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IMPLEMENTATION PLAN REVIEW FOR NORTH CAROLINA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

EPA-450/3-75-030

IMPLEMENTATION PLAN REVIEW

FOR

NORTH CAROLINA

REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

PREPARED BY THE FOLLOWING TASK FORCE:

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March 1975

NORTH CAROLINA

ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT
SECTION IV STATE IMPLEMENTATION PLAN REVIEW

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STATE IMPLEMENTATION PLAN REVIEW
FOR
THE STATE OF NORTH CAROLINA

1.0 EXECUTIVE SUMMARY

The enclosed report is the U.S. Environmental Protection Agency's (EPA's) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if control regulations for stationary fuel combustion can be revised without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA advise the state as to whether control regulations can be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the states. The states may, as under the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require states to change any existing plan.

Congress has intended that this report provide the state with information on excessively restrictive control regulations. The intent of ESECA is that SIPs, wherever possible, be revised in the interest of conserving low-sulfur fuels or converting to coal, sources which burn oil or natural gas. EPA's objective in carrying out the SIP reviews, therefore, has been to try to determine if emissions from certain combustion sources may be increased without interfering with the attainment and maintenance of standards. If so, it may be possible through altered resource allocations to effect significant "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel the implementation of EPA's policy on clean fuels. Under the Clean Fuels Policy, implementation plans have been reviewed with a view to saving low sulfur fuels. Where the primary sulfur dioxide air quality standards will not be exceeded, states have been encouraged to either defer attainment of secondary standards or to revise

the SO_2 emission regulations. The states have also been asked to discourage large-scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.

To date, this activity has involved only those states with the largest clean fuels saving potentials. Several of these states have revised or are currently in the process of revising their SO_2 regulations. These states are generally in the eastern half of the United States. ESECA, however, requires the analysis of potentially over-restrictive regulations in all 55 states and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

The adoption of emission limitations which may, in some areas of the state, be overly restrictive (or not restrictive enough) resulted largely from the use of the "example region" approach along with analyses which considered the "hot spots" of an Air Quality Control Region (AQCR) rather than the entire region. This type of approach was offered in EPA guidelines for plan development when states were preparing their original plans. Many states, through concurrence with EPA, adopted the example region approach, largely because of the short timetable dictated by the Clean Air Act. Also, in most cases, the original SIPs were designed to attain and maintain the original NAAQS, some of which have since been designated as "guides" only or actually rescinded. However, many states adopted and retained the original federal standards or, in a few cases, adopted more restrictive state standards, and these served as the bases on which their SIPs were approved. As a result, the requirements of many state plans conflict with legitimate national energy concerns, and thus a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal (1972) of the SIPs. At the time SIPs were approved by EPA if they demonstrated the attainment of the original NAAQS or the more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a state to identify the most polluted air quality control region and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCRs of the state if

the control regulations were applied to similar sources. But use of an example region can result in excessive controls, especially in the utilization of clean fuels, for areas of the state where sources would not otherwise contribute to NAAQS violations. For example, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned statewide, even though the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of states will use the review findings to assist them in deciding whether or not to revise portions of their State Implementation Plans. However, it is most important for such states to recognize the limitations of the present review. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgement and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources was found, however, it was used in the analysis.

The data upon which the report's findings are based is that most currently available to the federal government. However, EPA believes that the states possess the best information for developing revised plans. The states have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality. Therefore, those states desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data used to support EPA's findings. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution situations.

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

The following are the principle findings for the State of North Carolina. (Air Quality Control Regions are displayed on Figure 1-1.)

- The state has adopted ambient standards for TSP and SO_2 which are equivalent to the original federal Secondary National Ambient Air Quality Standards. Two of these standards for SO_2 are no longer in effect at the federal level but still exist as state standards. Attainment of these state standards would require stricter emission controls than would attainment of the present federal NAAQS only.

- The state used the example region approach to develop both SO_2 and particulate emission regulations. This approach was supplemented by rollback calculations at three locations where particularly high TSP levels were reported.

- Within the framework of this limited review, there appears to be little possibility for particulate emission regulation relaxation. High particulate levels are being measured throughout most of the state.

- North Carolina's SO_2 emission regulation allows fuel switching and the simultaneous use of high and low sulfur fuels to meet the SO_2 emission limit. A reduced emission limit is scheduled to be met in 1980.

- No SO_2 NAAQS violations were reported in North Carolina and there are indications of a significant state-wide capacity to absorb increased SO_2 emissions.

- Significant clean fuels savings could be realized in all AQCRs if regulations were relaxed and if higher sulfur fuels were available.

- Given the last three conclusions, the state of North Carolina could consider relaxation of its SO_2 emission regulations. However, even under the present regulations, many sources could utilize higher sulfur fuels than they presently burn. Thus, the potential for clean fuel savings exists for some sources even within the present regulation. An overall move to higher sulfur fuel use would require regulation revision. The present lack of data indicates that a substantial modeling effort would be required to indicate to what extent, if any, relaxation could be allowed.

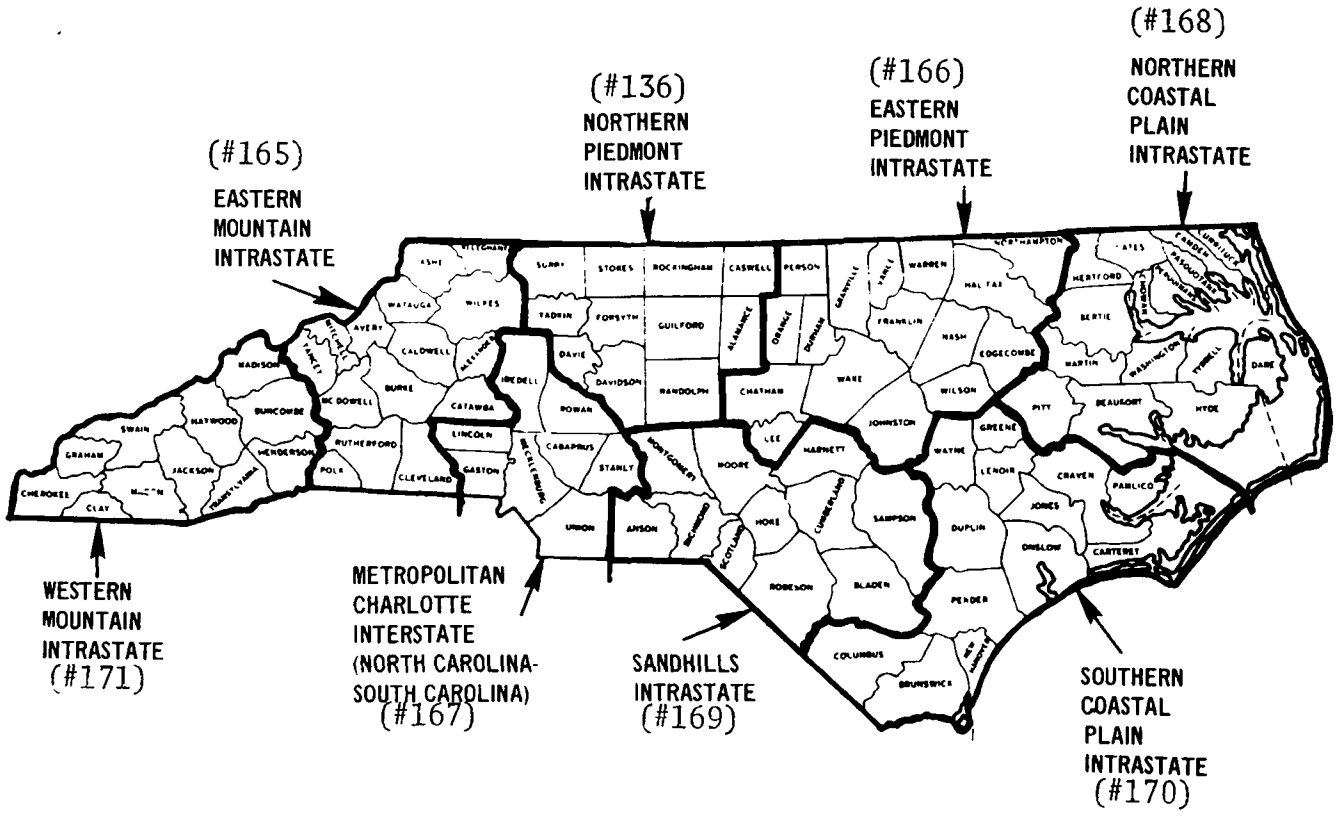

Figure 1-1. North Carolina Air Quality Control Regions (AQCRs)

- The generally poor particulate air quality suggests that allowing fuel switching from oil to coal would require careful consideration of the local and potential regional impact of any proposed switch.

- Present North Carolina regulations generally require coal with less than 2% sulfur and oil with 2-3% sulfur at plants burning a single type of fuel. (About 1% sulfur coal and 1.5% sulfur oil by 1980.) A significant amount of coal and oil is used in the state. The major effect of regulation relaxation would be to allow the utilization of both higher sulfur coals and oils.

2.0 NORTH CAROLINA STATE IMPLEMENTATION PLAN REVIEW

2.1 Summary

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the state have air quality standards which are more stringent than NAAQS?

- Does the state have emission limitation regulations for control of (1) power plants, (2) industrial sources, (3) area sources?

- Did the state use an example region approach for demonstrating the attainment of NAAQS or more stringent state standards?

- Has the state initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?

- Are there proposed Air Quality Maintenance Areas?

- Are there indications of a sufficient number of monitoring sites within a region?

- Is there an expected 1975 attainment date for NAAQS?

- Based on (1973) air quality data, are there reported violations of NAAQS?

- Based on (1973) air quality data, are there indications of a tolerance for increasing emissions?

- Are the total emissions from stationary fuel combustion sources a relatively small portion of the regional total?

- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?
- Is there a significant clean fuels savings potential in the region?
- Must the regulations be revised to accomplish significant fuels switching?

This SIP review has answered these questions based on an overall evaluation of EPA's current information. Based on these answers, each AQCR has been assessed as a good, marginal, or poor candidate for regulation relaxation. An AQCR is assessed as a good candidate if the air quality indicators show that the region has a tolerance to absorb increased emissions and if the source-by-source evaluations show that significant clean fuels savings could be effected by such revision. If the air quality situation is such that no emission increase could be tolerated and/or if the source evaluations show little or no clean fuel savings potential, then the region is classified as a poor candidate for regulation revision. If the air quality or clean fuels evaluations are inconclusive or show conflicting information, then the region is assessed as a marginal candidate for regulation revision and a more detailed analysis is needed to resolve the situation. Table 2-1 summarizes the conclusions of this State Implementation Plan Review and gives the overall candidacy assessment for each AQCR.

2.2 Air Quality Setting for the State of North Carolina

2.2.1 North Carolina Air Quality Control Regions

The state of North Carolina is divided into eight Air Quality Control Regions as shown on Figure 1-1. There are seven intrastate regions and one interstate region. The Northern Piedmont Intrastate AQCR (#136) and the Metropolitan Charlotte Interstate AQCR (#167) have significantly higher population densities than the other regions in the state. Based on present conditions and growth projections for the state, Guildford and Forsyth Counties in Northern Piedmont (#136) and Mecklenburg County in Metropolitan Charlotte (#167) have been proposed as Air Quality Maintenance Areas (AQMAs) for particulates as shown on Figure 2-1.

Table 2-1. State Implementation Plan Review Summary for North Carolina

"INDICATORS"	State		Northern Piedmont AQCR# 136		Eastern Mountain AQCR# 165		Eastern Piedmont AQCR# 166		Metropolitan Charlotte[a] AQCR# 167	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	No	Yes								
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources	Yes Yes Yes	Yes Yes Yes								
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Yes	Yes	b						Example Region	
• Has the State initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	No	No								
• Are there proposed Air Quality Maintenance Areas?			Yes	No	No	No	No	No	Yes	No
• Are there indications of a sufficient number of monitoring sites within a region?			Yes[c]	Yes	Yes[c]	Yes[c]	Yes[c]	Yes	Yes[c]	Yes
• Is there an expected 1975 attainment date for NAAQS?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Based on (1973) Air Quality Data, are there reported violations of NAAQS?			Yes	No	Yes[d]	No[d]	Yes	No	Yes	No
• Based on (1973) Air Quality Data, are there indications of a significant tolerance for increasing emissions?			No	Yes	No	Yes	No	Yes	No	Yes
• Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?			No	No	No	No	No	No	No	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
• Is there a significant Clean Fuels Saving potential in the region?			Yes		Yes		Yes		Yes	
• Must the regulations be revised to accomplish significant fuel switching?			Yes		Yes		Yes		Yes	
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?			TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Marginal	

Table 2-1. State Implementation Plan Review Summary for North Carolina (Contd.)

"INDICATORS"	Northern Coastal Plain AQCR# 168		Sandhills AQCR# 169		Southern Coastal Plain AQCR# 170		Western Mountain AQCR# 171	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?								
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources								
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?							[b]	
• Has the State initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?								
• Are there proposed Air Quality Maintenance Areas?	No	No	No	No	No	No	No	No
• Are there indications of a sufficient number of monitoring sites within a region?	Yes[c]	Yes	Yes[c]	Yes[c]	Yes[c]	Yes[c]	Yes[c]	Yes[c]
• Is there an expected 1975 attainment date for NAAQS?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Based on (1973) Air Quality Data, are there reported violations of NAAQS?	Yes[d]	No	Yes[d]	No[d]	Yes[d]	No[d]	Yes[d]	No[d]
• Based on (1973) Air Quality Data, are there indications of a significant tolerance for increasing emissions?	No	Yes	No	Yes	No	Yes	No	Yes
• Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?	Yes	No	Yes	No	Yes	No	No	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	NA	NA	NA	NA	NA	NA	NA	NA
• Is there a significant Clean Fuels Saving potential in the region?	Yes		Yes		Yes		Yes	
• Must the regulations be revised to accomplish significant fuel switching?	Yes		Yes		Yes		Yes	
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?	TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Marginal	

[a] Interstate.

[b] Example region modeling supplemented by rollback at high TSP stations in this region.

[c] There is a sufficient number of sites but not all of them are reporting an annual average.

[d] No annual data.

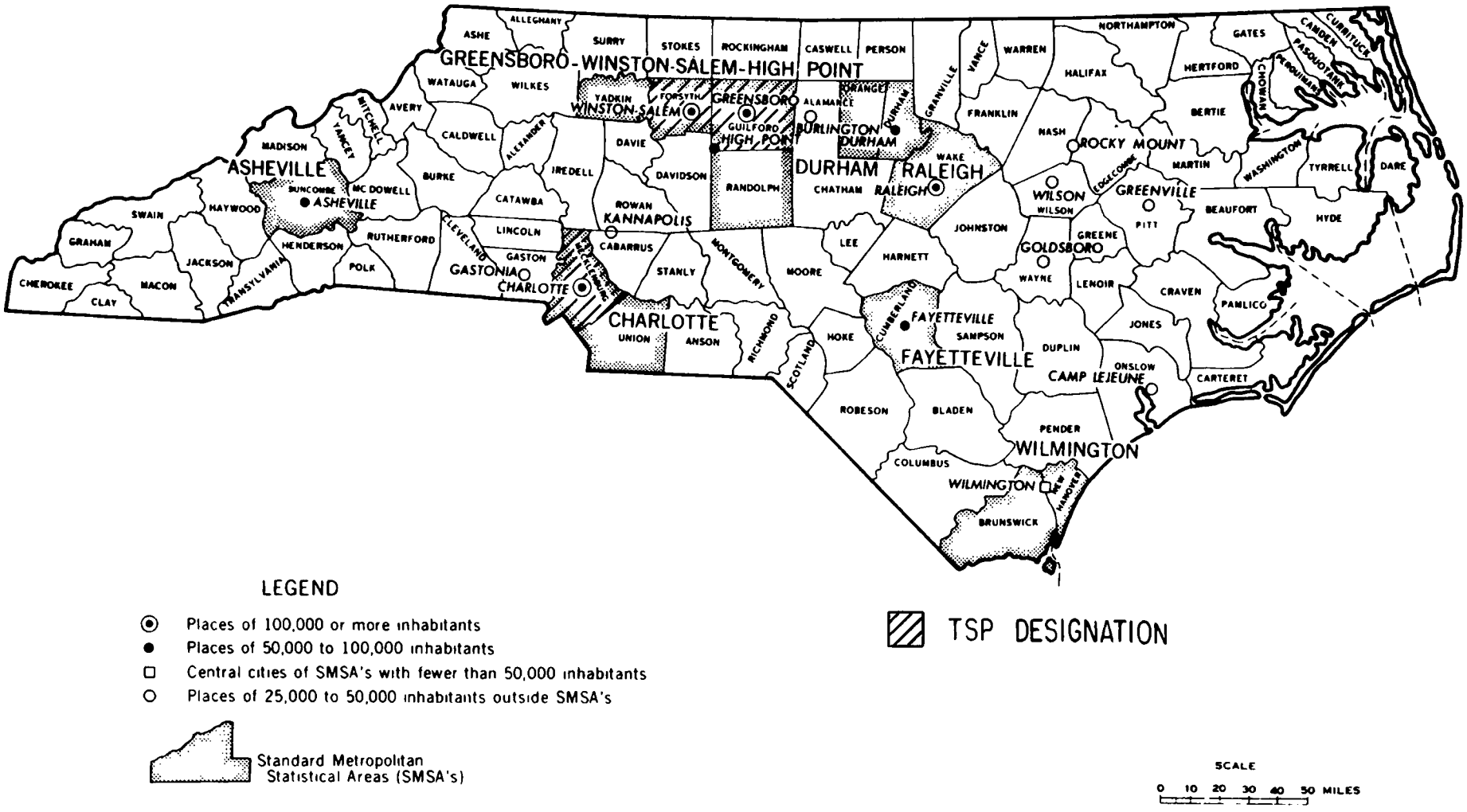

Figure 2-1. Proposed North Carolina Air Quality Maintenance Areas (AQMAs)

2.2.2 North Carolina Ambient Air Quality Standards

All the federal primary and secondary National Ambient Air Quality Standards for particulates, sulfur dioxide, and nitrogen dioxide apply in North Carolina. In addition, the state retains annual and 24-hour sulfur dioxide standards equivalent to federal secondary standards which have been rescinded by EPA. These state SO_2 standards are more stringent than the present federal primary standards. North Carolina also has a 24-hour nitrogen dioxide standard which can be more stringent than the federal standard. North Carolina air quality standards are summarized on Table 2-2. This review considers only the attainment of the federal NAAQS.

2.2.3 North Carolina Air Quality Status

Based on data in the SAROAD data banks as of June, 1974, both the annual and 24-hour particulate NAAQS were being violated in the Northern Piedmont (#136), Eastern Piedmont (#166), and Metrpolitan Charlotte (#167) AQCRs. Annual average data is unavailable for Eastern Mountain (#165), Northern Coastal Plain (#168), Sandhills (#169), Southern Coastal Plain (#170) and Western Mountain (#171). Each of these six regions, however, was recording violations of the short-term particulate standards. Since all regions are significantly above the NAAQS, there are regional indications that overall relaxation of particulate regulations would not be possible without disrupting NAAQS attainment or maintenance.

No SO_2 NAAQS violations were reported in any of North Carolina's eight AQCRs. However, no annual average data were available from the Eastern Mountain (#165), Sandhills (#169), Southern Coastal Plain (#170), and Western Mountain (#171) regions. There are thus indications based on regional air quality that a significant tolerance for increased SO_2 emissions exists throughout North Carolina.

2.2.4 North Carolina Emissions Summary

In the eight AQCR region, emissions from North Carolina fuel combustion account for about half of the total particulate and almost 90% of the total SO_2 emissions. There are no power plants in the Northern Coastal Plain AQCR (#168).

Table 2-2. North Carolina Ambient Air Quality Standards

All concentrations in $\mu gm/m^3$

		Total Suspended Particulate		Sulfur Oxides			Nitrogen Dioxide	
		Annual	24-Hour	Annual	24-Hour	3-Hour	Annual	24-Hour
Federal	Primary	75(G)	260[a]	80(A)	365[a]	---	100(A)	---
	Secondary	60(G)	150[a]	---	---	1300[a]	100(A)	---
State		60(G)	150[a]	60(A)[b]	260[a,b]	1300[a]	100(A)	250[a]

[a]Not to be exceeded more than once per year.

[b]Was adopted based on original EPA policy which was rescinded July, 1973.

(A) Arithmetic mean
(G) Geometric mean

The largest fraction of particulate emissions from fuel burning in North Carolina comes from electricity generation in the Eastern Piedmont (#166), Metropolitan Charlotte (#167), and Southern Coastal Plain (#170) AQCRs. Industrial/commercial/institutional point sources contribute the largest fraction in the Northern Coastal Plain (#168) and Western Mountain (#171) regions while area sources are the largest contributors in Northern Piedmont (#136) and Sandhills (#169). In the Eastern Mountain (#165) region, both electricity generation and area sources emit large portions of the particulates from fuel combustion.

The largest fraction of the SO_2 emissions from fuel combustion in North Carolina comes from electricity generation in the Northern Piedmont (#136), Eastern Mountain (#165), Eastern Piedmont (#166), and Metropolitan Charlotte (#167) AQCRs and from industrial/commercial/institutional point sources in the Northern Coastal Plain (#168) and Western Mountain (#171) AQCRs. Electricity generation, industrial/commercial/institutional point sources, and area sources each contribute about the same fraction of SO_2 emissions from fuel combustion in the Sandhills (#169) region. In the Southern Coastal Plain (#170) region, both electricity generation and industrial/commercial/institutional point sources emit about the same amount of SO_2 and substantially more than area sources.

2.3 Background on the Development of the Current State Implementation Plan

2.3.1 General Information

The example region approach was used to develop the North Carolina State Implementation Plan. Metropolitan Charlotte AQCR (#167) was designated as the example region. The Air Quality Display Model was used to demonstrate the sufficiency of the regulations to meet the SO_2 and particulate annual secondary NAAQS. (At that time, the annual and 24-hour secondary NAAQS for SO_2 were still in effect at the federal level.) At one or more sites in the Northern Piedmont (#136) and Western Mountain (#171) AQCRs, particulate concentrations higher than those in Metropolitan Charlotte (#167) were recorded. Rollback calculations were used at these sites to demonstrate the sufficiency of the proposed regulations. Considerations of expected growth over a five

year period in Metropolitan Charlotte indicated that the standards woul be maintained. The sufficiency of the regulations for attainment and maintenance for the 24-hour particulate and SO_2 and the 3-hour SO_2 standards was not demonstrated.

2.3.2 Particulate Control Strategy

The control strategy for particulate emissions from fuel combustion sources consists of enforcement of Section II, Regulation No. 2 for visible emissions and Section IV, §1.10 for particulate matter emissions from fuel burning sources of the Regulations Governing the Control of Air Pollution of the North Carolina Board of Water and Air Resources. These regulations were designed to meet the annual secondary NAAQS throughout North Carolina. They apply to area sources as well as point sources. Pertinent portions of these regulations are summarized on Table 2-3 and Figure 2-2.

2.3.3 Sulfur Dioxide Control Strategy

Section IV, §2.40 of the Regulations Governing the Control of Air Pollution contains the emissions limits whose enforcement consitutes the SO_2 control strategy. These limitations are summarized on Table 2-3. All sources, including area sources, are subject to regulations, designed to ensure attainment of the old annual secondary NAAQS for SO_2 throughout the state. (These standards have been rescinded at the federal level but remain state standards.) For sources existing on July 1, 1971, a more restrictive standard, equivalent to the standard for new sources, applies after July 1, 1980 than applies between 1971 and 1980. The regulation allows the mixed firing of high and low sulfur fuels to meet the emission limit.

2.4 Special Considerations for the State of North Carolina

2.4.1 Planned SIP Revisions

North Carolina is not presently considering changings its State Implementation Plan with respect to fuel combustion sources.

Table 2-3. North Carolina Fuel Combustion Emission Regulations

	Existing	New[a]
Visible[b]	No emission shall be darker than Ringelmann #2 or equivalent spacity for more than 5 min. in any one hour or for more than 20 min. in any 24-hour period. On July 1, 1976, the standard for new sources shall apply.	No emission shall be darker than Ringelmann #1 or equivalent opacity for more than 5 min. in any one hour or for more than 20 min. in any 24-hour period.
Particulate Matter[c]	Heat Input[d] (10^6 Btu/hr) / Maximum Allowable Emission of Particulate Matter (lb-hr/10^6 Btu) Up to and including 10: 0.60 100: 0.33 1,000: 0.18 ≥ 10,000: 0.10 Between the values listed see Figure A-1.	Same as existing units.
SO_2	2.3 lb $SO_2/10^6$ Btu input per hour[e] Existing sources must meet the new source standard by July 1, 1980 unless a source demonstrates that ambient air quality standards in its vicinity will not be contravened.	1.6 lb $SO_2/10^6$ Btu input per hour

[a]Constructed after July 1, 1975.

[b]Exceptions exist during startups using approved procedures or where uncombined water vapor is the only reason for failure to comply.

[c]Applies to fuels such as coal, coke, lignite and fuel oil, but not wood or refuse. Separate emission limits apply for wood and refuse.

[d]Total heat input of all fuel burning units in a plant is used to determine maximum allowable emission.

[e]Lower limit could apply if violations of ambient air quality standards due to a specific source were demonstrated.

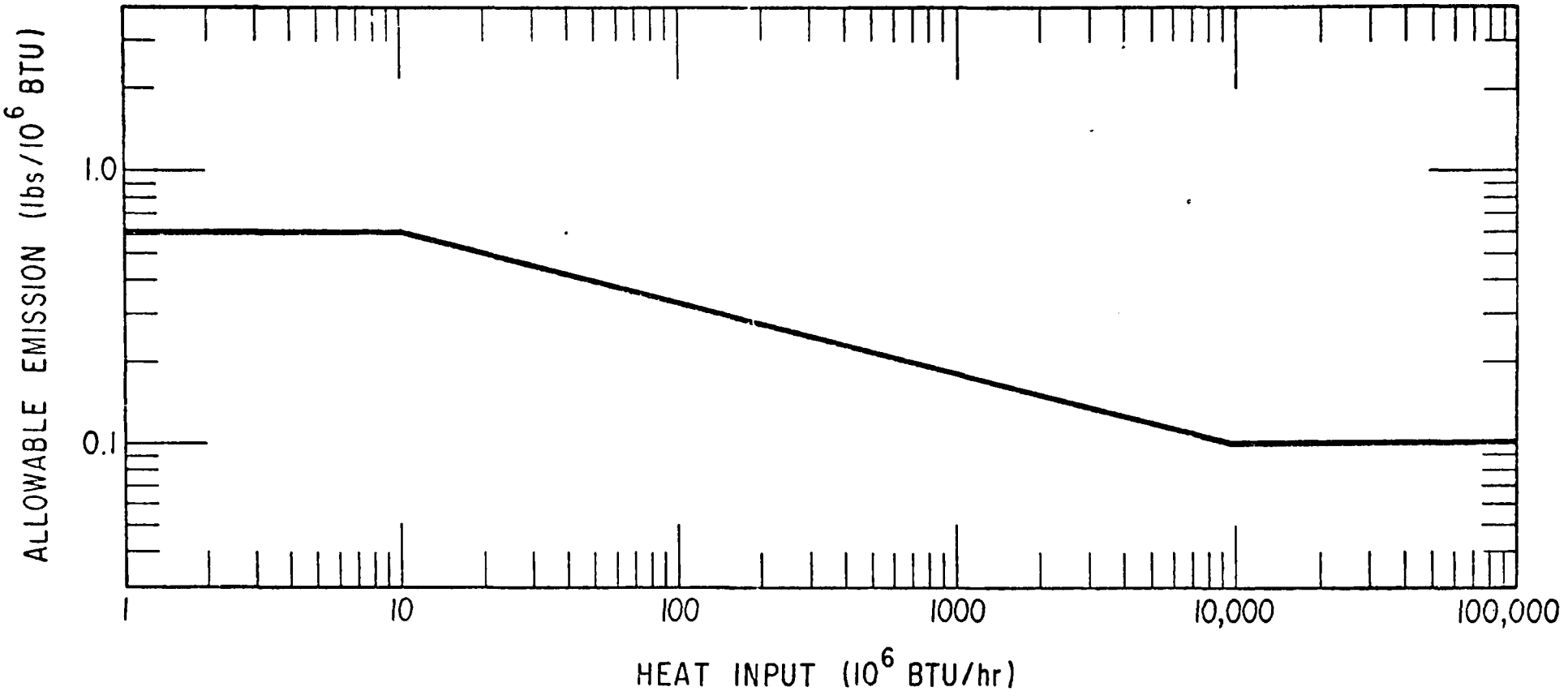

Figure 2-2. Allowable Particulate Emissions from Fuel Combustion Sources in North Carolina

2.4.2 Fuels

Compared to large industrialized states, North Carolina is not a large fuel user. Coal is the primary fuel in power plants. Several power plants, including the large new Belews Creek units, are coal-fired and state-wide about 60% of the heat input for industrial/commercial/institutional point sources comes from oil and about one-third from coal. For area sources, over half the heat input comes from gas and about 40% from oil.

2.4.3 Fuel Conversions

The Federal Energy Adminstration has identified the Sutton power plant in the Southern Coastal Plain (#17) AQCR as having the potential to shift from oil tocoal. Due to the indicated poor particulate air quality, such a change would require careful investigation of the possible effects on attaining and maintaining the particulate NAAQS.

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS OPEN ENDED TERMS	c. COSATI Field Group
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