust, resuspension, construction) is needed for attainment, the SIP must contain measures for such control.
- Carbon monoxide and oxidants: The SIP must provide for control of volatile organic compounds (VOC) from stationary and mobile sources. The plan must also include regulations to require RACT for stationary sources for which EPA has published a control techniques guidance.

> For urban areas that are nonattainment for oxidants, the SIP is to provide various transportation plans (to be explained in a guidance from EPA and the Department of Transportation) including public transit, parking controls, bus and carpool lanes, pedestrian malls, staggered work hours, traffic flow improvements, etc.

3.2.4 Reasonably Available Control Technology

RACT applies to existing sources of emissions; it is to be that level of control needed to achieve reasonable further progress towards attainment of the standards by the statutory deadlines. EPA defined RACT for stationary sources in a memo in 1976, as "the lowest emission level that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[18]

EPA reiterated this definition of RACT in regional workshops on nonattainment regulations.[19] The agency did not issue any specific guidelines for RACT to be required for sources of sulfur dioxide, nitrogen oxides or particulate matter. Instead, EPA referred to previous guidances for control techniques for these pollutants, such as the support material accompanying the criteria documents establishing the SO_2 and TSP standards in 1971, a 1978 publication on nitrogen oxide control,[20] and a 1977 report on control of fugitive particulates.[21] In general, however, EPA focused on the ability of an SIP to achieve reasonable further progress towards attainment, rather than on source-specific RACT requirements. In several cases, the RACT for an SO_2 source is in fact less stringent than in a previous SIP. (See Table 4.3.)

EPA did require that revised SIPs for carbon monoxide and/or oxidant nonattainment areas include the RACTs outlined in control techniques guidances for sources of volatile organic compounds. EPA published eleven guidances (as of May, 1979) covering such stationary sources as gasoline bulk plants, petroleum liquid storage facilities, cutback asphalt paving, etc. It is interesting to note that California considered the control techniques guidances to be less stringent than possible, while the Massachusetts state agency did not include several of the recommended controls in its SIP, arguing that they were unreasonably stringent.

3.2.5 Lowest Achievable Emission Rate

A new major source (or major modification) applying for a permit to construct in a nonattainment area is to be required to meet the lowest achiev-

able emission rate (LAER). LAER is intended to be based on the most stringent controls feasible, on the premise that a new source should be allowed in a nonattainment area only if its contribution to pollutants in the ambient air (which are already at levels where public health may be endangered) is reduced to the greatest degree possible.

The 1977 Clean Air Act Amendments defined LAER as:

> ...that rate of emission which reflects -- (A) the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or (B) the most stringent emission limitation which is achieved in practice by such class or category of source, whichever is more stringent. [Ref. 1, Sec. 171 (3)].

EPA has stated[22] that the transfer of control technology from one type of source to another will be considered in determining LAER, since the regulation is designed to force the development and application of technology.

LAER is to be determined on a case-by-case basis by the state or local agency reviewing an application for a permit to construct. EPA issued a LAER guidance document[23] in 1978, outlining points to be considered in determining such emission rates for 19 categories of sources of particulates, nitrogen oxides, sulfur dioxide and volatile organic compounds. In addition, EPA has established a clearinghouse of LAER determinations -- a record of cases of emission limitations set by permitting authorities -- and has distributed the report to the EPA regional offices. Although LAER is to be set on a case-by-case basis and is not necessarily to be uniform across the nation, information about LAER determinations is vital. Air quality officials commented that LAER determinations were the biggest administrative problem faced in reviewing new sources. (LAER is discussed further in Sec. 5.)

3.2.6 Additional Criteria

On April 4, 1979,[24] EPA promulgated a formal "Proposed Rulemaking on Approval of SIP Revisions for Nonattainment Areas," providing further guidance on the criteria for SIPs. EPA noted that states were urged to include the bubble concept in a revised SIP. This concept would enable a facility to meet the total emission control requirements of a SIP for a given pollutant through a mix of controls on multiple process-related emission sources, rather

than through specific limitations on each source. The approach is designed to be cost-effective, permitting "facilities to place a greater burden of control on sources where the marginal cost of control is low, and a lesser burden where cost is high."[25]

The April promulgation also noted the change in the oxidant standard: as of February 1979 the standard was altered from 0.08 to 0.12 parts per million and the designation of the pollutant changed from "oxidant" to ozone. A state could, therefore, relax SIP requirements to achieve the new, less stringent, standard.

SIPs are also to show attainment of the secondary NAAQS as expeditiously as possible. A state can request an 18-month extension for the submittal and approval of a revised SIP for a secondary nonattainment area.

EPA noted that "it also appears possible in a number of cases that attainment might be possible by December 31, 1982, without adding any significant new regulatory requirements to the SIP" (Ref. 12, p.18). In such cases, EPA suggested that the SIP revision might consist of an official notification that the deadlines for the primary and the secondary NAAQS contained in the Clean Air Act Amendments would be met by the existing SIP.

3.2.7 Conversion to Alternative Fuels

The 1977 Clean Air Act Amendments required (in Section 124) that, within one year after passage, all states should report to EPA on the extent to which an SIP depends on "the use by major fuel burning stationary sources of petroleum products or natural gas." EPA determined that states should consider in a revised SIP whether low-polluting fuels that were currently being used would continue to be available, noting that "it makes little sense for a State to revise their SIP without dealing with these issues, and then have EPA call for a SIP revision several months later" (Ref. 12, p.19).

Sources ordered to convert to coal by federal order, and sources converting to coal, if they had been able (before December 21, 1976) to accommodate an alternative fuel, are not considered major modifications and therefore are not subject to a preconstruction review. However, EPA determined that any increased emissions due to conversion would have to be charged against the emissions growth allowance. If there is no growth allowance and if the increased emissions are not covered by offsets, then the state cannot

issue additional permits for new sources until the SIP is revised; thus additional controls on existing sources are required in order to continue to achieve reasonable further progress toward attainment of the NAAQS.

3.3 DESCRIPTION OF SANCTIONS

The 1977 Amendments provided for three types of sanctions to be applied on July 1. According to Section 110(a)(2)I, no major stationary source of a pollutant could be constructed or modified in an area that was not attaining the standards for that pollutant unless a revised, approved SIP was in effect by the deadline. The ban on new emission growth applies only to major sources; minor sources are not affected. Only sources of the pollutant for which standards are violated are prohibited. (Thus a major source of particulates may be built in a nonattainment area for oxidants). The ban applies only to areas that can be shown by monitoring or modeling to be in violation of ambient air quality standards and to major sources seeking to locate in such nonattainment areas or close enough to have a significant impact on the nonattainment area.

Failure to have an approved SIP could also result in limitations on certain federal funding, according to Sections 176 and 316 of the 1977 Clean Air Act Amendments. Section 176 ordered the EPA Administrator and the Secretary of Transportation to deny approval of projects or allocation of grants under Title 23 (except for safety, mass transit, or air quality improvement measures) under certain conditions. Approval and funding were to be withheld from highway projects that would be located in an Air Quality Control Region containing primary nonattainment areas where transportation control measures were necessary for the attainment of the standard, and for which the Administrator found there was no approved revised SIP or that reasonable efforts toward submitting such an SIP were not being made.

Section 316 gave the EPA Administrator discretionary authority to withhold or restrict grants for the construction of sewage treatment works. The Administrator could withhold funds if he determined that the state did not have an approved SIP in effect that quantified and provided for increases in emissions of each air pollutant that could be anticipated to result directly or indirectly from the new treatment capacity created by the

construction. Grants could be withheld only so long as the state lacked an approved SIP.

3.4 EPA'S POSITION ON SANCTIONS

As the July 1 deadline for SIP submittal approached, with almost all states still without completed revised SIPs, legislation was introduced in Congress to revise the 1977 Amendments and extend the deadline. In May, 1979,[26] EPA sent a memo to Congress, clarifying the Agency's position on sanctions:

- EPA believes that the Congressional mandate for clean air was coupled with an intent not to create economic or social disruption. Where EPA has discretion in implementing the sanctions, it will be guided by the same principles.
- The sanctions are not automatic. Section 316(b) indicates that "...Administrator may (emphasis added) withhold, condition, or restrict the making of any grant ... (for municipal sewage treatment) ... if he determines that the state does not have in effect or is not carrying out, a SIP approved by the Administrator ..."
- Section 176(a) regarding highway funds includes the words "... or that reasonable efforts toward submitting such an implementation plan are not being made ..."
- Section 110(a)(2)(I) regarding the "prohibition of new sources" governs permits applied for after June 30, 1979. EPA feels that this provision will not have any impact until October 1979 since a typical permit requires approximately three months for processing, and a state can be processing these applications while EPA reviews the SIP.
- EPA expects only a very few SIPs to be excessively late or unacceptable. These will be handled on a case-by-case basis, and the final decision will be carefully considered after consultation with the Governor.

Following this informal enunciation of the position on the use of sanctions, EPA sent a memo to all Regional Administrators, outlining agency policy. The June 8, 1979, document (published in the Federal Register on June 30) outlines measures that could be taken to mitigate the effects of and reduce the need for imposing sanctions, with the comment that the agency does "...not expect major disruptions of industrial or state activities where states are making reasonable and expeditious efforts toward submitting an approvable SIP revision."[27]

The memo described the following mitigation strategies (summarized in Fig. 3.1):

- Any complete permit application postmarked or received prior to June 30, 1979, is exempt. A good faith effort to submit all necessary information may be considered a complete application.
- The ban applies only to major sources of the specific pollutant for which an area is in nonattainment.
- New permit applications may be submitted, processed, and approved, with the condition that an approved SIP must exist before construction can begin.
- Sources that would create a new NAAQS violation or impact NAAQS violations only in another state are subject to the Offset Ruling of January 16, 1979, but not the growth ban.
- SIPs may be approved on an area-by-area basis, limiting the sanction to areas for which approval has not been granted.
- Where appropriate, EPA will grant conditional approvals. Conditional approval would not result in sanctions unless the State failed to submit corrections by a specified date. Strong assurances by appropriate state authorities that deficiencies will be corrected will be necessary before conditional approval is granted. (The idea of conditional approval may be questioned, since the Amendments do not mention it. However, any legal challenge is likely to take enough time to enable states to obtain SIP approval in the interim.)
- A state may seek redesignation to attainment of nonattainment areas with supporting monitoring or modeling data.
- The imposition of sanctions on federal funds is discretionary, not mandatory. Guidelines for federal highway fund sanctions will be published in the Federal Register; guidelines for sewage treatment funds are still being developed.

3.4.1 Transportation Funding Limits

On June 11, 1979, EPA and the Department of Transportation published proposed rules[28] for applying transportation funding limits. Transportation funds will be withheld only if EPA finds that the Governor is not making reasonable efforts to submit a SIP which considers all the elements required by the 1977 Amendments. After July 1, an initial list of states with defi-

The Necessary Condition to Impose	The Sanction	EPA Interpretation of Its Ability to Impose	EPA Procedure for Decision to Impose	Mitigating Measures by States	Mitigating Measures by EPA	Condition Necessary to Lift Sanction
Failure to Have an Approved SIP by July 1, 1979	Prohibition on granting a permit for a new source of a pollutant on a site where it might have significant impact on a nonattainment area for that pollutant	Automatic	(Imposition Automatic)	• May process permit applications received during the ban, and grant conditioned on refraining from construction until SIP approved • May submit SIP area by area (ban limited to areas without approval) • May seek redesignation of status of nonattainment areas to attainment • May grant permits applied for prior to July 1, 1979	• Only major sources subject • May approve SIPs area by area • Applies only to major sources of pollutant for which an area is nonattainment • May grant conditional approval of SIP where states agree to correct deficiencies	SIP Approval or Conditional Approval (temporary lift)
	Withholding approval and funds for certain transportation projects (area-wide withholding)	Discretionary	1. EPA must find the Governor (state) is not making reasonable efforts to submit a SIP which considers all the elements required by Section 172 of 1977 Clean Air Act Amendments 2. An initial list of states with deficient SIPs to be prepared in July 3. EPA will negotiate with state to obtain agreements to correct deficiencies 4. Final list of states subject to withholding to be published between Sept. 1 and Oct. 31	• May make good faith efforts to submit a SIP which considers all the elements of Section 172 • May agree to correct deficiencies	• May find good faith effort to submit acceptable SIP • May continue to process grants but not approve (can approve immediately on SIP approval) • May accept agree-agreement to correct deficiencies • Will place withheld funds in escrow until SIP approval or 1 year is passed. Will not recommit funds for at least one year	SIP Approval or Conditional Approval or State Agreement to Correct Deficiencies
	Withholding approval and funds for certain sewage treatment projects (project by project withholding)	Discretionary	1. EPA must find that the facility would have significant direct or indirect impact upon a nonattainment area 2. Facility must meet minimum size and ratio of future to present population served 3. EPA will negotiate with state to obtain agreement to develop program to assure that emissions (direct and indirect) are accounted for in the SIP. Successful negotiations lead to conditional grants 4. Decisions are made project by project	• May commit to develop program to account for direct and indirect emissions from new facility in the SIP and measures to mitigate impacts • May continue to process applications until SIP approval	• May make conditional counting for emissions from new facility in SIP, either in growth allowance or by emission offsets • May continue to process applications until SIP approval but not approve (can approve immediately on SIP approval)	SIP Approval or Conditional Approval or State Commitment to Account for Increased Emissions in its SIP from the Facility and Still Attain NAAQS

Fig. 3.1. Sanctions: Process and Mitigation

cient SIPs was to be prepared, and EPA planed to negotiate with state officials in an effort to obtain agreements to correct deficiencies. From this initial compilation, a final list of states subject to funding limitations was to be published between September 1 and October 31. Any funds withheld were to be put in escrow until SIP approval and were not to be allocated to other applicants for a least one year.

3.4.2 Sewage Treatment Plant Funding Limits

On July 2, the EPA published a memo announcing the "intent to develop interim policy and procedures"[29] to implement sewage-treatment grant limitations in nonattainment areas. Size criteria, in terms of water flow and projected population to be served by the facility, were established for the review of projects. Procedures are to be developed to determine if a facility over the criteria size is accounted for in a revised SIP; to condition grants on the implementation of any revised SIP measure for which the grantee has responsibility; and to withhold grants if the facility is not covered in a revised SIP or if a revised SIP has not been approved.

3.4.3 Conditional Approval

On July 2, EPA published an elaboration of the conditional approval procedure for revised SIPs.[30] If a state submits a plan with only "minor deficiencies," EPA will conditionally approve the plan and will establish, in consultation with the state, a schedule for submitting corrections. With conditional approval, a state is able to issue permits to construct new sources in a nonattainment area. EPA argued that conditional approval was in accordance with congressional intent in the 1977 Amendments:

> The purpose of the restriction on new sources is not to punish a state for failure to control pollution, but rather to prevent the pollution problem from getting worse. The restriction would postpone construction that would worsen a violation of a national standard until after an acceptable plan is in effect that assures timely attainment of the standard. Where a plan has been revised so as to be in substantial compliance with the requirements of Part D, and the state provides assurances that any remaining minor deficiencies will be remedied within a short period, imposition of the restriction on new sources during that period would not serve the congressional purpose.30

3.4.4 Ban on New Sources

On July 2, EPA published two additional notices in the Federal Register,[30,31] clarifying the restrictions on new sources in nonattainment areas. The sanction on growth applies only to the construction or modification of any major source of the pollutant for which the area is designated as nonattainment and for which a revised SIP has not been approved. EPA also noted that the court decision on PSD in the Alabama Power Company case would alter the definition of a major source, but indicated that a subsequent ruling would be needed to clarify the new definition. The ban on new sources was explicitly extended to sources locating outside the nonattainment area if the emissions would have a significant impact (i.e., emission levels shown in Table 2.2) on the nonattainment area. EPA commented that "it would be inequitable for the statutory restriction to apply to one proposed source but not another, merely because they are on opposite sides of the boundary. It would likewise be unfair for the statutory restriction to apply more broadly in states that -- as part of an aggressive pollution control effort -- included broader areas within the boundaries of each designated nonattainment area."[32]

EPA also requested comments on how to deal with a source whose impact would cover several political subdivisions of a state if one such subdivision had a revised SIP in effect and another did not.

3.5 THE SIP APPROVAL PROCESS

The statutory and regulatory requirements for a revised SIP are lengthy and complicated, placing a substantial burden both on the states and on the regional EPA offices. In Fig. 3.2, the steps in the state preparation of a revised SIP are presented; in Fig. 3.3, the EPA review and approval/disapproval process is outlined. According to the 1977 Clean Air Act Amendments, the entire process was to be completed by July 1, 1979. A state that failed to have an approved SIP by that deadline would face serious consequences -- the sanctions on growth and funds that Congress wrote into the law. However, only one state (Wyoming) met that schedule. As of August 1979, a number of states still did not have revised, approved SIPs in effect for nonattainment areas (see Table 3.1). The industrial states of Region V (Illinois, Michigan, Indiana, Ohio, and Wisconsin) have been slow in submitting plans, but the regional office has projected conditional approval by the

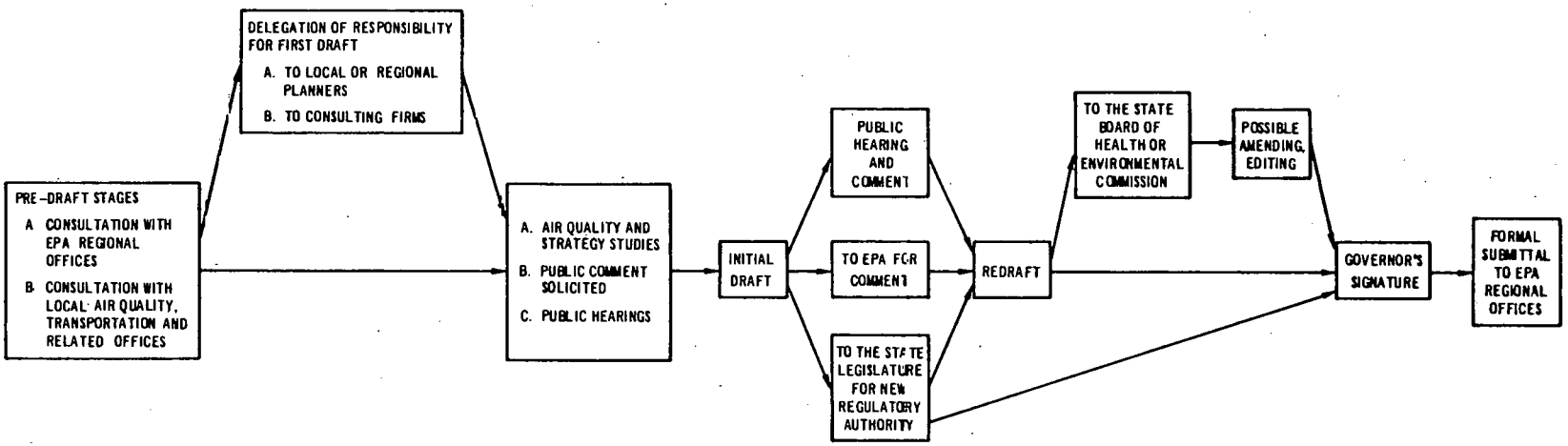

Fig. 3.2. The SIP Approval Process at the State Level

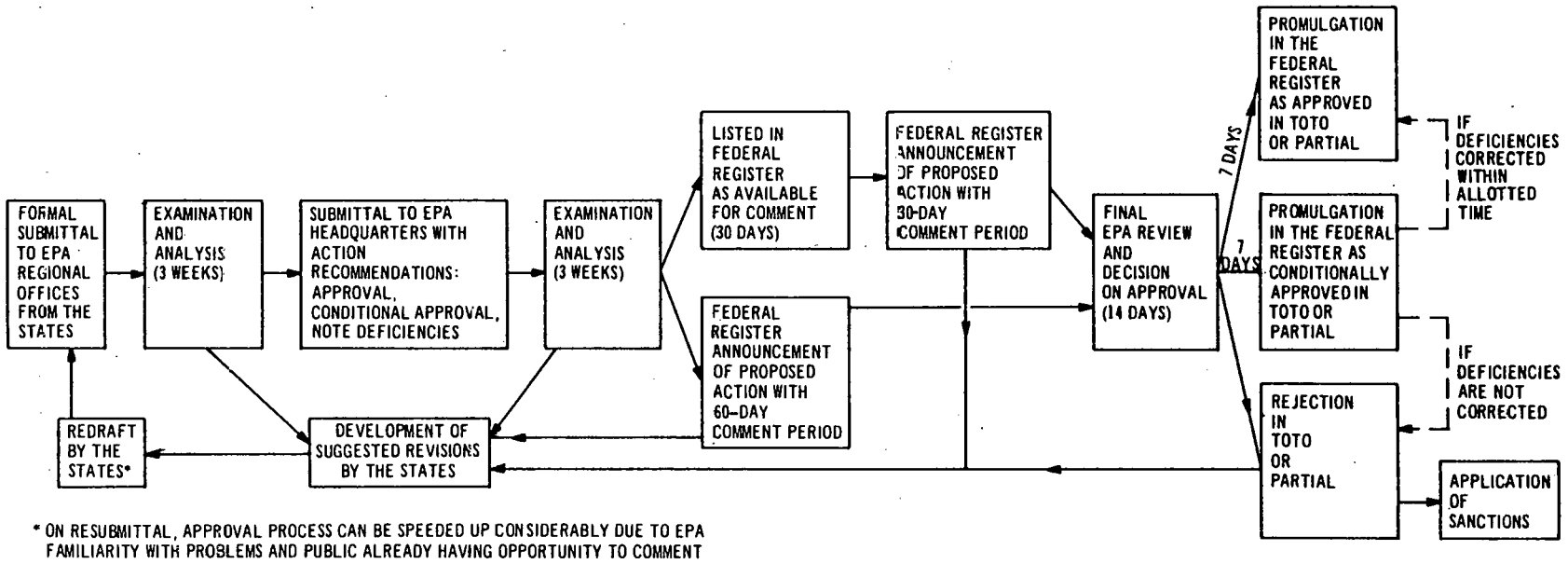

Fig. 3.3. The SIP Approval Process after State Action

end of 1979 or early 1980. California and Pennsylvania (Allegheny County/ Pittsburgh area) have also been slow.

In addition, there are several states that need automotive inspection and maintenance provisions in their SIPS, but have been unable to achieve passage of the necessary legislation. Of the 29 states that were required to have inspection and maintenance legislation, 20 have such legislation, four more are close to passing some legislation, but five states (New York, Ohio, California, Michigan, and Colorado) are all without enabling legislation and without real hope of the imminent passage of the necessary legislation.

Despite this record of late and partial submittals, no funding has yet been cut off nor has any source been denied a permit to construct in a nonattainment area because a revised SIP was lacking. States that have received conditional approval of an SIP will have six months to correct deficiencies. During that time, permits can be issued with the condition that a corrected SIP will be submitted and approved prior to initiation of construction. States that have not yet submitted a SIP or received even conditional approval can still continue to process permits for nonattainment areas. Paperwork for a permit normally takes three to four months. This should be adequate for a state to complete a SIP and receive approval, and thus avoid any ban on new sources. EPA believes that a construction ban will affect only "a few sources in a few states."

Table 3.1. Status of State Implementation Plans as of September 1, 1979

Approved	Disapproved	Final EPA Headquarters Review (approval/disapproval within 3 weeks)	Published for Comment in the Federal Register		Initial Review at EPA Headquarters (to be published within 3 weeks)	Submitted at EPA Regional Level	Submittal Expected
Wyoming	South Dakota (New Source Review)	Georgia (approval proposed previously)	Alabama	New Mexico	Iowa	Alaska	California (partial) (immediately)
South Dakota (except New Source Review)		Colorado (deficiencies noted previously)	Arizona	New York (partial)	New York (partial)	California (San Diego, San Francisco, South Coast, Air Basins)	Kansas (immediately)
Requests to extend deadline to submit plans to attain secondary TSP NAAQS			Arkansas	North Dakota	North Carolina (partial)	Connecticut	Ohio (September)
Oregon			Delaware	Oklahoma	West Virginia (draft)[a]	Idaho	Pennsylvania (Allegheny County) September
Idaho			D.C.	Pennsylvania (partial)		Indiana	
Washington			Florida	South Carolina		Kentucky	
			Illinois (draft)[a]	Tennessee		Minnesota (partial)	
			Louisiana	Texas		Missouri	
			Maine	Utah		Nebraska	
			Maryland	Vermont		New Hampshire	
			Massachusetts	Virginia		North Carolina (partial)	
			Michigan	Wisconsin (partial)		Rhode Island	
			Minnesota (partial)	Washington		Wisconsin (partial)	
			Mississippi				
			Montana				
			Nevada				
			New Jersey				

[a]Final rulemaking cannot occur until an official state version is submitted.

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4 NONATTAINMENT PROBLEMS AND ATTAINMENT STRATEGIES

4.1 LOCATIONS OF NONATTAINMENT AREAS

The following series of maps presents three different views of nonattainment areas:

- As counties containing nonattainment areas as designated by EPA and the states;
- As counties containing monitored violations for TSP, SO_2, and NO_x, based on 1975 SAROAD* data; and
- As those subcounty areas actually designated by the states in revised SIPs.

4.1.1 Counties Containing Designated Nonattainment Areas

Figures 4.1-4.5 identify counties containing nonattainment areas designated in Section 107 as of March 1978 and updated through changes published in the Federal Register through May 1979. For TSP (Fig. 4.1) and SO_2 (Fig. 4.2), counties are designated primary or secondary if either the 24-hour or annual averages were violated. If a county contained both primary and secondary nonattainment areas, the primary violation is indicated on the maps; similarly, if a county contains a secondary nonattainment area and an unclassified one, the secondary violation is shown.

The 1977 Clean Air Act Amendments had required that the designations be based on air quality as of the date of the Amendments -- August 7, 1977. Under EPA's guidance (as discussed in Sec. 3), the states used the most recent four quarters of air quality data available. For TSP and SO_2, areas that were clearly in violation or in attainment of the standards were classified accordingly; areas with limited data were designated as unclassified. For NO_x (Fig. 4.3), CO (Fig. 4.4), and O_x (Fig. 4.5), areas could be designated only as nonattainment or attainment/unclassified. No distinction was made between attainment and unclassified. Consequently, some of the counties indicated on the maps as in attainment for these three pollutants could conceivably be in violation of the NAAQS - the collection of additional, valid

*SAROAD: Storage and Retrieval of Aerometric Data -- EPA'S computer format for the transmittal of air data from state, local and federal monitoring operations to the National Air Data Bank (NADB), managed by the Monitoring and Data Analysis Division, Office of Air Quality Planning and Standards, USEPA, Research Triangle Park, North Carolina.

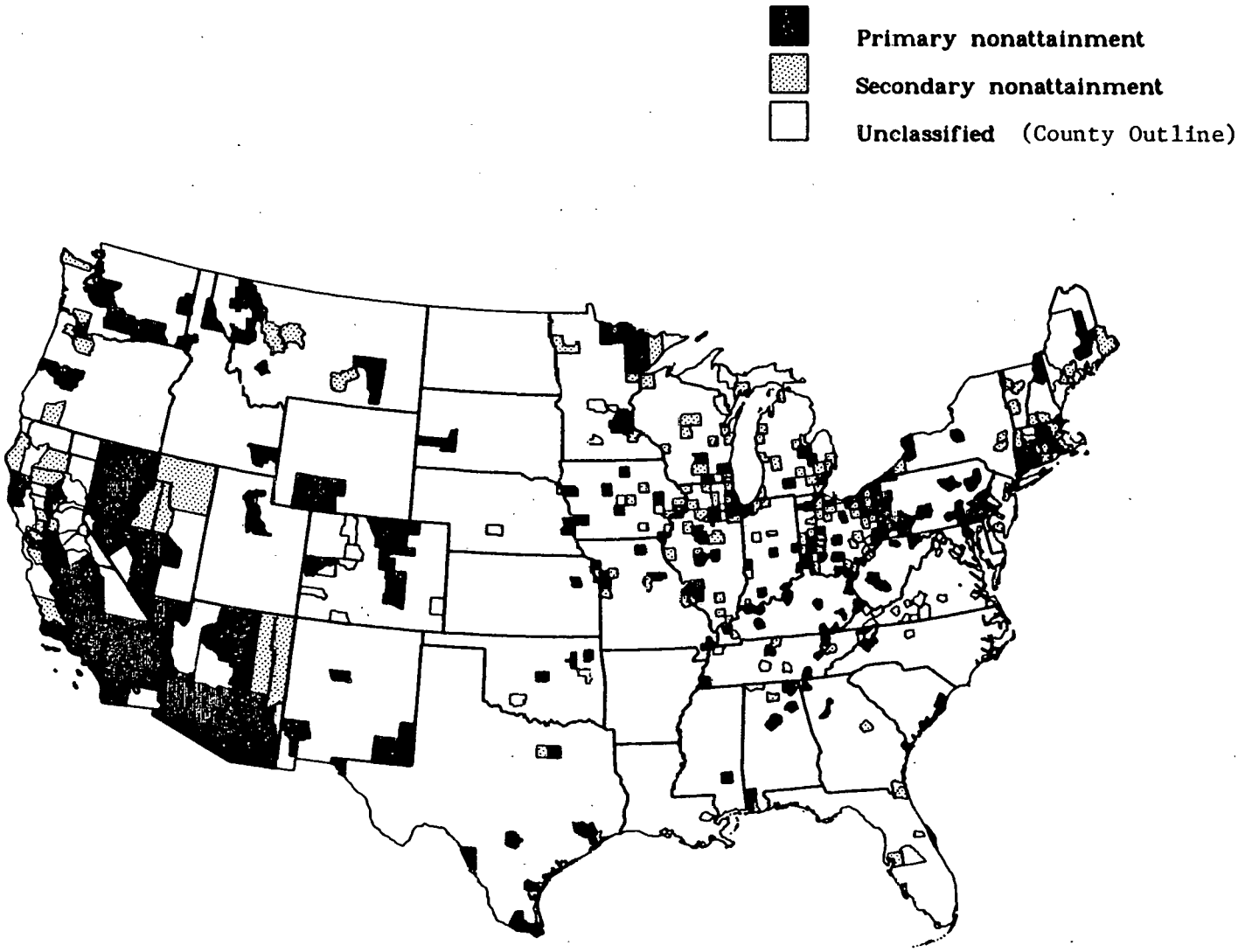

Fig. 4.1. U.S. Counties Containing Designated Nonattainment Areas for TSP, as of May 1979

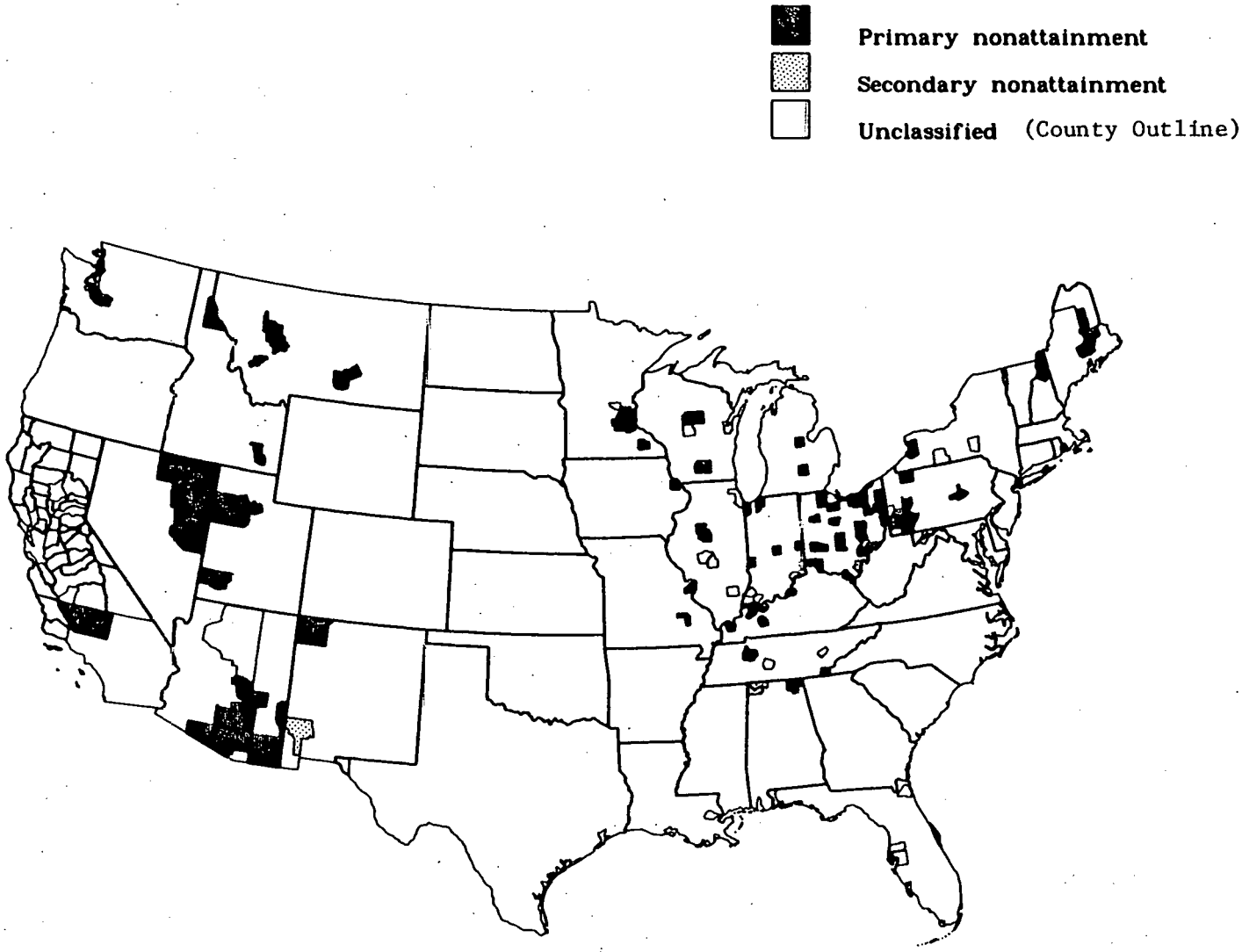

Fig. 4.2. U.S. Counties Containing Designated Nonattainment Areas for SO_2, as of May 1979

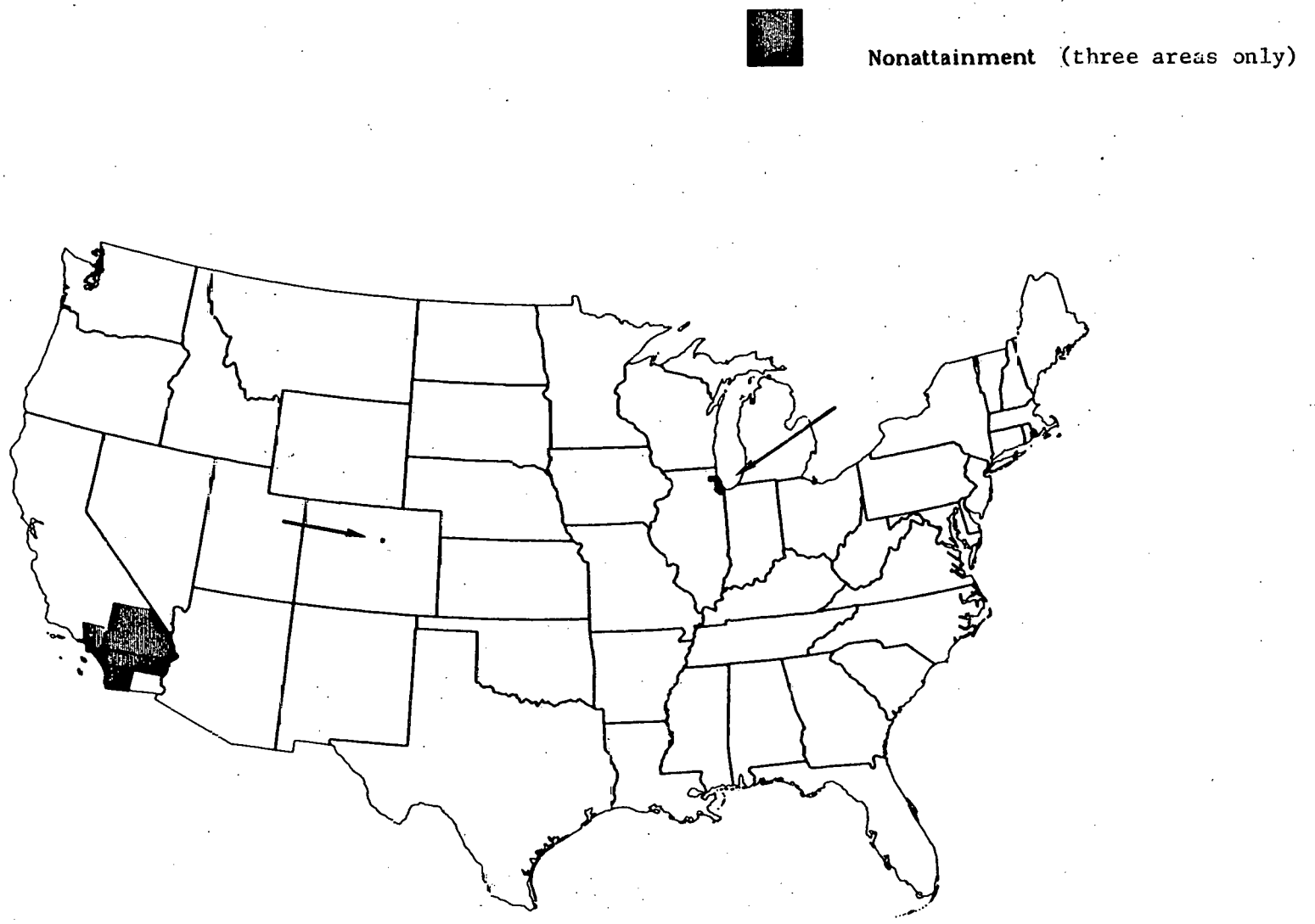

Fig. 4.3. U.S. Counties Containing Designated Nonattainment Areas for NO_x, as of May 1979

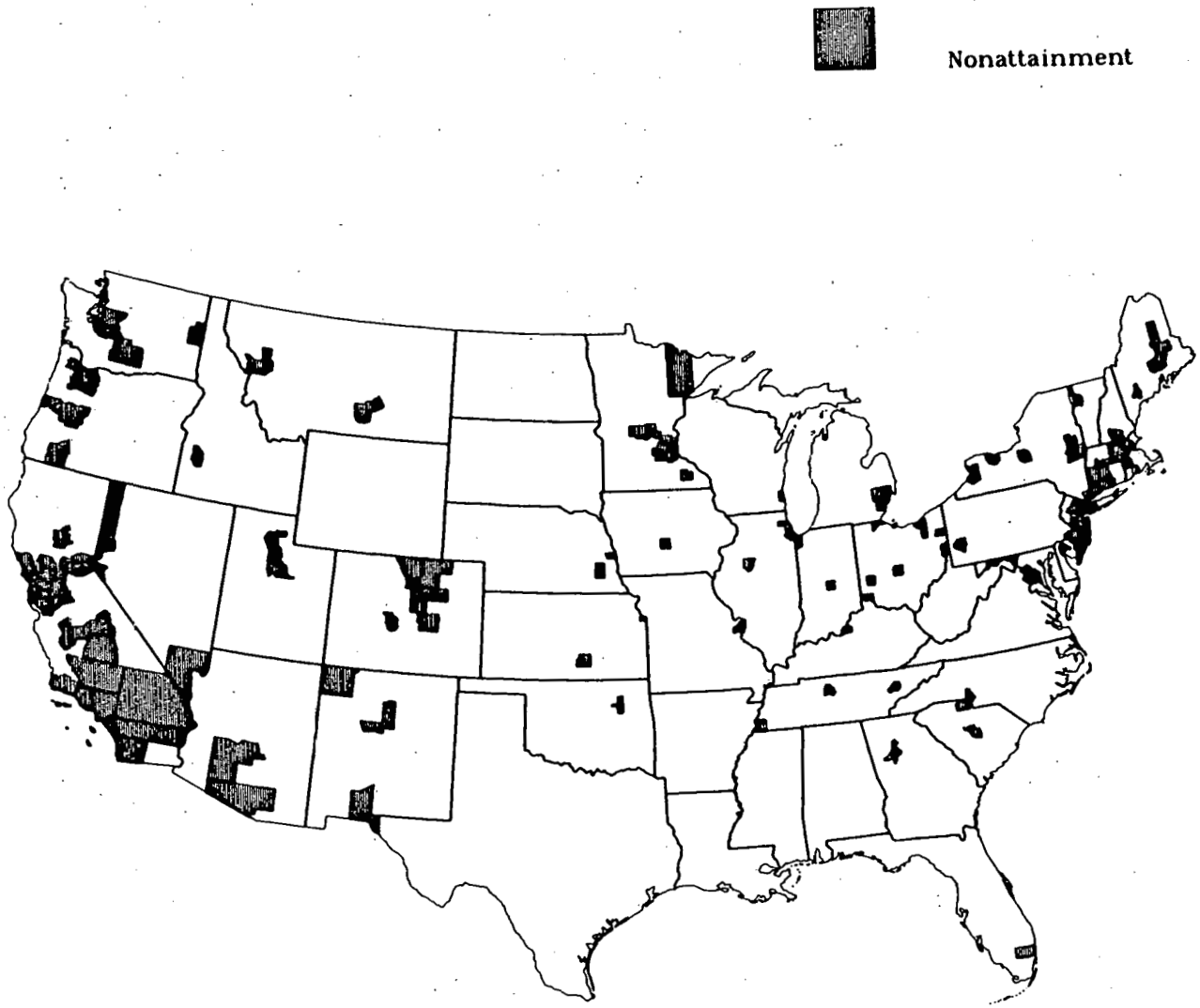

Fig. 4.4. U.S. Counties Containing Designated Nonattainment Areas for CO, as of May 1979

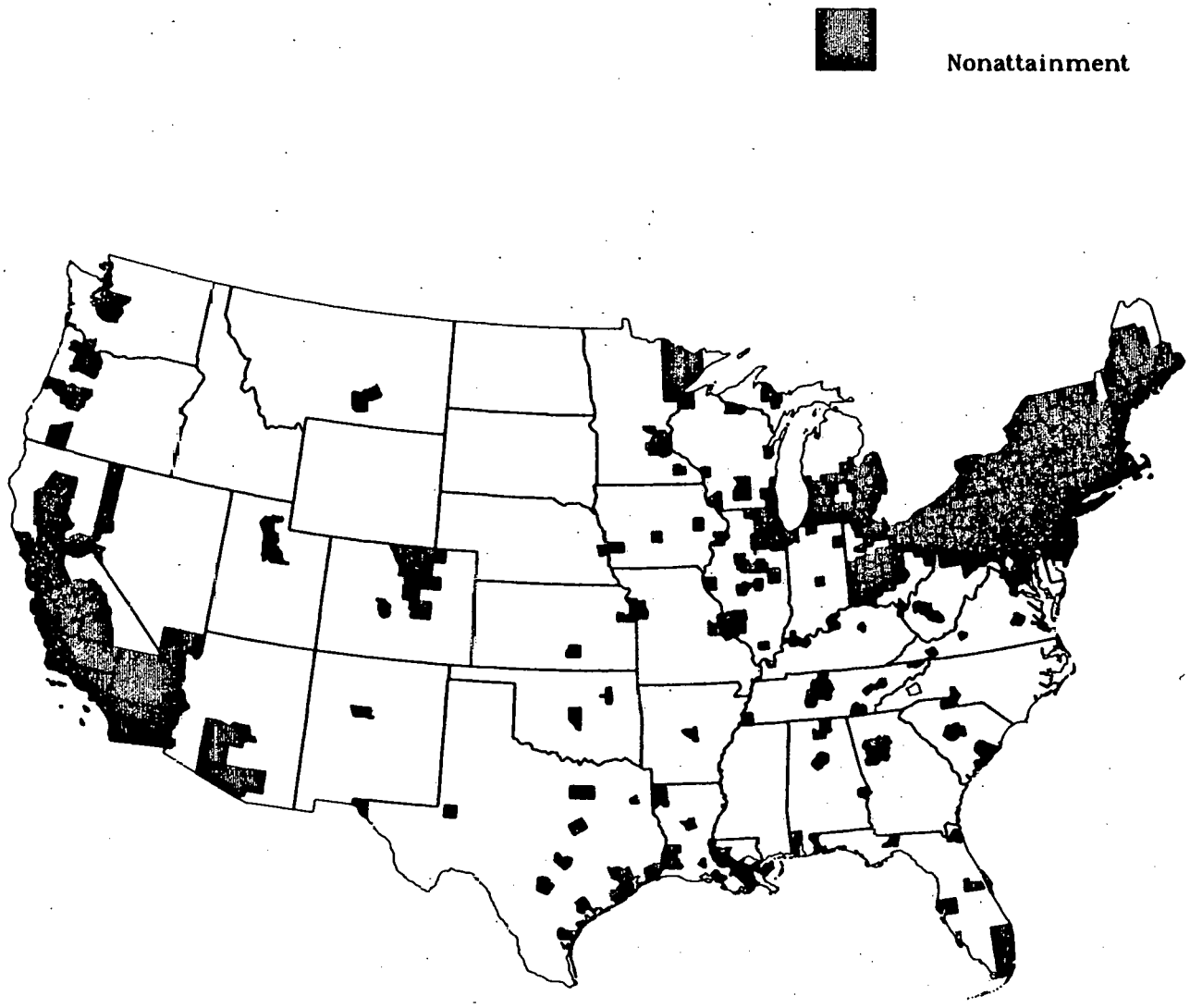

Fig. 4.5. U.S. Counties Containing Designated Nonattainment Areas for O_x, as of May 1979

air quality data is needed to make that determination. (The preconstruction monitoring requirement of a PSD permit will certainly contribute to the available air quality data.)

4.1.2 Counties Containing Monitored Violations

To illustrate the distinction between the Section 107 nonattainment areas and monitored violations, the following maps (Figs 4.6-4.8) have been prepared. The maps cover TSP, SO_2 and NO_x, the pollutants most likely to be of concern to energy sources. They are based on 1975 SAROAD data; a shaded county indicates that a monitor recorded a violation of either the 24-hour or the annual average standard of the primary NAAQS. These maps differ considerably from Fig. 4.1-4.3, which display counties containing nonattainment areas for the same set of pollutants.

For example, there are fewer counties containing monitored violations of the SO_2 standard (Fig. 4.7) than counties containing designated nonattainment areas (Fig. 4.2), especially in Ohio, Indiana, and Pennsylvania. In Ohio, EPA rather than the state agency made the SO_2 designations. (EPA had promulgated an SO_2 attainment plan in the absence of an acceptable state SIP.) There are fewer discrepancies, for TSP, between monitored violations (Fig. 4.1) and designated areas (Fig. 4.6) than is the case for SO_2. There are more extensive data for determining nonattainment for TSP, since there are more monitors for TSP than for other pollutants. (In 1975, 4,137 individual monitors provided data for TSP, compared to 2,631 for SO_2 and 824 for NO_x.) Only three areas were designated as nonattainment for NO_x in Fig. 4.3 -- Denver, San Diego/Los Angeles, and Chicago. The monitor data in Fig. 4.8 indicate additional violations in New York City, Virginia (Roanoke), and Massachusetts (Boston and Springfield), but <u>not</u> in Denver. (NO_x concentrations in the Denver area have been very close to the NAAQS in recent years -- 97 $\mu g/m^3$ in 1977 and 101 in 1978 -- according to the Colorado SIP.) The following facts should be taken into consideration in reviewing the disparities:

- The states may have used monitoring data for years more recent than 1975.

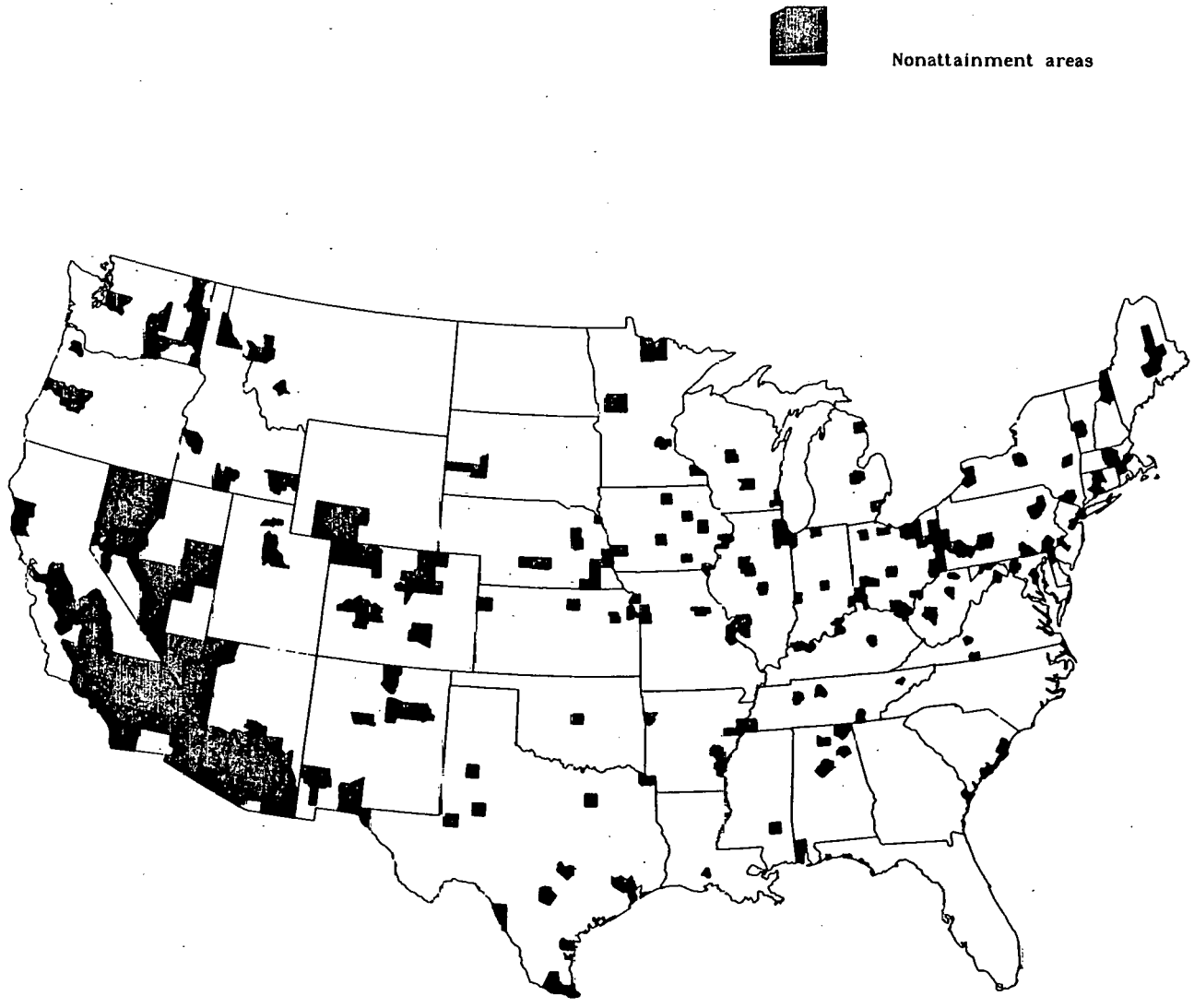

Fig. 4.6. U.S. Counties Containing Monitored Primary TSP Nonattainment Areas (Based on 1975 SAROAD Data)

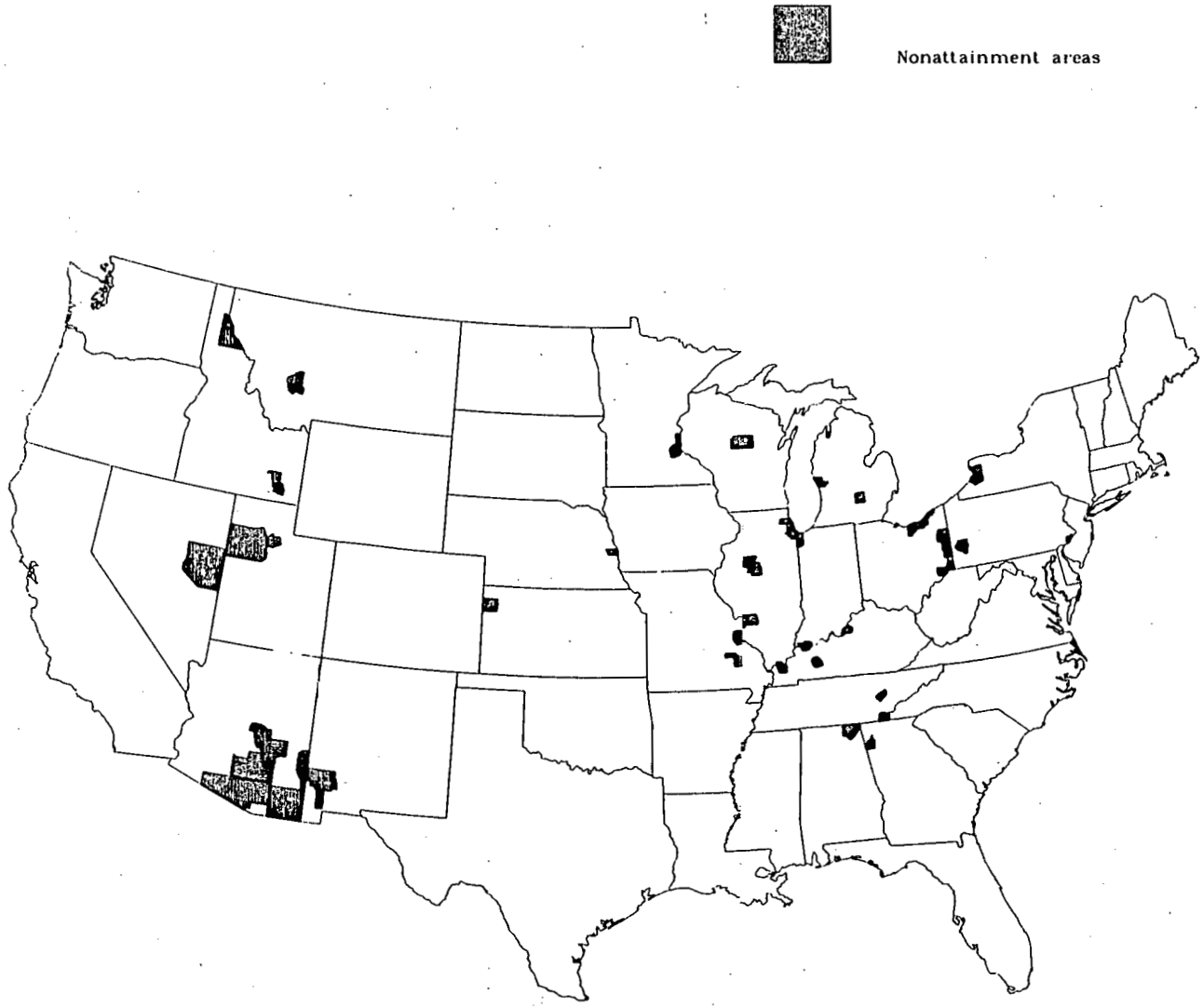

Fig. 4.7. U.S. Counties Containing Monitored Primary SO_2 Nonattainment Areas (Based on 1975 SAROAD Data)

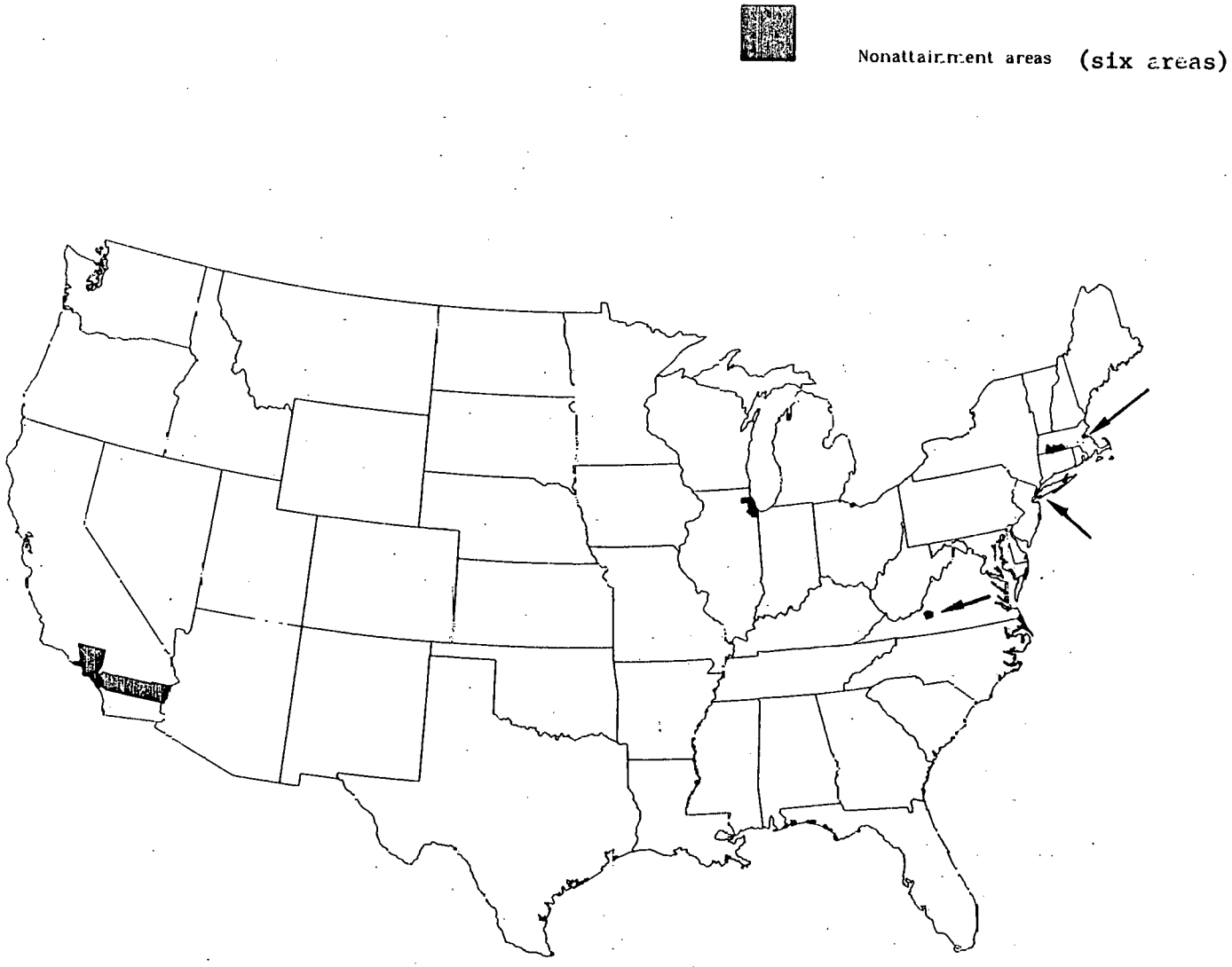

Fig. 4.8. U.S. Counties Containing Monitored Primary NO_x Nonattainment Areas (Based on 1975 SAROAD Data)

- The designations do not simply represent monitored violations. Modeling the impact of SO_2 sources was appropriate, if monitored data were not available.
- In some cases, EPA judged an SO_2 area to be nonattainment even though monitoring data did not indicate violations, if a source in the area was determined to be using an unauthorized control system or a stack taller than in accordance with good engineering practice.
- States sometimes designated an area as unclassified or attainment despite monitored violations, arguing that a monitor was improperly sited (for example, a particulate collector located too close to the ground might be unduly influenced by road dust).
- The SAROAD data do not include as violations any annual values defined as "tentative," i.e., where the data are not available for all four quarters.

4.1.3 Subcounty Areas Designated Nonattainment

The maps of U.S. counties containing nonattainment areas are readily available graphic displays of the general character and extent of the nonattainment problem. However, in most cases these maps seriously overstate the extent of the actual areas designated as nonattainment. A number of the initial March 1978 designations were made on a subcounty level -- 75% of TSP and 40% of SO_2 designations were only parts of counties. Although oxidant designations were made on a county level, NO_x and CO nonattainment areas were typically drawn around an urban center where monitors recorded violations. In the revised SIPs, the states, following EPA's suggestion, typically designated the geographic nonattainment area as small as reasonable around the monitor with recorded violations, particularly for TSP and SO_2 nonattainment areas. Ohio, for example, discarded the county-level designations set by EPA and drew SO_2 areas considerably smaller. California was the only state that consistently drew nonattainment areas on a scale larger than county-level (usually entire air basins).

Although the states designated small subcounty areas as nonattainment, maps of these areas were not available, except as hand-drawn submittals in an SIP. The areas were not defined by any standard boundaries, i.e., county or SMSA lines, but were drawn using highways, streets, and/or township lines as boundaries. Therefore, the use of county-level maps to identify problem areas for policy decisions introduced distortions, with too large an area being considered subject to a ban or a constraint on new

sources. In the western U.S., where counties are extremely large, the overstatement of county-level maps is even more serious.

Consequently, this project undertook the task of providing a computerized set of maps of nonattainment areas, drawn as actually designated by the states, samples of which are included in this report (Figs. 4.10, 4.12 and 4.14 to 4.17).* These maps are uniquely useful in detailed analyses of nonattainment constraints. Figures 4.9-4.12 present maps of counties containing nonattainment areas, in comparison with designated nonattainment areas, for Texas (TSP) and Ohio (SO_2). Clearly, the areas actually designated are far smaller than the counties; it is even possible that a designated nonattainment area plus the area of significant impact surrounding it might still be smaller than a county. An effort has also been made to display the designated areas on a scale more useful than 50 individual state maps. On a national map the areas become miniscule. On the scale of Federal Regions (See Figure 4.13 for a map of these Regions), the actual areas are discernible. Figures 4.14-4.17 present maps of of Federal Regions V and VI, showing nonattainment areas for TSP and SO_2.

4.2 NONATTAINMENT PROBLEM AREAS

Figure 4.5, in comparison with the other maps, indicates that violations of the oxidant standard are the most pervasive nonattainment problem in the U.S. The entire Northeast and parts of the Midwest have been designated as nonattainment. These maps do not reflect the revised, less stringent oxidant (now ozone) standard, which should bring a number of urban areas into attainment. TSP nonattainment is nearly as extensive as oxidant nonattainment, with violations occuring in many heavily industrialized areas in the Midwest and East. Although the western U.S. is indicated as containing numerous TSP nonattainment areas, many of these may be redesignated as attainment if violations can be shown to be the result of rural fugitive dust, as discussed in Sec. 3.1.4. There are few SO_2 nonattainment areas in comparison to those for TSP and O_x, and they tend to be clustered in heavily industrialized eastern Ohio and western Pennsylvania. The SO_2 nonattainment areas in the western part of the U.S. are typically the result of the emissions from nonferrous smelters. (Primary nonferrous smelters can apply

*A report on revised SIPs will contain maps of nonattainment areas for all pollutants for all states.

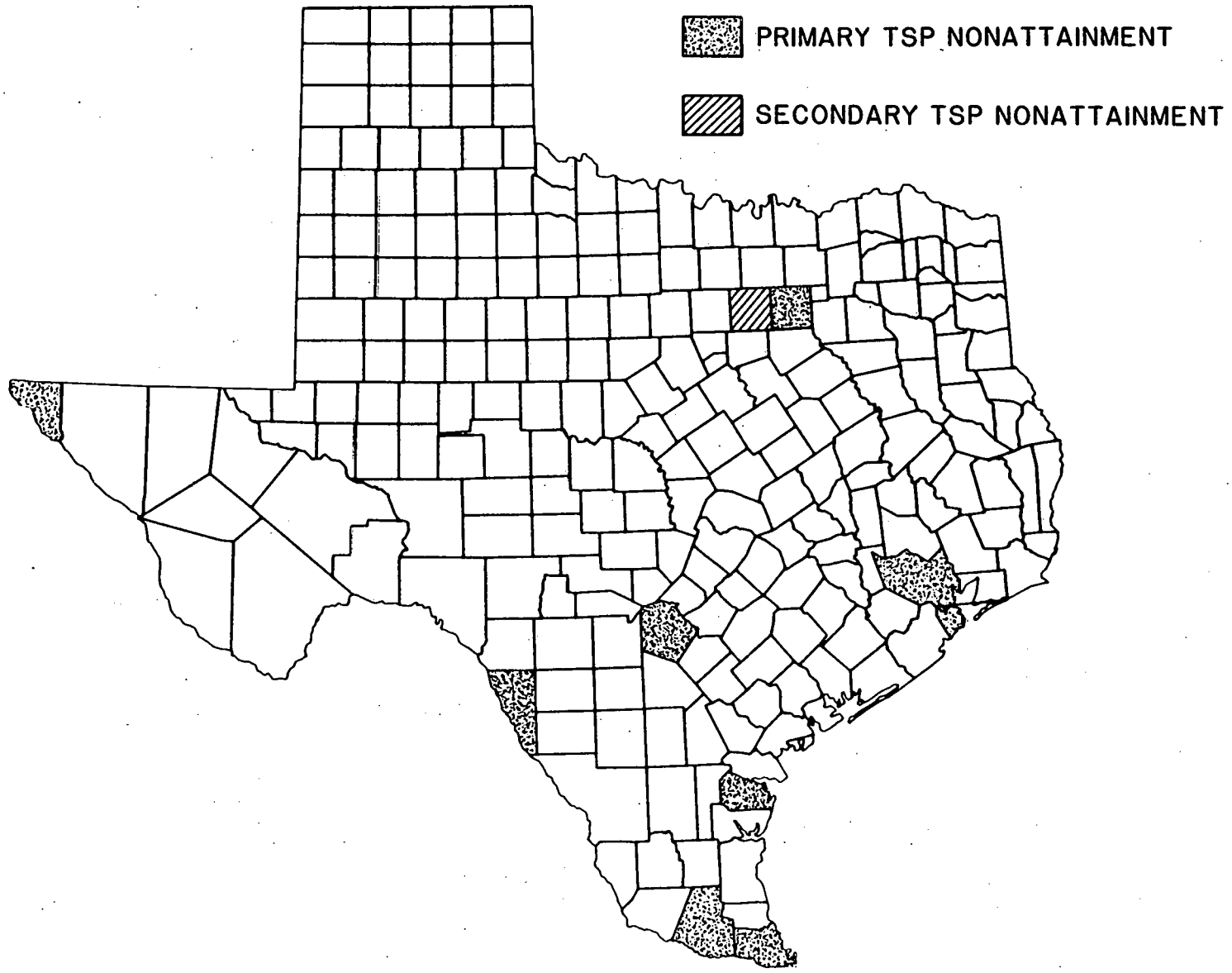

Fig. 4.9. Texas Counties Containing TSP Nonattainment Areas, as of May 1979

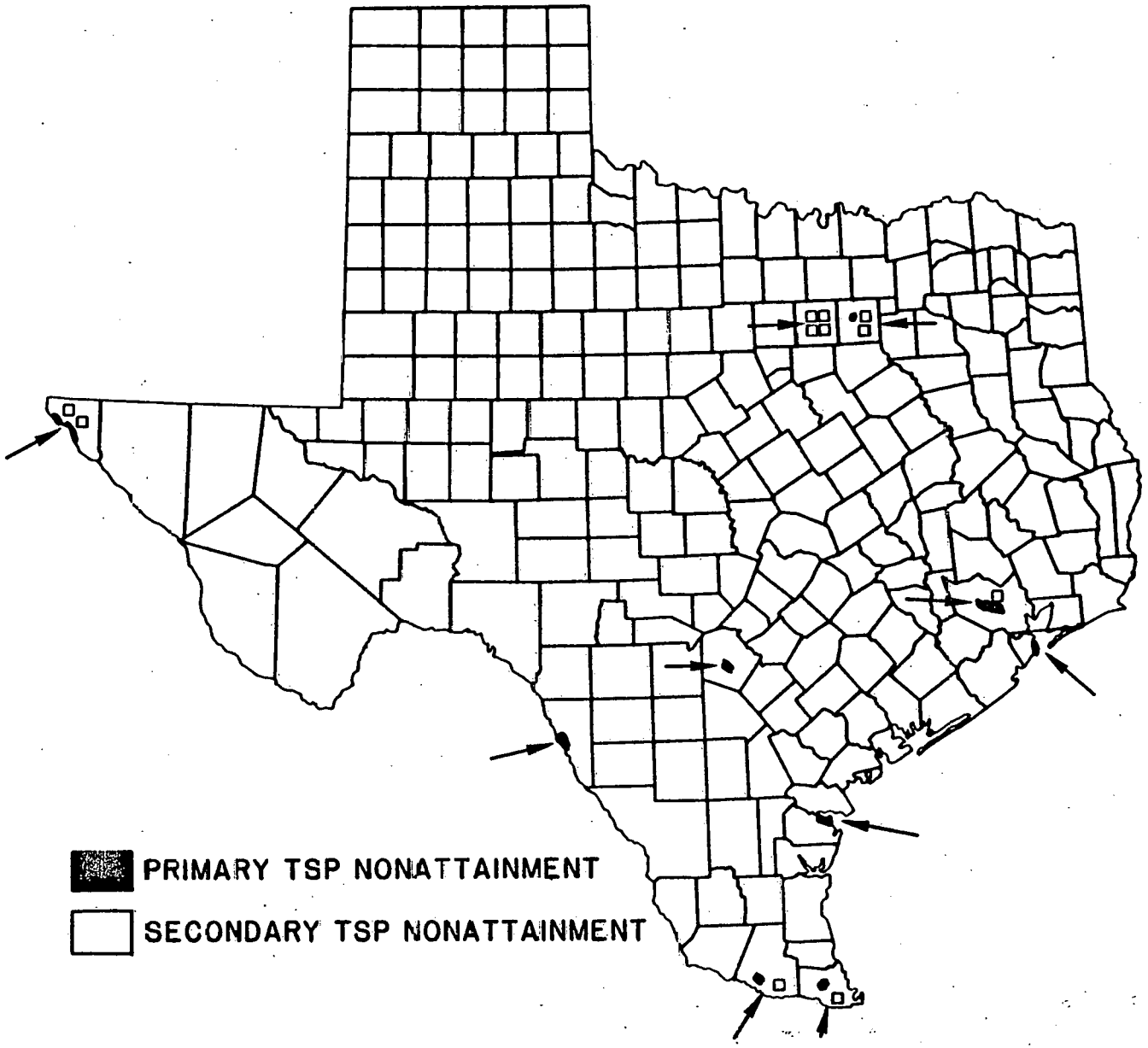

Fig. 4.10. Texas Nonattainment Areas for TSP, as Designated, as of May 1979

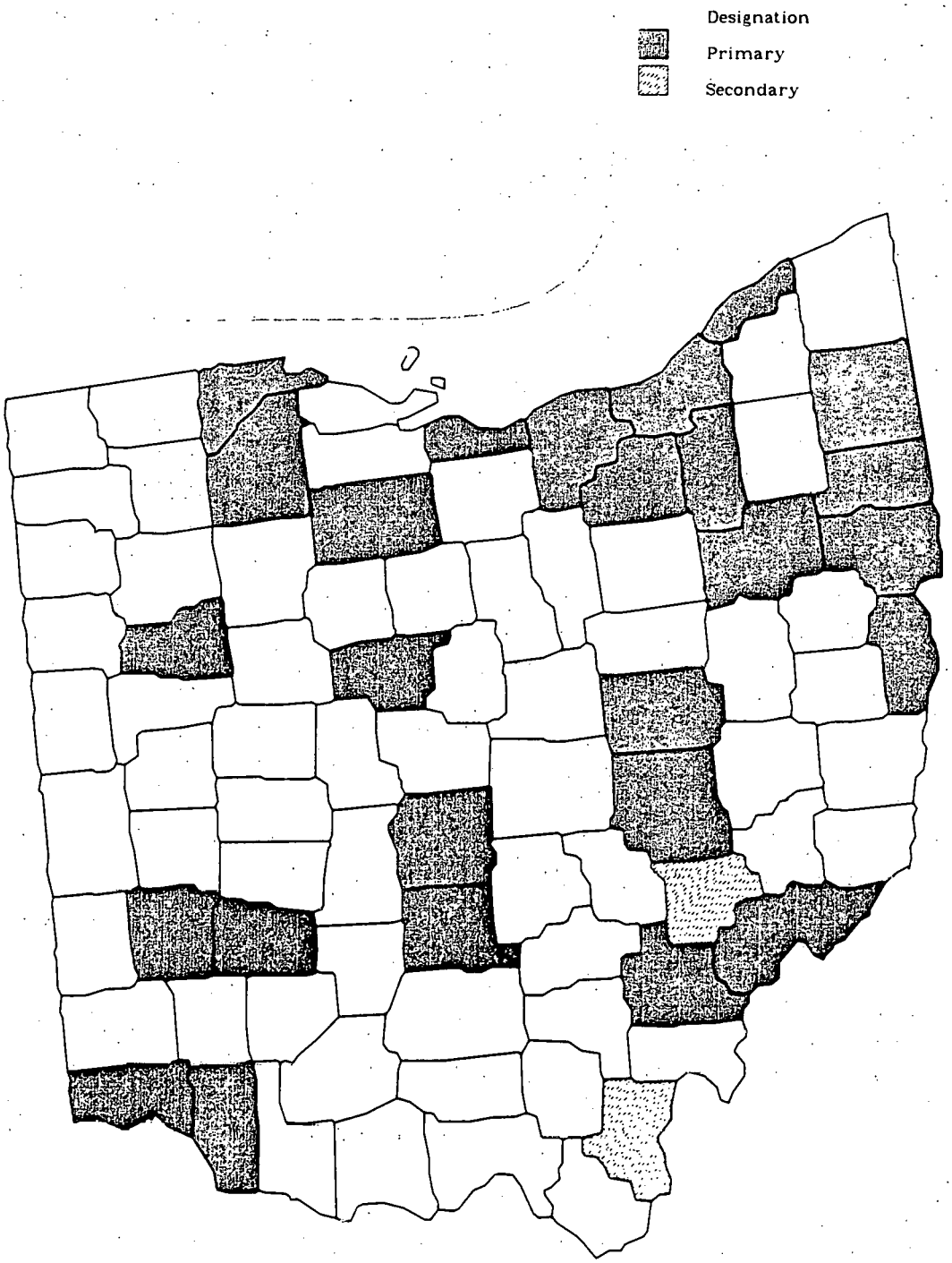

Fig. 4.11. Ohio Counties Containing SO_2 Nonattainment Areas, as of May 1979

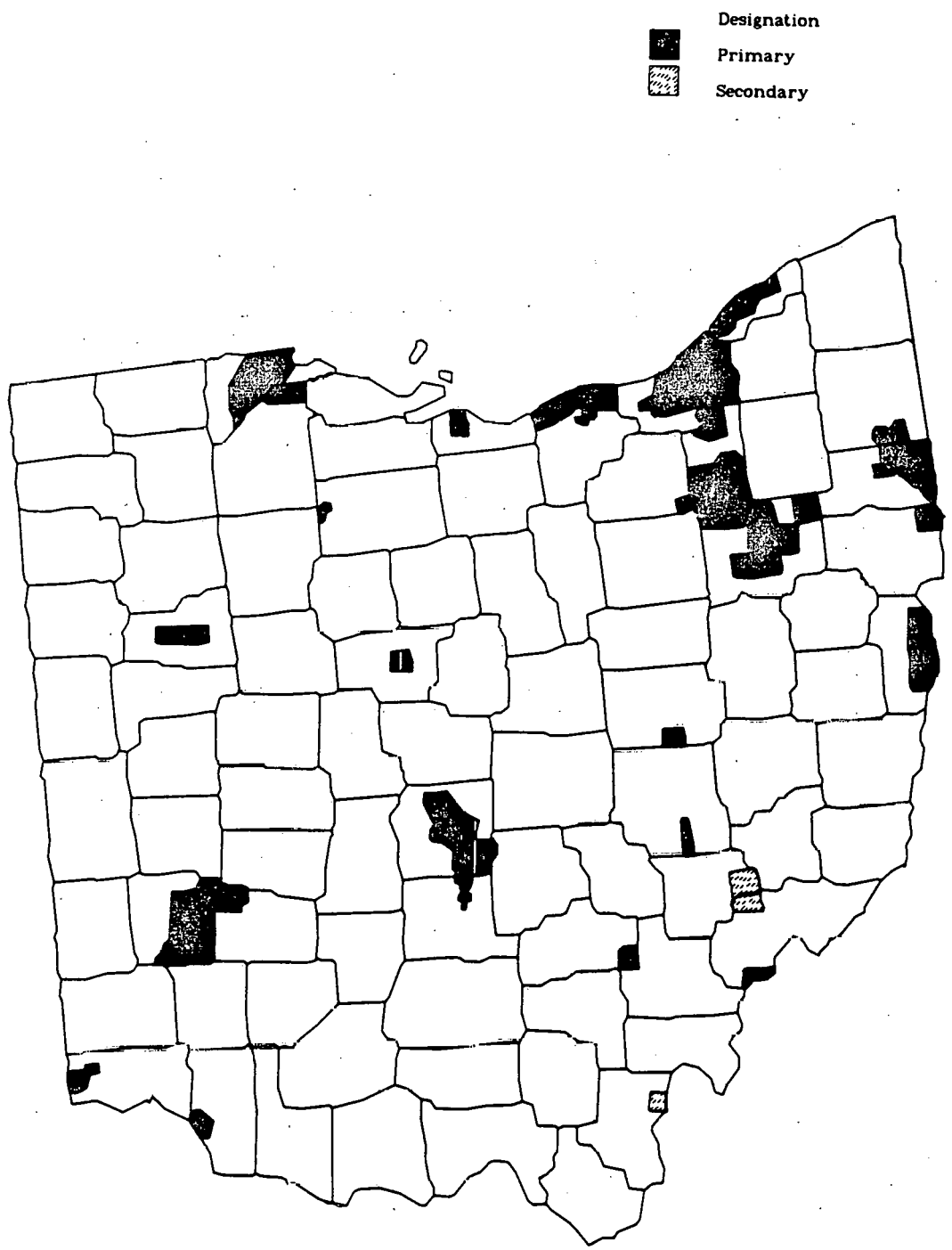

Fig. 4.12. Ohio Nonattainment Areas for SO_2, as Designated, as of May 1979

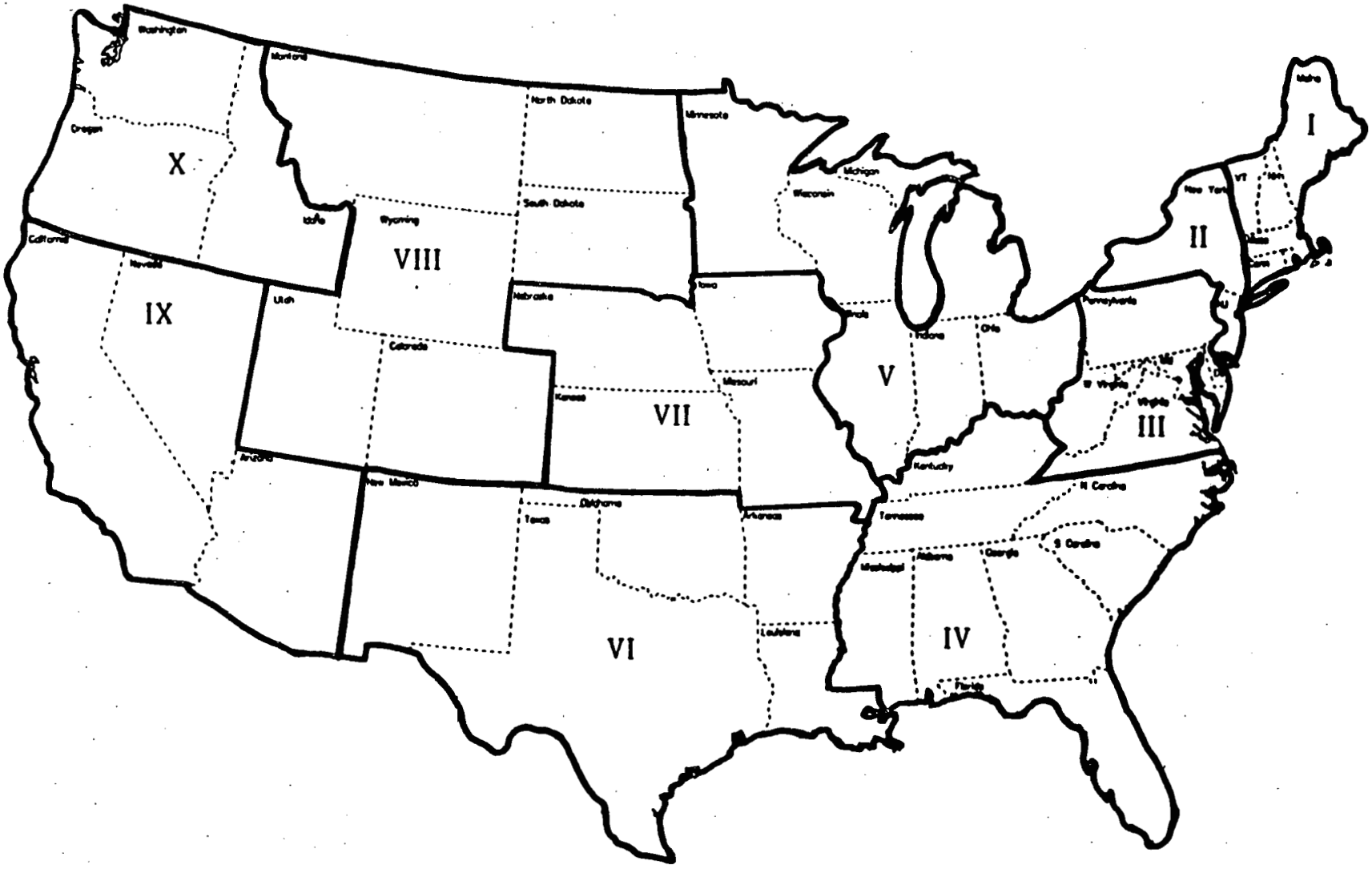

Fig. 4.13. Boundaries of Federal Regions

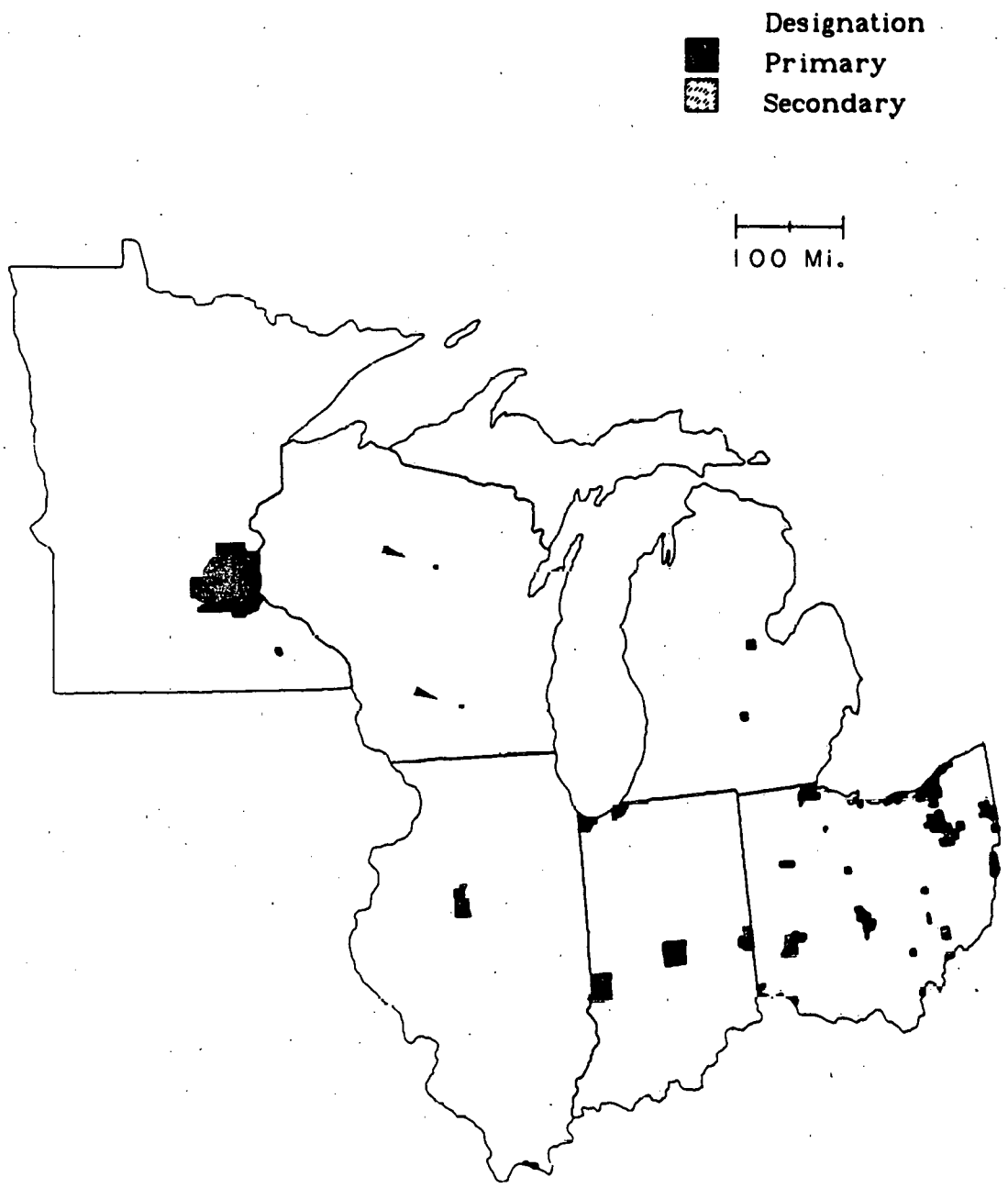

Fig. 4.14. SO_2 Nonattainment Areas, as Designated: Region V, as of May 1979

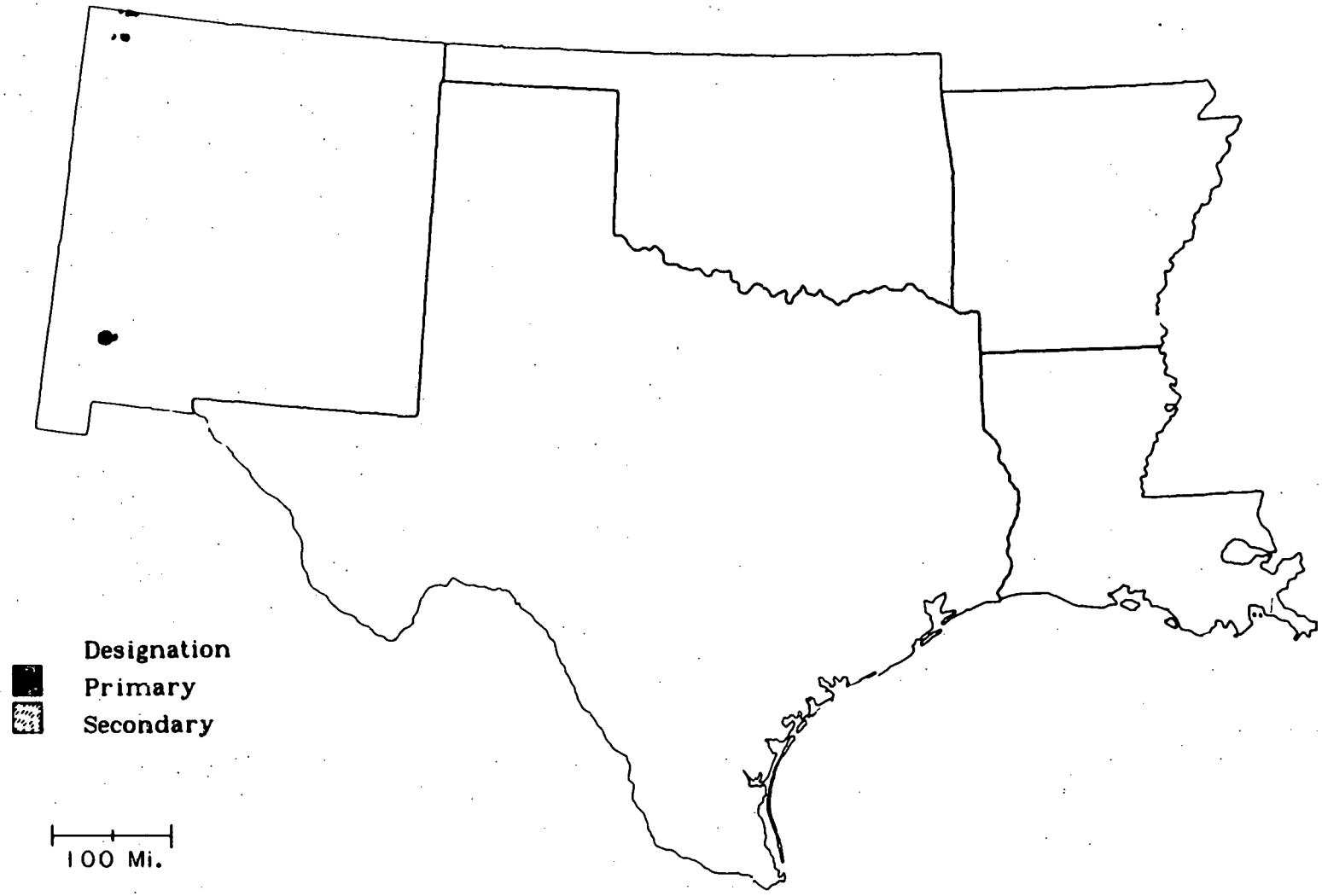

Fig. 4.15. SO_2 Nonattainment Areas, as Designated: Region VI, as of May 1979

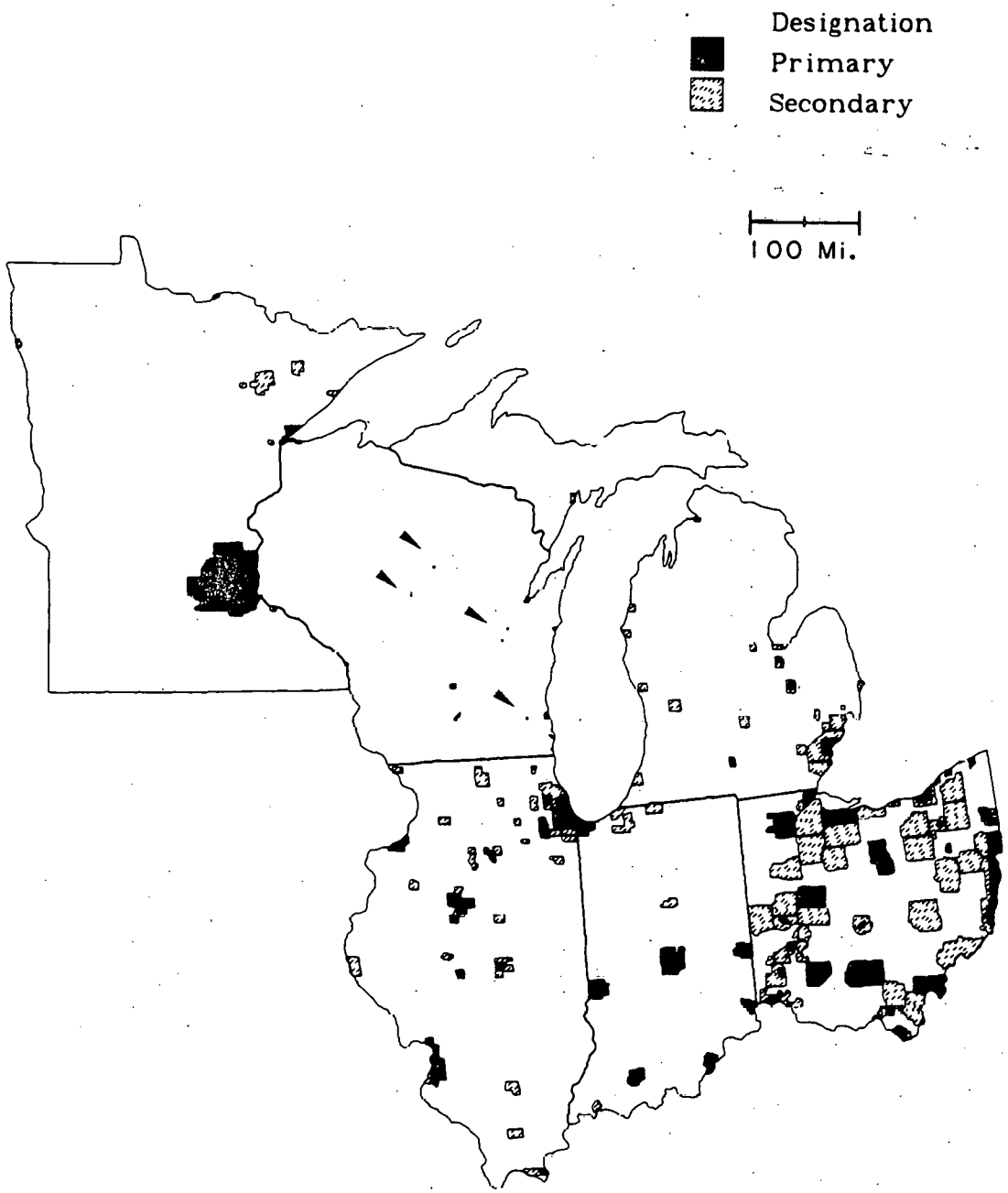

Fig. 4.16. TSP Nonattainment Areas, as Designated: Region V, as of May 1979

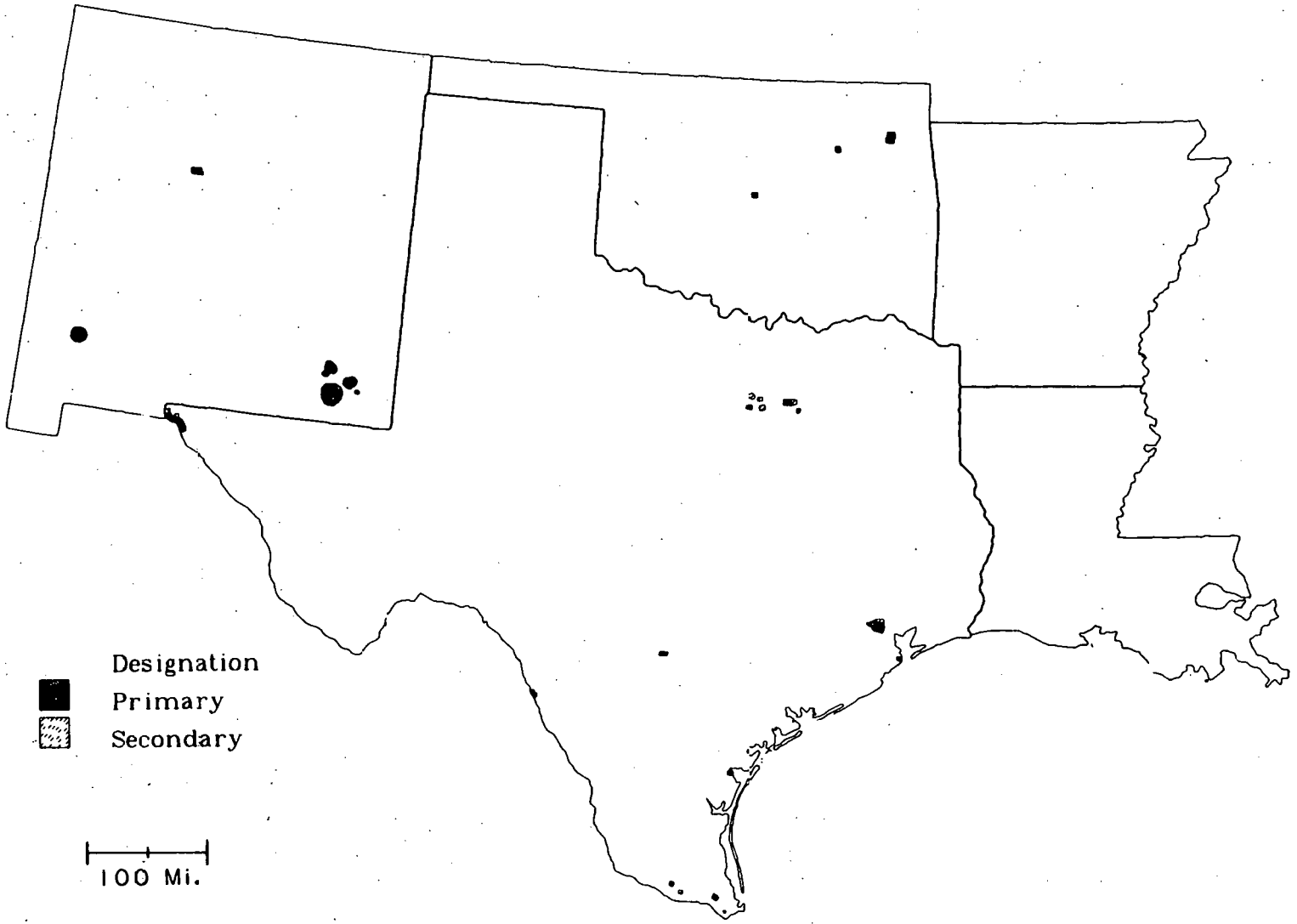

Fig. 4.17. TSP Nonattainment Areas, as Designated: Region VI, as of May 1979

for exemptions from emission limitations, postponing the need to achieve any SIP requirements through January 1988, according to Section 119 of the 1977 Clean Air Act Amendments). Carbon monoxide nonattainment is limited to urban areas, reflecting the fact that transportation causes the major part (80%) of the pollutant. Nitrogen oxide nonattainment areas are currently limited to three urban areas -- Chicago, Denver, and Los Angeles/San Diego. The rest of the country has been designated as unclassified/attainment, reflecting the lack of valid monitoring data and the fact that the only current NAAQS for NO_x is an annual standard.

Table 4.1 gives a breakdown of nonattainment areas by Federal Region. Regions IV, VI, VII, VIII, and X appear to have much better air quality, on the whole, than the other regions, on the basis of both the percentage of nonattainment counties and the percentage of counties that are nonattainment for more than one pollutant. The table also indicates the regional differences in problem pollutants. Most of the counties in the Northeast

Table 4.1 Number of Counties with Areas in Violation of the Primary NAAQS (based on March 1978 designations)

Federal Region	Total No. of Counties	Counties in Nonattainment					Counties in Nonattainment for More than One Pollutant
		O_x	TSP	CO	SO_2	NO_2	
I	97	65	11	17	2	0	17
II	83	83	5	25	1	0	26
III	247	160	34	15	11	0	41
IV	736	55	35	11	13	0	24
V	524	141	116	29	44	1	69
VI	502	28	17	7	3	0	8
VII	412	18	20	8	3	0	12
VIII	292	20	15	14	6	2	15
IX	94	63	40	34	9	5	32
X	120	11	14	11	3	0	13
Totals	3107	644	307	171	95	8	257

(Federal Region I, II, and III) are in violation of the oxidant standard, while the greatest number of TSP and SO_2 violations occur in Region V. In terms of air quality violations for all pollutants, however, the poorest air quality exists in Region IX.

Table 4.2 summarizes nonattainment problems by Federal Region (and state) and by pollutant.

4.3 ATTAINMENT STRATEGIES

The revised SIPs submitted by the states are required to contain strategies for attaining the NAAQS by 1982 or 1987 (as appropriate) for each nonattainment area. The causes of violations and the severity of violations are usually the result of local phenomena, such as meteorology, topography, land use, and characteristics of particular facilities, as well as the level of development and natural resources of a state. (Transport phenomena are sometimes significant contributors to high concentrations of ozone and sulfates.) Attainment strategies and the stringency of requirements on new and existing sources are also dependent on the goals of a state -- both for economic development and for environmental protection. Despite these local variations, patterns or trends in attainment strategies can be discerned. Similarities exist because:

- The same types of sources are responsible for nonattainment, and the control possibilities are similar;
- The Clean Air Act and EPA require certain strategies, such as inspection and maintenance of motor vehicles in ozone nonattainment areas;
- States seek solutions that are likely to be approved by EPA;
- Many states, lacking independent expertise, rely heavily on EPA advice (or the advice of consultants).

The following discussion, based on reviews of approximately 40 SIPs, examines attainment strategies for those pollutants of primary concern to national energy policy: sulfur dioxide, particulates, and nitrogen oxides.

4.3.1 Sulfur Dioxide

Sulfur dioxide nonattainment areas are usually the result of a few local stationary sources. The areas occur throughout the industrialized states

Table 4.2. Nonattainment Areas (NA) of the U.S., by Federal Region and Pollutant

Federal Region and State	TSP	SO_2	O_x	CO	NO_x
I. ME NH VT MA RI CT	8 primary NA; numerous secondary NA (primarily cities) Sources: area and fugitive emissions, out-of-compliance point sources, pollutant transport	2 primary NA sites in Maine and New Hampshire Sources: papermills	Most of the region Sources: motor vehicles, stationary VOC[a] emitters, pollutant transport	12 of the larger cities and towns; 1/2 of Connecticut Source: more than 95% from motor vehicles	None
II. NY NJ	3 primary NA; numerous secondary NA Sources: area and fugitive emissions, out-of-compliance point sources	1 primary NA in Lackawanna, New York Source: coke-oven gas from steel mills	The entire region Sources: motor vehicles, stationary VOC emitters	23 of the larger cities and towns Source: motor vehicles	None
III. PA DE MD DC WV VA	21 primary NA (mostly in Pennsylvania); 9 secondary NA Sources: industrial point sources, area and fugitive emissions	7 primary and 1 secondary NA in Pennsylvania Sources: steel mills, power plants, industrial boilers, area emissions	Most of Pennsylvania, Maryland, and D.C.; 19 counties in West Virginia and Virginia Sources: motor vehicles, stationary VOC emitters	9 cities and 1 Virginia county Source: motor vehicles	None
IV. KY TN NC SC GA FL AL MS	32 primary NA; 8 secondary NA Sources: out-of-compliance point sources, industrial fugitive emissions, other fugitive and area emissions	11 primary, 2 secondary NA, most in Kentucky Sources: power plants, chemical plants, and a refinery	30 NA (groups of counties around major cities) Sources: motor vehicles, stationary VOC emitters	9 cities and counties Source: motor vehicles	None
V. OH IN IL MI WI MN	Numerous primary and secondary NA Sources: point sources (power plants, steel mills, etc.) industrial fugitive emissions, other fugitive emissions	About 20 NA in Ohio; 5 in Indiana; 7 in the remaining states altogether Sources: power plants, industrial boilers, steel mills, chemical plants, institutional heating plants	The major metropolitan areas including 2/3 of Ohio, 1/2 of Michigan, and 1/3 of Illinois Sources: motor vehicles, stationary VOC emitters	8 Ohio counties, the Twin Cities metropolitan area, and parts of 10 other cities Sources: motor vehicles, one iron foundry	Downtown Chicago Sources: motor vehicles, fossil fuel-fired boilers
VI. LA AR TX OK NM	18 primary, 11 secondary NA, generally quite small Sources: industrial and other fugitive dust, a limited set of point sources	5 small primary NA in New Mexico Sources: a power plant and nonferrous smelters	49 counties and parishes around major cities and petroleum facilities Sources: motor vehicles, stationary VOC emitters, especially refineries and petrochemical plants	1 New Mexico county and portions of 5 cities Source: motor vehicles	None

[a]VOC = volatile organic compounds.

Table continued on next page

Table 4.2. (cont'd)

Federal Region and State	TSP	SO_2	O_x	CO	NO_x
VII. IA MO KS NB	16 primary, 13 secondary NA around larger cities and towns Sources: fugitive dust, area emissions, granaries, out-of-compliance point sources	3 small primary NA in Iowa and Missouri Sources: industrial boilers, chemical processes	9 NA surrounding major cities Sources: motor vehicles, stationary VOC[a] emitters	6 of the larger cities, primarily downtowns Source: motor vehicles	None
VIII. CO UT WY MT SD ND	14 primary, 5 secondary NA (primary in Colorado and Utah) Sources: specific industrial processes (e.g., smelting), area and fugitive emissions	5 primary NA: 3 in Montana, 2 in Utah Sources: 3 copper smelters, a refinery, and a college heating plant	13 counties surrounding Denver and Salt Lake City and 1 Montana county Sources: motor vehicles, stationary VOC emitters	Denver metropolitan area and 4 other cities Source: motor vehicles	Denver Sources: motor vehicles, fossil fuel-fired boilers
IX. CA NV AZ	About 1/3 of California is primary NA, 1/10 secondary; 12 primary and 1 secondary NA in Nevada and Arizona Sources: fugitive industrial, area, out-of-compliance point sources, and other fugitive emissions	1 Nevada air basin and part of a California air basin 6 sites in Arizona Sources: nonferrous smelters, tertiary oil recovery, power plants	Approximately 1/2 of California, 4 Nevada air basins, Phoenix and Tucson metropolitan areas Sources: motor vehicles, stationary VOC emitters	Vast sections of California, 3 Nevada air basins, 2 Arizona metropolitan areas Source: motor vehicles	Los Angeles-San Diego metropolitan areas Sources: motor vehicles, fossil fuel-fired boilers
X. WA ID OR	12 primary, 3 secondary NA in Washington and Idaho 1 Oregon AQMA is primary, 1 secondary Sources: industrial and other fugitive emissions, out-of-compliance point sources	2 sites in Idaho 1 site in Washington Sources: nonferrous smelters	Seattle metropolitan area, Portland-Vancouver 3 other Oregon AQMAs Sources: motor vehicles, stationary VOC emitters	8 NA (4 cities, 4 AQMAs) Source: motor vehicles	None

aVOC = volatile organic compounds.

of the Midwest and Northeast and in localized areas of the South and West where major SO_2 sources such as smelters, refineries, and coal-fired power plants are located. The following sections describe some general trends in SO_2 attainment strategies.

Out-of-Compliance Sources. In many instances, the SO_2 emissions causing nonattainment come from sources that are not in compliance with existing SIP limitations. EPA Region V, for example, has a significant number of SO_2 nonattainment areas, largely the result of coal-fired power plants. In 1978, in a report to the General Accounting Office, the EPA Region V office stated that "233 powerplants are responsible for 81 percent of the Region's sulfur dioxide emissions. Even though 52 percent of these plants (121) are in compliance, they account for only 26 percent of the sulfur dioxide emissions. The 112 plants not in compliance and those on cleanup schedules account for 74 percent of sulfur dioxide emissions and 78 percent of emissions from all powerplants."[33] Illinois, one of the states in Region V, addressed the SO_2 nonattainment problem in its revised SIP by retaining the existing SIP emission limitation on solid-fuel combustion sources (see Table 4.3), and adding regulations to govern the performance of emission control equipment.

In the revised SIP for Kentucky, 14 point sources of SO_2 were identified as the cause of eight nonattainment areas, and nine of those sources were out-of-compliance power plants. Kentucky's attainment strategy was simply to bring the power plants into compliance with existing SIP limitations, rather than making the emission limitations more stringent (see Table 4.3). In fact, Kentucky relaxed the SIP requirement in three counties where the air quality was judged to be sufficiently cleaner than the NAAQS to allow increased SO_2 emissions to occur.

Nonferrous Smelters. Nonattainment areas for SO_2 in several Western states (Nevada, Utah, Arizona, Montana, and New Mexico) are caused by the emissions from nonferrous smelters. The smelters are eligible for exemptions from compliance with SIP limitations until as late as 1988. The 1977 Amendments indicated that such exemptions could authorize continued use of supplementary control systems and tall stacks, but must also include interim requirements to prevent violations of the NAAQS.

Table 4.3. SO_2 Emission Limitations in Current and Revised SIPs: Illinois and Kentucky

State and Area	Size of Source Regulated (MM Btu/hr)	Current SIP Limitation (lb/MM Btu)	Revised SIP Limitation (lb/MM Btu)
Illinois			
Chicago, Peoria, East St. Louis	>100	1.8	1.8[a]
Any major metropolitan area with SO_2 concentrations >60 $\mu g/m^3$ prior to 5/76, or >45 $\mu g/m^3$ after 5/76	>100	1.8	1.8[a]
Elsewhere in state	>100	6.0	6.0[a]
Kentucky			
Class I Counties			
Jefferson, McCracken	>250[b]	1.2	1.2
Class II Counties			
Bell, Clark, Woodford	>250[b]	1.8	2.3
Class III Counties			
Pulaski	>250[b]	3.2	3.2

[a]Existing limit with additional regulations covering maintenance/malfunction of pollution control equipment.

[b]Scaled for smaller units.

Montana's revised SIP calls for control of between 75% and 80% of the sulfur emissions from three smelters. If the sources comply with the SIP limitations, the state predicts attainment by the December, 1982 deadline. The SIP does not address the possibility that the sources may be granted exemptions. Similarly, New Mexico and Nevada outline the emission limitations necessary for attainment but do not address the question of smelter exemptions.

Use of Clean Fuels. The continued use of low-sulfur oil is the SO_2 attainment strategy outlined by most states in the Northeast. Attainment for such major cities as Boston, New York, and Baltimore had been brought about under previous SIPs by the substitution of low-sulfur oil for high-sulfur coal and/or oil in utility and industrial boilers. The attainment strategy in the current revised SIP for Philadelphia includes further substitution of low-sulfur fuel (particularly oil). The 1977 Amendments (Sec. 124) had required

that any revised SIP containing an attainment strategy based on oil or natural gas should contain a statement about the continued availability of such clean fuels. In most cases, however the only such statements provided referred to contracts with suppliers.

Although Texas does not have any nonattainment areas for SO_2, the Texas Air Control Board investigated the air quality impacts of conversions of combustion facilities from gas to oil in the Houston area. The study[34] concluded that the conversion of all industry to 0.8%-sulfur oil would cause violations of the NAAQS for SO_2 in Harris, Fort Bend, and Chambers counties (the Houston area). The study did not address conversion to coal.

Summary of SO_2 Attainment Strategies. The SO_2 attainment strategies of the revised SIPs call for:

- Bringing stationary sources that are currently out of compliance into compliance with existing SIP emission limitations. This strategy is typical of the states in Regions V and VI;
- Continuing use of low-sulfur oil in Regions I, II, and III;
- Stating the emission limitations for smelters needed to bring an area into attainment, but not addressing the impact of an exemption order (Arizona, Utah, Montana, Nevada, and New Mexico);
- Requiring the new source review procedure outlined by the 1977 Amendments and EPA regulations. In most cases, the regulations are simply copied from the requirements into the SIP. Variations in implementing the review procedure are usually not included.

Increasing the stringency of SIP emission limitations for stationary sources is not a typical attainment strategy.

4.3.2 Total Suspended Particulates

In contrast to SO_2, nonattainment areas for TSP are widespread, and the sources of the air pollutants are both site-specific and area-wide. The "traditional" sources of particulates are stack and fugitive process emissions from fuel combustion, solid waste disposal, and industrial processes. These traditional sources are to be controlled to RACT levels in a revised SIP.

In many nonattainment areas, however, controls on traditional sources will not be adequate to attain the standards (particularly the secondary standards) since "nontraditional" sources may be significant contributors to particulate levels. EPA has estimated that nontraditional sources (e.g., resuspended dust, construction and demolition dust, tire particles, and dust from unpaved roads) contribute from 25 to 30 $\mu g/m^3$ to city-wide TSP levels[35] (the allowable annual average, in the primary NAAQS, is 75 $\mu g/m^3$). In the revised SIPs, urban road dust was estimated to be 45% of the TSP burden in Chicago, and 47% in Connecticut. Since nontraditional sources are not amenable to straight-forward emission limitations and controls, EPA has only required that schedules for control of such sources be included in an SIP. Development and adoption of actual control measures can be delayed.

Reclassifying TSP Nonattainment Areas. A number of states approach an attainment strategy for TSP by first attempting to reduce the size of the nonattainment areas. Some SIPs provided evidence that recorded violations of the standards were due to rural fugitive dust, improper monitor siting, temporary sources, or unique malfunctions of controls on sources otherwise in compliance with regulations. EPA's position was to allow discounting of these violations and permit reclassification of the area to an attainment or unclassified status. Typically, states in the Southwest have requested redesignation based on the rural fugitive dust policy. If the violations were not amenable to this approach, states have frequently designated as nonattainment an area as small as reasonable around a monitor that recorded violations.

TSP Control Strategies. The revised SIPs usually apply existing SIP emission limitations (e.g., Table 4.4) to stack emissions from traditional point sources, arguing that these sources are already subject to stringent limitations and additional controls would not be cost effective. (Existing limitations typically rquire a removal efficiency of more than 95%.) In some cases, a SIP strategy includes achieving compliance with existing regulations by sources currently out of compliance or under delayed compliance orders. However, the impact of such noncomplying sources is less than the impact of SO_2 sources on SO_2 nonattainment areas.

Table 4.4 TSP Emission Limitations in Revised SIPs: Illinois and Kentucky

State and Area	Source Regulated	Size of Source (10^6 Btu/hr)	Limitation (lb of particulates per 10^6 Btu)
Illinois			
Chicago	Solid-fuel combustion facilities	-[a]	0.1[b]
Elsewhere	Solid-fuel combustion facilities	>250	0.1
		< 10	1.0
		10-250	0.1-1.0
Kentucky			
AQCR[c] 078, 079, 072, 103 and 077	Combustion facilities	10-10,000	0.56-0.11
		>10,000	0.11
AQCR 102, 101 and 104	Combustion facilities	10-10,000	0.75-0.15
		>10	0.15
AQCR 105	Combustion facilities	10-10,000	0.80-0.18
		>10,000	0.18
	Process emissions	-	-[d]

[a]Any potential source of more than 100 tons of particulates per year.

[b]Existing RACT with additional regulations covering malfunction/maintenance of pollution control equipment.

[c]AQCR = Air Quality Control Region.

[d]Not more than 0.02 grains per ft^3, with 97%-efficient controls.

Controlling particulate emissions from the stacks of existing major sources will not, in most cases, bring about attainment. Although cleaning up smaller sources of particulates has the potential to reduce TSP levels, the states typically do not address these sources, but move on to outline proposed strategies for controlling fugitive industrial emissions. Fugitive industrial emissions are characterized as all emissions from an industrial process that do not exit from a stack or vent. They come from a variety of sources (leaks, poor seals, storage piles, unpaved roadways, and parking lots), they are difficult to measure, and their air quality impact cannot be estimated with current modeling techniques. Although EPA has issued a guidance document on the control of fugitive particulate emissions from industrial processes, the SIPs are generally vague about the limitations or controls to be required other than a general statement about RACT.

For those states where control of traditional TSP sources (both stack and fugitive emissions) will not be adequate for attainment, the SIP must include a schedule for studying measures to control nontraditional sources. Control measures that have been suggested include street sweeping, washing the wheels of trucks leaving construction sites, paving, wetting, or oiling all unpaved roadways and parking lots, and the revegetation of construction sites. Control measures must be implemented before the December 1982 attainment deadline. In Illinois, for example, the SIP (which has not yet been approved) calls for a study to begin in December 1979 on the potential control of dust from unpaved roads, re-entrainment, construction and demolition, and agricultural tilling. By January 1981, appropriate regulations are to be implemented. Whether this schedule is feasible and whether adequate control measures can be developed is questionable.

Secondary TSP Standards. Control of nontraditional sources of TSP is likely to be necessary for many states to attain the secondary particulate standards. The 1977 Amendments provide that EPA can approve an 18-month extension of the deadline for submitting a plan to achieve the secondary standards. In January 1979, EPA stated that such a plan should be submitted by December 1980 (or 18 months after the July 1979 deadline for SIPs to attain the primary standards). Failure to have a revised SIP for the attainment of the secondary standards was to lead to sanctions on growth and funding. Since the entire SIP revision process is late, the date for the imposition of these sanctions is unclear. Nevertheless, SIPs are required to cover attainment of the secondary standards, although there is no statutory deadline for attainment.

Summary of TSP Attainment Strategies. TSP nonattainment areas are more common than SO_2 areas, attainment strategies are more complicated, and attainment will be more difficult to achieve. The few large sources are already well controlled; the remaining sources are smaller and numerous. Attainment strategies focus on the large sources, even if this means efforts to control fugitive emissions. The typical TSP source is sufficiently small that many emitters will fall below new source review size under the latest definition of a major source as one emitting 100 tons per year, after controls. This may hamper attainment unless states review smaller sources. The strategies include:

- Redesignating rural areas as attainment, on the basis of the EPA rural fugitive dust policy;
- Drawing all nonattainment areas as small as EPA will accept;
- Retaining current SIP emission limitations on particulate matter from stacks;
- Requiring RACT on fugitive industrial emissions;
- Developing control strategies for nontraditional sources of fugitive dust in urban areas; and
- Asking for an 18-month extension for submittal of a revised SIP for the secondary standards.

4.3.3 Nitrogen Oxides

The designated nonattainment areas for this pollutant are limited to downtown Chicago, the city of Denver, and the air basins surrounding Los Angeles/San Diego, although (as indicated in the maps showing monitor data) more urban areas do in fact have recorded violations of the NAAQS for NO_x. Since there are only three areas, the attainment strategies will be discussed in more detail.

Illinois NO_x Attainment Strategy. The Illinois SIP indicated that the implementation of the Federal Motor Vehicle Emissions Control Program (FMVECP), in combination with the existing limitations on stationary sources, would be adequate to achieve attainment by December, 1982. The existing NO_x emission limits for new sources that burn more fuel than 250 MM Btu/hr are: for gas, 0.20 lb of NO_x per Btu; for oil, 0.3 lb/MM Btu; and for coal, 0.7 lb/MM Btu. Existing sources larger than 250 MM Btu/hr in the major metropolitan areas of Chicago and St. Louis may not emit more than 0.3 lb of NO_x per MM Btu if they burn gas or oil, and 0.9 lb/MM Btu if they use coal.

The SIP assumed that NO_x violations are restricted to the central business district of Chicago and are closely related to emissions from mobile sources. For 1977, the sources of NO_x emissions were estimated as: 35% from point sources (fuel combustion and industrial processes); 23% from area sources (residential and off-highway mobile); and 42% from on-high-way mobile sources. The state projected that attainment required a 13.4% reduction in mobile source emissions and that the use of the FMVECP and the introduction of other (unspecified) transportation control measures would achieve a 25% reduction in NO_x emissions.

Colorado NO_x Attainment Strategy. The Colorado SIP noted that the Denver region only marginally exceeds the NAAQS (0.054 ppm, compared to 0.05 ppm for the standard). The sources of NO_x emissions were: 37% from motor vehicles; 50% from large stationary sources (including power plants); and 10% from space heating. The SIP stated that the NAAQS will be attained by the December 1982 deadline, as a result of the increased controls on mobile sources needed to attain the CO and O_x standards. No additional, specific NO_x controls were projected to be needed. The state agency planned, however, to study possible controls on stationary sources, since only 2.5% of these NO_x emissions are currently controlled. The SIP projected an NO_x concentration of 0.048 ppm by 1982, through implementation of the FMVECP, and EPA accepted this portion of the SIP.

California NO_x Attainment Strategy. According to the draft SIP, the San Diego area is only marginally in nonattainment (0.06 ppm), with NO_x emissions the result of both mobile and industrial sources. Requiring NO_x controls (either fluidized-bed units or ammonia injection) had been considered for utility and industrial boilers. However, the San Diego Air Pollution Control District decided that these techniques were still too experimental, and instead of requiring technology-forcing controls, the district deferred development of a detailed attainment strategy. The SIP promised a further analysis to determine the most effective mix of controls, and a detailed plan to be submitted to EPA by the end of 1979.

According to San Diego district officials, the area is now petitioning the California Air Resources Board to be designated as attainment, on the basis of a study of the calibration techniques used in monitoring NO_x. (Laboratory tests indicated that the technique was incorrect and that an estimated 15% level of error resulted.) San Diego, however, will continue to be in violation of the California state NO_x standard (one-hour averages not to exceed 0.25ppm).* The district plans to increase mobile source control and to examine the local impact of several large fuel-burning sources (including three gas and oil-fired power plants).

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*This suggests that when a short-term NO_x standard is promulgated, areas that are currently in attainment for an overall standard may become nonattainment.

Summary of NO_x Attainment Strategies. NO_x nonattainment areas are currently limited to only three urban centers. Most of the rest of the country has been designated as attainment/unclassified. A short-term standard and additional monitoring data may reveal more nonattainment areas. In general, the three nonattainment areas plan to achieve attainment by:

- Relying on the increased controls on motor vehicles, required by the FMVECP to attain the O_x and CO standards; and
- Studying possible controls for stationary sources.

4.3.4 Emission Growth Allowances

According to the 1977 Amendments, states could choose between two approaches for permitting new sources to locate in a nonattainment area: (1) provide an emissions growth allowance by requiring the clean-up of existing sources to achieve more than just attainment; or (2) adopting the EPA emission offset policy. Under the first option, the state essentially provides offsets for the new sources, while, under the second option, the source owner must obtain the offsets. Our review of SIPs indicates that approximately half of the states will use EPA's emission offset policy, one-quarter will use an emission growth allowance (with source-by-source offsets as a back-up, in case the growth allowance proves to be inadequate), and the remaining quarter have not decided. The latter category contains states with few nonattainment areas. Those states with growth allowances have usually not quantified them, nor provided any solution to the allocation problem other than first-come, first-served. A state-by-state summary of growth allowance policies is included in Appendix B; general trends in the Federal Regions may be categorized as follows:

- Region I: offsets and limited growth allowance, with states predicting little or no major source growth in the near future.
- Region II: growth allowance.
- Region III: offset policy.
- Region IV: generally, an offset policy, except for North Carolina's growth allowance with offsets as a back-up.
- Region V: offsets. Illinois provides a growth allowance only for sources that cannot find offsets.
- Region VI: growth allowance and offsets.

- Region VII: growth allowance and offsets.
- Region VIII: neither, but states have few nonattainment areas.
- Region IX: California provides both a growth allowance and offsets.
- Region X: offsets.

4.3.5 Conclusions

Based on the review of revised SIPs, the following conclusions can be drawn about attainment strategies:

- SO_2 attainment can be fairly easily achieved by bringing existing out-of-compliance sources into compliance with emission limitations specified in existing (pre-revision) SIPs.
- Efforts to convert existing SO_2 sources in the Northeast from cleaner fuels to coal will be hampered (if not prevented) by the SO_2 attainment strategies.
- TSP nonattainment will be more difficult to correct. Control of fugitive emissions will become increasingly important.
- In many urban, industrialized areas, control of nontraditional sources of fugitive emissions will be necessary.
- NO_x attainment strategies rely on the increased controls on motor vehicles required to attain the O_x and CO standards, rather than requiring controls on stationary sources.

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5 EMISSION LIMITATIONS IN NONATTAINMENT AREAS

The previous section examined general requirements in revised SIPs for new and existing sources in nonattainment areas. Clearly, the heart of any attainment strategy is the level of emission reduction required for new sources (LAER) and existing sources (RACT). An examination of emission limitations required for fuel-burning sources in nonattainment areas will be useful in evaluating the impact of nonattainment on existing energy-related sources and the constraints that new energy facilities would face if they wished to locate in a nonattainment area. Consequently, this chapter focuses on SO_2, TSP, and NO_x limitations that have been placed on both new and existing sources. These pollutants have been selected because they are most likely to affect energy production and coal utilization. As indicated in Table 5.1, stationary fuel-burning point sources contribute approximately 80% of national SO_2 emissions, over 50% of NO_x emissions, 35% of TSP emissions, and less than 10% of the remaining criteria pollutants.

5.1 EMISSION LIMITATION REQUIREMENTS

All existing or new sources of emissions must comply with one or more of the following sets of regulations:

- State Implementation Plan (SIP) Regulations
- New Source Performance Standards (NSPS)
- Prevention of Significant Deterioration (PSD) Regulations
- Nonattainment Regulations

Each of these sets of regulatory policies requires a different procedural approach for obtaining a construction permit, and each policy has associated with it an implicit level of control requirement. The levels or degrees of control required by these procedures are referred to as "reasonably available control technology" (RACT), "new source performance standards" (NSPS), "best available control technology" (BACT), and "lowest achievable emission rate" (LAER), respectively.

5.1.1 Reasonably Available Control Technology

As described in Sec. 3, reasonably available control technology (RACT) is to be required for all existing sources in nonattainment areas,

Table 5.1. Estimates of National Emissions, 1976

Emission Source	TSP		SO_2		NO_x		HC		CO	
	10^6 tons	% of total	10^6 tons	% of total	10^6 tons	% of total	10^6 tons	% of total	10^6 tons	% of total
Transportation	1.2	9	0.8	3	10.1	43.9	10.8	38.7	69.7	80
Stationary Fuel Combustion, total	4.6	34.3	21.9	81.4	11.8	51.4	1.4	5.0	1.2	1.4
Electric Utilities	3.2	23.8	17.6	65.4	6.6	28.7	0.1	0.4	0.3	0.34
Industrial	1.1	8.2	2.6	9.7	4.5	19.6	1.2	4.3	0.5	0.57
Residential, Commercial, & Institutional	0.3	2.2	1.7	6.3	0.7	3.1	0.1	0.3	0.4	0.46
Industrial Processes	6.3	47	4.1	15.2	0.7	3	9.4	33.7	7.8	8.9
Solid Waste	0.4	3	0	0	0.1	0.4	0.8	2.9	2.8	3.2
Miscellaneous	0.9	6.7	0.1	0.4	0.3	1.3	5.5	19.7	5.7	6.5
Total	13.4	100	26.9	100	23.0	100	27.9	100	87.2	100

Source: U.S. EPA, *National Air Quality and Emissions Trends Report, 1976*, EPA-450/1-77-002. p. 5-8 (December 1977).

as part of a SIP to achieve and maintain the standards. Emission limitations and compliance schedules are to be included in the SIP, on a source-by-source basis. SIP requirements vary from state to state and even between localities within a state, depending on the severity of nonattainment, on the emission reductions needed to achieve attainment, and on the development plans of the state. EPA did not establish RACT guidelines for SO_2, TSP or NO_x, but instead focused on the ability of a SIP to achieve attainment of these standards by the December 1982 deadline. In order to be granted an extension of the deadline for achieving the carbon monoxide and/or oxidant standard, however, a SIP must require the RACT levels outlined in EPA's control technique guidances for sources of volatile organic compounds.

Examples of emission limitations in individual revised SIPs were provided in Sec. 4. To reiterate, Illinois' revised SIP set an emission limitation for solid-fuel emission sources larger than 100 MM Btu/hr of 1.8 lb of SO_2 per MM Btu in areas that were either nonattainment for SO_2 or that had ambient SO_2 concentrations of more than half the NAAQS. This limitation is the same as in the pre-revision SIP. In order to achieve attainment, the SIP added regulations intended to control the maintenance and malfunction of pollution control equipment. In Kentucky, the revised SIP retained the existing emission limitation for large (>250 MM Btu/hr) solid-fuel emission sources -- 1.2 lb of SO_2 per MM Btu. (See Table 4.3) Both these states required a particulate matter emission limitation of 0.1 lb of TSP per MM Btu for solid-fuel emission sources larger than 250 MM Btu/hr (See Table 4.4).

These generic emission limitations for TSP and SO_2 are the same as those required under the pre-1979 NSPS.

More interesting than these generic emission limitations, however, are examples of actual SIP limits for specific sources. (See Table 5.2) These emission limitations are contained in the revised SIP for Marion and Vigo counties, submitted by the state of Indiana in March 1979. Marion and Vigo counties both contain nonattainment areas for SO_2. In Marion County, 28 SO_2 sources and 5 control scenarios were analyzed. Various stack and fuel parameters were fed through an EPA-approved air quality model, and the combination of controls was chosen that would result in a prediction of attainment by 1983. The "least cost" scenario called for an emissions limitation on a 3500-MW power plant of 5.3 lb of SO_2 per MM Btu for coal and 0.35 lb of SO_2 MM Btu for oil, to be achieved by raising the source's stacks as high as is consistent with good engineering practice, and not by additional control devices. Under this scenario, the power company could "maintain a contract for approximately one million tons of Indiana coal annually and the local coal economy will not be disrupted as in the other four strategies."[36] The attainment strategy for Marion County required controls of varying degrees of stringency on other SO_2 sources in the nonattainment area, such as use of low-sulfur coal and low-sulfur oil in several industrial boilers.

Indiana's SIP requirements may not be representative of those of other states; in fact, no individual state's SIP can be chosen as typical.

Table 5.2. SO_2 Emission Limitations for Selected Utility Sources in Indiana

County	Utility	Name of Source	Size of Source (MW)	Number of Boilers	Sulfur Content of Fuel (%)[a]		1974[a] Control Level	SIP Limit (lb SO_2/MMBtu)
					Coal	Oil		
Marion[b]	Indiana Power and Light Co.	Stout	3584	13	2.5	0.3	no FGD 99% ESP	5.3 (Coal)[c] 0.35 (Oil)
Vigo	Public Service Co. of Indiana	Dresser	150	6	4.0	0.3	no FGD no ESP 7.53 lb SO_2/MM Btu	2.85
Vigo	Public Service Co. of Indiana	Wabash River	962	6	2.5	0.3	no FGD 98% ESP 3.52 lb SO_2/MM Btu	0.49

[a]FPC, *Steam-Electric Plant Air and Water Quality Control Data*, Sept. 1978 (1974 data).

[b]Prepared for Indianapolis by five companies, including IPALCO.

[c]To be achieved by raising stacks to a height consistent with good engineering practice, with no additional controls on boilers.

Indiana's approach to determining these limitations, however, is typical. Each state examined a combination of sources and controls, reviewed the severity of nonattainment and meteorological conditions, weighed local political and economic interests, and determined the emission limitations that could be predicted to achieve attainment.

5.1.2 New Source Performance Standards

The 1970 Clean Air Act Amendments required EPA to issue regulations establishing national standards of performance for new stationary sources. The standards were to reflect "...the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction) the Administrator determines has been adequately demonstrated"(Sec. 111). EPA has subsequently specified that certain sources (Table 5.3) must meet NSPS; these sources are to be reviewed prior to the issuance of a construction permit. In 1971, EPA promulgated[37] NSPS to regulate the levels of sulfur dioxide, particulate matter, and nitrogen oxides emitted from new fossil fuel-fired steam generators larger than 250 MM Btu/hr of heat input. The emission limitations (in pounds of pollutant per MM Btu of heat input) were:

	Coal	Oil	Gas
Sulfur dioxide	1.2	0.8	-
Particulate matter	0.1	0.1	0.1
Nitrogen oxides	0.7	0.3	0.2

In the 1977 Amendments, a standard of performance was redefined as:

> [A] standard - (i) establishing allowable emission limitations for such category of sources, and (ii) requiring the achievement of a percentage reduction in the emissions from such category of sources...through the application of the best technological system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated. [Sec. 169 (a)(3), emphasis added]

On June 11, 1979, EPA promulgated the revised standards[38] for electric utility steam-generating units larger than 250 MM Btu/hr of heat input, shown in Table 5.4. Compliance with the standards is to be determined on the basis of a 30-day rolling average of continuous monitor readings.

Table 5.3. Sources Subject to New Source Performance Standards

Source Category	Size Subject to NSPS
Fossil Fuel-Fired Steam Generators	> 73 MW >250 MM Btu/hr
Electric Utility Steam Generating Units	> 73 MW >250 MM Btu/hr
Incinerators	> 50 tons/day
Portland Cement Plants	All
Nitric Acid Plants	All
Sulfuric Acid Plants	All
Asphalt Concrete Plants	All
Petroleum Refineries	All
Storage Vessels for Petroleum Liquids	>40,000 gal
Secondary Lead Smelters	All
Secondary Brass and Bronze Plants	All
Iron and Steel Plants	All
Sewage Sludge Incinerators	All
Primary Copper Smelters	All
Primary Zinc Smelters	All
Primary Lead Smelters	All
Primary Aluminum Reduction Plants	All
Phosphate Fertilizer Plants	All
Coal Preparation Plants	All
Ferroalloy Production Facilities	All
Iron and Steel Plants	All
Kraft Pulp Mills	All
Grain Elevators	All
Lime Manufacturing Plants	All

Table 5.4. June 1979 Revised NSPS for Utility Boilers Larger than 250 MM Btu/hr Heat Input

Pollutant	Emission Limit (lb/MM Btu) and Percentage Reduction Required		
	Coal	Oil	Gas
Sulfur dioxide	1.2 (90%)[a]	0.8 (90%)[b]	0.8 (90%)[b]
Particulate matter	0.03 (99%)	0.03 (70%)	0.03
Nitrogen oxides	0.6[c] (65%)	0.3[d] (30%)	0.2[e] (25%)

[a]If less than 0.6 lb per MM Btu is emitted, only a 70% reduction is required.

[b]No percentage reduction required if less than 0.2 lb of pollutant per 10^6 Btu is emitted.

[c]For sub-bituminous coal and coal-derived fuels, the limit is 0.5 lb/MM Btu; for certain lignite-containing fuels, the limit is 0.8 lb/MM Btu.

[d]For shale oil and coal-derived liquid fuels, the limit is 0.5 lb/MM Btu.

[e]For coal-derived gases, the limit is 0.5 lb/MM Btu.

The NSPS for industrial steam generators larger than 250 MM Btu/hr remain at the 1971 level. NSPS have been incorporated as part of the general SIP in the majority of states, although states can set more stringent standards if they so choose. NSPS are considered to be the baseline for determinations of BACT and LAER.

5.1.3 Best Available Control Technology

In areas where the ambient air is cleaner than required by the standards for SO_2 and TSP, PSD regulations require new major sources in the 28 categories shown in Table 5.5 to use best available control technology (BACT). The 1977 Clean Air Act Amendments defined BACT as:

> ...an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, economic impacts and other costs, determines is achievable for such facility...(Sec. 111).

BACT determinations are to be made on a case-by-case basis by the state, or by the local air-pollution control agency, and cannot be less stringent than NSPS (if such a standard has been promulgated for the source category). The 1977 Amendments defined a major source as one with the potential to emit more than 100 tons of pollutant per year. Recent court action, however, has changed this definition to 100 tons per year of emissions after control, as discussed in Sec. 2.4.

EPA prepared a guidance on BACT in 1978, outlining guidelines to be followed in the determinations. The guidelines make an interesting point about consistency between case-by-case determinations:

> ...consistency does not necessarily mean that a new facility in one area will have an identical emission limit as the same type of facility in another area. Consistency means that a consistent approach is used in determining BACT and that the

Table 5.5. Source Categories for PSD Review

Fossil fuel-fired steam electric plants of more than 250 MM Btu/hr of heat input	Primary lead smelters
Coal cleaning plants with thermal dryers	Fuel conversion plants
Kraft pulp mills	Hydrofluoric acid plants
Portland cement plants	Sulfuric acid plants
Primary zinc smelters	Nitric acid plants
Iron and steel mills	Sintering plants
Primary aluminum ore reduction plants	Secondary metal production facilities
Primary copper smelters	Chemical process plants
Municipal incinerators capable of charging more than 250 tons of refuse per day	Fossil-fuel boilers (or groups thereof) totaling more than 250 MM Btu/hr of heat input
Phosphate rock processing plants	Petroleum storage and transfer facilities with a total storage capacity exceeding 300,000 barrels
Petroleum refineries	Taconite ore processing facilities
Lime plants	Glass fiber processing plants
Coke oven batteries	Charcoal production plants
Sulfur recovery plants	Any source with potential emissions of more than 250 tons per year
Carbon black plants (furnace process)	

> impacts of alternative emission control systems are measured by the same set of parameters, although evaluation of specific parameters is done on a case-by-case basis.[39]

NSPS are viewed as federal guidelines for BACT determinations, setting minimum acceptable emission limitations, but not necessarily reflecting new or improved control technology, as BACT should.

A BACT determination must take into consideration energy, environmental, and economic factors. The relative weights are to be assigned to the impacts by the states, depending on local preferences and economic conditions. EPA commented that it "does not consider it appropriate to design nationally applicable weighting factors." EPA did note, however, that it would provide assistance to the states and Regional offices through a new source review clearinghouse, to be managed by EPA's Office of Air Quality Planning and Standards. The clearinghouse was designed to provide "a communication link for advising reviewing authorities of each other's determinations." (The clearinghouse and its determinations are examined more fully in Sec. 5.2).

5.1.4 Lowest Achievable Emission Rate

As described in Sec. 3, new major sources of emissions in nonattainment areas are to meet the lowest achievable emission rate (LAER), as determined by the state agency, on a case-by-case basis. LAER is expected to be a technology-forcing standard, and (by definition) to be more stringent than BACT. Congress had stated that "in light of the adverse air quality and health consequences of this new pollution ...[from new sources in nonattainment areas]..., the committee concluded that all feasible efforts to reduce and control this new pollution should be mandated".[40]

LAER is to be a rate that is either the lowest achieved in practice anywhere in the country for the category of source, or the lowest rate required for the type of source in any SIP, whichever rate is more stringent. What is meant by "achieved in practice," however, is not clear. EPA has stated that, in view of the adverse health effects, the Agency would consider the transfer of technology from one source type to another (where the technology is applicable) in determining a rate to be achieved in practice. In addition, Congress stated quite explicitly that a rate achieved

in practice by use of a scarce fuel, such as low-sulfur oil, would not be appropriate as a LAER. Uncertainties about the continued supply of such a fuel would mean that an emission rate based on use of such fuel might not be achievable in practice:

> The committee does not intend all new major sources in nonattainment areas to meet emission limits for SO_2 based on use of 0.3 percent sulfur fuel, merely because such limits are included in New York City's plan. Since sufficient amounts of low-sulfur oil cannot be made available in all nonattainment areas to meet such limitations, this emission limit would not and could not be considered achievable. The committee thus intends that these requirements would not be merely speculatively achievable. Rather, there must be a reasonable basis for projecting that these requirements can be met in practice, if they have not already been complied with in actuality.[40]

The appropriate consideration to be given to costs in determining LAER is also somewhat uncertain. The LAER definition (in contrast to that of NSPS and BACT) does not specifically include cost as a factor, but practical considerations suggest that cost cannot be totally ignored. Moreover, Congress stated that:

> ... the traditional cost constraints on technology for the purpose of section 111 of the act ..[i.e., NSPS]... should not govern in this situation. This does not mean that the committee does not consider cost a relevant factor. It simply means that in light of the foregoing critical factors cost is of somewhat lesser weight in this context. Of course, if the cost of any given technology or means of compliance is so great that new major stationary sources could not build and operate, then emission reductions which necessitate use of that technology should not and would not be considered achievable, and could not be required by the Administrator.[40]

Congress required EPA to publish guidances to the states to assist them in LAER determinations. In response, EPA prepared a guidance document in August 1978, covering 19 major categories of stationary sources of TSP, SO_2, NO_x, and VOC, "to provide guidance in the form of reference material that is useful to engineers in industry and in state/local agencies, to those who prepare and those who review permit applications, and to those regulated by the LAER requirement, and those who implement it."[23] The guidelines were based on a review of SIPs, a limited retrieval of data from EPA's National Emissions Data System to examine rates that were "achieved in practice", and a review of NSPS. The most stringent of the rates reviewed for the 19 source

Table 5.6. Major Stationary Sources Covered by LAER Guidelines

Stationary gas turbines	Petroleum refinery fugitive emission
Kraft pulp mills	Graphic arts (printing)
Steel and gray iron foundries	Automobile and light trucks
Petroleum refineries	Metal furniture and large appliances
Gasification plants	Can coating
Industrial boilers	Metal coil coating
Primary aluminum plants	Paper coating
Bulk gasoline terminals	Fabric coating
Gasoline and crude oil storage	Flatwood products
Miscellaneous petroleum refinery sources	

categories (shown in Table 5.6) was then selected, and the technology for achieving that emission limit was described in the guidelines.

The guidelines, however, are largely a summary of existing control technique documents. For example, the bibliographic notes for the industrial boiler section include AP-42 (February 1976)[41]; a 1977 study of TSP control for coal-fired utility boilers;[42] the 1971 criteria documents for NO_x;[43] and reports from an April 1977 emission test at the Caterpillar Tractor Co.[44] The conclusion on LAER for this category is a collection of general levels that appear to have been achieved by industrial boilers, without reference to such items as the size of boilers, variations in fuel characteristics, etc.:

> Based on particulate control efficiencies of high-efficiency fabric filter and ESP systems, an emission limit of 13 ng/J (0.03 lb/10^6 Btu) can be achieved. This level of particulate emission will also require controls on some residual-oil-fired boilers depending on fuel sulfur content and firing efficiency. Control efficiencies in the range of 40 to 70 percent will be required.
>
> A sulfur dioxide emission reduction of 90 percent can be achieved. The economic feasibility of using FGD on smaller boilers, especially those that already burn low-sulfur fuel, is questionable.
>
> Nitrogen oxide emissions from packaged oil-fired boilers can be limited to 130 ng/J (0.3 lb/10^6 Btu). With pulverized-coal-fired boilers, a limit of 260 ng/J

> (0.6 lb/10^6 Btu) is achievable; this value is based on studies performed for NSPS revisions. A limit of 2.7 ng/J (0.5 lb/10^6 Btu) can be achieved by subbituminous coal-fired boilers. The economic feasibility of complying with these limits must be determined individually for existing boilers. (Ref. 23, pp. 3.6-21,22).

It is not clear that this document is what Congress had in mind when it directed EPA:

> ... to publish guidance to the States in carrying out the provisions relating to "lowest achievable emission rate." This is of critical importance so that each State will know what has been achieved beyond its own boundaries. The guidance documents should also advise of new technological breakthroughs, progress under technology innovation variances under section 112 of the bill, and technological practices in other countries.[45]

The net result of these activities is an extraordinary degree of uncertainty about LAER on the part of officials in air-pollution control agencies and the owners of proposed new sources in nonattainment areas. What is "achieved in practice"? How transferable is a technology between types of sources? How much regional consistency is possible (or even desirable)? How much consideration should be given to cost? EPA attempted to provide more practical guidance for LAER (and BACT) determinations by setting up a clearinghouse of actual permit conditions. The next section examines the contents of this clearinghouse.

5.2 EMISSION LIMITATION DETERMINATIONS

5.2.1 BACT/LAER Clearinghouse

In an effort to assist state and local permitting agencies, EPA has established a new source review clearinghouse for completed BACT/LAER determinations.[46] The clearinghouse is viewed by EPA as an important tool in achieving national consistency in control technology decisions. The Agency notes (p.1) that the purpose of the document is "to provide support to those making BACT/LAER determinations, ...and to establish a formal system that promotes communication, cooperation and sharing of information." The clearinghouse is not viewed by EPA as a source of detailed information on any particular determination. Information is provided on the size of source, with limited data on the emission requirements and the control stra-

tegies to be used. The material is designed to enable a permit officer to "ascertain if a determination on a source of a similar size and nature has been made, the substance of that determination and ...[locate]... a quick reference that can lead to the acquisition of more detailed information."[46,p.2] EPA did not intend the document to be a comprehensive, detailed reporting of individual determinations, since this might "tend to prescribe and bias the individualized consideration to be afforded an entity that seeks approval to install a new--or modify an existing--source."[46,p.2] These stated purposes of the clearinghouse -- to provide information about determinations to achieve national consistency and yet not to provide so much information as to prejudice a case-by-case determination -- seem somewhat contradictory.

The initial (and thus far only) compilation contains determinations made between February 1978 and January 1979, collected from the EPA regional offices. The determinations are predominantly BACT, with less than 10 LAER determinations presented. This is not surprising since most PSD (BACT) reviews are still handled at the regional office level, while LAER determinations are made by the state and local agencies and are not routinely submitted to a regional office. (We understand that EPA is planning another information gathering effort, at the state level, for LAER determinations.) EPA apparently planned to make the clearinghouse an established part of the new source review and permit process. Regional and states office were urged to contribute reports of determinations routinely. It appears, however, that this routine reporting has not happened.

State and local air-pollution control personnel have questioned the usefulness of the existing clearinghouse, since the determinations are few and, in most cases, at least a year old. Even when a LAER determination has been found for a specific process, there is no certainty that other more stringent determinations have not been made. A flow of information from states through regional offices to headquarters where BACT/LAER determinations are assembled and redistributed back to the regions and states is necessary for an adequate clearinghouse system. If such a system is in place, it does not appear to be operational.

5.2.2 NSPS/BACT/LAER Limits

The clearinghouse document contains one-page descriptions of determinations for sources in 10 major source categories: external combustion, solid waste disposal, internal combustion, evaporative loss, chemical process industries, food and agricultural industries, metallurgical industries, mineral products industries, petroleum industry, and wood processing. In approximately 250 pages, there are fewer than 20 determinations for external-combustion emission sources.

Tables 5.7-5.9 present the emission limits for 14 energy-related sources, combining NSPS with BACT and LAER determinations. Limitations for TSP (Table 5.7) are indicative of the age of available clearinghouse data -- BACT determinations are less stringent than the new NSPS of 0.03 lb of particulate matter per MM Btu. Limitations for SO_2 (Table 5.8) show the variations in the definition of LAER for apparently similar facilities -- a November 1978 LAER for a 50-MM Btu/hr oil-fired steam generator in California of 0.14 lb of SO_2 per MM Btu, using a scrubber with 90% removal efficiency, compared to an August 1979 LAER for another California facility of similar size, of 0.061 lb of SO_2 per MM Btu, using a scrubber with 95% removal efficiency. Without additional information on details of the facilities, the comparison of LAER seems to indicate an absence of consistency between determinations. The tables also show that a fluidized-bed unit in Illinois received the lowest BACT determinations for TSP and NO_x of all the coal-fired industrial boilers less than 250 MM Btu/hr contained in the clearinghouse. Table 5.9 has fewer entries, since there were fewer BACT/LAER determinations recorded for NO_x.

An additional determination in California (for Pacific Gas and Electric Co.) was not included in the clearinghouse because the determination is too recent. The utility is currently negotiating a permit to construct a new coal-fired facility of 1600 MW and has tentatively agreed to an emissions limitation of 0.006 lb/MM Btu for particulates with a 99.8% efficient baghouse; 0.12 lb/MM Btu for SO_2 with a 95% efficient scrubber; and an as yet undetermined NO_x limit.[47]

The tables indicate that there is little or no consistency in the emission limitations made as BACT/LAER determinations. The determinations are to be made on a case-by-case basis; however, information in the clearing-

Table 5.7. Particulate (TSP) Emission Limitations for Energy-Related Facilities

Facility	Date of Determination	Facility Size (MM Btu/hr)	NSPS Emission Limitation (lb/MM Btu)	BACT Emission Limitation (lb/MM Btu)	BACT Control Efficiency (%)	BACT Control Method	LAER Emission Limitation (lb/MM Btu)	LAER Control Efficiency (%)	LAER Control Method
Coal-Fired Utility Boilers	-	>250	0.03	-	-	-	-	-	-
Arizona Public Service Co. Phoenix, Arizona	2/78	1200		0.034	NA	ESP	-	-	-
Lakeland Utilities Lakeland, Florida	NA[a]	3240		0.044	99.5	ESP	-	-	-
Tucson Gas & Electric Co. Tucson, Arizona	12/77	1200		0.034	NA	ESP	-	-	-
Coal-Fired Industrial Boilers	-	≤250	-	-	-		-	-	-
GM Delco Dayton, Ohio	NA	150	-	0.06	99.5	Cyclone plus Fabric Filter	-	-	-
GM Truck & Coach Plant Pontiac, Michigan	NA	125	-	-	-	-	0.06	99.8	Cyclone plus Fabric Filter
GM Hydra-Matic Division Three Rivers, Michigan	NA	72.8	-	0.06	99+	Cyclone and Filter	-	-	-
Fisher Body Division of GMC Pontiac, Michigan	NA	245	-	-	-	-	0.03	99+	Cyclone and Filter
Combustion Engineering Great Lakes Naval Base, Illinois (FBC Unit)	NA	70	-	0.03 gr/ft^3[b]	99+	Filter	-	-	-
Coal-Fired Steam Generators	-	>250	0.1	-	-	-	-	-	-
HCC Chemical Co. Cleveland, Ohio	1/79	330		5.5 lb/hr	99.7	Baghouse	-	-	-
Oil-Fired Industrial Boilers		≤250	-	-	-	-	-	-	-
Hawaiian Electric Co. Honolulu, Hawaii	10/78	47	-	0.054	NA	NA	-	-	-
Oil-Fired Steam Generators	-	>250	0.1	-	-	-	-	-	-
Wood-Waste Boiler Mead Corporation Stevenson, Alabama	8/78	263	-	-	-	-	0.375 gr/ft^3[b]	98.5	Cyclone plus Wet Scrubber
Industrial Boiler Bark and #6 Oil Federal Paperboard Co. Riegelwood, NC	10/77	498	-	0.1	99+	Cyclone plus Scrubber	-	-	-

[a]Not Available.

[b]gr/ft^3 = grains per cubic foot.

SOURCE: Ref. 46

Table 5.8. SO_2 Emission Limitations for Energy-Related Facilities

Facility	Date of Determination	Facility Size (MM Btu/hr)	NSPS Emission Limitation (lb/MM Btu)	BACT Emission Limitation (lb/MM Btu)	BACT Control Efficiency (%)	BACT Control Method	LAER Emission Limitation (lb/MM Btu)	LAER Control Efficiency (%)	LAER Control Method
Coal-Fired Utility Boilers	-	>250	1.2	-	-	-	-	-	-
Arizona Public Service Co. Phoenix, Arizona	2/78	1200		0.072	94	Wet Limestone plus Low Sulfur Coal	-	-	-
Lakeland Utilities Lakeland, Florida	NA[a]	3240		1.2	80	Scrubber	-	-	-
Tucson Gas & Electric Co. Tucson, Arizona	12/77	1200		0.69	64	Wet Lime Scrubber	-	-	-
Coal-Fired Industrial Boilers	-	≤250	-	-	-	-	-	-	-
GM Delco Dayton, Ohio	NA	150	-	-	-	-	1.2	NA	Low Sulfur Coal (0.69%)
GM Truck & Coach Plant Pontiac, Michigan	NA	125	-	1.6	NA	Low Sulfur Coal (1.0%)	-	-	-
GM Hydra-Matic Division Three Rivers, Michigan	NA	72.8	-	1.6	NA	Low Sulfur Coal (1.0%)	-	-	-
Fisher Body Division of GMC Pontiac, Michigan	NA	245	-	1.6	NA	Low Sulfur Coal (1.0%)	-	-	-
Combustion Engineering Great Lakes Naval Base, Illinois (FBC Unit)	NA	70	-	0.7	90	Fluidized Bed (Calcium/Sulfur 4.0:1)	-	-	-
Coal-Fired Steam Generators	-	>250	1.2	-	-	-	-	-	-
HCC Chemical Co. Cleveland, Ohio	1/79	330	-	110.4 lb/hr	96	Alkali Scrubber	-	-	-
Oil-Fired Utility Boilers	-	>250	0.8	-	-	-	-	-	-
Oil-Fired Industrial Boilers	-	≤250	-	-	-	-	-	-	-
Getty Oil Co. Bakersfield, California	11/78	50	-	-	-	-	0.14	90	Scrubber
Double Barrel Oil Co. Bakersfield, California	8/79	50	-	-	-	-	0.061	95	Scrubber
Oil-Fired Steam Generators	-	>250	0.8	-	-	-	-	-	-
Industrial Boiler Bark and #6 Oil Federal Paperboard Co. Riegelwood, NC	10/77	498	-	0.8	NA	1.5% Sulfur Coal plus Scrubber	-	-	-

[a]Not Available.

SOURCE: Ref. 46

Table 5.9. NO_x Emission Limitations for Energy-Related Facilities

Facility	Date of Determination	Facility Size (MM Btu/hr)	NSPS	BACT			LAER		
			Emission Limitation (lb/MM Btu)	Emission Limitation (lb/MM Btu)	Control Efficiency (%)	Control Method	Emission Limitation (lb/MM Btu)	Control Efficiency (%)	Control Method
Coal-Fired Utility Boilers		>250	0.6	-	-	-	-	-	-
Arizona Public Service Co. Phoenix, Arizona	2/78	1200		0.7	-	NA[a]	-	-	-
Lakeland Utilities Lakeland, Florida	-	3240		0.7	-	NA	-	-	-
Tucson Gas & Electric Co. Tucson, Arizona	12/77	1200		0.697	-	NA	-	-	-
Coal-Fired Industrial Boilers		≤250	-	-	-	-			
Combustion Engineering Great Lakes Naval Base, Illinois (FBC Unit)	-	70	-	0.5	-	FBC (Low Temp)	-	-	-
Coal-Fired Steam Generators	-	>250	0.7	-	-	-	-	-	-
HCC Chemical Co. Cleveland, Ohio	1/79	330	-	236.8 lb/hr		Two-Stage Combustion	-	-	-
Oil-Fired Steam Generators	-	≤250	-	-	-	-	-	-	-
Hawaiian Electric Co. Honolulu, Hawaii	10/78	47	-	1.5	-	NA	-	-	-
Getty Oil Co. Bakersfield, California	11/78	50	-	-	-	-	0.18	-	Ammonia Injection
Wood Waste Boiler									
Mead Corporation Stevenson, Alabama	8/78	263	-	-	-	-	0.7	-	Burner Design

[a]Not Available.

SOURCE: Ref. 46

house is too limited to judge whether or not there is any underlying consistency. There are inadequate data to judge whether LAER is more stringent than BACT. The tables indicate that the new utility NSPS is, in fact, close to the levels of past BACT and LAER determinations.

5.2.3 Implications of BACT/LAER for Coal Types

Each of the emission limitations for coal-fired, energy-related sources (Tables 5.7-5.9) is based on specific characteristics of a coal (heat, sulfur, and ash content). This information is not usually available in the clearinghouse document, however. For example, the limit of 0.072 lb of SO_2 per MM Btu required for a powerplant in Arizona was based on low-sulfur coal and a scrubber with 94% removal efficiency. Although Congress had indicated that a LAER based on a scarce, low-polluting fuel should not necessarily be applied across the country, this LAER for SO_2, if broadly applied, could have an impact on the demand for particular types of coal.

Table 5.10 presents average heat, sulfur, and ash contents of commercially available U.S. coals. Calculated from the emission characteristics of a pulverized-coal cyclone furnace, the efficiency requirements necessary to attain BACT/LAER (as presented in the clearinghouse) are also shown in Table 5.10. BACT emission levels for particulates of 0.034 or 0.05 lb/MM Btu require particulate control equipment with efficiencies ranging from 90.2% to 97.9%. Since hot-side electrostatic precipitator efficiencies are typically above 99%[48], the choice of coal type is not important in meeting BACT or LAER for TSP. Sulfur dioxide emissions associated with BACT range from 0.69 to 0.072 lb/MM Btu. Scrubber efficiencies of 14.3% to 90.1% will be needed to meet the 0.69 lb/MM Btu limit, and from 70.0 to 98.9% to meet the 0.072 lb/MM Btu limit. Information from pilot plant FGD systems in the United States indicates that control systems with efficiencies above 95% are not typical.[48] The installation achieving the 0.072-lb limit in the BACT/LAER clearinghouse was intended to use an SO_2 control system capable of 94% efficiency. If an emission rate of 0.072 lb/MM Btu is to be achieved with a 94% efficient SO_2 cleaning system, low-sulfur Appalachian or Western coal must be used. The use of more readily available, higher sulfur Central or Northern Appalachian coal would be precluded.

Table 5.10. Heat, Sulfur, and Ash Content of U.S. Coals and Emission-Control Efficiencies Associated with LAER Requirements[a]

Coal Source (Region)	Heat Content (Btu/lb)	Sulfur Content (% by wt)	Ash Content (% by wt)	% Efficiency Required to Meet Particulate Emission Limits P		% Efficiency Required to Meet SO_2 Emission Limits S	
				P = 0.034 lb/MM Btu	P = 0.05 lb/MM Btu	S = 0.072 lb/MM Btu	S = 0.69 lb/MM Btu
Northwest Appalachia	12,902	2.5	10.5	95.8	93.9	97.7	89.4
Central Appalachia							
Low Sulfur	13,920	0.7	7.1	93.3	90.2	91.1	14.3
High Sulfur	13,350	1.0	8.1	94.4	91.8	94.0	42.5
Southern Appalachia	13,342	0.7	8.7	94.8	92.3	70.0	17.8
Mid and Central West	11,734	3.6	11.4	96.5	94.9	98.5	85.9
Gulf	11,460	5.0	9.9	96.1	93.8	98.9	90.1
Northern Great Plains	9,767	0.6	11.4	97.1	95.7	92.7	29.8
Rockies and Southwest	11,282	0.6	8.3	95.4	93.2	91.5	18.9
Northwest	9,224	2.0	15.4	97.9	97.0	97.9	80.1

[a]These efficiency requirements assume use of a pulverized-coal cyclone furnace with heat input greater than 100 MM Btu/hr and emission characteristics presented in EPA's AP-42 Compilation of Air Pollutant Emission Factors.

Source: U.S. Bureau of Mines, Bituminous Coal and Lignite Distribution, Calender Year 1973, Mineral Industry Surveys, Washington, D.C. (April 12, 1974).

5.3 ADVANCED ENERGY TECHNOLOGIES

The potential exists in nonattainment areas for using low-polluting, advanced energy technologies in place of conventional combustion systems, either as retrofit or for new facilities. Many advanced energy technologies have lower emissions of a given pollutant than conventional systems with add-on emission-control devices. The emission estimates for LAER for coal-fired power plants presented in the previous sections indicate the levels of emissions these advanced technologies would need to achieve to be viable alternatives in nonattainment areas.

Table 5.11 shows predicted emissions of sulfur dioxide and nitrogen oxides from a selection of these advanced technologies and typical emissions from conventional systems. (The emissions of SO_2 from conventional systems do not reflect the LAER levels of Table 5.8, however.) It is assumed that typical emissions of particulate matter from advanced technologies will not differ significantly from those from conventional combustion technologies, since the TSP level is mostly a function of the composition of the fuel. Table 5.11 indicates that there are specific improvements of performance over conventional systems. For example, NO_x emissions from fluidized-bed combustion (FBC) are generally lower than NO_x emissions from conventional coal combustion with state-of-the-art controls. Both FBC and use of solvent refined coal (SRC) can approach the sulfur removal capabilities of flue gas desulfurization systems on conventional boilers. In addition, costs may be lower and secondary environmental impacts may be reduced. Substitute natural gas (SNG) from coal produces low emissions of SO_2, NO_x, and particulates.

One additional advantage that advanced energy technologies might have over conventional systems with add-on controls is related to EPA's definition of the term "potential emissions." EPA had defined the size cut-off above which facilities will be subject to nonattainment provisions in terms of <u>potential</u> emissions in the absence of add-on control devices. This considerably lowered the size cut-off for conventional systems. If the fluidized bed in FBC is considered as an integral part of the operation, then potential emissions will simply refer to the emissions from the FBC unit. This implies that a considerably larger FBC unit could be constructed without coming under the nonattainment provision. EPA's definition has, however, been challenged in the courts, and the definition of major source has been proposed as one based on emissions after controls. Under such an interpretation, this advantage of FBC equipment would disappear.

Table 5.11. Typical or Predicted Emissions of SO_2 and NO_x from Conventional and Advanced Energy Technologies

Technology	SO_2 Emissions (lb/MM Btu)	NO_x Emissions (lb/MM Btu)
Solid Fuel		
Low-Sulfur Coal	0.2 - 0.8	0.5 - 0.7
High-Sulfur Coal with Flue Gas Desulfurization	0.5 - 1.2	0.5 - 0.7
High-Sulfur Coal with Advanced FGD and Staged Combustion	~ 0.2	~ 0.3
Atmospheric Fluidized-Bed Combustion	0.6 - 1.2	~ 0.3
Pressurized Fluidized-Bed Combustion	0.5 - 0.8	~ 0.3
Solvent Refined Coal-I	~1.1	~ 0.4
Magnetohydrodynamics	~0.5	~ 0.4
Liquid Fuel		
Advanced Oil Cleaning and Combustion Modification	~0.2	~ 0.1
Solvent Refined Coal-II	~0.6	0.3 - 0.8
H-Coal	0.7 - 0.8	0.3 - 0.7
Gaseous Fuel		
Natural Gas	~ 0	~ 0.1
Bumines Low-Btu Coal Gasification	0.8 - 1.0	0.2 - 0.4
High-Btu Coal Gasification	<0.1	0.2 - 0.4
Fuel Cell with Gasifier	0.7 - 0.8	<0.1
Closed-Cycle Gas Turbine	1.0 - 1.2	~ 0.3

Source: References 49-55.

5.4 SUMMARY

Emission limitations on new and existing sources in nonattainment areas vary widely across state agencies responsible for air polution control. The staff of those agencies have described the determination of LAER as the single most difficult task in administering new source review requirements. EPA has provided limited assistance through some general guidelines and through a brief effort to compile BACT/LAER determinations. The problems and inconsistencies of emission limitations may be summarized as follows:

- SIP emission limitations are not typical for similar sources in different states. Instead they reflect the emission reduction necessary to allow prediction of attainment for each individual nonattainment area.
- BACT are supposed to be based on a consistent methodology (according to EPA), but little effort has been made to achieve such consistency.
- LAER determinations, in accordance with the statutory requirement to be the lowest rate achieved in practice, are dependent on information flow. Beyond an initial compilation of determinations, state and local agencies are being left on their own to find out what has been achieved elsewhere.
- Based on a review of BACT and LAER in EPA's clearinghouse, there appears to be little or no consistency between determinations. LAER is not necessarily more stringent than BACT. For coal-fired utility boilers, in fact, BACT and LAER are both similar to the new (1979) NSPS.
- The most stringent LAER determination discovered for a coal-fired utility boiler was an emission limitation of 0.072 lb of SO_2 per MM Btu.

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6 NATIONAL ASSESSMENT OF NONATTAINMENT IMPACTS

The purpose of the analysis presented in this section is to assess, on a nationwide basis, the potential siting impediments to energy supply and industrial growth that might arise out of nonattainment regulations. The analysis examines, at the county level, the potential constraints on the siting of new fossil fuel-fired utility powerplants and on the increased use of coal and oil in the industrial sector.

Because of the magnitude of the study -- over 1300 counties were examined -- precision is limited for any individual county, and the results should be viewed as a screening procedure serving to highlight potential problem areas. Ideally, a more detailed analysis that considers long-range transport of pollutants, industrial process and area sources, revised SIP requirements, and other local factors should be used to confirm or refute the findings for any specific county. Nevertheless, as an assessment of impacts at the national level, the results are valid and informative.

The analysis that follows used data generated for the Regional Issue Identification and Assessment Program (RIIA-1) of the Regional Assessments Division, EV/OTI.

6.1 METHODOLOGY

The energy scenario on which this analysis is based is the Projection Series C (or TRENDLONG Mid-Mid) energy scenario developed by the Energy Information Administration of DOE. This scenario assumes medium energy demand and medium fuel supply through 1990. The assumed GNP growth rate is 4.1% between 1975 and 1985, and 3.2% between 1985 and 1990. Total energy consumption rises from 70.6 Quads in 1975 to 108.5 Quads in 1990 (1 Quad = 10^{15} Btu), with fuel use as shown in Table 6.1. The scenario assumes a dramatic increase in coal production through 1985, leveling off thereafter.

The national energy demand totals were initially apportioned to the Federal Regions for eight different technologies, using the Project Independence Evaluation System (PIES). County-level patterns of fuel use were developed from this for 1975, 1985, and 1990.

Table 6.1. Total Energy Consumption by Fuel Type, under EIA Projection Series C

Fuel	1975 (Quads)[a]	1985 (Quads)	1990 (Quads)
Coal	12.8	21.2	25.4
Petroleum	32.8	43.9	48.5
Gasoline	12.9	15.5	17.2
Distillate Oil	6.1	9.6	10.8
Residual Oil	5.7	6.6	6.4
Other Petroleum	8.2	12.2	14.1
Natural gas	20.0	19.1	19.3
Hydroelectric	3.2	4.2	5.0
Nuclear	1.8	6.2	10.3
Total	70.6	94.5	108.5

[a]A Quad = 10^{15} Btu.

Source: Energy Information Administration, Annual Report to Congress, DOE/EIA-0036/2, April, 1978.

New utility capacity was initially located according to existing utility company schedules. This total capacity was then compared to the regional totals projected by PIES. Where additional capacity was required, siting was determined using the Oak Ridge Spatial Analysis Model (ORSAM).

ORSAM hypothetically assigns new capacity to those counties determined by a screening procedure to be suitable for energy facilities. This procedure assigns capacity according to a set of criteria, such as fuel accessibility, population density, and water availability, that are weighted according to their relative importance. One criterion is that the county should not be an Air Quality Maintenance Area (AQMA, roughly equivalent to a nonattainment area). Thus ORSAM tends not to site new utility capacity in nonattainment areas, unless it is unavoidable due to other considerations. This approach seems to be an adequate representation of the real-world situation and does not predetermine the outcome of a nonattainment analysis.

Projections of industrial fuel use were less sophisticated. County-level patterns of fuel use were assumed to be unchanged through 1990, with the magnitude of future use determined by regional growth projections.

The county-level energy supply and demand data were then converted to levels of pollutant emissions by Brookhaven National Laboratory. In the utility sector, the major assumptions for coal-fired powerplants are:

- 90% SO_2 removal for new plants with start-up dates after 1983;
- SIP* or old NSPS limitations for new plants with start-up dates prior to 1983;
- Uncontrolled emissions from existing plants, based on 1976 FPC coal data;
- Coal conversions as mandated by ESECA.

In the industrial sector, the equivalent assumptions are:

- 80% SO_2 removal for new sources using more than 250 MM Btu/hr;
- A limitation of 1.5 lb SO_2 per MM Btu for new sources in the range 100-250 MM Btu/hr;
- SIP* limitations for new SO_2 sources using less than 100 MM Btu/hr and for existing sources.

Particulate emissions are assumed to be reduced by 99% for large, new industrial sources, and controlled to 0.05 lb/MM Btu for new industrial sources in the range 100-250 MM Btu/hr; small, new industrial plants and existing plants are assumed to be controlled to SIP limitations. Emissions from oil-fired facilities are assumed to meet SIP requirements. The resulting data set comprises SO_2 and TSP emission information for all counties projected to have significant fuel combustion activity between 1975 and 1990 (1319 counties in all).

These emissions data were then converted to ambient concentrations according to a rollback procedure developed at Argonne National Laboratory. The fundamental assumption in this procedure is that monitored pollutant concentration in the ambient air is proportional to the level of emissions in a

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*Note that these SIP limitations are based on SIPs in existence before the current (July 1979) revised SIPs for nonattainment areas. In those areas for which a revised SIP is not required (i.e., an attainment area), these SIP limitations are likely to be unchanged.

given county. A nonsource-specific background was assumed for particulate matter: 30 $\mu g/m^3$ for the annual reading, 15 $\mu g/m^3$ for the 24-hour reading, at minimum; if the lowest reading at a given monitor was higher than these values, that lowest monitor reading was used as a background value.

Monitored air quality data were gathered from the SAROAD data base for 1975. For averaging times of less than one year, the "highest, second-highest" reading of monitors in a county was selected as the appropriate value from which to assess attainment status. Annual and 24-hour readings for both SO_2 and TSP were evaluated. Total county-level emissions were gathered from the NEDS data base for 1975.

Projected changes in fuel combustion emissions between 1975 and 1985 and between 1975 and 1990 were then converted to changes in ambient pollutant concentrations using the rollback procedure. For counties in which a new facility was to be sited where none previously existed, an alternative method was used. The contribution to ambient air quality was determined from curves relating maximum air quality impact to pollutant emission rate. These curves were developed using dispersion models applied to a number of real utility and industrial sources.

The projected air quality levels for 1985 and 1990 were then compared with the primary National Ambient Air Quality Standards and attainment status determined. This analysis concentrates on the projections for 1990 and on the growth between 1985 and 1990.

6.2 ASSUMPTIONS

There are several important assumptions that must be borne in mind when the results that follow are examined.

- Process emissions are assumed to remain constant between 1975 and 1990. In reality, emissions from existing sources will decrease as SIP requirements are met, and emissions from new sources will be added to the total. The former will be the more significant effect. Inclusion of these changes in process emissions would therefore reduce the impacts described below, but predicting these changes is outside the scope of this study. Likewise, changes in transportation-related emissions are beyond the scope of this study.

- The revised SIPs, when promulgated, will be more restrictive than the existing SIPs on which this analysis is based. Again, this will act to mitigate the projected impacts.
- The whole of a county is assumed to be nonattainment if the county contains a portion of a designated nonattainment area or if one monitor reads in excess of the standard. In reality, many nonattainment areas are extremely small (a few square miles or less), and many counties are extremely large, especially in the West. For a typical county, however, the assumption is a good one, especially if the requirement not to exceed the "significance levels" is taken into account.
- The monitored TSP data include contributions from rural fugitive dust, which may not be counted by EPA as contributing to nonattainment. Thus, for several counties in the West, our determinations of nonattainment are not significant from a regulatory standpoint. This is discussed below.

If considered in more detail, each of these factors would reduce the magnitude of the nonattainment impact. Therefore, the results presented below must be viewed as representing the maximum impact that is projected to result under the given energy scenario. If each county were to be considered individually, the national impact would be reduced, and the analysis more accurate; such a task, however, would be enormous.

6.3 RESULTS

6.3.1 Potential Constraints on Siting of New Coal-Fired Utilities

In order to examine the potential constraints on the siting of new utility powerplants, the projected siting of all new coal capacity coming on line between 1983 and 1990 was compared with the patterns of both existing and projected nonattainment areas. The utility siting patterns, as described in Sec. 6.1, were established from utility schedules and modeling based on siting criteria and regional energy demands. Table 6.2 summarizes the results.

The total capacity projected to be coming on line between 1983 and 1990 is 77.1 GW, distributed in 71 counties. Six percent of this capacity is projected to be located in counties currently violating primary NAAQS for SO_2, as designated by EPA. Only 1% is projected to be located in counties in

Table 6.2. Potential Constraints on Projected Utility Siting (1983-1990)

Constraint on Projected County Site	Capacity Constrained					
	SO_2 Alone		TSP Alone		SO_2 & TSP Combined[a]	
	GW	%[b]	GW	%[b]	GW	%[b]
Current violation of primary NAAQS	4.70	6.1	5.33	6.9	7.00	9.1
Current violation of secondary NAAQS	0	0	8.70	11.3	-	-
Current unclassified status	1.40	1.8	3.24	4.2	-	-
None: current attainment	71.00	92.1	59.83	77.6	58.17	75.4
Projected violation of primary NAAQS	0.88	1.1	7.26	9.4	8.14	10.6
No current air quality data; emissions projected to increase >25%	39.91	51.8	16.45	21.3	-	-
None: projected attainment	36.31	47.1	53.39	69.2	29.97	38.9

[a]In these columns, nonattainment implies a violation for at least one pollutant; attainment implies no violation for either pollutant. Therefore, these figures do not necessarily add across rows.

[b]Percent of total projected capacity (77.10 GW), covering 71 counties.

violation of primary NAAQS for SO_2 in the year 1990. Constraints from SO_2 nonattainment are therefore expected to be almost nonexistent. It is important to point out, however, that 52% of the new capacity will be sited in counties that have no SO_2 air quality data, but which are projected to have more than a 25% increase in SO_2 emissions between 1975 and 1990. It is possible that several of these counties could, in fact, be in nonattainment status, when monitoring and modeling data become available. Additionally, the extent to which a new facility faces PSD problems instead of nonattainment constraints is not addressed in this analysis.

Only 7% of the utility capacity will be located in existing TSP nonattainment counties, and 9% in projected TSP nonattainment areas in 1990.

Concerning the overall constraints on utility siting that might arise because of either pollutant, 9% of the capacity will be sited in existing nonattainment areas and 11% in projected nonattainment areas. This

reflects the expectation that new utility plants will be located away from urban centers, in areas where the air quality is relatively good or where there are relatively few monitors. Figure 6.1 shows the counties where new capacity is projected to be located and the possible constraints that might arise from nonattainment.

In Table 6.3, those counties that may have problems assimilating projected new utility capacity are examined in more detail, to provide insight into the causes of the nonattainment problems in these counties and hence into the real magnitude of the projected constraints. We would caution the reader against inferring that the analysis predicts nonattainment for these specific counties with any high degree of certainty. As mentioned above, the analysis is valid only in the aggregate; these counties are identified merely to shed light on the causes of nonattainment in typical constrained counties.

Thirteen of the counties show projected violations of the annual TSP standard of 75 $\mu g/m^3$, and one county shows a violation of the 24-hour SO_2 standard of 365 $\mu g/m^3$. Eleven counties are in continuing nonattainment, and three show new violations in 1990.

An examination of the causes of the violations in these 14 counties shows that in six of them existing utilities are a major contributor. Fugitive dust is primarily responsible in three instances, specific industrial facilities in two others, and general urban industrial activity in the final three cases (Buffalo, Kansas City, and Tampa/St. Petersburg). The first and the last of these types will be most constraining: the first because existing utility emissions will be highly controlled by 1990, and the last because urban particulate problems and small industrial sources will be difficult to control to the level needed for attainment. Thus, of the 8.1 GW projected by the model to be constrained, perhaps 5.9 GW will be difficult to site in the counties to which it is assigned.

It is interesting to note that each of these counties would remain in nonattainment even if the new capacity is not added; it is not the emissions from the new facilities that will determine attainment status. Therefore, mitigating strategies for a new facility can only consist of relocating the new capacity to an adjacent county, instead of increasing control levels or switching fuel at the plant; of course, there is the possibility of negotiating additional cleanup of existing sources. This may prove to be

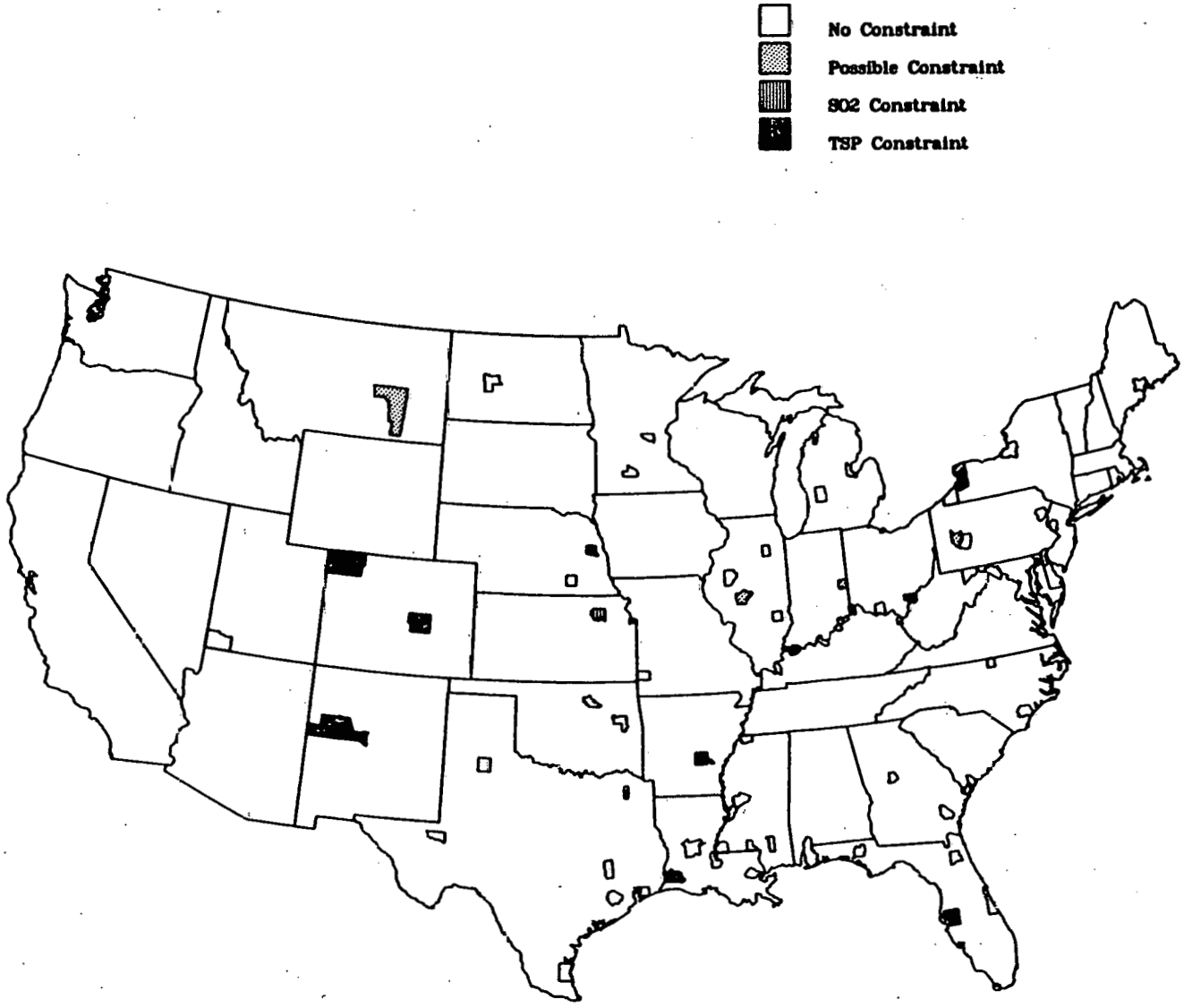

Fig. 6.1. Nonattainment Constraints on Utility Siting

Table 6.3. Counties that May Have Difficulty Assimilating Projected Increase in Utility Capacity (1983-1990) because of Nonattainment

County	Projected New Capacity, MW	Standard Violated	Probable Cause of Violation
Jefferson, AR	1400	24-hr & 1-yr TSP	Existing wood products industry
El Paso, CO	200	1-yr TSP	Mobile sources and fugitive dust in Colorado Springs
Moffat, CO	380	24-hr & 1-yr TSP	Probably fugitive dust
Hillsborough, FL	425	1-yr TSP[a]	Existing utility emissions and industry around Tampa and St. Petersburg
Pottawatomie, KS	880	24-hr SO_2[a]	New violation caused by utility plant; may be SAROAD error
Wyandotte, KS	300	1-yr TSP	Existing utility, minerals, and agricultural industries in Kansas City
Boone, KY	1200	1-yr TSP	S.W. Cincinnati, existing utility plants in adjacent Dearborn Co., Indiana
Henderson, KY	200	1-yr TSP	Existing utility plant (Henderson #1 and 2)
Calcasieu, LA	1080	1-yr TSP[a]	Existing utility plant (Nelson) and petroleum refining industry
Dodge, NB	85	1-yr TSP	Existing grain milling operations
Valencia, NM	180	1-yr TSP	Probably fugitive dust
Erie, NY	730	1-yr TSP	Industrial development in and around Buffalo, New York
Richmond, NY	700	1-yr TSP	Existing utility plant on Staten Island (Arthur Kill)
Meigs, OH	375	1-yr TSP	Existing utility plants in adjacent Gallia County, Ohio

[a]New Violation

difficult in the cases of plants in the Ohio River Basin (Henderson and Boone Counties, Kentucky, and Meigs County, Ohio), which are flanked by other existing nonattainment areas along the banks of the Ohio River. Similarly, the suburban facilities near Buffalo, Kansas City, and Tampa may have problems in relocating, but the other facilities should have little trouble in finding suitable alternative sites.

6.3.2 Potential Constraints on Industrial Coal Use

To investigate potential constraints on growth in industrial coal use, a set of counties was selected on the basis of a significant increase in industrial coal use between 1985 and 1990. All counties having an increase greater than 2×10^{12} Btu were selected -- 69 counties in all, a set of similar size to the set of counties with new utility siting.

Coal use in these 69 counties in 1990 is projected to be 1.33 Quads, compared to a total industrial coal use of 2.95 Quads. Thus, these selected counties account for 45% of the total industrial coal use in 1990. The remaining 55% is unlikely to be seriously constrained, as it represents dispersed siting in relatively clean-air areas. A total increase of 281×10^{12} Btu is projected for the 69 counties between 1985 and 1990. The aim of this analysis is to determine how much of this total increase will be constrained because of SO_2 and TSP nonattainment, in an exactly analogous way to the analysis of constraints on the total utility capacity of 77.1 GW. The assumption is made that all increased coal use in a particular county will be constrained if the county is in nonattainment in 1990. In reality, an undetermined proportion might be assimilated in some counties before nonattainment is reached. Table 6.4 shows the results of this analysis.

As expected, potential constraints on industrial coal use are greater than on utility coal use, because of the proximity of new industrial sources to existing nonattainment areas. Nineteen percent of the new industrial activity is projected to be in existing SO_2 nonattainment areas, and 10% in projected SO_2 nonattainment areas. A massive 61% is in existing TSP nonattainment areas, and 63% is in projected TSP nonattainment areas. The combined constraints on industrial coal use are: 65% in existing nonattainment areas and 66% in projected nonattainment areas. Because this new fuel use is projected for industrial areas, where monitors already exist, very little increase is in counties with no air quality data (14% for SO_2, none for TSP).

Table 6.4. Potential Constraints on Increased Industrial Coal Use (1985-1990)

Constraint on Projected County Site	SO_2 Alone		TSP Alone		SO_2 & TSP Combined[a]	
	10^{12} Btu	%[b]	10^{12} Btu	%[b]	10^{12} Btu	%[b]
Current violation of primary NAAQS	52.7	18.8	171.8	61.2	181.0	64.5
Current violation of secondary NAAQS	0	0	23.0	8.2	-	-
Current unclassified status	2.3	0.8	6.3	2.2	-	-
None: current attainment	225.6	80.4	79.5	28.3	79.5	28.3
Projected violation of primary NAAQS	27.8	9.9	175.2	62.4	184.3	65.7
No current air quality data; emissions projected to increase >25%	38.8	13.8	0	0	-	-
None: projected attainment	214.0	76.3	105.4	37.6	96.3	34.3

[a]In these columns, nonattainment implies a violation for at least one pollutant; attainment implies no violation for either pollutant. Therefore, these figures do not necessarily add across rows.

[b]Percent of total projected increase in coal use (280.6 x 10^{12} Btu) in 69 counties having increases >2 x 10^{12} Btu between 1985 and 1990.

The regions of major industrial coal use and the projected nonattainment constraints are shown in Fig. 6.2. The only region to be seriously affected as a whole is the northern Colorado/southern Wyoming area.

Thirty-five counties are constrained by TSP nonattainment, and they generally represent major urban areas: Los Angeles, Denver, Chicago, St. Louis, Kansas City, Cleveland, Detroit, Pittsburgh, Houston, and Salt Lake City. The real magnitude of TSP constraints on industrial coal use in these cities will depend entirely on implementation of strict SIP provisions aimed at transportation emissions, fugitive urban emissions, and small industrial sources. Such measures are beyond the scope of this analysis.

Counties that may have difficulty assimilating the projected growth in

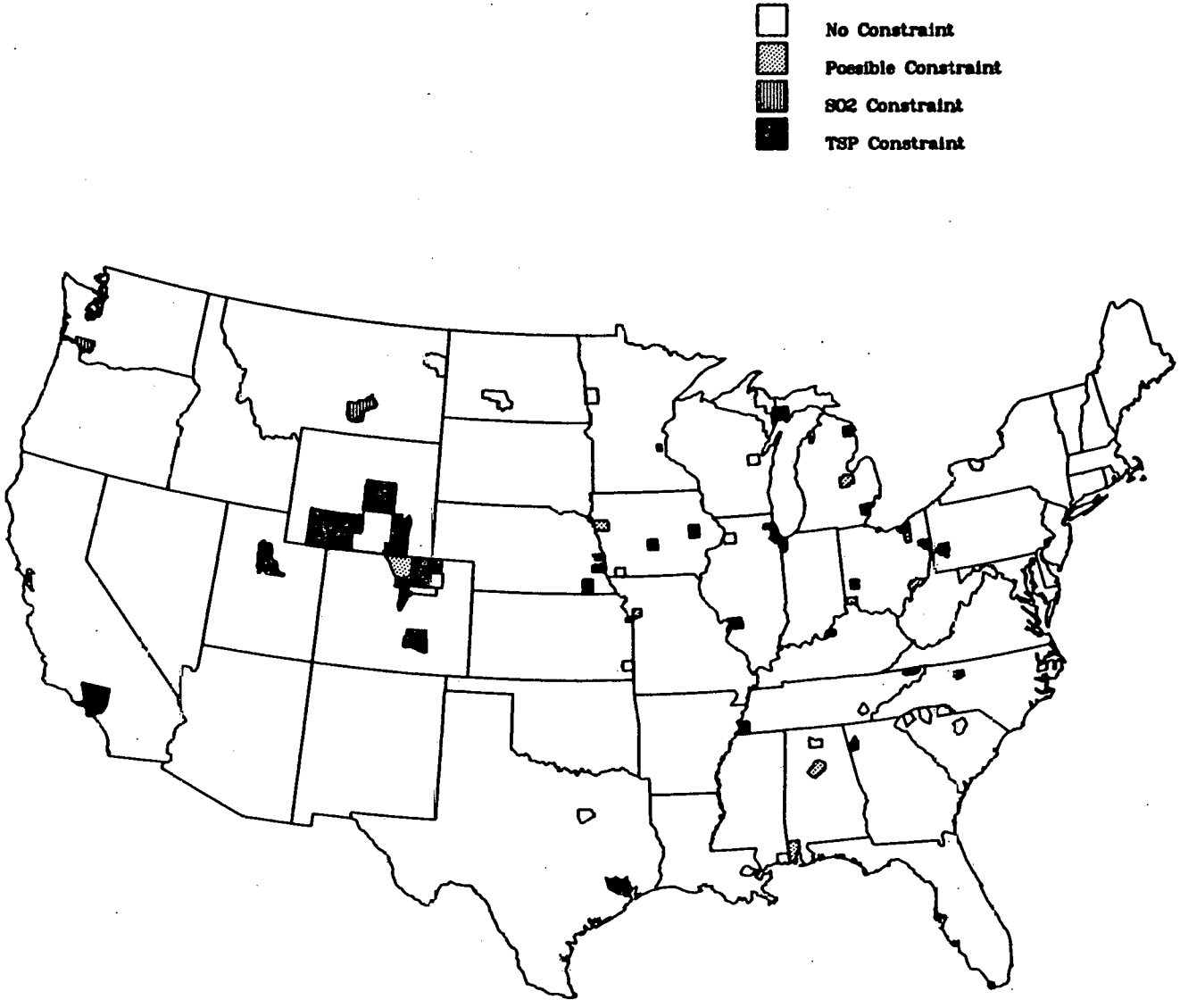

Fig. 6.2. Nonattainment Constraints on Industrial Coal Use

industrial coal use because of SO_2 nonattainment (Table 6.5) can be examined more closely, as the violations tend to be point-source-specific. Again, the caveats of Sec. 6.3.1 apply. Of the 27.8 x 10^{12}-Btu increase projected for SO_2 nonattainment counties in 1990, 17.5 x 10^{12} Btu are projected for counties where nonattainment arises from specific out-of-compliance industrial process sources: refineries and metal smelters in particular. The projection for the Chicago/Gary area, which is in nonattainment because of steel mills and general industrial development, is 7.8 x 10^{12} Btu. The final 2.5 x 10^{12} Btu is projected for Floyd County, Georgia, which is in nonattainment for SO_2 because of the Hammond power plant.

6.3.3 Potential Constraints on Industrial Oil Use

The third area in which constraints on energy use might arise out of nonattainment regulations concerns the SO_2 emissions from industrial oil use. A parallel analysis to that described in Sec. 6.3.2 was performed. Counties showing increases in oil use of greater than 2 x 10^{12} Btu between 1985 and 1990 were selected. This amounted to 131 counties, representing a total increase of 581 x 10^{12} Btu. Particulate emissions from oil combustion are sufficiently low that no serious constraints will arise.

Of this total increase, 11% is projected for counties currently in violation of SO_2 standards, and 12% is projected for counties in nonattainment in 1990 (Table 6.6). The small increase reflects the continued use of oil in industrial nonattainment areas, as opposed to coal, of which relatively more is assigned to attainment areas.

Figure 6.3 shows the distribution of these large oil-growth counties and the potentially constrained areas. The Gulf Coast and South Central region (Texas, Louisiana, Arkansas, and Oklahoma) is projected for large increases and some constraints. Washington State may also experience SO_2 problems arising from increased oil combustion. The remaining increases are projected for counties with existing heavy industry, which may or may not coincide with urban centers.

Table 6.5 shows those counties that may have problems assimilating additional oil combustion because of SO_2 nonattainment. A total increment of 70.4 x 10^{12} Btu of oil use is projected for SO_2 nonattainment areas in 1990 -- more than double the equivalent increment of coal use. Fourteen counties are affected, half of which are subject to new violations. An in-

Table 6.5. Counties that May Have Difficulty Assimilating Projected Increase in Industrial Fuel Use (1985-1990) because of SO_2 Nonattainment

County	Increase in Fuel Use (10^{12} Btu)		SO_2 Standard Violated	Probable Cause of Violation
	Coal	Oil		
Polk, FL	-	3.5	24-hr[a]	Growth in existing chemicals industry
Floyd, GA	2.5	6.8	24-hr	Existing utility plant (Hammond)
Cook, IL	2.3	5.4	24-hr	Industrial development in and around Chicago
Lake, IN	5.5	13.0	1-yr	Industrial development in the Chicago/Gary area
Sherman, KS	-	2.4	24-hr	Not known
Hennepin, MN	-	3.0	24-hr & 1-yr	Industrial development in and around Minneapolis
Yellowstone, MT	3.1	6.3	24-hr[a] & 1-yr	Existing petroleum refining
Georgetown, SC	-	2.2	24-hr	Growth in utility sector (1975-1982) plus existing wood products industry
Salt Lake, UT	8.4	3.7	24-hr & 1-yr	Primary metals industry
Hopewell City, VA	2.0	3.0	24-hr[a]	Growth in unknown industry
Clallam, WA	-	2.4	1-yr[a]	Existing wood products industry plus new refining industry and oil use
Cowlitz, WA	4.0	10.4	1-yr[a]	Probably new refining industry and oil use
Snohomish, WA	-	3.4	24-hr[a]	Existing wood products industry plus new refining industry and oil use
Whatcom, WA	-	4.9	1-yr[a]	Growth in existing refining industry

[a]New violation

Table 6.6 Potential SO_2 Constraints on Projected Industrial Oil Use (1985-1990)

Constraint on Projected County Site	Capacity Constrained	
	10^{12} Btu	%[a]
Current violation of primary NAAQS	61.5	10.6
Current violation of secondary NAAQS	0	0
Current unclassified status	27.2	4.7
None: current attainment	492.1	84.7
Projected violation of primary NAAQS	70.4	12.1
No current air quality data; emissions projected to increase > 25%	109.8	18.9
None: projected attainment	400.6	69.0

[a]Percent of total increase in oil use (580.8 x 10^{12} Btu) in 131 counties having increases >2 x 10^{12} Btu between 1985 and 1990

crease of 27.4 x 10^{12} Btu is projected for counties with new or existing violations caused by petroleum refining and increased oil combustion, and 12.6 x 10^{12} Btu for counties with violations caused by other process sources (the metals and chemicals industries, primarily). An increase of 21.4 x 10^{12} Btu is projected for urban areas -- Chicago/Gary and Minneapolis -- and 9.0 x 10^{12} Btu for counties in which utility emissions cause the nonattainment.

The real constraint on the siting of new refinery capacity and the other process industries will depend largely on the compliance achieved by existing process sources. In general, it can be expected that offsets from existing sources will be available in such areas where nonattainment persists. Similarly in the urban areas, existing SO_2 sources will probably be available for offsets, although the constraints will be greater than for the major emitters of TSP. Where additional fuel use is projected for counties in nonattainment primarily because of existing utility emissions, constraints may be severe, because compliance with SIP requirements is assumed for utilities by 1985. There may be no offsets available, and new industrial sources may be forced to relocate in other counties. The siting of new refinery capacity may also be constrained by hydrocarbon/oxidant nonattainment, which is not addressed in this study.

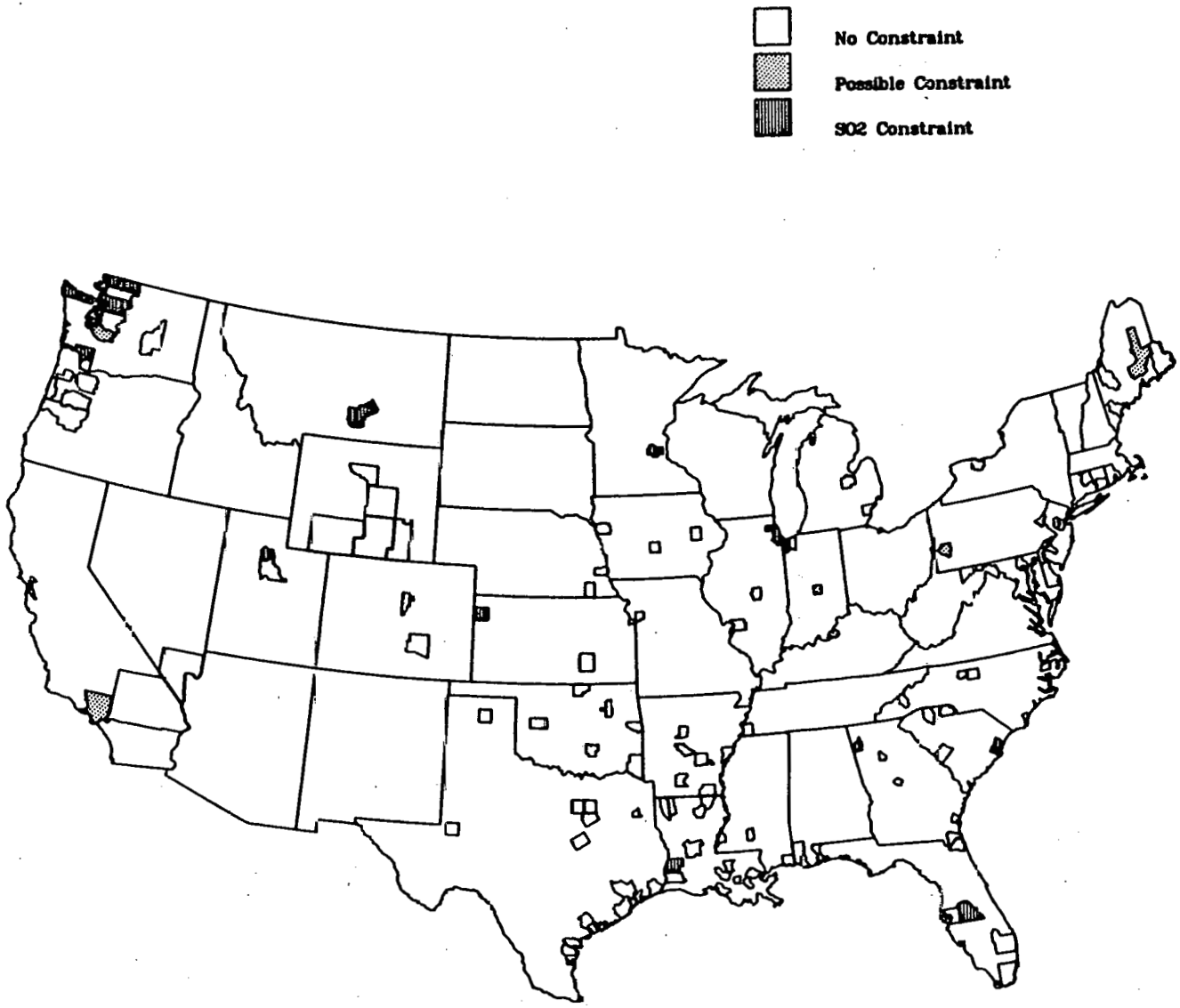

Fig. 6.3. Nonattainment Constraints on Industrial Oil Use

6.4 SUMMARY OF NONATTAINMENT IMPACTS

An analysis has been presented to quantify potential constraints that might arise on energy activity in 1983-1990 as a result of nonattainment of air quality standards for SO_2 and TSP. It must be emphasized that the assumptions of the analysis (described in Sec. 6.2) result in a "worst case" scenario, in which sites (in general) are those that would have been chosen without consideration of air quality, emission limitations are based on SIPs previous to the required revisions, and there is no cleanup of existing process sources of emissions.* Three facets of energy activity have been investigated: the construction of new coal-fired utility powerplants, the growth in combustion of coal by industry, and the growth in combustion of oil by industry. Those counties have been studied where growth is projected for the three areas of energy activity. Counties are assumed to be constrained if the air quality analysis indicates nonattainment in the year 1990.

Table 6.7 summarizes and compares the foregoing results. The analysis has been taken one step further than in Sec. 6.3, for the sake of comparison, by assuming that no constraints will exist in counties other than those studied. This is a reasonable assumption, because the increase of fuel use in these other counties is small ($<2 \times 10^{12}$ Btu between 1985 and 1990) and the counties tend to be in attainment for both pollutants.

The largest potential constraint is on the burning of coal in industry, because of TSP nonattainment (30% of the increased fuel use may be constrained). Nine percent of new utility capacity will be constrained by TSP nonattainment. Approximately 5% of increases in industrial use of both coal and oil will be constrained by SO_2 nonattainment. Overall, 11% of new utility capacity will have potential problems in being assimilated by the counties in which it is projected to be sited; and 32% of new industrial coal use and 5% of new industrial oil use will be constrained by nonattainment. As stressed earlier, these should be viewed as maximum possible constraints, which could be reduced by detailed consideration of changes in emissions from sources other than fuel combustion.

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*The review of revised SIPs (Sec. 4) has led us to conclude that this assumption of existing SIP limitations for SO_2 does not introduce significant distortions, since the new SIPs are generally not more stringent. The new SIPs available, however, require controls on currently uncontrolled industrial TSP sources as well as reduction of emissions from nontraditional area sources of TSP.

Table 6.7. Summary of Maximum Potential Nonattainment Constraints on Energy Growth to 1990

Energy Use	Growth, 10^{12} Btu/yr	Percent Constrained		
		SO_2	TSP	Either
New Utility Coal Capacity				
Total (71 counties)	4,390[a]	1.1	9.4	10.6
New Industrial Coal Use				
All counties[b]	580	4.8[b]	30.2[b]	31.8[b]
In 69 counties with increases >$2x10^{12}$ Btu	281	9.9	62.4	65.7
New Industrial Oil Use				
All counties[b]	1,300	5.4[b]	0[c]	5.4[b]
In 131 counties with increases >$2x10^{12}$ Btu	581	12.1	0[c]	12.1

[a]Equivalent to 77.1 GW at 65% capacity utilization.

[b]Assuming no constraints in counties other than those studied.

[c]Assuming no constraints on industrial oil use due to TSP nonattainment.

With respect to severity of constraints, geographical patterns of constrained counties, and potential mitigating strategies, the following points can be made:

- The most severe constraints could be on the siting of new coal-fired utility powerplants along the Ohio River.
- Other major constraints on utility siting could be in counties close to several urban centers: Buffalo, New York City, Tampa, Cincinnati, and Kansas City.
- In some counties, the assimilation of projected utility capacity will depend on SIP cleanup of existing process sources.
- Industrial coal use may be seriously constrained in many urban locations because of TSP nonattainment: Los Angeles, Denver, Chicago, St. Louis, Kansas City, Cleveland, Detroit, Pittsburgh, Houston, and Salt Lake City. Severity of the constraint will depend on stringency and enforcement of SIP limitations on process and area sources.
- Constraints on industrial coal use because of SO_2 nonattainment may be less widespread, but potentially more severe due to scarcity of offsets. Industrial development in the Chicago/Gary area may have such problems.

Other specific industrial facilities, such as smelters in Salt Lake City and refineries in Yellowstone, Montana, will have to reduce process emissions sufficiently to allow for growth.

- Industrial oil use may be constrained in a few areas because of SO_2 nonattainment: in particular, addition of oil-burning industries and expansion of refineries in Washington, and industrial growth in Chicago, Gary, and Minneapolis, may be constrained. Again, SIP reductions in process emissions may mitigate the problems in other counties.
- The Gulf Coast and South Central region -- comprising the states of Texas, Louisiana, Arkansas, and Oklahoma -- may have general problems due to increases in oil consumption and a shift from oil and gas to coal.

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APPENDIX A

Bibliography
of
EPA's Policy Guidances on Revised
State Implementation Plans
for
Nonattainment Areas

A.1. DETERMINATION OF ATTAINMENT STATUS

A.1 Designations

1. *Air Quality Control Regions, Criteria and Control Techniques: Attainment Status Designations,* 43 Federal Register 40412 (September 12, 1978).

A general preamble outlining EPA's position on certain issues raised in comments on the original designation of areas. Issues covered include those raised by states in response to EPA's designations, such as disagreements over the validity of some monitor readings. The material also includes tables listing changes in attainment designations. (These designations have been updated subsequently.)

2. *National Ambient Air Quality Standards, States Attainment Status,* 43 Federal Register 8962 (March 3, 1978).

A statement of the approach used in the initial designations of nonattainment areas, including the suggestions made to the states on appropriate air quality data to be used. The material includes state-by-state, pollutant-by-pollutant, tables of attainment status.

A.1.2. Modeling and Monitoring

1. *Air Programs: Ambient Air Quality Monitoring, Data Reporting and Surveillance Provisions,* 44 Federal Register 27558 (May 10, 1979).

A ruling setting out ambient air quality monitoring and data reporting regulations. The rules are designed to establish a uniform nationwide network of air monitoring stations.

2. *Proposed Revision to Clean Air Act Stack Height Regulation,* 44 Federal Register 2608 (January 12, 1979)

Ruling to assure that emission limitations in the SIPs needed for control of any pollutant not be affected by a stack height which exceeds good engineering practice.

3. *Air Quality Surveillance and Data Reporting,* 43 Federal Register 34892 (August 7, 1978).

Draft rules setting out guidelines for ambient air monitoring for SIPs and for reporting air quality data to EPA. The rules were made final in May 1979.

A.2 GENERAL SIP REQUIREMENTS

A.2.1 Administrator's Criteria Memorandum

1. *General Preamble for Proposed Rulemaking on Approval of SIP Revisions for Nonattainment Areas,* 44 Federal Register 20372 (April 4, 1979).

A general description of requirements for contents of SIP and the major considerations that are to be used by EPA in evaluating submittal.

2. *Criteria for Proposing Approval of Nonattainment Area Implementation Plan Revisions,* 43 Federal Register 21673 (May 19, 1978) (Reprint of letter from David Hawkins, Asst. Administrator for Air and Waste Management, to EPA Regional Administrators, dated February 24, 1978.)

A summary of the elements an SIP must contain in order to be approved by EPA. The Agency considered the memo to state "nationally applicable" policy, but not final rules or regulations.

A.2.2 Guidances to Interpreting Criteria

1. Questions and Answers on 1979 SIP Revisions (memo from EPA Control Programs Operations Branch to Regional Air Program Offices, October 11 and December 21, 1978).

The October memo summarizes six previous monthly question-and-answer memos. The memos provide insight into the types of problems regional EPA offices face in evaluating SIPs and interpreting EPA's criteria for approval.

2. Checklists for Approval/Disapproval of the 1979 SIP Revisions for Nonattainment Areas (memo from Control Programs Development Division to Regional Air Branch chiefs, September 28, 1978).

Transmittal of a series of checklists, arranged by pollutant, to assist the regions in interpreting the criteria for approval and to provide a detailed record of how each SIP revision meets the requirements of the Clean Air Act Amendments. The checklists are intended "to promote a consistent approach to the review of SIP revisions."

3. Checklist for Review of Transportation Portions of 1979 SIP Submissions (memo from David Hawkins to Regional Administrators, October 17, 1978).

Memo suggesting that checklist be used by regional office staff in reviewing transportation portions of 1979 SIP submissions. The checklist aims at clarifying previous guidance on adequate commitments by the states for implementing the necessary control measures.

4. *Workshop on Requirements for Nonattainment Area Plans,* Office of Air Quality Planning and Standards, #1.2-103 (April 1978).

A summary of the presentations made by EPA headquarters staff at a series of workshops held in Philadelphia, San Francisco, and Kansas City for the regional offices. The workshops covered Clean Air Act requirements and criteria for SIP approval.

A.2.3 Miscellaneous

1. *Proposed Policy Statement Recommending Alternative Emissions Reduction Options,* 44 Federal Register 3740 (January 18, 1979) (Reprint of memo from Douglas Costle, EPA Administration, to Directors of State Air Programs, December 21, 1978).

Statement suggesting that states incorporate the "bubble" concept into the revised SIPs. The concept would enable a facility to meet the total emission control requirements of the SIP for a given pollutant through a mix of controls on multiple process-related emission sources rather than specific limitations on each source. The approach is designed to be cost-effective, permitting "facilities to place a greater burden of control on sources where the marginal cost of control is low, and a lesser burden where cost is high."

2. Use of Uniform Population Projections in Air and Water Quality Planning (memo from David Hawkins, Air and Waste Management, and Thomas Jorling, Water and Waste Management, to Regional Administrators, October 18, 1978).

Brief memo noting that state SIP population projections must coincide with projections developed for EPA by the Bureau of Economic Analysis.

3. Secondary Standards Attainment Plans -- Extensions of Submittal Data (memo from David Hawkins to Regional Offices, September 21, 1978).

Note to clarify that EPA can grant an 18-month extension for the submission of SIPs for attainment of the secondary standards. Such extension is to be based on a showing that attainment of the secondary standards would require emission reductions beyond those achievable by RACT.

4. Policy and Technical Guidance for the Development of SIPs for Particulate Matter (memo from Control Programs Development Division to Regional Offices, October 19, 1977).

Memo listing available reports on controls for TSP. The EPA policy toward rural fugitive dust in contrast to urban fugitive dust is also noted. Areas where violations of NAAQS can be proved to be the result of rural fugitive dust can claim attainment of the standard.

A.3 IMPOSITION OF SANCTIONS

A.3.1 General Policy

1. *General Preamble for Proposed Rulemaking on Approval of Plan Revisions for Nonattainment Areas -- Supplement,* 44 Federal Register 38583 (July 2, 1979).

Brief note explaining the public comment period requirement for SIPs and describing EPA's interpretation of conditional approval of SIPs.

2. *Impact of Clean Air Act Nonattainment Sanctions,* 44 Federal Register 37679 (June 30, 1979). (Memo from David Hawkins to Regional Administrators, June 8, 1979.)

Memo sets forth agency policy on the imposition of sanctions on construction of new sources and on transportation and sewage funds as a result of the failure of states to have revised SIPs in effect on July 1, 1979.

3. Letter from Walter Barber, Deputy Asst. Administrator for Air Quality Planning and Standards, to Congressman D. Walgren, May 2, 1979.

Earlier version of EPA's interpretation of the limitations on the imposition of sanctions.

A.3.2 Ban on New Sources

1. *Statutory Restriction on New Sources Under Certain Circumstances for Nonattainment Areas,* 44 Federal Register 38471 (July 2, 1979).

An interpretive ruling clarifying the language of the sanction on growth, i.e., that it applies only to the construction or modification of any major source of the pollutant for which the area is designated as nonattainment and for which a revised SIP has not been approved. The ruling also notes that the court decision in the Alabama Power Company case on PSD will alter the definition of a major source, but indicates that a subsequent ruling will be needed to clarify the new definition.

2. *Proposed Rule on the Approval and Promulgation of Implementation Plans,* 44 Federal Register 38583 (July 2, 1979).

A proposed ruling to extend the ban on new growth to new sources locating outside nonattainment areas only if the new source will have a "significant" impact on the nonattainment area. The ruling also requests comments on how to deal with a source whose impact would cover several political subdivisions of a state if one such subdivision has a revised SIP in effect and another does not.

A.3.3 Sanctions on Funding

1. *Proposed Policy and Procedures for Applying Transportation Funding Limits,* 44 Federal Register 33474 (June 11, 1979)

A joint EPA/DOT policy statement to establish procedures for implementing sanctions on transportation funds. After July 1, EPA regional offices will list areas subject to sanctions and forward the list to the Federal Highway Administration. The states will have 30 days to negotiate before the list is published in the Federal Register and sanctions imposed. Any funds suspended will be held in an escrow account.

2. *Interim Policy on Water Quality and Sewage Plant Construction,* 44 Federal Register 38575 (July 2, 1979). (Reprint of memo from David Hawkins and Thomas Jorling to Regional Offices, June 8, 1979.)

A policy statement clarifying the implementation of Section 316 of the Clean Air Act Amendments. A new sewage plant must be accounted for in an SIP. If not, grant awards are to be withheld until measures for dealing with direct and indirect emissions associated with the new plant are incorporated into the SIP.

APPENDIX B

Table B.1

New Source Review

Provisions of the

Revised SIPs (Nominally, July 1979)

Table B.1. Growth Allowance Versus Offsets in the Revised SIPs (July 1979)

Code	State	Growth Allowance	Offset Policy		Banking Policy		Comments
			USEPA	Ratio	USEPA	Time Limit	
11	Connecticut	None	Yes	> 1	Being Developed		State does not expect any major sources in the near future.
12	Maine	Yes, for Rockland TSP nonattainment area and PSD areas	Yes	> 1	Yes	2 yr	In PSD regions 25% of increment reserved for small sources; voluntary reductions after 1/1/79 may be banked for 2 years, with possible repeated 2 year extension.
13	Massachusetts	None	Yes	> 1	Being Developed		Offset policy presently exists for secondary TSP areas.
14	New Hampshire	None	Yes	> 1	Being Developed		State plans to set up banking registry.
15	Rhode Island	Yes; expected to be sufficient	Being Developed	-	Being Developed		Offset policy should be completed by late 1979 for use as backup to growth allowance.
16	Vermont	None	Yes	> 1	Yes	-	Net pollution offset rather than net air quality benefit required; banking is informally acknowledged but no official policy; state has reclassified all nonattainment areas down to smallest possible size to avoid offsets.
21	New Jersey	Yes; expected to be sufficient	Yes	> 1 up to 2:1	Being Developed		Reductions since 7 Aug 77 must be approved within six months; banking policy to go to public hearings; expect to have free market; offset ratio depends on pollutant type and distance.
22	New York	Yes, but availability uncertain in different regions	Yes	> 1	Being Developed		BACT and LAER not required if net air quality benefit can be shown: reductions since 7 Aug 77 may be used.
31	Delaware	Yes	Yes	> 1	None		Offset regulations for O_x only (only pollutant for which nonattainment); state does not expect any offset cases.
32	Dist. of Columbia	None	Being Developed	> 1	None		Expected policy will follow EPA guidelines; will not permit offsets from minor sources unless permanent reductions can be shown.
33	Maryland	None	Yes	> 1	None		Temporarily following EPA guidelines; ratio of 1.1 being considered.

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Table B.1. (Cont'd)

Code	State	Growth Allowance	Offset Policy		Banking Policy		Comments
			USEPA	Ratio	USEPA	Time Limit	
34	Pennsylvania						
	Department of Environmental Resources	Yes; 0.5% per year to point sources, and 0.5% per year to area sources; primarily for smaller sources	Yes	1:1 up to 5:1	Yes	1 yr up to 5 yr	Banking allowable for one year with 5 years permitted if specific plan submitted within six months of offset creation; source of offset to final user is only permissible transaction; ratios based on type of emission.
	Allegheny County/ Pittsburgh	Yes; 0.5% per year primarily for smaller sources	Yes	> 1 to 5:1.	Yes	7 yr	Offsets to be traded on free market.
	Philadelphia	Yes; but small allowance for 5-county area; will not satisfy major sources	Yes	1:1 up to 5:1	Yes	1 yr up to 5 yr	Presently following DER banking regulations while considering local regulations.
35	Virginia	Yes; expected to be sufficient	Yes	> 1	Yes	until 12/82	Offsets are not expected to be necessary.
36	W. Virginia	None	Yes	> 1	None		
41	Alabama	Yes	Yes	> 1	Yes		
42	Florida	Yes; expected to be sufficient	Yes	> 1	Yes	3 yr	Banking will be registered on permit; after 3 years offsets default to the state.
43	Georgia	Yes; expected to be sufficient	None		None		No detailed banking policy; state probably will act as banker if offsets and banking become necessary.
44	Kentucky	Yes; expected to be sufficient	Yes	> 1	Being Developed		State suggests but does not demand ratio of 1.2 to 1.
45	Mississippi	Yes	None		None		State will deal with the issue of offsets when and if it arises, probably with a policy following EPA guidelines; there is only one nonattainment area in the state, for TSP.
46	N. Carolina	Yes; expected to be sufficient	None		Yes	-	Banked offsets will be recorded on permits with no time limit specified; if offsets necessary policies similar to EPA's will be incorporated.
47	S. Carolina	Yes; small allowance for O_x	Yes	1.05	Yes	None	Banked credits certified by letter; modeling not required for VOC; EPA's policy backed up by growth allowance.
48	Tennessee	Yes; approximately 4% per year in all areas	Yes	> 1	Yes	None	"Banked Credit Agreed Rate" for sources controlled beyond RACT; state will maintain BCAR records.

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Table B.1. (Cont'd)

Code	State	Growth Allowance	Offset Policy		Banking Policy		Comments
			USEPA	Ratio	USEPA	Time Limit	
51	Illinois	Yes; limited to sources unable to obtain offsets	Yes	> 1	Yes	-	If offset source is more than 100 miles away a higher ratio may be required; transfer of banked offsets is permissible; lifetime is unspecified.
52	Indiana	None	Yes	1.1	Yes	5 yr	Banked credits are renewable.
53	Michigan	None	Yes	> 1	Being Developed		-
54	Minnesota	None	Yes	> 1	Yes	-	Banked credit is listed on permit; reduction without permit is lost; ambient air standards are more stringent than EPA's.
55	Ohio	Yes; will be sufficient in some areas.	Yes	> 1	None		SIP to be submitted; no formal banking policy, although state suggests use of the offsets within one year; Ohio EPA requests but does not demand ratio of 1.2 to 1.
56	Wisconsin	None	Yes	1.2	Yes	-	Banking of offsets only occurs via phased development program; internal only.
61	Arkansas	Yes; expected to be sufficient	None		None		Offset policy will be incorporated into SIP if necessary; there is only one O_x area; banking is under consideration.
62	Louisiana	-	Yes	-	-	-	-
63	New Mexico	None	Yes	> 1	None		State defines modification as no increase in emissions; modifications do not require offsets; offsets not likely in the near future.
64	Oklahoma	Yes; expected to be sufficient	Yes	> 1	Being Developed		Expected banking policy will follow federal guidelines.
65	Texas	Yes; in most areas. Allowance probably will be allocated only to new sources unable to find offsets and to start-ups	Yes	> 1	Yes	None	Voluntary reductions since 7 Aug 77 may be banked by source; documentation at time of use only; Board will not certify credit.
71	Iowa	None	Yes	1.25	Yes	None	Greater than 100 ton/yr potential subject to offsets; if external or away from source an adequate diffusion model must be used; banking: "exclusive use or control of the person achieving the reduction".
72	Kansas	Yes	Yes	> 1	None		-

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Table B.1. (Cont'd)

Code	State	Growth Allowance	Offset Policy		Banking Policy		Comments
			USEPA	Ratio	USEPA	Time Limit	
73	Missouri	Yes; expected to be sufficient	Yes	> 1	None		-
81	Colorado	Yes, small allowance for Denver	Yes	> 1	Being Developed		SIP not expected to be submitted until Sept. 79.
82	Montana	None	None		None		State officials see offset program as a possibility but probably inappropriate. The only point sources of SO_2 are smelters, TSP being primarily fugitive dust.
83	N. Dakota	None	None		None		No nonattainment areas.
84	S. Dakota	None	None		None		Limited nonattainment areas.
86	Wyoming	None	None		None		Limited nonattainment areas.
91	Arizona	None	Yes	> 1	None		-
92	California	Yes	Yes	1.2 up to 2:1	Yes	-	Internal banking only.
	Bay Area (San Francisco)	Yes; 25 ton/yr for HC; none for other pollutants	Yes	1.2 up to 2:1	Yes	3 yr	AMQD may impose moritorium on further banking, or (after June 1982), on use of banked emissions allowances.
	South Coast (Los Angeles)		Yes	1.2 up	Being Developed		6 April 79 interim rule allows internal offsets only, and does not explicitly provide for banking. Ratio increases with distance.
01	Idaho	None	Yes	1.2	Yes	5 yr	The added 20% offset requirement may be satisfied by another pollutant if area is also nonattainment for the second pollutant.
02	Oregon	-	Yes	> 1	None		-
03	Washington	None	Yes	> 1	Being Developed		
	Puget Sound	None	Yes	> 1	Being Developed	5 yr	The proposed banking policy and its 5-year limit soon will be tested by an applicant.

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