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Final Northeast Regional Environmental Impact Statement

The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels

October 1982

U.S. Department of Energy
Economic Regulatory Administration
Office of Fuels Programs

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Summary of Issues and Conclusions

The Final Northeast Regional Environmental Impact Statement (FEIS), issued by the U.S. Department of Energy, Economic Regulatory Administration (USDOE), addresses the proposed action of converting, under the authority of the Powerplant and Industrial Fuel Use Act, up to 42 powerplants in the Northeast from oil or gas to coal. This proposed action has associated with it the potential for cumulative or interactive regional environmental impacts. The FEIS is designed to provide decision-makers with information on the types and magnitude of environmental impacts associated with a range of conversion scenarios within the coal alternative. The scenarios are defined in terms of the air pollution emission limitations that could be imposed on a particular facility by a state or federal agency as a condition for conversion to coal.

To obtain public input on the DEIS, USDOE held public hearings December 16-18, 1981, in Boston, New York, and Philadelphia. From these meetings the following key issues were identified:

- Validity of the original number of conversions (42 powerplants).
- Changes in stack parameters and emission limitations that would occur upon conversion of some stations.
- Validity of assumptions in the long-range transport model, ASTRAP.
- Severity of acid deposition impacts on agriculture, water quality, and cultural resources.
- Availability and feasibility of waste disposal sites, particularly ocean disposal of ash.
- Potential for marketing coal ash as a reusable product.
- Predicted impact of incremental changes in air quality from coal conversion upon public health.
- Availability of low-sulfur coal from Appalachia.
- Potential for additional opportunities for conservation and utilization of alternative energy technologies in the Northeast.

Environmental consequences were reanalyzed, using new data provided by the utilities for the 42-station conversion (Coal SIP and Modified Coal SIP) scenarios and the 27-station (Voluntary Conversion) scenario. The substantive environmental areas analyzed in the FEIS are the same as those analyzed in the DEIS: air quality, water quality, land use, biotic resources, socioeconomics, and health effects. Analysis indicates that there are few regional cumulative or interactive impacts associated with the proposed

Responsible Agency: U.S. Department of Energy
Economic Regulatory Adminstration
Office of Fuels Programs
Division of Fuels Conversion

Title of Proposed Action: Potential Conversion from Oil to Coal of 42 Powerplants in the Northeastern United States

Designation: Final Environmental Impact Statement

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Abstract: This final environmental impact statement (FEIS) assesses the potential for cumulative and interactive impacts resulting from the conversion of 42 powerplants in the Northeastern United States from oil to coal and from a more likely "Voluntary Conversion" scenario of 27 powerplants. The FEIS is designed to provide decision-makers with information on the types and magnitude of environmental impacts associated with a range of conversion scenarios within the coal alternative. These scenarios are defined in terms of the air pollution emission limitations that could be imposed on a particular facility by a state or federal agency as a condition for conversion to coal. The substantive areas of environmental impact that are analyzed are: air quality, water quality, land use, biotic resources, socioeconomics, and health effects. In addition to coal burning, the potential environmental impacts associated with conservation, and with the solar, wind, hydroelectric, coal-fired cogeneration, wood, and geothermal alternatives are assessed. This document together with the draft environmental impact statement (DEIS) constitute USDOE's Final Northeast Regional Environmental Impact Statement.

action under the Coal SIP and Modified Coal SIP scenarios and that under the Voluntary Conversion Scenario, there are even fewer impacts and those that do occur are of lesser intensity than was analyzed in the DEIS.

The areas where there remains potential for cumulative impacts are identified below:

- At the regional scale, long-range transport modeling predicts an increase in sulfur deposition of up to 6% under worst-case conditions in the New York City area, with the increase droping off rapidly away from the area. Under the Voluntary Conversion Scenario, the increase is 3-4% in the New York City area and 1-2% in New England and the Maritime Provinces. The slight increase in hydrogen ion deposition is not expected to cause an appreciable change in the pH of the regional surface waters or significant impacts on biotic resources. (Note that the use of the long-range model to provide order-of magnitude estimates is appropriate for EIS purposes, although such models cannot be used to provide a quantitative basis for use in the regulatory process.)

- Under the Voluntary Conversion Scenario, the regional volume of combustion waste (both ash and sludge) is about 35% of that produced under the Coal SIP Scenario reported in the DEIS. If air pollution limitations require the use of scrubbers, the sludge generated from coal combustion could tax available disposal capacity in Connecticut.

- Transportation network modeling indicates that no serious bottlenecks in the rail system should occur from the predicted 20% increase in the demand for coal associated with conversions in the Northeast. There could, however, be bottlenecks at Port Reading, New Jersey, if expansion plans for this facility are not implemented. Under the Voluntary Conversion Scenario, the increase in demand for coal is reduced to 14%.

- The 4% increase in mining activity associated with the 20% increase in coal demand will result in an increase in mining fatalities in 1991 of 4% over a base of 68.2. Injuries will increase by 3% over a base of 8387. There will also be a potential increase of 30 fatalities (over a base of 1541) and 1050 injuries (over a base of 54,306) associated with increased rail traffic. This would be reduced under the Voluntary Conversion Scenario.

- Dispatch analysis for the three power pools in the region (the New England Power Pool, the New York Power Pool, and the Pennsylvania-New Jersey-Maryland Interconnection) indicates that if maximum displacement of oil is to be achieved, alternative technologies (including conservation) are complementary to coal conversion, and cannot be substituted for it.

Increases in short-term pollutant concentrations will increase the risk of aggravation of existing asthmatic and respiratory conditions, cause additional slight eye irritation and minor transitory effects in persons undergoing strenuous exercise, and may slightly increase public susceptibility to bacterial infections. These effects will be confined primarily to large urban areas where pollution levels are already high.

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1. SUMMARY

1.1 DESCRIPTION OF THE PROPOSED ACTION

In October 1981, the United States Department of Energy (USDOE) issued the Draft Northeast Regional Environmental Impact Statement (DOE/EIS-0083-D). That DEIS addressed the proposed action of the cessation of the use of oil and natural gas as the primary energy source in up to 42 powerplants in the Northeastern United States. For the analysis contained in the DEIS, it was assumed that such cessation would be accomplished through the use of coal as a primary energy source in these powerplants.

Comments on the DEIS were received both during and after a formal 90-day public comment period. The purpose of this document is to address those comments. This document, designated DOE/EIS-0083-F, and the DEIS (incorporated by reference) together constitute USDOE's Final Northeast Regional Environmental Impact Statement.

As explained in the DEIS, USDOE involvement in the proposed action consists of the potential for issuance of a prohibition order covering one or more of these powerplants under the provisions of the Powerplant and Industrial Fuel Use Act (FUA) of 1978. As amended by the Omnibus Budget Reconciliation Act (OBRA) of 1981, which provides for a totally voluntary conversion program, a utility may certify to USDOE that statutory findings regarding the technical and financial feasibility of the conversion can be met, and may request that USDOE issue a prohibition order based on that certification. A powerplant covered by such an order is eligible for certain preferential status under the Clean Air Act.

The 42 powerplants included in the study (see Table 1.1) are located in a ten-state region extending from Maryland to Maine.* The sites were selected from an original list of 117 coal-capable plants developed by the President's Coal Commission. The original list was reduced by the U.S. Department of Energy (USDOE), using the criteria of eliminating (1) most units over 25 years of age and (2) stations with an aggregate capacity of less than 100 megawatts (MW). The age and size criteria focused attention on those powerplants that had the greatest potential for oil displacement and economic benefits, and on those units having the longest remaining useful life.

The proximity of these coal-capable powerplants to each other (see Fig. 1.1) suggests a potential for the impacts from coal combustion to interact, creating larger or different types of effects than would generally be associated with any individual plant. The physical extent of these collective impacts might also reach beyond the area surrounding the individual plants into a larger geographic region.

For the purposes of the EIS, the following types of impacts are defined:

- Site-specific impacts are impacts confined to the immediate area, generally within 50 km, of a particular site, e.g., impacts associated with the conversion of a single powerplant.
- Interactive impacts result from the combination or interaction of individual impacts from two or more powerplant conversions, and may differ from the individual impacts.
- Regional impacts are interactive impacts which extend beyond the areas surrounding the individual plants into a larger region.
- Cumulative impacts are impacts that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such action.

An effective strategy for coal conversion involving multiple facilities requires information on these larger-scale cumulative and interactive effects so that decisions on site feasibility can

*Vermont generally has been excluded from the study, as the state contains none of the subject utility boilers, nor is it considered a location for combustion waste disposal.

Table 1.1. Facilities Included in the Northeast Regional Environmental Impact Statement

42-Station Conversion Scenarios[a]		27-Station (Voluntary) Conversion Scenario[b]	
State/Facility	Unit	State/Facility	Unit
Connecticut		Connecticut	
Bridgeport Harbor	3	Bridgeport Harbor	3
Devon	7,8	Devon	7,8
Middletown	1,2,3		
Montville	5		
Norwalk Harbor	1,2	Norwalk Harbor	1,2
Delaware		Delaware	
Edge Moor	1,2,3,4	Edge Moor	3,4
Maine		Maine	
Mason	1,2,3,4,5	Mason	3,4,5
Maryland		Maryland	
Brandon Shores	1,2	Brandon Shores	1,2
Crane	1,2	Crane	1,2
Riverside	4,5		
Herbert A. Wagner	1,2		
Massachusetts		Massachusetts	
Canal	1		
Mt. Tom	1	Mt. Tom	1
Mystic	4,5,6	Mystic	4,5,6
New Boston	1,2	New Boston	1
Salem Harbor	1,2,3	Salem Harbor	1,2,3
Somerset	6	Somerset	5,6
West Springfield	3	West Springfield	1,2,3
New Hampshire		New Hampshire	
Schiller	4,5,6	Schiller	4,5,6
New Jersey		New Jersey	
Bergen	1,2	Bergen	2
Burlington	7	Burlington	7
Deepwater	7,8,9	Deepwater	7,8,9
Hudson	1		
Kearny	7,8		
Sayreville	4,5	Sayreville	4,5
Sewaren	1,2,3,4		
New York		New York	
Albany	1,2,3,4	Albany	1,2,3,4
Arthur Kill	2,3	Arthur Kill	2,3
Danskammer Point	1,2,3,4	Danskammer Point	3,4
E.F. Barrett	1,2	E.F. Barrett	1,2
Far Rockaway	4		
Glenwood	4,5		
Lovett	3,4,5	Lovett	3,4,5
Northport	1,2,3,4		
Oswego	1,2,3,4		
Port Jefferson	1,2,3,4	Port Jefferson	3,4
Ravenswood	3	Ravenswood	3
Pennsylvania		Pennsylvania	
Cromby	2	Cromby	2
Schuylkill	1		
Southwark	1,2		
Springdale	7,8		
Rhode Island		Rhode Island	
South Street	12	South Street	12
TOTAL STATIONS	42	TOTAL STATIONS	27
TOTAL UNITS	94	TOTAL UNITS	55

[a]See Figure 1.1.

[b]See Figure 1.2.

Fig. 1.1. Facilities Included in the Northeast Regional Environmental Impact Statement under the 42-Station Conversion Scenarios

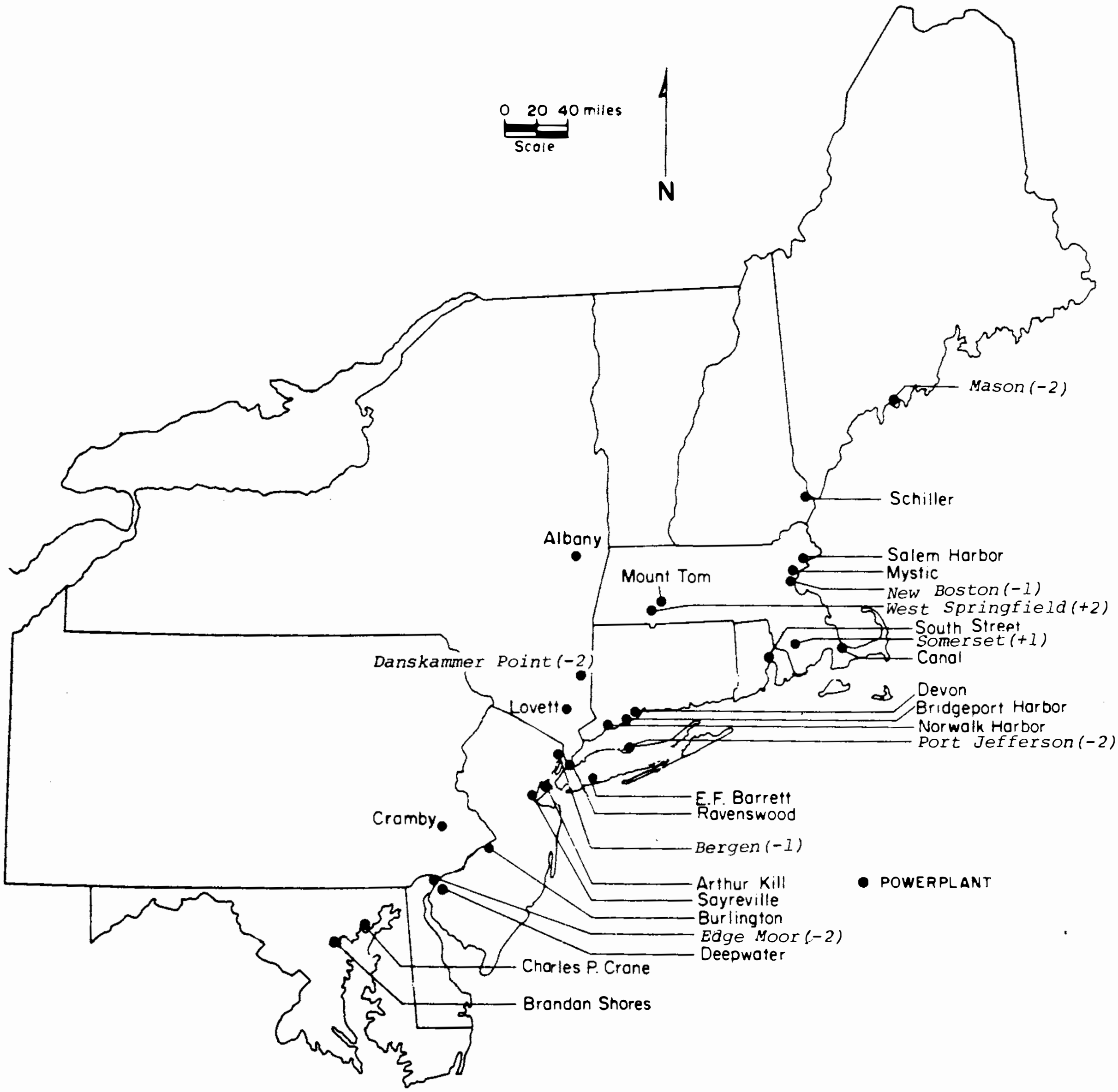

Fig. 1.2. Facilities Included in the Northeast Regional Environmental Impact Statement under the 27-Station (Voluntary) Conversion Scenario. Station names set in italic type indicate a change in the number of units likely to convert.

be made and appropriate mitigative strategies adopted. The cumulative analysis provides the site-specific analyses with a broad set of constraints which if not considered could reduce the likelihood of individual conversions.

In an effort to provide information on these various kinds of impacts, the Northeast Regional Environmental Impact Study was undertaken by USDOE. The study focuses on the potential effects of multiple coal conversions, in a fairly discrete geographic region, on (1) air quality, (2) solid waste disposal, (3) fuel supply and transportation, and (4) health effects. These technical areas were identified as those in which cumulative effects are most likely to occur. A separate technical task force report for each of these technical areas (see References at the end of this section) provides information on the extent and magnitude of the impacts predicted from the increase in demand for coal in the northeastern United States as a result of the conversions. Information from these reports has been incorporated in the analysis for this EIS.

The depth and breadth of coverage in the technical reports and in this EIS are sufficient to provide a data base for site-specific environmental analyses as well as providing a broader perspective for assessing the impacts of the proposed action. Detailed site-specific issues are not treated in this study; instead, generic issues that are cumulative or interactive on a regional basis are emphasized. This approach conforms to the intent of the National Environmental Policy Act (NEPA) in general, and to the Council on Environmental Quality Regulations on implementing NEPA procedures in particular, as the documents provide the middle tier in a three-tiered approach to impact assessment. The first tier is the published Final Programmatic Environmental Impact Statement for the Fuel Use Act (USDOE 1979) and the Revised Programmatic Environmental Impact Statement for the Energy Supply and Environmental Coordination Act (Federal Energy Administration 1977); this is followed by the Draft EIS and the Final EIS (this document). The final tier is composed of site-specific environmental impact statements.

1.2 APPROACH TO ANALYSIS

This environmental impact statement is designed to provide decision-makers with information on the types and magnitude of environmental impacts associated with a range of coal conversion strategies.* To provide this type of information, the approach to environmental impact analysis in the DEIS focused on the assessment of four alternative conversion scenarios. These scenarios are defined in terms of the air pollution emission limitations that could be imposed on a facility by a state or federal agency as a condition for conversion. The use of air quality levels as criteria for determining the feasibility of any proposed conversions is in consonance with the FUA stipulation that all facilities undergoing conversion meet all applicable environmental requirements.

The four air quality scenarios in the DEIS are: (1) the emissions from burning coal at the rate specified for oil in the current State Implementation Plan (Oil SIP); (2) the emissions from burning coal at the current coal SIP (Coal SIP); (3) the emissions from burning coal at the 1971 New Source Performance Standards (1971 NSPS); and (4) the emission limitations proposed by certain utilities and state agencies for their powerplants, with all other powerplants modeled at the coal SIP (Modified Coal SIP). The application of an air quality scenario to all 42 units represents a worst-case estimation of the air quality impacts associated with that scenario.

The overall organizing framework for the DEIS is composed of three interrelated elements: (1) the coal fuel cycle; (2) substantive environmental impact areas such as air quality, water quality, and biotic resources; and (3) geographically defined impact assessment regions. This type of organization provides information on the magnitude and size of an impact as well as on its geographic incidence.

The first element of the framework, the coal fuel cycle, can be disaggregated into five major components: mining, coal cleaning and processing, transportation, combustion, and waste disposal. The second element in the framework, the substantive environmental impact areas, are acted upon by the components of the fuel cycle, potentially producing cumulative and interactive environmental impacts. The substantive environmental impact areas included in this analysis are air quality, water quality, land use, biotic resources, socioeconomics, and public health.

The potential impacts of the fuel cycle components on each of these substantive areas, both in terms of type and degree, depend on the existing conditions (baseline environment) in the physical area where the interaction occurs. In the DEIS, the potential impacts of the proposed action are assessed as they could occur in four conceptually distinct but geographically overlapping regions, each one associated with one or more components of the coal fuel cycle. The

*In this analysis, the only FUA-related fuel that is considered is coal. The assumption is that of the alternate fuels available to a utility, coal, even with adequate environmental controls, provides in comparison a worst-case situation for the purposes of environmental impact analysis.

assessment regions are: the Supply Region, the Transportation Networks Region, the Combustion Region, and the Deposition Region. The relationship between the component of the coal fuel cycle and the assessment regions is represented in Figure 1.3. A summary of environmental impacts that could occur as a result of the proposed action is presented in Table 1.2.

In December 1981, public hearings were held in Boston, New York City, and Philadelphia to receive comments on the DEIS from interested parties. In addition, written comments on the DEIS were received from interested parties through February 1982. Based on all comments that were received, revisions to the DEIS were undertaken.

The following issues were identified:

- Validity of the original number of conversions (42 powerplants).
- Changes in stack parameters and emission limitations that would occur upon conversion of some stations.
- Validity of assumptions in the long-range transport model, ASTRAP.
- Severity of acid deposition impacts on agriculture, water quality, and cultural resources.
- Availability and feasibility of waste disposal sites, particularly ocean disposal of ash.
- Potential for marketing coal ash as a reusable product.
- Predicted impact of incremental changes in air quality from coal conversion upon public health.
- Availability of low-sulfur coal from Appalachia.
- Potential for additional opportunities for conservation and utilization of alternative energy technologies in the Northeast.

The responses to issues raised were of two types: those that consisted of clarification and updating of the analysis done in the DEIS; and those that consisted of the analysis of additional scenarios. These two types of responses formed the organizational basis for the Final Northeast Regional Environmental Impact Statement.

The basis for most of the additional analysis was the concern about the number of stations or units included in the study as well as the accuracy of the site information used in the analysis. To rectify this problem, a survey of all the utilities included in the draft study was undertaken to determine which powerplants were still being considered for coal conversion, the correct operating parameters for the facilities and the current approved SIP limits (see Appendix A, Letter to Utilities). Based on the survey, the 27 stations listed in Table 1.1 and shown in Figure 1.2 are included in the expanded analysis as a separate subset. The 27-station scenario has been designated as the "Voluntary Conversion Scenario," and represents a more likely maximum conversion case, to be contrasted with the 42-station worst-case scenario in the DEIS. The information from the survey provided the basis for revising the existing DEIS air quality analysis; it also provided an additional set of air quality scenarios. The results of the additional air quality modeling were assessed to determine potential environmental impacts.

This Final Northeast Regional Environmental Impact Study is organized in the following way.

Copies of the letters of comment received during the Draft Environmental Impact Statement (DEIS) review period are included in this Final EIS in Section 4. Each letter has been assigned a response code consisting of one or more alphabetical letters, and consecutive numbers have been assigned to individual comments contained in each letter. For example, the correspondence received from the U.S. Environmental Protection Agency has a response code USEPA, and the U.S. Department of Interior has a response code USDOI. The individual comments in the letters are, therefore, assigned designations such as USEPA-1, USEPA-2, USDOI-1, USDOI-2, etc. The letters themselves have been bracketed and coded so the reviewer can readily locate the response to any given comment. Both the letters and specific responses have been reduced in size so that the actual letter appears on the left side of a page and the corresponding response appears on the right side. Where appropriate, a written response has been provided for each comment.

In some cases, a substantial number of comments dealt with one particular area of concern. These comments have been addressed by Topical Responses which appear in Section 3. Thus, for comments requesting more information on the impacts of acid deposition on cultural resources, the response would be: "See Topical Response 3.4." These Topical Responses are designed to answer the comments received on the particular issue. The Topical Responses also include analyses of the new air quality scenarios discussed in Section 2.

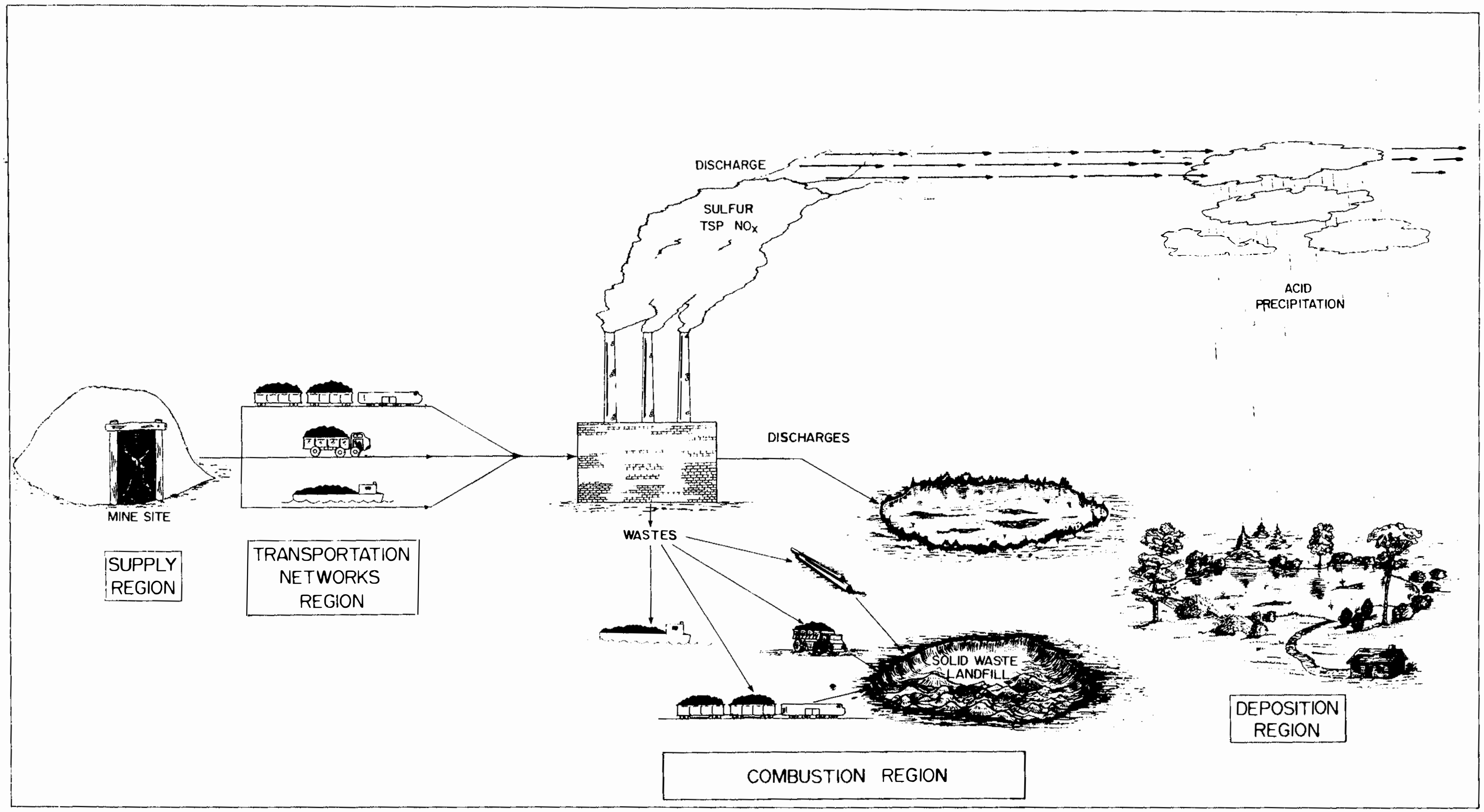

Figure 1.3. Relationship of Coal Fuel Cycle Components and Environmental Assessment Regions

Table 1.2. Summary of Environmental Impacts[a]

	Supply Region	Transportation Networks Region	Combustion Region	Deposition Region
Air quality	No regional cumulative impacts are anticipated. There is a potential for site-specific increases in TSP associated with increases in mining activity. (DEIS Sec. 5.1.1)	No regional cumulative impacts are anticipated. Impacts associated with increased train movements may occur adjacent to the transportation links. (DEIS Sec. 5.1.2)	Dispersion modeling predicts that the conversions will not result in violations of air quality standards or PSD increment on the regional scale as a consequence of cumulative impact under any of the conversion scenarios. (Topical Response 3.1)	Under the Voluntary Conversion Scenario, the increase in sulfur deposition is 3-4% in the New York City area and 1-2% in the Maritime Provinces. (Topical Response 3.2)
Water quality	No regional cumulative impacts are anticipated if the Surface Mining Control and Reclamation Act is adequately enforced. (DEIS Sec. 5.2.1)	No regional cumulative impacts are anticipated. Site-specific impacts may result from spills, leaching, and leakage from coal, limestone and waste, particularly at loading and unloading points. (DEIS Sec. 5.2.2)	No regional cumulative impacts are anticipated. Site-specific impacts could result from the thermal and chemical discharge of individual powerplants into adjacent surface waters. (DEIS Sec. 5.2.3)	For the Voluntary Conversion Scenario, the sulfur deposition of up to 4% represents a pH change of less than 0.02. (Topical Response 3.6)
Land use	No regional cumulative impacts are anticipated. Some site-specific increases in the land area disturbed by surface mining will occur. The total increase in land disturbed is 6% over the total land mined in 1990. (DEIS Sec. 5.3.1)	No regional cumulative impacts are anticipated, as no new railway line construction is required. Site-specific impacts are possible at expanded port facilities. (DEIS Sec. 5.3.2)	The additional solid waste generated by coal combustion and the use of pollution control technology may tax waste disposal capacity in several states in the Northeast (DEIS Sec. 5.3). Under the Voluntary Conversion Scenario the volume of combustion wastes is about 35% of that produced under the DEIS Coal SIP Scenario. (Topical Response 3.5)	No regional cumulative impacts are anticipated from the predicted small increases in in sulfur deposition. (DEIS Sec. 5.3.4)

Table 1.2. Concluded

	Supply Region	Transportation Networks Region	Combustion Region	Deposition Region
Biotic resources	No regional cumulative impacts are anticipated. Site-specific impacts on biotic resources might result from habitat loss associated with mining and coal processing. (DEIS Sec. 5.4.1)	No regional cumulative impacts are anticipated from the increase in coal transport. (DEIS Sec. 5.4.2)	No regional cumulative impacts are anticipated. Site-specific impacts including loss of habitat might result from increase in activity at limestone mines and quarries. (DEIS Sec. 5.4.3)	Based upon available data, the contribution of the proposed action would not appear to adversely affect agricultural production on the region. (Topical Response 3.3)
Socioeconomics	No regional cumulative impacts are anticipated. The increase in coal production associated with the conversion program is within normal levels of activity and is not expected to produce adverse impacts. Increases in mining activity may have positive socioeconomic impacts. (DEIS Sec. 5.5.1 and Topical Response 3.9)	Transportation network modeling indicates the potential for bottlenecks in the port areas if plans for expanding these facilities are not implemented. (DEIS Sec. 5.5.2 and Topical Response 3.10)	There is a potential for the consumption of PSD increment by the converted powerplants. This could limit industrial growth in a number of highly industrialized counties. The extent of this impact could not be quantified. (DEIS Sec. 5.5.3)	Economic impacts associated with the predicted increase in sulfur deposition could not be quantified (DEIS Sec. 5.5.4)
Health effects	An increase of 4% in fatalities in 1991 is associated with increased mining activity. The corresponding increases in injuries and disabilities are 3% and up to 9%, respectively. (DEIS Sec. 5.6.1)	The potential increase in fatalities and injuries associated with increased railroad traffic by 1991 is about 2% above the base case of 111 occupational and 1430 public fatalities, and 47,900 occupational and 6450 public injuries. (DEIS Sec. 5.6.2)	The worst-case increase in the 24-hour pollution concentrations of SO_2, TSP, ozone, NO_2, and respirable particulates (recurrence interval of 5 years) under the Coal SIP Scenario may aggravate respiratory conditions in a small portion of the 17% of the population who have respiratory diseases. Other slight, transitory effects will occur. The health risk for the Voluntary Conversion Scenario will be less. (Topical Response 3.7)	A 2% increase in monthly levels of atmospheric sulfate may contribute to a slight increase in public susceptibility to bacterial infection in areas where high concentrations of other pollutants are present. (Topical Response 3.7)

[a]Unshaded table entries indicate a potential for regional cumulative impacts, or insufficient information to conclude that there is no potential for such impacts. Shaded entries indicate that no regional cumulative impacts are expected.

Some of the letters of comments contained lengthy enclosures consisting of statistical data, reports, large maps, etc. Since this documentation in many cases is not specific to the proposed action but is simply being provided in association with some of the actual comments contained in the letters, or else had no bearing on the comments themselves, it is not reproduced in the FEIS in an effort to conserve space and materials. However, the enclosures are available for public inspection at the Economic Regulatory Administration Office in Washington, D.C. They are incorporated into the official file, and they have been reviewed to determine whether or not their content would change any of the conclusions reached in the Draft EIS.

The comments have been arranged in the following order: federal agencies, state agencies, regional and county agencies, utilities, and private organizations and individuals. Within each of these categories, the comments have been arranged chronologically. The acronyms used to identify the letters of comment are listed on page 4-3.

Section 5 contains a list of Errata and Addenda to the DEIS, and Section 6 is a list of preparers of the FEIS.

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2. DESCRIPTION OF AIR QUALITY SCENARIOS

2.1 INTRODUCTION

The proposed action assessed in the Draft Northeast Regional Environmental Impact Statement (DEIS) was the cessation of the use of oil and natural gas as primary energy sources in up to 42 powerplants in the northeastern United States. The objective of the proposed action, in consonance with the purpose of the Powerplant and Industrial Fuel Use Act of 1978 (Pub. L. 95-620) (FUA), was to minimize or eliminate oil consumption in as many of these units as possible, in compliance with all environmental regulations. These sites were selected from a list of 117 coal-capable plants developed by the President's Coal Commission.

The environmental impact analysis was based upon four alternative conversion scenarios, defined in terms of air pollution emission limitations that could be imposed on a facility by a state or federal agency as a condition for conversion. These four air quality scenarios were: (1) the emissions from burning coal at a rate specified for oil in the current State Implementation Plan (Oil SIP); (2) the emissions from burning coal at the current coal SIP (Coal SIP); (3) the emissions from burning coal at the 1971 New Source Performance Standards (1971 NSPS); and (4) the emission limitations proposed by certain utilities and state agencies for specific powerplants, with all other powerplants modeled at the Coal SIP (Modified Coal SIP).

On August 13, 1981, the Fuel Use Act was amended by the Omnibus Budget Reconciliation Act to provide for a totally voluntary conversion program. As a result of this change, many of the units at these 42 powerplants will not be converted, and the number of powerplants considered to be conversion candidates has been reduced from 42 to 27 (see Table 1.1).

Most of the station data used in the DEIS were obtained from information supplied by the utility to the Federal Energy Regulatory Commission (FERC Form 67). At public hearings held December 16-18, 1981, several utility representatives raised questions about some of the data used in the analysis. Some of these parameters would not apply if conversion occurred (e.g., stack heights) and some information was missing, incorrect, or out of date. It also was noted that many of the conversions considered in the DEIS will not occur, and should not be considered in an assessment of the cumulative impacts of conversion.

As a result of these concerns, a request for additional information on coal conversion plans was sent to each of the utilities involved on January 18, 1982 (see Appendix A, Letter to Utilities). The responses either verified or corrected the stack parameters and/or emission limitations used in the DEIS modeling. If no mention was made of a particular topic, it was assumed that the information in the DEIS was correct. The utilities also were requested to indicate which units they intended to convert to coal. With the new data, three scenarios were developed to analyze the impacts from the various combinations of coal conversions that might occur.

2.2 FEIS AIR QUALITY SCENARIOS

The first scenario is the Coal SIP (CS) Scenario, which is similar to the Coal SIP Scenario in the DEIS. The data used included any corrected plant operating parameters (stack height, gas exit temperature, gas exit velocity, plant capacity factor, etc.) received from the utilities. The emission limitations are the Coal SIP values used in the DEIS except in cases where new information representing regulatory agency limitations was received.

The second scenario analyzed was the Modified Coal SIP (MCS) Scenario, which also included any new data from the utilities, in addition to changes in SIP values that would apply to several of the plants. In all cases, the stack parameters of the MCS are identical to those of the CS. The difference between the two scenarios is in the emission rates: the emission rates of the MCS represent the levels that the utility or Public Service Commission would prefer. In most cases the MCS emission rate is higher than the corresponding value used in the CS scenario. For the Brayton Point facility in southern Massachusetts, which has already converted and is included in the background air quality, the actual emissions from coal burning were used. The purpose of analyzing these two scenarios was to identify possible changes in environmental impacts described in the DEIS that would result from the use of more accurate data.

The third scenario, Voluntary Conversion, includes only the 27 plants (55 units) considered to be the more likely conversion candidates. These plants are modeled as stated under the MCS Scenario and plants not converting are modeled using current emission parameters. Station and location data for all powerplants are presented in Table 2.1, which is an updated version of Table 2.1 of the DEIS. Units that will not be converted are indicated, and three additional conversion candidates not originally considered are added: Somerset 5 and West Springfield 1 and 2. Table 2.2 is a list of relevant information obtained from comments on the DEIS and the specific comment in which the information was provided.

Table 2.3 contains station parameters used for modeling the various scenarios in the FEIS. The information for the Voluntary Conversion Scenario is not explicitly listed but can be determined from Table 2.1. For the units that are not converting, the information listed under baseline conditions was used, and for those converting the information under the Modified Coal SIP Scenario was used.

2.3 QUANTIFICATION OF COAL COMBUSTION AND EMISSION ABATEMENT BY-PRODUCTS FOR THE FEIS AIR QUALITY SCENARIOS

Appendix G of the DEIS contains tabulations of the estimated quantities of ash and FGD solid wastes that would be produced by the conversion of oil- or gas-fired powerplants in the Northeast to coal firing. As a result of new information obtained from many utilities and state agencies, these quantities have been recalculated for the three scenarios specified in Section 2.2.

Although the new information specified that capacity factors for five units will be different from that assumed in the DEIS, the differences are only a few percent. For this reason, the capacity factors were not changed for the purpose of estimating waste produced. For air quality modeling purposes, the capacity factors provided were used (see Topical Response 3.1).

Table 2.4 contains the estimates of resources required and wastes generated for the Coal SIP Scenario using the new information, and corresponds to Table G.2 in the DEIS. Tables 2.5 and 2.6 are the results for the Modified Coal SIP Scenario and the Voluntary Conversion Scenario, respectively. Quantities of ash produced by station are given in Tables 2.7 and 2.8. Tables 2.9 through 2.11 provide the same data by state rather than by generating station.

A comparison of Table 2.9 and Table G.5 of the DEIS shows that the total lime or limestone required for FGD and the wastes produced increase by approximately 8.5%. The primary cause is a decrease in several of the Coal SIPs. For example, in the DEIS the Coal SIP used for the Danskammer Point station was 3.80 lb $SO_2/10^6$ Btu, which could be achieved burning 2.18% S coal with no scrubbing. New information indicated that the Coal SIP should have been 1.06 lb $SO_2/10^6$ Btu, which can be met by burning 0.61% S coal with no scrubbing or 3.5% S coal with 83% scrubbing. The latter was chosen as more reasonable since 0.61% S coal is difficult to obtain economically. The total ash collected decreased by 7% as a result of new information on the ash content of coal to be burned at several stations.

Under the Modified Coal SIP Scenario (Table 2.10), the estimate of resources required and sludge generated decreases by a factor of two. This results from increases in some of the proposed SIPs that permit burning coal without scrubbing. By eliminating units that are not expected to convert, the sludge quantities decrease by an additional factor of three (Table 2.11). Quantities of ash collected decrease by approximately 47% under the Voluntary Conversion Scenario.

Table 2.1. Northeast Regional Conversion Candidates--Station and Location Data
(see footnotes b and c for deletions from and additions to the Voluntary Conversion Scenario)

Station	Utility	Makeup Water Source	Unit	Mega-watts	Year in Service	Boiler Type[a]	City/State	County
Albany	Niagara Mohawk Power Company	Hudson River	1	100	1952	RTAN	Albany, NY	Albany
			2	100	1952	RTAN		
			3	100	1952	RTAN		
			4	100	1954	RTAN		
Arthur Kill	Consolidated Edison Co. of New York	Arthur Kill Estuary	2	335	1959	RFRO, PCFR (dry)	New York, NY	Richmond
			3	491	1969	PCTA (dry)		
Barrett, E.F.	Long Island Lighting Co.	Atlantic Ocean	1	190	1956	RTAN, GTAN, PCTA (dry)	Island Park, NY	Nassau
			2	190	1963	RTAN, GTAN (dry)		
Bergen	Public Service Electric & Gas Co.	Overpeck Creek	1[b]	287	1959	RFRO (wet)	Ridgefield, NJ	Bergen
			2	283	1960	RFRO (wet)		
Brandon Shores	Baltimore Gas & Electric Co.	Patapsco River	1	610	1982	Dry-bottom	Baltimore, MD	Anne Arundel
			2	610	1984	Dry-bottom		
Bridgeport Harbor	United Illuminating Co.	Bridgeport Harbor	3	410	1968	RTAN (dry)	Bridgeport, CT	Fairfield
Burlington	Public Service Electric & Gas Co.	Delaware River	7	180	1955	RFRO (wet)	Burlington, NJ	Burlington
Canal	Canal Electric Co.	Atlantic Ocean	1[b]	572	1968	ROPP	Sandwich, MA	Barnstable
Crane, Charles P.	Baltimore Gas & Electric Co.	Seneca Creek	1	192	1961	CYCL (wet)	Chase, MD	Baltimore
			2	192	1963	CYCL (wet)		
Cromby	Philadelphia Electric Co.	Schuylkill River	2	201	1955	PCTA (dry)	Phoenixville, PA	Chester
Danskammer	Central Hudson Gas & Electric Corp.	Hudson River (estuary)	1[b]	39	1951	RTAN (dry)	Newburgh, NY	Orange
			2[b]	73	1954	RTAN (dry)		
			3	122	1959	RTAN (dry)		
			4	234	1967	RTAN (dry)		
Deepwater	Atlantic City Electric Co.	Delaware River	7	24	1942	OTHE (dry)	Penns Grove, NJ	Salem
			8	80	1954	PCFR, RFRD, GFRP (dry)		
			9	25	1957	RFRO, PCFR (dry)		
Devon	Connecticut Light & Power Co.	Housatonic River	7	107	1956	RTAN	Berlin, CT	New Haven
			8	107	1958	RTAN		

Table 2.1. Continued

Station	Utility	Makeup Water Source	Unit	Megawatts	Year in Service	Boiler Type[a]	City/State	County
Edge Moor	Delmarva Power & Light Co.	Delaware River	1[b]	70	1951	RTAN	Wilmington, DE	New Castle
			2[b]	70	1951	RTAN		
			3	82	1954	RTAN		
			4	167	1966	RTAN		
Far Rockaway	Long Island Lighting Co.	Atlantic Ocean	4[b]	114	1953	RTAN, GTAN, PCTA (dry)	Far Rockaway, NY	Queens
Glenwood	Long Island Lighting Co.	Long Island Sound	4[b]	114	1952	PCTA, RTAN, GTAN (dry)	Hicksville, NY	Nassau
			5[b]	113	1954	PCTA, RTAN, GTAN (dry)		
Hudson	Public Service Electric & Gas Co.	Hackensack River	1[b]	383	1964	CYCL (wet)	Jersey City, NJ	Hudson
Kearny	Public Service Electric & Gas Co.	Hackensack River	7[b]	146	1953	RTAN (wet)	Kearny, NJ	Hudson
			8[b]	146	1953	RTAN (wet)		
Lovett	Orange & Rockland Utilities, Inc.	Hudson River	3	68	1955	PCTA, RTAN, GTAN (dry)	Stony Point, NY	Rockland
			4	187	1966	PCFR, RFRO, GFRO (dry)		
			5	202	1969	PCFR, RFRO, GFRO (dry)		
Mason	Central Maine Power Co.	Sheepscot River (tidal)	1[b]	22	1942	RFRO (dry)	Wiscasset, ME	Lincoln
			2[b]	22	1947	RFRO (dry)		
			3	36	1952	RFRO (wet)		
			4	36	1952	RFRO (wet)		
			5	33	1955	RFRO (wet)		
Middletown	Hartford Electric Light Co.	Connecticut River	1[b]	70	1954	PCFR (wet)	Middletown, CT	Middlesex
			2[b]	117	1958	PCFR (wet)		
			3[b]	233	1964	CYCL (wet)		
Montville	Connecticut Light & Power Co.	Thames River	5[b]	81	1954	RTAN	Uncasville, CT	New London
Mount Tom	Holyoke Water Power Co.	Connecticut River	1	144	1960	RFRO, PCFR (dry)	Holyoke, MA	Hampden

Table 2.1. Continued

Station	Utility	Makeup Water Source	Unit	Mega-watts	Year in Service	Boiler Type[a]	City/State	County
Mystic	Boston Edison Co.	Tidal Basin	4	145	1957	RTAN (dry)	Everett, MA	Middlesex
			5	142	1959	RTAN (dry)		
			6	155	1961	RTAN (dry)		
New Boston	Boston Edison Co.	Tidal Basin	1	358	1968	ROPP (dry)	South Boston, MA	Suffolk
			2[b]	380	1972	ROPP (dry)		
Northport	Long Island Lighting Co.	Long Island Sound	1[b]	383	1967	RTAN (dry)	Northport, NY	Suffolk
			2[b]	383	1968	RTAN (dry)		
			3[b]	383	1972	RTAN (dry)		
			4[b]	386	1977	RTAN (dry)		
Norwalk Harbor	Connecticut Light & Power Co.	Long Island Sound	1	162	1960	RTAN	Norwalk, CT	Fairfield
			2	171	1963	RTAN		
Oswego	Niagara Mohawk Power Corp.	Lake Ontario	1[b]	90	1940	RFRO (dry)	Oswego, NY	Oswego
			2[b]	90	1941	RFRO (dry)		
			3[b]	95	1948	RFRO (dry)		
			4[b]	100	1951	RFRO (dry)		
Port Jefferson	Long Island Lighting Co.	Long Island Sound	1[b]	49	1948	PCTA, RTAN (dry)	Port Jefferson, NY	Suffolk
			2[b]	48	1950	PCTA, RTAN (dry)		
			3	190	1958	PCTA, RTAN (dry)		
			4	190	1960	PCTA, RTAN (dry)		
Ravenswood	Consolidated Edison Co. of	East River Estuary	3	928	1965	TRAN, PCTA (dry)	New York, NY	Queens
Riverside	Baltimore Gas & Electric Co.	Patpasco River	4[b]	78	1951	RFRO (dry)	Baltimore, MD	Baltimore
			5[b]	65	1953	RFRO (dry)		
Salem Harbor	New England Power Co.	Atlantic Ocean	1	83	1952	PCFR (wet)	Salem, MA	Essex
			2	80	1952	PCFR (wet)		
			3	147	1972	PCFR (wet)		
Sayreville	Jersey Central Power & Light Co.	Raritan River	4	138	1955	CYCL, PCFR, FGRO, RFRO (wet)	Sayreville, NJ	Middlesex
			5	138	1958	CYCL, PCFR, GFRO, RFRO (wet)		

Table 2.1. Concluded

Station	Utility	Makeup Water Source	Unit	Mega-watts.	Year in Service	Boiler Type[a]	City/State	County
Schiller	Public Service of New Hampshire	Piscataqua Estuary	4	50	1952	RFRO, PCFR (dry)	Porstmouth, NH	Rockingham
			5	50	1955	RFRO, PCFR (dry)		
			6	50	1957	RFRO		
Schuylkill	Philadelphia Electric Co.	Schuylkill River	1[b]	166	1958	RTAN		
Sewaren	Public Service Electric & Gas Co.	Arthur Kill Estuary	1[b]	104	1948	RTAN (wet)	Sewaren, NJ	Middlesex
			2[b]	111	1948	RTAN (wet)		
			3[b]	107	1949	RTAN (wet)		
			4[b]	124	1951	RTAN (wet)		
Somerset	Montaup Electric Co.	Taunton River	5[c]	76				
			6	124	1959	RTAN	Fall River, MA	Bristol
South Street	Narragansett Electric Co.	Estuary	12	100	1955	PCFR, RFRO (dry)	Providence, RI	Providence
Southwark	Philadelphia Electric Co.	Delaware River	1[b]	178	1947	PCFR (dry)	Philadelphia, PA	Philadelphia
			2[b]	178	1948	PCFR (dry)		
Springdale	Allegheny Power Service Corp.	Allegheny River	7[b]	86	1945	RFRO	Springdale, PA	Allegheny
			8[b]	137	1954	PCFR (dry)		
Wagner, H.A.	Baltimore Gas & Electric Co.	Patpasco River	1[b]	137	1956	RFRO (dry)	Baltimore, MD	Anne Arundel
			2[b]	134	1959	RFRO (dry)		
West Springfield	Western Massachusetts Electric Co.	Connecticut River	1[c]	51	1949	PCTA, RTAN (dry)	West Springfield, MA	Hampden
			2[c]	51	1952	PCTA, RTAN (dry)		
			3	107	1957	PCTA, RTAN, GTAN (dry)		

[a]Boiler Types:
PCFR - Pulverized coal, front firing
PCOP - Pulverized coal, opposed firing
PCTA - Pulverized coal, tangential firing
CYCL - Cyclone
SPRE - Spreader stoker
OSTO - Other stoker
FLUI - Fluidized bed
RFRO - Residual oil, front firing
ROPP - Residual oil, opposed firing
RTAN - Residual oil, tangential firing
GFRO - Gas, front firing
GOPP - Gas, opposed firing
GTAN - Gas, tangential firing

[b]These units are not considered as conversion candidates at this time.

[c]These units have been added to the list of conversion candidates.

Table 2.2. Additional or Corrected Data Obtained from Comments on the DEIS

Commentor	Comment	Station or Area	Data
Atlantic Electric	AE-1	Deepwater	Stack parameters; input for CS, MCS[a]
Baltimore Gas & Electric	BGE-1	Crane	Input for CS
	BGE-1	Brandon Shores	Stack parameters
	BGE-2	Wagner, Brandon Shores	Plant location
	BGE-5	Wagner	Stack parameters
Boston Edison	BE-5	New Boston & Mystic	Input for MCS
Central Hudson Gas & Electric	CHGE-2	Danskammer	Stack parameters; input for CS, MCS
Central Maine Power	CMP-1	Mason	CS
	CMP-2	Mason	AAQ[a]
	CMP-3	Mason	Capacity factor
	CMP-4	Mason	Stack parameters
	CMP-6	Mason	Stack parameters, AAQ, coal characteristics
Consolidated Edison	Con Ed-2, -6	New York Subregion	AAQ
	Con Ed-6	Arthur Kill	Stack parameters
	Con Ed-9	Ravenswood	Plant capacity
	Con Ed-10	Arthur Kill, Ravenswood	Stack parameters, AAQ, input for MCS
Jersey Central Power & Light	JCP&L-1	Sayreville	Stack parameters; input for CS, MCS
	JCP&L-2	Sayreville	AQ monitoring
Long Island Lighting Company	LILCO-1	E. F. Barrett, Northport, Port Jefferson	Stack parameters, fuel limitations
Middlesex County Air Quality Planning Commission	MCAQPC-1	Schiller	Input for CS
	MDAQC-22	Massachusetts	Input for CS
Massachusetts Dept. of Air Quality Control	MDNR-3	Brandon Shores	Stack parameters
	MDNR-7	Maryland	AQS[a]
Montaup Electric Co.	MEC-1	Somerset	Stack parameters; AAQ; ash content; input for CS
New England Power	NEP-2	Brayton Point	Actual SO_2 emissions
	NEP-3	Brayton Point	Actual TSP emissions
	NEP-6	Salem Harbor, South Street	Stack parameters; ash content; AAQ; input for MCS
New Jersey Dept. of Environmental Protection	NJDEP-1	Philadelphia Subregion	AAQ
	NJDEP-4	New Jersey plants	TSP emissions
Niagara-Mohawk Power	NMP-2	Albany	Stack parameters; input for CS, MCS
Northeast Utilities	NU-7	Devon, West Springfield, Norwalk Harbor;	AAQ
	NU-7	Massachusetts and Connecticut	Input for CS
New York City Dept. of Environmental Protection	NYCDEP-5	Arthur Kill	Stack parameters
New York Dept. of Environmental Conservation	NYDEC-17	New York City	AAQ
Philadelphia Electric Co.	PEC-1	Cromby	Stack parameters; coal characteristics
	PEC-2	Cromby	Input for CS, MCS
Public Service Electric & Gas	PSEG-2	Kearny	Megawatt capacity
	PSEG-5	New York City	AAQ
	PSEG-18	Bergen, Burlington, Hudson	Stack parameters, input for CS, OS[a]
	PSEG-19	Burlington, Bergen	Stack parameters, input for MCS, fuel requirements
Public Service of New Hampshire	PSNH-1	Schiller	Stack parameters, input for MCS
Rhode Island Dept. of Environmental Management	RIDEM-1	South Street	Input for MCS

[a]AAQ - Ambient Air Quality
AQS - Air Quality Standards
CS - Coal SIP Scenario
MCS - Modified Coal SIP Scenario
OS - Oil SIP Scenario

Table 2.3. Station Parameters Used in Conversion Scenarios

Plant	Unit	Stack Height (m)	Stack Dia. (m)	Exit Vel. (m/s)	Exit Temp. (°K)	MWe	SIP (#/10^6 Btu)	Expected Capacity Factor	Current Capacity Factor	Peak SO_2 (g/s)	Ave NO_x (g/s)		
							BASELINE						
ALBANY	1	102.4	3.96	11.58	438.5	100.	2.14	65.	61.50	251.54	25.63	ALBANY	1
	2	102.4	3.96	11.58	438.5	100.	2.14	65.	72.40	255.73	26.06		2
	3	102.4	3.96	11.58	438.5	100.	2.14	65.	77.00	243.99	24.87		3
	4	102.4	3.96	11.58	438.5	100.	2.14	65.	73.80	249.96	25.47		4
AURTHUR KILL	2	157.3	5.89	45.54	405.2	335.	0.32	65.	36.70	136.43	95.51	AURTHUR KILL	2
	3	157.3	5.89	45.54	405.2	491.	0.32	65.	47.20	189.71	278.92		3
BERGEN	1	93.3	3.51	37.95	404.7	287.	0.32	60.	69.70	107.28	145.12	BERGEN	1
	2	93.3	5.33	37.95	404.7	283.	0.32	63.	57.30	103.26	146.66		2
BRANDEN SHORES	1	213.4	6.71	34.44	588.4	610.	0.80	65.	63.30	646.86	377.98	BRANDEN SHORES	1
	2	213.4	6.71	34.44	588.4	610.	0.80	65.	63.30	646.86	377.98		2
BRAYTON POINT	1	107.3	4.42	21.34	408.0	250.				681.60	172.60	BRAYTON POINT	1
	2	107.3	4.42	21.34	408.0	250.				681.60	172.60		2
	3	107.3	5.94	25.97	400.0	657.				1688.40	168.80		3
	4	152.4	5.64	27.61	459.0	440.				1399.60	76.20		4
BRIDGPORT HAR	3	151.8	4.27	40.65	421.9	410.	1.10	60.	61.00	555.07	216.58	BRIDGPORT HAR	3
BURLINGTON	7	68.5	4.93	14.33	408.5	180.	0.53	67.	49.30	107.63	98.19	BURLINGTON	7
CANAL	1	151.8	5.49	29.57	399.7	572.	2.42	60.	60.60	1477.83	123.34	CANAL	1
CRANE	1	107.6	3.33	29.87	444.1	192.	1.07	60.	61.51	280.63	113.55	CRANE	1
	2	107.6	3.33	28.96	438.5	192.	1.07	60.	57.50	250.18	101.23		2
CROMBY	2	91.4	4.27	20.12	409.7	201.	0.60	61.	68.89	146.94	105.12	CROMBY	2
DANSKAMMER	1	67.1	3.66	9.02	427.4	39.	1.06	65.	27.30	92.52	40.47	DANSKAMMER	1
	2	67.1	3.66	9.02	427.4	73.	1.06	65.	26.30	92.45	19.26		2
	3	73.2	3.78	17.21	399.7	133.	1.06	65.	41.20	172.71	35.97		3
	4	73.2	4.88	15.12	421.9	216.	1.06	65.	64.30	283.03	58.95		4
DEEPWATER	7	53.4	4.27	10.30	477.4	24.	1.05	60.	72.00	92.19	17.78	DEEPWATER	7
	8	68.1	3.25	15.91	416.3	80.	1.05	60.	69.00	99.22	19.14		8
	9	68.7	3.35	16.31	440.1	25.	1.05	60.	80.00	89.66	36.31		9
DEVON	7	103.6	3.96	30.48	394.1	107.	1.10	60.	52.40	137.75	53.12	DEVON	7
	8	103.6	3.96	30.48	394.1	107.	1.10	60.	40.50	136.56	52.66		8
EDGE MOOR	1	67.1	3.66	12.49	435.7	70.	1.07	60.	58.52	105.90	20.08	EDGE MOOR	1
	2	67.1	3.66	12.55	435.7	70.	1.07	60.	39.22	103.58	19.64		2
	3	67.1	3.66	11.17	421.9	82.	1.07	60.	57.66	104.39	19.79		3
	4	67.1	3.66	20.31	408.0	167.	1.07	60.	70.08	203.60	38.60		4
E.F. BARRETT	1	76.2	4.06	10.90	255.4	190.	1.60	65.	66.00	354.96	49.28	E.F. BARRETT	1
	2	106.7	3.12	19.10	255.4	190.	1.60	65.	66.00	342.75	47.59		2
FAR ROCKAWAY	4	80.8	3.96	79.25	255.4	114.	0.32	65.	29.00	46.96	32.83	FAR ROCKAWAY	4
GLENWOOD	4	75.1	3.96	64.00	255.4	114.	0.40	65.	29.00	70.65	39.33	GLENWOOD	4
	5	75.1	3.96	64.00	255.4	113.	0.40	60.	20.00	72.82	37.42		5
H.A. WAGNER	1	87.4	3.10	22.86	409.7	137.	1.07	60.	39.29	187.39	75.93	H.A. WAGNER	1
	2	87.4	3.10	22.86	409.7	134.	1.07	60.	56.30	194.69	78.89		2
HUDSON	1	99.2	4.27	34.44	416.9	383.	0.32	60.	46.80	147.93	200.20	HUDSON	1
KEARNY	7	84.2	4.27	14.02	441.3	146.	0.32	60.	50.90	46.78	30.15	KEARNY	7
	8	84.2	4.27	14.02	441.3	146.	0.32	60.	54.10	50.02	32.24		8
LOVETT	3	53.3	3.78	10.39	427.4	68.	0.40	65.	8.60	42.53	23.73	LOVETT	3
	4	64.6	3.96	30.14	395.8	187.	0.40	65.	20.90	100.52	117.80		4
	5	74.7	4.88	16.58	415.8	202.	0.40	65.	32.00	115.92	135.84		5
MASON	1	38.4	1.68	11.58	471.8	22.	2.67	5.	1.05	114.66	1.51	MASON	1
	2	38.4	1.68	11.28	482.9	22.	2.67	5.	1.08	122.62	1.61		2
	3	42.1	0.65	18.84	448.0	36.	2.67	60.	4.60	147.09	23.24		3
	4	42.1	0.65	18.04	448.0	36.	2.67	60.	4.30	146.15	23.10		4
	5	42.1	0.80	18.04	448.0	33.	2.67	60.	4.80	141.46	22.36		5

Table 2.3. Continued

MIDDLETOWN	1	81.1	3.10	14.63	420.8	70.	1.10	60.	11.70	85.76	33.73	MIDDLETOWN	1
	2	81.1	2.90	24.99	410.8	117.	1.10	60.	37.50	158.50	62.34		2
	3	81.1	3.66	29.57	420.8	233.	1.10	60.	66.50	275.25	108.27		3
MONTVILLE	5	75.9	3.45	16.00	421.9	81.	1.10	60.	17.40	144.58	27.07	MONTVILLE	5
MT TOM	1	112.8	3.05	27.43	409.7	144.	2.42	60.	64.20	399.41	70.87	MT TOM	1
MYSTIC	4	103.6	3.20	33.20	409.4	135.	1.10	60.	35.20	199.00	36.93	MYSTIC	4
	5	103.6	3.20	33.20	416.5	135.	1.10	60.	15.70	199.00	36.68		5
	6	103.6	3.20	36.30	438.7	149.	1.10	60.	42.30	208.00	39.22		6
NEW BOSTON	1	76.2	3.05	36.90	422.0	350.	1.10	60.	69.90	431.00	202.76	NEW BOSTON	1
	2	76.2	3.05	36.90	422.0	350.	1.10	60.	58.90	413.00	201.71		2
NORTHPORT	1	182.9	5.11	18.29	421.9	383.	3.08	65.	62.00	1465.47	103.63	NORTHPORT	1
	2	182.9	5.11	18.29	421.9	383.	3.08	65.	50.00	1460.19	103.25		2
	3	182.9	5.11	18.29	421.9	383.	3.08	65.	48.00	1446.42	102.28		3
	4	182.9	5.11	18.29	421.9	386.	0.80	65.	61.00	401.42	109.28		4
NORWALK HARBOR	1	106.7	4.88	24.48	397.4	162.	1.10	60.	73.30	202.80	37.59	NORWALK HARBOR	1
	2	106.7	4.88	24.48	255.4	171.	1.10	60.	67.50	213.45	39.56		2
OSWEGO	1	213.4	9.14	9.14	421.9	90.	2.14	65.	17.00	379.70	81.04	OSWEGO	1
	2	213.4	9.14	9.14	255.4	90.	2.14	65.	28.60	294.22	62.80		2
	3	213.4	9.14	9.14	255.4	95.	2.14	65.	43.60	258.36	55.15		3
	4	213.4	9.14	9.14	255.4	100.	2.14	65.	72.20	199.65	42.61		4
PORT JEFF	1	91.4	3.51	17.89	255.4	49.	3.08	65.	12.00	176.55	12.43	PORT JEFF	1
	2	91.4	3.51	17.89	255.4	48.	3.08	65.	12.00	176.55	12.43		2
	3	129.5	3.12	19.54	255.4	78.	3.08	65.	78.00	687.63	48.42		3
	4	129.5	3.12	19.54	255.4	77.	3.08	65.	77.00	679.55	47.85		4
RAVENSWOOD	3	152.1	7.32	32.00	466.3	928.	0.32	65.	28.45	286.22	199.91	RAVENSWOOD	3
RIVERSIDE	4	65.8	2.54	23.47	425.2	78.	1.07	60.	42.98	109.72	44.16	RIVERSIDE	4
	5	65.8	2.54	23.47	425.2	65.	1.07	60.	28.31	113.34	45.62		5
SALEM HARBOR	1	76.2	3.20	17.07	421.9	83.	2.42	60.	53.10	247.99	43.62	SALEM HARBOR	1
	2	76.2	3.20	17.07	421.9	80.	2.42	60.	52.30	282.27	49.65		2
	3	76.2	3.10	19.81	421.9	147.	2.42	60.	68.40	432.04	75.99		3
SAYREVILLE	4	67.4	3.51	16.61	435.7	138.	0.32	60.	52.10	47.97	65.00	SAYREVILLE	4
	5	67.4	3.51	16.49	435.7	138.	0.32	60.	67.80	48.58	65.83		5
SCHILLER	4	68.9	2.44	22.56	471.8	50.	2.14	60.	24.55	161.65	32.01	SCHILLER	4
	5	68.9	2.44	22.86	477.4	50.	2.14	60.	22.73	163.52	32.38		5
	6	68.9	2.44	22.86	471.8	50.	2.14	60.	20.95	176.04	34.86		6
SCHUYLKILL	1	83.8	3.35	17.53	388.6	166.	0.53	60.	53.80	114.46	44.69	SCHUYLKILL	1
SEWAREN	1	68.6	3.73	15.24	418.5	104.	0.32	60.	28.20	48.47	31.15	SEWAREN	1
	2	68.6	3.73	15.24	418.5	111.	0.32	60.	24.70	60.20	38.69		2
	3	68.6	3.73	15.24	418.5	107.	0.32	60.	29.10	44.65	28.70		3
	4	68.6	3.73	15.54	416.3	124.	0.32	60.	41.10	51.28	32.96		4
SOMERSET	5	79.2	3.96	10.21	430.8	76.	2.42	60.	58.20	212.74	17.81	SOMERSET	5
	6	94.5	3.96	13.90	419.7	124.	2.42	60.	58.20	346.47	29.01		6
SOUTH STREET	12	99.1	3.66	17.60	416.3	50.	1.07	60.	39.70	179.97	72.06	SOUTH STREET	12
SOUTHWARK	1	80.5	4.27	14.63	457.9	178.	0.53	60.	17.32	170.59	139.95	SOUTHWARK	1
	2	80.5	4.27	14.63	255.4	178.	0.53	60.	7.01	183.94	150.91		2
SPRINGDALE	7	64.3	4.88	10.06	471.8	86.	0.60	60.	17.70	75.01	53.04	SPRINGDALE	7
	8	64.3	3.66	17.98	444.1	137.	0.60	60.	35.70	104.67	74.01		8
WEST SPRING	1	54.9	3.35	13.36	400.0	51.	2.42	60.	17.80	151.09	12.58	WEST SPRING	1
	2	54.9	3.35	13.36	400.0	51.	2.42	60.	16.30	151.09	12.58		2
	3	68.0	3.96	16.86	421.9	107.	2.42	60.	64.63	317.22	26.39		3

COAL SIP

ALBANY	1	102.4	3.96	11.58	438.5	100.	3.80	65.	61.50	446.66	59.88	ALBANY	1
	2	102.4	3.96	11.58	438.5	100.	3.80	65.	72.40	454.11	60.88		2
	3	102.4	3.96	11.58	438.5	100.	3.80	65.	77.00	433.25	58.08		3
	4	102.4	3.96	11.58	438.5	100.	3.80	65.	73.80	443.86	59.51		4
AURTHUR KILL	2	157.3	5.89	45.54	405.2	335.	0.40	65.	36.70	170.53	217.19	AURTHUR KILL	2
	3	157.3	5.89	45.54	405.2	491.	0.40	65.	47.20	237.14	302.03		3
BERGEN	1	93.3	3.51	37.95	404.7	287.	2.20	60.	69.70	737.57	262.77	BERGEN	1
	2	93.3	5.33	25.12	435.7	283.	2.20	63.	57.30	709.92	265.56		2
BRANDON SHORES	1	213.4	6.71	23.77	403.0	610.	1.20	65.	63.30	970.28	411.93	BRANDON SHORES	1
	2	213.4	6.71	23.77	403.0	610.	1.20	65.	63.30	970.28	411.93		2

Table 2.3. Continued

BRAYTON POINT	1	107.3	4.42	21.34	408.0	250.				1285.20	158.80	BRAYTON POINT	1
	2	107.3	4.42	21.34	408.0	250.				1285.20	158.80		2
	3	107.3	5.94	25.97	400.0	657.				3200.30	394.40		3
	4	152.4	5.64	27.61	459.0	440.				1390.6	76.20		4
BRIDGEPORT HAR	3	151.8	4.27	40.65	421.9	410.	1.10	60.	61.00	555.07	237.30	BRIDGEPORT HAR	3
BURLINGTON	7	106.7	4.57	18.68	405.2	180.	2.20	67.	49.30	446.76	177.73	BURLINGTON	7
CANAL	1	151.8	5.49	29.57	399.7	572.	2.42	60.	60.60	1477.83	287.18	CANAL	1
CRANE	1	107.6	3.33	29.87	444.1	192.	3.50	60.	61.51	917.95	205.56	CRANE	1
	2	107.6	3.33	28.96	438.5	192.	3.50	60.	57.50	818.35	183.26		2
CROMBY	2	91.4	4.27	19.80	409.7	201.	0.90	61.	68.89	220.41	117.09	CROMBY	2
DANSKAMMER	1	67.1	3.66	9.02	427.4	39.	1.06	65.	27.30	92.52	44.47	DANSKAMMER	1
	2	67.1	3.66	9.02	427.4	73.	1.06	65.	26.30	92.45	44.43		2
	3	137.2	3.69	17.20	399.7	133.	1.06	65.	41.20	172.71	83.01		3
	4	137.2	4.72	15.10	421.9	216.	1.06	65.	64.30	283.03	136.03		4
DEEPWATER	7	53.4	4.27	10.30	477.4	24.	1.66	60.	72.00	145.74	41.29	DEEPWATER	7
	8	68.1	3.25	15.90	416.3	80.	1.66	60.	69.00	156.87	44.44		8
	9	68.7	3.35	16.30	444.1	25.	1.66	60.	80.00	141.74	40.15		9
DEVON	7	103.6	3.96	30.48	394.1	107.	1.10	60.	52.40	137.75	58.89	DEVON	7
	8	103.6	3.96	30.48	394.1	107.	1.10	60.	40.50	136.56	58.38		8
EDGE MOOR	1	67.1	3.66	12.49	435.7	70.	1.67	60.	58.52	165.29	46.54	EDGE MOOR	1
	2	67.1	3.66	12.55	435.7	70.	1.67	60.	39.22	161.66	45.52		2
	3	67.1	3.66	11.17	421.9	82.	1.67	60.	57.66	162.92	45.88		3
	4	67.1	3.66	20.31	408.0	167.	1.67	60.	70.08	317.77	89.48		4
E.F. BARRETT	1	76.2	4.88	15.80	421.9	190.	1.60	65.	66.00	354.96	113.02	E.F. BARRETT	1
	2	106.7	3.12	38.70	421.9	190.	1.60	65.	66.00	342.75	109.13		2
FAR ROCKAWAY	4	80.8	3.96	79.25	255.4	114.	0.40	65.	29.00	58.70	74.77	FAR ROCKAWAY	4
GLENWOOD	4	75.1	3.96	64.0	255.4	114.	0.40	65.	29.00	70.65	89.98	GLENWOOD	4
	5	75.1	3.96	64.0	255.4	113.	0.40	60.	20.00	72.82	85.61		5
H.A. WAGNER	1	87.4	3.10	22.86	409.7	137.	1.66	60.	39.29	290.71	82.36	H.A. WAGNER	1
	2	87.4	3.10	22.86	409.7	134.	1.66	60.	56.30	302.03	85.56		2
HUDSON	1	99.2	4.27	34.44	416.9	383.	2.20	60.	46.80	1017.02	664.26	HUDSON	1
KEARNY	7	84.2	4.27	14.02	441.3	144.	2.20	60.	50.90	321.58	114.57	KEARNY	7
	8	84.2	4.27	14.02	441.3	146.	2.20	60.	54.10	343.86	122.50		8
LOVETT	3	53.3	3.78	10.39	427.4	68.	0.40	65.	8.60	42.53	54.17	LOVETT	3
	4	144.8	3.05	32.92	394.1	187.	0.40	65.	20.90	100.52	128.03		4
	5	144.8	3.35	34.14	421.9	202.	0.40	65.	32.00	115.92	147.64		5
MASON	1	38.4	1.68	11.58	471.8	22.	2.40	5.	1.05	103.06	1.68	MASON	1
	2	38.4	1.68	11.28	482.9	22.	2.40	5.	1.08	110.22	1.80		2
	3	75.3	2.89	30.48	455.2	36.	2.40	60.	4.60	132.21	43.18		3
	4	75.3	2.89	30.48	455.2	36.	2.40	60.	4.30	131.37	42.90		4
	5	75.3	2.89	30.48	455.2	33.	2.40	60.	4.80	127.15	41.53		5
MIDDLETOWN	1	81.1	3.10	14.63	420.8	70.	1.10	60.	11.70	85.76	61.10	MIDDLETOWN	1
	2	81.1	2.90	24.99	410.8	117.	1.10	60.	37.50	158.50	112.94		2
	3	81.1	3.66	29.57	420.8	233.	1.10	60.	66.50	275.25	359.56		3
MONTVILLE	5	75.9	3.45	16.00	421.9	81.	1.10	60.	17.40	144.58	61.81	MONTVILLE	5
MT TOM	1	112.8	3.05	27.43	409.7	144.	2.42	60.	64.20	399.41	77.62	MT TOM	1
MYSTIC	4	152.4	3.20	36.50	408.0	135.	1.10	60.	35.20	199.07	85.10	MYSTIC	4
	5	152.4	3.20	36.50	408.0	135.	1.10	60.	15.70	197.69	84.51		5
	6	152.4	3.20	36.00	408.5	149.	1.10	60.	42.30	211.37	90.36		6
NEW BOSTON	1	113.4	4.30	30.90	394.0	350.	1.10	60.	69.90	516.33	220.74	NEW BOSTON	1
	2	113.4	4.30	29.40	422.0	350.	1.10	60.	58.90	513.66	219.59		2
NORTHPORT	1	182.9	5.11	18.29	421.9	383.	3.08	65.	62.00	1465.47	242.40	NORTHPORT	1
	2	182.9	5.11	18.29	421.9	383.	3.08	65.	50.00	1460.19	241.53		2
	3	182.9	5.11	18.29	421.9	383.	3.08	65.	48.00	1446.42	239.25		3
	4	182.9	5.11	18.29	421.9	386.	1.20	65.	61.00	602.13	255.63		4
NORWALK HARBOR	1	106.7	4.88	24.48	397.4	162.	1.10	60.	73.30	202.80	86.70	NORWALK HARBOR	1
	2	106.7	4.88	24.48	255.4	171.	1.10	60.	67.50	213.45	91.25		2
OSWEGO	1	213.4	9.14	9.14	421.9	90.	3.80	65.	17.00	674.23	90.39	OSWEGO	1
	2	213.0	9.10	9.10	255.4	90.	3.80	65.	28.60	522.44	70.04		2
	3	213.0	9.10	9.10	255.4	95.	3.80	65.	43.60	458.77	61.51		3
	4	213.0	9.10	9.10	255.4	100.	3.80	65.	72.20	354.51	47.53		4
PORT JEFF	1	91.4	3.51	17.89	255.4	49.	3.08	65.	12.00	176.55	29.20	PORT JEFF	1
	2	91.0	3.50	11.3	255.4	48.	3.08	65.	12.00	176.55	29.20		2
	3	129.5	3.12	40.23	426.9	78.	3.08	65.	78.00	687.63	113.74		3
	4	129.5	3.12	40.23	426.9	77.	3.08	65.	77.00	679.55	112.40		4
RAVENSWOOD	3	152.1	7.32	32.00	466.3	928.	0.40	65.	28.45	357.78	455.68	RAVENSWOOD	3
RIVERSIDE	4	65.8	2.54	23.47	425.2	78.	1.66	60.	42.98	170.23	48.22	RIVERSIDE	4
	5	65.8	2.54	23.47	425.2	65.	1.66	60.	28.31	175.83	49.81		5

Table 2.3. Continued

SALEM HARBOR	1	137.2	2.74	16.15	421.9	83.	2.42	60.	53.10	247.99	80.32	SALEM HARBOR	1
	2	137.2	2.74	17.07	421.9	80.	2.42	60.	52.30	282.27	91.42		2
	3	137.2	3.35	19.08	421.9	147.	2.42	60.	68.40	432.04	139.93		3
SAYREVILLE	4	117.3	3.99	27.43	338.6	138.	0.32	60.	52.10	47.97	215.40	SAYREVILLE	4
	5	117.3	3.99	27.43	338.6	138.	0.32	60.	67.80	48.58	218.16		5
SCHILLER	4	68.9	2.44	22.62	471.8	50.	2.50	60.	24.55	188.84	35.52	SCHILLER	4
	5	68.9	2.44	22.62	471.8	50.	2.50	60.	22.73	191.03	35.93		5
	6	68.9	2.44	22.62	471.8	50.	2.50	60.	20.95	205.65	38.68		6
SCHUYLKILL	1	83.8	3.35	17.53	388.6	166.	0.50	60.	53.80	107.98	101.56	SCHUYLKILL	1
SEWAREN	1	68.6	3.73	15.24	418.5	104.	2.20	60.	28.20	333.22	118.71	SEWAREN	1
	2	68.6	3.73	15.24	418.5	111.	2.20	60.	24.70	413.87	147.45		2
	3	68.6	3.73	15.24	418.5	107.	2.20	60.	29.10	307.00	109.37		3
	4	68.6	3.73	15.54	416.3	124.	2.20	60.	41.10	352.53	125.59		4
SOMERSET	5	100.6	3.96	10.21	430.8	76.	2.42	60.	58.20	212.74	41.34	SOMERSET	5
	6	100.6	3.96	13.90	419.6	124.	2.42	60.	58.20	346.47	67.33		6
SOUTH STREET	12	99.1	3.66	17.68	416.3	50.	1.10	60.	39.70	185.01	79.10	SOUTH STREET	12
SOUTHWARK	1	80.5	4.27	14.63	457.9	178.	0.50	60.	17.32	160.93	151.36	SOUTHWARK	1
	2	80.5	4.27	12.10	255.4	178.	0.50	60.	7.01	173.53	163.21		2
SPRINGDALE	7	64.3	4.88	10.06	471.8	86.	0.60	60.	17.70	75.01	58.79	SPRINGDALE	7
	8	64.3	3.66	17.98	444.1	137.	0.60	60.	35.70	104.67	82.04		8
WEST SPRING	1	54.9	3.35	13.36	400.0	51.	2.42	60.	17.80	151.20	29.38	WEST SPRING	1
	2	54.9	3.35	13.36	400.0	51.	2.42	60.	16.30	151.20	29.38		2
	3	68.0	3.96	16.86	421.9	107.	2.42	60.	64.63	317.22	61.64		3

MODIFIED COAL SIP

ALBANY	1	102.4	3.96	11.58	438.5	100.	3.80	65.	61.50	446.66	59.88	ALBANY	1
	2	102.4	3.96	11.58	438.5	100.	3.80	65.	72.40	454.11	60.88		2
	3	102.4	3.96	11.58	438.5	100.	3.80	65.	77.00	433.25	58.08		3
	4	102.4	3.96	11.58	438.5	100.	3.80	65.	73.80	443.86	59.51		4
AURTHUR KILL	2	157.3	5.89	45.54	405.2	335.	1.66	65.	36.70	707.71	217.19	AURTHUR KILL	2
	3	157.3	5.89	45.54	405.2	491.	1.66	65.	47.20	984.12	302.03		3
BERGEN	1	93.3	3.51	37.95	404.7	287.	2.00	60.	69.70	670.52	262.77	BERGEN	1
	2	93.3	5.33	25.12	435.7	283.	2.00	63.	57.30	645.39	265.56		2
BRANDEN SHORES	1	213.4	6.71	23.77	403.0	610.	1.20	65.	63.30	970.28	411.93	BRANDEN SHORES	1
	2	213.4	6.71	23.77	403.0	610.	1.20	65.	63.30	970.28	411.93		2
BRAYTON POINT	1	107.3	4.42	21.34	408.0	250.				1015.31	158.80	BRAYTON POINT	1
	2	107.3	4.42	21.34	408.0	250.				1015.31	158.80		2
	3	107.3	5.94	25.97	400.0	657.				2528.20	394.40		3
	4	152.4	5.64	27.61	459.0	440.				1104.90	76.20		4
BRIDGPORT HAR	3	151.8	4.27	40.65	421.9	410.	1.10	60.	61.00	555.07	237.30	BRIDGPORT HAR	3
BURLINGTON	7	106.7	4.57	18.68	405.2	180.	2.31	67.	49.30	469.10	177.73	BURLINGTON	7
CANAL	1	151.8	5.49	29.57	399.7	572.	2.42	60.	60.60	1477.83	287.18	CANAL	1
CRANE	1	107.6	3.33	29.87	444.1	192.	3.50	60.	61.51	917.95	205.56	CRANE	1
	2	107.6	3.33	28.96	438.5	192.	3.50	60.	57.50	818.35	183.26		2
CROMBY	2	91.4	4.27	19.80	409.7	201.	3.70	61.	68.89	906.12	117.09	CROMBY	2
DANSKAMMER	1	67.1	3.66	9.02	427.4	39.	2.40	65.	27.30	209.48	44.47	DANSKAMMER	1
	2	67.1	3.66	9.02	427.4	73.	2.40	65.	26.30	209.33	44.43		2
	3	137.2	3.69	17.20	399.7	133.	2.40	65.	41.20	391.03	83.01		3
	4	137.2	4.72	15.10	421.9	216.	2.40	65.	64.30	640.82	136.03		4
DEEPWATER	7	53.4	4.27	10.30	477.4	24.	1.66	60.	72.00	145.74	41.29	DEEPWATER	7
	8	68.1	3.25	15.90	416.3	80.	1.66	60.	69.00	156.87	44.44		8
	9	68.7	3.35	16.30	444.1	25.	1.66	60.	80.00	141.74	40.15		9
DEVON	7	103.6	3.96	30.48	394.1	107.	1.10	60.	52.40	137.75	58.89	DEVON	7
	8	103.6	3.96	30.48	394.1	107.	1.10	60.	40.50	136.56	58.38		8
EDGE MOOR	1	67.1	3.66	12.49	435.7	70.	1.67	60.	58.52	165.29	46.54	EDGE MOOR	1
	2	67.1	3.66	12.55	435.7	70.	1.67	60.	39.22	161.66	45.52		2
	3	67.1	3.66	11.17	421.9	82.	1.67	60.	57.66	162.92	45.88		3
	4	67.1	3.66	20.31	408.0	167.	1.67	60.	70.08	317.77	89.48		4
E.F. BARRETT	1	76.2	4.88	15.80	421.9	190.	1.83	65.	66.00	405.98	113.02	E.F. BARRETT	1
	2	106.7	3.12	38.70	421.9	190.	1.83	65.	66.00	392.01	109.13		2
FAR ROCKAWAY	4	80.8	3.96	79.25	255.4	114.	0.40	65.	29.00	58.70	74.77	FAR ROCKAWAY	4
GLENWOOD	4	75.1	3.96	64.0	255.4	114.	0.40	65.	29.00	70.65	89.98	GLENWOOD	4
	5	75.1	3.96	64.0	255.4	113.	0.40	60.	20.00	72.82	85.61		5

Table 2.3. Continued

H.A. WAGNER	1	87.4	3.10	22.86	409.7	137.	1.66	60.	39.29	290.71	82.36	H.A. WAGNER	1
	2	87.4	3.10	22.86	409.7	134.	1.66	60.	56.30	302.03	85.56		2
HUDSON	1	99.2	4.27	34.44	416.9	383.	2.20	60.	46.80	1017.02	664.26	HUDSON	1
KEARNY	7	84.2	4.27	14.02	441.3	144.	2.20	60.	50.90	321.58	114.57	KEARNY	7
	8	84.2	4.27	14.02	441.3	146.	2.20	60.	54.10	343.86	122.50		8
LOVETT	3	53.3	3.78	10.39	427.4	68.	2.40	65.	8.60	255.17	54.17	LOVETT	3
	4	144.8	3.05	32.92	394.1	187.	2.40	65.	20.90	383.50	128.03		4
	5	144.8	3.35	34.14	421.9	202.	2.40	65.	32.00	442.00	147.64		5
MASON	1	38.4	1.68	11.58	471.8	22.	2.67	5.	1.05	114.66	1.68	MASON	1
	2	38.4	1.68	11.28	482.9	22.	2.67	5.	1.08	122.62	1.80		2
	3	75.3	2.89	30.48	455.2	36.	2.67	60.	4.60	147.09	43.18		3
	4	75.3	2.89	30.48	455.2	36.	2.67	60.	4.30	146.15	42.90		4
	5	75.3	2.89	30.48	455.2	33.	2.67	60.	4.80	141.46	41.53		5
MIDDLETOWN	1	81.1	3.10	14.63	420.8	70.	1.10	60.	11.70	85.76	61.10	MIDDLETOWN	1
	2	81.1	2.90	24.99	410.8	117.	1.10	60.	37.50	158.50	112.94		2
	3	81.1	3.66	29.57	420.8	233.	1.10	60.	66.50	275.25	359.56		3
MONTVILLE	5	75.9	3.45	16.00	421.9	81.	1.10	60.	17.40	144.58	61.81	MONTVILLE	5
MT TOM	1	112.8	3.05	27.43	409.7	144.	2.42	60.	64.20	399.41	77.62	MT TOM	1
MYSTIC	4	152.4	3.20	36.50	408.0	135.	2.42	60.	35.20	467.00	85.10	MYSTIC	4
	5	152.4	3.20	36.50	408.0	135.	2.42	60.	15.70	467.00	84.51		5
	6	152.4	3.20	36.00	408.5	149.	2.42	60.	42.30	487.00	90.36		6
NEW BOSTON	1	113.4	4.30	30.90	394.0	350.	2.42	60.	69.90	1007.00	220.74	NEW BOSTON	1
	2	113.4	4.30	29.40	422.0	350.	2.42	60.	58.90	1007.00	219.59		2
NORTHPORT	1	182.9	5.11	18.29	421.9	383.	3.08	65.	62.00	1465.47	242.40	NORTHPORT	1
	2	182.9	5.11	18.29	421.9	383.	3.08	65.	50.00	1460.19	241.53		2
	3	182.9	5.11	18.29	421.9	383.	3.08	65.	48.00	1446.42	239.25		3
	4	182.9	5.11	18.29	421.9	386.	1.20	65.	61.00	602.13	255.63		4
NORWALK HARBOR	1	106.7	4.88	24.48	397.4	162.	1.10	60.	73.30	202.80	86.70	NORWALK HARBOR	1
	2	106.7	4.88	24.48	255.4	171.	1.10	60.	67.50	213.45	91.25		2
OSWEGO	1	213.4	9.14	9.14	421.9	90.	3.80	65.	17.00	674.23	90.39	OSWEGO	1
	2	213.0	9.10	9.10	255.4	90.	3.80	65.	28.60	522.44	70.04		2
	3	213.0	9.10	9.10	255.4	95.	3.80	65.	43.60	458.77	61.51		3
	4	213.0	9.10	9.10	255.4	100.	3.80	65.	72.20	354.51	47.53		4
PORT JEFF	1	91.4	3.51	17.89	255.4	49.	3.08	65.	12.00	176.55	29.20	PORT JEFF	1
	2	91.0	3.50	11.3	255.4	48.	3.08	65.	12.00	176.55	29.20		2
	3	129.5	3.12	40.23	426.9	78.	3.08	65.	78.00	687.63	113.74		3
	4	129.5	3.12	40.23	426.9	77.	3.08	65.	77.00	679.55	112.40		4
RAVENSWOOD	3	152.1	7.32	32.00	466.3	928.	1.66	65.	28.45	1484.78	455.68	RAVENSWOOD	3
RIVERSIDE	4	65.8	2.54	23.47	425.2	78.	1.66	60.	42.98	170.23	48.22	RIVERSIDE	4
	5	65.8	2.54	23.47	425.2	65.	1.66	60.	28.31	175.83	49.81		5
SALEM HARBOR	1	137.2	2.74	16.15	421.9	83.	2.42	60.	53.10	247.99	80.32	SALEM HARBOR	1
	2	137.2	2.74	17.07	421.9	80.	2.42	60.	52.30	282.27	91.42		2
	3	137.2	3.35	19.08	421.9	147.	2.42	60.	68.40	432.04	139.93		3
SAYREVILLE	4	117.3	3.99	27.43	338.6	138.	0.60	60.	52.10	89.94	215.40	SAYREVILLE	4
	5	117.3	3.99	27.43	338.6	138.	0.60	60.	67.80	91.09	218.16		5
SCHILLER	4	68.9	2.44	22.62	471.8	50.	2.60	60.	24.55	196.40	35.52	SCHILLER	4
	5	68.9	2.44	22.62	471.8	50.	2.60	60.	22.73	198.67	35.93		5
	6	68.9	2.44	22.62	471.8	50.	2.60	60.	20.95	213.87	38.68		6
SCHUYLKILL	1	83.8	3.35	17.53	388.6	166.	0.50	60.	53.80	107.98	101.56	SCHUYLKILL	1
SEWAREN	1	68.6	3.73	15.24	418.5	104.	2.20	60.	28.20	333.22	118.71	SEWAREN	1
	2	68.6	3.73	15.24	418.5	111.	2.20	60.	24.70	413.87	147.45		2
	3	68.6	3.73	15.24	418.5	107.	2.20	60.	29.10	307.00	109.37		3
	4	68.6	3.73	15.54	416.3	124.	2.20	60.	41.10	352.53	125.59		4
SOMERSET	5	100.6	3.96	10.21	430.8	76.	2.42	60.	58.20	212.74	41.34	SOMERSET	5
	6	100.6	3.96	13.90	419.6	124.	2.42	60.	58.20	346.47	67.33		6
SOUTH STREET	12	99.1	3.66	17.68	416.3	50.	2.42	60.	39.70	407.03	79.10	SOUTH STREET	12
SOUTHWARK	1	80.5	4.27	14.63	457.9	178.	0.50	60.	17.32	160.93	151.36	SOUTHWARK	1
	2	80.5	4.27	12.10	255.4	178.	0.50	60.	7.01	173.53	163.21		2
SPRINGDALE	7	64.3	4.88	10.06	471.8	86.	0.60	60.	17.70	75.01	58.79	SPRINGDALE	7
	8	64.3	3.66	17.98	444.1	137.	0.60	60.	35.70	104.67	82.04		8
WEST SPRING	1	54.9	3.35	13.36	400.0	51.	2.42	60.	17.80	151.20	29.38	WEST SPRING	1
	2	54.9	3.35	13.36	400.0	51.	2.42	60.	16.30	151.20	29.38		2
	3	68.0	3.96	16.86	421.9	107.	2.42	60.	64.63	317.22	61.64		3

Table 2.4. Estimates of Resources Required and Wastes Generated for the Coal SIP Scenario

State	Station/Unit(s)	Unit Capacity Factor (%)	Coal SIP (lb SO_2 per MMBtu)	Max. Allow. S Content w/o Scrubber (%)	Selected S Content (%)	Scrubber Cap. Factor to Meet Coal SIP (%)	Coal Burned per Year (10^3 ton)	Lime Required per Year (10^3 ton)	Limestone Required per Year (10^3 ton)	Weight of Sludge Produced/Year, 60%[a] solids (10^3 ton)		Volume of Sludge Produced/Year, 60%[a] solids (10^6 ft^3)	
										Lime Scrubbing	Limestone Scrubbing	Lime Scrubbing	Limestone Scrubbing
Connecticut	Bridgeport Harbor 3	60	1.10	0.63	3.5	82	915	53.2	104.0	224	242	4.67	5.04
	Devon 7&8	60	1.10	0.63	3.5	82	452	26.3	51.2	111	120	2.31	2.49
	Norwalk Harbor 1&2	60	1.10	0.63	3.5	82	686	39.9	77.8	168	181	3.50	3.78
	Montville 5	60	1.10	0.63	3.5	82	238	13.9	27.1	59	63	1.22	1.32
	Middletown 1-3	60	1.10	0.63	3.5	82	856	50.0	97.4	209	227	4.38	4.73
Delaware	Edge Moor 1-4	60	1.67	0.96	0.96	0	878	0	0	0	0	0	0
Maine	Mason 1-5	60	2.40	1.38	3.50	61	457	19.8	38.5	83.2	89.7	1.73	1.87
Maryland	Brandon Shores 1&2	65	1.20	0.69	0.69	0	3180	0	0	0	0	0	0
	Riverside 4&5	60	1.66	0.95	0.95	0	378	0	0	0	0	0	0
	Charles P. Crane 1&2	60	3.50	2.01	2.01	0	900	0	0	0	0	0	0
	Herbert A. Wagner 1&2	60	1.66	0.95	0.95	0	648	0	0	0	0	0	0
Massachusetts	New Boston 1&2	60	1.10	0.63	3.5	82	1698	98.8	192	415	449	8.66	9.35
	Mystic 4-6	60	1.10	0.63	3.5	82	1003	58.4	114	245	265	5.11	5.52
	Canal 1	60	2.42	1.39	1.39	0	1110	0	0	0	0	0	0
	Mt. Tom 1	60	2.42	1.39	1.39	0	299	0	0	0	0	0	0
	Salem Harbor 1-3	60	2.42	1.39	1.39	0	722	0	0	0	0	0	0
	Somerset 5&6	60	2.42	1.39	1.39	0	449	0	0	0	0	0	0
	West Springfield 1-3	60	2.42	1.39	1.39	0	527	0	0	0	0	0	0
New Hampshire	Schiller 4-6	60	2.50	1.44	1.44	0	425	0	0	0	0	0	0
New Jersey	Deepwater 7-9	60	1.66	0.95	0.95	0	485	0	0	0	0	0	0
	Sayreville 4&5	60	0.32	0.18	1.8	90	547	18.0	35.0	75.6	81.7	1.58	1.70
	Bergen 1&2	60	2.20	1.26	1.26	0	1193	0	0	0	0	0	0
	Kearny 7&8	60	2.20	1.26	3.5	64	549	24.9	48.5	105	113	2.19	2.36
	Sewaren 1-4	60	2.20	1.26	3.5	64	1160	52.7	103	222	240	4.62	4.99
	Hudson 1	60	2.20	1.26	3.5	64	839	38.1	74.1	160	173	3.34	3.60
	Burlington 7	60	2.20	1.26	1.26	0	368	0	0	0	0	0	0
New York	Danskammer Point 1-4	65	1.06	0.61	3.5	83	1188	69.9	136	294	317	6.13	6.61
	Arthur Kill 2&3	65	0.40	0.23	2.30	90	2008	84.0	164	354	382	7.36	7.96
	Ravenswood 3	65	0.40	0.23	2.30	90	1760	73.7	144	310	335	6.46	6.98
	E. F. Barrett 1&2	65	1.60	0.92	3.5	74	857	45.0	87.6	189	204	3.95	4.26
	Northport 1-3	65	3.08	1.77	1.77	0	2790	0	0	0	0	0	0
	Northport 4	65	1.20	0.69	0.69	0	986	0	0	0	0	0	0
	Far Rockaway 4	65	0.40	0.23	2.30	90	288	12.1	23.6	50.9	55.0	1.06	1.15
	Glenwood 4&5	65	0.40	0.23	2.30	90	705	29.6	57.6	125	134	2.60	2.80
	Port Jefferson 1-4	65	3.08	1.77	1.77	0	1099	0	0	0	0	0	0
	Albany 1-4	65	3.80	2.18	2.18	0	920	0	0	0	0	0	0
	Oswego 1-4	65	3.80	2.18	2.18	0	1039	0	0	0	0	0	0
	Lovett 3-5	65	0.40	0.23	2.30	90	1272	53.4	104	225	243	4.68	5.05
Pennsylvania	Cromby 2	60	0.90	0.52	3.5	85	444	26.8	52.2	113	122	2.35	2.54
	Schuylkill 1	60	0.50	0.29	2.9	90	392	20.7	40.4	87.2	94.2	1.82	1.96
	Southwark 1&2	60	0.50	0.29	2.9	90	1214	64.2	125	270	291	5.63	6.07
	Springdale 7&8	60	0.60	0.34	3.4	90	543	33.7	65.6	142	153	2.95	3.19
Rhode Island	South Street 12	60	1.10	0.63	3.5	82	305	17.7	34.6	74.7	80.6	1.56	1.68

[a]Weight of sludge with 30% solids is twice that listed for 60% solids.

[b]Volume of sludge with 30% solids is 2.54 times that listed for 60% solids.

Table 2.5. Estimates of Resources Required and Wastes Generated for the Modified Coal SIP Scenario

State	Station/Unit(s)	Unit Capacity Factor (%)	Coal SIP (lb SO_2 per MMBtu)	Max. Allow. S Content w/o Scrubber (%)	Selected S Content (%)	Scrubber Cap. Factor to Meet Coal SIP (%)	Coal Burned per Year (10^3 ton)	Lime Required per Year (10^3 ton)	Limestone Required per Year (10^3 ton)	Weight of Sludge Produced/Year, 60%[a] solids (10^3 ton)		Volume of Sludge Produced/Year, 60%[a] solids (10^6 ft^3)	
										Lime Scrubbing	Limestone Scrubbing	Lime Scrubbing	Limestone Scrubbing
Connecticut	Bridgeport Harbor 3	60	1.10	0.63	3.5	82	915	53.2	104	224	242	4.67	5.04
	Devon 7&8	60	1.10	0.63	3.5	82	452	26.3	51.2	111	120	2.31	2.49
	Norwalk Harbor 1&2	60	1.10	0.63	3.5	82	686	39.9	77.8	168	181	3.50	3.78
	Montville 5	60	1.10	0.63	3.5	82	238	13.9	27.1	59	63	1.22	1.32
	Middletown 1-3	60	1.10	0.63	3.5	82	856	50.0	97.4	209	227	4.38	4.73
Delaware	Edge Moor 1-4	60	1.67	0.96	0.96	0	878	0	0	0	0	0	0
Maine	Mason 1-5	60	2.67	1.54	3.50	56	457	18.1	35.3	76.3	82.3	1.59	1.72
Maryland	Brandon Shores 1&2	65	1.20	0.69	0.69	0	3180	0	0	0	0	0	0
	Riverside 4&5	60	1.66	0.95	0.95	0	378	0	0	0	0	0	0
	Charles P. Crane 1&2	60	3.50	2.01	2.01	0	900	0	0	0	0	0	0
	Herbert A. Wagner 1&2	60	1.66	0.95	0.95	0	648	0	0	0	0	0	0
Massachusetts	New Boston 1&2	60	2.42	1.39	1.39	0	1698	0	0	0	0	0	0
	Mystic 4-6	60	2.42	1.39	1.39	0	1003	0	0	0	0	0	0
	Canal 1	60	2.42	1.39	1.39	0	1110	0	0	0	0	0	0
	Mt. Tom 1	60	2.42	1.39	1.39	0	299	0	0	0	0	0	0
	Salem Harbor 1-3	60	2.42	1.39	1.39	0	722	0	0	0	0	0	0
	Somerset 5&6	60	2.42	1.39	1.39	0	449	0	0	0	0	0	0
	West Springfield 1-3	60	2.42	1.39	1.39	0	527	0	0	0	0	0	0
New Hampshire	Schiller 4-6	60	2.60	1.49	1.49	0	425	0	0	0	0	0	0
New Jersey	Deepwater 7-9	60	1.66	0.95	0.95	0	485	0	0	0	0	0	0
	Sayreville 4&5	60	0.60	0.34	3.45	90	547	34.4	67.1	145	156	3.02	3.26
	Bergen 1&2	60	2.00	1.15	1.15	0	1193	0	0	0	0	0	0
	Kearny 7&8	60	2.20	1.26	3.5	64	549	24.9	48.5	105	113	2.19	2.36
	Sewaren 1-4	60	2.20	1.26	3.5	64	1160	52.7	103	222	240	4.62	4.99
	Hudson 1	60	2.20	1.26	3.5	64	839	38.1	74.1	160	173	3.34	3.60
	Burlington 7	60	2.31	1.33	1.33	0	368	0	0	0	0	0	0
New York	Danskammer Point 1-4	65	2.40	1.38	1.38	0	1188	0	0	0	0	0	0
	Arthur Kill 2&3	65	1.66	0.95	0.95	0	2008	0	0	0	0	0	0
	Ravenswood 3	65	1.66	0.95	0.95	0	1760	0	0	0	0	0	0
	E. F. Barrett 1&2	65	1.83	1.05	1.05	0	857	0	0	0	0	0	0
	Northport 1-3	65	3.08	1.77	1.77	0	2790	0	0	0	0	0	0
	Northport 4	65	1.20	0.69	0.69	0	986	0	0	0	0	0	0
	Far Rockaway 4	65	0.40	0.23	2.30	90	288	12.1	23.6	50.9	55.0	1.06	1.15
	Glenwood 4&5	65	0.40	0.23	2.30	90	705	29.6	57.6	125	134	2.60	2.80
	Port Jefferson 1-4	65	3.08	1.77	1.77	0	1099	0	0	0	0	0	0
	Albany 1-4	65	3.80	2.18	2.18	0	920	0	0	0	0	0	0
	Oswego 1-4	65	3.80	2.18	2.18	0	1039	0	0	0	0	0	0
	Lovett 3-5	65	2.40	1.38	1.38	0	1272	0	0	0	0	0	0
Pennsylvania	Cromby 2	60	3.70	2.13	2.13	0	444	0	0	0	0	0	0
	Schuylkill 1	60	0.50	0.29	2.9	90	392	20.7	40.4	87.2	94.2	1.82	1.96
	Southwark 1&2	60	0.50	0.29	2.9	90	1214	64.2	125	270	291	5.63	6.07
	Springdale 7&8	60	0.60	0.34	3.4	90	543	33.7	65.6	142	153	2.95	3.19
Rhode Island	South Street 12	60	2.42	1.39	1.39	0	305	0	0	0	0	0	0

[a] Weight of sludge with 30% solids is twice that listed for 60% solids.

[b] Volume of sludge with 30% solids is 2.54 times that listed for 60% solids.

Table 2.6. Estimates of Resources Required and Wastes Generated for the Voluntary Conversion Scenario

State	Station/Unit(s)	Unit Capacity Factor (%)	Coal SIP (lb SO_2 per MMBtu)	Max. Allow. S Content w/o Scrubber (%)	Selected S Content (%)	Scrubber Cap. Factor to Meet Coal SIP (%)	Coal Burned per Year (10^3 ton)	Lime Required per Year (10^3 ton)	Limestone Required per Year (10^3 ton)	Weight of Sludge Produced/Year, 60%[a] solids (10^3 ton): Lime Scrubbing	Weight of Sludge Produced/Year, 60%[a] solids (10^3 ton): Limestone Scrubbing	Volume of Sludge Produced/Year, 60%[a] solids (10^6 ft^3): Lime Scrubbing	Volume of Sludge Produced/Year, 60%[a] solids (10^6 ft^3): Limestone Scrubbing
Connecticut	Bridgeport Harbor 3	60	1.10	0.63	3.5	82	915	53.2	104	224	242	4.67	5.04
	Devon 7&8	60	1.10	0.63	3.5	82	452	26.3	51.2	120	120	2.31	2.49
	Norwalk Harbor 1&2	60	1.10	0.63	3.5	82	686	39.9	77.8	181	181	3.50	3.78
Delaware	Edge Moor 3&4	60	1.67	0.96	0.96	0	522	0	0	0	0	0	0
Maine	Mason 3-5	60	2.67	1.54	3.50	56	295	11.7	22.8	49.4	53.2	1.03	1.11
Maryland	Brandon Shores 1&2	65	1.20	0.69	0.69	0	3180	0	0	0	0	0	0
	Charles P. Crane 1&2	60	3.50	2.01	2.01	0	900	0	0	0	0	0	0
Massachusetts	New Boston 1	60	2.42	1.39	1.39	0	851	0	0	0	0	0	0
	Mystic 4-6	60	2.42	1.39	1.39	0	1003	0	0	0	0	0	0
	Mt. Tom 1	60	2.42	1.39	1.39	0	299	0	0	0	0	0	0
	Salem Harbor 1-3	60	2.42	1.39	1.39	0	722	0	0	0	0	0	0
	Somerset 5&6	60	2.42	1.39	1.39	0	449	0	0	0	0	0	0
	West Springfield 1-3	60	2.42	1.39	1.39	0	527	0	0	0	0	0	0
New Hampshire	Schiller 4-6	60	2.60	1.49	1.49	0	425	0	0	0	0	0	0
New Jersey	Deepwater 7-9	60	1.66	0.95	0.95	0	485	0	0	0	0	0	0
	Sayreville 4&5	60	0.60	0.34	3.45	90	547	34.4	67.1	145	156	3.02	3.26
	Bergen 1	60	2.00	1.15	1.15	0	608	0	0	0	0	0	0
	Burlington 7	60	2.31	1.33	1.33	0	368	0	0	0	0	0	0
New York	Danskammer Point 3&4	65	2.40	1.38	1.38	0	845	0	0	0	0	0	0
	Arthur Kill 2&3	65	1.66	0.95	0.95	0	2008	0	0	0	0	0	0
	Ravenswood 3	65	1.66	0.95	0.95	0	1760	0	0	0	0	0	0
	E.F. Barrett 1&2	65	1.83	1.05	1.05	0	857	0	0	0	0	0	0
	Port Jefferson 3&4	65	3.08	1.77	1.77	0	873	0	0	0	0	0	0
	Albany 1-4	65	3.80	2.18	2.18	0	920	0	0	0	0	0	0
	Lovett 3-5	65	2.40	1.38	1.38	0	1272	0	0	0	0	0	0
Pennsylvania	Cromby 2	60	3.70	2.13	2.13	0	444	0	0	0	0	0	0
Rhode Island	South Street 12	60	2.42	1.39	1.39	0	305	0	0	0	0	0	0

[a]Weight of sludge with 30% solids is twice that listed for 60% solids.

[b]Volume of sludge with 30% solids is 2.54 times that listed for 60% solids.

Table 2.7. Estimates of Ash Produced for Coal SIP and Modified Coal SIP Scenarios

State	Station/Unit(s)	Unit Capacity Factor (%)	Coal Burned per Year (10^3 ton)	Selected Ash Content (%)	Weight of Ash Collected/Year (10^3 ton)		Volume of Ash Collected/Year (10^3 ft^3)	
					Fly Ash	Aggregate	Fly Ash	Aggregate
Connecticut	Bridgeport Harbor 3	60	915	13.4	103	18.4	2580	230
	Devon 7&8	60	452	13.4	51.0	9.1	1280	114
	Norwalk Harbor 1&2	60	686	13.4	77.4	13.8	1940	172
	Montville 5	60	238	13.4	26.9	4.8	672	60
	Middletown 1-3	60	856	13.4	46.7	67.6	1170	794
Delaware	Edge Moor 1-4	60	878	13.4	98.9	17.6	2470	220
Maine	Mason 1-5	60	475	13.4	43.6	17.1	1090	203
Maryland	Brandon Shores 1&2	65	3180	4.02	108	19.2	2680	240
	Riverside 4&5	60	378	7.5	23.8	4.2	597	53
	Charles P. Crane 1&2	60	900	13.4	23.9	96.5	597	1140
	Herbert A. Wagner 1&2	60	648	6.7	36.5	6.5	913	81
Massachusetts	New Boston 1&2	60	1698	13.4	157	28.0	3930	351
	Mystic 4-6	60	1003	11.0	92.9	16.5	2320	207
	Canal 1	60	1110	13.4	125	22.3	3120	278
	Mt. Tom 1	60	299	13.4	33.8	6.0	844	75
	Salem Harbor 1-3	60	722	10.0	46.4	25.2	1160	297
	Somerset 5&6	60	449	9.0	34.0	6.0	849	76
	West Springfield 1-3	60	527	13.4	59.4	10.6	1620	132
New Hamsphire	Schiller 4-6	60	425	13.4	47.9	8.5	1200	107
New Jersey	Deepwater 7-9	60	485	4.02	16.4	2.9	411	37
	Sayreville 4&5	60	547	13.4	14.5	58.7	363	690
	Bergen 1&2	60	1193	10.0	76.8	41.8	1920	491
	Kearny 7&8	60	549	5.27	18.6	10.1	465	119
	Sewaren 1-4	60	1160	5.27	39.4	21.4	983	252
	Hudson 1	60	839	13.4	22.2	89.9	556	1060
	Burlington 7	60	368	10.0	23.7	12.9	593	152
New York	Danskammer Point 1-4	65	1188	13.4	134	23.8	3350	299
	Arthur Kill 2&3	65	2008	13.4	226	40.2	5640	503
	Ravenswood 3	65	1760	13.4	198	35.3	4960	442
	E. F. Barrett 1&2	65	857	13.4	96.7	17.2	2420	216
	Northport 1-3	65	2790	13.4	314	56.0	7870	701
	Northport 4	65	986	13.4	111	19.8	2780	248
	Far Rockaway 4	65	288	13.4	32.5	5.8	813	72
	Glenwood 4&5	65	705	13.4	79.4	14.2	1990	177
	Port Jefferson 1-4	65	1099	13.4	124	22.1	3100	276
	Albany 1-4	65	920	13.4	104	18.5	2590	231
	Oswego 1-4	65	1039	13.4	117	20.9	2930	261
	Lovett 3-5	65	1272	13.4	144	25.5	3590	320
Pennsylvania	Cromby 2	60	444	10.0	37.4	6.7	935	83
	Schuylkill 1	60	392	13.4	44.2	7.9	1100	98
	Southwark 1&2	60	1214	13.4	137	24.4	3420	305
	Springdale 7&8	60	543	10.7	48.9	8.7	1220	109
Rhode Island	South Street 12	60	305	10.0	25.7	4.6	642	57

Table 2.8. Estimates of Ash Produced for the Voluntary Conversion Scenario

State	Station/Unit(s)	Unit Capacity Factor (%)	Coal Burned per Year (10^3 ton)	Selected Ash Content (%)	Weight of Ash Collected/Year (10^3 ton)		Volume of Ash Collected/Year (10^3 ft^3)	
					Fly Ash	Aggregate	Fly Ash	Aggregate
Connecticut	Bridgeport Harbor 3	60	915	13.4	103	18.4	2580	230
	Devon 7&8	60	452	13.4	51.0	9.1	1280	114
	Norwalk Harbor 1&2	60	686	13.4	77.4	13.8	1940	172
Delaware	Edge Moor 3&4	60	522	13.4	58.9	10.5	1470	131
Maine	Mason 3-5	60	295	13.4	25.5	13.9	636	163
Maryland	Brandon Shores 1&2	65	3180	4.02	108	19.2	2680	240
	Charles P. Crane 1&2	60	900	13.4	23.9	96.5	597	1140
Massachusetts	New Boston 1	60	851	11.0	78.8	14.0	1970	176
	Mystic 4-6	60	1003	11.0	92.9	16.5	2320	207
	Mt. Tom 1	60	299	13.4	33.8	6.0	844	75
	Salem Harbor 1-3	60	722	13.4	46.4	25.2	1160	297
	Somerset 5&6	60	449	9.0	34.0	6.0	849	76
	West Springfield 1-3	60	527	13.4	59.4	10.6	1620	132
New Hamsphire	Schiller 4-6	60	425	13.4	47.9	8.5	1200	107
New Jersey	Deepwater 7-9	60	485	4.02	16.4	2.9	411	37
	Sayreville 4&5	60	547	13.4	14.5	58.7	363	690
	Bergen 1	60	608	10.0	39.1	21.3	978	250
	Burlington 7	60	368	10.0	23.7	12.9	593	152
New York	Danskammer Point 3&4	65	845	13.4	95.3	16.9	1050	212
	Arthur Kill 2&3	65	2008	13.4	226	40.2	5640	503
	Ravenswood 3	65	1760	13.4	198	35.3	4960	442
	E. F. Barrett 1&2	65	857	13.4	96.7	17.2	2420	216
	Port Jefferson 3&4	65	873	13.4	98.4	17.5	2460	219
	Albany 1-4	65	920	13.4	104	18.5	2590	231
	Lovett 3-5	65	1272	13.4	144	25.5	3590	320
Pennsylvania	Cromby 2	60	444	10.0	37.4	6.7	935	83
Rhode Island	South Street 12	60	305	10.0	25.7	4.6	642	57

Table 2.9. Estimates of Resources Required and Wastes Generated for the Coal SIP Scenario, by State

State	Lime Required/ Year (10^3 ton)	Limestone Required/ Year (10^3 ton)	Weight of Sludge Produced/Year, 60% Solids (10^3 ton)		Volume of Sludge Produced/ Year, 60% Solids (10^6 ft^3)		Weight of Ash Collected/ Year (10^3 ton)		Volume of Ash Collected/ Year (10^3 ft^3)	
			Lime Scrubbing	Limestone Scrubbing	Lime Scrubbing	Limestone Scrubbing	Fly Ash	Aggregate	Fly Ash	Aggregate
Connecticut	183	357	771	833	16.08	17.36	305	114	7,640	1,370
Delaware	0	0	0	0	0	0	98.9	17.6	2,470	220
Maine	19.8	38.5	83.2	89.7	1.73	1.87	43.6	17.1	1,090	203
Maryland	0	0	0	0	0	0	192	126	4,790	1,510
Massachusetts	157	306	660	714	13.77	14.87	548	115	13,840	1,415
New Hampshire	0	0	0	0	0	0	47.9	8.5	1,200	107
New Jersey	134	261	563	608	11.73	12.65	212	238	5,290	2,800
New York	368	717	1,548	1,670	32.24	34.81	1,680	299	42,030	3,750
Pennsylvania	145	283	612	660	12.75	13.76	267	47.7	6,675	595
Rhode Island	17.7	34.6	74.7	80.6	1.56	1.68	25.7	4.6	642	57
Total	1,024	1,997	4,312	4,655	89.86	97.00	3,420	988	85,670	12,020

Table 2.10. Estimates of Resources Required and Wastes Generated for the Modified Coal SIP Scenario, by State

State	Lime Required/ Year (10^3 ton)	Limestone Required/ Year (10^3 ton)	Weight of Sludge Produced/Year, 60% Solids (10^3 ton)		Volume of Sludge Produced/ Year, 60% Solids (10^6 ft^3)		Weight of Ash Collected/ Year (10^3 ton)		Volume of Ash Collected/ Year (10^3 ft^3)	
			Lime Scrubbing	Limestone Scrubbing	Lime Scrubbing	Limestone Scrubbing	Fly Ash	Aggregate	Fly Ash	Aggregate
Connecticut	183	357	771	833	16.08	17.36	305	114	7,640	1,370
Delaware	0	0	0	0	0	0	98.9	17.6	2,470	220
Maine	18.1	35.3	76.3	82.3	1.59	1.72	43.6	17.1	1,090	203
Maryland	0	0	0	0	0	0	192	126	4,790	1,510
Massachusetts	0	0	0	0	0	0	548	115	13,840	14,150
New Hampshire	0	0	0	0	0	0	47.9	8.5	1,200	107
New Jersey	150	293	632	682	13.17	14.21	212	238	5,290	2,800
New York	41.7	81.2	176	189	3.66	3.95	1,680	299	42,030	3,750
Pennsylvania	119	231	499	538	10.40	11.22	267	47.7	6,675	595
Rhode Island	0	0	0	0	0	0	25.7	4.6	642	57
Total	512	998	2,154	2,324	44.90	48.46	3,420	988	85,670	12,020

Table 2.11. Estimates of Resources Required and Wastes Generated for the Voluntary Conversion Scenario, by State

State	Lime Required/ Year (10^3 ton)	Limestone Required/ Year (10^3 ton)	Weight of Sludge Produced/Year, 60% Solids (10^3 ton)		Volume of Sludge Produced/ Year, 60% Solids (10^6 ft^3)		Weight of Ash Collected/ Year (10^3 ton)		Volume of Ash Collected/ Year (10^3 ft^3)	
			Lime Scrubbing	Limestone Scrubbing	Lime Scrubbing	Limestone Scrubbing	Fly Ash	Aggregate	Fly Ash	Aggregate
Connecticut	119	233	525	543	10.48	11.31	231	41.3	5,800	516
Delaware	0	0	0	0	0	0	58.9	10.5	1,470	131
Maine	11.7	22.8	49.4	53.2	1.03	1.11	25.5	13.9	636	163
Maryland	0	0	0	0	0	0	132	116	3,280	1,380
Massachusetts	0	0	0	0	0	0	345	78.3	8760	965
New Hampshire	0	0	0	0	0	0	47.9	8.5	1,200	107
New Jersey	34.4	67.1	145	156	3.02	3.26	93.7	95.8	2,345	1,130
New York	0	0	0	0	0	0	962	171	22,710	2,140
Pennsylvania	0	0	0	0	0	0	37.4	6.7	935	83
Rhode Island	0	0	0	0	0	0	25.7	4.6	642	57
Total	165	323	719	752	14.53	15.68	1,959	547	47,780	6,677

3. TOPICAL RESPONSES

3.1 AIR QUALITY MODELING

The subregional air quality dispersion modeling has been redone to incorporate a number of changes that have occurred since the release of the DEIS. At the public hearings held December 16-18, 1981, comments indicated that some stack parameters used in the DEIS modeling analysis were incorrect due in part to scheduled plant design changes. The utilities were asked to respond to a USDOE survey (see Appendix A, Letter to Utilities) by providing corrected stack parameters; these were used in the FEIS modeling. If no response was received, it was assumed that the data input used in the DEIS were correct. Table 2.3 contains the stack parameters used in the FEIS modeling analysis.

The survey also included a request for information on plant capacity factors. The capacity factors used in the DEIS were USDOE's estimates of the need for power over the next decade. If a utility replied with its own estimate of plant capacity factor, then that was used; if no reply was received, then the value used in the DEIS was assumed to represent a reasonable estimate. The plant capacity factors used in this analysis also are given in Table 2.3.

The utilities also were asked to provide current information on emission limitations and to indicate which units they presently intend to convert. Many regulatory agencies also furnished revised SIP limits as part of their written comments. This resulted in a number of discrepencies as to what the emission rates eventually might be and, as a consequence, three modeling scenarios were designed to bracket the range of possible impacts. The Coal SIP and Modified Coal SIP scenarios are similar to those in the DEIS, while the Voluntary Conversion Scenario includes only the 27 plants that constitute a more likely conversion scenario (see Sec. 1). More detail on the scenarios, the emission rates, and the converting plants can be found in Tables 2.1 and 2.3 and in Section 2.2.

The rural, full-year version of the Robert A. McCormick model, RAMFR, was again used to calculate air quality impacts of the plant conversions. The primary reason for using RAMFR in the DEIS was that at the time of the original analysis (1979) it was the only USEPA-approved multi-source model; it was used in this FEIS analysis because only minor changes in the source term data from the DEIS were needed, making RAMFR the most cost-effective model. Also, a change in models would have complicated the comparison of results presented in the DEIS with the FEIS predictions.

As stated in the DEIS, the RAMFR model has inherent weaknesses: it assumes level terrain and uses only one source of meteorology. As a result, it has not been included as a recommended model in the proposed revisions of USEPA's Guideline on Air Quality Models (USEPA 1980). The fact that the model does not treat terrain is of minor consequence in meeting the objectives of this study. For the most part, high levels of ambient air concentrations resulting from plume impaction from tall stacks on areas of complex terrain are localized and site-specific (within a few kilometers of the source), and beyond the scope of this document. Localized impacts are to be discussed and analyzed in the site-specific assessments.

The RAMFR model, as well as the rest of the USEPA-approved models, uses only one source of meteorological data. For this study, the four subregions were set up as geographical areas within which the conversion candidates tended to cluster. Five years of meteorological data from only one representative site within each subregion (except for the large Boston subregion, which was further divided, so that three sets of data were used) were chosen for the dispersion estimates for that subregion. The time and effort needed to collect and prepare site-specific meteorological data for each plant for one or for part of one subregion would have been extensive. The analysis could have been accomplished by modeling each conversion candidate separately and tracking the concentrations from each source at each receptor and totaling the contributions of all the plants on each receptor. However, if plant A has a maximum 24-hour contribution of 50 $\mu g/m^3$ at receptor C, and plant B also has a maximum 24-hour contribution of 50 $\mu g/m^3$ at receptor C, the cumulative impact is not necessarily 100 $\mu g/m^3$, because the maximum impacts may occur on different days during different meteorological conditions. It is for these reasons that a multisource model with one meteorological source was used for the analysis.

The newer USEPA models, such as the ISC and MPTER models, were developed with internal consistency in mind; that is, when modeling similar sources under similar meteorological conditions, the different models yield similar results. These newer models are developed around the basic algorithm found in the CRSTER model with a number of added options. The RAMFR model differs slightly from these models in calculation of effective stack height and plume rise, wind speed variation with height, and comparison of mixing height data to effective stack height. The variation in prediction between these models can range from 10% to 20% (Martin 1979), but these differences do not severely affect the final conclusions presented in this FEIS, since the objective is to predict trends in the air quality due to conversion.

At the time of the DEIS analysis, it could only be speculated which areas would be highly impacted if all conversions were to take place. One of the goals of the modeling was to identify such locations. Since then, there have been efforts to make refined studies of PSD increment consumption and possible air quality standard violations. By identifying those potential "hot spot" areas in a cost-effective manner, as was done in the DEIS and repeated here, a better understanding of interaction and cumulative impacts would be available for the site-specific work.

More recent ambient air quality monitoring data have been incorporated into the FEIS analysis where they play an important role in defining current conditions. The ambient air quality data serve two purposes: they are used to determine areas where small increases in air pollution are critical (e.g., New York City) and they represent the impacts from all other sources in the northeastern United States. Also, the data enable the modeler to subtract the current contribution of the candidate plants as they burn oil and then add the contribution if they were to burn coal.

The following sections are summaries of the results of the subregional analyses for the three scenarios used in the FEIS analysis.

3.1.1 Boston Subregion

As discussed in the DEIS, the Boston Subregion was further subdivided because of its large size. In doing so, meteorological data from three locations were used to simulate atmospheric dispersion in each of the subdivisions. The North Boston Subdivision contains the Schiller and Mason stations and, meteorological data for 1960-1964 from Portland (surface and upper air data) were used in the modeling. Table 3.1-1 contains air concentration data for two particular locations within the subdivision, Portland, ME, and Portsmouth, NH, and Figures 3.1-1 through -3 show isopleths for maximum 24-hour increases of SO_2 as a result of coal conversion under the three scenarios.

The important differences in this analysis compared to that in the DEIS center around new information pertaining to the Mason facility: more recent ambient air quality data, a lower emission limitation under the Coal SIP, new good engineering practice (GEP) stacks, conversion of only three rather than five units, and extremely low capacity factors on the unconverted units. The new modeling analysis indicates that there should be no serious impacts in the Mason area.

Table 3.1-1. Predicted Increases in SO_2 Concentrations ($\mu g/m^3$) in North Boston Subdivision[a] under Coal SIP, Modified Coal SIP, and Voluntary Conversion Scenarios

Scenario	Averaging Period	NAAQS	Measured Background[b] A[c]	Measured Background[b] B[c]	PSD	Predicted Increase A	Predicted Increase B	Predicted Total Concentration A	Predicted Total Concentration B
Coal SIP (42 plants)	Annual	80	13	28	20	<1	2	13	30
	24-hr	365	39	108	91	<1	8	39	116
Modified Coal SIP (42 plants)	Annual	80	13	28	20	<1	2	13	30
	24-hr	365	39	108	91	<1	11	39	119
Voluntary Conversion (27 plants)	Annual	80	13	28	20	<1	2	13	30
	24-hr	365	39	108	91	<1	11	39	119

[a]Includes Schiller and Mason Stations.

[b]1981 data for Portland (Mason Station)
1978 data for Portsmouth.

[c]A - Portland
B - Portsmouth.

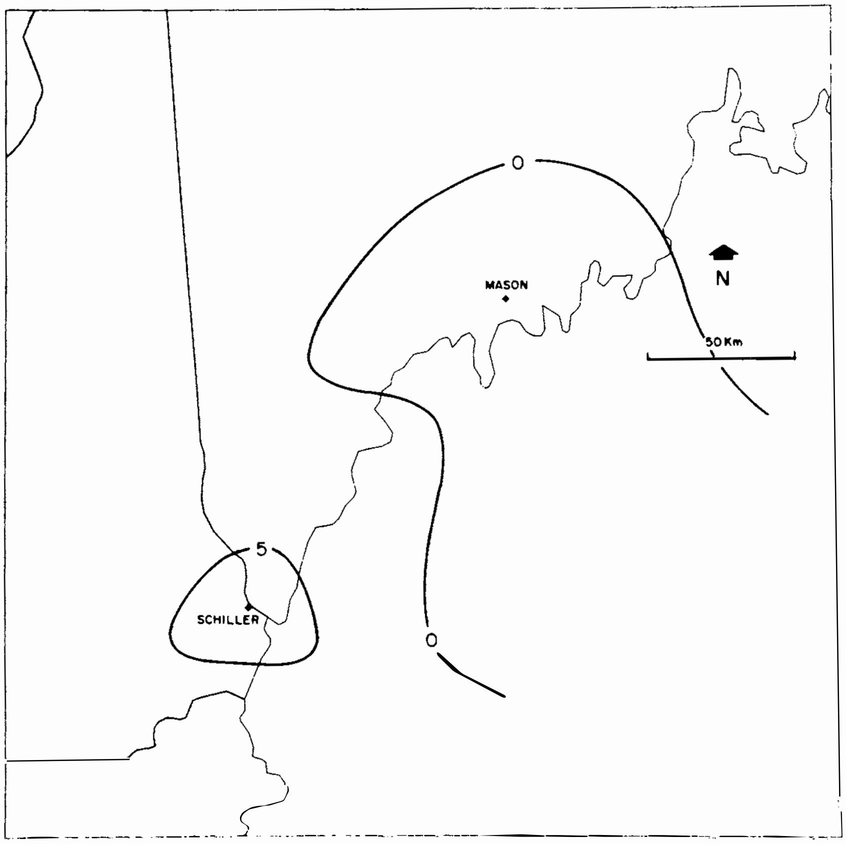

Fig. 3.1-1.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in North Boston Subdivision under Coal SIP Scenario (42 Plants)

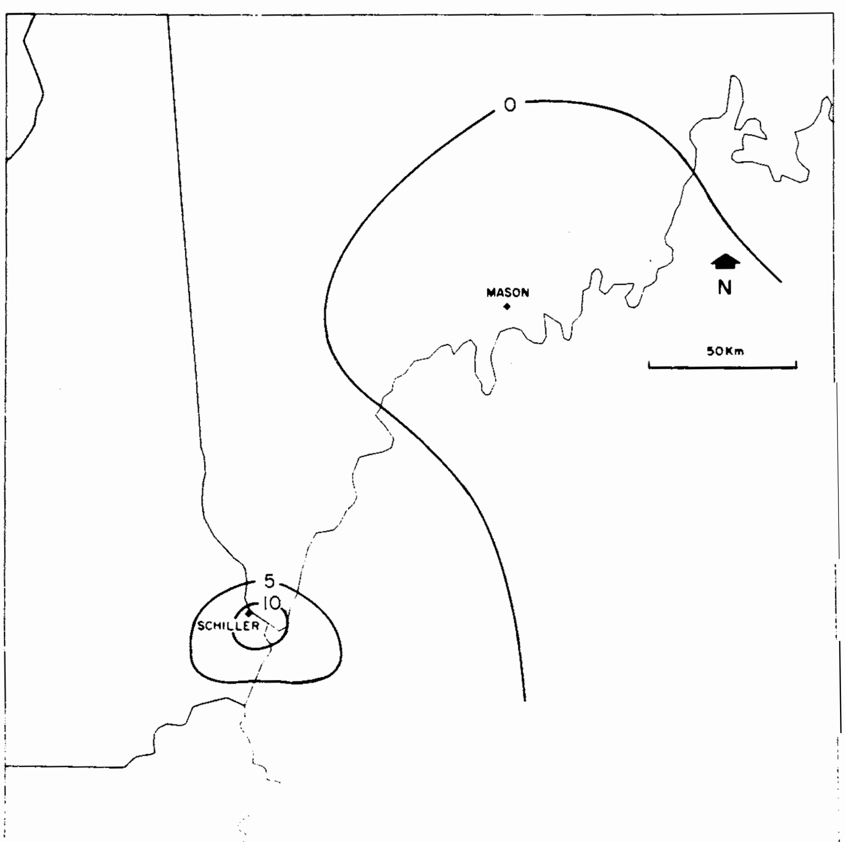

Fig. 3.1-2.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in North Boston Subdivision under Modified Coal SIP Scenario (42 Plants)

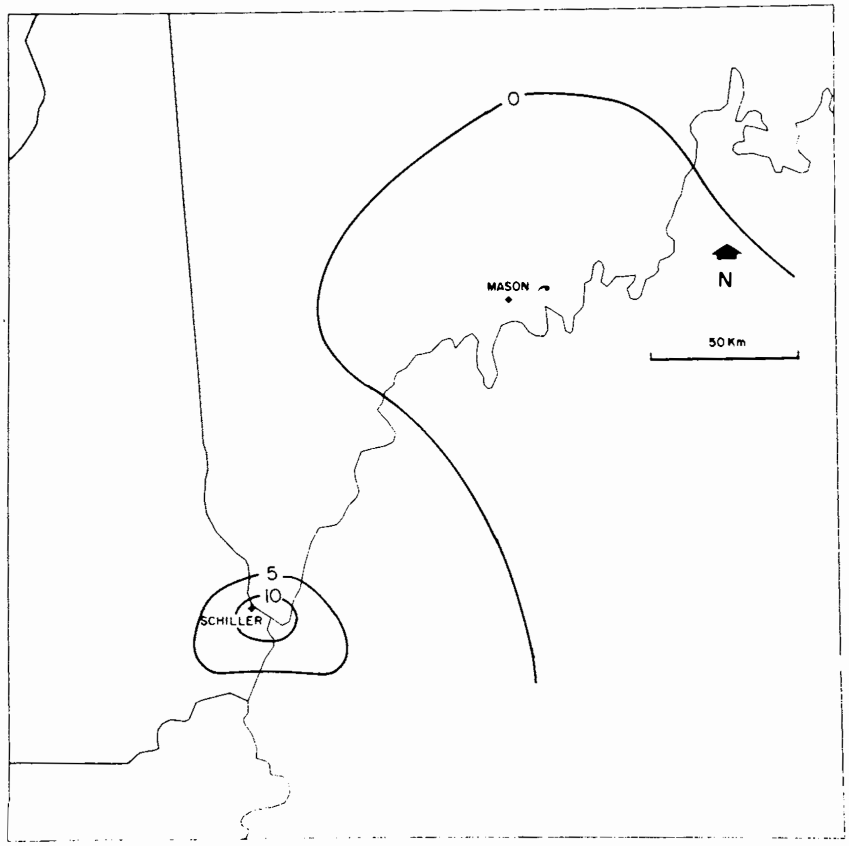

Fig. 3.1-3.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in North Boston Subdivision under Voluntary Conversion Scenario (27 Plants)

The small difference in the predicted increases in the Portsmouth area between the Coal SIP and the Modified Coal SIP is due to the discrepancy between two written comments that were received: Comment MCAQPC-1 gave a coal SIP value of 2.5 lb/ 10^6 Btu, and Comment PSHNH-1 listed a value of 2.6 lb/ 10^6 Btu.

The East Boston Subdivision contains the Mystic, New Boston, Salem Harbor, Canal, South Street, Somerset, and Brayton Point stations, and uses meteorological data for 1970-1974 from Boston (surface data) and Chatham (upper air data). Table 3.1-2 contains air concentration data for two particular locations within the subregion, and Figures 3.1-4 through -6 show isopleths of maximum 24-hour increases of SO_2 as a result of coal conversion under the three scenarios.

The impacts in the Fall River area are greatest under the Coal SIP. This is a result of modeling Brayton Point with stack emissions as were published in the Brayton Plant site-specific FEIS. (USDOE 1979). Brayton Point was modeled because its conversion impacts would not have been contained in the monitoring data, since that plant has only recently been converted. Since its conversion, the coal purchased for Brayton Point has had a lower sulfur content than needed to meet the emission limitations; therefore, the results in Comment NEP-2 were incorporated into the latter two scenarios.

The largest impact in the Boston area (see Table 3.1-2) would occur under the Modified Coal SIP. This was expected, since all plants were assumed to have converted and have higher emissions limitations under this scenario. The impacts in the Boston area would be lower than predicted in the DEIS, partially because of the taller stacks that will be built at the Mystic and New Boston facilities.

The West Boston Subdivision contains the Mt. Tom, West Springfield, Montville, and Middletown stations and was modeled using meteorological data for 1970-1974 from Hartford (surface data) and JFK airport (upper air data). Upper air data from either of the closest recording stations, Albany or JFK, could have been used with little difference in the modeling results. No changes in impacts are anticipated in the West Boston Subdivision since emission limits between SIPs do not change and there are no appreciable changes in plant capacity factors. Table 3.1-3 contains air concentration data for two particular locations within the subregion, but no figures are shown of maximum concentration changes since they are less than 1 $\mu g/m^3$.

Table 3.1-2. Predicted Increases in SO_2 Concentrations ($\mu g/m^3$) in East Boston Subdivision under Coal SIP, Modified Coal SIP, and Voluntary Conversion Scenarios

Scenario	Averaging Period	NAAQS	Measured Background[b] A[c]	Measured Background[b] B[c]	PSD	Predicted Increase A	Predicted Increase B	Predicted Total Concentration A	Predicted Total Concentration B
Coal SIP (42 plants)	Annual	80	62	51	20	<1	<1	62	51
	24-hr	365	135	240	91	62	15	217	255
Modified Coal SIP (42 plants)	Annual	80	62	51	20	<1	1	62	52
	24-hr	365	135	240	91	40	20	175	260
Voluntary Conversion (27 plants)	Annual	80	62	51	20	<1	<1	62	51
	24-hr	365	135	240	91	40	15	175	255

[a]Includes Mystic, New Boston, Salem Harbor, Canal, South Street, Somerset, and Brayton Point stations.

[b]1978 data.

[c]A - Fall River
B - Boston.

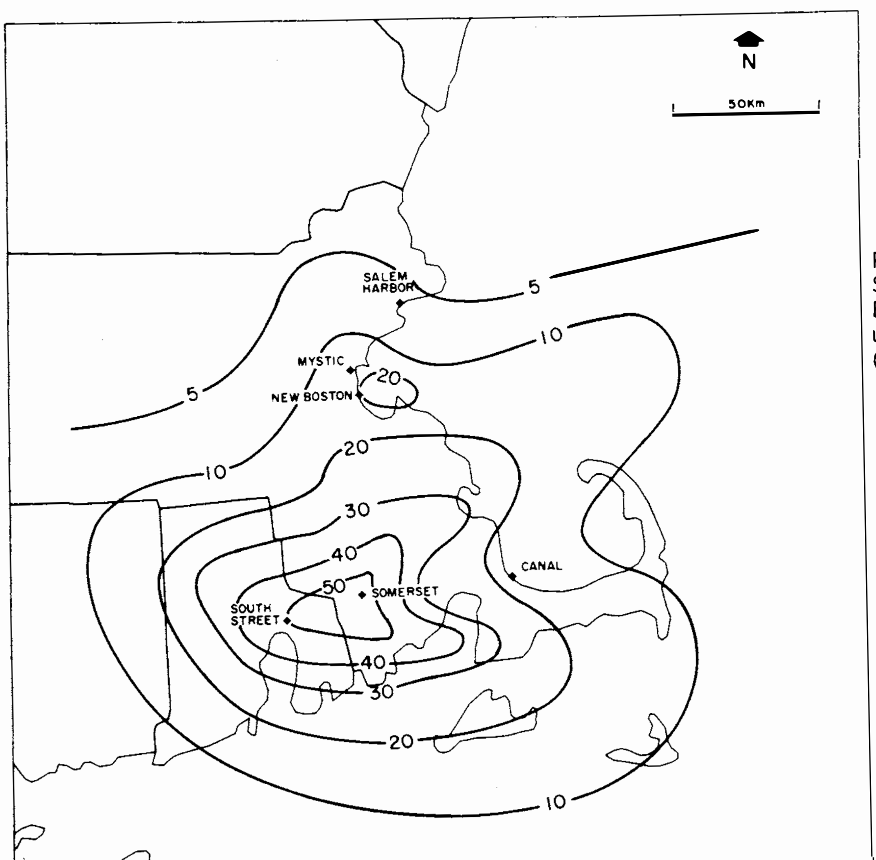

Fig. 3.1-4.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in East Boston Subdivision under Coal SIP Scenario (42 Plants)

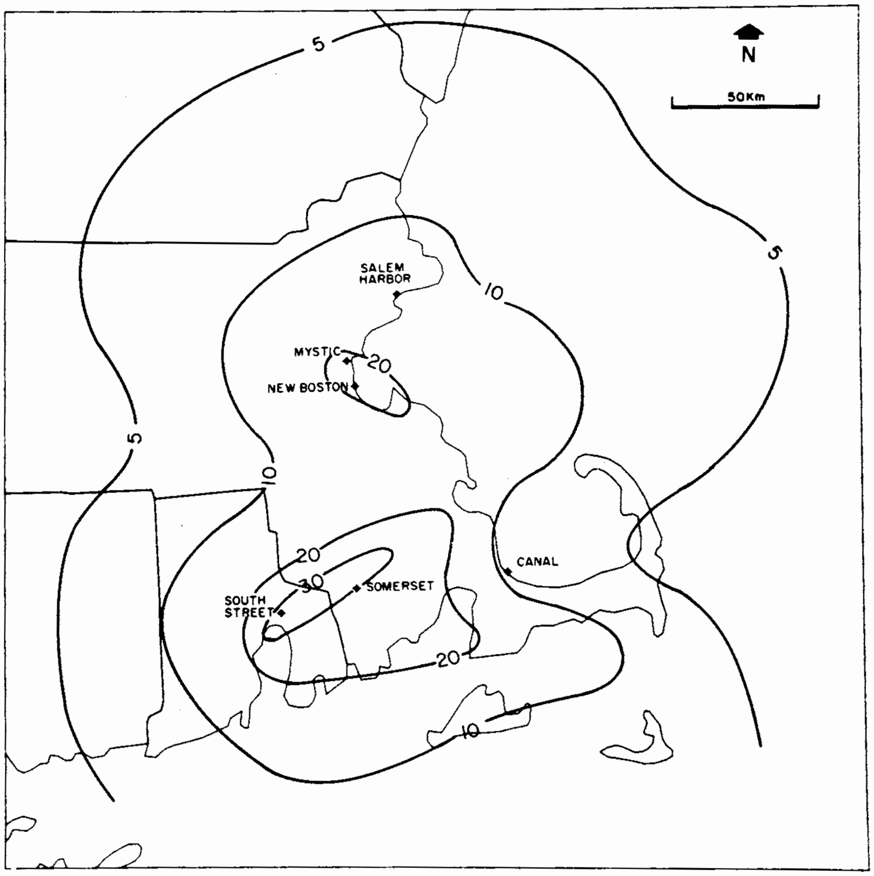

Fig. 3.1-5.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in East Boston Subdivision under Modified Coal SIP Scenario (42 Plants)

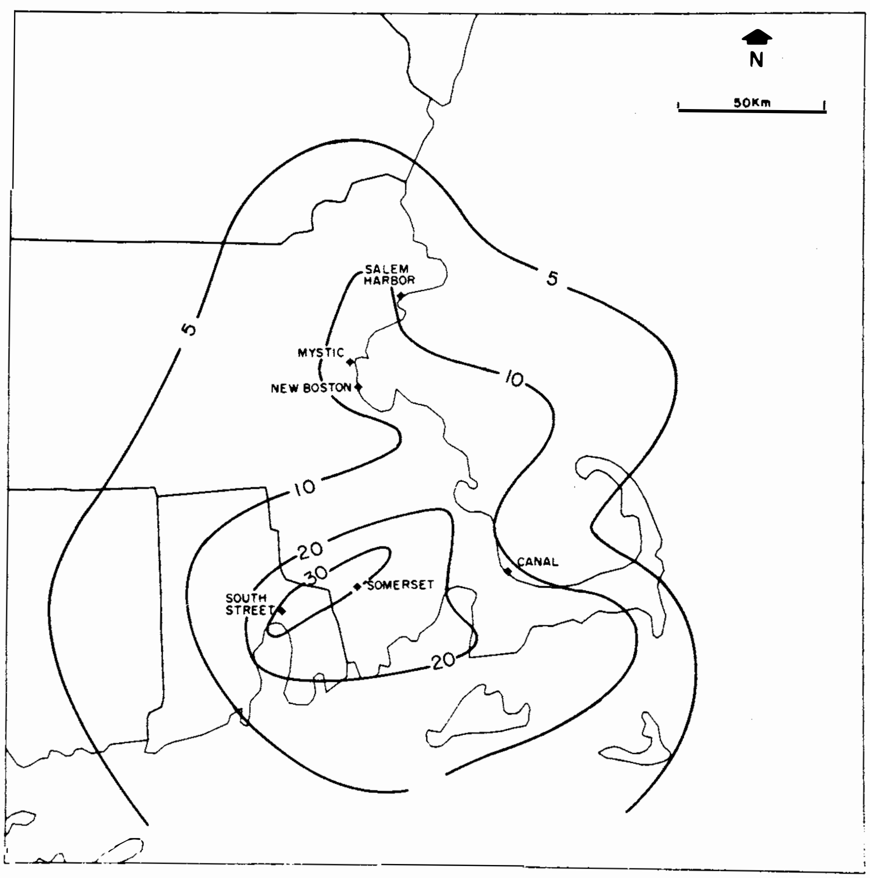

Fig. 3.1-6.

Predicted Increases in 24-hr SO_2 Concentratipns ($\mu g/m^3$) in East Boston Subdivision under Voluntary Conversion Scenario (27 Plants)

Table 3.1-3. Predicted Increases ($\mu g/m^3$) in SO_2 Concentrations in West Boston Subdivision[a] under Coal SIP, Modified Coal SIP, and Voluntary Conversion Scenarios

Scenario	Averaging Period	NAAQS	Measured Background[b] A[b]	Measured Background[b] B[b]	PSD	Predicted Increase A	Predicted Increase B	Predicted Total Concentration A	Predicted Total Concentration B
Coal SIP (42 plants)	Annual	80	33	33	20	0	0	33	33
	24-hr	365	287	207	91	<1	<1	287	207
Modified Coal SIP (42 plants)	Annual	80	33	33	20	0	0	33	33
	24-hr	365	287	207	91	<1	<1	287	207
Voluntary Conversion (27 plants)	Annual	80	33	33	20	0	0	33	33
	24-hr	365	287	207	91	<1	<1	287	207

[a]Includes Mt. Tom, West Springfield, Montville, and Middletown stations.

[b]A - West Springfield
B - Middletown.

3.1.2 New York Subregion

The New York Subregion was not subdivided. It was modeled using meteorological data for 1974-1978 from LaGuardia (surface data) and JFK airport (upper air data).

The most important change in the New York subregion is the more recent ambient air quality data for New York City, which indicates substantially lower background levels of SO_2 than were monitored at the time of the DEIS analysis. The result is that the analysis now shows no threat to ambient air quality standards, even under the Modified Coal SIP, which yields the greatest impact.

The predicted impacts in southern Long Island essentially remain as predicted in the DEIS, with no violations expected.

Some impacts will occur in the extreme southwest corner of Connecticut because of the emissions of the northern New Jersey, Manhattan, and Long Island plants. No violations are expected.

In the Albany area the results indicate moderate increases in SO_2 concentrations, but no violations are anticipated. The potential for localized high impacts due to terrain effects for those plants in the Hudson Valley are not discussed in this analysis because the model does not take into account differences in elevation. High concentrations due to plume impactions in areas of complex terrain are localized phenomena and are the result of emissions from a single plant. Since this does not constitute a cumulative impact, it will be discussed in the site-specific EIS.

Table 3.1-4 contains air concentration data for four particular locations in the New York Subregion, and Figures 3.1-7 through -9 show isopleths of maximum 24-hour increase of SO_2 as a result of coal conversions under the three scenarios.

Table 3.1-4. Predicted Increases in SO_2 Concentrations ($\mu g/m^3$) in New York Subregion Under Coal SIP, Modified Coal SIP, and Voluntary Conversion Scenarios

Scenario	Averaging Period	NAAQS	Measured Background[a] A[b]	B[b]	C[b]	D[b]	PSD	Predicted Increase A	B	C	D	Predicted Total Concentration A	B	C	D
Coal SIP (42 plants)	Annual	80	71	58	32	46	20	2	5	3	2	73	63	35	48
	24-hr	365	295	200	180	237	91	20	55	25	10	315	255	205	247
Modified Coal SIP (42 plants)	Annual	80	71	58	32	46	20	3	5	4	3	74	63	36	49
	24-hr	365	295	200	180	237	91	20	55	25	10	315	255	205	247
Voluntary Conversion (27 plants)	Annual	80	71	58	32	46	20	2	2	2	<1	73	60	34	46
	24-hr	365	295	200	180	237	91	20	10	10	<1	315	210	190	247

[a]Data are 1978 except for annual NYC, which are 1981 data.

[b]A - NYC
B - Southern Long Island
C - Northern New Jersey
D - Western Connecticut, Bridgeport.

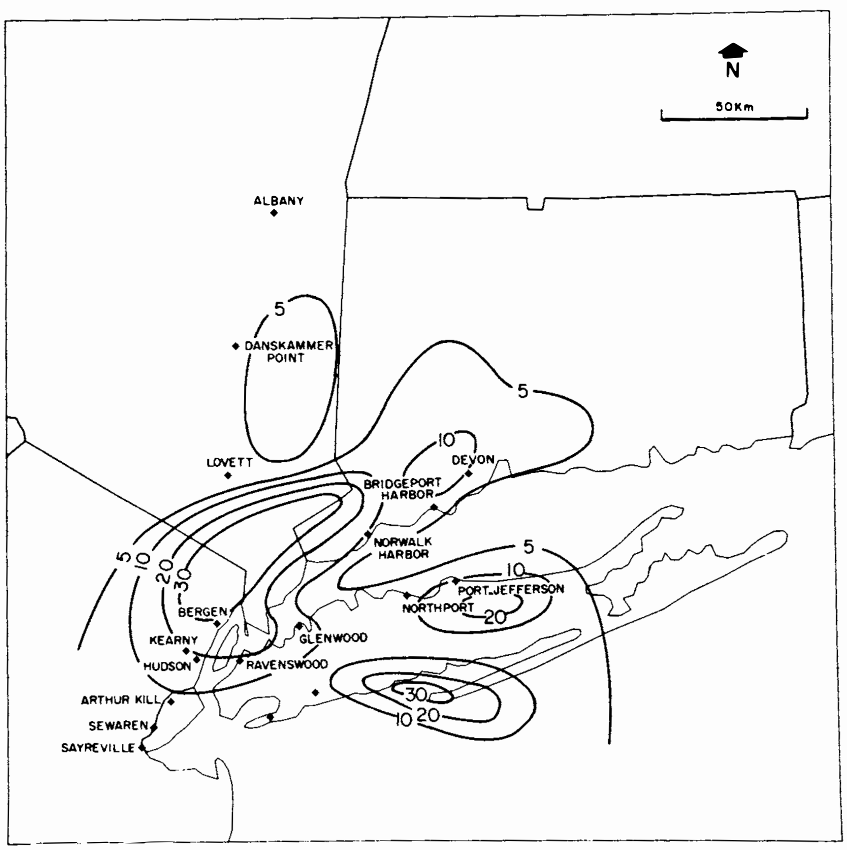

Fig. 3.1-7. Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in New York Subregion under Coal SIP Scenario (42 Plants)

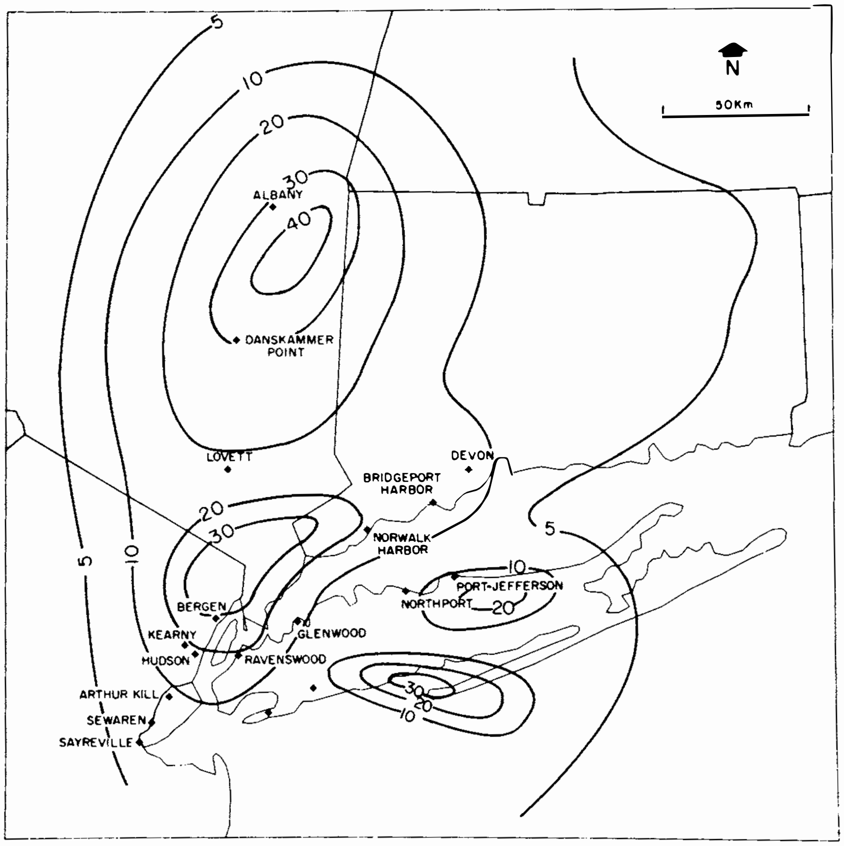

Fig. 3.1-8.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in New York Subregion under Modified Coal SIP Scenario (42 Plants)

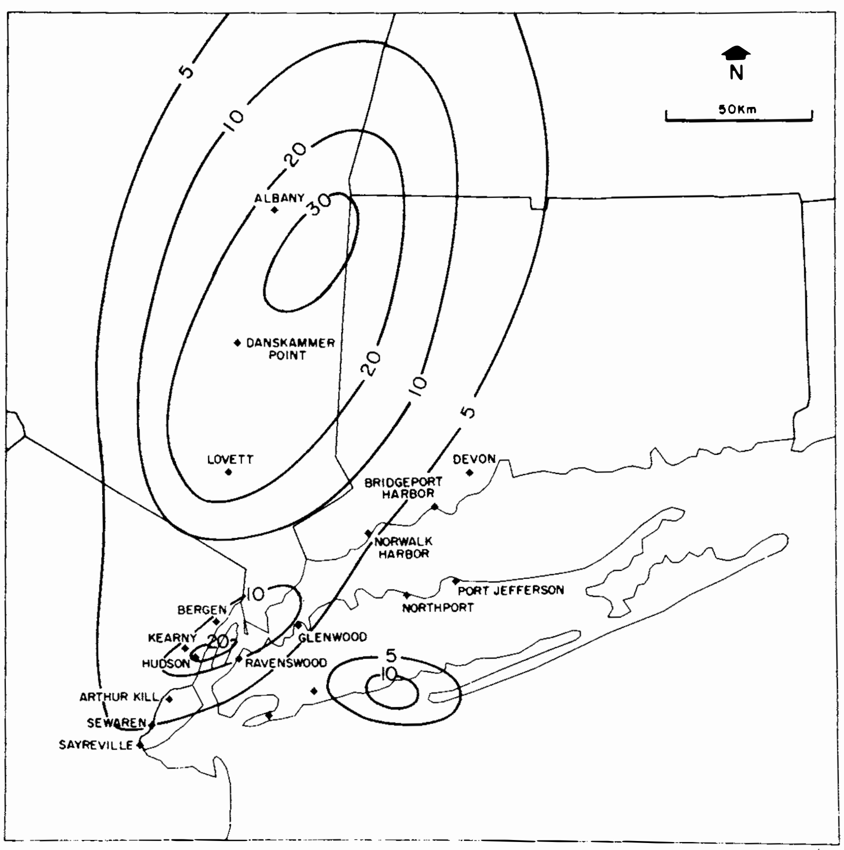

Fig. 3.1-9.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in New York Subregion under Voluntary Conversion Scenario (27 Plants)

3.1.3 Philadelphia Subregion

The Philadelphia Subregion was modeled using meteorological data for the period 1960-1964 from Wilkes-Barre (surface data) and Albany (upper air data). The current ambient air quality monitoring data in certain areas of the Philadelphia Subregion show a fairly high concentration of SO_2, but the conversions on the subregion as a whole should not create any great impacts in those locations.

In the northwestern Philadelphia area, the predicted increases are larger than those in the DEIS because of the higher emission rate at Cromby. These larger increases are predicted under the Modified Coal SIP and Voluntary Conversion scenarios since the emission rate represents a request for a change in the emission limitations. Impacts from the Cromby plant do not appear to interact with those from other plants in the subregion.

Some cumulative impact occurs in the Delmarva Peninsula with the predicted interaction of Edge Moor and Deepwater. The impacts are slightly less than anticipated in the DEIS, partially because not all units at these plants are converting.

The Burlington, Schuylkill, and Southwark plants will also have some cumulative impact; however, the impacts are not expected to be large. Of these three plants, Burlington has the highest emission rate and is one of the plants listed as a potential conversion.

The Philadelphia Subregion as a whole will contribute very little to air quality degradation in the New York Subregion. Under the Modified Coal SIP the predicted change in annual 24-hour SO_2 values in New York City is less than 0.25 $\mu g/m^3$. Table 3.1-5 contains air concentration for two particular locations within the subregion, and Figures 3.1-10 through -12 show isopleths of maximum 24-hour increases of SO_2 as a result of the coal conversions under the three scenarios.

Table 3.1-5. Predicted Increases in SO_2 Concentrations ($\mu g/m^3$) in the Philadelphia Subregion under the Coal SIP, Modified Coal SIP, and Voluntary Conversion Scenarios

Scenario	Averaging Period	NAAQS	Measured[a] Background[b]		PSD	Predicted Increase		Predicted Total Concentration	
			A[b]	B[b]		A	B	A	B
Coal SIP (42 plants)	Annual	80	50	70	20	3	4	53	74
	24-hr	365	170	200	91	15	30	185	230
Modified Coal SIP (42 plants)	Annual	80	50	70	20	3	5	53	75
	24-hr	365	170	200	91	30	30	200	230
Voluntary Conversion (27 plants)	Annual	80	50	70	20	3	5	53	75
	24-hr	365	170	200	91	30	20	200	220

[a]1978 data.

[b]A - NW Philadelphia
B - Philadelphia.

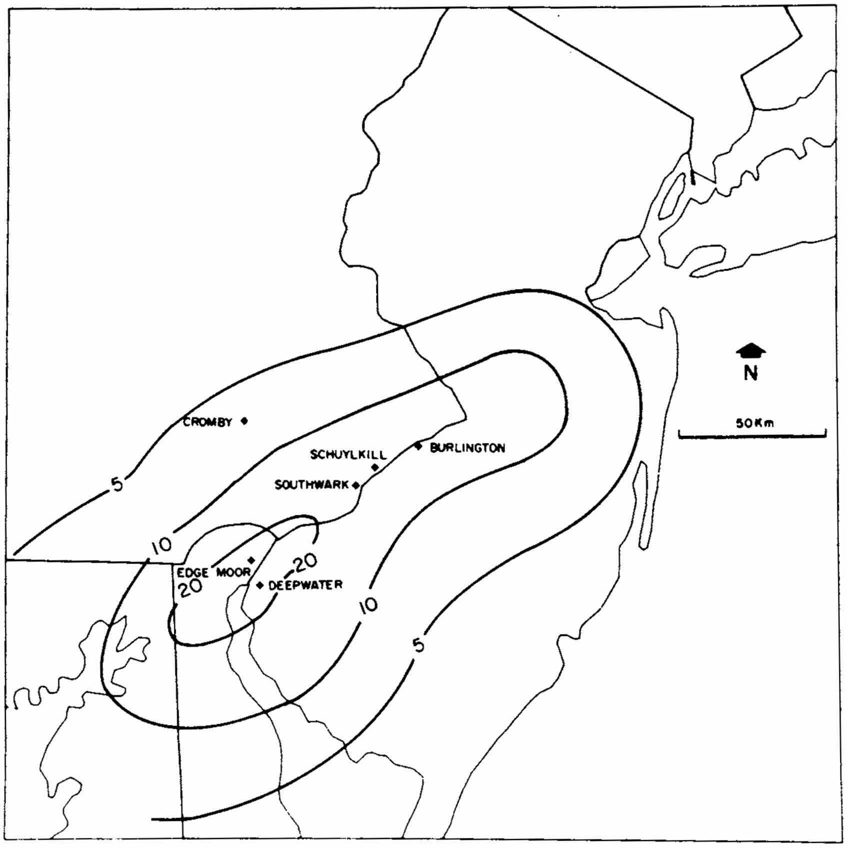

Fig. 3.1-10.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in Philadelphia Subregion under Coal SIP Scenario (42 Plants)

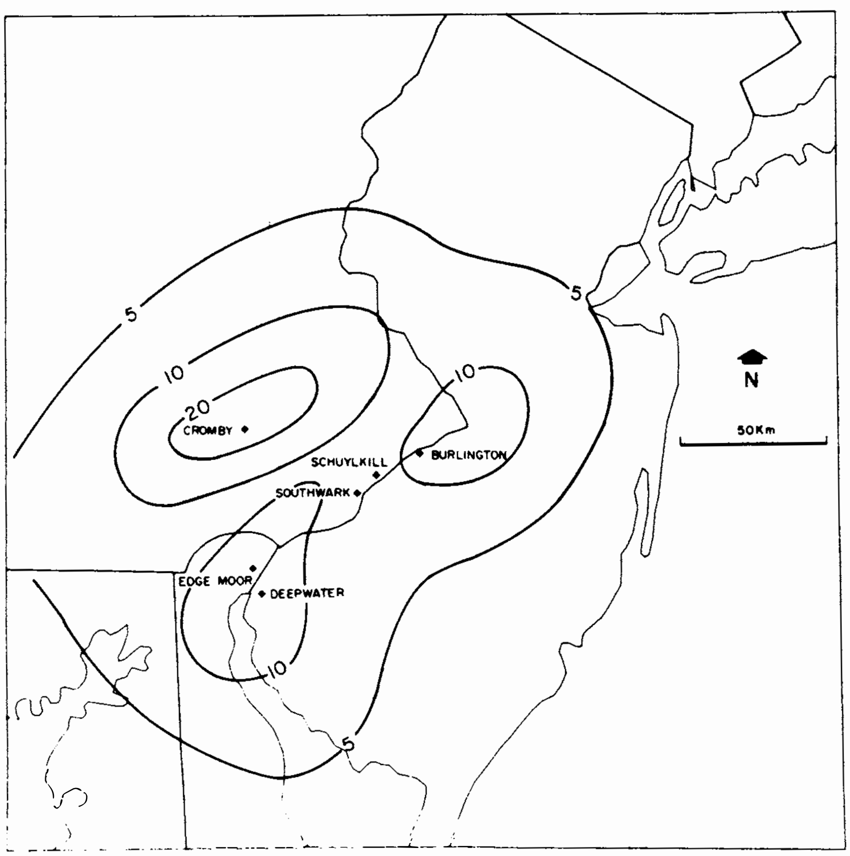

Fig. 3.1-11.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in Philadelphia Subregion under Modified Coal SIP Scenario (42 Plants)

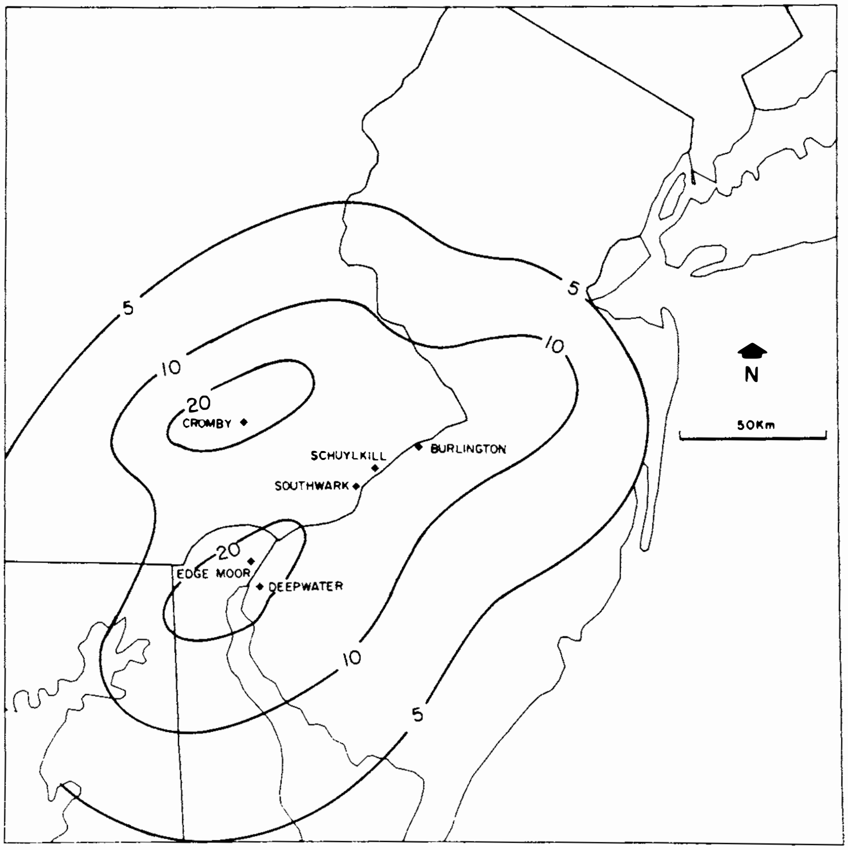

Fig. 3.1-12.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in Philadelphia Subregion under Voluntary Conversion Scenario (27 Plants)

3.1.4 Baltimore Subregion

The Baltimore subregion was modeled using meteorological data for the period 1964-1968 from Baltimore (surface data) and Dulles (upper air data).

The most important difference in the result of the new modeling analysis is the larger increase in SO_2 concentrations northeast of Baltimore. This is due to the higher emission rate at Crane. The increase is the same for all three scenarios since the emission rate is based on an approved Coal SIP and the plant is planning to convert to coal.

The predicted increases in the subregion are the same under the Coal SIP and Modified Coal SIP scenarios because there are no requests for SIP relaxations. The lesser impacts in the southwestern Baltimore area under the Voluntary Conversion Scenario are due to the fact that H.A. Wagner and Riverside are not planning to convert.

Table 3.1-6 contains air quality concentration data for two particular locations within the subregion, and Figures 3.1-13 through -15 show isopleths of maximum 24-hour increases of SO_2 as a result of the coal conversions under the three scenarios.

Table 3.1-6. Predicted Increases in SO_2 Concentrations ($\mu g/m^3$) in Baltimore Subregion under Coal SIP, Modified Coal SIP, and Voluntary Conversion Scenarios

Scenario	Averaging Period	NAAQS	Measured Background[a] A[b]	Measured Background[a] B[b]	PSD	Predicted Increase A	Predicted Increase B	Predicted Total Concentration A	Predicted Total Concentration B
Coal SIP (42 plants)	Annual	80	22	30	20	3	3	25	33
	24-hr	365	131	151	91	45	40	176	191
Modified Coal SIP (42 plants)	Annual	80	22	30	20	3	3	25	33
	24-hr	365	131	151	91	45	40	176	191
Voluntary Conversion (27 plants)	Annual	80	22	30	20	3	1	25	31
	24-hr	365	131	151	91	45	20	176	171

[a]1978 data.

[b]A - Essex
B - Baltimore Area.

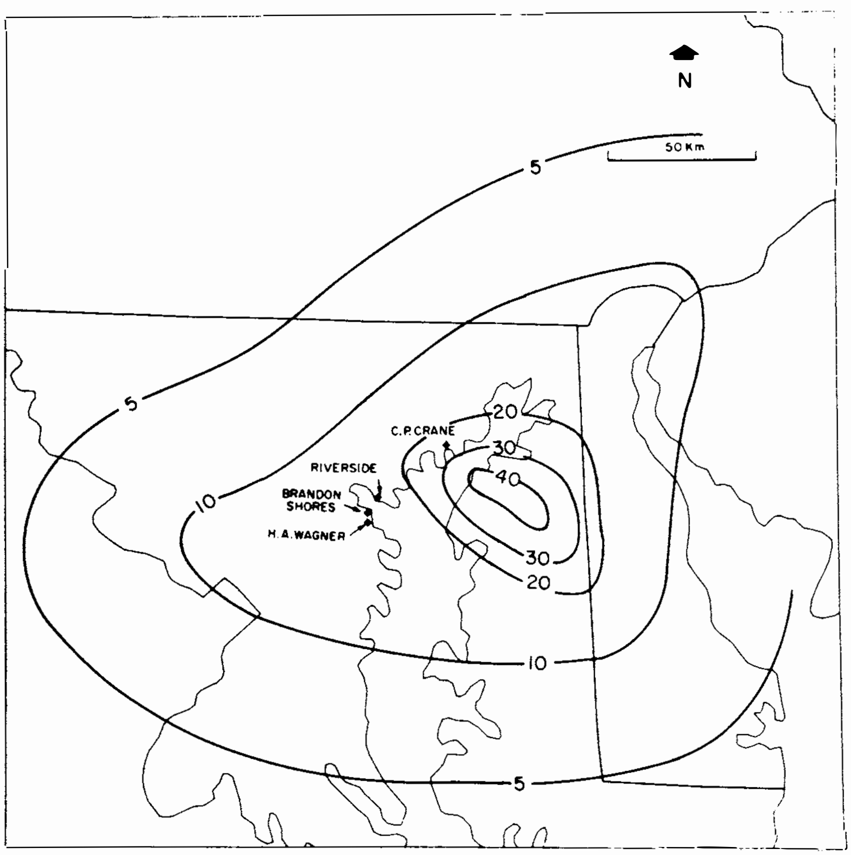

Fig. 3.1-13.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in Baltimore Subregion under the Coal SIP Scenario (42 Plants)

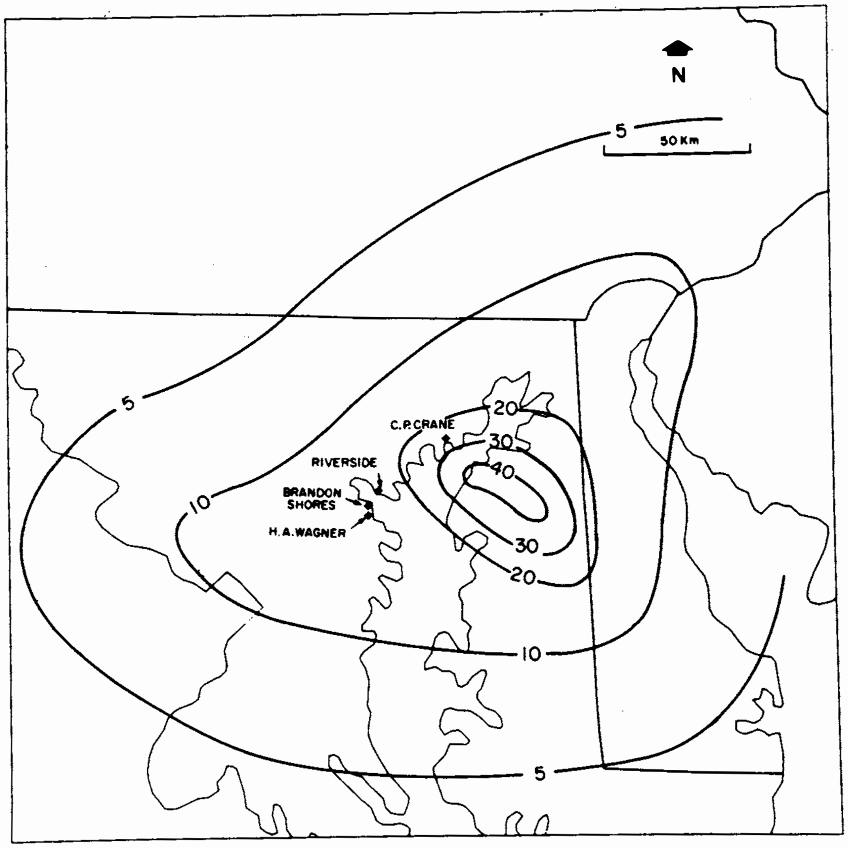

Fig. 3.1-14.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in Baltimore Sub-region under Modified Coal SIP Scenario (42 Plants)

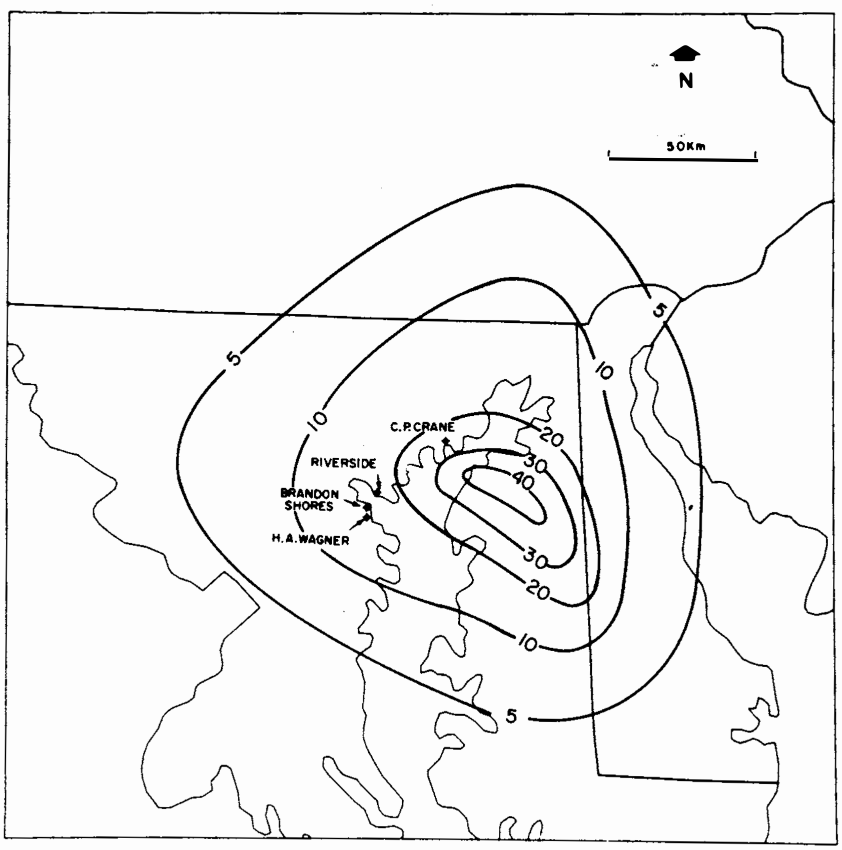

Fig. 3.1-15.

Predicted Increases in 24-hr SO_2 Concentrations ($\mu g/m^3$) in Baltimore Sub-region under Voluntary Conversion Scenario (27 Plants)

3.1.5 Oxides of Nitrogen

Predictions of incremental changes in annual oxides of nitrogen were also made. In the Boston Subregion the increases are generally below 1 $\mu g/m^3$ with the largest increase of 3 $\mu g/m^3$ predicted to occur in Boston. In the New York Subregion the increases are generally below 2 $\mu g/m^3$ with the largest increase of 5 $\mu g/m^3$ occurring in southern Long Island near E.F. Barret and Far Rockaway. In the Philadelphia and Baltimore subregions the predicted increase is generally less than 1 $\mu g/m^3$ with no anticipated increases exceeding 1.5 $\mu g/m^3$.

3.1.6 Summary

In general, the Voluntary Conversion Scenario results in lower impacts than predicted in any other scenario because fewer plants are converting. Exceptions to this are those plants that are essentially isolated from other plants, such as the Schiller plant in the North Boston Subdivision and the Cromby plant in the Philadelphia Subregion. In these cases the Voluntary Conversion Scenario results in the same impact as the Modified Coal SIP Scenario.

The isopleths contained in the figures in this section show the approximate incremental changes in 24-hour SO_2 concentration. Only the 24-hour values are shown because this is the most difficult averaging time with which to achieve compliance, with the exception of New York City. For PSD analysis a more refined grid is necessary. However, the figures indicate approximate values for the subregion as a whole. Therefore, the incremental changes for areas removed from the central part of the subregions, such as Class I PSD locations (e.g., Brigantine Wilderness Area or Arcadia National Park) can be estimated from the figures. In all cases, the incremental change is below 5 $\mu g/m^3$, the 24-hour Class I PSD increment for SO_2.

This modeling analysis does not predict with 100% accuracy, nor will any subsequent study done by any other agency or utility. However, the results in this FEIS identify those plants that would interact, estimate the degree to which they would interact, and approximate the resulting air quality in the northeastern United States under different conversion scenarios under the proposed action.

Emissions of total suspended particulates (TSP) were not modeled in the DEIS nor in this FEIS. The State Implementation Plans (SIPs) set maximum particle emissions for utilities burning either oil or coal. Those emission limitations for the generating stations in this study are identical whether the stations are fueled by oil or coal. Therefore, if the plants emitted at their respective allowable emission rates, there would be no change in ground-level concentration. Several comments on the DEIS pertain to particulate collection efficiency, relative ash content in coal and oil, and collection devices on oil-fired units. Most commentors suggest that particulate emissions will increase following coal conversion. However, the Brayton Point Generating Station, which recently converted with a retrofitted electrostatic precipitator, has a lower particulate emission rate with coal than with oil. The particulate emission rate at all the plants will undoubtedly change slightly after conversion, but the change in emission rate will be small, especially since the magnitude of the allowable emission rate is small. For this reason, a simplified approach to TSP concentrations is taken in this analysis. In the site-specific documents, this subject will be addressed in more detail, along with impacts of fugitive dust from such sources as the coal storage pile.

In some instances, utilities may apply for a Delayed Compliance Order. This would allow the plants to temporarily release pollutants at rates higher than allowed under the SIPs. These orders might be approved for a short time to enable the utility to test its new flue-gas cleaning equipment. However, under no circumstances are the elevated emissions allowed to cause or contribute to violations of ambient air quality standards.

3.2 LONG-RANGE TRANSPORT MODELING

While it is recognized that confidence limits on ASTRAP simulations are highly desirable, they are difficult to define. There have been some limited comparisons with wet deposition of total sulfur in Canada and with sulfate and SO_2 concentrations in the United States, but the statistics cannot be directly extended to these analyses for several reasons. First, the techniques for routine monitoring of dry deposition (as opposed to careful, limited field studies) have yet to be developed. Second, partial statistical verification of model results with limited measurements of wet deposition presupposes that both emission inventories and measurements are accurate and representative; many scientists (particularly modelers) are not fully confident that the conditions hold. Third, any verification thus far has been for all emissions, whereas the simulations here involve emission increments.

Models such as ASTRAP involve linear assumptions between emissions and deposition, i.e, if the emissions field is increased uniformly by 25%, the deposition field will also increase by exactly 25%. Many critical processes, however, may not be linear, particularly over small intervals of time and space. It is recognized that "what goes up must come down," and thus the linear assumption between emissions and deposition (although not necessarily rainfall pH) must hold over a sufficiently broad time and space. The difficulty here is in determining where and how departures from linearity become important. For example, if wet deposition of sulfur is limited not by the availability of oxides of sulfur but by oxidizing agents such as H_2O_2, a 10% increase in emissions of sulfur oxides might lead to only a 5% increase in wet sulfur deposition in the nearby region. However, as recent field studies have indicated that the dry deposition rates of SO_2 and sulfate are rather similar, and as dry deposition is directly proportional to surface concentration for a given surface and stability, the increase in dry deposition in this hypothetical case would be greater than 10%. Thus, the total deposition increment in the nearby region might be very close to 10%, regardless of whether the transformation of SO_2 to SO_4 is significantly nonlinear on a regional scale. It remains for ecologists to determine how critical the mode of deposition is.

In any case, the uncertainty of interest here is the uncertainty of the entire system, including the individual uncertainties involved in emission changes, deposition modeling, effects modeling, and assessment. It is not understood how the uncertainties combine with the system. Although preliminary efforts are underway, such understanding is not likely to be reached within the next several years. Therefore, such models cannot be used to provide a quantitative basis for use in the regulatory process. However, use of the model to provide order-of-magnitude estimates is appropriate for EIS purposes.

The model simulations here examine atmospheric concentrations and deposition of sulfur pollutants associated with increased emissions of sulfur oxides. The patterns of wet deposition of total sulfur are similar to the patterns of wet deposition of hydrogen ion, or acidity, in the Northeast, and thus sulfur deposition is frequently used as a surrogate for acid deposition. While sulfur oxides are not the only contributor to precipitation acidity, they are the main contributor in the Northeast. Use of the sulfur deposition increment as an indicator of the increment of acid deposition implies that the other acidifying substances (primarily nitrate) increase an equivalent amount. Since mobile sources are important in emissions of nitrogen oxides but not in emissions of sulfur oxides, the relative increase in emissions of nitrogen oxides associated with the Voluntary Conversion Scenario is less than the relative increase in emissions of sulfur oxides (Table 3.2-1). Thus the use of the relative increase of sulfur deposition as a surrogate for the relative increase of acid deposition is somewhat conservative.

Simulations of regional transport and deposition indicate that the sulfur deposition changes are of the order of 3-4% or less on the regional scale, and that under the assumption that deposition of hydrogen ions is mainly correlated with the deposition of sulfate ions, as is currently the case in the Northeast and southeastern Canada, the increase in deposition of hydrogen ions (and implied increase in acidity) is no greater than 3-4% in the New York City urban area and 1-2% in New England and the Maritimes.

Table 3.2-1. Comparisons of Increases in Emissions of Sulfur Oxides and Nitrogen Oxides under Voluntary Conversion Scenario (kT/yr)

	Sulfur Oxides	Nitrogen Oxides
Current emissions, U.S. & Canada	30,300	22,600
Emissions increase under Voluntary Conversion Scenario	190	86

In discussions of the regional deposition analysis in the DEIS, a worst-case emission increment involving 42 powerplants was stressed, as a conservative approach. Since the issuance of the DEIS, the USDOE has determined that 27 of the 42 powerplants constitute a more likely conversion scenario (see Sec. 1). This Voluntary Conversion Scenario is described in Section 2; predicted air quality under the Voluntary Conversion Scenario is discussed in Topical Response 3.1.

In addition to the lower level of increased emissions under the Voluntary Conversion Scenario (96×10^3 metric tons of sulfur per year compared with 280×10^3 metric tons of sulfur per year under the Modified Coal SIP Scenario in the DEIS), the base-case emission inventory is somewhat different, and a different meteorological period is examined. The base-case simulations here involve emissions for all of the U.S. and Canada, and not just eastern North America; but emissions estimates in this response are 10-15% lower for the eastern United States than in the DEIS (although some emissions, such as for New York, have been adjusted upward). This most recent inventory adjustment arises from the Phase III effort of the U.S./Canadian scientific investigations for the Memorandum of Intent on Transboundary Air Pollution. The use of January and July 1978 meteorological data is a result of the same effort, since model intercomparisons with data were done for those months.

Simulations of pollutant sulfur concentrations and deposition in the northeastern U.S. and southeastern Canada resulting from current U.S. and Canadian emissions are shown in Figures 3.2-1 and -2. These simulations correspond with the incremental fields from the Voluntary Conversion Scenario shown in Figures 3.2-3 and -4. The negative sulfate concentration in the Voluntary Conversion Scenario winter case can be explained as follows: The primary sulfate emission factor (the fraction of the pollutant sulfur leaving the stack in the form of SO_3, H_2SO_4, or sulfate) is estimated as 5% for oil combustion and 1.5% for coal combustion. Even though total sulfur oxide emissions are increased under the Voluntary Conversion Scenario, the emissions of sulfate are decreased. In winter, chemical transformation of SO_2 to sulfate in the atmosphere is relatively slow. Thus, near the sources in winter the reduction in primary sulfate emissions can be somewhat greater than the increase in secondary sulfate produced by transformation of the increased SO_2 emissions.

In the DEIS, isopleths of concentrations and deposition increments resulting from all anthropogenic sulfur oxide emissions in the eastern U.S. and southeastern Canada were shown across the Northeast for the worst-case scenario (the Modified Coal SIP) and across eastern North America for the base case. The percentage increment to deposition associated with the Modified Coal SIP scenario was examined only in the three sensitive areas (the Adirondacks, central Maine, and southern Nova Scotia), although estimates of the percentage increment elsewhere could be made from comparison of the appropriate isopleths of deposition.

The maximum deposition increment in the three sensitive areas examined in the DEIS (ca. 6% in southern Nova Scotia) was overstated, as later information indicated that the emission inventory used in the DEIS underestimated Maritime Provinces emissions by about 50% and thus the background calculation was low there. On the other hand, the maximum deposition increment anywhere within the region, as implied by the DEIS simulations but not discussed, was about 15% in the New York City urban area.

In this Topical Response, the percentage increments of pollutant sulfur concentrations and deposition associated with the 27-plant Voluntary Conversion Scenario are presented as isopleths across the northeastern U.S. and southeastern Canada (Figures 3.2-5 and -6) and thus may be more easily examined anywhere within the field. Under the Voluntary Conversion Scenario, the maximum deposition increment (New York City urban area) is reduced to 3-4%, while the deposition increment in the sensitive areas examined in the DEIS (the Adirondacks, central Maine, and southern Nova Scotia) is between 1 and 2%.

Examination of the percentage contribution of the current oil-fired combustion of the 42 plants, and the percentage increase over background under the Coal SIP and Modified Coal SIP scenarios (Figures 3.2-7 and -8, 3.2-9 and -10, and 3.2-11 and -12, respectively) indicate that the 42 plants now contribute a maximum of 10-15% to deposition in the Northeast, and that percentage contribution falls off rapidly away from the New York City-Boston area. The Coal SIP Scenario has maximum increases of 3-4%, while the Modified Coal SIP Scenario has maximum increases of 5-6%.

The maximum value in any of the simulated fields represents an average over a region about 100 km on a side. The application of the modeling techniques in ASTRAP with these meteorological data sets does not allow meaningful simulation over smaller spatial scales, although with finer data sets smaller scales have been examined in other applications. The concentration maxima near the plants will be higher than the ASTRAP results, and are therefore being addressed with different models. Even at several hundred kilometers distance, the actual deposition occurring over a short time period is not a smooth pattern, since rainfall itself is often irregular over short periods. However, the pattern of expected deposition is a smooth function, just as the pattern of expected rainfall is generally smooth, particularly over homogeneous terrain.

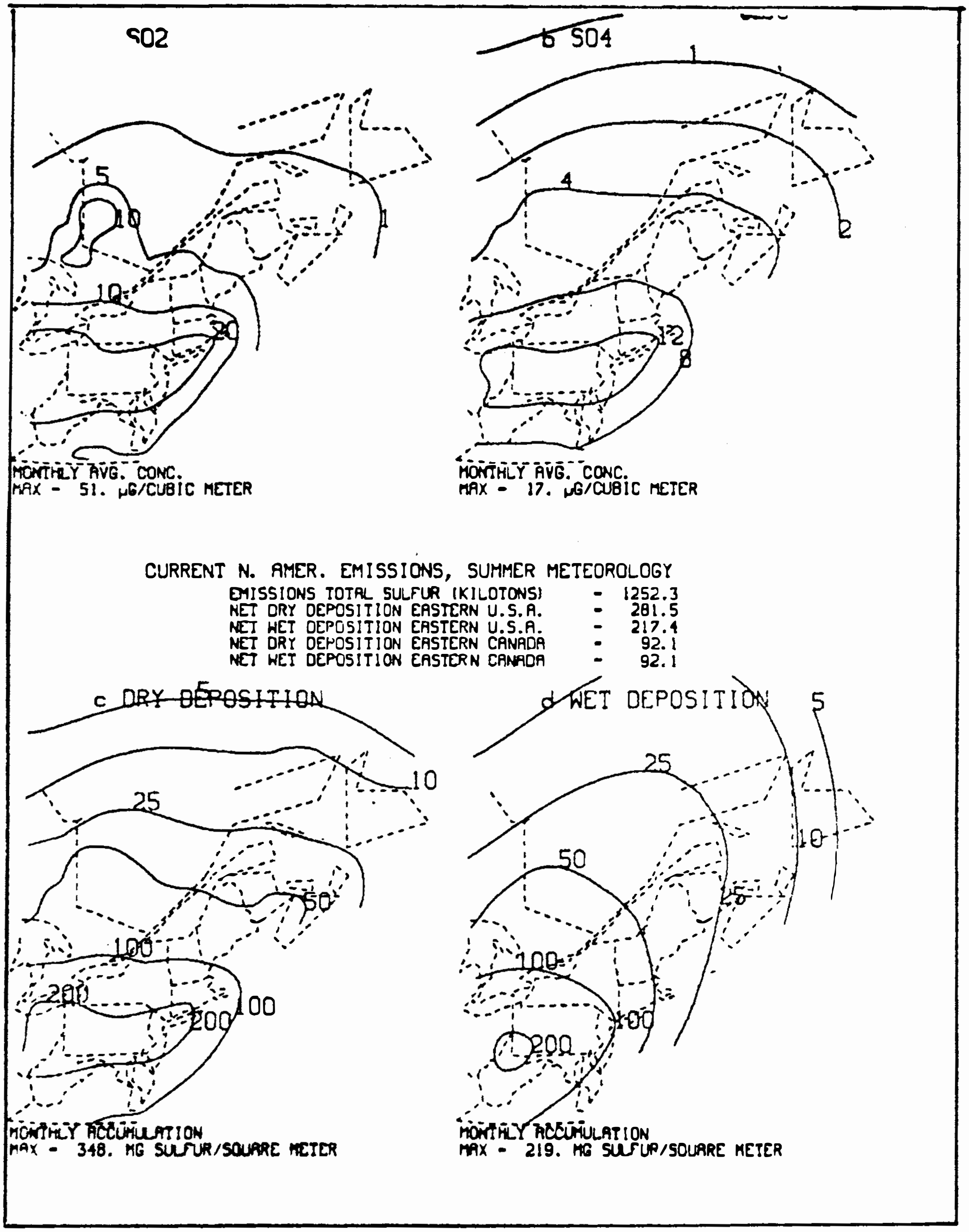

Fig. 3.2-1. Simulated Pollutant Sulfur Concentrations and Deposition in the Northeastern U.S. and Canada Resulting from Current U.S. and Canadian Emissions, Summer Meteorology

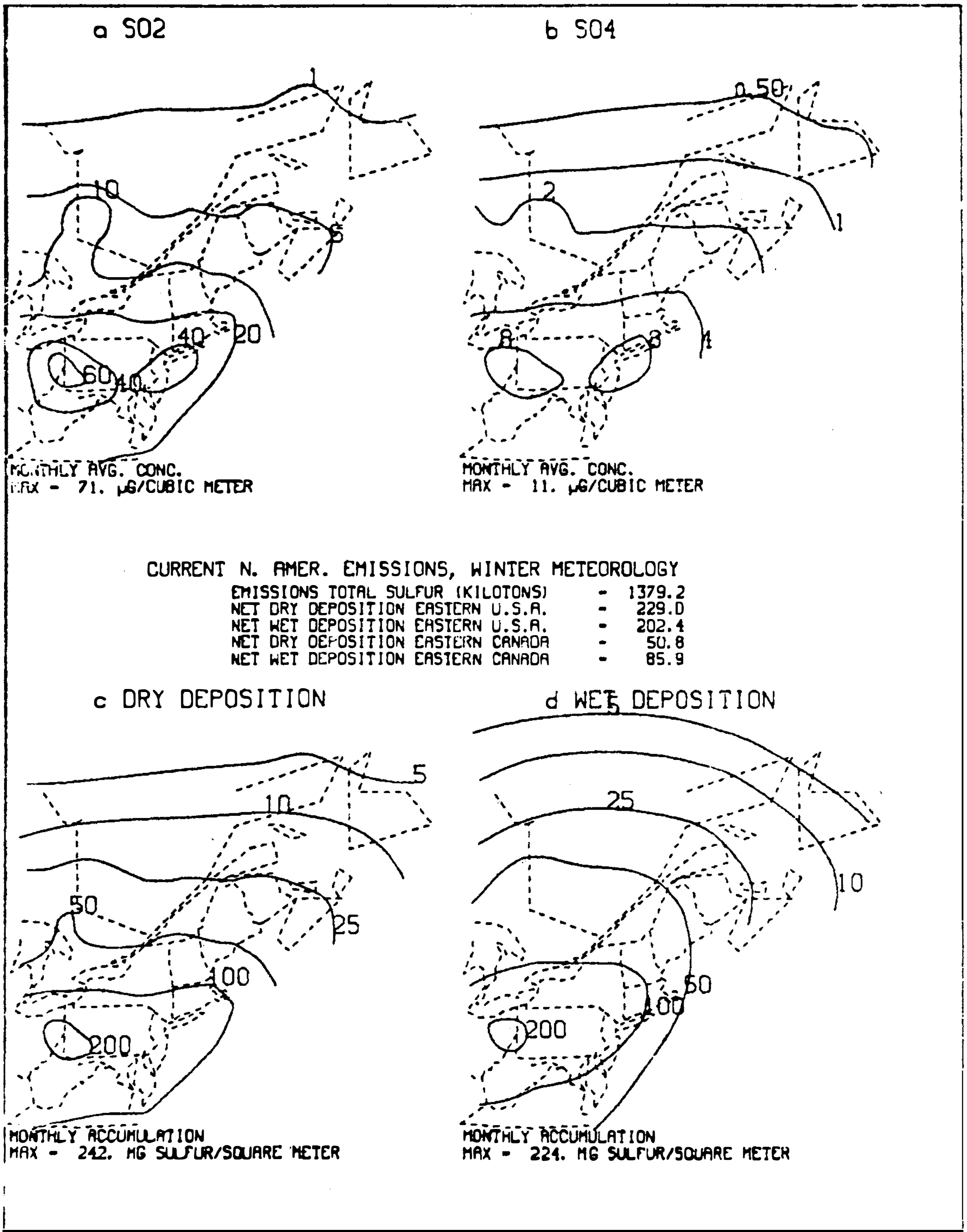

Fig. 3.2-2. Simulated Pollutant Sulfur Concentrations and Deposition in the Northeastern U.S. and Canada Resulting from Current U.S. and Canadian Emissions, Winter Meteorology

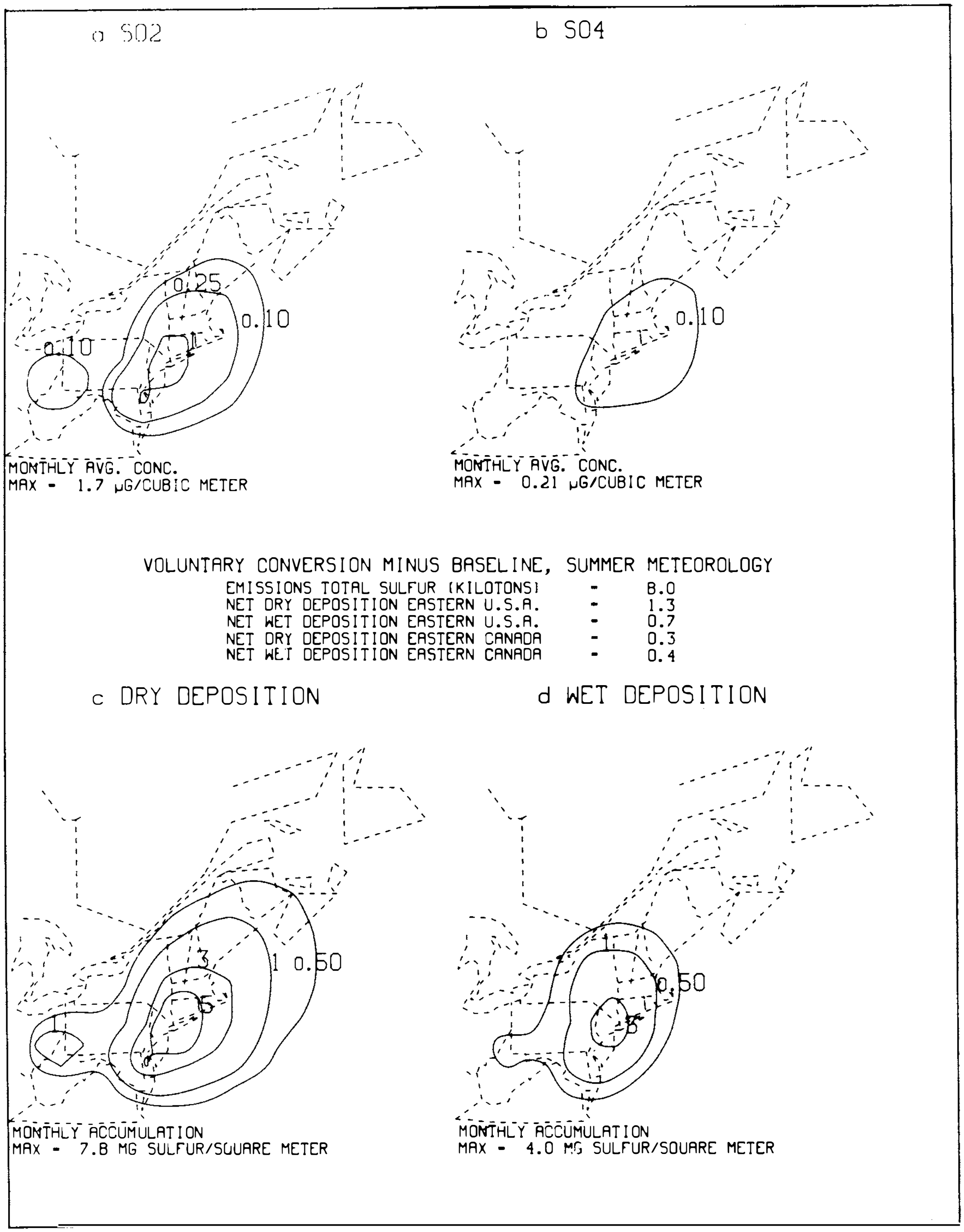

Fig. 3.2-3. Projected Incremental Pollutant Sulfur Concentrations and Deposition in the Northeastern U.S. and Canada under Voluntary Conversion (27-Plant) Scenario, Summer Meteorology

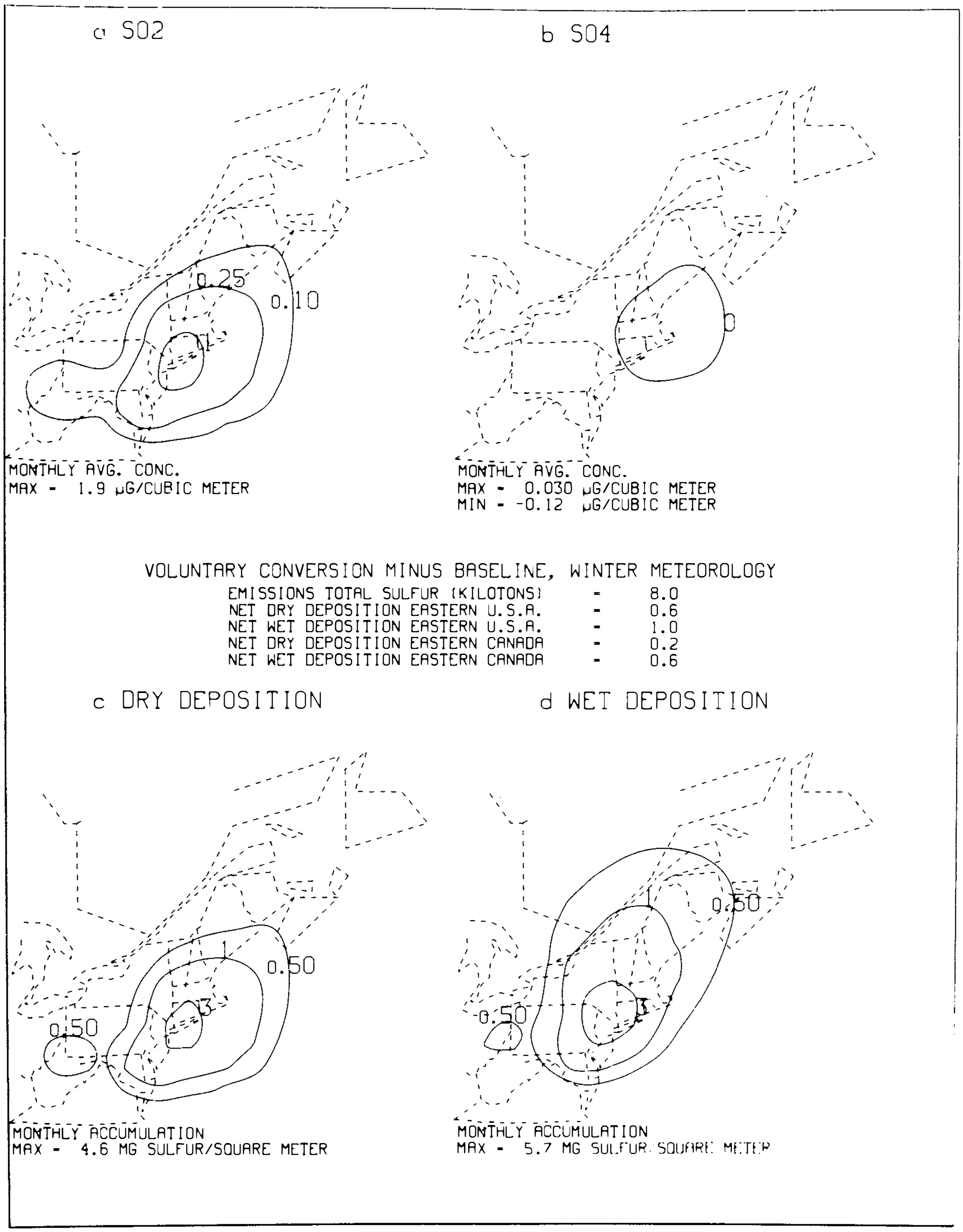

Fig. 3.2-4. Projected Incremental Pollutant Sulfur Concentrations and Deposition in the Northeastern U.S. and Canada under Voluntary Conversion (27-Plant) Scenario, Winter Meteorology

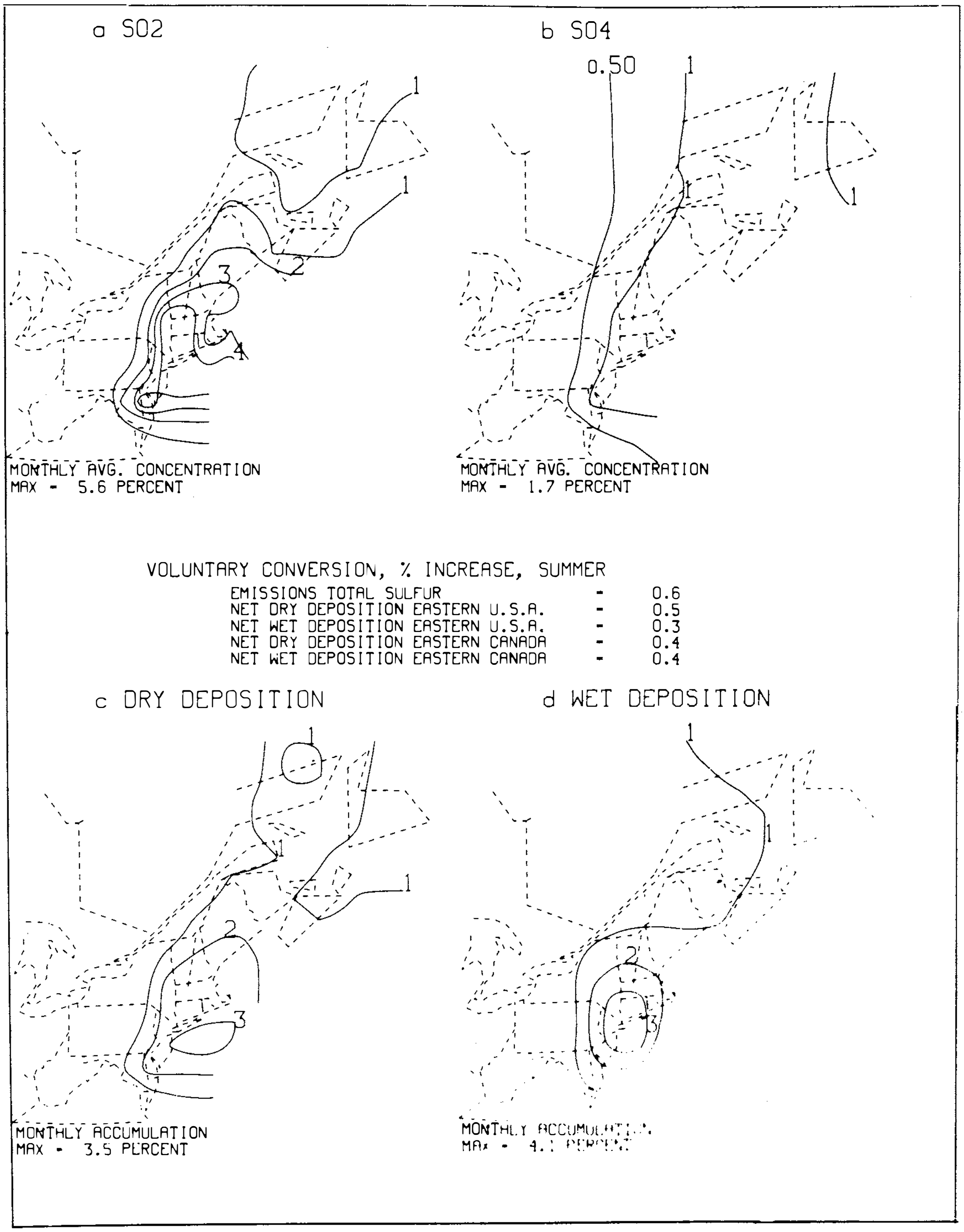

Fig. 3.2-5. Relative Changes in Concentrations and Deposition of Pollutant Sulfur under Voluntary Conversion Scenario (Percent Increase), Summer Meteorology

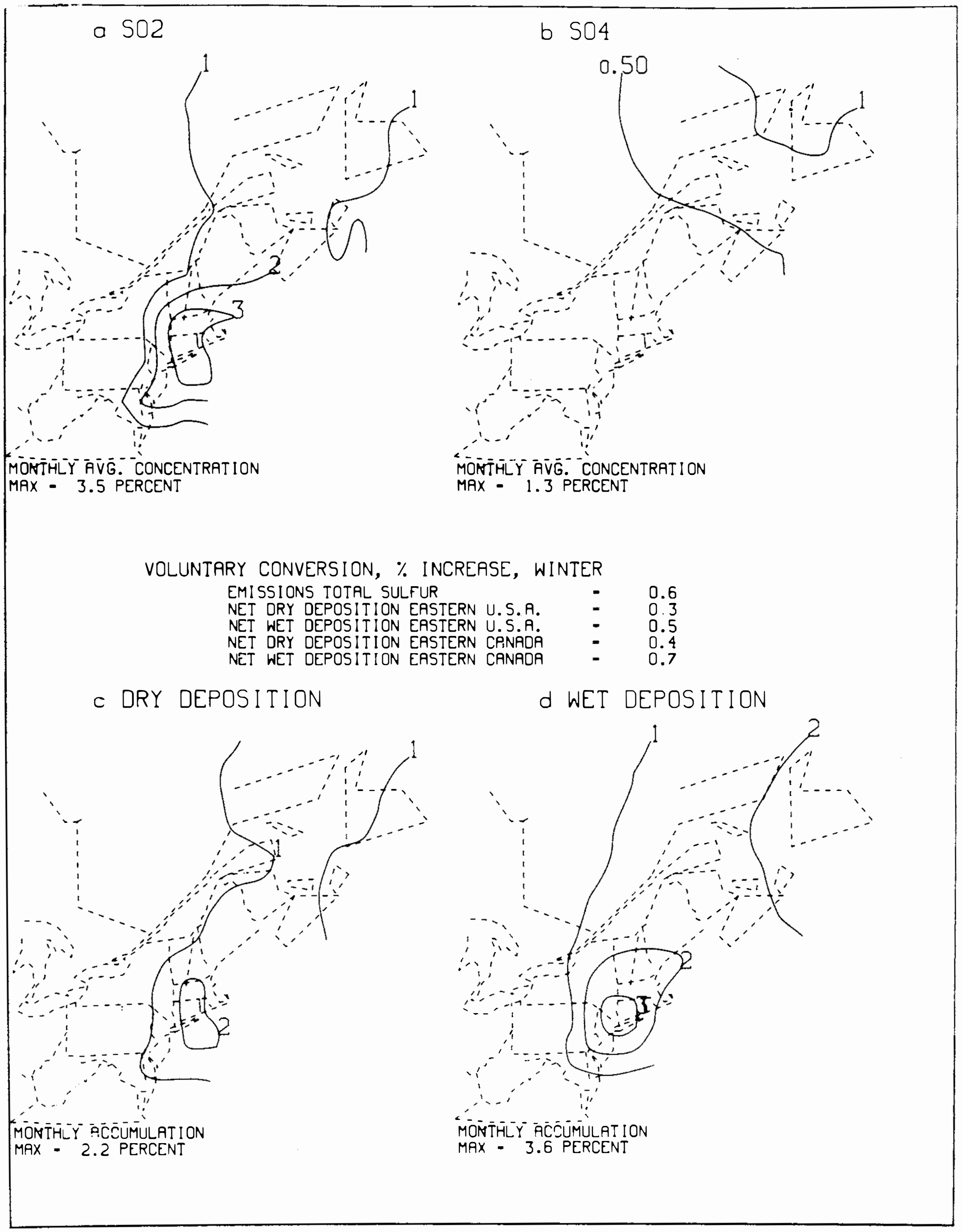

Fig. 3.2-6. Relative Changes in Concentrations and Deposition of Pollutant Sulfur under Voluntary Conversion Scenario (Percent Increase), Winter Meteorology

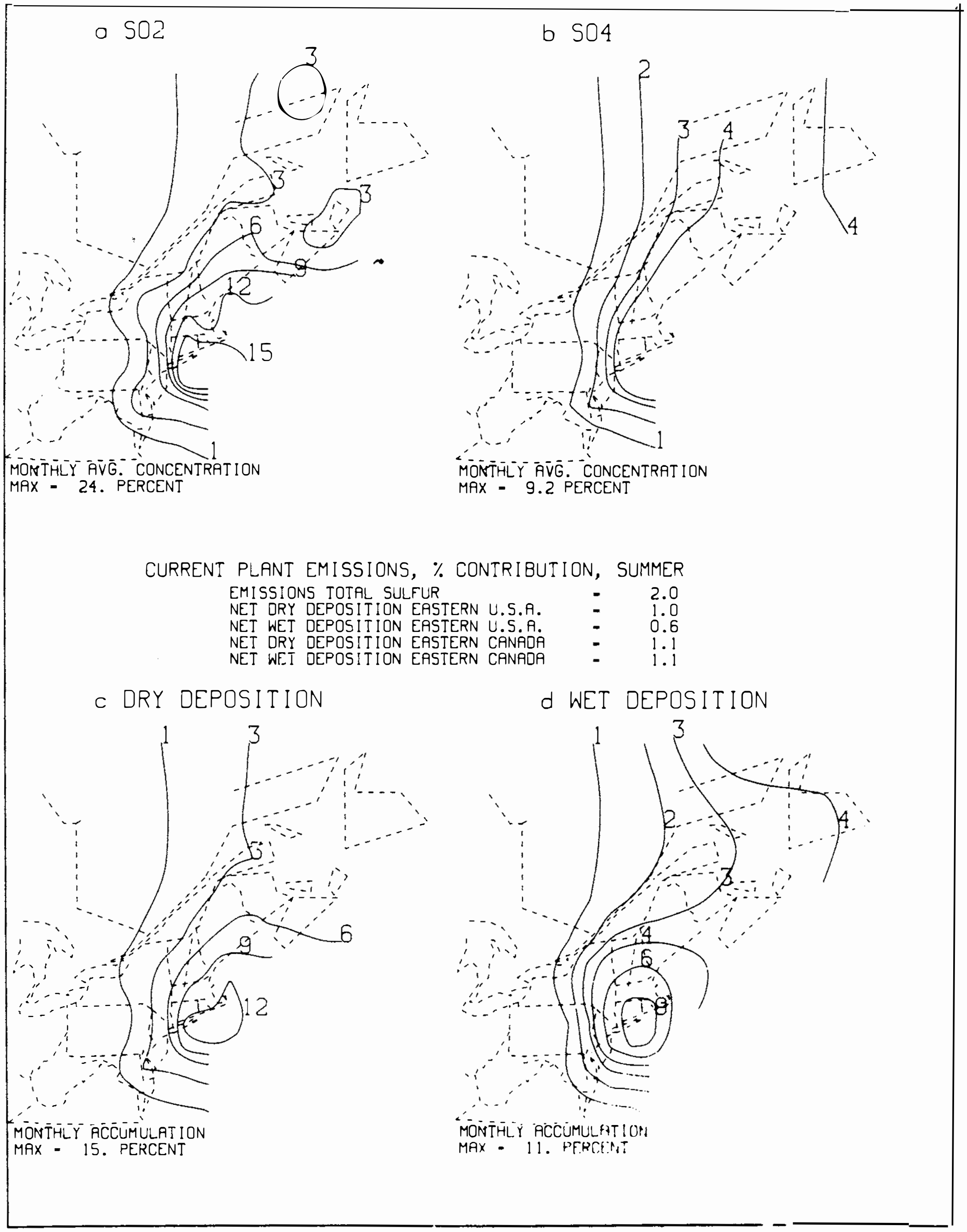

Fig. 3.2-7. Percentage Contribution to Background of the Current Oil-Fired Emissions of the 42-Plant Scenario, Summer Meteorology

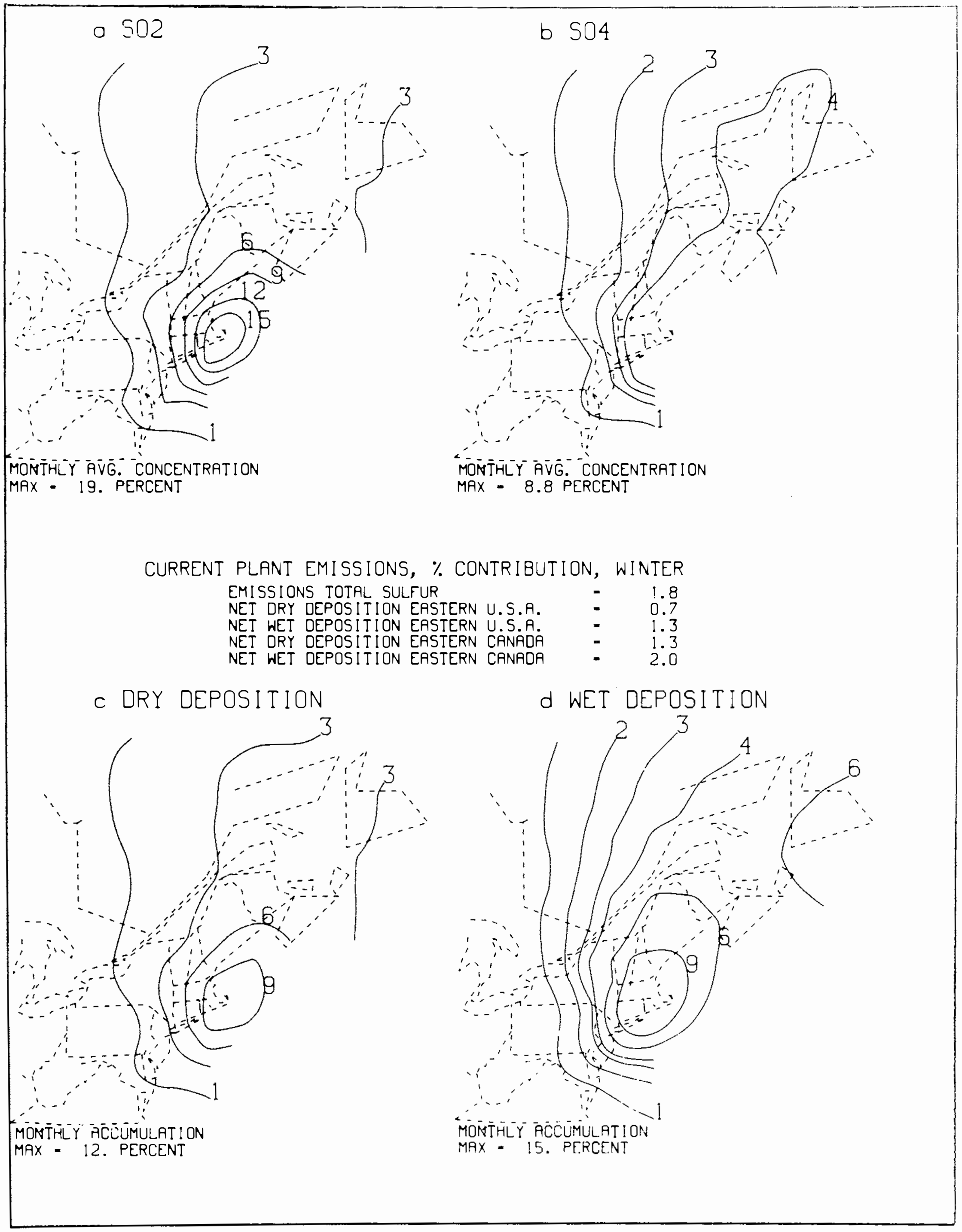

Fig. 3.2-8. Percentage Contribution to Background of the Current Oil-Fired Emissions of the 42-Plant Scenario, Winter Meteorology

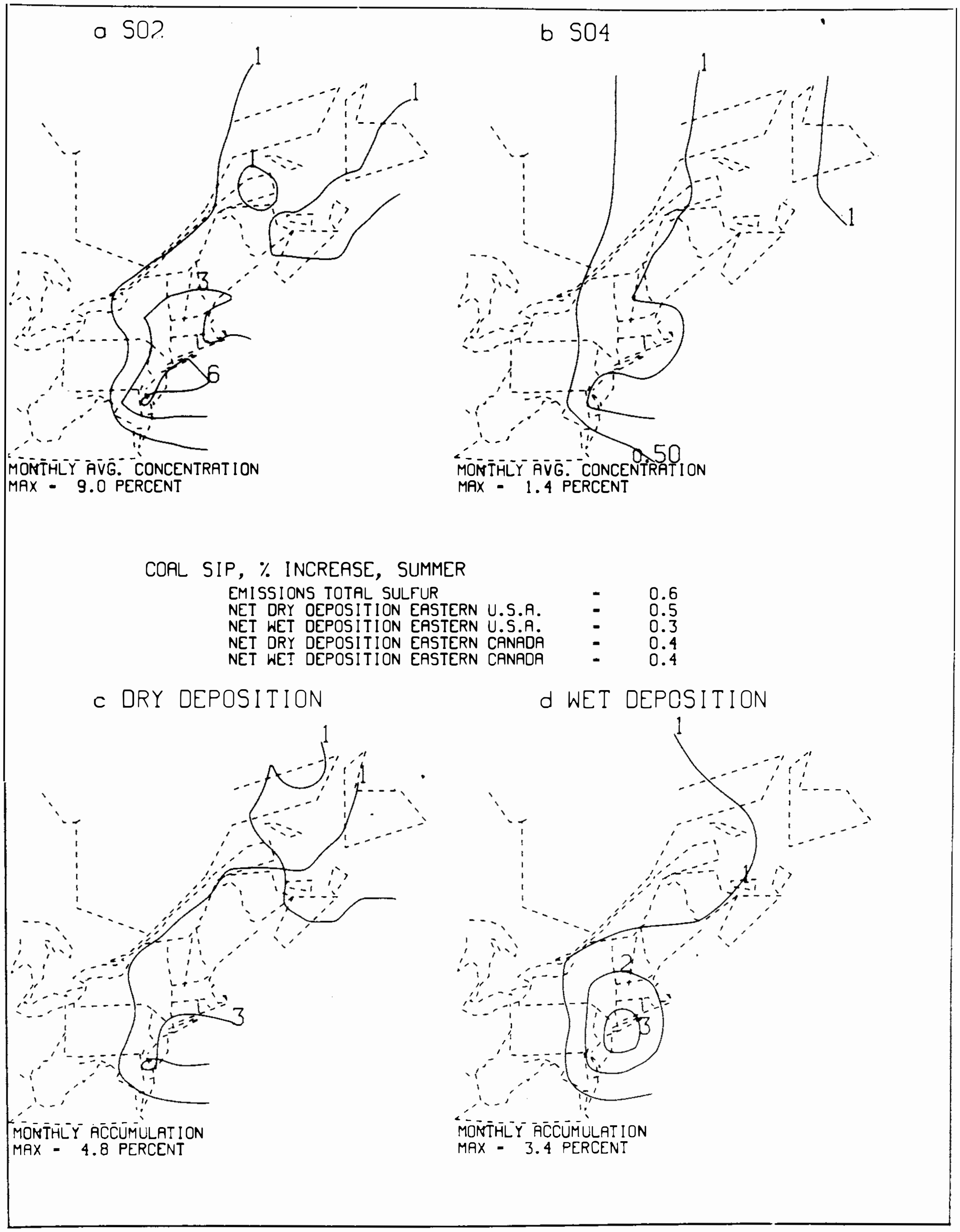

Fig. 3.2-9. Percentage Increase Associated with Coal SIP Scenario (42 Plants), Summer Meteorology

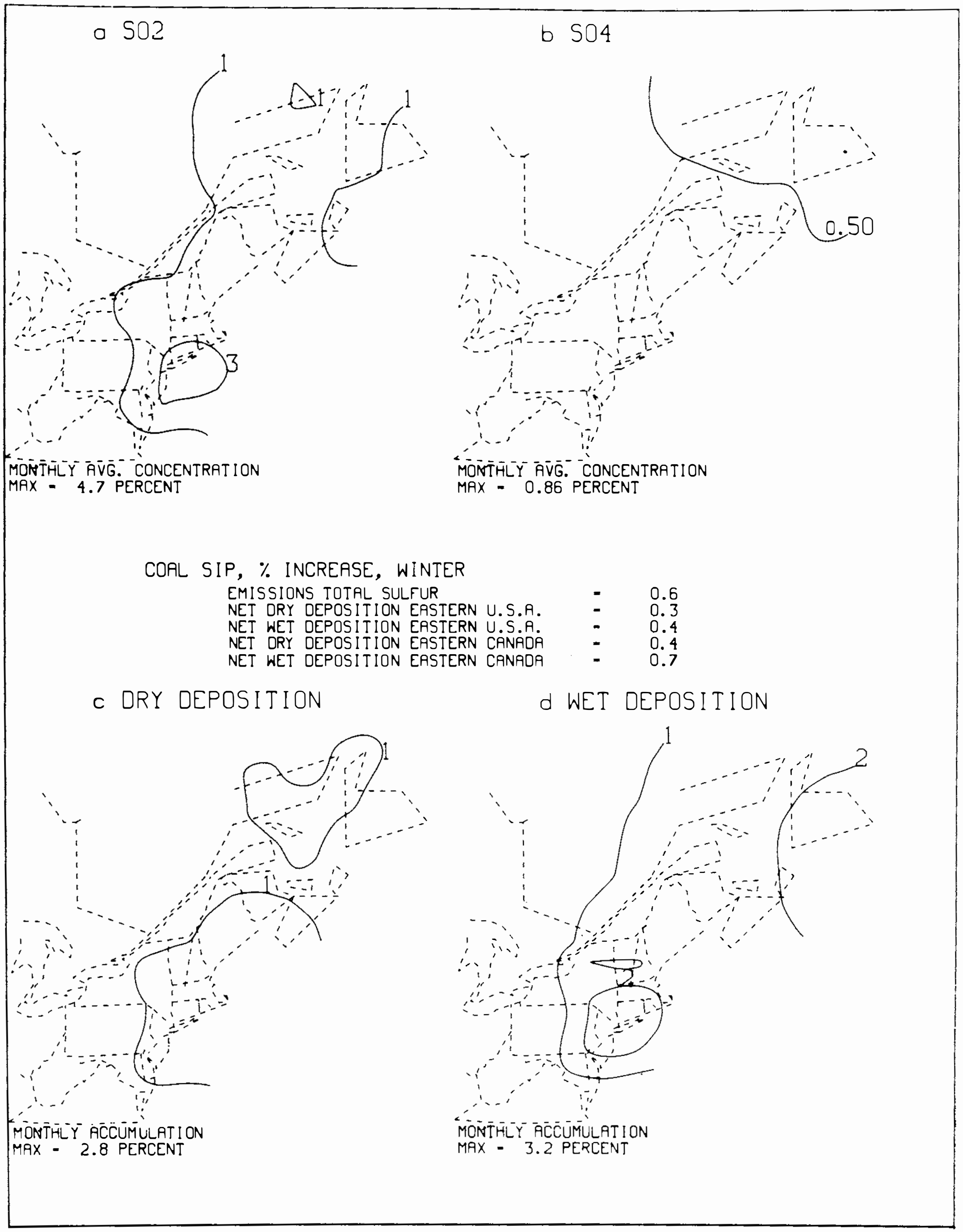

Fig. 3.2-10. Percentage Increase Associated with Coal SIP Scenario (42 Plants), Winter Meteorology

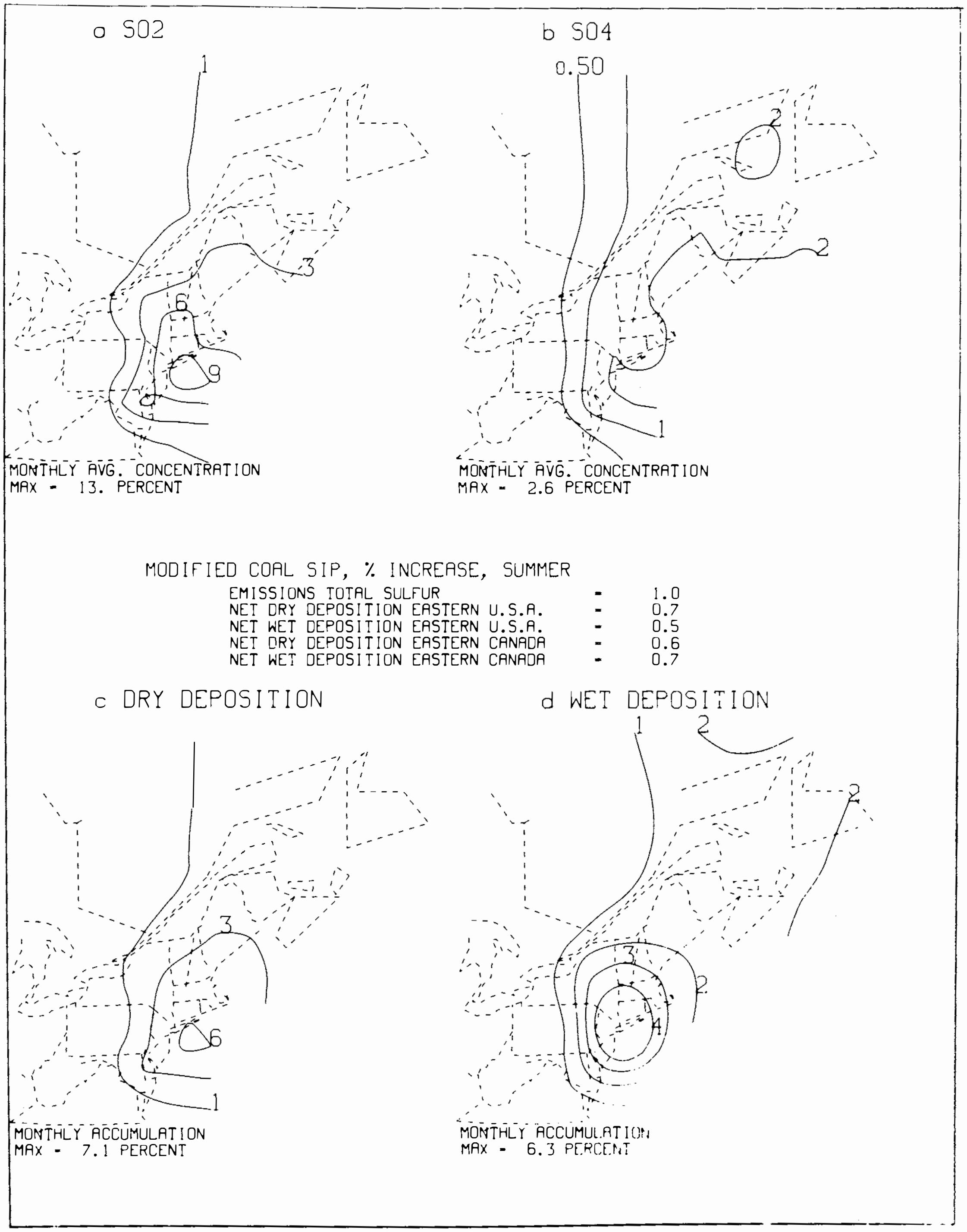

Fig. 3.2-11. Percentage Increase Associated with Modified Coal SIP Scenario (42 Plants), Summer Meteorology

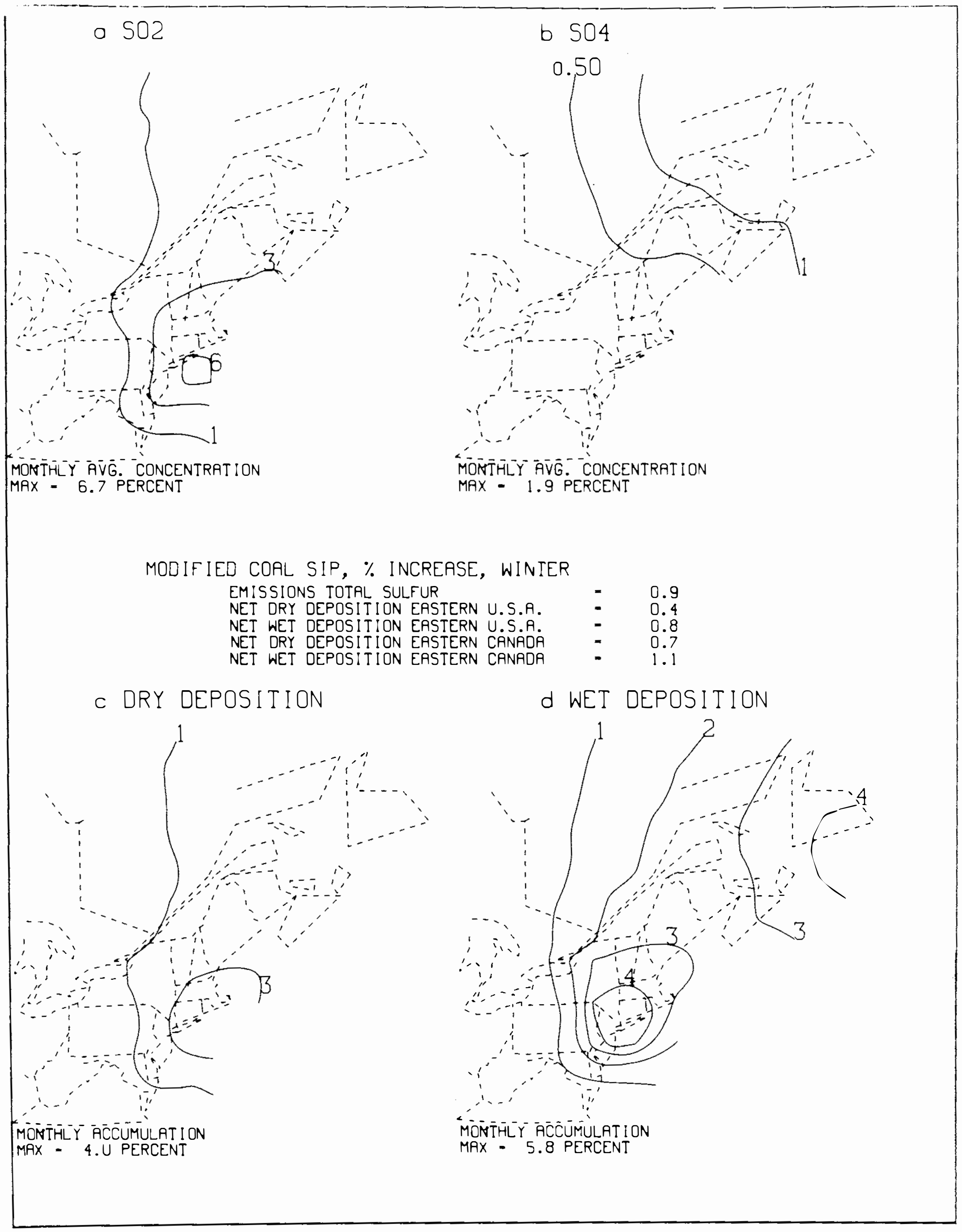

Fig. 3.2-12. Percentage Increase Associated with Modified Coal SIP Scenario (42 Plants), Winter Meteorology

3.3 ACID DEPOSITION IMPACTS ON AGRICULTURE

Acid deposition can adversely impact agricultural production in two ways. First, acid deposition may cause changes in soils that slow or limit plant growth. Second, acid deposition may directly injure crop plants. Because relatively little is known concerning the effects of dry acidic deposition on soils and vegetation, this discussion focuses principally on the effects of acid precipitation.

3.3.1 Acid Precipitation Impacts on Agricultural Soils

There are three general areas of concern relative to acid precipitation impacts on soils: (1) effects of acid precipitation on nutrient leaching and ultimately on the nutrient status of agronomic soil, (2) soil acidification, and (3) effects of acid precipitation on soil microbes (Evans et al. 1981).

3.3.1.1 Effects of Acid Precipitation on Nutrient Leaching

As water containing hydrogen cations moves through soil, some hydrogen ions replace adsorbed exchangeable cations (e.g., Ca^{++}, Mg^{++}, K^{+}, Na^{+}). The removed cations are then carried deep into the soil profile or into groundwater (Wiklander 1979). The additional input of hydrogen ions from acid precipitation could accelerate this process. Indeed, increased cation leaching has been observed in field experiments. Overrein (1972) observed an increase in calcium leaching under simulated acid precipitation conditions. In addition to calcium, increased leaching of Mg^{++} and Al^{+3} were observed in New Hampshire soils treated with simulated acid rain of pH 4.4 (Cronan 1980). The loss of nutrients in this manner is determined primarily by the buffering capacity of the soil and composition of precipitation (pH and salt content). Unless soil buffering capacity is high and/or precipitation contains sufficient amounts of salt, nutrient leaching could eventually lead to soil acidification (Wiklander 1979). Soil buffering capacity depends upon several factors, including soil mineral content, texture, structure, pH, base saturation, salt content, and water permeability (USDOE 1981).

Soil nutrient leaching is ameliorated by several naturally occurring processes, including the release of new cations by weathering and recycling of nutrients from vegetation by microbes and animals (McFee et al. 1976). Leaching of soil nutrients also is inhibited efficiently by vegetation, since plant roots frequently take up nutrients in excess of that required for plant growth. Large amounts of these nutrients will later be redeposited on the soil surface as litter or as leachate from the vegetation canopy; on the soil surface they can decompose and recycle to the soil nutrient pool (Abrahamsen and Dollard 1979).

Acid precipitation also increases the amounts of sulfate and nitrate entering soils. However, since soil nitrate is usually deficient for both plants and soil microorganisms, it is rapidly taken up and retained within the soil-plant system (Abrahamsen and Dollard 1979). This is especially true in agricultural systems; agronomic plants typically have high nitrogen requirements (100 to 300 kg N/ha/yr). Nitrogen deposition by acid precipitation, while potentially beneficial to crops, is usually of insignificant magnitude to contribute to crop nitrogen status. It should be noted that the proposed conversion of powerplants to coal firing will not significantly alter regional nitrogen deposition.

Sulfur, like nitrogen, is essential for optimal plant growth. Further, there is evidence that the atmospheric deposition of sulfur may be beneficial to many agricultural soils. Tabatabai and Laflen (1976) conclude that precipitation inputs of sulfur (13 to 17 kg S/ha) are important for crop production on Iowa's sulfur-deficient soils. Brady (1974) indicates that the wet and dry deposition are major sources of plant-required sulfur. The incidence of sulfur concentrations in soil insufficient to meet crop nutritional requirements has been increasing. However, this increase has not been accompanied by an increase in sulfur-deficiency symptoms in field-grown crops. Based on this information, it has been suggested that atmospheric deposition helps fulfill crop sulfur needs (Evans et al. 1981). In intensively managed agricultural soils, it seems unlikely that atmospheric inputs of sulfur to soil acid precipitation would prove anything but beneficial to crop production.

In general, agricultural soils have a better nutrient status and are better buffered than forest soils, resulting in their being far less susceptible to adverse nutritional effects caused by acid precipitation (McFee 1980; Evans et al. 1981). More significantly, the effects of fertilization and liming more than compensate for the effects of acid precipitation on such soils (McFee 1980). Wiklander (1979) has concluded that the sensitivity of cultivated soils (if soil pH is greater than 5 and buffering capacity is high) to the adverse effects of acid precipitation is slight.

3.3.1.2 Effects of Acid Deposition on Soil Acidity

If acid deposition inputs are sufficient to acidify agricultural soil, adverse impacts on agricultural crops could occur. The principal effect would be increased availability of toxic metals to plants. A number of potentially toxic metals, principally those that are cations, become more available for plant uptake as soil pH decreases. For example, low soil pH has been associated with phytotoxic plant-available aluminum concentrations. However, such a situation is very unlikely to occur on managed soils, primarily due to the chemical nature of currently used fertilizers. Nitrogen has typically been applied to agricultural soils as ammonium sulfate or ammonium nitrate, which are oxidized by bacteria to form sulfates or nitrates and hydrogen ions (Brady 1974). Hydrogen ions also are released to the the soil solution when these mineral nutrients are taken up by plants. Thus, the release of hydrogen ions from fertilizers eventually causes the soil to become slightly acidified. The acidifying effect of fertilizer use is countered in agricultural soils through periodic additions of lime. Liming raises soil pH, thereby eliminating the major problems associated with acidic soils--including increased availability of toxic trace elements (Brady 1974). The regular use of lime on agricultural soils will also ameliorate any increased soil acidity caused by acid deposition.

To conclude, current research indicates that acid deposition will not result in major impacts to agricultural soils. For properly managed agricultural soils, acid deposition should cause only a slight increase in the lime requirement to prevent soil acidification, but this cost will be compensated for by the increased supply of sulfur, nitrogen, magnesium, potassium and calcium made available to crop plants (Wiklander 1979).

3.3.1.3 Effects of Acid Precipitation on Soil Microbes

Soil microbiological processes necessary for plant growth may be adversely affected by soil acidification resulting from acid precipitation. It is principally through the activity of heterotrophic microorganisms that nitrogen, phosphorus, and sulfur are made available to autotrophic higher plants. In studies employing simulated acid precipitation, there have been overall reductions in several soil microbial processes (Evans et al. 1981). However, these studies typically have been conducted for only short periods of time with high levels of acid input (Alexander 1980). The capacity of some microorganisms to acclimate to soil pH changes is overlooked in such studies, and requires further investigation. Additionally, most microbial transformations can be carried out by more than one species. The reduction or elimination of one population by soil acidification may not be detrimental to plant growth or ecosystem functioning, as a second unaffected population may fill the partially or totally vacated niche (Alexander 1980).

It is difficult to make generalizations concerning the effects of soil acidification on microorganisms. Although many microbial processes important to plant growth are inhibited at low soil pH, the inhibition occurring in one soil at a given pH may not be noted at the same pH in a different soil (Alexander 1980). To date, investigations of the effects of soil acidification on soil microorganisms have not examined how adverse impacts may be avoided (eg., through agricultural techniques such as liming). It seems likely that if soil acidification can be prevented by liming, adverse impacts to soil microorganisms due to acid deposition will also be avoided or significantly reduced.

3.3.2 Acid Precipitation Impacts on Agronomic Plants

Acid precipitation may adversely affect crops in several ways. The acidity in precipitation may cause (1) a loss of crop yield and/or food quality, (2) visible injury that reduces the market value of a crop, or (3) altered sensitivity to other air pollutants and/or plant pathogens leading to either of the above injuries (Evans et al. 1981). Although sulfates, nitrates, and other water-soluble compounds present in acid precipitation can be assimilated through plant leaves, it is generally assumed that the free hydrogen ions present in acid rain are the component most likely to cause detrimental effects on vegetation (USDOE 1981). Hydrogen ion concentrations equivalent to those measured in very acidic rain events (pH 1.5-3.6) have been reported to cause tissue injury (necrotic lesions) in a wide variety of plant species under laboratory and/or greenhouse conditions (Shriner 1980). There are no confirmed reports of exposure to ambient acidic precipitation causing visible foliar injury to field-grown vegetation in the continental United States (Jacobson 1980).

Experiments in which plants are exposed to simulated acid precipitation over days, weeks, or a growing season are conducted to evaluate relationships between hydrogen ion concentrations and plant responses (Evans et al. 1981). To date, plant responses have been shown to vary greatly depending upon a number of factors, including duration and frequency of exposure; acid content and size of rain drops; rainfall intensity; total loading of hydrogen, sulfate, and nitrate ions into the soil system; and method of simulated precipitation application. Plant response also varies depending upon the nutrient status of soil, plant nutrient requirements, and plant growth stage. Because of these variations, the impacts of acid precipitation need to be studied on an individual plant species basis (Evans et al. 1981).

3.3.2.1 Loss of Crop Yield and/or Food Quality

As discussed in Section 3.3.1 of this Topical Response, agricultural soils are generally less susceptible than forest soils to acid precipitation effects because of fertilizer and lime applications (McFee 1980; Evans et al. 1981). Therefore, if acid precipitation causes yield or food quality losses in crop plants, this effect must result from foliar exposure (Evans et al. 1981). Several investigators have reported the occurrence of yield reductions without visible signs of injury in crop plants consistently exposed to very acidic simulated rain.

Lee et al. (1980) evaluated the effects of simulated acid rain on 27 crop species grown in pots. When exposed to acidic precipitation with mean pH levels of 3.0, 3.5, and 4.0, marketable yields of radish, beet, carrot, mustard greens, and broccoli were reduced as compared to pH 5.7 treatments (control). The yield of six other species (tomato, green pepper, strawberry, alfalfa, orchard grass, and timothy) increased with exposure to the same acidity levels. No consistent effects were seen in the 16 other crops tested. It should be noted that these results are from a single experiment conducted over one growing season and are considered preliminary in nature.

After exposure to acidic mists in a greenhouse, no signs of visible injury were reported, but the dry weight of pinto beans trifoliate leaves and pods with seeds were significantly reduced (19% and 11%, respectively) (Hindawi et al. 1980). Simulated acid rain of pH 3.1 and below decreased the dry weight of seeds, leaves, and stems of pinto beans grown in pots under greenhouse conditions (Evans and Lewin 1980). The yield depression was attributed to (1) decreased number of pods per plant and (2) decreased number of seeds per pod. A similar study was conducted with soybeans. While stem and leaf dry weights were reduced, an increase in seed yield occurred. An increased dry weight per seed was responsible for this effect (Evans and Lewin 1980).

Soybeans also were employed in a field experiment where simulated acid rain was applied only to wet the foliage. Standard agronomic practices were used in this investigation (Evans et al. 1980). Plants exposed to simulated acid precipitation of pH 4.0, 3.1, and 2.7 in addition to ambient rain events had seed yields reduced 2.6, 6.5, and 11.4%, respectively, below that of plants exposed to ambient rain alone. It should be noted that short-duration rain events that just wet vegetation are considered to be the most damaging. A larger percentage of total leaf area is contacted for a longer period of time by rain or mist having a small droplet size, when compared to rain having larger droplets.

Stimulation of crop production as a result of exposure to acid precipitation also has been reported. Agronomic plants have high nitrogen and sulfur requirements; input of these nutrients into soils as a result of acid precipitation may be beneficial to crops. A 4% increase in seed weight was reported for field-grown soybeans treated with pH 3.1 acid precipitation in addition to ambient rainfall (Irving and Miller 1981). The increased seed weight was though to be caused by a fertilizing effect from sulfur and nitrogen inputs which, in turn, delayed plant senescence, allowing for increased seed development. Jacobson (1980) has also obtained increased soybean yields in field-grown plants exposed to pH 2.8 simulated acid precipitation.

3.3.2.2 Visible Injury Reducing Crop Market Value

The market value of many crops is reduced if the foliage or fruits exhibit blemishes or lesions. If such lesions are induced by acid precipitation, then acid precipitation may result in serious impacts to agriculture. Simulated acid rain has induced lesions on leaves and reproductive structures under experimental conditions (Evans et al. 1981). The highest experimental treatment pH reported to cause visible lesions is pH 4.0 (Lee et al. 1980). Of the 35 cultivars examined in this study, 31 exhibited foliage damaged by simulated acid rain of pH 3.0; 28 were damaged at pH 3.5, and 5 were damaged at pH 4.0. Foliar injury was not generally related to yield. Of the cultivars exhibiting damage, only swiss chard, mustard greens, spinach, and possibly tomato would have reduced market values. The quality of tomatoes also was reduced by exposure to simulated acid rain of pH 3.0 in both greenhouse and field trials (Jacobson 1980).

Visible foliar injury has also been reported by other investigators employing beans, pinto beans, tomatoes, soybeans, and sunflowers (Ferenbaugh 1976; Hindawi et al. 1980; Evans et al. 1977; 1978; Evans and Curry 1979; Jacobson 1980). In these studies, a large percentage of the leaf area may exhibit lesions following exposure to simulated acid rain with a pH of around 3.1; with higher pH treatments little visible injury has been observed (Evans et al. 1981).

3.3.2.3 Altered Sensitivity to Other Air Pollutants and/or Plant Pathogens

Acid precipitation may affect gas exchange in plants, which could alter plant sensitivity to other air pollutants (Evans et al. 1981). This could occur as a result of acid precipitation-induced injury to epidermal cells (this has been reported following exposure to simulated rain of pH 3.4 or below) or alterations in the cuticle or functioning of guard cells (Evans et al. 1977; Evans et al. 1981). Unfortunately, there is little information available to evaluate the potential effects of the interactions of acid precipitation and gaseous pollutants on vegetation. However, preliminary results reported by several authors indicate that such interactions may occur for some pollutants.

Evaluating the growth of bush beans, Shiner (1978a) found no significant interactions between multiple exposures to simulated acid rain of pH 4.0 and four sulfur dioxide fumigations (7500 $\mu g/m^3$ peak for 1 hour). In another study, simulated precipitation of pH 3.1 (in addition to ambient rainfall) in combination with intermittent sulfur dioxide fumigations (seventeen 4-hour fumigations with 475 $\mu g/m^3$) reduced seed weight, but not seed yield in field-grown soybeans (Irving and Miller 1981). Shriner (1978a) also examined bush bean response to four weekly exposures to acid rain (pH 4.0) in combination with ozone (four 3-hour exposures to 294 $\mu g/m^3$). A significant growth reduction was observed at time of harvest. Field-grown soybeans were exposed to three levels of simulated acid precipitation (pH 2.8, 3.4 and 4.0) and two ozone concentrations ($< 59\ \mu g/m^3$ and $< 235\ \mu g/m^3$) in open-top exposure chambers (Jacobson et al. 1980). Ozone depressed both the growth and yield of soybeans with all three rain treatments; the effect was greatest at pH 2.8.

Additional research which employs acid precipitation and other pollutants in concentrations and mixtures resembling actual exposure conditions in the Northeast are required before the influence of pollutant mixtures on crop yields can be adequately determined.

Acid precipitation can also affect microorganisms that inhabit the surfaces of higher plants (Evans et al. 1981), and thus might influence the plant diseases that infect crops. When plants were exposed to simulated acid rain of pH 3.4, the percentage of leaf area affected by bean rust (Uromyces phaseoli) decreased 29% (Shriner 1978b). The occurrence of holo blight (caused by Pseudomonas phaseolicola) on bean seedlings was either stimulated or inhibited by simulated acid rain, depending upon the point in the disease cycle at which acid rain was applied. Simulated acid rain stimulated initial infection but inhibited pathogen development when applied after infection had begun (Evans et al. 1981).

The overall effects of plant pathogen interactions with ambient acidic precipitation remains unknown at present (Evans et al. 1981).

3.3.2.4 Evaluation of Acid Precipitation Effects on Agronomic Plants

Caution must be exercised in evaluating presently available data describing the effects of acid precipitation on crops. The information available concerning these effects is the result of controlled laboratory and field experiments using "simulated" acid precipitation. In evaluating results of this nature, it is important to distinguish among effects observed at hydrogen ion concentrations: (1) very much above (i.e., very low pH) the volume-weighted mean hydrogen ion concentration of ambient precipitation, (2) near ambient hydrogen ion concentrations and (3) so-called "control" hydrogen ion concentrations that are much below ambient levels (e.g., pH $\geq$ 5.6) (Evans et al. 1981). Both extremes (unusually high or low hydrogen ion concentrations) represent conditions that do not occur in the northeastern United States (Evans et al. 1981). Unfortunately, most available information comes from studies in which vegetation was consistently exposed to simulated rain having very high hydrogen ion concentrations (low pH). In some cases the simulated rain was simply dilute sulfuric acid. The reports of acid precipitation causing visible injury to foliage and fruits fall into this category. At present, there are no published experimental data linking realistic levels of acid precipitation to visible foliar or fruit injury of the degree that would reduce crop marketability (Evans et al. 1981).

Although yield reductions without visible injury have been observed, these experiments have been conducted primarily with simulated rain pH values below pH 4.0. Additional experimentation is needed to document whether changes in plant productivity or survival may be expected from actual acidic precipitation exposures (Evans et al. 1981). Of the agronomic species tested to date, most have not exhibited yield losses following exposure to ambient acid precipitation. However, present data do suggest that if acid-precipitation-induced injury does occur, it is less than the year-to-year changes in yield caused by differences in natural climatic factors such as precipitation volume and temperature (Evans et al. 1981).

3.3.3 Impacts of the Proposed Action on Agriculture

Since the issuance of the DEIS, the USDOE has determined that 27 of the 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). The proposed conversion of these powerplants in the Northeast Region will cause slight increases in atmospheric emissions of sulfur and nitrogen oxide. Long-range transport modeling conducted using the ASTRAP model (see Topical Response 3.2) indicates that the conversion of these generating stations under the most-polluting emissions scenario would result in a 3-4% increase in hydrogen ion deposition in the vicinity of New York City, and a 2% or less increase for most of the Northeast and southeastern Canada. Such small increases are unlikely to appreciably alter the acidity of regional precipitation. The levels of acidity present in ambient precipitation have not been shown to cause significant yield losses in agronomic crops. Additional research is required to better understand the influence of acid precipitation on crops. However, based upon available information, the contribution of the proposed action to acid precipitation would not appear to adversely affect agricultural production of the region.

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3.4 EFFECTS OF ACID DEPOSITION ON CULTURAL RESOURCES

Acidic deposition (both wet and dry) is known to corrode metals, accelerate the weathering of stone and concrete, and contribute to the deterioration of paints, plastics, fabrics, paper, and leather (Interagency Task Force on Acid Precipitation 1981). Although it has been determined that cultural resources constructed from such materials are adversely affected by acid deposition, the extent to which buildings, statues, gravestones, works of art, and other cultural resources are damaged by acid deposition in relation to other environmental factors is poorly understood. Other variables, not necessarily related to acid deposition, that must be considered as contributing to cultural resource degradation are meteorology (e.g., relative humidity, temperature, rainfall, air movement, and sunlight exposure), types of materials involved, method of construction, and other pollutants (e.g., salt spray).

Reliable estimates of the economic impact of acid deposition on cultural resources have not been developed. Various damage functions and non-market and indirect market economic approaches have been used in an attempt to determine economic costs associated with materials damaged due to increased pollutant concentrations. A number of inherent problems are associated with using these approaches to determine effects on cultural resources, such as the ability to measure physical damage and isolate damage caused by acid deposition from that caused by other pollutants or climatic factors. To date, no acceptable damage functions have been developed to isolate costs associated with acid deposition from those associated with other environmental factors. Financial costs to cultural resources resulting from cleaning, maintenance, and protective treatments, plus any costs associated with amenity and utility loss, must be appropriately allocated to the various environmental factors affecting the resource before such economic studies concerning acid deposition costs on materials can be considered valid.

The Acid Precipitation Act of 1980 (Title VII of the Energy Security Act of 1980, Pub. L. 96-294) established an Interagency Task Force on acid precipitation. The task force subsequently developed and is now implementing the National Acid Precipitation Assessment Program to evaluate the environmental, social, and economic effects of acid precipitation. Part of this current research effort is to determine the effects of acid rain on materials and cultural resources. The major tasks concerning materials research are: (1) investigating the effects on materials and cultural resources, (2) determining the susceptibility of cultural resources, (3) estimating the costs of materials damage and (4) research on protective coating and mitigative treatments (Interagency Task Force on Acid Precipitation 1982). This research is being carried out by the U.S. Department of the Interior in cooperation with the U.S. Environmental Protection Agency and other federal agencies. It is anticipated that such research will culminate in the ability to properly assess and mitigate the physical effects and economic costs of acid deposition on cultural resources.

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3.5 WASTE DISPOSAL

3.5.1 Introduction

Several comments on the DEIS relate to (1) the availablity and feasibility of waste disposal sites, (2) the potential for marketing coal ash as a reusable product, and (3) the possibility of ocean disposal of ash. These three topics are addressed in the DEIS (Secs. 4.3.3.2 and 5.3.3 and Appendix I) and in the EIS technical support document on solid waste disposal (Saguinsin et al. 1981; see Secs. 6.3 and 10). The purpose of this Topical Response is to update the DEIS discussion of these three topics by including new information supplied by utilities and government agencies. The three topics are discussed in the following subsections.

3.5.2 Waste Disposal Sites

The DEIS included an analysis of potential use of land for disposal of coal combustion wastes that would be produced by the 42 converted powerplants in the Northeast Region. The study indicated that in some areas of the Northeast, coal conversion represents a challenge for solid waste disposal planners. Land constraints are occasionally severe, and opposition to landfill siting is becoming almost universal. A summary of disposal problems in each state along with some suggested solutions to alleviate the problems is presented in Table 4.16 of the DEIS.

Evaluation of the new information indicates that the waste disposal problems in the Northeast would not be as severe as predicted in the DEIS. The estimated quantity of ash collected from the 42 plants under the Coal SIP Scenario would be reduced by 6.7% as a result of new information indicating a decrease in ash content in the coal to be burned at several stations (see Tables 2.9 of the FEIS and G.5 of the DEIS). Under the Modified Coal SIP Scenario, the volume of scrubber sludge produced would decrease by a factor of two (Table 2.5). This large decrease results from increases in some of the proposed SIPs that permit burning coal without scrubbing.

Under the Voluntary Conversion Scenario, there would be an even greater reduction in the waste quantities produced: the total volume of combustion wastes would be about 35% of the quantity estimated in the DEIS. This significant reduction of waste quantity would reduce the aggregate land area required for disposal and would help eliminate some of the disposal siting problems in the region.

The disposal prospects for each of the 27 stations considered under the Voluntary Conversion Scenario has been further investigated. Officials of many utilities were contacted to determine the availability of onsite disposal areas and their alternative disposal plans. In addition, information provided by various commentors on the characteristics of certain disposal sites was reviewed and included in the analysis. A summary of the updated disposal plans for all 27 stations is presented in Table 3.5-1. Results of the analysis indicate that since most of the stations do not have onsite disposal areas, the wastes would have to be trucked offsite. Officials of many utilities appear to be optmistic about securing landfills for disposal. In addition, there appears to be a potential for marketing coal ash as a reusable product. The possibility of ocean disposal of stabilized fly ash and scrubber sludge also is being seriously considered by several utilities. These two disposal alternatives are discussed in more detail in the following sections. In general, because of the significant decrease in projected waste quantities, disposal prospects in the Northeast Region appear to be better than presented in the DEIS.

3.5.3 Coal Ash Marketing

Ash marketing still appears to be a viable alternative for landfill disposal in certain areas of the Northeast. Several potential areas of ash utilization and their associated problems have been identified and evaluated by Faber and Babcock (1979) and by Saguinsin et al. (1981). Specific ways of ash utilization include concrete mixtures, structural fill, sand blast grit, road surfacing, and landfill cover. The use of coal ash as an intermediate cover material for sanitary landfills has been receiving growing attention mainly because of its low permeability after compaction. Fly ash samples collected from the New England Power's Brayton Point station have been tested. The results indicated that the permeability of compacted fly ash samples was about 2×10^5 cm/s (see Comment NEP-4). The coal ash generated at Brayton Point has been used extensively as landfill cover in nearby communities. This experience indicates that coal ash sheds rain water better than gravel and thus greatly reduces the potential for leachate formation in the landfill. However, the reduction in leachate would create increased runoff, which may have to be corrected and treated, then discharged to a stream or river. In addition, there is concern about using coal ash as cover material because of its fine nature and inherent dust problems, its ability for use on side slope stabilization, and its poor nutrient value for establishing vegetative cover. Major expansion of the use of coal ash for landfill cover will hinge upon an acceptable analysis of ash chacteristics, and further research in that area is required.

Table 3.5-1. Summary of Updated Disposal Plans for 27 Conversion Candidate Stations[a]

State/Station	Unit(s)	Waste Disposal Plan
Connecticut		
Bridgeport Harbor	3	
Devon	7,8	Offsite disposal and/or sale for all three plants
Norwalk Harbor	1,2	
Delaware		
Edge Moor	3,4	Onsite disposal
Maine		
Mason	3,4,5	Offsite disposal at a property of Maine Yankee Atomic Power Co.
Maryland		
Brandon Shores	1,2	Purchase landfill site within one mile
Crane	1,2	Offsite disposal at landfill owned by utility
Massachusetts		
Mt. Tom	1	Offsite disposal and/or sale
Mystic	4,5,6	Offsite disposal, reuse, or ocean disposal
New Boston	1	Offsite disposal, reuse, or ocean disposal
Salem Harbor	1,2,3	Offsite disposal at commercial landfill in Amesbury, MA, and/or sale
Somerset	5,6	Offsite disposal at landfill or abandoned coal mine
West Springfield	1,2,3	Offsite disposal and/or sale
New Hampshire		
Schiller	4,5,6	Offsite disposal at Turnkey landfill near Rochester, NH
New Jersey		
Bergen	2	Offsite disposal and/or sale
Burlington	7	Offsite disposal and/or sale
Deepwater	7,8,9	Sale for bottom ash after dewatering; offsite disposal and/or sale for fly ash
Sayreville	4,5	Offsite disposal at landfill about one mile from station
New York		
Albany	1,2,3,4	Onsite disposal or offsite disposal at quarry about two miles south
Arthur Kill	2,3	Ocean dumping for 3-5 years if no offsite landfill available
Danskammer Point	3,4	Onsite disposal, offsite disposal at 3-4 quarries, or ocean disposal
E.F. Barrett	1,2	Offsite disposal at abandoned quarry along Hudson River
Lovett	3,4,5	Offsite disposal at Tompkins quarry about 36 miles north of Danskammer Point
Port Jefferson	3,4	Offsite disposal at quarry about one mile southeast of plant
Ravenswood	3	Ocean dumping for 3-5 years if no offsite landfill available
Pennsylvania		
Cromby	2	Offsite disposal at Montgomery County landfill
Rhode Island		
South Street	12	Offsite disposal and/or use as cover on state-owned landfill sites

[a]Information obtained from officials of each utility.

Ash utilization is also dependent upon the status of coal ash marketing regulations in the Northeast Region. The regulations as of May 1982 are summarized below.

The U.S. Environmental Protection Agency has not elected at this time to regulate the marketing of recycled materials as such and no specific federal regulations, by USEPA or any other federal agency, apply to the marketing of coal ash per se.

With two exceptions, the states in the Northeast Region have not by statute or regulation explicitly addressed the marketability of coal ash or other recycled materials. Massachusetts, by statute, exempts recycled coal ash from regulation as waste. It should be noted, however, that Massachusetts is in the process of revising its solid waste and hazardous waste regulations; under the new regulations coal ash may be required to meet criteria of freedom from hazard before it may be marketed. The new regulations are expected to be released sometime in 1982.

Delaware solid waste disposal regulations specifically exempt recycled materials. The significance of this exemption is not entirely clear, however, because the same regulations impose a requirement that approval be obtained from the Delaware Department of Natural Resources and Environmental Control before a recycling activity is started.

Rhode Island solid waste management regulations define "cover material" to be "soil or earth" used as a cover in a sanitary landfill. The Rhode Island Department of Environmental Management intreprets this definition as excluding the use of coal ash as a cover in sanitary landfills.

None of the other states in the Northeast Region have specifically addressed the marketing of coal ash.

3.5.4 Ocean Disposal

As indicated in Table 3.5-1, several utilities are interested in ocean disposal of ash. This alternative would be uniquely suited for a large urban utility for whom vacant land is at a premium and whose generating stations typically include substantial docking facilities. However, there appears to be considerable debate as to whether ocean disposal is an available option for managing industrial wastes such as coal ash. The primary legislation now regulating barged waste disposal in the ocean is the Marine Protection, Research, and Sanctuaries Act (MPRSA), administered by the U.S. Environmental Protection Agency. This legislation went into effect in 1972 and was amended during 1977 and late 1980.

The USEPA Ocean Dumping Regulations and Criteria contain provisions for selecting, designating, and managing ocean disposal sites, and for issuing permits to use the sites for waste disposal. Fourteen interim municipal and industrial waste disposal sites (most of them located in the U.S. mid-Atlantic) were listed in USEPA's Final Ocean Dumping Regulations and Criteria published in January 1977. USEPA has been conducting in-depth studies of various dump sites to determine their acceptability in keeping with the criteria (USEPA 1980). The agency has designated a number of existing dump sites on an interim basis for use pending completion of the studies and formal designation or termination of the sites. Among these interim designations is the 106-Mile Industrial Waste Site (Fig. 3.5-1), approximately 100 nautical miles east of Cape May, New Jersey. The 106-Mile Site is used primarily by industries located in the New York/NewJersey/Delaware area.

Consolidated Edison recently filed an application for a Special Ocean Dumping Permit to temporarily dump 500,000 tons/year of ash at 106-Mile Site. Their application includes the results of a research program analyzing ash disposal impacts on marine environments under a USEPA Research Ocean Dumping Permit. Con Ed indicated that based on the study results, ocean disposal of unconsolidated ash from a moving barge would not unduly degrade or endanger the marine environment; would not impact esthetic, recreational, and economic values in the area; and would not present a significant threat to other uses of the ocean (DePass et al. 1981). Only ash wastes are being evaluated; scrubber wastes are not under consideration for ocean dumping. Con Ed believes that ocean dumping of coal ash would be the only viable temporary alternative for disposal of large quantities of coal ash until a land-based option can be instituted. However, to date (1982), USEPA has made no determination about the acceptability of the ash for ocean disposal. Therefore, the prospects of disposing of large quantities of coal ash generated from conversion plants into the ocean remains to be seen.

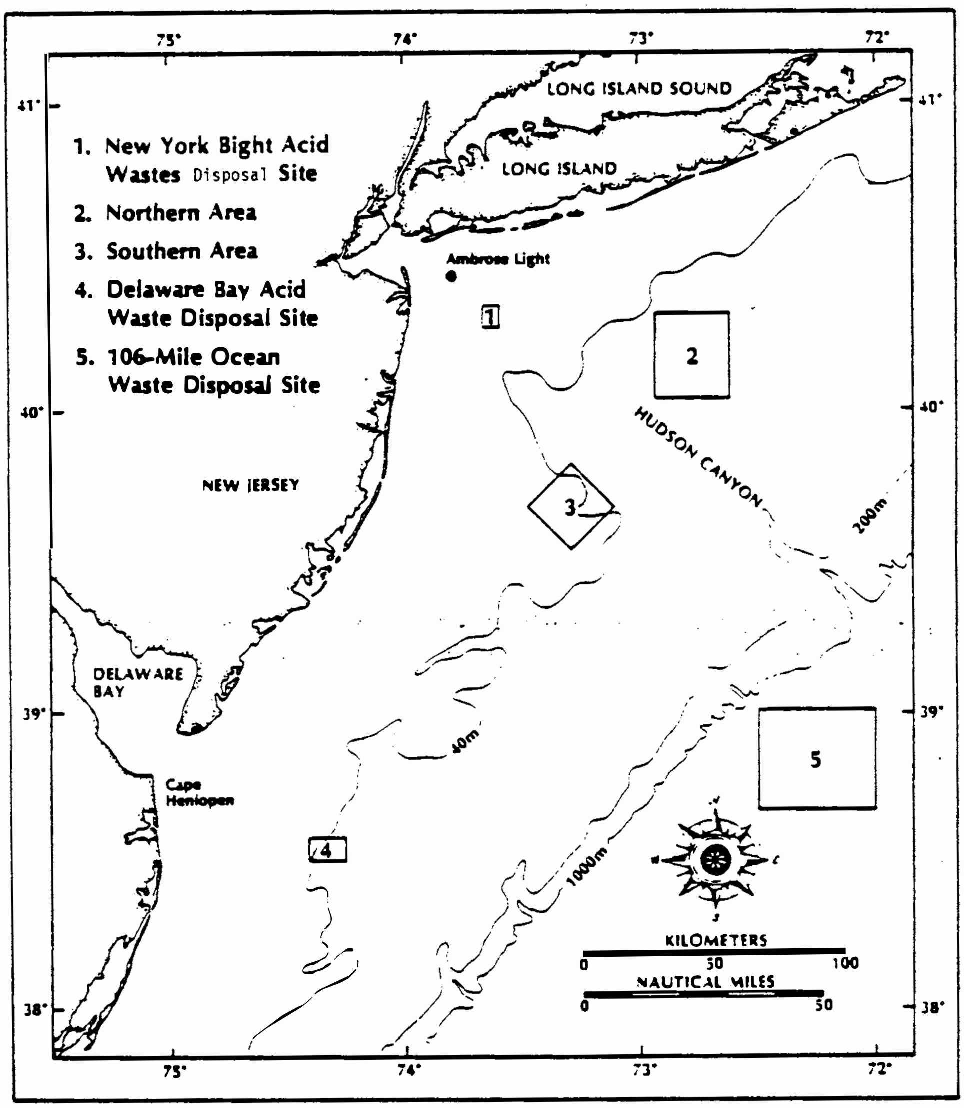

Fig. 3.5-1. Location of the 106-Mile Ocean Waste Disposal Site. From USEPA (1980).

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3.6 WATER QUALITY

The potential effects of acid deposition on surface waters as well as soils and surface ecosystems are discussed in the DEIS for the worst-case emission scenario involving 42 candidate conversion powerplants. The discussion is expanded in this Topical Response for two purposes: (1) to assess the change of water quality impacts due to the reduction of the number of powerplants considered for conversion and (2) to collectively respond to comments on the DEIS related to water quality impacts.

The results presented in DEIS indicated that the increase in acid deposition resulting from the proposed conversion of 42 powerplants would be about 6% in the Maritime Provinces, where surface waters are most sensitive to acidification. This increase in acid deposition would correspond to a rather minimal decrease of less than 0.03 units in the pH of the receiving waters.

The transport and deposition of pollutants was simulated under the Voluntary Conversion Scenario (see Topical Response 3.2), under which only 27 plants are expected to convert. The results indicate that the maximum deposition increment would be on the order of 3-4% in the New York City urban area and 1-2% in New England and the Maritimes. Using this incremental deposition and assuming that the precipitation pH in the Northeast Region ranges from 4.0 to 4.2, the incremental addition of hydrogen ions in precipitation would result in a change of no more than 0.02 pH units in precipitation, and for most of the Region would be even less. Simulations of regional transport and deposition also indicate that the relative increase in acid deposition is the largest for the urban New York area. In this area, surface waters in rivers, lakes, and estuaries (particularly near the Hudson River) generally have pH values ranging from 5 to 8 (U.S. Geological Survey 1979), which are greater than the assumed base case precipitation of pH 4.0. Therefore, surface waters in the New York urban area would have buffering capacity to offset the effect of base case precipitation and would not be significantly affected by the incremental acid deposition due to the proposed action.

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3.7 INCREMENTAL POLLUTION CHANGES AND EXPECTED HEALTH EFFECTS

Several of the comments on the DEIS are related to existing air quality for several of the criteria and non-criteria pollutants; interpretation of the data base relating pollutant exposures to health effects; and, the predicted impact of the incremental changes in air quality for coal conversion upon public health. These topics were addressed in Sections 4.6 and 5.6 of the DEIS and in the technical support document for the DEIS by Walsh et al. (1981). Since the comments on the DEIS were broad and far-reaching it was felt that a reanalysis of the public health effects of coal combustion section was necessary. This reanalysis is included in this Topical Response and Appendices B and C.

3.7.1 Introduction

The summary of health effects of air pollution presented in Appendix B indicates that for many of the irritant-type pollutants, peak acute exposures are more important than lower-level chronic exposures in producing adverse health effects in animals and humans. High short-term exposures are more closely associated with acute health effects, although the data for sulfur oxides and NO_2 indicate that they may also play a role in the development of progressive chronic disease. For this reason, much of this Topical Response is directed towards identifying the impacts of coal conversion on peak pollution levels and the associated acute health impacts. Because of the lack of specificity inherent in health effects analysis, the highest projected pollution concentrations are used to provide an upper bound on the health impacts that may be expected.

Although emissions and atmospheric concentrations of many of the criteria and non-criteria pollutants have generally improved across the U.S., large daily and annual variations occur at individual monitoring locations. The variations in ground-level concentrations of pollution emitted by coal-fired powerplants results from temporal and spatial variations in atmospheric conditions. Meteorological phenomena affect pollution dispersion. In addition, ground-level concentrations are affected by wet and dry deposition and pollutant transformations fueled by sunlight, high temperatures, and high relative humidity.

The U.S. Environmental Protection Agency (USEPA 1972) measured mixing heights and wind speeds throughout the U.S. as indicators of the potential for air pollution episodes in different geographic locations. The mixing height is indicative of the extent of vertical dilution in the lower atmosphere: the lower the mixing height, the smaller the volume of air into which pollutants can disperse, resulting in higher concentrations. The presence of low mixing heights with light winds (limiting horizontal dispersion) and little precipitation provide optimal conditions for accumulation of air pollution over an area.

An episode is defined as a period of two days during which mixing heights are less than 2000 m, wind speeds are less than 6.0 m/s, and there is no significant precipitation. USEPA identified the total number of days with episodic conditions occurring during a five-year period in the United States. The northeastern states generally experienced between 39 and 60 episodes, lasting between 111 and 178 days. One site in northern Maine and another on the coast of Massachusetts experienced many fewer episodes and episode-days. Thus, there is potential for meteorological conditions conducive to pollution buildup in the Northeast, and this potential generally increases from northeast to southwest; several regionally high concentrations of sulfate have been recorded over the Northeast (Altshuller 1980).

The population of the Northeast is composed of many subpopulations with varying degrees of sensitivity to air pollution. Historically, those individuals afflicted with chronic cardiovascular and respiratory diseases, the elderly, asthmatics, and young children have been among the first to experience ill effects of high air pollution levels in the ambient environment. Clinical studies generally support this experience. Children are likewise more susceptible to radiation-induced cancer than are adults, and trace metals are more rapidly absorbed from the gastrointestinal tracts of children (Calabrese 1978). Strenuous physical activity is a stress factor potentiating respiratory and cardiovascular effects from atmospheric irritants, as are temperature extremes, rapid fluctuations in temperature, and fog. Other evidence indicates that smokers are at higher risk of suffering illness and disease from air pollution than their nonsmoking counterparts (Calabrese 1978).

National estimates suggest that 3-5% of the U.S. population display persistent chronic respiratory disease symptoms, 7% have heart disease serious enough to limit their activity, and 2-5% are asthmatic (Calabrese 1978). Approximately 37% of adult men and 31% of adult women are smokers (U.S. Dept. of Health and Human Services 1981). The characteristics of the population of the Northeast should not differ greatly from these nationwide estimates.

The predicted incremental changes in pollutant concentrations and the probable resultant health effects in the Northeast Region are discussed by pollutant in the following subsections.

3.7.2 Sulfur Dioxide

The maximum increases in annual and 24-hour SO_2 concentrations for the four subregions (Topical Response 3.1) are summarized in Table 3.7-1. Also shown are peak concentrations, and percentage increases of background concentrations for the predicted maximum annual and 24-hour averages.

Table 3.7-1. Predicted Annual and 24-hr Average Increases and Peak SO_2 Concentrations ($\mu g/m^3$) in Northeast Subregions

	Annual	24-hr	Peak[a]
Boston	2 (15%)[b]	62 (45%)	62 (annual) 287 (24-hr)
Philadelphia	5 (10%)	30 (18%)	75 (annual) 230 (24-hr)
New York City	5 (9%)	55 (28%)	74 (annual) 315 (24-hr)
Baltimore	3 (14%)	45 (34%)	33 (annual) 191 (24-hr)

[a]Maximum predicted concentration after conversion.

[b]Numbers in parentheses are percent of background concentrations for a once-in-5-years recurrence interval.

Information presented in Appendix C.1 reveals that the lowest levels at which SO_2 alone has clinically produced decreased pulmonary function in animals and normal humans are 840 $\mu g/m^3$ and 1950 $\mu g/m^3$, respectively. One researcher reported that two asthmatics and one healthy teenager experienced decreased pulmonary function and increased symptoms upon SO_2 exposure of 1300 $\mu g/m^3$. Another found effects in asthmatics at 260 $\mu g/m^3$ SO_2. These latter results may not be directly applicable to ambient conditions, however, due to the unusual breathing device used for exposing the test subjects to SO_2. Epidemiological studies have generally associated daily SO_2 levels of 400 to 500 $\mu g/m^3$ with increased mortality and levels of 250-722 $\mu g/m^3$ with increased symptoms and decreased pulmonary functions in persons with COPO (chronic obstructive pulmonary disease). Similar levels of TSP also were present. SO_2 and TSP concentrations in excess of 180 $\mu g/m^3$ are regarded as levels above which sensitive ashtmatics experience symptoms. Chronic exposures of 125-300 $\mu g/m^3$ SO_2 and TSP has been associated with symptoms and effects in children and adults.

The highest predicted annual level of SO_2 after conversion is 75 $\mu g/m^3$, which is well below the lowest chronic SO_2 concentration associated with adverse effects in children and adults. The maximum predicted 24-hour SO_2 concentrations after conversion range from 191 to 315 $\mu g/m^3$. These levels are above those associated with increased symptoms in the most sensitive asthmatics, and exceed the lowest levels associated with increased symptoms and decreased pulmonary function in COPO patients. Maximum predicted 24-hour SO_2 concentrations are 19% of the lowest levels associated with effects in clinical experiments with healthy human subjects. In conclusion, on the days with peak SO_2 concentrations, asthmatics and COPO patients are at higher risk of experiencing increased disease symptoms.

3.7.3 Total Suspended Particulates (TSP)

The predicted annual increases of TSP for the four subregions are listed in Tables 5.5-5.8 of the OEIS. The increases range from 0 to 1 $\mu g/m^3$, or 0 to 2% over 1978 maximum average background concentrations. As discussed in Appendix C.2, the lowest concentrations of particulate matter associated with mortality are 500-600 $\mu g/m^3$ using the British Smoke-shade filter method [BS]. In association with 400-500 $\mu g/m^3$ of SO_2, this concentration caused increased mortality in persons 45 years of age and older having bronchitis, pneumonia, or cardiac disease. Health effects in bronchitics and decreased pulmonary function in patients with chronic obstructive pulmonary disease (COPO) are associated with daily levels of 350 $\mu g/m^3$ total suspended particulate matter (TSP) with concurrent SO_2 levels of 250-722 $\mu g/m^3$. In the U.S., particulates in the atmosphere are typically measured as TSP. The monitoring technique and characteristics of the measured pollutants are different from the British method of atmospheric particulate measurement, the BS method. Therefore, in discussing the results of epidemiological research conducted in the two countries, the distinction between monitoring methodologies must be considered. The National Academy of Sciences (National Research Council 1978) concluded that 180 $\mu g/m^3$ appears to be the level above which the most sensitive asthmatic subjects begin to experience increased symptoms from TSP and SO_2. Chronic exposure to particulate matter at levels between 100 and 300 $\mu g/m^3$ (BS) with SO_2 levels of 150-275 $\mu g/m^3$, and 180 $\mu g/m^3$ TSP concurrent with SO_2 concentrations as low as 56 $\mu g/m^3$ has been associated with a greater prevalence of respiratory symptoms in postal workers, decreased pulmonary function in children and adults, and the likely increased frequency of lower respiratory tract infections in children.

The highest predicted annual TSP concentration following conversion is 76 $\mu g/m^3$ in northern New Jersey, which is well below that associated with any chronic health effects detected by widely accepted epidemiological research. Information on peak daily and peak hourly TSP concentrations resulting from conversion are not available. Levels in excess of 180-300 $\mu g/m^3$ may increase symptoms experienced by asthmatics and persons with chronic obstructive pulmonary disease (COPD).

3.7.4 Respirable Particles

Respirable particles emitted by fossil-fuel combustion may be crystalline or amorphous forms, fibers, spheres, or aggregate meshes. Toxic metals, transformation products, and organic substances can adsorb onto particle surfaces. Particulates derived from oil combustion are known to be highly porous in contrast to the smooth, aluminosilicate spheres common to coal combustion. Short-range (less than 8 km) particle transport in the atmosphere and particle size distribution are thought to be similar for both oil- and coal-fired powerplants. However, the total quantity of particles released from uncontrolled oil-fired facilities is typically 50 times less than that from a similar uncontrolled plant burning coal (Walsh et al. 1981).

From 5 to 70% (by mass) of uncontrolled coal-fired powerplant particulate emissions have diameters less than 2.5 μm, compared with from 70 to 95% for oil-fired powerplant emissions (USEPA 1980a, 1980b; Suprenant et al. 1979; Taback et al. 1979). Electrostatic precipitators (ESPs) are generally used to control particulate emissions from coal-fired powerplants. Control efficiency for large particles approaches 99.5% by mass, while that for particles in the respirable range decreases to approximately 70% (Walsh et al. 1981). ESPs can reduce total particulate emissions from a coal-fired powerplant to approximately the levels emitted by an uncontrolled oil plant. For illustrative purposes, assuming that an uncontrolled oil plant emits 100 tons of total particulates per year, the range of emissions of respirable particles can be calculated by:

70%	x	100 tons/yr	=	70 tons/yr	(3.7-1)
fraction of respirable particles in uncontrolled oil emissions		total emissions from theoretical oil plant		amount of respirable particles emitted by uncontrolled oil plant	
95%	x	100 tons/yr	=	95 tons/yr.	(3.7-2)

Assuming that uncontrolled particulate emissions in a coal plant are 50 times those produced by an oil plant, the total uncontrolled emissions would be:

50 x 100 tons/yr = 5000 ton/yr.

The range of uncontrolled emissions in the respirable range would be:

5%	x	5000 tons/yr	=	250 tons/yr	(3.7-3)
fraction of respirable particles in uncontrolled coal emissions		total uncontrolled emissions from hypothetical coal plant		amount of respirable particles emitted by uncontrolled coal plant	
70%	x	5000 tons/yr	=	3500 tons/yr.	(3.7-4)

Assuming that ESPs capture 70% of fine particle emissions, the range of respirable particles emissions would be:

30%	x	250 tons/yr	=	75 tons/yr	(3.7-5)
fraction of respirable particles escaping ESP		range of uncontrolled respirable particle emissions in coal plant		amount of respirable particles emitted by controlled coal plant	
30%	x	3500 tons/yr	=	1050 tons/yr.	(3.7-6)

Comparing the range of results for a controlled coal plant (Equations 3.7-5 and -6) to those for an uncontrolled oil plant (Equations 3.7-1 and -2) reveals that the ratio of respirable particles from coal and oil is from 0.79 (75/95) to 15 (1050/70). Switching to coal could therefore slightly decrease the total respirable particle emissions from converting plants or could increase them 15-fold. In addition there would be a increase of up to 2% in TSP concentrations composed of 4-49% respirable particles (see Sec. 3.7.3).

Combustion of oil and coal by utilities accounted for about 30% of the total particulate emissions in the United States in 1975 (Walsh et al. 1981). Assuming that northeastern utilities contribute similar percentages to total emissions, the worst-case emissions from the conversion program would result in impacts ranging from a negligible decrease in respirable particle concentrations to a small but significant increase. These effects would occur primarily in local areas near single or multiple powerplants. Due to the relatively long half-lives of respirable particles in the atmosphere, however, the increased small-particle emissions from conversion may alter the respirable fraction of TSP on a regional scale.

A limited data base gathered by USEPA on its newly established dichotomous particulate sampling network indicates that the mean fine fraction concentration was 19.5 $\mu g/m^3$ (range 13.3-25.9 $\mu g/m^3$). Based upon a fine-to-coarse particle ratio of 1.55 and an inhalable (< 15 μm diameter) to TSP percentage of 40-100%(described in Appendix B, Sections B.2 and B.8), the 1978 annual mean of median respirable particle concentrations in the Northeast would be expected to range from 13.19 to 32.98 $\mu g/m^3$, with maximum annual values of 33 to 83 $\mu g/m^3$. Maximum 24-hour values could be several times higher.

As discussed in Appendix C.8, respirable particles are suspected of at least contributing to the health effects associated with air pollution. However, the existing data base is inadequate to assess the impact of increased respirable particle levels in the Northeast. British data using the British Smoke-shade (BS) method of particle measurement, which preferentially measures particles in a smaller size range than the Hi-vol TSP samplers used in the U.S., may be more appropriate for health analysis. In epidemiological studies, 500-600 $\mu g/m^3$ (BS) was found to be the lowest daily levels of particulate matter associated with increased mortality. Lower levels of TSP have been associated with acute and chronic diseases in susceptible and sensitive individuals. Assuming that the current ratio of respirable to TSP particles is similar to that of the past, the health effects in the studies indicating increased acute effects in bronchitics and patients with COPD would have occurred at respirable particle concentrations of 78-195 $\mu g/m^3$ (26-65% of TSP values) (see Appendix B.8). Asthmatics may be expected to experience increased symptoms at 180 $\mu g/m^3$ TSP, or 46.8-117 $\mu g/m^3$ respirable particles. Health effects have been noted in postal workers working in ambient air, in other adults and in children after chronic exposure to particulate levels of 100 to 300 $\mu g/m^3$ (BS) and 180 $\mu g/m^3$ (TSP). The TSP levels are comparable to respirable particle levels of 46.8-117 $\mu g/m^3$. Comparing these values to those estimated to occur in the Northeast (calculated from percentages of fine to total particles and 1978 annual TSP data and presented above) (Appendix B.2 and B.8) indicates that recent maximum concentrations exceed the lowest levels associated with acute health effects in persons with illness or disease. An increase in respirable particle emissions may therefore be of concern. Much more research is necessary to clarify the role of fine particles in human disease.

3.7.5 Nitrogen Dioxide

As described in Topical Response 3.1.5, the maximum increase in annual NO_2 concentrations predicted from coal conversion is 2-5 $\mu g/m^3$, approximately 2-10% of measured background levels. The highest predicted annual NO_2 concentration is 92 $\mu g/m^3$ (with the lowest being 37 $\mu g/m^3$). While there are no data on the short-term impacts of coal conversion, a general rule of thumb is that for every 1 $\mu g/m^3$ change in modeled annual concentrations, a 10 $\mu g/m^3$ change in 24-hour concentrations is expected (Turner 1970). Therefore, maximum increases of 20-40 $\mu g/m^3$ can be expected in 24-hour NO_2 values as a result of the proposed action. Increased NO_2 concentrations resulting from coal conversion would contribute to the general trend of increasing NO_2 levels in the Northeast (Appendix B.3). If data obtained 10 years ago are still of value today, 1-hour peak concentrations as high as 10,000 $\mu g/m^3$, but generally around 500 $\mu g/m^3$, can be expected to occur in urban areas of the Northeast (Appendix B.3). With the trend toward increasing concentrations and the added contributions from fuel conversion, peak levels probably will be higher.

The discussion in Appendix C.6 indicates that in general the lowest level of NO_2 associated with acute effects in clinical studies with humans is 2800 $\mu g/m^3$. Reversible increased airway resistance occurred after 15-45 minutes of exposure. Continuous prolonged exposure to 940 $\mu g/m^3$ for 3 to 6 months reduced resistance to bacterial infection of laboratory animals. This same effect has been observed in human populations after exposure to between 100 and 580 $\mu g/m^3$. Decreased ventilatory function in populations has been observed at concentrations greater than 150 $\mu g/m^3$.

Maximum annual NO_2 concentrations after conversion would be below those that have resulted in reduced resistance to bacterial infection in laboratory animals and humans. However, limited data indicate that peak daily and hourly values may occasionally reach the levels associated with changes in pulmonary function in human subjects in the laboratory. In addition, asthmatics are expected to experience these effects and perhaps increased symptoms at these peak levels.

3.7.6 Ozone and Photochemical Oxidants

Air quality in much of the Northeast currently exceeds the health standard for O_3 of 0.12 ppm (235 μg/m^3) (Appendix B.4). One hour levels as high as 0.253 ppm (≅ 500 μg/m^3) were measured in Connecticut in 1978 (Conn. Dept. of Environ. Prot. 1980). The increased (2-5 μg/m^3) annual NO_2 concentrations from conversion are expected to react with excess hydrocarbons in the atmosphere to produce ozone and other photochemical oxidants. Ozone makes up the greatest portion of photochemical oxidant pollution. It is comparatively easily measured, is one of the most toxic components, and is the accepted indicator of photochemical oxidant pollution. Temporal, spatial, and meteorological conditions and the availability of excess hydrocarbons would determine the amount of O_3 produced from these added emissions. All that can be concluded with existing information is that O_3 concentrations can be expected to increase slightly in the Northeast as a result of conversion. The primary increases of concern would occur between May and September. Reduced emissions from motor vehicles and stationary sources (responsible for a decline in levels in recent years) may reduce the impact of increased NO_2 emissions from the converted coal plants, however.

As discussed in Appendix C.7, ozone has produced alterations in pulmonary function after short-term clinical exposure to 730 μg/m^3 in healthy, asthmatic, and sensitive subjects. Concentrations as low as 200 μg/m^3 have reportedly produced these effects in subjects undergoing strenuous exercise in the laboratory. During these experiments subjects have reported symptoms such as throat tickle, susternal tightness, and pain upon deep breathing and cough. Biochemical alterations in blood have been observed in humans and animals exposed to 730 μg/m^3 O_3. Epidemiological studies show decreased effects in physical performance at oxidant concentrations between 200-290 μg/m^3 and increased symptoms above 490-570 μg/m^3 oxidant. Photochemical pollutants associated with ozone in concentrations of 200-800 μg/m^3 have been linked with eye irritation.

It is impossible to predict the maximum levels of O_3 that would occur in the Northeast as a result of fuel conversion. If there is any increase, it is expected to be small. While present measurement techniques probably are inadequate to distinguish any incremental health effects resulting from the increase in O_3 levels, additional concentrations resulting from conversion may combine with existing smog levels and contribute to slight increases in eye irritation and slight transitory effects in persons undergoing strenuous exercise such as jogging.

3.7.7 Hydrocarbons and Organic Matter

Data on organic emissions from coal- and oil-fired powerplants are limited. Polynuclear organic matter (POM) is formed during coal and oil combustion. Investigators have found that POM emissions from coal-fired powerplants vary according to type, size, and age of the boiler. In a 1972 study (Walsh et al. 1981), coal-fired powerplants were associated with an estimated 1 ton of benzo(a)pyrene (B(a)P, used as an indicator of POM concentrations) emissions nationwide, compared to a national total inventory of 1320 tons per year. This implies that coal powerplants are not an important source of atmospheric B(a)P nor probably POM. The concentration of B(a)P emissions can vary by 1000 in coal combustion operations from 20-400 μg/10^6 Btu in efficient modern utility plants to 1.7-3.3 g/10^6 Btu for hand-stoked residential boilers. Older utility plants with short stacks located in urban areas have been the subject of some concern as sources of large amounts of B(a)P emissions (Walsh et al. 1981). Information on the contribution of B(a)P and other organic compounds to atmospheric levels from oil-fired powerplants in the Northeast, or relative to coal, is not available (Walsh et al. 1981).

Organic compounds generally are associated with respirable particles, although lower-molecular-weight species may be more prevalent in the vapor phase (see Appendices B.8 and B.9). Concentrations generally are higher in urban areas, and are higher in winter than in summer. Concentrations of total organic compounds in New York City were measured as 22 μg/m^3 (23% of TSP values) in the winter and 13.3 μg/m^3 (15% of TSP values) during August. The organic fraction contains a variety of compounds known to be toxic and carcinogenic to animals and humans including B(a)P. B(a)P has generally been detected at levels a small fraction of total organic concentrations. National trends in B(a)P concentrations decreased over 90% between 1958 and 1973 to an annual average of 0.5 ng/m^3. This reduction is partially attributable to reduced reliance on coal for residential heating purposes and reduced incineration of municipal wastes.

As indicated in Appendix C.10, the range of B(a)P concentrations associated with increased cancer risks in working populations is 1.2-200 μg/m^3. No clear association has been established between B(a)P ambient concentrations and increases in community cancer rates, yet no data are available to conclusively refute such a relationship. Urban concentrations in the Northeast average nearly 0.5 ng/m^3, or 2400 times less than the lowest levels associated with cancer in workers. Despite a lack of information on the effects of coal conversion on organic and POM emissions and ambient concentrations in the Northeast, current levels of these substances in the atmosphere are low, and coal-fired powerplants are a relatively insignificant source. Thus, the conversion program is not expected to increase the population risks of cancer from this pollutant.

3.7.8 Trace Elements

Several trace elements of public health significance have been identified in coal-fired powerplant plumes at concentrations great enough to be of concern (Appendix C.11). Ambient concentrations of these elements, atmospheric trends, expected concentrations from a typical 1000-MW coal-fired powerplant, and recommended safe atmospheric levels are listed in Table 3.7-2. Vanadium is included because it is associated with oil-fired powerplant emissions. As can be seen, even using the conservative estimates for maximum ambient concentrations from coal emissions presented in Walsh et al. (1981), "unsafe" levels are not approached. Furthermore, oil plants emit small quantities of many of these elements, so that incremental increases from conversion to coal probably would not be as high as those presented in Walsh et al. (1981). The ambient concentrations of other metals such as Ni and V would actually be expected to decrease as a result of conversion from oil to coal.

Due to the low background levels of atmospheric elements, their generally decreasing trends, and the elimination of oil as a fuel source, the fuel conversion program is not expected to cause trace-metal-associated public health effects.

3.7.9 Sulfate and Sulfuric Acid

In the long range-transport analysis (Topical Response 3.2), it is predicted that under the Voluntary Conversion Scenario the maximum increase of monthly atmospheric sulfate concentrations would be 0.21 $\mu g/m^3$ in the summer and 0.03 $\mu g/m^3$ in the winter. The maximum increases are expected to occur over New York City and are approximately 1.7% over background for the summer and 1.3% over background for the winter.

As stated in Appendix B.6, annual sulfate levels in urban areas in the Northeast currently are 10 $\mu g/m^3$, while nonurban areas have annual averages around 8 $\mu g/m^3$. Approximately 12% of the time sulfate concentrations in nonurban areas are above 15 $\mu g/m^3$. Twenty-four-hour sulfate concentrations as high as 40-50 $\mu g/m^3$ have recently been recorded (Appendix B.6). Annual sulfate trends in urban areas have generally been declining, while levels in nonurban areas are increasing. Summer concentrations have remained stable in urban areas and increased in rural areas. Similarly, the frequency and severity of peak concentrations seems to be increasing. Most of the urban sulfate in the Northeast is ammonium sulfate and ammonium bisulfate. However, during high photochemical activity, H_2SO_4 may make up a significant portion of total sulfate. Rural sulfates are generally more acidic, with relatively higher ratios of H_2SO_4 to total SO_4.

Sulfuric acid is the most toxic sulfate species with ammonium sulfate and ammonium bisulfate possessing approximately 10% and 3% of its irritant potency in animals (Appendices C.3 and C.4). Generally, the lowest level of H_2SO_4 to produce changes in pulmonary function in clinical studies with healthy human subjects is 1000 $\mu g/m^3$. Increased mucociliary clearance has been detected in nonsmokers at between 100 and 1000 $\mu g/m^3$ H_2SO_4. Acute concentrations as low as 190 $\mu g/m^3$ have slowed particle clearance in the bronchi of donkeys. Subchronic exposure to monkeys of 380-4790 $\mu g/m^3$ H_2SO_4 produced morphological changes in bronchiolar epithelia. Repeated 1-hour exposures in donkeys to 100 $\mu g/m^3$ H_2SO_4 have altered bronchial clearance rates. These same levels have been hypothesized to possibly produce persistent changes in mucociliary clearance in healthy humans and aggravate existing COPD conditions.

Sulfates produce the same type of respiratory effect in animals and humans as H_2SO_4 does, but higher doses are generally required (Appendix C.4). As with sulfuric acid, the relative irritancy of sulfates is highly dependent upon particle size, the optimal of which is approximately 2 μm in diameter. General conclusions from human experiments indicate that sulfate concentrations less than 1000 $\mu g/m^3$ produce only slight and transient effects on pulmonary function. Based upon results with H_2SO_4, however, morphological changes, increased susceptibility to infection, and changes in respiratory tract clearance rates are expected after acute and chronic exposures to levels between 100 and 1000 $\mu g/m^3$.

Even assuming worst-case conditions (that all sulfate in the Northeast exists as sulfuric acid and that all occurs in the optimal size range for producing health effects), the concentrations expected to occur (background + incremental increase from conversion) are not predicted to cause any adverse health effects resulting from acute or chronic exposures.

3.7.10 Nitrates

Fuel conversion is predicted to increase NO_2 concentrations a maximum of 2-5 $\mu g/m^3$ or up to 10% of current measured levels (see Topical Response 3.7.5). NO_2 can oxidize in the atmosphere to form a variety of nitrates, including nitric acid, ammonium nitrate, and sodium nitrate (Appendix B.7). The mechanism or relationship for this reaction is not completely understood. Therefore

Table 3.7-2. Potentially Harmful Trace Elements Emitted by Coal- and Oil-Fired Powerplants, Expected Concentrations, and "Safe" Levels

Element	Ambient Concentrations (ng/m^3)[a]	Trends	Predicted Air Concentrations ($\mu g/m^3$) from Coal Plant[b]	Ultimate Atmospheric Concentrations ($\mu g/m^3$) (Col. 1 + Col. 3)	Acceptable Air Concentration ($\mu g/m^3$)[c]	Estimated Permissible Concentration ($\mu g/m^3$)[d]
As(V) or total	- (resp. fract.)	-	1.2×10^{-4}	1.2×10^{-4} plus	0.1	0.005
AS(III)	- (resp. fract.)	-	-	-	1×10^{-5}	0.005
Be	0.02	Too low to tell	2.9×10^{-4}	3.1×10^{-4}	5×10^{-3}	1.0
Cd	0.0024	Down	1.2×10^{-4}	1.2×10^{-4}	0.05	0.12
Cr	0.0072	No trend	7.2×10^{-6}	1.44×10^{-5}	0.05	0.12
Cr (VI insol)	-	No trend	-	-	1×10^{-6}	0.12
Hg	-	-	1.2×10^{-3}	1.2×10^{-3} plus	0.1	0.024
Hg-organic	-	-	-	-	0.01	0.024
Ni	0.0128 (variable)	Down	4.8×10^{-4}	4.9×10^{-4}	0.01	0.24
Ni/carbonyl	-	-	-	-	1×10^{-6}	0.8
Se	(resp. fract.)	-	2.4×10^{-5}	2.4×10^{-5} plus	0.1	0.5
Tl	-	-	3.0×10^{-6}	3.0×10^{-6} plus	0.01	0.24
V	0.030 (variable)	Down	2.4×10^{-4}	2.7×10^{-4}	0.05	1.2

Derived from Table 4.9 of Walsh et al. (1981).

[a]Arithmetic mean for urban areas averaged over 1970-74 period from Table B.2.

[b]Values taken from Vaughan et al. (1975) as cited in Walsh et al. (1981).

[c]Values based on Morrow et.al. (1977) as cited in Walsh et al. (1981). Where human intake data were used, ambient air concentrations were calculated assuming 10 m^3 air/day breathed with 100% particulate deposition. Values shown represent considerations of urban and ambient air data. Where these data varied widely or were limited and the metal has a relatively short biological retention, additional weight was given to the 1/1000 occupational TLV.

[d]From USEPA (1977).

the impacts of increased nitrogen oxide emissions from coal conversion upon nitrate concentrations in the Northeast are unknown. Recent measurements of average annual background nitrate levels in the Northeast revealed a maximum annual concentration of 4 $\mu g/m^3$ near Philadelphia (Appendix B.7). Concentrations decrease to 1 $\mu g/m^3$ to the north. Higher levels are expected near areas characterized by high nitrogen oxides emissions and/or ambient concentrations. Using background NO_2 data for Philadelphia (see Topical Response 3.1) of approximately 75 $\mu g/m^3$, we find a nitrate-to-NO_2 ratio of 4 $\mu g/m^3$ to 75 $\mu g/m^3$, or 0.05. With a maximum increase in annual NO_2 concentrations of 5 $\mu g/m^3$ from conversion the maximum increase in annual nitrate concentrations might be expected to be approximately 0.27 $\mu g/m^3$. The resultant maximum annual nitrate concentration would be 4.27 $\mu g/m^3$. This level is more than 1000 times less than the level found not to produce any effect in healthy and asthmatic volunteers in laboratory studies (Appendix C.5). Thus, no adverse health effects from nitrate concentrations after coal conversion are expected to occur.

3.7.11 Combined Exposures

Many residents of the Northeast are simultaneously exposed to relatively high levels of atmospheric SO_2, TSP, NO_2, O_3, CO, SO_4, NO_3, H_2SO_4, and organic substances. The fuel conversion program may increase atmospheric concentrations of SO_2, respirable particles, NO_2, SO_4, and H_2SO_4 (Topical Responses 3.7.2, 3.7.4, 3.7.5, and 3.7.9). Clinical and epidemiological research has identified a close association between SO_2 and TSP and adverse health effects (Appendices C.1 and C.2). The simultaneous occurrence of these pollutants in concentrations of approximately 200-400 $\mu g/m^3$ may produce increased symptoms and pulmonary function decrements in persons with COPD. Chronic levels of these pollutants above 100 $\mu g/m^3$ have been associated with adverse respiratory changes and increased susceptibility to viral infections in both children and adults. The role of respirable particles in producing these health effects is not clear (Appendix C.8). It is generally accepted that particles in this size range are capable of deeper penetration into the respiratory tract and clinical research has found them to be considerably more toxic than larger particles. For this reason, the potential impact of increasing the respirable to total particle ratio from fuel conversion to absolute respirable particle concentrations near those calculated to have been associated with the adverse health effects noted above is of concern and requires further investigation. According to Appendix C.11, simultaneous or sequential exposures to H_2SO_4 and O_3, and O_3 and NO_2 have reduced the resistance to bacterial infections in laboratory animals at levels below those which could be attributable to the individual pollutants themselves. No interactive effects have been detected upon pulmonary function in humans exposed to relatively high levels of SO_2, NO_2 and O_3. Similar negative results were obtained from human exposures to lower levels of O_3, NO_2 and Co. Multiple pollutant exposure in animals (SO_2, H_2SO_4, CO, HC, NO_2 and O_3) did not reveal potentiation upon pulmonary function in animals for any combination of pollutants studied.

Therefore, in addition to the effects associated with high levels of TSP (and/or respirable particles) and SO_2, the only other interactive effect from pollutant exposure at levels predicted to occur in the Northeast after fuel conversion might be a slightly increased susceptibility to bacterial infections among those simultaneously exposed to the highest concentrations of H_2SO_4, O_3 and NO_2. Concentrations of these pollutants are expected to be maximized during the summer months, traditionally a period of low incidence for respiratory infections.

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3.8 AVAILABILITY OF LOW-SULFUR COAL FROM APPALACHIA

Several commentors expressed concern about the availability of low-sulfur (1% or less) coal from the Appalachian coal fields. The location of the coal source for the 42 powerplants is addressed in Appendix D and Section 5 of the DEIS.

The USDOE has determined that 27 of the 42 conversion candidates constitute a more likely conversion scenario (see Sec. 1). This reduction will mean a reduction in the amount of coal consumed. Changes in the SIPs now applicable will result in some difference in coal requirements and sulfur content from that reported in the DEIS.

This topical response includes a comparison of the amounts and types of coal (by sulfur content) required under the Coal SIP scenario from the DEIS and a new scenario, Voluntary Conversion (FEIS; see Sec. 2), under which the number of converted plants is reduced. Also taken into consideration are changes in the SIPs. A study of the coal resources of the state of West Virginia was conducted to determine the availability of coal of the type and amount required. This study was done for West Virginia only to indicate the ready availability of coal from one state of several (see Table 3.8.2) which will ultimately supply coal to the plants converting. West Virginia was also selected because, of all these states, the available information on coal quality, by seam, was the most detailed and best documented. This study was done only to illustrate the ready availability of coal of the proper quality and quantity.

3.8.1 Effect of Changes in Scenario on Type and Quantity of Coal Required for Conversion

Table 3.8-1 is a comparison of data on the sulfur content and quantity of coal required under the Coal SIP scenario and the Voluntary Conversion scenario. The data developed for the DEIS, as summarized in Table J.3 of that document, shows the expected sources of coal to be those shown in the first column of Table 3.8-2.

For illustrative purposes only, this topical response includes data indicating that West Virginia could supply all of the coal necessary for conversion, the other sources shown in Table 3.8-2 would surely be used to some extent. The actual distribution of coal delivered by the sources in Table 3.8-2 probably would be similar to that presented in Table 3.8-2 for the Coal SIP scenario, expressed as a percentage of the total.

3.8.2 Summary Data for Coal Resources, Reserves, and Production in the State of West Virginia, Including Data on Low-Sulfur (<1%) Coal

The state of West Virginia contains about 100 billion tons of accessible coal resources. Accessible coal resources are those resources whose location and general quality are known. Reserves of coal are those quantities for which not only is the location well known but specific information on quality and quantity is available. Also, reserves can be mined by presently available technology. Reserves of bituminous coal are currently estimated at 38 billion tons (Keystone Coal Industry Manual 1980, pp. 713-716). Coal production can be expanded rapidly; mines in West Virginia increased their production from about 80 million tons in 1978 to more than 110 million tons in 1979. West Virginia regularly produces 15-20% of U.S. coal production. It has been estimated that 40% of the West Virginia coal resources (33% of its reserves) are low-sulfur (Keystone Coal Manual 1980, p. 607).

Production information (U.S. Bureau of Mines Coal Data Base) for the year 1978 indicates that of the 80 million tons of coal produced in that year, 47 million are low-sulfur.

Eight counties in West Virginia produced almost all of the low-sulfur coal considered in this Topical Response. These counties are Boone, Fayette, Kanawha, Logan, McDowell, Mingo, Nicholas, and Raleigh. They are all located in the southeastern portion of West Virginia.

The 30-year requirement for coal for all of the 27 stations indicated to convert under the Voluntary Conversion scenario is about 660 million tons, an average of 22 million tons per year. Of this amount, the revised SIPs used in the new scenario will require that one-third, or about 8 million tons per year, must contain less than 1% sulfur. This 8 million tons per year of low-sulfur coal required for conversion by 1991 would be less than 20% of the 1979 low-sulfur production. The total amount for lifetime operation of the converted plants (660 million tons) would be about 3% of the estimated West Virginia reserves of bituminous coal are low-sulfur (Keystone Coal Manual 1980, p. 608).

This information is presented to put into perspective the amount of coal required for conversion compared to the amount available. It is not meant to indicate that West Virginia would be the only state to supply coal for conversion. Eastern Kentucky, Maryland, Pennsylvania, and Virginia all have reserves of low-sulfur coal that could, and probably would, be used to some extent.

Table 3.8-1. Sulfur Content of Coal and Quantity Required under the Coal SIP and Voluntary Conversion Scenarios

	Coal SIP-- (DEIS) (42 Plants)	Voluntary Conversion-- (FEIS) (27 Plants)
Quantity of coal required for conversion in 1991 (10^6 ton)	38	22
Annual coal requirements 1991, by sulfur content (10^6 ton)		
Up to 1.04% S	11 (29)[a]	8 (36)
1.05-2.24% S	13 (34)	11 (50)
>2.25% S	14 (37)	3 (14)
MWe converted	16,106	9,624
Thirty-year coal requirements (10^6 ton)	1,140	660

[a]Numbers in parentheses are percentages of total converted coal consumption.

Table 3.8-2. Expected Coal Sources for FUA-Related Coal Conversion under Coal SIP and Voluntary Conversion Scenarios

	Coal SIP-- (DEIS) (42 Plants)		Voluntary Conversion-- (FEIS) (27 Plants)	
	10^3 ton	%	10^3 ton	%
Kentucky	3,830	10	-	-
Maryland	None	-	-	-
Pennsylvania	9,251	24	-	-
Virginia	5,219	13	-	-
West Virginia	19,994	52	22,036	100
Total	38,294		22,036	

3.8.3 Comparison of Utility and Total Coal Demands in the Northeast

Information comparable to that in Comment NYDEC-87, which is based on Table D.4 of the DEIS, is given in Table 3.8-3. In Comment NYDEC-87 it is suggested that emissions from coal used in converted plants will be greater than the ratios indicate, based on the DEIS Coal SIP Scenario. Under the Voluntary Conversion Scenario, however, the amounts of low- and medium-sulfur coal required, expressed as a percentage of the coal used for conversion, are greater than the percentages under the DEIS Coal SIP Scenario. It is possible that emissions from stations under the Voluntary Conversion Scenario would more closely approximate the ratios given in Table 3.8-3.

Table 3.8-3. Utility Portion of Northeast Coal Demand[a] (10^6 ton)

Year	Total Demand in NE Region	Existing Utility Demand	Conversion Utility[b]	Total Utility	Ratio: Utility to Region Total	Ratio: Conversion Utility to Region Total
1982	112.6	61.0	-	61.0	0.54	0
1983	113.9	60.2	-	60.2	0.53	0
1984	116.1	63.8	-	63.8	0.55	0
1985	125.4	63.0	6.4	69.4	0.55	0.05
1986	132.7	61.8	11.5	73.3	0.55	0.09
1987	140.1	64.7	13.1	77.8	0.56	0.09
1988	148.2	65.9	15.6	81.5	0.55	0.11
1989	157.5	69.6	19.6	89.2	0.56	0.12
1990	164.9	72.4	21.6	94.0	0.57	0.13
1991	173.7	79.0	22.0	101.0	0.58	0.13

[a]Based on Table D.4, p. D-11 of DEIS.

[b]Conversion Utility Demand from Topical Response 3.9.

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3.9 EFFECT OF VOLUNTARY CONVERSION SCENARIO ON COAL DEMAND

The reduction in the number of electric generating facilities considered appropriate candidates for conversion to coal from oil or gas (see Sec. 1) means a reduction in coal demand when compared to values given in the DEIS. This topical response is a discussion of that reduction.

3.9.1 Coal Demand under the Voluntary Conversion Scenario

Station data for the 27 conversion candidates are given in Table 2.1 of this FEIS. Table 3.9-1 is a comparison of coal demand under the DEIS Coal SIP Scenario and the FEIS Voluntary Conversion scenario. In some cases the SIP has changed, as well, and this information was used to develop the data in Table 3.9-1.

With the exception of the number of stations expected to be converted (27 instead of 42) and the SIP changes, the same assumptions were used in this FEIS analysis as were used in the DEIS analysis. Table 3.9-2 contains the projected coal demand and utility capacity of converted plants for 1985 through 1991 by DRI region; coal demand by station is shown in Table 3.9-3.

3.9.2 Comparison of Voluntary Conversion and Coal SIP Scenarios

In Appendix D of the DEIS there is a description of the DRI coal model and the results of using the model (pp. D-12 through D-14). The DRI coal model was not rerun to provide new demand data under the Voluntary Conversion Scenario for this FEIS. New demand data were developed manually, in the same manner as for the DEIS, and are shown in Table 3.9-1 which, like the DEIS, is a regional analysis.

State demand was reduced in every case except Rhode Island, which stayed the same. The state that consumed the most coal as a result of conversion under both scenarios was New York. The largest reduction in coal use resulting from conversion under the Voluntary Conversion scenario was for Pennsylvania.

Demand in 1991 is reduced by about 40% under the new Voluntary Conversion scenario (Figure 3.9-1). Price studies conducted from the DEIS indicated that the driving forces for state prices for delivered coal for conversion were demand and location, in that order. Since the locations of the plants that are no longer included as conversion candidates have not changed, demand would still seem to be the most important factor and its reduction would, if anything, tend to force prices downward. This would not, however, change the conclusions concerning the economic impacts of conversion that were made in the DEIS.

Table 3.9-1. Coal Demnd for the Northeast Region under the DEIS Coal SIP and FEIS Voluntary Conversion Scenarios (10^3 ton)

	1984		1985		1986		1987	
Scenario	CS[a]	VC[a]	CS	VC	CS	VC	CS	VC
Total non-utility demand	53,006	53,006	56,670	56,670	60,192	60,192	63,215	63,215
Existing utility demand	63,791	63,791	62,956	62,956	61,795	61,795	64,697	64,697
Converted utility demand	-0-	-0-	4,569	6,419	10,263	11,539	18,811	13,074
Total demand	116,798	116,798	124,195	126,045	132,250	133,526	146,723	140,986
Imports	668	668	744	744	808	808	877	877
Net demand from U.S. sources	116,130	116,130	123,451	125,301	131,442	132,718	145,846	140,109
Average annual growth of net demand (%)	2	2	6	8	6	6	11	5

	1988		1989		1990		1991	
Scenario	CS	VC	CS	VC	CS	VC	CS	VC
Total non-utility demand	67,629	67,629	69,648	69,648	72,029	72,029	73,849	73,849
Existing utility demand	65,886	65,886	69,605	69,605	72,378	72,378	79,037	79,037
Converted utility demand	27,072	15,591	32,566	19,623	35,920	21,572	38,281	22,044
Total demand	160,587	149,106	171,819	158,876	180,327	165,979	191,167	174,922
Imports	953	953	1,035	1,035	1,124	1,124	1,122	1,122
Net demand from U.S. sources	159,634	148,153	170,784	157,841	179,202	164,855	190,045	173,800
Average annual growth of net demand (%)	10	6	7	7	5	4	6	5

Overall (1984-1991) average annual growth rate of net demand
CS 7.3
VC 6%

[a]CS - Coal SIP Scenario--DEIS (42 Plants)
VC - Voluntary Conversion Scenario--FEIS (27 Plants)

Table 3.9-2. Projected Coal Demand and Utility Capacity for Converted Plants under Voluntary Conversion Scenario, by DRI Region, 1985-1991

DRI Region Designation	Region Designation	State(s)	Transportation Centroid	Converted Coal Capacity, MW and Coal Demand (10^3 ton)[a]						
				1985	1986	1987	1988	1989	1990	1991[b]
WNC	3	CT	New Haven, CT	743 (1601)	957 (2053)	957 (2053)	957 (2053)	957 (2053)	957 (2053)	957 (2053)
WSC2	8	DE	Wilmington, DE						249 (522)	249 (522)
ESC2	2	MA	Boston, MA	144 (299)	663 (1548)	663 (1548)	663 (1548)	1663 (3851)	1663 (3851)	1663 (3851)
WSC1	7	MD	Baltimore, MD	994 (2408)	994 (2473)	994 (2488)	1604 (3748)	1604 (3395)	1604 (3439)	1604 (3606)
NENG	1	ME, NH, VT	Portsmouth, NH		150 (425)	255 (720)	255 (720)	255 (720)	255 (720)	255 (720)
MTN3	5	NJ	Newark, NJ			180 (368)	585 (1400)	868 (2008)	868 (2008)	868 (2008)
MTN2	4	NY	New York, NY	826 (835)	2211 (5288)	2591 (6145)	2971 (6370)	3371 (7326)	3727 (8171)	3727 (8171)
MATL	6	PA	Allentown, PA						201 (444)	201 (444)
MTN1	9	RI	Providence, RI						100 (305)	100 (305)

[a]Coal demand numbers are given in parentheses.

[b]This column shows the MW converted and annual coal burned for each DRI Region after all conversions are completed.

Table 3.9-3. Northeast Regional Coal Demand from Converted Utilities, by Station

State	Station[a]	Units	Plant Factor[b]	Annual Coal[c] Burned (10^3 ton) 1985	1986	1987	1988	1989	1990	1991	Cumulative (10^3 ton)
CT	Bridgeport Harbor	3	60	915	915	915	915	915	915	915	6,405
	Devon	7,8	60	0	452	452	452	452	452	452	2,712
	Norwalk Harbor	1,2	60	686	686	686	686	686	686	686	4,802
DE	Edge Moor	3,4	60	0	0	0	0	0	522	522	1,044
ME	Mason	3-5	60	0	0	295	295	295	295	295	1,475
MD	Brandon Shores	1,2	65	1,445	1,493	1,534	2,786	2,482	2,490	2,685	14,915
	Crane, Charles P.	1,2	60	964	980	954	962	913	949	921	6,643
MA	Mount Tom	1	60	299	299	299	299	299	299	299	2,093
	Mystic	4-6	60	0	0	0	0	1,003	1,003	1,003	3,009
	New Boston	1	60	0	0	0	0	851	851	851	2,553
	Salem Harbor	1-3	60	722	722	722	722	722	722	722	5,054
	Somerset	5,6	60	0	0	0	0	449	449	449	1,347
	West Springfield	1-3	60		527	527	527	527	527	527	3,162
NH	Schiller	4-6	60	0	425	425	425	425	425	425	2,550
NJ	Bergen	1	60	0	0	0	0	608	608	608	1,824
	Burlington	7	60	0	0	368	368	368	368	368	1,840
	Deepwater	7-9	60	0	0	0	485	485	485	485	1,940
	Sayreville	4,5	60	0	0	547	547	547	547	547	2,735
NY	Albany	1-4	65	0	0	0	0	466	920	920	2,306
	Arthur Kill	2,3	65	835	2,008	2,008	2,008	2,008	2,008	2,008	12,883
	Barrett, E.F.	1,2	65	0	0	857	857	857	857	857	4,285
	Danskammer	3,4	65	0	0	0	0	0	845	845	1,690
	Lovett	3-5	65	0	1,272	1,272	1,272	1,272	1,272	1,272	7,632
	Port Jefferson	3,4	65	0	0	0	225	873	873	873	2,844
	Ravenswood	3	65	0	1,760	1,760	1,760	1,760	1,760	1,760	10,560
PA	Cromby	2	60	0	0	0	0	0	444	444	888
RI	South Street	12	60	0	0	0	0	0	0	305	305
Total coal use				5,866	11,539	13,621	15,591	19,263	21,572	22,044	109,494

[a]See Table 2.1 for station information.

[b]Plant factors are ERA assignments.

[c]Coal = 11,500 Btu/lb.

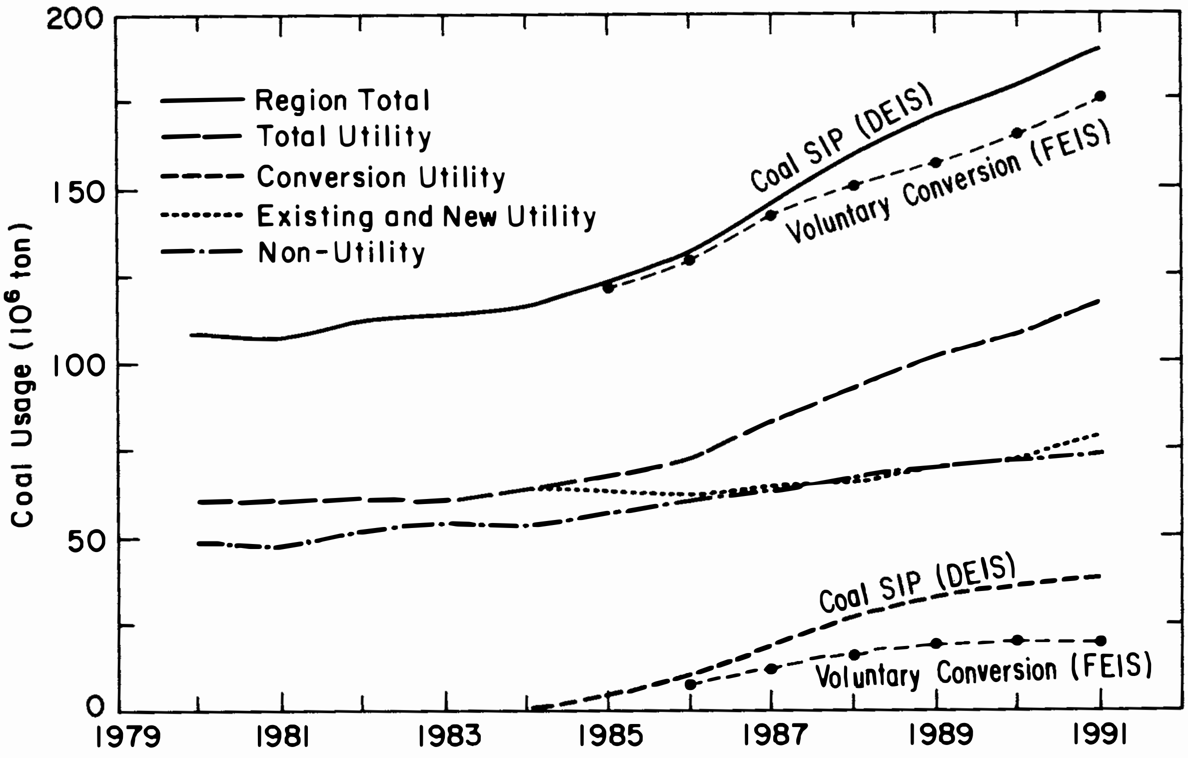

Fig. 3.9-1. Simulated Coal Usage in the Northeast Region, 1979-1991, under the DEIS Coal SIP Scenario (42 Stations) and FEIS Voluntary Conversion Scenario (27 Stations).

3.10 EFFECT OF VOLUNTARY CONVERSION SCENARIO ON TRANSPORTATION IMPACTS

The reduction in coal demand under the Voluntary Conversion Scenario (see Sec. 1) has the general effect of reducing the transportation impacts discussed in the DEIS (Section 5.5.2). The specific changes are described below.

3.10.1 Rail

The total rail ton-miles are reduced from 11.3 billion to 6.7 billion for the maximum water use scenario and from 14.9 billion to 9.2 billion for the maximum rail use scenario. Changes in tonnage to converting plants for specific route segments are:

- The maximum possible tonnage on the Conrail route along the southern shore of Lake Erie to Oswego will change from 8.9 million tons to 6.0 million tons and from Oswego to Albany will change from 7.8 million tons to 6 million tons.
- The maximum possible tonnage on the Selkirk Bridge will change from 6 million tons to 4.4 million tons.
- The maximum possible tonnage on the Conrail route along the west bank of the Hudson River from the New York City area will be reduced from 5 million tons to 2.7 million tons.
- The tonnage in the Harrisburg to Philadelphia corridor will be reduced from 22 million tons to 11.3 million tons.

3.10.2 Water

The tonnage shipped by water for the maximum rail use scenario changes from 15 million tons to 8.6 million tons and the tonnage shipped by water for the maximum water use scenario changes from 36.2 million tons to 12.2 million tons. The water ton-miles are reduced from 1.9 billion ton-miles to 1.8 billion ton miles for the maximum rail use scenario and from 5.6 billion ton-miles to 4.5 billion ton-miles for the maximum water use scenario.

Under the Voluntary Conversion Scenario, there are 18 converting plants located on the intracoastal waterway connected to New York Harbor. With the reduction in demand, expansion of port facilities in New York Harbor to a capacity of approximately 17 million tons annually would be sufficient to allow all but one of these plants to receive coal via inside routes. This would reduce interference with export shipments.

3.10.3 Truck

The total coal demand by conversion candidates in 1991 is 38.3 million tons a year for the original 42 stations considered in the DEIS and is 22 million tons for the new set of 27. This 42.5% reduction in coal required will give a comparable reduction in impact on coal haul roads. An even greater reduction in truck traffic for transport of solid wastes and FGD raw material will result since the Voluntary Conversion Scenario also inclues SIP changes which greatly reduce the number of plants requiring FGD. The locations of the 27 plants remaining are such that the probability of cumulative impacts for trucking solid waste and FGD raw material are greatly reduced.

3.11 CONSERVATION AND ALTERNATIVE ENERGY TECHNOLOGIES

The DEIS elicited several comments noting further opportunities for conservation in the Northeast and suggesting significantly lower growth rates than projected in the draft report. The analysis in response to these comments focused on:

1. Sectoral end-uses of sufficient size that conservation improvements would have a meaningful impact on utility loads.

2. Conservation opportunities of sufficient technical and economic (3-year payback) attractiveness to the user that meaningful load impacts could reasonably be anticipated.

3. Usage patterns or likely patterns not already reflected in utility load forecasts.

4. Conservation actions likely under market conditions, rather than legislative or regulatory mandate.

Given these constraints, the major, reasonably likely, and unaccounted-for conservation opportunities lie in the commercial sector, especially commercial space conditioning. The effect of these opportunities on utility loads is significant; however, the initial conclusions regarding the economic attractiveness of coal conversion are unaffected.

Over the next decade, load growth in the various sectors of the pools is projected at about 2.0% per year. Sectoral shares should not change. In 1978, the residential sector was the leading electrical consumer in NEPOOL. The commercial sector led NYPP, and the industrial sector led PJM. Clearly, each of the three major sectors plays an enormous role in the Northeast. The composition of the sectoral load is much more consistent. In all three pools, appliances represent 60% or more of the residential load. Electric space heating, while growing, is less than 10%. In the commercial sector, lighting and air conditioning are the predominant end-uses, with the air conditioning share steadily increasing in moving from NEPOOL to NYPP to PJM. In the industrial sector, process heat and machine drive applications dominate.

Growth in electrical demand in the Northeast reflects trends underway across the United States. Increased electrification in all sectors is offset by increased efficiency in all sectors. Generally, utility forecasts reflect these trends. This is particularly true in the residential sector, where utilities recognize continued appliance saturation, and increasing use of electric heating, but also increasing use of heat pumps and high-efficiency appliances and the comparatively high level of weatherization in all-electric homes. The crux of the argument, of course, is over the strength of the opposing trends and their recognition by the utilities.

Of the three sectors, the commercial sector appears to have the most attractive and least-recognized major conservation opportunities. Relatively new conservation opportunities, having important end-use applications and offering two- to three-year paybacks are (1) high-frequency electronic ballasts, (2) reduced ventilation rates, (3) heating-ventilation-air conditioning (HVAC) scheduling, and (4) wall insulation. If these conservation opportunities are accepted as forecast in this analysis, they will displace an estimated 1.0% of the electrical load in NEPOOL in 1990 and 1.6% in each of the other two pools. By far the greatest savings (55-80% of the total) are from HVAC scheduling for cooling. These savings are a function of the large cooling market as well as the large savings potential in that market. Electronic ballasts offer the second largest source of savings.

It is important to note that insulation and weatherization in the commercial sector, better lighting use, and more efficient processes and machines will continue to increase electrical efficiency in the commercial sector. Current utility forecasts, however, already incorporate these trends.

Industrial conservation, especially among heavy industrial users, is somewhat different. Of the three sectors, industry has shown the greatest responsiveness to rising energy prices. There is substantial disagreement, however, over the industry's ability to continue reaping large gains through easy, low cost housekeeping-type measures. In the future, most major savings will be through normal capital replacement with high-efficiency motors and machines. Utilities recognize this trend.

In the residential sector, some cost-effective opportunities for conservation of electricity remain undeveloped, but extremely stringent residential purchase criteria sharply limit the expected savings. For example, massive shifts from incandescent to fluorescent lights were considered not sufficiently attractive, given the very stringent payback requirements of individuals. In the area of high-efficiency appliances, particularly refrigerators, another phenomenon appears. Available evidence indicates that while refrigerator efficiency is increasing, refrigerator purchases reflect an offsetting trend towards more voluminous and more option-laden units. Further, it is clear that individuals generally are unwilling to accept the capital cost premium for higher-efficiency units. Life-cycle costing at the residential level is all but nonexistent. It is important to note that in areas where individual conservation has been strong, for example, weatherization, utility forecasts recognize this trend.

Thus far, the analysis has been based on likely market responses to conservation opportunities. Aggressive conservation efforts, particularly if spearheaded by utilities, could produce far greater results. Perhaps the greatest advantage of utility-sponsored, aggressive conservation is that it can partly overcome market failure, particularly at the residential and commercial (multifamily) housing level. By substituting its purchase criteria for the individual's criteria, utilities can cost-effectively invest in or support numerous beneficial measures that would otherwise be ignored. Utility programs to finance insulation retrofits are an example. Another advantage of active utility involvement is that it gives uninformed individuals and businesses a central source of assistance. Utility audits are an example of this assistance. Finally, utility activities in load management, time-of-day rates, energy management systems, and so forth generally benefit rate payers and companies alike, and deserve increasing consideration.

In this analysis, utility forecasts and conservation trends and opportunities in the residential, commercial, and industrial sectors were considered. Only in the commercial sector are there technically and economically acceptable conservation opportunities (from the user's perspective) that (1) offer significant savings, (2) seem reasonably likely, and (3) appear unaccounted for in utility plans. The electricity savings from these measures are estimated at 1% in NEPOOL and 1.6% in NYPP and PJM. The economics of coal conversion reported earlier are unaffected by these findings because of the complementarity of electricity conservation and coal conversion. However, certain activities not currently in the utility forecasts, such as aggressive, utility-sponsored conservation, could save a significant amount. These "what if" activities merit further consideration; however, they are beyond the scope of this analysis, which focuses on what is and what will be, given present and reasonably foreseeable trends in conservation.

4. COMMENTS AND RESPONSES

Comments on the Draft Northeast Regional Environmental Impact Statement were received from federal and state agencies, regional organizations, local governments, utilities, and private organizations and individuals. Those comments are reproduced and the responses to those comments are presented in this section of the FEIS. Additional information on many of the subjects discussed may be found in Sections 1 (Introduction), 2 (Description of Air Quality Scenarios) and 3 (Topical Responses), and the appendices. A table of contents and list of acronyms precede the responses and comments.

CONTENTS

ACRONYMS USED FOR COMMENTS AND RESPONSES

ACHP	Advisory Council on Historic Preservation
AGA	American Gas Association
AE	Atlantic Electric
BGE	Baltimore Gas & Electric Co.
BE	Boston Edison Co.
CHGE	Central Hudson Gas & Electric Co.
CMP	Central Maine Power
CEC	Commonwealth Electric Co.
CDEP	Connecticut Dept. of Environmental Protection
CLF	Conservation Law Foundation of New England
Con Ed	Consolidated Edison Co. of New York
DOB	Delaware Office of the Budget
EDF	Environmental Defense Fund
JCP&L	Jersey Central Power & Light Co.
LILCO	Long Island Lighting Co.
MDHMH	Maryland Dept. of Health and Mental Hygiene
MDNR	Maryland Dept. of Natural Resources
MDAQC	Massachusetts Division of Air Quality Control
MCAQPC	Middlesex County Air Quality Planning Commission
MCPB	Middlesex County Planning Board
MI	Minigrip, Inc.
GVM	Molinari, G.V. (Congressman)
MEC	Montaup Electric Co.
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
NEP	New England Power
NHARC	New Hampshire Air Resources Commission
NJDCA	New Jersey Dept. of Community Affairs
NJDOE	New Jersey Dept. of Energy
NJDEP	New Jersey Dept. of Environmental Protection
NYCDEP	New York City Dept. of Environmental Protection
NYDAM	New York Dept. of Agriculture and Markets
NYDEC	New York Dept. of Environmental Conservation
NYPP	New York Power Pool
NYSEO	New York State Energy Office
NMP	Niagara Mohawk Power Corp.
NU	Northeast Utilities
OCDPED	Orange County Dept. of Planning and Economic Development
PDER	Pennsylvania Dept. of Environmental Resources
PEC	Philadelphia Electric Co.
PANYNJ	Port Authority of New York and New Jersey
PSNH	Public Service of New Hampshire
PSEG	Public Service Electric & Gas Co.
RIDEM	Rhode Island Dept. of Environmental Management
TCCWM	Tri-County Council of Western Maryland
USACOE	U.S. Army Corps of Engineers
USDOE	U.S. Dept. of Energy
USDOI	U.S. Dept. of the Interior
USEPA	U.S. Environmental Protection Agency
WCCNY	Women's City Club of New York

Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

January 19, 1982

Ms. Marsha S. Goldberg
Department of Energy
Economic Regulatory Administration
Office of Fuels Conversion
2000 M Street, NW.
Washington, DC 20461

Dear Ms. Goldberg:

Thank you for providing us a copy of the draft Northeast Regional Environmental Impact Statement (NEREIS) for possible powerplant conversions in the region. While it is premature for us to comment at length, since most of our concerns would be site-specific, they include the following possible types of impacts:

ACHP-1

(1) increases in total coal demand, resulting in increases in land areas disturbed by surface mining;

(2) increased land disturbances at expanded port facilities for handling coal transport;

(3) increased need for land for solid-waste disposal of ash and sludge; and

(4) possible increases (up to 6%) in acid precipitation (older masonry structures may be particularly susceptible to damage).

Each of these types of impacts increases the potential for adverse effects on historic and archeological resources on a site-specific basis, and the issuance of required Federal permits and other Federal undertakings for the above actions, to the extent possible, would be subject to review under Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. Sec. 470(f)).

Thank you. If you have questions about our comments, please contact Ronald Anzalone of the Council staff at 202-254-3974.

Sincerely,

Jordan E. Tannenbaum
Chief, Eastern Division of
Project Review

ACHP-1 Comment noted. The U.S. Department of Energy will continue to cooperate with the Council on Historic Preservation and all appropriate State Historic Preservation Offices concerning the effects on cultural, historic, and archeological resources from site-specific projects requiring federal permits or undertakings subject to review under Section 106 of the National Historic Preservation Act of 1966, as amended. The effect of acid deposition on cultural resources is discussed in Topical Response 3.4.

GENERAL COUNSEL OF THE
UNITED STATES DEPARTMENT OF COMMERCE
Washington, D.C. 20230

January 4, 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N. W.
Washington, D. C. 20461

Dear Ms. Goldberg:

This is in reference to your draft environmental impact statement entitled "The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving four copies of the final environmental impact statement.

Sincerely,

Robert T. Miki
Director of Regulatory Policy

Enclosure: Memo from Andrew Robertson
Office of Marine Pollution Assessment
National Oceanic and Atmospheric Administration
Rockville, Maryland 20852

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OFFICE OF MARINE POLLUTION ASSESSMENT
Rockville, Maryland 20852 RD/MP:GP/JO'C

18

TO: PP/EC - Joyce Wood

FROM: RD/MP - Andrew Robertson

SUBJECT: DEIS 8111.18 - The Potential Conversion of 42 Powerplants from Oil to Coal or Alternative Fuels

We have reviewed this EIS and identified a few gaps.

NOAA-1

1) The model of stack emissions predicts that the proposed actions, in the worst case, will lower the pH of precipitation by only 0.03 pH unit (pp. 5-40 to 5-41). The model, however, considers the acidifying influences of sulfur compounds only, not NO_x (p. 5-41). We are not certain how significant the incremental NO_x would be from coal-fired plants, but cannot believe that it is simply "unknown" (p. 5-41, para. 5). The implicit implication that NO_x is unimportant to acid rain in this context is not supported in the EIS.

NOAA-1 It is recognized that oxides of nitrogen contribute to acid deposition, and that the conversions would be associated with increased emissions of nitrogen oxides. There have been some attempts to modify regional sulfur transport and deposition models to treat regional transport and deposition of nitrogen pollutants. In each case the modificaton consisted of changing parameterization rates rather than changing modeling methods. Unfortunately, the parameterization rates for nitrogen pollutants are based upon field investigations much more limited than in the case of sulfur pollutants. There have been very few reliable field measurements of nitrogen oxides/nitrate deposition, because of lack of suitable instrumentation. Post regional-scale atmospheric nitrate observations are now known to have suffered serious artifact formation and destruction. The investigation of cloud physics processes involving nitrogen pollutants has been extremely limited. The chemical transformations involving nitrogen oxides are more rapid than those involving sulfur oxides and are thus not well suited for regional-scale linear parameterizations. No model evaluation comparable to those for sulfur oxide models in the U.S./Canadian Memorandum of Intention research has been done. Since power plants are the main source of sulfur oxide emissions while a large share of nitrogen oxide emissions are produced in transportation, the increase in nitrogen oxide emissions is a smaller percentage than the increase in sulfur oxide emissions. The "conservative" aspect of assuming that the percentage increase in sulfur deposition represents the percentage increase in acid deposition is that such an approach implies that other acidifying substances are increased on equivalent amount, while in fact the increase in deposition of pollutant nigrogen is likely to be somewhat less.

NOAA-2

2) In reference to the incremental acidity of rain, the EIS fails to rigorously consider "the potential for cumulative or interactive regional environmental impacts," as promised on p. 1, para. 1. We find no such analysis of acid rain impacts apart from undocumented assertions that the lowered pH of receiving waters from Virginia to Nova Scotia are "unlikely to generate any secondary or tertiary impacts" (p. 2) or "the change .... attributable to the proposed action alone is insignificant," (p. 5-41).

NOAA-2 The results of computer simulations of the transport of air pollutants originating from the 42 conversion candidate powerplants and the resultant deposition of these pollutants are presented and discussed in Section 5.1.4 of the DEIS. The conversion of powerplants from oil to coal would create only minor changes in the pH of water bodies in the Deposition Region. There is a potential for more significant impacts in areas of Nova Scotia mainly because the waters of lakes and streams in those areas are potentially sensitive to acidification (Sec. 4.2.4 of the DEIS), but the magnitude of the change that could be attributed to the proposed action alone is insignificant, amounting to a decrease in pH of less than 0.03. As a result of converting only 27 of the original 42 plants (see Sec. 1) the impacts would be less than indicated in the DEIS (see Topical Response 3.2).

NOAA-3

3. The EIS does not seem to consider the future possibility of ocean disposal of stabilized fly ash and fly ash/scrubber sludge. Appendix I seems to dismiss ocean disposal of coal wastes without even acknowledging the DOE-supported work of Drs. Iver Duedall, Peter Woodhead, et al. at the Marine Sciences Research Center, SUNY, Stony Brook. This team has described the potential for stabilization of large quantities of coal wastes, for use as fish reefs, etc. Albeit still in a research stage at present, I believe this waste disposal strategy has much promise, and will soon become a significant coastal assessment issue of the DOE and of NOAA.

NOAA-4

4. "Impacts to aquatic biota and habitats cannot be determined generically (sic) since the impacts would be site-specific," (p. 5-52, para. 3) but we do, nonetheless, know these impacts from many past efforts in assessing coal-fired plants. The most useful reports on such effects should be synthesized in order to estimate the effects of concern in broad terms. Such site-specific effects (including those on estuaries) can be assessed in broad terms, and the DOE is responsible for doing it in an EIS. Perhaps site-specific EISs will cover these issues? Even so, this EIS purports to 'focus on the cumulative regional and interactive impacts' (p. 2-8, para. 2)--a task left undone with regard to biota in aquatic habitats.

NOAA-5

5. Neither does the EIS seriously discuss the incremental impacts of coal combustion products on aquatic biota. We find no useful assessment of incremental hydrocarbon emissions and their probable impacts upon aquatic biota. Yet we know the fossil fuel burning contributes most of the N-alkanes, and lots of the other petroleum hydrocarbons, present in western North Atlantic sediments (Farrington and Tripp (1977) Geochem. Cosmochim. Acta. 41:1627-1641).

cc:
J. O'Connor

NOAA-3 Ocean disposal of coal wastes is discussed in Topical Response 3.5.

NOAA-4 The statement was made as part of a discussion of the impacts to aquatic biota and habitats from the onsite processing, handling, and storage of coal (Sec. 5.4.3.2 of the DEIS). The statement applies only to the impacts caused by such activities, which will be localized. While the effects of these activities are known, site-specific impacts are beyond the scope of this document (see DEIS, p. 2-8). These impacts will be discussed at length in the site-specific EISs prepared for each conversion candidate powerplant. Cumulative and interactive impacts to aquatic biota identified as being significant are discussed throughout the document (see Sec. 5.4 of the DEIS).

NOAA-5 The significant incremental impacts to aquatic biota caused by effects considered cumulative, interactive, or regional in nature are discussed in Section 5.4 of the DEIS. Fossil-fuel combustion does result in significant hydrocarbon emissions. However, the majority of the total hydrocarbon emissions in this country come from motor vehicles, aircraft, railroads, and vessels (about 50%) (USEPA 1978). Estimates prepared by the U.S. Department of Energy indicate that utility boilers (burning oil, gas, and coal) will contribute less than 0.5% of hydrocarbons emitted during 1985 (Pechan 1977). While an increase in hydrocarbon emissions is expected to occur with the conversion of candidate powerplants to coal firing, the incremental increase will be quite small compared to the total hydrocarbon loading of the aquatic environment. Therefore, the increased hydrocarbon emissions associated with the proposed conversion of up to 42 powerplants to coal firing are expected to have little, if any, adverse impact on aquatic biota. Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1), further reducing the predicted increase in emissions, and the potential for adverse impacts on aquatic biota.

REFERENCES

Pechan, E.H. 1977. 1985 Air Pollution Emissions. DOE/PE-0001. U.S. Department of Energy, Assistant Secretary for Policy and Evaluation, Washington, D.C.

U.S. Environmental Protection Agency. 1978. Air Quality Criteria for Ozone and other Photochemical Oxidants. PB80-124 753. Research Triangle Park, N.C.

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

January 7, 1982

OFFICE OF THE
ASSISTANT DIRECTOR
FOR ASTRONOMICAL
ATMOSPHERIC EARTH,
AND OCEAN SCIENCES

Ms. Marsha S. Goldberg
U. S. Department of Energy
Economic Regulatory Administration
Office of Fuels Conversion
2000 M Street, NW
Washington, D.C. 20461

Dear Ms. Goldberg:

The Department of Energy's Draft Northeast Regional Environmental Impact Statement on "Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels" has been reviewed by two NSF staff members, the Program Manager for Atmospheric Chemistry and the Deputy Division Director for Environmental Biology. Their comments are enclosed.

Sincerely,

Adair F. Montgomery
Chairman
Committee on Environmental
Matters

Enclosures

cc: Dr. R. A. Carrigan
Dr. W. F. Harris

Comments on Draft EIS, "Potential Conversion of 42 Powerplants from Oil to Coal or Alternate Fuels"

A. Comments regarding portions of the EIS dealing with Deposition Regions; this portion is mostly affected by atmospheric chemistry.

NSF-1

1. A better understanding of the situation would emerge if the EIS would place the proposed changes (42 powerplants to be converted) in its full context. There is no readily accessible statement of how many powerplants exist in the region. How does the incremental emission from these 42 plants compare with the total emissions from all such plants in the source region? One wonders if the low predicted relative impact of this change (sulfur deposition no more than 6% above the base case) is because the 42 plants add only a small percentage increment to total emissions in the source region. If this is the case, then one would not be surprised. But if these 42 plants represent most of the emitted stack gases in the area, then the EIS may encounter some lack of credibility. This is not to question how carefully the study was done, but only to suggest that the report could be strengthened by clarifying this point. In view of possible critical attack on the report, thought should be given to this point other than simply to pass the matter off by saying that the location of the plants probably allows most of the pollution to blow out to sea, or across national borders.

NSF-1 In the data base used in the air quality analysis, powerplant emissions were not segregated from emissions from other sources. These data could have been determined; however, by comparing only sulfur emissions from powerplants and ignoring other sources, such as residential and industrial, the results would not have been in the proper context. Sulfur emissions from the 42 plants may be compared to total sulfur emissions in the source region by comparing Tables 5.12 and 5.13 of the DEIS. The current emissions represent about 1.3% of the total sulfur emissions, the Modified Coal SIP Scenario about 4.0%, and the Voluntary Conversion Scenario slightly less than 2.0%. Total sulfur emissions from powerplants are approximately two-thirds of the sulfur emissions from all sources.

NSF-2

2. The ASTRAP model (Appendix M) is very recent indeed (1981 publication). Perhaps it represents the best that can be done now. The authors of the EIS may well be aware of recent thinking in the atmospheric chemistry community to the effect that <u>all</u> current models suffer badly from assumptions about the relationship between SO_2 emissions and remote acid deposition. There is an emerging view that the chemistry, and the mixing processes, occurring between sources and deposition areas are so complex, or so little understood, that reliance cannot be placed on state-of-the-art models. Clearly, DOE has to do the best it can with available methodologies, but it would be well to be prepared for hard questions. This is a point that is not well represented in the list of "limitations" of long-range transport models on page 5-14.

NSF-2 See Response NYPP-1.

There is a dichotomy of views among ecological effects modelers as to whether long-term or short-term ecological "insults" are of greatest importance. If those who emphasize long-term (seasonal or longer) deposition of total sulfur and total nitrogen are correct, then linear approximations of various transformation and removal processes are more likely to be acceptable than is expected for modeling of events or episodes. Emissions decisions based on pollutant deposition considerations are more likely to be long-term than short-term since uncertainty in the latter case is so much greater.

NSF-3

3. On page 5-13 the discussion of ammonia as a neutralizer of acids misses what may be an important point. Indeed ammonia does neutralize acids, but when it enters a soil it typically converts to nitric acid (or at least to a nitrate) by microbiological action.

NSF-3 The discussion in question is of the role of ammonia in the atmospheric neutralization of acids. The sources of atmospheric ammonia include decomposition of plant material and animal wastes, municipal waste-water treatment facilities, and certain industrial processes.

Ammonia entering soil is converted to nitrate via a process called nitrification. Nitrification is the sequential oxidation of ammonia to nitrite and then to nitrate by autotrophic and heterotrophic microbial communities (Brady 1974). Higher plants are known to assimilate nitrogen in the form of nitrate, as well as ammonia. As nitrogen is the major nutrient limiting plant growth in nature, ammonia entering the soil will quickly be taken up by plants or microbes directly, or converted to nitrate and subsequently assimilated. It is highly unlikely that ammonia inputs to soil would have an acidifying or detrimental effect on soil or vegetation.

REFERENCES

Brady, N.C. 1974. The Nature and Properties of Soils. Macmillan Publishing Co., Inc., New York. 639 pp.

NSF-4 4. On page 5-15, it might strengthen the report if some rough quantitative statement could be made, rather than just to say that the 42 plants would create an impact "considerably less than that due to emissions from regions outside the study areas."

NSF-4 Some regional sulfur deposition budget studies (Shannon and Woldner 1982; Shaw 1982) indicate total outside source deposition impact in Nova Scotia or the Maritime Provinces of about 75%, in comparison to the 2% increment involved in this study in Nova Scotia.

REFERENCES

Shannon, J.D., and E.C. Woldner. 1982. Estimation of wet and dry deposition of pollutant sulfur and eastern Canada as a function of major source regions. Water Air Soil Pollut. (In press).

Shaw, R.W. 1982. Deposition of atmospheric acid from local and distant sources at a rural site in Nova Scotia. Atmos. Environ. 16:337-348.

B. Comments regarding Chapters 1, 2, 4, and 5.

NSF-5 1. The preparers appear to have been assessed only in terms of acidification of surface waters directly or by surface runoff. Given the background levels of atmospheric acids, the incremental contribution would be small as shown. An area of uncertainty is the acidification of water bodies via flow through soil and the acid aluminum production and transport associated with the reaction between strong mineral acids and soil alumina. Depending upon the distribution of soil aluminum, the increment to atmospheric acidity could have localized effects other than those now described. Consideration of the above would not change the conclusions outlined in Chapters 2, 4, and 5—at most it would add a qualification at a site-specific level.

NSF-5 It is true that acidification of surface waters could be caused not only by direct precipitation and surface runoff but also by discharge from groundwater flow. As discussed in Response MDAQC-16, the increment of atmospheric acidity would have localized effects only in aquifers composed of intensely fractured or faulted crystalline rock. However, the impacts are expected to be minimal, mainly because the maximum change in the pH of the precipitation in the area where water is most sensitive to acidification would be only about 0.03, and would be even less significant with the conversion of only 27 instead of 42 plants.

NSF-6 2. In this same vein, Figures 4.8–4.13 describe "sensitivity" of surface waters in terms of bicarbonate, hardness (as $CaCO_3$) or carbonate-bearing geologic materials. This description grossly overstates the case for sensitivity to acidification. Certainly the variables shown are contributors to sensitivity but there are others (e.g., watershed area ratios, soil alumina, residence time of soil water in soil, etc.). All of these factors acting together determine sensitivity. There are, however, no inventory data for these factors. Thus, the region bears careful monitoring as indicated by the data in Figures 4.8–4.13, but the text shown might be modified to reflect the difficulty in judging just where real effects now occur and which combination of factors predispose areas to greater sensitivity with any increments to atmospheric acidity.

NSF-6 As indicated in Section 4.2.4 of the DEIS, it was recognized that several factors acting together contribute to the sensitivity of surface waters to acidification. The effects caused by the combination of all these factors have not been determined; however, it is believed that alkalinity is the primary factor that determines the sensitivity of surface water to acidification.

NSF-7 3. Considerable data are presented on water supply. Beyond hardness data, very few data are presented on other water quality parameters. Do data exist for Al, pH for streams in the deposition region? Such data might yield some indication of areas already impacted which would add a better perspective in which to assess the bottomline conclusions of substantially no change.

NSF-7 Limited water quality data for aluminum, pH, and other parameters are available (e.g., Water Resources Data compiled by the U.S. Geological Survey) for various streams in the Deposition Range. However, because the data are scattered and it is difficult to integrate them in a regional format, the data for aluminum, pH, etc., were not used for assessing the regional impacts of the proposed action on water quality.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION. CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM. MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDPL-I

6 January 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

We have reviewed the Draft Northeast Regional Environmental Impact Statement concerning the Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels.

USACOE-1

The data submitted with the Draft EIS doea not clearly indicate what work, if any, will be done in waters of the United States. If any work involving structures or the discharge of dredged material or fill material either permanent or temporary, is going to be done in any waters or adjacent wetlands, a Department of the Army permit may be required.

If any fill is to be placed in any waterway or wetland, a more detailed discussion of alternatives and mitigation measures to avoid or minimize the impact of any fill placed in any waterways or wetlands, will be required. In addition, the resulting Environmental Impact Statement should contain a 404(b) review which should be prepared as outlined in the final guidelines of the Environmental Protection Agency (Title 40 CFR, Part 320).

To insure that the resulting Environmental Impact Statement adequately describes the impacts of the work which may be subject to our permit authority, we suggest that a meeting be arranged with the lead agency preparing the DEIS and members of our Regulatory and Impact Analysis Branches.

Thank you for the opportunity to comment and we look forward to continued coordination. Should you have any questions please contact Mr. Carl P. Melberg of my staff at (617) 894-2400, extension 518 or Mr. Hynes of our Regulatory Branch, extension 372 for regulatory matters.

Sincerely,

JOSEPH L. IGNAZIO
Chief, Planning Division

USACOE-1 The Northeast Regional Environmental Impact Study is designed to assess the cumulative and interactive effects associated with multiple conversions. Because of the large number of sites (42) included in the study, the engineering associated with any specific conversion was not addressed. Issues associated with the technical solutions to specific conversion problems will be addressed in subsequent site-specific EISs. All work on site-specific documents will be coordinated with the Corps as appropriate.

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT. CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK. N. Y. 10278

REPLY TO
ATTENTION OF:

NANPL-E

4 February 1982

Ms. Marsha S. Goldberg
U. S. Department of Energy
Economic Regulatory Administration
Office of Fuels Conversion
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

This office has reviewed your agency's Draft Northeast Regional Environmental Impact Statement (EIS) for the potential conversion of forty-two power plants from oil to coal or alternate fuels, dated October 1981. Fifteen of the referenced power plants, which are found in the New York metropolitan area, Long Island, and Hudson River Valley, are located within the New York District Corps of Engineers boundaries. Waterway activities concerning the proposed fuel conversions of these 15 plants would fall within the jurisdictional review of this office.

USACOE-2 Your Final EIS should note that any dredging, bulkhead and dock construction, and disposal of dredged material for the purpose of accommodating coal barge deliveries or barge transportation of solid wastes at any of the referenced fuel conversion facilities would require permit review by the Corps of Engineers. Upgrading of the Port Reading coal transfer facility or construction of a new coal transfer facility in New York Harbor will also require review by New York District under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act.

The proposed regional fuel conversions do not directly affect any project currently being studied by the New York District.

Sincerely,

SAMUEL P. TOSI
Acting Chief, Planning Division

USACOE-2 Comment noted. These issues will be discussed in the site-specific EISs. Cumulative impacts are discussed on pages 5-26 and 5-48 to 5-59 in the DEIS.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 81/2409

FEB 5 1982

Mr. Rayburn Hanzlik
Administrator
Economic Regulatory Administration
Department of Energy
2000 M Street, N.W.
Washington, D.C. 20461

Dear Mr. Hanzlik:

Thank you for your letter of November 5, 1981, transmitting copies of the Draft Environmental Impact Statement for Conversion of 42 Powerplants from Oil to Coal or Alternate Fuels in the Northeast, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Delaware and Maryland. Our comments are presented according to the format of the statement or by subject.

<u>General Comments</u>

While the draft statement represents a considerable effort to collect, analyze and present information relevant to the proposed action, the geographic and institutional scopes of the analyses often preclude meaningful identification of anticipated regional and local impacts to fish and wildlife. The general approach of the draft statement is to conclude that such effects will be minimal, relying upon one or more of the following strategies:

1. The limited institutional scope of the analysis, namely the narrow authority of DOE under past and current legislation to reduce the combustion of oil and natural gas by electric powerplants;

USDOI-1

2. The broad regional (ten-State) scale of the impact analyses, namely the analytical inability to focus attention on small areas potentially susceptible to the impacts from conversion to coal.

3. The inadequacy of baseline information and knowledge;

4. The limitations of state-of-the-art analytical and predictive techniques; and

5. The presumption that applicable State and Federal regulations outside of DOE's purview will be used successfully to mitigate anticipated environmental degradation.

These mechanisms are used repeatedly to conclude that the environmental effects of the proposed conversions will be minimal and acceptable. Upon close examination, individual conclusions in the draft statement are often unsubstantiated, inconsistent with the scope

USDOI-1 The Northeast Regional Environmental Impact Study was designed to assess the effects of the incremental change in the existing environment attributable to coal conversions. The overall analytical approach provides a broad environmental framework within which more site-specific issues can be addressed. For this reason it was not appropriate to focus on small geographic areas, to collect detailed baseline information, or to assess localized impacts. The types of data as well as small-scale analyses will appear in subsequent site-specific documents. The results of the regional analysis indicate that the levels of cumulative or interactive impact associated with multiple conversions will be minimal. The document does not address the potential for impacts associated with activity at a specific site; these will be addressed in the site-specific EISs.

and extent of technical analysis, or simply overly dependent on alternative institutional measures to mitigate potential environmental impacts. Additional technical analyses and a more thorough substantiation of conclusions should be presented in the final statement. In addition, some effort should be made to classify and discuss subareas in this region that might be sensitive to increased emissions from coal combustion.

Cultural Resources

USDOI-2 The Heritage Conservation and Recreation Service, now merged with the National Park Service (NPS), furnished the Department of Energy a technical assistance comment in response to the Notice of Intent to Prepare an Environmental Impact Statement. A primary concern expressed in that letter of August 14, 1980, was that cultural resources, including historical and architectural sites in the area surrounding the 42 sites may be adversely affected by acid rain, changes in the existing transportation system, and other identified impacts. We remain concerned with these impacts on cultural resources, including impacts on gravestones and building stones sensitive because of their location near roadways and exposure to precipitation. The final statement should consider effects on properties which are listed on or eligible for listing on the National Register of Historic Places. For example, such consideration would include Independence Hall, the First Bank, the Second Bank, and the Merchants Exchange Building, Philadelphia, Pennsylvania. All of these buildings, as well as numerous other sites in the entire northeast region, have shown the deleterious effects of acid rain caused by the impacts from oxides of sulphur on calcareous stone. These effects may be exacerbated if concentrations of sulphur oxide increase because of the proposed conversions. Since these possible adverse impacts may be unavoidable, specific measures to protect such cultural resources in the northeast should be presented in the final statement. The final statement should discuss the feasible approaches and techniques available to preserve and protect cultural resources from deterioration.

Natural Resources

USDOI-3 It is briefly mentioned that air quality Class I areas could affect nearby projects if prevailing winds carry emissions into the Class I area. Acadia National Park on Mount Desert Island in the State of Maine is a Class I area. The cumulative impacts on the air-quality related values of this park need to be further addressed.

USDOI-4 In the discussion of Prevention of Significant Deterioration (PSD), mention of mandatory Class II areas has been omitted. Under Section 164(a) of the Clean Air Act, as amended, an area which exceeds ten thousand acres in size and is a national monument, a national primitive area, a national preserve, a national recreation area, a national wild and scenic river, a national wildlife refuge, or a national lakeshore or seashore is a Class II area which may only be redesignated Class I. Such areas in the North Atlantic Region include Gateway National Recreation Area (which includes the Jamaica Bay Wildlife Refuge), Fire Island National Seashore (which includes the Fire Island National Wilderness Area) and Cape Cod National Seashore, all located along the Atlantic Coast, which is the highest impact zone of this proposed action. The cumulative impacts on these areas should also be addressed, especially in light of the fact that New York City currently approaches and may even exceed the National Ambient Air Quality Standards (NAAQS).

USDOI-2 Comment noted. See Topical Response 3.4 concerning the effects of acid deposition on cultural resources.

USDOI-3 See Topical Response 3.1.

USDOI-4 Present PSD Class II areas that may be redefined as Class I areas may be affected by the conversions. The cumulative impacts of the proposed conversions are predicted for the entire Northeast Region. Isopleths of predicted short-term impacts are presented in Topical Response 3.1; the effects of the proposed action on any currently designated Class I area appear to be within prescribed limitations.

USDOI-5 The statement does not address the impact on secondary ambient air quality standards although these standards are exceeded in several air quality control regions in the Northeast. It is stated that the increased emissions of nitrogen oxide and hydrocarbons are likely to result in increased ozone formation. Although many areas in the Northeast are non-attainment for ozone, the impacts of this increased ozone have not been discussed.

USDOI-6 In general, the section discussing the impacts to water quality is inadequate due to the large body of findings present in the literature that were not taken into account. The National Park Service can provide more current reference upon request. For instance, in the impacts to water quality section, no mention is made of the impact on estuaries, many of which are acid-sensitive areas and are located in National Park System areas.

USDOI-7 The report provides only preliminary assessments of cumulative impacts on water quantity and quality due to lack of site-specific data. (For example, sites of coal production facilities, transportation routes, coal storage piles, limestone quarries, cumulative impacts on surface water quality from discharges of heated water and chemical wastes.) However, without site-specific data, a complete evaluation of potential cumulative impacts to National Park System areas cannot be made. Data for pH of surface water resources in NPS areas in New England are not compatible with typical pH values given in the report (pp. 5-41). The report contradicts itself on this data (compare with pp. 4-34 to 5-41). This issue should be resolved.

USDOI-8 The data given on alkalinity (pp. 4-34) indicates the susceptibility of the surface waters in most of the Northeast. The discussion on water quality impacts from the proposed conversions does not take this alkalinity data into account.

USDOI-9 The 6 percent increase in acid deposition refers only to increases due to sulphur (pp. 5-14). Contributions of other constituents to the acidity of the precipitation is not considered and the decrease in the pH of the precipitation is therefore likely to be an underestimate.

USDOI-10 The increased leaching of trace elements (such as aluminum, calcium, potassium, magnesium, zinc, nickel, lead, cadmium, and manganese) naturally present in soils in the watershed area in lake sediments has significant impacts on water resources, both surface and ground water. This impact is not discussed in the report.

USDOI-5 Secondary ambient air quality standards are addressed in the Air Quality Technical Report (Kornegay et al. 1982). Because of the complexity of the chemical reactions involved in the formation of secondary pollutants (for example, ozone), it was decided that modeling of such pollutants would not be attempted. Rather, changes in atmospheric concentrations in secondary pollutants could be inferred by examining changes in concentrations in the primary pollutants, which are instrumental in the formation of the secondary pollutants. The results of modeling plant emissions under the Voluntary Conversion Scenario indicate that increased ground-level concentrations of nitrogen dioxide will be below 1 $\mu g/m^3$ for all areas except New York City, where the maximum increase will be below 2 $\mu g/m^3$. The amount of hydrocarbon emissions may decrease because of decreased use of of petroleum products. It appears that any changes in ozone concentration will also be small and from an air quality standpoint the difference will be negligible.

REFERENCES

Kornegay, F.C., et al. 1982. The Northeast Regional Environmental Impact Study: Air Quality Technical Report. ANL/ES-122. Prepared by Oak Ridge National Laboratory, Oak Ridge, Tenn., and Argonne National Laboratory, Argonne, Ill., for U.S. Dept. of Energy.

USDOI-6 See Response NOAA-1.

USDOI-7 The cumulative impacts on surface water quality resulting from coal pile runoff and heated water and chemical waste discharges were evaluated using site-specific data. The results are presented in Section 5.2.3 of the DEIS.

The inconsistency of the pH values pointed out in this comment has been corrected. The typical pH levels of Adirondack Lake should be stated to range from 4.3 to 6.4 instead of 4.5 to 5.5.

Some water quality data supplied by the National Park Service indicate that the pH of surface water resources in New England ranges from 4 to 8, which appears compatible with the typical pH values presented in the statement.

USDOI-8 The data on sensitivity of the surface waters presented in Section 4.2.4 of the DEIS were provided for background information and for evaluating the results of the long-range transport model (Secs. 5.1.4 and 5.2.4 of the DEIS). The water sensitivity data indicate that vast areas of eastern Canada including Newfoundland and Nova Scotia are highly sensitive to acidification. However, under the Voluntary Conversion Scenario, the level of increased sulfur deposition will be 3-4% in New York City and 1-2% in the Maritimes, resulting in a decrease of less than 0.02 pH units.

USDOI-9 See Responses NYDEC-3, NOAA-1, and CLF-8, and Topical Response 3.2.

USDOI-10 The leaching of trace elements naturally present in soils in the watershed area in lake sediments may have significant impacts on water resources. However, these impacts would not be caused by the proposed conversion activity in the Northeast Region and, therefore, are not discussed in the statement.

Regional Dependence on Coal and Wood

USDOI-11 The pollution dispersion modelling in the statement assumes baseline conditions that appear unreasonable for the combustion of wood and coal by the residential, commercial and industrial sectors. The assumption that these uses will remain relatively unchanged through 1990 may not be reasonable. It is not supported nor consistent with past trends and future predictions. While the report (Section 3.3.3.7) readily admits to a "potential for significant increases in air pollution from uncontrolled emissions from wood burning," it fails to take this into consideration in the dispersion modelling. The rationale that such emissions are "beyond the scope" of the DEIS should be reexamined since the statement estimates that 20 percent of all homes in Maine, New Hampshire and Vermont are already burning wood. The importance of emissions of polycyclic organic matter and the general absence of appropriate controls on residential and commercial combustion of wood and coal may require further analysis for use as baseline data. The final statement should attempt to predict likely increases in these emissions and include these predictions in its baseline projections and modelling analyses.

USDOI-11 USDOE agrees that conversion of existing oil-fired residential, commercial, and industrial facilities to wood or coal are likely to continue. However, the magnitude of these changes is impossible to accurately predict, and the analysis of the effects of such potential conversions on the future air quality baseline of the region is not presently possible. Furthermore, USDOE believes that such attempts at quantification are not needed for this analysis, since the resulting changes in the baseline air quality would be very localized and would not contribute significantly to a regional analysis of utility conversions. Typical wood combustors emit more particulates than would the oil-fired units they replace, but SO_2 emissions are considerably lower (Braunstein et al. 1981). Uncontrolled emissions of particulates and SO_2 from small-scale coal combustors are generally higher than from similar-sized oil-fired units. For either fuel, emissions of particulates, oxides of nitrogen, and SO_2 following conversion from oil could increase slightly or even decrease, depending on the characteristics of the specific fuels. However, the impact on air quality would be localized, typically within a few kilometers, due to the characteristics (e.g., stack height) of the sources converted. Therefore, such changes are unlikely to affect the conclusions of this analysis, because the major potential cumulative impact of multiple utility conversions is increased SO_2 concentrations over a wide area, which are unlikely to be significantly affected by small-scale conversions.

REFERENCES

Braunstein, H.M., et al. 1981. Biomass Energy Sytems and the Environment. Pergamon Press, New York. 182 pp.

Disposal of Contaminated Dredge Spoil

USDOI-12 The DEIS (Section 5.5.2.2) acknowledges that selective expansion and deepening of coastal ports are likely to accompany conversions to coal, but fails to address the consequences of these activities in any detail. While the report recognizes (Section 5.5.2.2) that "Dredge spoil disposal is complicated by the fact that bottom sediments in commercial harbor areas often are polluted," it does not elaborate on the consequences of either dredging or spoil disposal. To the contrary, it simply dismisses these concerns (Section 5.4.2.2), citing the potential effectiveness of "proper state and federal regulations." The past and future ability of such regulations to protect fish and wildlife resources is not indisputable. Dredging and spoil disposal practices are currently receiving considerable attention in major harbors such as New York City and Boston. The final statement should, therefore, reflect a more thorough and realistic treatment of the potential consequences of ancillary dredge and spoil disposal activities to fish and wildlife resources.

USDOI-12 It was not intended in the discussion in Section 5.4.2.2 of the OEIS to dismiss the issue of dredge spoil disposal. Within the context of this document, the adverse regional impacts of dredging and dredge spoil disposal are considered to be small. These impacts will be further reduced if appropriate state and federal regulations are effectively enforced. The vast majority of dredging activity expected to occur as a result of the proposed action will be due to the renovation, expansion, or development of coal-delivery facilities at the coal conversion caididate powerplants. Such activity is considered site-specific in nature (see p. 2-8) and is beyond the scope of this document. These impacts will be addressed in the site-specific EISs prepared for powerplants where dredging is required. While the expansion of the coal dumping capacity of New York Harbor could potentially result in adverse regional impacts, such impacts do not appear likely. This conclusion is based upon several factors. First, the expansion of existing facilities in an urban, developed area is not likely to displace native, undisturbed plant or animal communities. The biological systems remaining at these facilities have undoubtedly been extensively altered in the past. Thus, the impacts to fish and wildlife resources due to expansion of coal-dumping facilities are not expected to be significant. Second, dredging activities in New York Harbor would likely produce clean sand material that could be used in a variety of ways (see Sec. 5.4.2.2 of the DEIS), rather than causing a disposal problem (see Attachment 1, comments of the Port Authority of New York and New Jersey).

Emission Models and Their Sensitivity

USDOI-13 Impacts of emissions from 40 to 42 coal-fired powerplants on air quality and fish and wildlife resources were investigated using two models, RAM and ASTRAP. Both were developed to facilitate analyses of large-scale, long-term patterns of transport and deposition, and may not necessarily be of sufficient spatial or temporal resolution to predict sub-regional and local impacts to stream acidity or fish and wildlife resources. In particular, RAM has several inherent weaknesses that both reduce its accuracy and warrant closer examination in the final statement. One weakness is the effect of topography and elevation on predicted pollutant levels and patterns. The final statement should at least address the sensitivity of predictions to these physical considerations.

USDOI-13 The inherent weaknesses of the RAM model, including its anability to treat the effects of terrain, are discussed in Appendix F of the DEIS. The degree of inaccuracy, or sensitivity, is dependent upon the complexity of the terrain ignored in the model; therefore, the degree of sensitivity varies from site to site. The intent in the DEIS was to evaluate regional impacts, not localized impacts such as plume impaction on nearby terrain. Localized phenomena will be fully addressed in the site-specific EISs (see Response MDNR-4).

USDOI-14 Similarly, the final statement should explain why 1975 was selected as the year for which recorded meteorological data were used in the ASTRAP model. No rationale for the selection of 1975 as presumably a representative or typical year is presented in the draft statement, nor does it consider the appropriateness of analyzing atypical, but otherwise consequential years. Confidence in the predictions from the models would be greatly enhanced if these concerns were addressed in the final statement. This might improve confidence in the analyses because the draft statement indicates that "resultant predictions are not highly accurate" or "probably are accurate within a factor of two" (Section 3.2.2.3; pgs. 3-18, 3-20). In turn, this would help shed more light on the potential consequences of SO_2 and NO_x emissions on fish and wildlife.

Emission Impacts on Fish and Wildlife

USDOI-15 The DEIS's analyses of long-term transport and deposition of emissions are not addressed in sufficient detail or spatial resolution to support the conclusion (Section 3.2.2.3) that "the increase in deposition represents a change of less than 0.03 in the pH of receiving waters." Additional information concerning the spatial (three-dimensional and temporal averaging of deposition, and the designation, mixing, pH and hardness of receiving waters is needed in the final statement to better assess and substantiate both the accuracy and significance of the conclusions. Specific attention should focus on local and episodal depositions, and on the relationship of deposition to runoff (e.g. snow melts), which are known to be particularly consequential to aquatic resources. This need is especially critical since "Ecological impacts of acid precipitation are recognized as a problem in the study area," and the proposed conversions would increase acid precipitation by as much as 6 percent, on average.

USDOI-16 To the extent that conversion of individual powerplants to coal would require additional site-specific impact assessments, some of the more localized impacts would be addressed in greater detail later. However, it is unlikely that the serious cumulative and synergistic off-site effects, such as increased regional acidification of surface waters, will be addressed adequately in any one of these future assessments. Therefore it is essential that the final statement reflect a more thorough and accurate attempt to describe the environmental consequences and trade-offs inherent in multiple conversions. This might best be accomplished by focusing more attention on the spatial and temporal resolution of the analyses; by testing the sensitivity of those analyses to baseline conditions, parameters, and assumptions; and most importantly, by selecting some representative and critical locations for more detailed analysis in order to confirm the appropriateness of the general approach.

We hope these comments will be helpful to you in the preparation of a final statement.

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

USDOI-14 Meteorological data for 1975 were used in the DEIS because that data set was then available in a form usable by ASTRAP. The data used in Topical Response 3.2 are for 1978, which is the period emphasized in recent intercomparisons of models in U.S./Canadian scientific efforts in support of the Memorandum of Intent on Transboundary Air Pollution. It is impossible to fully verify any deposition model at this time since dry deposition, roughly one half of the problem, cannot yet be monitored.

USDOI-15 At present, it is beyond the capability of the ASTRAP model to increase the resolution of the predicted sulfur deposition patterns beyond that presented in Section 5.1 of the DEIS and Topical Response 3.2. (See also Response MDAQC-12). The present pH and hardness conditions of surface waters in the Northeast are discussed in Sections 4.2 and 5.2 of the DEIS. It should be noted that the 6% increase in sulfur deposition is associated with the most-polluting emissions scenario (Modified Coal SIP--Section 5.1 of the DEIS); this rate of deposition is predicted to occur in only a limited area of the Northeast following conversion of the 42 powerplants to coal firing. Most of the region would receive a much smaller increase in sulfur deposition, with the exception of the New York City urban area (see Topical Response 3.2). The 0.03 shift in surface water pH associated with this deposition increase was calculated assuming the receiving water had no buffering capacity whatsoever (Sec. 5.2.4 of the DEIS). If such a rate of deposition should actually occur, the pH of surface waters is likely to change even less due to dilution and buffering.

Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). Long-range transport modeling (see Topical Response 3.2) indicates that acid deposition in most of the Northeast would increase by 3-4% in the New York City urban area and 1-2% in New England and the Maritime Provinces following fuel conversion of the remaining candidate powerplants. This small increase in deposition is unlikely to cause an apreciable change in surface water pH. While local and episodal depositions and the influence of runoff on acidification of freshwaters merit attention, it is not presently possible to realistically model these factors.

USDOI-16 It is agreed that the Northeast Regional EIS is the proper forum for discussion of cumulative and interactive impacts (see page 2-8 of the DEIS). However, the suggested methods for improving the accuracy of the assessment of surface water acidification due to the proposed action are not feasible at this time. This assessment is dependent upon prediction of atmospheric sulfur deposition rates following fuel conversion. The main limitations of the long-range transport models, such as ASTRAP (see Sec. 5.1.4.1 of the DEIS), are the lack of a way of check the validity and accuracy of model results, and limited time and space resolution (primarily due to limited input data). Several critical locations were selected and analyzed in the DEIS (see Table 5.11 of the DEIS) and isopleths are presented (see Topical Response 3.2).

Since the issuance of the DEIS, the DOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). Long-range transport modeling (see Topical Response 3.2) indicates that acid deposition would increase by 3-4% in the New York City urban area, and 1-2% in New England and the Maritime Provinces following fuel conversion of the remaining candidate powerplants. This small increase in deposition is unlikely to cause an appreciable change in surface water pH. The impacts caused by this slight increase in sulfur deposition are likely to be small.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

February 5, 1982

Mr. Steve Ferguson
Acting Chief, Analysis Branch
Office of Fuels Programs
Economic Regulatory Administration
Department of Energy
2000 M. Street, N.W.
Washington, DC 20461

Dear Mr. Ferguson:

Enclosed are EPA's comments on the Draft Northeast Regional Coal Conversion Environmental Impact Statement (EIS). We appreciate DOE's efforts to analyze the complex interactive impacts caused by the conversion to coal of these 42 powerplants. The final product will be valuable to the public, to industry and to EPA. Many questions have been raised on the cumulative impacts of these conversions, and the Final EIS should go a long way toward answering them.

Our comments are focused on air quality, solid waste disposal, and water quality impacts. In our view, the EIS described most of the major concerns, but does not analyze some of them in sufficient detail or present them in a proper context. A summary of our comments, which are discussed in detail in the Attachment, follows:

- Air Quality
  - TSP impacts are not adequately discussed.
  - Emission limits and capacity factors used in the modeling need to be updated.
  - Results from the modeling need to be described more realistically.
- Solid Waste
  - Ash disposal alternatives other than landfilling are not discussed.
  - Assumptions about coal ash contents and disposal techniques need to be updated.

- Water Quality
  - Better discussion of effluent controls is needed.
  - The predicted pH change in the deposition region should be documented and portrayed more realistically.

We have tried to be as specific as possible in these comments and have attached information in appendices when it would be useful. In accordance with our EIS rating system (explanation enclosed) we have rated this EIS as ER-2. Please call Tom D'Avanzo of my staff at 223-0400 if you have further questions.

Sincerely,

Lester A. Sutton, P.E.
Regional Administrator

Enclosures

EXPLANATION OF EPA RATING

Environmental Impact of the Action

LO -- Lack of Objections

EPA has no objections to the proposed action as described in the draft environmental impact statement; or suggests only minor changes in the proposed action.

ER -- Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating federal agency to reassess these aspects.

EU -- Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1 -- Adequate

The draft environmental impact statement sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 -- Insufficient Information

EPA believes that the draft environmental impact statement does not contain sufficient information to assess fully, the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft environmental impact statement.

Category 3 -- Inadequate

EPA believes that the draft environmental impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft environmental impact statement is assigned a Category 3, no rating will be made of the project or action; since a basis does not generally exist on which to make such a determination.

EPA COMMENTS ON REGIONAL COAL CONVERSION EIS

AIR QUALITY

General

USEPA-1

The coal conversion program's most significant impact will be on air quality. Experience so far shows that these conversions can take place without violating air quality standards. Some conversions, such as Brayton Point in Somerset, Massachusetts, may even result in improved air emissions. (See Attachment 1) Any conversion, however, raises a number of important air quality issues which need to be addressed. With the exception of TSP impacts, most of these issues are discussed in the Environmental Impact Statement (EIS).

The EIS notes that new electrostatic precipitators can provide more than adequate particulate control for converting units. However, the EIS fails to mention that many of the converting plants may take advantage of the Delayed Compliance Order provisions of the Clean Air Act and burn coal before new ESP's are installed. These units will emit much more than the present amount of TSP between the time coal burning starts and the time new precipitators are functioning. This time will vary, but may be as long as 4 years.

To fully describe TSP concerns, the Final EIS should include an overview of short term TSP impacts during this interim DCO period. This should also include a discussion of mitigation measures that utilities can use to minimize TSP emissions before new precipitators are installed. Such emission mitigation measures are required by Section 113(d)(7) of the Clean Air Act. Information on these controls is provided in Attachment 2.

USEPA-2

One other general comment concerns the assumptions used for modeling air quality impacts in both the combustion and deposition regions. The EIS makes a number of assumptions about SO_2 emission limits, units which will be converting, and plant capacity factors that may not reflect the intentions of the converting utilities or the States in which the plants are located. The emission factors shown in Table F.4 assume many of these plants will not seek variances from the current SIP, and will use Flue Gas Desulfurization to meet a stringent sulfur limit. In fact, the use of FGD could preclude some of these plants from converting at all. It is more likely that many of these plants will receive relaxations from the current SIP rather than convert using FGD. We realize that SIP limits present a "moving target" that are difficult to categorize. However, better information should be available from the utilities and the relevant state air agencies. These groups should also have updated information on the units in each plant which are likely to convert. Please feel free to call EPA Regional air programs for this information as well.

Plant capacity factors are also an important variable in any determination of air quality impacts. All of DOE's analysis is directed at evaluating the incremental change in air pollution that can be expected from the conversions. While this approach makes sense, determining the capacity factors to use in this evaluation requires making assumptions about the way in which those plants will operate under coal. Again, the utilities will be the best source for this information.

USEPA-1 It is noted that some facilities may operate under delayed compliance and that ground-level concentrations might be higher. However, the emissions will not be allowed to be so great that violations of the ambient air quality standards occur; emissions will be determined by agreement between the utility and the appropriate regulatory agencies. Anticipating which plants will be operating under delayed compliance orders and what the elevated emission levels might be is not possible. Mitigation measures that can be used by utilities to minimize TSP emissions before installation of new precipitators and resulting impacts will be discussed in the site-specific EISs.

USEPA-2 The Modified Coal SIP is an attempt to model possible relaxation of SIPs. In many cases, FGD will not be required (see Tables 2.5 and 2.6). The Voluntary Conversion Scenario is designed to model only those plants planning to convert voluntarily. The effects of changing the short-term capacity factors for the oil-fired scenarios would increase the predicted impacts of conversion. However, the data upon which such an assumption could be based are unavailable. Therefore, an identical value for pre- and post-conversion short-term capacity factor, 100%, was chosen. The latest data, as received from the utilities, are given in Section 2, Table 2.3.

A discussion of dispatching procedures used by utilities is outside the scope of this document.

For example, in determining the annual average impacts using the RAM model, DOE used projected capacity factors of about 60-65%. While modeling using capacity factors less than 100% may provide acceptable results, those used in the draft EIS appear low. This is particularly true considering that many of these plants will be increasing their capacity factors once they switch to lower cost coal. Many utilities may be planning to operate converted units at capacity factors closer to 80%.

Capacity factors also play a role in the long range transport (deposition region) modeling, in quantifying coal combustion by-products (appendix G) and in the 24 hour modeling using RAM. The possibility of increased capacity factors for a converted unit makes this 24 hour analysis particularly difficult. The Draft uses the following equation for the 24 hour analysis:

Coal Emissions (100% Capacity)	-	Oil Emissions (100% Capacity)	=	Incremental Emission Change

For oil burning plants that are now used as intermediate or peaking facilities, assuming a 100% capacity factor under oil may not be a conservative assumption. It may, instead, overestimate oil emissions and in doing so underestimate the incremental impact of a converted plant. An alternative approach would be to model oil emissions at a lower capacity factor for the 24 hour analysis, perhaps based on actual fuel consumption.

In a related point, the Final EIS should discuss in general terms the dispatching methods utilities use to distribute electricy from a set of powerplants (oil, coal, nuclear, hydro, etc.) to consumers. These methods vary, but are often based on computerized algorithms which include the cost of fuel as an important variable. An example is the New England Power Exchange operated by the New England Power Pool.

As plants convert, increased production by coal burning plants may be offset by decreased production from other (possibly oil burning) plants. The net emission change will vary from area to area, and would be difficult to compute. However, the Final should provide the reader with an overview of dispatching procedures and the way in which utilities may increase or decrease the capacity factors of the plants in their grid.

USEPA-3 A final general comment concerns the lack of information on sulfur variability. The sulfur content of coal supplied to a boiler, even when from the same mine, varies hour-to-hour and day-to-day. Coal handling and cleaning practices influence this natural variability, usually decreasing it. The final EIS should provide some basic information on this subject and note its relevance to modeling short-term impacts. Information so far on the Brayton Point coal supply shows that the sulfur content is averaging less than the 1.5% regulatory limit. (See Attachment 3.) The final EIS should present information on this trend, as well.

USEPA-3 Coal variability is difficult to predict: variability occurs naturally, and is enhanced by coal cleaning and handling. Because of the uncertainty in sulfur content of the coal to be burned, it was assumed that the coal purchased would exactly meet the specifications required to achieve the emission rate described in each scenario. In general, the concentrations predicted by the model are greater than those that would actually occur, except for plants with aerodynamic downwash problems or plants located in areas of complex terrain. This degree of conservativeness is appropriate for inclusion in environmental impact statements and is consistent with the modeling requirements of many regulatory agencies.

Long Range Transport

USEPA-4

One of the most useful functions of this Regional EIS is to analyze the long range transport of emissions. While there is controversy over the usefulness of long range transport models, ASTRAP is among the best of those models available. Any model, however, is only as good as the inputs to it, and DOE should again note the reservations expressed above concerning the emission limits and capacity factors used in the draft.

In introducing the ASTRAP model (Section 5.1.5), DOE outlines some of the limits to using a long range transport model to predict acid deposition and resulting pH. The omission of nitrate deposition from the model is one important drawback that is mentioned. This section should be expanded to fully clarify the model's strengths and weaknesses. For example, the assumption that stack heights will not change is not mentioned, nor is the assumption of linear atmospheric sulfur chemistry.

Given these drawbacks, the sections discussing results of the model convey too great an impression of certainty and accuracy. The underlined statement at the top of Page 5-41, for example, states that a decrease of pH by .03 units is the greatest possible change. This precision is unrealistic. Numbers like these need to be placed in context, perhaps by including a range of figures or by placing confidence intervals around them.

The derivation of these numbers is also important to an understanding of them. We realize that a detailed technical air quality report is being prepared in a separate volume. However, the final EIS should still have a better presentation of the way in which the .03 pH change and similar figures were derived; perhaps in an appendix. The SO_2 loadings assumed for the modeling should also be included in this appendix.

USEPA-5

Finally, the attempt to treat the effects of change in acid deposition rates separately from the acid precipitation phenomenon needs more analysis. It could be that the effects of acid precipitation are the result of cumulative depositions over longer periods. If this is proven true, then even small increases in deposition rates might adversely influence long range acid precipitation impacts. Because of these uncertainties, we recommend that this section be more fully analyzed and that the conclusions reached in the draft report be clarified in the final document.

Combustion Region Impacts

USEPA-6

The draft EIS also attempts to analyze short range SO_2 impacts in the "combustion region" surrounding each of the converted plants. As the EIS states, such an analysis can only predict general trends in ambient air quality resulting from the conversions. Without a much more thorough analysis not appropriate for this EIS, this modeling will provide, at best, only an overview of local air quality impacts.

The draft lists some of the reasons this is true. The RAM model used for the draft does not consider terrain surrounding the plants, uses a single

USEPA-4 Stack height assumptions are a limitation of scenario descriptions, not of ASTRAP capabilities. The scenarios examined in Topical Response 3.2 show considerable modifications in stack parameters. For a response to the comments on nitrate deposition, see Response CLF-8.

There cannot yet be full verification of any long-range transport and deposition model, since dry deposition cannot yet be successfully monitored. The most complete verification statistics for ASTRAP are in the Phase III report of the modelers subgroup for the U.S.Canadian research supporting the Memorandum of Intent on Transboundary Air Pollution, and that has not yet been officially released.

The 0.03 pH decrease arose from conversion of the linear 6% maximum deposition increment. The maximum deposition increments under the Voluntary Conversion Scenario in this FEIS are somewhat less, particularly away from the New York City urban area (see Topical Response 3.2.)

USEPA-5 The acid deposition rates discussed in the DEIS include contributions from both wet (i.e., snow, rainfall) and dry processes. These deposition rates are the basis of the assessment of the impacts to biota caused by increases in sulfur deposition as a result of the proposed action (see Topical Response 3.2). It is apparent that the adverse effects of acid precipitation seen in sensitive aquatic ecosystems are the result of an increase in the acidity of these systems occurring over a period of decades. Long-term acidification has not been conclusively shown to occur in terrestrial ecosystems (see also Sec. 5.4 of the OEIS and Topical Response 3.3). As the deposition of sulfur in most of the Northeast is expected to increase by 2% or less under the Voluntary Conversion Scenario (see Topical Response 3.2), no appreciable change in surface water acidity is expected following fuel conversion.

USEPA-6 The modeling was intended to predict general trends in ambient air quality, and was not designed for an NAAQS analysis or a PSD increment consumption analysis. At the time of the analysis no other modeling effort of this magnitude had been attempted. Since then, there have been attempts to model the impacts of multiple coal conversions, but these included fewer plants and used a different dispersion model. Until the Northeast Regional analysis was finished, it could only be conjectured as to where potential "hot spots" of high concentration might occur. That was the goal of the study--to identify and analyze areas of potentially high regional impact resulting from multiple conversions, not those that would be considered in the analysis of a single conversion (for example, the effects of <u>one</u> conversion on acid deposition).

meteorological data set, uses a coarse receptor network, and is designed for rural areas. These and other limitations make the data in the draft inappropriate for either an NAAQS analysis or a PSD increment consumption analysis for any one plant.

While the draft acknowledges these limits in some sections, other sections state that the data is highly conservative and reflects worst-case conditions. The underlined sentence on the top of page 3-19, for example, explains "the assumptions used in the model were conservative which should result in a conservative or "worst-case" prediction of air quality ..." Such claims are unwarranted in light of the modeling constraints discussed above. As the modeling submitted in the DCO applications for both the Salem Harbor and Mt. Tom conversions shows, there is no reason to believe that the RAM modeling in the draft is conservative. Site-specific factors might well alter the SO_2 values stated in the draft.

Sections discussing those areas in which the model does predict exceedences of the SO_2 standard are vague. The draft refers to "slight exceedences" which can be eliminated by the application of "mitigative techniques". The Final EIS should expand on this discussion by explaining the mitigative measures that would be needed to avoid NAAQS violations. In addition, the Final should describe the next series of steps which will be taken to better analyze local air quality impacts.

For example, the states of New Jersey and New York have organized a modeling committee under a bi-state group called the Atlantic Alliance. With technical assistance provided by EPA's Region II, the group will assess the potential conversion of 18 power plants in the New York metropolitan area. Detailed modeling will also be a part of any Delayed Compliance Order application. Such modeling will provide a refined analysis of the trends presented in the EIS.

Although the RAM model does not include the effects of terrain, neither did any other EPA-approved multisource model at the time of the analysis. The RAM model only uses one set of meteorological data, but no USEPA-approved Gaussian model uses more than one meteorological data set. A decision had to be made concerning whether the meteorological data set should be representative of the source, the receptor, or the transport regime between the two. The analysis included a centralized set of data found within the subregion of concern. The exception was the Boston Subregion, which was further divided to make use of Portland, ME, Boston, MA, and Hartford, CT, data. A course receptor grid was used. An NAAQS or PSD analysis for the entire northeastern United States with a grid spacing to satisfy the needs of such analyses, combined with all the scenarios that were identified, would have been cost-prohibitive. The rural version of RAM was used because the urban version predicted violation of NAAQS in areas where monitored data showed no violation. The rural version provided more acceptable estimates of atmospheric concentrations.

Additional, more sophisticated modeling is certainly warranted to assess the effects of conversion on smaller areas.

See also Responses USEPA-1 and NYDEC-9, and Topical Response 3.1.

SOLID WASTE

Solid waste disposal is second in importance only to air quality as a coal conversion issue. The problem of disposing of coal combustion waste products, particularly ash, will grow in direct proportion to the number of utilities (and industries) burning coal.

USEPA-7 It is disappointing, therefore, that the draft EIS was not able to provide more information on ash disposal alternatives, in particular the potential for marketing ash as a re-usable product. This information is also not available in the EIS's Technical Report on Waste Disposal. At a minimum, a survey of some possible re-use techniques would give the reader the general idea that alternatives to disposal are possible. While research in this developing area is needed, some re-use techniques have been well established.* More information on this subject, in particular the use of ash from Brayton Point as landfill cover, is included in Attachment 4.

* See: New York State Energy research and Development Authority, Assessment of Needs and Management Options for the Disposal of Coal Wastes in New York State, Prepared by Fred C. Hart Associates, November, 1980.

USEPA-7 A discussion of coal ash marketing was presented in Section I.2 in Appendix I of the DEIS, and has been expanded in Topical Response 3.5 (Waste Disposal), incorporating the information provided in this comment.

The draft does provide a good overview of landfill siting criteria, but this discussion would benefit by more detail on what utilities are actually doing with their ash wastes. The EIS does not make it clear, for example, that some plants use a wet sluicing system and lagoon the ash on-site while other plants use a dry, pneumatic system in which ash remains on-site only for a very few days. A characterization of actual ash disposal techniques (for those plants that are far enough along to provde this information) would clarify this section.

USEPA-8 Some utilities may be interested in ocean disposal of ash. As described in Appendix H, an EPA permit under the Marine Protection, Research, and Sanctuaries Act would be required for ocean disposal. Consolidated Edison recently applied for a Special Permit to temporarily dump 500,000 tons/year of ash at EPA's 106-mile Ocean Disposal Site. Their application includes results of a research program analyzing ash disposal impacts conducted last year under an EPA research permit. To date, EPA has made no determination about the acceptability of the ash for ocean disposal. Only ash wastes are under evaluation; scrubber wastes are not being considered for ocean dumping.

USEPA-9 Finally, as discussed above, the utilities should be consulted concerning their plans to convert using FGD, and whatever plans are available should be used for the Final. The Final EIS should also include better information on the ash content of coals. The estimate in Table G.3 of 13.4% ash is too high for many plants. Ash contents closer to 10% or 9% are more realistic and in accordance with most state SIP regulations.

WATER QUALITY

USEPA-10 The section addressing water quality concerns in the supply region provides a good summary of mining operations impacts. The discussion is, however, overly optimistic about the ability of current technology to control those impacts. Acid seeps from mines in areas high in pyrite minerals are difficult to control, even with best available technology. Similarly, the assumption that dilution of mine effluents will cause minimum impacts in large river systems is vague, apart from any discussion of the size of the mine. A large mine in a large watershed could have a comparable effect to a smaller operation in a smaller watershed.

USEPA-11 In the combustion region, on-site water quality impacts are caused primarily by runoff and leachate from a plant's coal pile and ash management systems. The section describing these impacts should also include information on mitigation measures that are used to control these impacts. The Brayton Point plant, for example, is constructing a collecting trench around its coal pile to transport runoff to a waste treatment system. Some plants using a wet sluicing system may need to line their ash disposal lagoons. Similar measures can be used to minimize the impacts outlined in the draft.

USEPA-12 The Final EIS should also reference the anadromous fish restoration programs that are being undertaken for some rivers adjacent to coal conversion candidates. The Connecticut River, for example, has an active Atlantic Salmon restoration

USEPA-8 A discussion of ocean disposal of coal ash and scrubber sludge is presented in Appendices H and I of the DEIS, and has been expanded in Topical Response 3.5 (Waste Disposal).

USEPA-9 The utilities were surveyed (see Appendix A, Letter to Utilities) and the information provided was used to develop the scenarios used in this FEIS (see Sec. 2). Comparison of Table 2.7 of this FEIS and Table G.3 of the DEIS indicates which utilities have provided information on projected ash content of the coal. The value 13.4% was used as a conservative case that could meet the SIP with 99% collection efficiency.

USEPA-10 Section 5.2.1, p. 5-23, line 22, of the DEIS is revised as follows:

"...How closely the regulations set out in this Regulatory Program can be followed and enforced will partially determine the extent to which water uses will and can be protected from the adverse effects of coal mining. It must be noted, however, that even with the use of best available technology in mine areas high in pyrite minerals, control of acid seeps from mines may be extremely difficult."

USEPA-11 Section 5.2.3.2, p. 5-28, lines 10-14 of the DEIS are revised as follows:

"Proper collection and treatment of runoff and infiltration from coal and ash storage piles will help reduce site-specific impacts. The measures to be used to reduce the production of leachate and runoff from these piles are similar to those discussed in Section 5.2.2 for coal storage systems."

USEPA-12 Emissions of metals from coal-fired powerplants into aquatic ecosystems are most likely to occur as the result of (1) the deposition of particulates into surface waters or (2) runoff from coal and coal-combustion waste storage facilities. The amount of metals entering surface waters from fuel conversion candidate powerplants (operating with efficient particulate control devices program, and utilities are projected to spend over $40 million on fish ladders there alone.* Some concern has been voiced that even low level concentrations of metals may hinder these efforts.

USEPA-13 The previous comment on long-range transport addressed water impacts in the deposition region. Again, pH predictions resulting from the ASTRAP model need to be described more realistically.

* New England River Basin Commission, Water, Watts and Wilds, Hydropower and Competing Uses in New England, August, 1981.

and well-designed coal and combustion waste storage facilities) will be quite small. Any additions will be quickly diluted due to the high monthly average flow rates in the river systems of the Northeast Region (Table 5.17 of the DEIS). Therefore, it is unlikely that metals emitted from powerplants following fuel conversion will have an adverse affect on anadromous fish populations. Other potential impacts to anadromous fish populations resulting from fuel conversion (e.g., the effects of increased thermal plumes) are not considered to be cumulative or interactive in nature (see DEIS p. 2-8). This conclusion is based upon the spatial distribution of the conversion candidates and the results of analyses performed in the DEIS (for example, see Sec. 5.2.3.3). Site-specific impacts to anadromous fish populations will be discussed at length in EISs prepared for those generating facilities where such impacts might occur.

A detailed description and analysis of waste disposal sites is presented in the technical report on waste disposal (Saguinsin et al. 1981).

REFERENCES

Saguinsin, J.C.S., et al. 1981. The Northeast Regional Environmental Impact Study: Waste Disposal Technical Report. DOE/RG-0058. Prepared by Argonne National Laboratory, Argonne, Ill., for Economic Regulatory Administration, U.S. Department of Energy, Washington, D.C.

USEPA-13 Since the DEIS was issued, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). Under this scenario, projected sulfur deposition has been substantially reduced to 3-4% in the New York City Area and 1-2% in the Maritime Provinces (see Topical Response 3.2).

4.2 STATE AGENCIES

State of Connecticut
Department of Environmental Protection
State Office Building Hartford, Connecticut 06115

Stanley J. Pac
Commissioner

January 12, 1982

Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

The State of Connecticut Department of Environmental Protection has reviewed the Draft Regional Environmental Impact Statement prepared for the potential conversion of forty-two powerplants from oil to coal or alternative fuels and submits the following commentary.

Overall, because of the extremely general nature of the analyses of the potential environmental impacts, it is impossible to provide any technical comments relating to the possible effects of conversion to Connecticut, especially air quality impacts. It would require a significant amount of staff time and a rather extensive modeling effort to generate the specific data on air quality impacts to the state which is not included in the regional EIS. For this reason, a more detailed review must await the preparation of site-specific environmental impact statements for the conversion of individual plants.

CDEP-1 / CDEP-2: In addition to the lack of specific information relating to the environmental impacts on Connecticut, there are other topics which were not adequately addressed in the E.I.S. In the discussion of alternative technologies and conservation, each alternative is separately assessed and then dismissed as inadequate. However, a combination of all of these alternative technologies and conservation could result in a significant decrease in electrical consumption from fossil fuel generation and thus reduce the total number of plant conversions, if several plants could be retired. Also, although the discussion of solid waste disposal within Connecticut recognizes the lack of a disposal area at the present time, it is overly optimistic as to an eventual solution to this problem.

CDEP-3: In summary, Connecticut is not opposed to the concept of coal conversion. There is, however, concern that the conversion of the powerplants upwind from Connecticut would significantly affect Connecticut's air quality and could preclude the conversion of the plants within the State. Because the Regional E.I.S. does not adequately address the interstate transport and impact of air

CDEP-1 The reviewer appears to have misunderstood the methodology employed. Each alternative technology and conservation concept is separately discussed and evaluated on its own merits. If the technologies in question are not expected to have a major market share by 1990, then they were not analyzed further. Those technologies that passed the market test were summed together for analysis of their electricity consumption and fuel displacement impacts.

Alternative energy and conservation technologies alone cannot do the job. While some alternative and conservation technologies displace peak as well as base (hence displace oil), the net effect is to complement the required coal conversion. Coal conversion still remains the major opportunity for the largest oil displacement.

CDEP-2 Additional discussion on coal waste disposal within the State of Connecticut is presented in Topical Response 3.5 (Waste Disposal).

CDEP-3 In the modeling analysis of the New York Subregion, ground-level concentrations were calculated for receptor locations throughout Connecticut and as far as Providence, Rhode Island. In the DEIS, the isopleths on the appropriate figures and the concentrations shown in the appropriate tables represent the effect of interstate transport on air quality in Connecticut. In this document the corresponding figures are 3.1-7 through -9 and the corresponding table is 3.1-4.

pollutants, this remains the State's major apprehension related to coal conversion.

Sincerely,

Stanley J. Pac

cc: Len Bruckman
Charlie Kurker

STATE OF DELAWARE
EXECUTIVE DEPARTMENT
OFFICE OF THE BUDGET
DOVER DELAWARE 19901

TELEPHONE (302) 736-4205

December 10, 1981

Ms. Marsha S. Goldberg
U. S. Department of Energy
Economic Regulatory Administration
Office of Fuels Conversion
2000 M Street, N.W.
Washington, DC 20461

Dear Ms. Goldberg:

RE: Draft Northeast Regional Environmental Impact Statement
The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels

DOB-1 No response required.

The Office of the Budget, in its function as the State Clearinghouse, has reviewed the above listed Draft EIS and has no negative comments to offer at this time.

Sincerely,

Henry James Decker
State Budget Director

HJD:FB:jm

MARYLAND
DEPARTMENT OF STATE PLANNING
301 W. PRESTON STREET
BALTIMORE, MARYLAND 21201

HARRY HUGHES
GOVERNOR

CONSTANCE LIEDER
SECRETARY

January 6, 1982

Mr. Rayburn Hanzlik, Administrator
Economic Regulatory Administration
Department of Energy
Washington, D.C. 20461

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) REVIEW

Applicant: U.S. Department of Energy

Project: Draft EIS - Proposed Conversion of Power plants from Oil to Coal Fired

State Clearinghouse Control Number: 82-11-93

State Clearinghouse Contact: James McConnaughhay (383-7875)

Dear Mr. Hanzlik:

The State Clearinghouse has reviewed the above statement. In accordance with the procedures established by the Office of Management and Budget Circular A-95, the State Clearinghouse received comments from the following:

Department of Agriculture, Department of Transportation, Public Service Commission and our staff noted that the statement appears to adequately cover those areas of interest to their agencies.

Department of Economic and Community Development including their Historical Trust Section noted (copy attached) that the Statement does not properly reflect the positive economic impact that would result from conversion. The conversion, by reducing electricity costs to industry and by providing a more labor intensive means of producing electricity, promise to stimulate the Northeast Region's economy without significantly effecting the air quality of the Region.

Department of Natural Resources indicated (copy attached) their agency's general endorsement for conversions subject to the site specific restrictions which may be encountered at each plant and provided a detailed evaluation and critique of the air quality and solid waste analysis included in the Statement.

Office of Environmental Programs provided information (copy attached) on other studies conducted on the potential impact from conversion in Maryland and made comparisons and conclusions regarding these various studies and the draft EIS.

Tri-County Council for Western Maryland noted (copy attached) that the Statement should address the use of methanol as a substitute fuel for oil. Several reports document that methanol is a feasible, cost effective, clean and desirable alternative fuel that could be used to produce electricity.

TELEPHONE: 301-383-7875
OFFICE OF STATE CLEARINGHOUSE

The State Clearinghouse appreciates your attention to this A-95 review process and anticipates that the comments made in this review will be considered and documented in the final Statement being developed for this project. Thank you for your continued cooperation in this regard.

Sincerely,

James W. McConnaughhay
Director, State Clearinghouse

cc: Thomas Hatem
H.E. Binks
Stephen Kocsis
Lowell Frederick
Clyde Pyers
Herbert Sachs
Max Eisenberg

JMc:BG:pm

Date: 12/24/81

Maryland Department of State Planning
State Office Building
301 West Preston Street
Baltimore, Maryland 21201

SUBJECT: PROJECT SUMMARY NOTIFICATION REVIEW

Applicant: U. S. Department of Energy

Project: Draft EIS - Potential Conversion of Powerplants from Oil to Coal

State Clearinghouse Control Number: 82-11-93

CHECK ONE

This agency has reviewed the above project and has determined that:

1. The project is not inconsistent with this agency's plans, programs or objectives and where applicable, with the State approved Coastal Zone Management Program. ____

2. The project is not inconsistent with this agency's plans, programs or objectives, but the attached comments are submitted for consideration by the applicant. XX see memo

3. Additional information is required before this agency can complete its review. Information desired is attached. ____

4. The project is not consistent with this agency's plans, programs or objectives for the reasons indicated on attachment. ____

Signature: [signature]
William M. Eichbaum

Title: Assistant Secretary for Environmental Programs

Agency: Department of Health

Address: 201 West Preston Street
Baltimore, Maryland 21201

cc: Dr. Max Eisenberg

4-30

STATE OF MARYLAND—DEPARTMENT OF HEALTH AND MENTAL HYGIENE

MEMORANDUM

Copies: E. L. Carter
W. von Schultz

TO Michael Kurman From Arnold Solomon ALS Date 12-18-81

Subject Air Quality - Review of Draft Northeast Regional Environmental Impact Statement: The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels

A review of the Draft Northeast Regional Environmental Impact Statement: The Potential Conversion of Forty-two Powerplants from Oil to Coal or Alternate Fuels, October 1981, prepared by the U. S. Department of Energy and Economic Regulatory Administration, Office of Fuels Conversion, was conducted for the effected areas and power plants located within the State of Maryland.

MDHMH-1 A review of the input data used in the economic and air quality model produced differences from data available from Air Management Administration. The differences in stack emissions, exit characteristics, and start-up dates are shown in the attached table. These differences in stack characteristics will most likely not significantly change any of the conclusions reached on air quality impact. The differences in start-up dates might be large enough to change coal demand results. The increase in emissions for the Crane Power Station will most certainly alter impacts for the Coal SIP Scenario.

The use of the RAM model to develop long and short term expected air quality impact is excepted EPA methodology, and the conclusion that the SO_2 standards are not expected to be violated in the Baltimore Sub-region under any of the scenarios analysed agree with State SIP and the Draft Environmental Impact Report, ERA/DOE Project; Case I, Brandon Shores Generating Station, C. P. Crane Generating Station, H. A. Wagner Generating Station, Riverside Generating Station, Baltimore Maryland, June 1981. This June 1981 EIS did show air quality violations for coal conversion scenarios not covered in the October 1981. Since the October 1981 EIS stated goal was to predict trends in pollutant concentration and not precise impact, its analysis is sufficient.

The analysis of the regional scale modeling of long-range transport phenomena using the ASTRAP model is only a gross estimation of the resultant acid deposition. The October 1981 draft EIS does identify the limitations of, the analysis, but at the present time, the analysis is one of the available techniques to make these analyses. Its conclusion of minimum impact should be taken with these limitations in mind.

ALS:mm
Attachment

MDHMH-1 A new modeling analysis is presented in Topical Response 3.1.

Stack Characteristics which differ with Maryland Air Quality Registration Files and Data found in Appendix F Air Quality Modeling Input Data and Assumptions

	Reg. File	EIS
Riverside # 4 & 5		
Exit Velocity (ft/sec)	101	77
Temperature (°F)	320	206
Crane # 1 & 2		
Exit Velocity (ft/sec)	108	98, 95
Temperature (°F)	340,330	320,330
Emissions (lb $SO_2/10^6$ BTU)	3.5	1.66
Wagner # 1 & 2		
Exit Velocity (ft/sec)	75	108
Temperature (°F)	278	330

Assumptions which differ with Scheduled Start-Up Dates and Data found in Appendix D

	Scheduled	EIS
Brandon Shores # 1	1984	1987
# 2	1988	1988
Crane # 1	Feb. - 1983	1988
# 2	May - 1983	1988

Date:

DEPT. OF STATE PLANNING RECEIVED DEC 23 1981
REVIEWED
ANSWERED

Maryland Department of State Planning
State Office Building
301 West Preston Street
Baltimore, Maryland 21201

SUBJECT: PROJECT SUMMARY NOTIFICATION REVIEW

Applicant: U. S. Department of Energy

Project: Draft EIS - Potential Conversion of Powerplants from Oil to Coal

State Clearinghouse Control Number: 82-11-93

CHECK ONE

This agency has reviewed the above project and has determined that:

1. The project is not inconsistent with this agency's plans, programs or objectives and where applicable, with the State approved Coastal Zone Management Program. ___
2. The project is not inconsistent with this agency's plans, programs or objectives, but the attached comments are submitted for consideration by the applicant. X
3. Additional information is required before this agency can complete its review. Information desired is attached. ___
4. The project is not consistent with this agency's plans, programs or objectives for the reasons indicated on attachment. ___

Signature: [signature]

Title: Asst Director

Agency: PPSP/DNR

Address: Tawes Building

JAMES B. COULTER
SECRETARY

STATE OF MARYLAND

DEPARTMENT OF NATURAL RESOURCES
ENERGY ADMINISTRATION
TAWES STATE OFFICE BUILDING
ANNAPOLIS 21401
(301) 269-2261

BUREAU OF MINES
ENERGY OFFICE
POWER PLANT SITING PROGRAM

December 14, 1981

Mr. Steve Ferguson
Chief, Office of Fuels Conversion
Economic Regulatory Administration
Department of Energy
Washington, D.C. 20461

Dear Mr. Ferguson:

I am writing in regard to the draft Northeast Regional Environmental Impact Statement, as issued in October, 1981. While my detailed comments will be forwarded through the normal process of clearinghouse review, I feel sufficiently strong about my review that this letter is necessary.

MDNR-1

The content of the report regarding the environmental impact on air quality in the Baltimore region is almost completely incorrect (and there are serious deficiencies in the biological section). Moreover, the errors in air modeling correspond almost exactly to errors pointed out in my letter of January 6, 1981 to you regarding the draft EIR for the Baltimore region. There appears to have been no communication between the group doing the Northeast region and the Baltimore region nor was their communication among staff at ERA. It is also clear that the technical expertise needed to review these drafts does not exist at ERA.

The waste of time, effort, and money is appalling. My suggestion is that these issues (local air quality and biological effects) be deferred to the local regional area where these issues have been reviewed and (hopefully) corrected.

Sincerely,

RAR

Randy A. Roig
Administrator, Impact Assessment

RAR:dc

MDNR-1 The comments referring to the Brandon Shores site-specific EIS were not communicated to the individuals working on the regional DEIS. This omission has been rectified in the FEIS.

JAMES W. COULTER
SECRETARY

BUREAU OF MINES
ENERGY OFFICE
POWER PLANT SITING PROGRAM

STATE OF MARYLAND

DEPARTMENT OF NATURAL RESOURCES
ENERGY ADMINISTRATION
TAWES STATE OFFICE BUILDING
ANNAPOLIS 21401
(301) 269-2261

December 17, 1981

MEMORANDUM

TO: Brian Gatch

VIA: Mike Nelson

FROM: Randy Roig

SUBJ: DOE Draft EIS Concerning Conversion of Power Plants from Oil to Coal

We have reviewed the draft EIS in matters concerning environmental impact in the "combustion region". Our comments indicate major deficiencies in the draft EIS, particularly in the air quality section.

I also wish to note that we favor conversions at the Brandon Shores, Wagner, and Crane Power Plants. It is our opinion that both expense and environmental impact do not favor such a conversion at Riverside.

RR:kss

Air Quality

A. The stack modeling analysis contained in appendix F is almost completely incorrect as regards the predicted ground level concentrations (glc). The following problems are noted, many of which existed in the original review of the site specific EIS reviewed by PPSP one year ago:

MDNR-2 1. The position of the Wagner and Brandon Plants are reversed in figures F 12-14 (and presumably in the analysis).

MDNR-3 2. In the analysis, Brandon Shores was defined as emitting at a temperature of 266°F and exit velocity 77.65 fps. The actual base case for Brandon Shores on oil involves an exit velocity of 113 fps and an exit temperature of 600°F. Also, the mitigation case presumably involves FGD for this plant, implying a maximum temperature of 170°F (and corresponding exit velocity). In all cases, the analysis supplied by DOE strongly understates the real change in glc.

MDNR-4 3. The last paragraph of page F-7 indicates that the author is not familiar with modeling sources such as power plants. For single sources such as power plants, changing from rural to urban coefficients almost always increases glc's. The increased σ_z produces plume ground contact closer to the stack. Our predictions for these plants indicate a 20-40% increase in glc for the Riverside and Wagner plants for such a shift. Second, changing

MDNR-2 The reversal of the Wagner and Brandon Shores plants in Figures F.12 through F.14 is acknowledged. For modeling purposes, the plants were correctly located.

MDNR-3 The information supplied has been used to develop the scenarios described and discussed in Section 2.

MDNR-4 Page F-7, line 22 should read as follows:

"The rural version (RAMFR) provides conservative (high) estimates of ground-level concentration as compared to actual monitoring data. Use of the urban version (RAMF) led to estimates much higher than that measured by ambient air monitors and even higher than predicted by the rural version. Therefore, the RAMFR version was used in place of the RAMF because of the more acceptable estimates despite the fact that urban-induced roughness of terrain and subsequent additional dispersion is not considered in the model."

the dispersion parameters in a multiple source case changes the overlap in plumes. It is difficult, if not impossible, to predict if concentrations will increase or decrease. The present analysis is not conservative, as stated herein.

MDNR-5 The modeling analysis will have to be completely redone to reflect these comments. Perhaps this analysis could be lifted from the site-specific EIS - presumably that analysis has been revised to reflect comments 2 and 3, (as stated in our letter of January 6, 1981, reviewing the original site-specific EIS).

MDNR-5 The modeling has been redone and reflects the information given in Comments MDNR-3 and -4. (See Topical Response 3.1).

MDNR-6 B. The issue of particulates, especially where a non-attainment area exists, has been ignored. Problems of fugitive dust impact have been a major issue in coal conversion hearings at the Crane and Brandon Shores Plants. The Riverside Plant is in the non-attainment area. Cumulative impacts, particularly on progress towards attainment, would seem likely. While these potential impacts deserve more discussion at the site-specific level, they should be mentioned in this document.

MDNR-6 Fugitive dust is a localized problem and will be discussed only at the site-specific level. See Response NJDEP-3.

MDNR-7 C. Maryland Air Quality Standards were repealed as of July 1, 1978. Only the NAAQS apply as for SO_2, TSP, and NO_x. Thus, table 4.8 should be corrected.

MDNR-7 The changes are noted. The values that appear in Table 4.8 for Maryland should be removed. This change is included in Section 5, Errata and Addenda.

RR:dlh

Water Quality/Biological Effects/Solid Waste

The present discussion is considered inadequate and incorrect in several important areas as it applies to the Baltimore Harbor plants.

MDNR-8 1. The thermal plumes of Wagner and Riverside not only overlap in several cases, but they also strongly overlap with other thermal discharges in the region (Bethlehem Steel, Glidden Paint). Synergistic effects have been observed at the present operating level between these discharges and would be expected to be exacerbated at higher loads.

MDNR-9 2. The statement at the bottom of page 5-53 is, in general, true for most once-through cooling systems - the plants usually withdraw at 100% capacity all the time. This is not, unfortunately, true at Wagner, Riverside, and Crane. Impingement and entrainment would be expected to increase at these plants. In particular, the regulatory status of Riverside with regard to State thermal discharge regulations (COMAR 08.05.04.13) would be changed to require detailed studies of the biological effects if the annual capacity factor exceeded 25%.

MDNR-10 3. The Joy landfill has been permanently closed (pg 4-47).

MDNR-8 Comment noted. The Wagner and Riverside powerplants are no longer conversion candidates. Therefore, further analysis of the impacts caused by an increase in thermal discharges associated with coal conversion and a subsequent increase in plant capacity factors is not warranted.

MDNR-9 Comment noted. The Wagner and Riverside powerplants are no longer conversion candidates. Therefore, further analysis of the cumulative impacts of increased impingement, entrainment, and thermal discharges following fuel conversion and a subsequent increase in the annual capacity factors at these stations is not warranted. As the Crane station is not located near other coal conversion candidates, the impacts of increased impingement and entrainment following fuel conversion are considered site-specific in nature (see p. 2-8). An analysis of such impacts is beyond the scope of this document. These impacts will be considered in the site-specific EIS prepared for the Crane facility.

MDNR-10 Comment noted. The closure of Joy landfill would not present a significant problem to all BG&E's plants proposed for conversion mainly because no scrubber sludge would be generated from these plants (see Tables 2.3-1 through 2.3-3). In addition, BG&E has acquired property adjacent to Brandon Shores for the disposal of fly ash generated there.

Date: DEC 10 1981

DEPT. OF STATE PLANNING
RECEIVED
DEC . . . .
REVIEWED
ANSWERED

Maryland Department of State Planning
State Office Building
301 West Preston Street
Baltimore, Maryland 21201

SUBJECT: PROJECT SUMMARY NOTIFICATION REVIEW

Applicant: U. S. Department of Energy

Project: Draft EIS - Potential Conversion of Powerplants from Oil to Coal

State Clearinghouse Control Number: 82-11-93

CHECK ONE

This agency has reviewed the above project and has determined that:

1. The project is not inconsistent with this agency's plans, programs or objectives and where applicable, with the State approved Coastal Zone Management Program. ____

2. The project is not inconsistent with this agency's plans, programs or objectives, but the attached comments are submitted for consideration by the applicant. ____

3. Additional information is required before this agency can complete its review. Information desired is attached. ____

4. The project is not consistent with this agency's plans, programs or objectives for the reasons indicated on attachment. *Research comments attached* ✓

Signature: [signature]

Title: ____

Agency: *WECI*

Address: *2525 Riva Rd*

Division of Research Comments

MDNR-11

The Draft Northeast Regional Environmental Impact Statement omits or distorts issues important to the economic case for the conversion from oil to coal in power plants. First, it is widely thought that burning coal in power plants, even with stringent environmental controls, is cheaper than burning oil. The Statement should verify these cost differences and trace their impacts. If cost reductions would lead to lower utility rates, the impact of the lower rates on economic activity, employment and tax collections in the Northeast Region should be studied. Also, handling and burning coal is more labor intensive than burning oil. This may also have an impact on industrial employment rates in the Northeast Region.

It is ironic that the direct, positive economic impacts of coal conversions were omitted from the Statement since section 4.5.3.3 discusses the Regional Economy and calls attention to Table 4.24 which shows that Baltimore County lost 15.3% of its employees in manufacturing between 1967 and 1977 while Anne Arundel County lost 20.3%. (Incidentially, why was Baltimore City not mentioned?)

MDNR-12

A second issue related to the economic impact of the conversions is the consumption of the PSD increment for TSP and SO_2. Section 5.5.3.2 states that increment consumption by the conversions would "represent only small contributions to the economy in an area" but would "consume a significant portion of the available PSD increment" and "may preclude greater economic growth in that area."

These statements are untenable. The conversions, by reducing electricity costs to industry, and by providing a more labor intensive means of producing electricity, promise to stimulate the Northeast Region's economy

MDNR-11 In Section 3.1 of the Draft EIS, information regarding the comparative costs of operating existing oil plants and converted coal plants is shown in Table 3.4 (p. 3-4). The assumptions made to develop the comparative costs are given in the footnotes to Table 3.4. The comparison shows a definite economic advantage for conversion to coal, based on the stated assumptions for the 10-state region studied. However, the regional effect of the conversion of the 42 plants on rates charged for electricity would be small since less than 15% of the total generating capacity of the region studied would be involved in conversion. Recent information indicates that less than 10% will actually convert. Since the Draft EIS is a regional study, the economic and socioeconomic effects of individual sites were not considered to be within the scope of the study, but were to be treated subsequently in the environmental studies for individual stations that might convert.

The impacts of conversion are discussed in Section 5 of the DEIS, while Section 4 covers only the existing environment.

MDNR-12 See Topical Response 3.1. Pages 5-61 and 5-67 contain information on PSD consumption as it is constrained by a regional study (as the DEIS is) versus an individual site study.

significantly. Virtually every survey received by DECD on industry's concerns with regard to locational decisions places great stress on the cost of electricity. As stated above, these effects were not studied in the Statement. To say that the conversions represent only small contributions to the economy is misleading at best.

Also, the conversions would not in fact consume a significant portion of the available PSD increment. TSP, especially, has very localized effects, which can be varied by changing stack parameters. Only the largest plants would consume all of a PSD increment and that would happen only in very small areas. This would have almost no impact on the ability of new industrial plants or indeed additional power plants to locate in the PSD region as they could readily position themselves or adjust their stack parameters so as to affect the PSD region at points other than those affected by the conversions.

The effect of the Statement's omissions and misinterpretations of the economic impacts of the conversions is to show a much smaller positive economic impact for the conversions than would actually be the case. The Division of Research supports the conversions for solid economic reasons. We are concerned about the inadequacies of this Statement.

Date: December 7, 1981

DEPT. OF STATE PLANNING
RECEIVED
DEC 10 1981
REVIEWED
ANSWERED

Maryland Department of State Planning
State Office Building
301 West Preston Street
Baltimore, Maryland 21201

SUBJECT: PROJECT SUMMARY NOTIFICATION REVIEW

Applicant: U. S. Department of Energy

Project: Draft EIS - Potential Conversion of Powerplants from Oil to Coal

State Clearinghouse Control Number: 82-11-93

CHECK ONE

This agency has reviewed the above project and has determined that:

1. The project is not inconsistent with this agency's plans, programs or objectives and where applicable, with the State approved Coastal Zone Management Program. ___

2. The project is not inconsistent with this agency's plans, programs or objectives, but the attached comments are submitted for consideration by the applicant. X

3. Additional information is required before this agency can complete its review. Information desired is attached. ___

4. The project is not consistent with this agency's plans, programs or objectives for the reasons indicated on attachment. ___

Signature: [signature]

Title: Executive Director

Agency: Tri-County Council for Western Maryland, Inc.

Address: 3 Pershing Street, Room 228
Cumberland, Maryland 21502

Tri-County Council for Western Maryland

December 7, 1981

Mr. James W. McConnaughhay
State Clearinghouse
Maryland Department of State Planning
301 W. Preston Street
Baltimore, Maryland 21201

RE: Clearinghouse Review #82-11-93

Dear Mr. McConnaughhay:

I would like to take this opportunity to comment at length on the above referenced Clearinghouse Review of a U. S. Department of Energy Document (DOE/EIS-0083-D) titled "Draft Northeast Regional Environmental Impact Statement", dated October 1981.

Although I have checked No. 2 on your Project Response Sheet, in that the project is not inconsistent with this Agency's plans, it is my considered opinion that it makes a significant error in not discussing fully alternatives to conversion of power plants to coal. We are referring, of course, to the use of methanol as a substitute fuel.

TCCWM-1 I wish to state at the outset that coal conversion of plants would undoubtedly have a beneficial impact on the economy of Western Maryland through the use of Western Maryland coal in any such conversion. I do not dispute, and do not wish to be misconstrued as disputing, the need to provide a continued strong market for Western Maryland coal, both within the United States and for foreign sales.

However, Tri-County Council has been working for approximately one and one-half years on the promotion of a synthetic fuel industry in the Upper Potomac Valley. This project has become known as WESTMAR Synfuels Project and would, in fact, locate a significant synthetic fuel plant for the conversion of coal to methanol here in Western Maryland. It is clear from a feasibility report that we have had prepared by Stone and Webster Engineering Corporation of Boston, Mass. that such an approach is very reasonable and, in fact, marketable given present and projected future costs of natural gas, fuel oil and coal. A copy of this report can be made available to you or to the authors of the DOE Study for their use.

County Office Building, Room 228, 3 Pershing Street Cumberland Maryland 21502 • 301-777-2159

TCCWM-1 The USDOE report referred to in the comment (DOE/PE-0012) clearly establishes that increased use of methanol is not an alternative to conversion to coal. The powerplants contained in the study are all of a steam boiler/turbine-generator design and currently burn residual oil to generate the vast majority of their power. However, the quoted material shows that the most likely near-term utility market for methanol would be to displace distillate oil in peaking units of a combustion turbine design. Even at the optimistic price of $5.00/10^6 Btu, methanol as an emerging technology would have no cost advantage over residual oil sufficient to offset the latter's traditional acceptance as a boiler fuel, and it would cost more than double the price of coal, although as the comment correctly notes, it would be competitive with distillate oil. Thus, even if all 42 powerplants were converted to coal, this would not affect the potential for methanol penetration into the combustion turbine market.

The DOE Report under consideration discusses the use of wood as a possible source of electricity producing fuel; it also talks of photovoltaic solar energy and it even talks of co-generated electricity from coal and electricity generated from small dams and windmills. We can find no real mention or analysis of the use of methanol as a substitute for oil in power plants. We realize that the report is considering the time frame to the year 1990 and trying to arrive at the most plausible scenario for conversion; we feel that such a timetable is feasible for a synthetic fuel plant.

The glaring weakness of the report is in neglecting to consider an alternative that both the Department of Energy and utility industry consider one of the most viable alternatives: co-generated electricity and methanol. The Department of Energy report, DOE/PE-0012, The Report of the Alcohol Fuels Policy Review (6/79), on page 116, states and I quote, "Use in gas turbine peaking units (referring to methanol) would likely make up the major portion of the early methanol market....the majority of methanol would substitute for distillate fuels." Still further, on page 117, in discussing boiler fuels, the report says, "the limited experience with methanol in boilers to-date (1979) has yielded no serious problems....the most promising result of these tests is an apparent substantial reduction in NO_x emmissions."

The electric utility industry is even more positive about methanol. In a paper delivered at the Eighth Energy Technology Conference in 1981, Gluckman and Louks of EPRI (Electric Power Research Institute) talk of replacing oil and natural gas in electric generators currently producing 200,000 MW. They recommend the conversion to methanol.

In tests conducted in California in 1979 EPRI found virtually no NO_x nor SO_2 when methanol was burned in one of two gas turbines at Ellwood Station. Further, the EPRI sponsored reports recommend co-generated electricity produced from coal gasification with a simultaneous manufacture of methanol.

Currently methanol produced from natural gas cost about $11.50 per 10^6 BTU. Methanol produced from the coal gasification plant would cost about $5.00 per 10^6 BTU using a Texaco gasifier; by way of comparison, fuel oil in 1981 costs about $8.00 per 10^6 BTU.

We would like to ask the following questions concerning this report:

1) Why was the use of coal derived methanol excluded from serious consideration or, in fact, any consideration ?

2) Were significant cost comparisons done on this possible fuel, as compared to direct coal or oil firing, and if so, what were the results ?

Page Three
December 7, 1981

Again, I would like to state that we are not questioning the basic premise of the report: that is to use more energy that is available in the United States. What we are questioning is the almost complete disregard of coal derived methanol with co-generation of electricity as an alternative to oil. I would hope that these comments are relayed to the Department of Energy and they take them into consideration.

If anyone has further questions on these comments, please contact Mr. Jack Meyer at our office.

Sincerely yours,

Stephen E. Kocsis
Executive Director

SEK:nm

ANTHONY D. CORTESE, Sc. D.
Commissioner

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Air Quality Control
One Winter Street, Boston 02108

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

I would like to take this opportunity to thank you for extending the comment period so that the Commonwealth can comment on the Draft EIS: Potential Conversion from Oil to Coal of 42 Powerplants in the Northeastern United States. Staff from the Division of Air Quality Control, the Division of Hazardous Waste, the Office of Criteria and Standards, and the Office of Planning and Program Management have reviewed portions of the Draft EIS.

The magnitude of assessing the proposed action, the alternatives, and various scenarios was certainly emense and you and your staff are to be commended for your efforts of assembling the information presented in the Draft EIS.

In general, the reviewers found the Draft EIS to be quite comprehensive. Close examination revealed several inconsistencies, however. These inconsistencies are noted in the attached review. The reviewers also noted a number of areas where additional information might help predict whether or not public health or un-vironmental effects might occur. Several scientific documents are attached which might be incorporated into the Final EIS.

Massachusetts has established a strong record of environmentally sound coal conversions. We know that a conversion program can continue without significant environmental impact. In fact environmental improvements can occur. What is needed is close attention to the environmental factors. This report adds the needed regional perspective to coal conversions.

Again I wish to thank you for the opportunity to comment on the Draft EIS. It is my hope that the attached comments will help your efforts in producing the Final EIS.

Sincerely yours,

Kenneth A. Hagg

Kenneth A. Hagg, Director
Division of Air Quality Control

AVA/kah/yw

Chapter 3

Alternatives Including the Proposed Action and Summary of their Environmental Effects.

3.2.2.3 Major Impacts of the Proposed Action

"... there are few substantial areas where regional, cumulative, or interactive impacts are expected to occur, and even in those areas the magnitude of the potential impact is small." page 3-11

MDAQC-1 Comment: We do not find this statement consistent with others within the EIS. As a matter of point we believe that the EIS indicates that there is the potential for exasperating subregional environmental and public health impacts. As examples we ite the potential for a 24-hour SO2 violations in the Boston Region (coal SIP scenario), incremental but potentially significant increases in primary and secondary sulfate as well as nitrogen oxides, ozone, respirable and non respirable TSP, and further exasperation of the already serious problem of acid deposition and toxic trace element deposition. Taken individually, it is possible that none of the impacts of the proposed action constitute a significant impact, but the aggregate effect does not appear to be less than significant.

"... SO_2 concentrations are expected to increase if candidate plants are converted from oil to coal." page 3-17

"The emissions from the converted powerplants could result in increased levels of sulfate and nitrate particles downwind of the emission sources." page 3-17

"The present state of the art does not allow a quantitative estimate of the effects of the proposed concentrations on the visibility of downwind areas." page 3-17

MDAQC-2 Comment: We suggest that there is some evidence which may help estimate the effects of the proposed concentrations on visibility. The work of CAPITA located in St. Louis, Mo. should be a good starting point. References are attached.

"Theoretically, the increased emissions of nitrogen oxides and hydrocarbons could also result in increased ozone formation as complex chemical reactions convert nitrogen oxides and hydrocarbons to ozone." page 3-17

MDAQC-3 Comment: Recent modelling by EPA has proven fruitful regarding the prediction of ozone generation. We have attached reference and graphics for your aid.

"The proposed action may result in an incremental decrease of pH in some of the poorly buffered lakes in the northern parts of the Deposition Region on a site-specific basis. However, the change in pH associated with the increase in acid deposition is likely to have little or no effect or aquatic species." page 3-25

MDAQC-4 Comment: We find this statement unsubstantiated, especially because many Northeast aquatic resources have poor or no buffering capacity, and hence will reflect changes in pH principally during spring snow melt and during intence acid rain events. An increase in acid loading (H^+ and $SO_4^=$) to sensitive aquatic ecosystems will likely effect acid sensitive aquatic spaces.

MDAQC-1 See Topical Response 3.7.2 through 3.7.11.

MDAQC-2 The DEIS was not intended as a quantitative assessment of impacts on visibility. The current state-of-the-art does not allow accurate or defensible estimates to be made. Current research in this area may eventually provide a procedure by which reasonable impacts can be predicted, but in this EIS the issue is addressed on a qualitative basis. The references submitted by the commentor have been noted and examined and are appreciated.

MDAQC-3 The USEPA does provide guidance for determining ozone generation. However, as stated in Response USDOI-5, detailed ozone analysis was not performed. The reference and graphics submitted by the commentor were examined and are appreciated.

MDAQC-4 Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). As a result, new modeling of the long-range transport of sulfur emissions associated with the conversion of these remaining powerplants has been conducted (Topical Response 3.2). The results of this analysis show the predicted increase in sulfur deposition to be much smaller than that discussed in the DEIS. The predicted increase in sulfur deposition associated with most polluting emissions scenario (Modified Coal SIP) is expected to be less than 2% over much of the Northeast, including sensitive areas such as the Adirondacks. Deposition in the vicinity of New York City would be expected to increase 3-4%. The actual conversions of candidate power plants may well occur under one of the other, less polluting emissions scenarios (Section 5.1 of the DEIS and Topical Response 3.1), which would further reduce sulfur emissions. The relatively small predicted addition to sulfur deposition should not add appreciably to snow pack acidity. The impacts caused by this slight increase in sulfur deposition are likely to be minor. The predicted increase in nitrogen dioxide emissions associated with the proposed action is discussed in Responses NYDEC-24 and -39.

It is our contention that although an "increase acid deposition by 6% over the entire Deposition Region (?) may not present a significant increase on yearly basis (over the entire region), it will potentially cause significant additions to snow melt and acid rain events. We suggest that a more thorough examination be made of the effects of the "6%" increase (which unfortunately excludes potential acid contributions from increased nitrate) on sensitive aquatic ecosystems.

"On the basis of the NAAQSs, which are considered to be at least adequate by most reviews of the supporting scientific evidence on health effects, and published information which indicates that SO_2 in relatively innocuous when compared to other pollutants, it is fair to say that SO_2 concentrations caused by the coal conversion scenario per se do not present a serious health problem." page 3-28

MDAQC-5 Comment: Although SO_2 may be considered "relatively innocuous when compared to other pollutants "(such as plutonium or TCDD?) it is our position that the increases in SO_2 emissions of roughly 50 + % (Modified Coal SIP. Table 5.12, page 5-17) are not innocuous and will likely contribute to regional air pollution episodes which frequent portions of the Northeast. The various articles presented in the Human Health Effects Section of Atmospheric Sulfur Deposition Environmental Impact and Health Effects, edited by D.S. Shriner, C.R. Richmond, and S.E. Lindberg, (1980, Ann Arbor Science Publishers) are particularly informative.

MDAQC-5 Under the worst-case scenario, the regional emissions of SO_2 from coal conversion will increase about 3%. The health analysis in Topical Response 3.7.2 concludes that short-term concentrations may contribute to increased symptomology in a portion of exposed persons with preexisting disease.

"The main health concern related to sulfur oxide emissions is the conversion of SO_2 to sulfates, ...
"While trends are unknown, atmospheric sulfate levels over many of the urban areas of the Northeast Region currently exceed or approach threshold values for health effects discussed in section 4.6.3.2." page 3-28

MDAQC-6 Comment: We concur with the first statement, and the latter part of the second statement. Trends in atmospheric SO_4 levels though not fully doucmented are not completely undefined. Data from MAPS3S and SURE air monitoring networks should be of value. We attach our own data for Springfield, Massachusetts and encourage the use of the CAPITA data which is also attached.

MDAQC-6 A discussion of current sulfate concentrations in the Northeast appears in Appendix B, Existing Air Quality in the Northeast Region.

"The sulfate increment resulting from the proposed fuel conversions (under the worst-case scenario) is, on the average, only on the order of 1% over the Combustion and Deposition regions (see Sec. 5.14)." page 3-28

MDAQC-7 Comment: According to Figures 5.1 and 5.3 there appears to be a significant increase in the extent and concentration of SO_4 over the Northeast Region. It may be misleading to state that "On the average" the increase will be "on the order of 1%" for the Combustion and Deposition Regions (the entire deposition region?).

MDAQC-7 The percentage increment is now presented in map format in Topical Response 3.2 to minimize misunderstanding of relative budget changes.

"The 42 power plants in question..." emit "approximately 250 tpd of nitrogen oxide emissions."
page 3-28

"... the effects of the proposed fuel conversion would be to add roughly 120 tpd to current nitrogen oxide emissions representing a 2% increase in the Region."
page 3-28

"... considering the general upward trend in nitrogen oxide emissions in the U.S., incremental nitrogen oxide emissions from conversion deserve some attention."
page 3-28

MDAQC-8 Comment: The increase in NO_x emissions of the order of 120 tpd or 43.8×10^3 tons per year may be significant when viewed from the perspective of its role in increasing SO_2 to SO_4 transformation rates. Is the 2% increase in NO_x based on total NO_x emitted by just the power facilities or is it from all sources (auto, industrial combustion, etc.)?

MDAQC-8 The 2% increase is based on total nitrogen oxides emitted by all sources.

"... there are documented studies (Ferris et al. 1971, 1973, 1976; see Sec. 4.6.3) that indicate that the present TSP standards provide adequate protection for public health. Therefore, no detectable adverse impact from TSP increment generated by the proposed fuel conversions are expected."
page 3-28

"However, slight increases in TSP concentrations due to coal conversions "are predicted to produce, or contribute to, violations of annual AAQS for TSP in some subregions;"
page 3-29

MDAQC-9 Comment: We assume that TSP standards have been set to protect the public health. Since there appears to be the potential for TSP concentrations to increase due to coal conversions and "contribute to or cause violations" of an annual AAQS for TSP, we find the above quotes inconsistent. Also since some of the increased TSP will undoubtedly be particles in the respirable range, should not the question of increases in respirable TSP be addressed separately and in depth?

MDAQC-9 The lowest average TSP concentration at which adverse health effects have been observed is 180 $\mu g/m^3$ (see Topical Response 3.7 and Appendix C.2). Pulmonary function decreased and symptoms appeared in adults chronically exposed to this concentration. Sensitive asthmatics exposed to this level of TSP for short periods with simultaneous exposure to 180 $\mu g/m^3$ SO_2 may experience increased symptoms. Therefore, the annual average TSP AAQS seems to incorporate a safety factor for the most sensitive individuals, while the short-term standard of 260 $\mu g/m^3$ does not. Marginal exposure to TSP concentrations in excess of the annual AAQS for particulates reduces the safety margin, but is not in itself expected to cause adverse health consequences. Twenty-four-hour (or less) concentrations of TSP near the short-term AAQS may increase symptoms in highly sensitive persons if high levels of SO_2 are also present. See Topical Response 3.7.4 for a discussion of expected increases in respirable particulate emissions and associated health impacts.

"At present, radionuclides, trace elements, and polycyclic organic matter are not covered under the Clean Air Act." "Unfortunately plant-specific and regional exposure information is not available for these emissions." "... health effects assessment was conducted using generic exposure information..." "In general the emissions levels anticipated for these materials are not expected to cause adverse health effects."
page 3-29

"In summary, since the additional air quality impacts arising from the proposed fuel conversion in the Northeast Region are expected to be minimal, the incremental health impacts are not expected to be significant."
page 3-29

MDAQC-10 Comment: The second quote "In summary..." cannot be substantial because little is known about the emission levles, current exposure levels, and anticipated exposure levels for radio-nuclides, trace elements, and POM. We suggest that a strong statement of these facts be incorporated into the text. There seems to be little basis in fact to state that impacts "are expected to be minimal" or insignificant. The following quotes underscore the potential for significant and non-minimal impacts.

MDAQC-10 Refer to appropriate sections of Topical Response 3.7 and Appendices B and C and Responses NJDEP-5, and -6, and NU-4.

Section 4.6.3.2 Combustion Region

"Respirable particulates (approximately 2 μ diameter or less) play a critical role in the development of human respiratory disease because they provide a vehicle for the deposition of toxic substances deep into the lung. Several of the toxic elements released to the atmosphere during coal combustion are associated with small-particle emissions. Some compounds found concentrated on the surface of fine particulates are not only known to be toxic but are also suspected carlenogens. (e.g., polycyclic organic matter, and all compounds of the elements lead, cadmium, arsenic, nickel, and chromium."

page 4-78

"Studies of the effects of NO_2 on human populations have revealed slight increases in respiratory illness and bronchitis morbidity, and decreases in pulmonary function at a mean concentration of 30-150 ppb (150-280 $\mu g/M^3$). In one community study, the Lower limit at which health effects were noted as 60 ppb (113 $\mu g/M^3$) (Sly et al. 1970a. 1970b)."

page 4-78

"Increased acute respiratory diseases and chronic bronchitis have been observed at sulfate levels of 9-15 ug/M^3. Concentration of 6-10 ug/M^3 of suspended sulfates were estimated to aggravate asthma, and cardiopulmonary symptoms in the elderly were observed at levels of 6 ug/M^3."

page 4-77

Section 4.2.3.2 Surface Water Quality

"Major water quality problems in the region include... and deposition, ..." "... acid deposition has created serious acidification of a large number of freshwater lakes in the Adirondack Mountain area and in New England..."

page 4-25

MDAQC-11 Comment: We concur with this statement. It is our position, however, that unless significant emission reductions do not come about in the next 5-10 years, then the currently unacceptable acid loading will continue into the 21st century and numerous aquatic ecosystems will acidify. Therefore we view any increases in either NO_x or SO_x with caution because they might (or will) contribute to an already unacceptable situation.

Section 5.1.4.2 ASTRAP Modelling Results

"ASTRAP simulations of the relative increase of sulfur deposition sited by wet processes are thus used instead for the relative increase of acid precipitation."

page 5-14

"ASTRAP is applicable at the regional scale the effects on a local and urban scale are not addressed here."

page 5-14

MDAQC-12 Comment: Because of the current acid deposition problem and the potentially significant impacts of this conversion action on the acid deposition problem, it is our position that every effort should be made to accurately predict long term and event impacts. We strongly suggest that other LRT models be applied (such as the Fay LRT Model and the ENAMAP Model) to predict the impact(s) of the proposed action and that all models be verified using 2 years of existing field data - S deposition and SO_2/SO_4 levels in ambient air. The data are available from a number of sources including SURE, MAP3S , NADP and DOE.

MDAQC-11 The results of computer simulations of the transport of air pollutants originating from the 42 conversion candidate powerplants and the resultant deposition of these pollutants are presented and discussed in Section 5.1.4 of the DEIS. The conversion of powerplants from oil to coal would create only minor changes in the pH of water bodies in the Deposition Region. There is a potential for more significant impacts in areas of Nova Scotia mainly because the waters of lakes and streams in those areas are potentially sensitive to acidification (Sec. 4.2.4 of the DEIS). However, the magnitude of the change that could be attributed to the proposed action alone is insignificant, amounting to a decrease in pH of less than 0.03.

Further discussion of acid deposition is presented in Topical Responses 3.2 and 3.6.

MDAQC-12 A version of the Fay model and ENAMAP, along with ASTRAP and five other models, were intercompared with observations of atmospheric sulfate concentrations and wet deposition of sulfate in the Phase III effort of the U.S.Canadian scientific research for the Memorandum of Intent on Transboundary Air Pollution. None of the models address local or urban scales, and none can be compared to dry deposition, since it is not yet monitored. Some models adjust dry deposition velocities to rates unsupported by recent characterization studies, in order to fit better the atmospheric concentrations and wet deposition. This is improper, and is not the approach taken by ASTRAP.

Section 5.2.4 Deposition Region

"... precipitation of some storm events in parts of the Northeastern U.S. is in the 4.0-4.2 range (class 19--).

page 5-40

"Therefore, the most direct impacts of acid deposition on water quality could potentially include Lowering of pH and reduction of buffering compacity of water. However, <u>the decrease in pH attributable to the predicted 6% maximum increase in acid deposition resulting from the proposed action</u> (Sec. 5.1.4) <u>corresponds to a decrease in the pH of the precipitation by at the most 0.03 pH unit</u>."

page 5-41

Section 5.1.4.1 Introduction

"... sulfate values calculated by the models can be used as a substitute for acid deposition only with some caution. It is likely to be a reasonable approximation for small changes in emissions, concentration, and deposition rates, but may not be valid for large changes."

page 5-13

"The main limitations on long-range transport model applications...
4) There is no way to check the validity and accuracy of the model results
5) Neither nitrogen nor hydrogen in chemistry is taken into account in the models."

page 5-15

"The conversion of powerplants from oil to coal would only create minor changes in the pH of water bodies in the Deposition Region. There is a potential for more significant impacts in areas of Nova Scotia mainly because the waters of lakes and streams in those areas are potentially sensitive to acidification (Sec. 4.2.2), but the magnitude of the change that could be attributed to the proposed action <u>alone</u> is insignificant amounting to a decrease in the pH of less than 0.03, as noted above."

page 5-41

MDAQC-13

Comment: Current information indicates that the Northeast receives an annual average pH of between pH 3.9 and 4.3. In Massachusetts the annual average is between pH 3.9 and pH 4.1. Individual storm events, however, are frequently between pH 3.5 and pH 3.9 and infrequently have pH values between pH 2.9 and pH 3.5. In all, the acidity of the precipitation in the Northeast is significant.

According to the data presented in figures 5.2, 5.4, and 5.6 increased sulfur deposition attributed to the proposed action will likely <u>increase the areal extent and rate</u> of deposition over much of the Northeast (Modified Coal SIP). Using these figures and interpolating data for Massachusetts we find the following:

S deposition

Current			Predicted Increase	ASTRAP Background
Wet	Summer	5-10 mg/M^2	10^+ mg/M^2	100-200 mg/M^2
	Winter	5-10 mg/M^2	10^+ mg/M^2	---------
Dry	Summer	7-25 mg/M^2	20-35 mg/M^2	50-100 mg/M^2
	Winter	5-10 mg/M^2	7-12 mg/M^2	---------

MDAQC-13 See Responses MDAQC-7 and USEPA-5, and Topical Response 3.2.

MDAQC-14 Before such "no adverse impact" statements can be justified it will be necessary to determine the emission amounts and the rate of deposition. Furthermore, since the trace elements persist in the environment, some attempt should be made to predict the cummulative impact over the next 10-20 years (see quote below). Trace elements have already begun to accumulate in the sediments of New England at an accelerated rate (refer to Dr. Norton's work on this subject).

"Short-term impacts to aquatic ecosystems are not expected to be significant on a regional basis; however, potential long-term impacts on ecosystems could occur if trace elements persist or accumulate to toxic levels (Van Hook 1979)."

page 5-56

"In view of these relatively small increments in sulfate and sulfur deposition; it is doubtful that the proposed fuel conversion will worsen the existing sulfate problem."

page 5-63

Section 5.6.3 Combustion Region

"The 1972 sulfate levels in the Northeast U.S., 13.6 ug/M^3 in urban air and 10.2 ug/M^3 in Non-urban air USEPA 1975, already exceed some of the threshold values presented in these studies. Therefore, any adverse health effects would appear to be primarily the result of existing sulfate levels rather than the 1% increase in sulfate levels expected as a result of the proposed action. In any case, increases in health efforts attributable to small incremental changes in air quality resulting from the proposed action are not quantifiable at present."

page 5-72

MDAQC-15 Comment: We find the last sentence in the second quote and the first quote totally inconsistent, in light of the fact that Northeast SO_4 values are approaching or exceed threshold levels for health effects. Also the 1% increase in sulfate levels undoubtedly represents an increase over a large region. In figures 5.1 and 5.2 the depicted increases and the extreme highs are well above the 1% levle quoted. This inconsistency needs clarification.

It is not altogether clear whether the SO_4 values are primary or secondary sulfate, or both. This point needs to be clarified throughout the text.

Again, ASTRAP modelling should be done for more than 2 month periods. The use of very limited meterological data is not acceptable. The model should be run using data from existing data sources and verified. Two years worth of data are available from SURE, EPA, and othe sources. Are there other Models, such as the Fay Model, which can also be used to predict SO_4 levels? If so how do they compare?

MDAQC-14 The regional concentration or deposition increments, regardless of modeling assumptions, are within the noise level of normal meteorological variations and thus are extremely difficult to quantify as to effects.

Many attempts have been made to predict the cumulative impacts to aquatic and terrestrial ecosystems of long-term (20-40 years) trace element deposition. These include the modeling studies of Vaughan et al. (1975), Dvorak et al. (1977), and Evans et al. (1980). In all cases, the predicted accumulation of trace elements in both terrestrial and aquatic ecosystems was considered very small. (See also Response MDAQC-17.) The statement in question is part of a discussion of the impacts to aquatic biota and habitats from coal combustion waste collection and disposal (Sec. 5.4.3.4 of the DEIS). This statement is amended as follows:

"Short-term impacts to aquatic ecosystems are not expected to be significant on a regional basis; however, potential long-term impacts on ecosystems could occur unless coal-combustion waste disposal sites are properly designed, constructed, and reclaimed to contain deposited waste materials (Soholt et al. 1980)."

The statement is amended to indicate the potential source of long-term impacts, i.e., the failure of containment systems at waste disposal sites due to poor design, construction, or reclamation (Soholt et al. 1980).

While work by Norton and others does indicate increased trace element loading in recently deposited sediments, no attempt is made to identify the source of these inputs (S.A. Norton, personal communication). In fact, one of the metals that has increased most in sediments is lead. The likely source of this enrichment is automobile exhaust, not coal combustion emissions.

REFERENCES

Dvorak, A.J., et al. 1977. The Environmental Effects of Using Coal for Generating Electricity. NUREG-0252. Prepared by Argonne National Laboratory, Argonne, Ill., for the U.S. Nuclear Regulatory Commission, Washington, D.C. 221 pp.

Evans, D.W., J.G. Wiener, and J.H. Horton. 1980. Trace element impacts from a coal burning power plant to adjacent terrestrial and aquatic environments. J. Air Pollut. Control Assoc. 30:567-573.

Soholt, L.F., et al. 1980. Handling of Combustion and Emission-Abatement Waste from Coal-Fired Power Plants: Implications for Fish and Wildlife Resources. FWS/OBS-80/33. U.S. Fish and Wildlife Service, Biological Services, Biological Services Program, National Power Plant Team. 184 pp.

Vaughan, B.E., et al. 1975. Review of Potential Impact on Health and Environmental Quality from Metals Entering the Environment as a Result of Coal Utilization. Battelle Energy Progress Report, Pacific Northwest Laboratories--Battelle Memorial Institute, Richland, Wash. 75 pp.

MDAQC-15 The sulfate concentrations shown are for total sulfate (primary plus secondary). It is conceded that simulations over more meteorological periods would be desirable, but the available analyzed fields of wind and precipitation for the appropriate regions and scales are quite limited. The deposition increment is expressed as a percentage increment map in Topical Response 3.2.

It is not clear as to what field data are cited in the comment since dry deposition is not monitored at all (dust fall in plastic buckets is meaningless, as dry deposition is surface specific). In addition, wet/dry collectors are notoriously poor collectors of snow. ASTRAP results indicate approximate equality of wet and dry deposition. If that is not a consensus opinion it is at least a middle ground.

Additional discussion of current sulfate concentrations in the Northeast appears in Appendix B.6.

These data show that the ASTRAP predicted increase in S deposition is not insignificant when compared to either the current deposition rate predicted by ASTRAP or the background deposition rate. Furthermore, if the highest current and highest predicted increase S deposition values are compared, then some areas of the Depostion region (not denoted in the text) are predicted to show significant increases in S deposition. Given this information and the importance of accurately predicting the impact(s) of the proposed action,we strongly suggest that much more extensive work be conducted on LRT. On the same note, however, we are not completely convinced that ASTRAP accurately predicts S deposition on a scale much smaller than EASTERN NORTH AMERICA.

Also, we puzzle over the fact that ASTRAP appears to predict dry S deposition to be greater than wet S deposition during both the Summer and Winter periods (figures 5.2 and 5.4). This is completely contrary to most field data on S deposition and contrary to current theory. Again since this subject is so important, please elucidate on these findings.

"Groundwater degradation by recharge with acid rain probably would not be detectible in the Northeast Region, where the aquifiers are composed mainly of carbonate rock such as limestone or dolomite, or calcareous formations of some type, since any acidic recharge would quickly be neutralized."
page 5-41

MDAQC-16 Comment: We find this statement. by and large unsupported by our own field data and those of the United States Geological Survey (USGS). It is our suggestion that USGS data be used in this context.

Section 5.4.3.3 Combustion

"However, Van Hook (1978) concludes that the trace element enrichment from coal combustion atmospheric effluents is not a significant hazard in surface aquatic systems." "Thus no adverse impacts are expected from the trace elements emitted from the converted powerplants."
page 5-41

"Concentrations of trace elements in atmospheric emissions from coal-fired powerplants do not appear to be significant ecological hazard (Van Hook, 1979)."
page 5-53

"Long-term regional impacts may be of concern if trace elements persist or are allowed to accumulate to toxic levels."
page 5-53

MDAQC-17 Comment: Van Hook (1979), however, does state that an accumulation or persistence of trace elements can cause potential hazards. Several studies in the Northeast have shown that a) the rate of trace element deposition appears to be increasing in aquatic ecosystems and that b) these elements appear to persist in terrestrial environments (references attached). Because of these facts we cannot concur with "no adverse impacts are expected" especially since the amounts of these elements emitted and their deposition rates are not well known. We suggest that you consult Galloway, Eisenreich, and Scott 1980. Toxic Substances in Atmospheric Deposition: A Review and Assessment published by the National Atmospheric Deposition Program.

MDAQC-16 The U.S. Geological Survey field data suggested in this comment are not specific, and are unavailable for review. However, the description of the aquifers in the region was based primarily on both the state and U.S. Geological Survey data (see cited references). Furthermore, it was indicated in the statement that only in regional aquifers composed of carbonate rock or calcarceous formations of some type (see DEIS Fig. 4.7 for areal distribution of rock formations) would the acid rain impact on groundwater not be detectable. In areas where the aquifers are composed of intensely fractured or faulted crystalline rock, the acid deposition would affect the pH values in groundwater. However, the expected maximum change in pH would be about 0.03 (see Sec. 5.2.4 of the DEIS). In addition, as indicated in DEIS Section 4.2.3.4, most of the groundwater withdrawal in the region is primarily for industrial, commercial, and domestic uses. The small change in pH would not affect these uses.

MDAQC-17 As noted in the comment, Van Hook (1979) does indicate that potential long-term impacts on ecosystems could occur if trace elements emitted from coal combustion persist or accumulate in ecosystems to toxic levels. This conclusion is based upon reports of adverse effects on soil/litter communities and possible alterations of primary productivity following trace-element enrichment (Tyler 1972, 1975). However, several modeling studies (Vaughn et al. 1975; Dvorak et al. 1977; Page et al. 1979; Evans et al. 1980) and field investigations (e.g., Klein and Russell 1973; Horton et al. 1977; Lyon 1977; Evans et al. 1980) have indicated that the amounts of trace elements accumulated in terrestrial and aquatic ecosystems following long periods of exposure (24-40 years) to emissions from coal-fired powerplants will be negligible. Slightly increased levels of some trace elements (cadmium, copper, iron, molybdenum, nickel, selenium, strontium, tungsten, and zinc) may occur in the biota of systems exposed to trace element deposition. However, it is unlikely that potentially toxic concentrations will result. It should also be noted that the soils of the northeastern United States do not contain enough molybdenum or selenium to meet the nutritional requirements of animals (Kubota and Allaway 1972). This further reduces the potential for adverse impacts caused by the addition of these elements to terrestrial or aquatic ecocsystems through coal combustion emissions. Therefore, it does not appear that the persistence of trace elements released to the environment through the proposed action would cause a significant impact.

REFERENCES

Dvorak, A.J., et al. 1977. The Environmental Effects of Using Coal for Generating Electricity. NUREG-0252. Prepared by Argonne National Laboratory, Argonne, Ill., for the U.S. Nuclear Regulatory Commission, Washington, D.C. 221 pp.

Evans, D.W., J.G. Weiner, and J.H. Horton. 1980. Trace element impacts from a coal burning power plant to adjacent terrestrial and aquatic environments. J. Air Pollut. Control Assoc. 30:567-573.

Horton, J.H., R.S. Dorsett, and R.E. Cooper. 1977. Trace elements in the Terrestrial Environment of a Coal-Fired Powerhouse. DP-1475. Savannah River Laboratory, Aiken, S.C.

Klein, D.H., and P. Russell. 1973. Heavy metals: fallout around a power plant. Environ. Sci. Technol. 7:357-358.

Kubota, J., and W.H. Allaway. 1972. Geographic distribution of trace element problems, pp. 525-554. In J.J. Mortvedt, P.M. Geordano, and W.L. Lindsay (eds.), Micronutrients in Agriculture. Soil Science Society of America, Inc., Madison, Wis.

Lyon, W.S. 1977. Trace Element Measurements at the Coal-Fired Steam Plant. CRC Press, Inc., Cleveland, Ohio. 136 pp.

Additional Comments

Appendix H. Regulatory Considerations of Solid Waste Disposal in the Northeast Region

MDAQC-18

Will 404 of the Clean Water Act have to be satisfied?

Section 404 is administered by the Army Corps of Engineers and not the USEPA.

In Massachusetts site assignment for the disposal of material in a landfill is carried out by the local Board of Health.

Section 4.3.3.2 Potential Use of Land for Waste.

MDAQC-19 page 4-47 In Massachusetts there is an outlet for ash as a landfill cover.

Section 5.4.3.4 Waste Collection and Disposal

MDAQC-20

We do not concur with the following quote.

"Thus the relatively high frequency of precipitation, low evaporation rates, and low wind speeds typical of the Northeastern United States will aid in preventing the ash and Sludge wastes from drying and contributing to fugitive dust."

We are concerned over the potential impacts of fugitive dust from ash and sludge wastes because of extended summer dry periods and high winds.

Page, A.L., A.A. Elseewi, and I.R. Straughan. 1979. Physical and Chemical Properties of Fly Ash from Coal-Fired Power Plants with Reference to Environmental Impacts. Residue Rev. 71:83-120.

Tyler, G. 1972. Heavy metals pollute nature, may reduce productivity. Ambio 1:52.

Tyler, G. 1975. Effects of heavy metal pollution on decomposition and mineralization rates in forest soils, p. 217. In International Conference on Heavy Metals in the Environment. Toronto, Canada, October 1975, Vol. II, Part 1.

Van Hook, R.I. 1979. Potential health and environmental effects of trace elements and radionuclides from increased coal utilization. Environ. Health Perspect. 33:227-247.

Vaughan, B.E., et al. 1975. Review of Potential Impact on Health and Environmental Quality from Metals Entering the Environment as a Result of Coal Utilization. Battelle Energy Progress Report, Pacific Northwest Laboratories--Battelle Memorial Institute, Richland, Wash. 75 pp.

MDAQC-18 Refuse disposal facilities in Massachusetts cities and towns are sited by the local Board of Health. Public hearings are a required part of the siting process.

The Corps of Engineers does not at this time classify combustion wastes as "dredge and fill" material, and therefore does not consider 404 of the Clean Water Act to be applicable to ocean disposal of such wastes (telephone conversation, U.S. Army Corps of Engineers, New England District, April 2, 1982).

MDAQC-19 Information provided in this comment has been incorporated into Topical Response 3.5 (Waste Disposal).

MDAQC-20 The relatively humid climate of the northeastern United States will aid in preventing fugitive dust emissions from ash and sludge disposal areas. It should also be noted that upon drying, fly ash and scrubber sludges form surface crusts that are fairly resistant to wind erosion. When these characteristics are considered in conjunction with appropriate disposal-site design and operating procedures (see Soholt et al. 1980) that will also limit wind erosion, the impacts of fugitive dust from coal combustion and emission-abatement waste disposal areas even during dry periods and high winds are likely to be small. Consideration of the impacts of fugitive dust from ash and sludge disposal areas will be an important part of the site-specific EISs prepared for each conversion candidate powerplant.

REFERENCES

Soholt, L.F., et al. 1980. Handling of Combustion and Emission-Abatement Waste from Coal-Fired Power Plants: Implications for Fish and Wildlife Resources. FWS/OBS-80/33. U.S. Fish and Wildlife Service, Biological Services, Biological Services Program, National Power Plant Team. 184 pp.

Section 5.1.4.3 Other Concerns

"Conversion of 42 powerplants in the Northeast U.S. is predicted to increase the atmospheric concentration of oxides of sulfur, oxides of nitrogen, and some complex hydrocarbons. These increases will result in increased levels of sulfate and nitrate particles downwind of the emission sources." These increases may affect the visibility in downwind areas, but the increased concentrations are predicted to represent a small fraction of the present levels. The present state-of-the-art does not allow a quantitative estimate of the effects of the proposed concentrations on the visibility of downwind areas, but small increases are likely to result in small degradations in visibility." page 5-15

"Increased emissions of nitrogen oxide and hydrocarbons are likely to result in increased ozone formation. Complex chemical reactions covert nitrogen oxide and hydrocarbons to ozone, but no available techniques can accurately predict the increases in ozone formation and concentration likely to result from the proposed conversions." page 5-23

"It would be impossible to anticipate or predict a change in health effects resulting from a small (2%) incremental increase in nitrogen oxide levels; however considering the general trend of increasing nitrogen oxide emissions and the fact that nitrogen oxide levels already are high enough to warrant concern, the incremental nitrogen oxide emissions warrant some concern." page 5-72

MOAQC-21 Comment: It is our opinion that the increase in NO_x emission warrents much more attention. We would like to see a much more thorough write up on potential changes in subregional visibility, interaction with other pollutants to produce ozone, health effects, and acid deposition. In all, it is our opinion that the final EIS should describe much more fully the potential impacts of NO_x increases.

MOAQC-21 See Response NOAA-1.

Mass. Div. Air Quality Control

Additional Comments

MDAQC-22

The ambient air quality modeling performed for determining compliance with ambient air quality standards does not agree in several respects with information in the Department's files and with modeling results obtained by others. In particular:

The SO_2 emission limitations used for the coal and oil SIP are not the same as the actual requirements of the SIP. The SIP requirements are the same for oil and coal are the same and are shown below

Station	Sulfur in fuel
Mystic	0.55 lb/mmBtu heat release potential
New Boston	0.55
West Springfield	1.21
Mt. Tom	1.21
Salem Harbor	1.21
Somerset	1.21
Canal	1.21

MDAQC-23

Downwash has not been accounted for in these calculations. Some of these plants have very severe downwash problems. This should be looked at.

MDAQC-24

Modeling that has been performed in the past by the Boston Edison Company (and accepted by the Department) show that emissions from the Mystic and New Boston Stations will not cause or contribute to violations of the ambient air quality standards for SO_2. This modeling was done using the Industrial Source Complex (ISC) model.

MDAQC-25

EPA guidance requires that all major sources (greater than on hundred tons per year, actual) of the pollutant within 20 km of the source be included in the interactive modeling to determine if violations of the standards are likely. Admittedly, this would be a very large, if not almost impossible task given the magnitude of the project. But it does seem reasonable that large nearby sources should be included.

MDAQC-22 The information supplied has been used to develop the scenarios described and discussed in Section 2.

MDAQC-23 Downwash is a localized problem and will be dealt with in the site-specific analyses.

MDAQC-24 See Response NYDEC-7.

MDAQC-25 The impacts of existing large nearby sources are assumed to be manifested in the ambient air quality data. Any new PSD-permitted sources in the four sub-regions have been included in the modeling.

The State of New Hampshire
Air Resources Commission
Health & Welfare Building
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Tel. 603 271-4582

DENNIS R. LUNDERVILLE
Technical Secretary

January 4, 1981

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

I have reviewed the Draft Northeast Regional EIS for the Potential Conversion of 42 Powerplants from Oil to Coal or Alternate Fuels, October 81. One of the plants studied is the Schiller Station of the Public Service Company of N.H., located in Portsmouth, N.H.

NHARC-1

It might be worth noting in the Final EIS that the SO_2 emission limit which is being required by this Agency of Schiller if converted is considerably more stringent than the coal SIP limit for N.H. cited in the draft (4 lb/MM BTU) and used in the modeling for it. In 1980 the N.H. Public Utilities Commission ordered Schiller to convert, subject to the results of an air quality impact study to be conducted by our Agency. The study included sequential modeling (ISC) and was completed in May 1981. The modeling in support of the Draft EIS was based on protection of the NAAQS only, however New Hampshire has a regulation regarding interstate air quality impacts which requires that New Hampshire facilities shall not interfere with PSD measures in adjacent states as well as NAAQS. PSD (in Maine) was the controlling factor in the modeling results upon which this Agency has based its required SO_2 limit of 2.5 lb/MM BTU.

Sincerely,

Thomas M. Noel
Assistant Director
Air Resources Agency

TMN/kab

NHARC-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

STATE OF NEW JERSEY

DEPARTMENT OF COMMUNITY AFFAIRS

JOHN P. RENNA
COMMISSIONER

383 WEST STATE STREET
CN 800
TRENTON, N.J. 08625

February 16, 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street
Washington, DC 20461

RE: NJ8111202018 — Draft Northeast Regional Environmental Impact Statement - The Potential Conversion of Forty-Two Powerplants from oil to coal or alternate fuels

Dear Ms. Goldberg:

This Letter of Clearance is to certify that your application, with the State Identifier Number NJ8111202018, has met the Project Notification and Review System requirements of the U.S. Office of Management and Budget's Circular A-95 Revised and Chapter 85 of the New Jersey Laws of 1944.

The New Jersey State Clearinghouse has circulated the application to the appropriate state agencies and has received comments from five agencies relative to their final review. Based upon these comments, which appear below, the Clearinghouse recommends that the application be:

_____ Approved

__X__ Approved with conditions

_____ Disapproved

The comments received from the New Jersey Departments' of Environmental Protection and Energy have already been forwarded to your agency, a copy of which is attached.

NJDCA-1 The Hackensack Meadowlands Development Commission has submitted the following: "The impact of coal conversion at PSE&G's Bergen, Hudson and Kearny appears to be underestimated. Unproved air pollution devices are depended upon to preserve local air quality. The consumption of available PSD increments could inhibit or seriously restrict development in the Hackensack Meadowlands. Estimates of available space for disposal of waste materials from coal conversion are in error. Written comments will be forwarded to USDOE, if requested."

As a result of budgetary constraints, the Delaware Valley Regional

NJDCA-1 Since the DEIS was issued, the USDOE has determined that 27 of the original 42 powerplants constitute a more likely conversion scenario (see Sec. 1). Under this Voluntary Conversion Scenario, Bergen 1, Hudson, and Kearny will not convert (see Sec. 2 of the FEIS).

Planning Commission (DVRPC) has been forced to reduce its review activities as mandated by Federal A-95 Project Notification and Review System requirements. In order to insure that the regional perspective continues to be represented, the New Jersey State Clearinghouse has assumed the responsibility of circulating applications to the county planning board having jurisdiction. A copy of this application has been sent to the Burlington County Planning Board and comments have been received.

The County Department of Economic Development has made the following comment: "This Department has strong concern over the adverse economic impact which may be imposed by the Potential Conversion of forty-two Powerplants from Oil and Gas to Coal or Alternative Fuels. This conversion is the subject of the above referenced Draft Environmental Impact Statement (EIS) prepared for the U.S. Department of Energy.

NJDCA-2 Section 5.5.3.2. (PSD Consumption and Economic Growth), of the EIS states that 'conversions represent a potential economic impact to the economy... and... makes it more difficult, and generally more expensive, for other industrial categories that require PSD review to locate in the area. Thus, conversions which represent only small contributions to the economy in an area but which consume a significant portion of the available PSD increment may preclude greater economic growth in that area.'

The EIS predicts an adverse economic impact on our area. The EIS implies that soon methods for estimating the magnitude of this impact will be available to evaluate site specific concerns. We strongly believe that no action regarding conversion can justifiably take place until full economic impact can be measured at the site - specific level.

NJDCA-2 See Response MDNR-12.

NJDCA-3 The Burlington Generating Station (listed as Unit 7 in the report) has a strategic location, in the heart of Burlington County's industrial complex. This fact prohibits our Department from accepting any change to Unit 7 which would cause an adverse impact on the expansion of existing industry or the attraction of new into the area.

As soon as there is technical data available concerning the site specific impact that conversion of Unit 7 will have, we will again be happy to review the information. In the absence of such information we must withhold approval and if necessary support denial."

NJDCA-3 Comment noted. No change to Unit 7 will be made prior to the preparation of a site-specific EIS.

NJDCA-4 Also, the County Department of Health has made the following comment: "Without the benefit of being able to study the comprehensive EIS, the following concerns are set forth with the expressed request that these areas be addressed. Increased rail usage in the areas of Burlington County along the Delaware River from Palmyra to Burlington County without upgrading the existing railway lines in view of the recent and past history of derailments due to track conditions, may add to additional hazards of chemical tank car derailments. The overall energy and economic benefits otherwise would appear to outweigh the indicated air pollution impacts at the local level."

In conclusion, the New Jersey Department of Transportation has stated the following: "The particular facilities cited in the Draft EIS have both rail and water access for coal transportation. The facilities are located on rail lines which are apparently 'safe' from being abandoned. These facilities may also be receiving their oil via barge and would receive coal the same way.

NJDCA-4 This increased rail use would be from the Burlington plant only, and is to be addressed in the site-specific EIS.

NJDCA-5 The potential bottleneck at Port Reading if this facility is not improved

NJDCA-5 Comment noted.

February 16, 1982

can be averted by utilizing Oak Island, Croxton and Natural Docks."

As an applicant, it is your responsibility to include a copy of this Letter of Clearance when you submit your formal application to the Federal funding agency. Also, if you should change your formal application by submitting a request that differs substantially from this one, then you will have to resubmit your final application to this office for review.

If you have any questions, please call Vincent Amico of my staff at 609-292-2963.

Very truly yours,

Richard A. Ginman
State Review Coordinator

RAG:pp
CC: Mr. Rayburn Hanzlik, Administrator

DEPARTMENT
OF
ENERGY

STATE OF NEW JERSEY

101 COMMERCE STREET
NEWARK, NEW JERSEY 07102
PHONE (201) 648-3430

January 18, 1982

Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

We have reviewed the Draft Northeast Regional Environmental Impact Statement and the accompanying supporting document: Conservation and Alternative Energy Contributions and Environmental Impacts In the Northeastern United States. Our comments and suggestions are limited to the alternatives section of the DEIS.

The New Jersey Department of Energy (NJDOE) supports the effort by public and private concerns alike to move away from dependence on oil-fired generation facilities. Moreover, the NJDOE has established policy to encourage coal utilization through conversions where it is cost effective and environmentally acceptable (Draft Revisions to the New Jersey Energy Master Plan, 1981, p. D-13). However, we do not agree with the conclusion reached in the DEIS that conservation will have only a minor impact in reducing energy consumption. Our major criticism is that the conclusion is based on an inadequate analysis of conservation potential in the Northeast and sends the wrong message to public and private officials on the nature of this regions energy and environmental problems. Our specific comments are outlined below:

1. Need

NJDOE-1

- The statement is made on p. 3-34 of the DEIS that: "In all power pools, electricity use will expand in the period between 1978 to 1990." There is, however, no explicit discussion of the need for the forty-two powerplants in the DEIS. A forecast of electricity demand should be included in the DEIS.

NJDOE-1 Forecasts of electricity demand in the three powerpools are shown in Appendix D, Figure D.1. The 42 powerplants are base-load plants serving current demand. Consequently, they will be needed to serve demand, regardless of fuel source.

NJOOE-2

° The projections for the need for power on p. B-4 in the appendix to the supporting study are unrealistic, given the region's electricity rates and economic climate. New Jersey's electric utility forecasts have consistently been revised downward in recent years and the NJDOE currently forecasts a compounded energy growth rate of only 1.00% per annum over the next twenty years. Even in higher growth areas, such as California, the projected energy demand over the next twenty years is only 1.65% per annum (California Energy Commission, Energy Tomorrow, 1981, p. 92). The forecasts cited in the appendix should therefore be revised to reflect more realistic economic assumptions.

NJOOE-2 The reviewer confuses electricity growth with overall energy growth. According to the NJ Master Plan (Table 107), electricity demand will grow at a 2.5% rate for 1980-1990. Total energy growth is 1% per year. In Table 103 of the same document, natural gas consumption rises very slightly 1980-1990, while in Table 104, petroleum is forecast to drop in that period. Coal consumption (Table 102) is forecasted to rise significantly. This pattern is typical of all the states in the Northeastern powerpools. Additional detail is provided in Appendix D.2.

NJDOE-3

° The statement is made on p. B-7 that the BEPS will produce insignificant energy savings in the residential and commercial sectors due to small market shares of electric heating and cooling. Where then will the major increase in electricity occur? It is unlikely that industrial growth will occur at anywhere near the levels projected in the forecast on p. B-4.

NJOOE-3 USOOE believes that the assumptions regarding electric heating and cooling in the residential and commercial sectors are valid. Continued growth in Northeastern household formation, albeit at 1% per year, provides one source of growth in the residential sector and explains the strong growth of appliances vis-a-vis other end uses. Commercial sector new construction is increasingly electric-heated and -cooled. The industrial sector continues to expand its use of electricity. See Topical Response 3.11 and Appendix D.2 for more detail.

2. End Use and Conservation

NJOOE-4

° It is stated on p. I-1 of the appendix to the supporting study that: "Knowledge of residential end use is a prerequisite for accessing the potential of certain solar, conservation, and wood combustion technologies." This is just as true for the commercial and industrial sectors. However, end use data is neither presented or discussed even though conclusions are drawn on the effectiveness of conservation and alternative energy technologies in these sectors. We therefore question the validity of the analysis since inadequate data were clearly used.

NJOOE-4 Appendix Tables D.2 and D.8 provide the electricity end use data for residential, commercial, and industrial sectors that were used in the analysis.

NJOOE-5

° A number of conservation options are not discussed at all in the DEIS or supporting study. For example, conservation options that could reduce commercial lighting include: task lighting, high efficiency bulbs and tubes, electronic ballasts, and high efficiency reflectors and improved diffusors. One study (Resource Alternatives for Seattle City Light, Mathematical Science Northwest for Seattle City Light, 1981) indicates that 32 average MW could be saved in Seattle by reducing commercial lighting from 4 to 2 watts per square foot. Considering that Seattle City Light has the lowest electricity rates in the country, this is significant.

NJOOE-5 Additional major conservation options are considered in the analysis in Appendix D.3 and D.4. Only conservation concepts with major impact potential were considered in this additional analysis, however. Further, many of the Seattle City Light concepts for lighting improvement were oriented toward incandescent systems. The cited Seattle commercial sector reduction of 2 W/ft^2 from the current 4 W/ft^2 is much larger than the expected improvement of 0.5 W/ft^2 expected to accrue from New York state lighting standards, which are voluntary. Extrapolation from the Seattle lighting expectation cannot be made to the Northeast, given the New York information. Further, the New York standard should be accounted for in the utility forecast.

NJDOE-6

- There is no attempt to specify the actual levels of conservation. For example, on p. B-5 of the appendix, it is stated that: "Weatherization means the addition of insulation, storm windows, and storm doors." This is an inadequate description. Was the analysis of weatherization based on minimum energy code insulation levels of R-19 ceilings and R-11 walls or was it based on state-of-the-art levels and techniques such as R-38+ ceilings, R-19+ floors, R-19+ walls, vapor barrier, caulking and weather-stripping, and an air-to-air heat exchanger to reduce indoor air quality problems?

NJDOE-7

- The discussion of environmental impacts associated with conservation technologies cites indoor air quality problems. This implies tight residences with minimal air exchanges and thus implies far more conservation potential than cited in the DEIS (The literature on indoor-air quality has grown considerably in recent years. George Tsongas at Portland State University and Gary Roseme at Lawrence Berkeley Labs have both done extensive work on the issue and are excellent sources of reliable information).

NJDOE-8

The implication that conservation has little to offer (even by 1990) contradicts a number of studies far more in-depth and explicit than the DEIS supporting study. Some of these include: Our Energy: Regaining Control by Marc Ross and Robert Williams, the recent SERI study of solar and conservation potential in the United States, and recent work by the City of Seattle, Mathematical Sciences Northwest, and the California Energy Commission. Although these studies are not specific to the Northeast, they do indicate at the very least, that far better analysis can be done to assess conservation and alternative energy technologies.

To conclude, we strongly feel that the analysis is not rigorous enough to bear out the conclusion that conservation will play a minimal role in the Northeast. NJDOE will continue to pursue conservation as the least expensive, quickest, and least polluting of all our fuel options.

Thank you for the opportunity to comment on the DEIS.

Sincerely,

Edward J. Linky

Edward J. Linky, Esq.
Assistant Director
Division of Planning
and Conservation

EJL:jwp

NJDOE-6 The analysis was based on minimum energy code insulation levels. Also note that all-electric houses are much better insulated than heretofore believed, although additional caulking/weatherization is necessary. For example, the insulation level of electrically heated homes in the Northeast varies from R-19 to R-30 in the ceiling and R-11 to R-19 for walls. As for air-to-air heat exchangers, indoor air quality problems are generally not a problem for electrically heated homes unless they are designed to be very tight, an uncommon occurrence.

NJDOE-7 Only a small portion of the residential market will consider the long paybacks (2-3 years) associated with retrofitting a residence to reduce air infiltration to the point that air quality becomes an issue. Further, the environmental health problem cited is not considered a major issue for all-electric residences.

NJDOE-8 USDOE has reviewed the studies cited and remains confident that the predicted conservation contributions are valid. Many of the conservation improvements cited in the SERI study and Williams and Ross study already are in the conservation trends accounted for in utility forecasts. For example, Public Service of Electric and Gas Company (New Jersey) forecasts both residential heating and detailed appliance use. The appliance use forecast is paramount in the Northeast due to the large fraction it represents of the residential load.

Other conservation improvements will not be considered by individuals due to strict purchase criteria. From the utilities investment perspective of life-cycle cost criterion, many of these investments should be cost-effective. The individual, with his short investment payback period (2-3 years maximum for 85% of the potential market) will not make the improvements in anything approaching the level suggested in the SERI study or the study by Williams and Ross. In fact, Williams and Ross recognize this problem and suggest the need for more utility and government involvement. For a more detailed critique on each study cited, see Appendix D.5.

State of New Jersey
Department of Environmental Protection
Office of the Commissioner
CN 402
Trenton, N. J. 08625
609-292-2885

January 21, 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street
Washington, DC 20461

Dear Ms. Goldberg:

The New Jersey Department of Environmental Protection's Office of Environmental Review has completed its review of the "Draft Northeast Regional Environmental Impact Statement - The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels". The Draft EIS appears to address those concerns expressed by the Department's Division of Environmental Quality at the July 16, 1980 public scoping meeting in Philadelphia and in follow up written comments submitted August 18, 1980. The draft clearly shows that for all major conversion scenarios, the NAAQS for sulfur dioxide will be violated in the New York - North New Jersey subregion. Certain "mitigative" scenarios are investigated but not advanced.

Seven powerplants in New Jersey are identified in the Draft EIS for potential action. To date the Deepwater, Burlington and Sayerville generating stations have received proposed prohibition orders from your agency for certain units. For your information, at the Deepwater and Burlington stations, Atlantic City Electric and Public Service Electric and Gas are proceeding with the voluntary conversion to coal of specific units with the necessary air pollution control permits from the Division of Environmental Quality. Conversions are also being considered for Public Service Electric and Gas Company's Bergen Station and Jersey Central Power and Light's Sayerville Station.

Attached are several specific comments on air quality and solid waste related issues.

We wish to express our appreciation to the Department of Energy for the opportunity to review the Draft EIS. I hope our comments will help you in the selection of a course of action and with the preparation of the Final EIS.

Sincerely,

Lawrence Schmidt, Chief
Office of Environmental Review

Attachments

Comments

NJDEP-1 1. Particulates - Tables 4.5 and 4.7 in the draft EIS (pp. 4-7 and 4-9) incorrectly identify the cities of Jersey City and Camden as not meeting the primary air quality standard for total suspended particulates (TSP). Actually both cities are designated unclassifiable with respect to the primary standard and nonattainment for the secondary standard.

NJDEP-2 Baghouse and ESPs are expected to be used, but no analysis is given to show the effects of not using these devices. The report concludes that no "detectable adverse health impacts... are expected" but the potential emission levels are not defined.

NJDEP-3 The draft EIS does not adequately document that particulate emissions will insignificantly increase due to coal conversions at the subject power plants. The final EIS should identify the particulate emission limits for both oil and coal combustion for each plant. It should be noted that actual particulate emissions from oil combustion are usually much less than the allowable limit. To be conservative we would recommend that the difference between the actual emissions from oil combustion and the allowable limit be used as a measure of potential increase. In actuality this is close to the truth as it is more difficult and expensive to control particulate emission from coal burning boilers than oil. We believe, this bears scrutiny. As indicated by the air quality data, there is relatively little margin of safety for particulate.

NJDEP-4 We would suggest that the final EIS consider the alternative of limiting particulate emissions from each conversion to 0.03 lb/10^6 btu heat input, the current NSPS for large utility boilers. The State of New Jersey is currently requiring this limit for utility conversions. This may result in emissions below that from low sulfur oil. However, other states may not require such a low emission rate, and the conclusion that there will be no detectable health effects from particulates may not be valid. The final EIS should discuss how the uniform application of this particulate limit would lessen the quantity and impact of total particulates, fine particulates, trace metals, sulfates, and radionuclides expected from coal conversions at the subject power plants.

NJDEP-5 2. Radionuclides - The draft EIS (pp. E-11 and E-14) does not adequately discuss increased human exposure to radioactivity in fly ash from coal combustion. Because of the large number of conversion candidates and dense population in the New York Sub-region, the radiation doses presented in table E.9 (p. E-13) could be much higher. Also, no detailed estimate of existing background radiation is provided.

NJDEP-1 Tables 4.5 and 4.7 have been modified to correct this error (see Sec. 5, Errata and Addenda).

NJDEP-2 See the discussion on respirable-particle incremental increases from fuel conversion and the associated health analysis in Topical Response 3.7.

NJDEP-3 Particulate matter emissions from coal-fired facilities can be controlled. Several of the facilities included in this study presently burn oil with no particulate matter emission controls. The SIP emission limits for particulate matter under which these facilities operate are sufficiently high that with the modification required for coal firing, these facilities could easily attain or better the requirements. Also, the Oil SIP and Coal SIP emission limits for most plants were identical. It was therefore felt that assuming no particulate matter emission rate increases or decreases would adequately address the problem. (See also Response NEP-3 and Topical Response 3.1).

NJDEP-4 A uniform emission rate of 0.03 lb particulate matter per 10^6 Btu heat input would result in lower impacts than predicted in this study for those facilities presently emitting particulate matter in excess of 0.03 lb per 10^6 Btu heat input. An analysis of the impacts of such a limitation would require information on the actual pollution controls, fuel use, coal characteristics, and operating characteristics of the converted facilities that is not presently available. As stated in Response NJDEP-3, since the assumption of no changes in particulate emissions was made, no particulate matter modeling analysis was performed.

NJDEP-5 The radiation doses calculated by McBride et al. (1978) were for airborne emissions from a model, well-controlled 100-MWe coal-fired powerplant having a surrounding population of 3.5 million people within 88.5 km of the facility. The population density in persons per square km assumed for a radial distance of 8 km from the plant was 37; from 8 to 40 km, 49; and from 40 to 88.5 km, 170. The population density near the powerplants undergoing conversion in the northeast may be less than, similar to, or greater than that used by McBride et al. The population doses presented in Table E.9 of the DEIS are dependent upon population density and hence may also be less than, equal to, or greater than those that will actually occur in specific locations in the Northeast. The maximum individual dose commitments listed in Table E.9 are not affected by population density and would remain the same. The conservative assumptions utilized by McBride et al. (1978) may overestimate the population dose commitments that will actually be received in the northeast (Beck et al. 1980). In addition, the location of many of the plants near the ocean shore will tend to reduce population exposure to radiation in the same manner it has been projected to decrease exposure to other atmospheric contaminants (DEIS, Sec. 5.1.3).

Beck et al. (1980) have reviewed the subject of population exposure to radiation emissions from the coal fuel cycle. They assumed the use of coal containing higher average levels of uranium and thorium than was assumed by McBride et al. (1978), in a modern 1000-MWe powerplant designed to meet USEPA emission standards for particulates. These investigators estimated the maximum individual dose equivalent to the lung from exposure to uranium, thorium, and their daughter products to be 0.14 mrem/yr. This figure is 7% of that calculated for the lung by McBride et al. (1978). These authors identified the critical pathway for population exposure to be inhalation and the critical organ the lung. Based upon soil sample analysis around three operating powerplants, Beck et al. (1980) concluded that the dose from direct external exposure to nuclides deposited in the ground emenating from their model powerplant would be insignificant. Furthermore, they concluded, as did the National Council on Radiation Protection and Measurements in a 1977 report, that ingestion could be neglected as a potential pathway for increased population dose from coal-fired powerplants. This was calculated to be the major pathway of exposure by McBride et al. (1978). Therefore, it is expected that the population dose commitments received as a result of coal conversion in the Northeast would be much lower than those presented in Table E.9.

Maximum individual radiation exposure to the whole body and lungs from natural sources of radiation has been estimated to be 80 mrem/yr and 180 mrem/yr, respectively (NCRP 1975). Beck et al. (1980), in attempting to put the radiation dose from coal combustion into perspective, predicted that the population dose commitment received from 1 year of global electrical production of electricity from coal at present world capacity would be equivalent to that received during 0.02 days of exposure from natural sources.

REFERENCES

Beck, H.L., C.V. Gagolak, K.M. Miller, and W.M. Lowder. 1980. Perturbations on the natural radiation environment due to the utilization of coal as an energy source, pp. 1521-1558. In T.F. Gesell and W.M. Lowder (eds.), Natural Radiation Environment III, Vol. 2.

McBride, J.P., R.E. Moore, J.P. Witherspoon, and R.E. Blanco. 1978. Radiological impact of airborne effluents of coal and nuclear plants. Science 202(8):1045-1050.

National Council on Radiation Protection and Measurements (NCRP). 1975. Natural Background Radiation in the United States. NCRP Report No. 45. Washington, D.C.

NJDEP-6 The concentration of radioactive materials in bottom ash and captured fly ash which may be disposed of in landfills or sold by utilities, and resulting human exposure are only mentioned in the draft EIS (p. E-14) and should be discussed more thoroughly in the final EIS.

NJDEP-6 Beck et al. (1980) discussed the radiological properties of coal-fired powerplant wastes. They assumed that most of the captured fly and bottom ash was sluiced to holding ponds with approximately 20% being sold for use as landfill or building materials. The impact of the ash stored at the powerplant site was estimated based upon measurements of radon emanation (ratio of escape to production rates) of ash samples. In all cases the Rn-222 escaping from the vitrified, glassy fly ash particles was less than 1% of the production rate. This compares to 15% for coal, 20% for uranium mill tailings and up to 70% for soils. They concluded that little Rn-222 would be released from ash disposal ponds. The leaching of radionuclides from the sluice waters into public water supplies was also discussed. Previous measurements of sluice waters revealed that little dissolved activity was found despite the occurrence of high activity in suspended solids. These results indicate that fly ash is relatively insoluble in water. The impact of these insoluble particles on the natural radiation environment was concluded to probably be insignificant.

The ash currently being sold by utilities has been used for a variety of applications including the manufacture of cement and concrete where up to 30% of the cement medium may be comprised of coal ash. Other major uses include roadbase stabilizers, lightweight aggregate, road fill, and asphalt mix. The major health concern was seen to be increased radiation exposure to persons occupying structures built with ash containing materials. Naturally occurring terrestrial radionuclides are thought to increase the radiation dose to persons indoors by 130% of outdoor levels (NCRP 1975). The authors, therefore, concluded that the contribution of utility ash in building materials to population dose will be relatively minor. In fact, due to the low Rn-222 emenation rates from fly ash (less than 1%), building materials containing fly ash may actually decrease the population exposure to radiation from this source by decreasing levels of Rn in dwellings. The radiological properties of scrubber sludge were identified as an area where additional research is required.

REFERENCES

Beck, H.L., C.V. Gagolak, K.M. Miller, and W.M. Lowder. 1980. Perturbations on the natural radiation environment due to the utilization of coal as an energy source, pp. 1521-1558. In T.F. Gesell and W.M. Lowder (eds.), Natural Radiation Environment III, Vol. 2.

National Council on Radiation Protection and Measurements (NCRP). 1975. Natural Background Radiation in the United States. NCRP Report No. 45. Washington, D.C.

NJDEP-7

3. Sulfur Dioxide - The draft EIS (p. 5-7) presents several mitigative scenarios for the New York Subregion which provide for varying degrees of powerplants sulfur dioxide control. These scenarios were developed to reduce consumption of Prevention of Significant Deterioration (PSD) increments and the potential for contravention of the National Ambient Air Quality Standards (NAAQS).

The result for all major scenarios (pg. 3-19) appears to be violation of the NAAQS for SO_2 in the New York region. The EIS appears to conclude that scrubbers controlling low sulfur coal combustion (pg. 5-12) will only "mitigate" SO_2 emissions but not actually protection human health. This conclusion should be more clearly stated.

NJDEP-7 The latest background SO_2 concentrations, reflected in Topical Response 3.1, indicate that violations of NAAQS are unlikely to occur for any of the mitigating scenarios.

NJDEP-8

The analysis should have considered only partial conversion of the candidate plants in the region. The utilities could provide information on which units have the most potential for conversion. For some powerplants in the subregion there are physical space limitations which would prevent construction of scrubbers or make it economically unfeasible. Also, by prioritizing, the analysis could effectively allocate each conversion with the remaining available increment.

NJDEP-8 The information supplied has been used to develop the scenarios described and discussed in Section 2. Prioritizing conversions is regulatory in nature, and is not within the scope of this document.

NJDEP-9

The 1971 NSPS scenario (p. 5-6) assumes that low sulfur coal will be available for all the conversion candidates in New Jersey, and therefore assumes that scrubbing is not necessary to meet the emission limitation. Because of different boiler configurations, some units require specific coal types which may not be available with low sulfur content in a dependable long term supply.

NJDEP-9 Comment noted.

NJDEP-10

The draft EIS does not indicate the potential impact from all the conversions in the Philadelphia Subregion on the Brigantine National Wildlife Refuge in New Jersey, a Class I area for PSD.

NJDEP-10 The Brigantine National Wildlife Refuge, a PSD Class I area, lies outside of the area of predicted major impact. Incremental changes in 24-hour SO_2 concentrations in the area of Brigantine following the conversions can be inferred from the figures found in Topical Response 3.1. In all cases, the incremental change is less than 5 $\mu g/m^3$. Violations of SO_2 and TSP increments are not predicted to occur in the Class I area. Potential impacts on soils, vegetation, and visibility are impossible to predict at this time.

NJDEP-11

The presentation of the results of the air quality analyses in the draft EIS (pp. 5-5 to 5-12, and Appendix F) could be improved. Information regarding the relative contribution of each source to the maximum predicted concentrations would be helpful in assessing plant impacts. Areas of maximum interaction among groups of closely located plants could be highlighted, perhaps on a larger scale than the figures in Appendix F. This information combined with a knowledge of which plants are more likely to convert would help in development of subregional conversion strategies.

NJDEP-11 The degree of detail in the figures found in Appendix F of the DEIS is adequate to determine areas of cumulative impacts, which is the objective of the analysis.

4. Documentation - When the final EIS is issued, the Division would also like to receive copies of the supporting technical reports on air quality and waste disposal referenced in the Draft EIS (p. 5-75 Kornegay et al, and p. 5-76 Sequinsin et al).

NJDEP-12

5. The draft EIS indicates that under the Oil SIP Scenario (the burning of coal at the rate specified for oil in the current SIP) a 9.9% increase in the total waste quantities generated within NJ would occur by 1990. Ash would account for 4.4% of the 9.9%, and sludge from air pollution control equipment would account for 5.5% of the remaining increment.

The draft EIS further indicates that the waste stream disposal alternatives within NJ are "fair", since ash marketing possibilities exist within the state, and that ash is approved as a cover material at sanitary landfill.

As such, the following comments made:

A) Current regulations for New Jersey do not allow for the use of incinerator ash or wet scrubber sludge for landfill cover purposes. The use of such material for cover would be questionable due to it's porosity, its fine nature and inherent problems with dust, its ability for use on side slope stabilization, and its poor nutrient value for establishing final vegetative cover. Incinerator ash would be classified as waste type #27 Non-chemical Industrial Waste, and such must be handled, transported and disposed of as a solid waste. Scrubber sludge, depending on its chemical as well as physical characteristics could possibly be treated as a hazardous waste (due to heavy metals) or as a "liquid sludge" depending on dewatering steps and resultant flow charactersitics. In both cases, special waste handling and disposal requirements would have to be met. Disposal options within NJ are limited to non-existant for both of these waste catagories.

B) Ash marketing, which may have future application, has not been established to any extent within the state to date.

NJDEP-12 Information provided in this comment has been incorporated into Topical Response 3.5 (Waste Disposal).

NJDEP-13

6. In the absence of specific uses (as identified within the EIS) for the increased ash-sludge generated by the proposed coal conversion, sanitary landfilling becomes the only major viable disposal option available. As such the following comments are made:

Landfilling capacity within New Jersey will be decreasing with the forthcoming implementation of resource recovery facilities. Such plants will most likely be first located in the more populated areas of the state, where the disposal alternatives are the most limited and where solid waste generation is the greatest. Similarly, these areas are also the host sites for the seven utilities slated for coal conversion. Resource Recovery facilities will be generating incinerator ash and fly ash end products, as well as scrubber sludges. Residue disposal is provided for by landfilling at sites with remaining disposal capacity or through the opening of new-smaller landfilling operations.

NJDEP-13 The competing demands for disposal areas in the Northeast Region are recognized and discussed in Appendix I of the DEIS and in the supporting technical report on solid waste disposal (Saguinsin et al. 1981). Further discussion on this issue is included in Topical Response 3.5 (Waste Disposal).

REFERENCES

Saguinsin, J.L.S., et al. 1981. Northeast Regional Environmental Impact Study. Waste Disposal Technical Report. DOE/RG-0058. Prepared by the Division of Environmental Impact Studies, Argonne National Laboratory, Argonne, Ill., for the Economic Regulatory Administration, U.S. Department of Energy, Washington, D.C.

As such, utility ashsludge will be in competion with resource recovery operation for a more reduced landfill space. Secondly, computed solid waste disposal capacity will be increasing to meet anticipated increases in solid waste generation, but disposal will be by means of combustion which is not conductive to utility ashsludge disposal. Thirdly, failure on the part of the EIS authors to account for the future implementation of the resource recovery disposal option, minimizes the impact the oil to coal conversion will have on the total solid waste stream contemplated for 1990. For example, if 50% of the solid waste in NJ was to be disposed of via incineration, the 9.9% increase anticipated by oil to coal conversion would more realistically approach a 19% by volume increase (assuming 95% volume reduction).

NJDEP-14

The draft EIS refers to making use of the remaining ambient air quality PSD increments in the proposed conversion from oil to coal combustion operations. As such the following comments are made:

The draft EIS fails to address how the implementation of the planned resource recovery projects will impact on the "remaining increment" (in some areas the increment does not exist now), and how the use of the remaining increments may be mutually exclusionary to the oil to coal conversion proposal and resource recovery implementation in New Jersey.

NJDEP-14 Because conversions will take place at different times and because there is no way of predicting changes in a region's emission inventory, PSD availability for different locations is impossible to determine within the scope of this document.

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE AND MARKETS
J. ROGER BARBER, COMMISSIONER
ALBANY, NEW YORK 12235

February 5, 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

RE: Correspondence with addendum February 4, 1982--corrections

Dear Ms. Goldberg:

Regarding this agency's recently submitted comments on the Draft Northeast EIS--The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels; please be advised that certain typographical errors occur in the addendum.

NYDAM-O

The following corrections should be made:

Page 9, paragraph 5, second sentence reads: "With increasing omissions of. . ." The word omissions should be changed to emissions.

Pg. 15, paragraph 1, sixth sentence reads: "Likewise, then combined. . ." The word then should be changed to when.

Thank you for tending to this detail.

Sincerely,

John Lacey
Rural Development Specialist III
Environmental Resource Unit

JL:tv
cc: Fred Howell, NYS DEC, Bureau of Energy

NYDAM-O The changes were made.

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE AND MARKETS
J. ROGER BARBER, COMMISSIONER
ALBANY, NEW YORK 12235

February 4, 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C.

Re: Comments on DOE/EIS-0083-D; Draft Northeast Regional Environmental Impact Statement--The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels.

Dear Ms. Goldberg:

Our Department appreciates the opportunity provided for comments on the Draft Northeast Regional EIS-The Potential Conversion of Forty-Two Powerplants from Oil to Coal or Alternate Fuels. Due to late receipt of materials, though, our full response was not provided to this State's comment-coordinating-agency (the Department of Environmental Conservation), by the established date. Hence, we hereby submit this letter and its addendum, directly.

The Draft EIS presents a primary objective of recognizable merit, i.e. the potential conversion of forty-two powerplants from oil to coal or alternate fuels. However, the EIS is significantly deficient in addressing several key interrelating issues, as well as potential adverse impacts and measures of mitigation. A major omission of serious concern is the whole area of Northeast Agriculture and New York State's Agriculture in particular.

In the addendum, we have contributed comments/recommendations aimed at the development of a credible Final EIS.

It is intended that such input will assist in rendering a beneficial energy program, one that meets the demands while preventing adverse impacts of a direct and an indirect nature. We have provided ample background on the importance of Agriculture to this State for use in preparing a more complete Final EIS. Data on the economics and the ranking of the State's crop production are furnished. Likewise, concerns about acidic precipitation and its precursors, based on air quality and vegetation research are entered.

Noted in the addendum is the recommendation for provision of mitigative measures in the Final EIS. A mitigative element of major importance is the establishment of a permanently on-going plant-sensitivity monitoring program; one that is directly integrated with the implementation of progressive emission standards for coal-burning powerplants in the Northeast region. This can provide a mechanism for minimizing the potential adverse impacts on Agriculture.

We hope that our Department's input will be useful in presenting a credible Final EIS.

Sincerely,

JOHN LACEY
Rural Development Specialist III
Environmental Resources Unit

Addendum

cc: Kim T. Blot, Agriculture & Markets, Division of Rural Affairs
Fred Howell, NYS Department of Environmental Conservation, Bureau of Energy

ADDENDUM-COMMENTS NYS DEPARTMENT OF AGRICULTURE AND MARKETS
ON
DRAFT NORTHEAST REGIONAL IMPACT STATEMENT THE POTENTIAL CONVERSION OF FORTY-TWO POWER PLANTS FROM OIL TO COAL OR ALTERNATE FUELS

Contents

NEW YORK AGRICULTURE

Agriculture is a multi-billion dollar business in New York, and one of the State's economic mainstays. The State is a top national producer of dairy products, several fruits, fresh market vegetables, and maple syrup.

The State's diverse physiography and soils are the foundation of the fourteen diverse agricultural regions of New York and a primary factor in making New York a variety-agriculture rather than a single-agriculture State.

—FOOD AND ECONOMICS

As the single largest enterprise in the state, farming and agri-business contribute not only dollars and jobs to the economy, but also provide a continual supply of high quality, reasonably priced food to the people of New York and for export. As the second most populous state in the nation, New York has the third largest rural population. Its 48,000 farms are distributed in all parts of the State, from Suffolk County, Long Island north to the St. Lawrence River, and west to Lakes Ontario and Erie.

In 1980, New York farms produced $2.4 billion of farm products, ranking the State 23rd in the Nation. New York is one of the nation's leading suppliers of numerous land intensive speciality products, as noted below:

CASH RECEIPTS FROM FARM MARKETING—AND PRODUCTION RANKING OF SELECTED COMMODITIES, NEW YORK STATE, 1980

Selected Commodity	Cash Receipts ($ million)	Ranking Among States
Apples	107.0	2
Grapes	38.0	2
Cherries	7.8	2 (tart)
Sweet Corn	19.7	7,2 a/
Cabbage	18.6	1,3 a/
Cauliflower	6.5	3
Onions	44.2	3
Snap Beans	26.5	3,3 a/
Beets	2.8	2
All Commodities	2,417.7	23

Source: NYS Crop Reporting Service, 1981.

a/ Processed and fresh, respectively.

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New York ranks third nationally in milk production. The value of milk and milk products used for home consumption in New York in 1980 was $1.4 billion. Besides fluid milk, other important dairy products produced include cheeses. The State ranks first in production of cottage and cream cheese, and third in all cheese.

Perhaps least understood is New York's role in the production of fruits and vegetables. Northeast location leads many to falsely believe New York's climate is not suited to the production of food crops. However, New York is a major producer of a wide range of fruits and vegetables. Only the State of Washington produces more apples than New York. With three major apple production regions, New York produces a large amount for processing as well as for the fresh market. Grapes are the second major fruit crop grown in the State. In addition to being No. 2 in the Nation for the production of apples and grapes, New York maintains the same rank in the production of tart cherries. Receipts from both sweet and tart cherries total almost $8 million.

New York is the fourth most important state in vegetable production. Sweet corn is a major fresh market crop, as are cabbage and cauliflower. Onions are the top cash vegetable crop; total production ranks third in the Nation. New York ranks third in snap beans produced for the fresh and processed markets. It ranks first in production of cabbage for kraut and is the second largest supplier of beets for canning. In all, the state ranks sixth in the production of vegetables for the processing industry.

Relative to jobs in the food industry alone there are over 455,000 employees in New York, engaged in production, manufacturing, wholesaling and retailing. Food processing has remained a consistently important contributor to the state's economy. Only four major manufacturing industries in NYS employ more than the 94,000 in the food processing (manufacturing) sector of the food industry and no other segment of manufacturing is more widely disbursed throughout the state.

The interdependence of food producers and processors is an important link in the overall picture of the food industry. The dominance of the state in fresh fruit and vegetable production should continue, as this State's farmers have expanded their output. Fruit and vegetable processors have responded to the expansion. More efficient and larger plants have been built, replacing the small and the outdated, and employment has actually increased. An average of more than 13,300 New Yorkers were employed in produce processing during 1979. Perishability of the product requires processing to occur as close to areas of production as possible.

—PRESSURES ON FARMING AND FOOD PRODUCTION

Although much of the food produced in New York is shipped out of the state, at the present time New York farms produce nearly 70 percent of the dairy products that state residents consume; 33 percent of the eggs; 43 percent of the vegetables; 31 percent of the fruit; 68 percent of the potatoes; as well as 13 percent of grain products. A 1980 report by the State Assembly Subcommittee on Food, Farm and Nutrition Policy states:

> ...pressures exerted by energy shortages and inflation may succeed only in driving the prices of goods up and not in increasing the production and consumption of locally grown food, which would hold prices down. Farmers have very little control over the distribution of their product while retailers and consumers see only a minimal connection between their needs and local farming activities. This need not always be the case.

The Subcommittee's report on food policy recognized that New York cannot become completely self sufficient; but nevertheless an increase in state and regional self sufficiency was encouraged.

State, national and world-wide economic prospects suggest problems ahead that cannot be ignored. For New York State, the economic value of agriculture and the social and cultural importance of rural communities compel attention to primary and secondary problems which test the continuing ability of family-owned and family-operated farms to survive.

NORTHEAST REGION, COMPLEX NEEDS

NYDAM-1 As far back as the mid-1970's national losses from air pollution damage to vegetation amounted to approximately $200 million annually based on agricultural prices and production figures.[1] While air pollution standards are established to arrest pollution and protect the environment, including vegetation, there are fundamental questions that have yet to be definitively satisfied; i.e. are the existing standards based on good data, are they realistic,[1] and will project-specific standards implemented in one locality be effective in controlling ambient air pollution when the standards between different locations (e.g. states, regions) may vary? A problem that is correspondent with air pollutants is the ecological and agricultural effects of acidic precipitation. This problem, however, enlarges to include the sources, transport and transformations of the components of the acidic precipitation. The significance of such components as sulfur compounds cannot be properly assessed in isolation from nitrogen compounds, ozone, hydrocarbons and suspended aerosols.[2]

NYDAM-2 The Draft Northeast EIS does not cover Agriculture's regional importance. The ability of New York and the Northeast to raise, process and market agricultural products close to the region's population centers is directly linked to the land resource and to the ambient weather. Productive farmland in the Northeast is a limited resouce. In acknowledgement of this, the Northeast EIS should specify the necessity of protecting and maintaining New York State's and the Northeast's industry and resource bases of Agriculture.

For the Final EIS, the inclusion of potential impacts on Agriculture and methods for mitigating such impacts are recommended as major means of improving the EIS's credibility. The Northeast EIS can be improved by emphasizing the use of quality coal conversion techniques which are firmly open for applying future pollutant controlling standards. Such standards should be based on an integrated, on-going monitoring program. In the scientific community the complexity of problems due to pollutant emissions has warranted expanded research. Such research must be persistent; and corresponding efforts of monitoring must be conducted as an on-going component of the Northeast's power plant conversion in order to provide a firm basis for establishing the policies for coal sources, revisable pollution control standards and land use. These requirements of effective research must be recognized by those responsible for planning and applying the conversion to coal for energy. Accordingly, the Northeast EIS should emphasize the intent to use coal conversion guidelines which will not irreversibly prevent the direct application of future upgraded emission adaptations based on on-going plant-sensitivity monitoring.

For the Department of Energy's constructive use in legitimizing the above noted Draft improvements, we are herewith contributing additional information....

1/ Diagnosing Vegetation Injury Caused by Air Pollution, 1976. Air Pollution Training Institute, U.S. Environmental Protection Agency.

2/ Research on the Chemistry and Ecological Effects of Atmospheric Pollutants Initiated By the Department of Energy; in: Scientific Papers From the Public Meeting on Acid Precipitation, 1978. New York State Assembly, (released, March 1979).

NYDAM-1 The potential impact of acid deposition on agriculture is discussed in Topical Response 3.3. The ecological impacts of acid deposition are discussed in Section 5.4 of the DEIS. While it is true that vegetation actually responds to the total pollutant loading rather than single pollutants, the influence of these mixtures on plant growth and development is poorly understood. The lack of understanding of this phenomenon prevents meaningful analysis of effects of pollutant mixtures on agricultural productivity. See also Response NYDEC-45.

NYDAM-2 The predicted effects of the conversion scenarios upon agriculture in the Northeast are minimal (see Topical Response 3.3). For this reason, the necessity to describe in depth the regional importance of agriculture, the necessity of protecting agricultural resources, recommendations of monitoring, and other similar issues was deemed to be outside the scope of this document.

NEW YORK-NORTHEAST AGRICULTURE

—VULNERABILITY

Evidence is steadily accruing that air pollution is affecting crop production and forest yields as well.[3] Concern for agriculture has developed over potential increases in oxides that could accompany greater utilization of coal as an energy source.[3] [4] Estimates provided in a Department of Energy report indicate that even if Federal Clean Air Act requirements were properly implemented the emission of sulfur dioxide from coal-fired utility boilers could increase 15 percent by 1990; and corresponding greater volumes of emission would occur through other industries conversion to coal.[4] In addition, if emission standards are discretionary between states and even between regions then potential air quality benefits of good planning and application in one locality can be compromised by the emissions from another locality. Accordingly, if firmly stringent emission requirements are not progressively upgraded, greater volumes will be discharged.[3]

NYDAM-3

If crop yields are permitted to become measurably affected by low level yet chronic exposure via coal burning facilities, the corresponding yield reductions will necessitate more agricultural land to meet the production needs; i.e. with a reduced yield per acre, more acres will be needed. The paradox for the Northeast is that the agricultural land base is heavily strained now due to the direct and secondary effects which were met on (former) farmlands by incremental, irreversible changes. One Northeast reaction to the critical need for in-region farmland has been the permanent or otherwise long-term commitment of land to farming. The major forms of commitment in New York State are local Agricultural Districts and individual 8-year agreements. Such approaches have been expanding throughout the Northeast. But, unless standards governing power plant emissions and coal ash - scrubber waste (disposals) are future-committed to progressively accommodate this region's present and future agriculture, then the farm-based resources and industries and the public will be adversely impacted. Such a committal is recommended as one major component for the EIS's redress of Agriculture.

NYDAM-3 The effects of long-term, low-level exposure to air pollutant mixtures on crop productivity are not well known. It would be premature to suggest that these effects would be of a magnitude sufficient to necessitate bringing additional acreage into production.

—SOIL RESOURCE AND FOOD PRODUCTION

NYDAM-4

Many of New York State's Soil and Water Conservation Districts have cited local concern about air quality; industrial pollution of the ambient air; and acid rain.[5] Agricultural regions within New York State from which such concern has been registered include the Hudson Basin and peripheral uplands; Long Island; the Erie-Ontario Lake Plains; the Central Plains; the Alleghany "acid soil belt" Plateau; and the North Country. The majority of these regions have only a medium-to-low buffering capacity for acid-neutralization within their dominant rock formations. Many of this State's agricultural regions contain

NYDAM-4 The effect of acid precipitation on agricultural soils is discussed in Topical Response 3.3.

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[3] Farm Land and Energy: Conflicts in the Making, 1980. National Agricultural Lands Study, Interim Report Number Three.

[4] An Assessment of the National Consequences of Increased Coal Utilization, 1979. U.S. Department of Energy.

[5] Framework—Long Range Program, 1981. Series Number Three, New York State Soil and Water Conservation Committee.

soils which are noticably sensitive to acid rain. A recently completed evaluation of soils and crop foliage as to susceptibility to the effects of acid rains cites New York State and the majority of the Northeastern States as being highly vulnerable.[6] Regarding potential impacts on New York's capability to produce food, reports of the U.S. Department of Agriculture and all of this State's Soil and Water Conservation Districts verify that concern for such impacts is indeed statewide.[7]

CROPS AND AMBIENT AIR QUALITY

—BROAD IMPACTS

Impacts of air pollution on agriculture are direct as well as indirect. Agricultural losses are felt by both the farmer and the consumer. A direct loss involves damage to crops in terms of either quality or quantity and includes leaf injuries which in themselves make certain produce unmarketable, or cause a reduction in quantity of the soluble solids of other vegetative components.

Indirect losses can be generated-by or related-to direct losses. Crop sensitivity to ambient air pollution levels may force a farmer to switch crops. A switch may or may not be economically feasible. Pollutants may predispose plants to insect or disease injury forcing the farmer to spray or take other precautionary measures, and incur a financial loss.

NYDAM-5 One of the most serious long-term threats posed by existing ambient air pollution levels—coupled with proposals for Northeast coal conversion (which currently omits Agriculture in the Draft EIS)—is the long-term reduction of land capability/property value. If farm land in an area is degraded, production may become so economically unfeasible that the land becomes permanently diverted from agricultu l production and committed to other uses. The general public is affected by such potential impacts as: loss of the farmland, increased production costs and increased processing costs for out of region products.

While monitoring and research on the effects of air pollution on vegetation deserves and needs on-going pursuit, the relative sensitivity of many plants to air pollutants is presently available. Based on three classifications of sensitivity: "Tolerant", "Intermediate", and "Sensitive", a listing of some of the plants which are ranked "Sensitive" is provided below:

6/ Acid Rain Vulnerability of the 27 States East of the Mississippi River, 1982. National Wildlife Federation.

7/ Framework—Long Range Program, 1981. Series Number Two, New York State Soil and Water Conservation Committee.

NYDAM-5 The long-term degradation of farm land capability by air pollutants could occur primarily as a result of changes in agricultural soils caused by pollutant exposure. The pollutant with the greatest potential for altering soils is acid deposition. The effects of acid deposition on agricultural soils are discussed in Topical Response 3.3. The influence of atmospheric deposition of trace elements on soils is discussed in Section 5.4.3.3 of the DEIS and Responses MDAQC-14 and -17.

PLANTS RANKED "SENSITIVE" TO CERTAIN AIR POLLUTANTS a/ b/

	Ozone	Peroxyacetyl Nitrate	Oxides of Nitrogen	Sulfur Dioxides
Alfalfa	X		X	X
Apple			X	X
Bean	X	X		X
Broccoli				X
Celery		X		
Cherry, Ground		X		
Clover		X		
Clover Red	X		X	X
Corn, Sweet	X			
Grape	X			
Grass, Brome	X			
Lettuce		X	X	X
Muskmelon	X			
Oats	X	X	X	X
Onion	X			
Pear			X	
Peas		X		X
Potato, Sweet				X
Potato, White	X			
Rye	X			
Soybean	X			
Squash				X
Tomato	X	X		X
Wheat	X			X

a/ Adapted from: Diagnosing Vegetation Injury Caused By Air Pollution, 1976. Air Pollution Training Institute, U.S. Environmental Protection Agency.

b/ Note: Absence of a plant from the above list does not signify tolerance to a pollutant.

NYDAM-6 While single pollutants affecting plants are noted in the preceding chart it must be realized within the Final Northeast EIS, that a variety of pollutants may occur simultaneously, sequentially or intermittantly in the ambient air. Mixures of gaseous pollutants may cause plant injuries and alterations affecting growth and productivity. Among potentially damaging combinations are: sulfur dioxide and ozone; and sulfur dioxide and nitrogen dioxide.

NYDAM-6 The importance of pollutant mixtures in determining the impacts of gaseous pollutants on vegetation and agriculture is discussed in Section 5.4.3.3 of the DEIS and Response NYDEC-45.

—RESEARCH

The legitimate need for the Northeast EIS to redress Agriculture and cite potential impacts on agriculture as well as cite the necessary mitigation measures for preventing adverse agricultural impacts—while constructively retaining the basic proposal for coal conversion—is underscored via research of the recent past and of present day.... From the Boyce Thompson Institute of Plant Research at Cornell University:

> Large agricultural and forested areas of the country are being affected by air pollutants. The problem is likely to grow with the proposed shift to coal as a source of energy.... Institute scientists seek to undestand how plants respond to pollutants such as sulfur dioxide (SO_2), hydrogen flouride (HF), ozone (O_3) and nitrogen dioxide (NO_2)....
>
> The goal of these studies is to provide scientific information that can be used to broaden the basis for secondary air quality standards and to develop the methodology for efficiently evaluating environmental consequences of pollutants.
>
> These pollutants have been implicated in the decline of agricultural and forest species in some areas. For example, snap beans grown in Yonkers, NY where there was a high level of ozone and other photochemical pollutants, had a 25 percent lower yield than plants grown in "filtered air." "Fresh air" tomato harvests declined by 33 percent because of this pollution...[8]
>
> Studies show that the current level of acidity of rainfall in the United States is only slightly below the threshold for production of foliar injury on susceptible plants. With increasing emissions of sulfur and nitrogen oxides which contribute to the acidity of rain, there may be a substantial increase in risk of such injury in the future.[8]

Added impetus for redress of Agriculture and the improvement of the Northeast EIS is offered from the 1978 Annual Meeting of the Air Pollution Control Association:

> Current energy strategies seem to dictate the use of more coal and less "clean" fuel in the future, thereb increasing the load of phytotoxic pollutants in the atmosphere. Depending on the energy plan selected and the control technologies utilized, emissions of sulfur oxides are predicted to increase by 23 to 68% between 1976 and 2000. Emission of nitrogen oxides will probably increase substantially in the next 5-10 years and then decline, but emissions in 2000 are expected nevertheless to be 1.6 times the 1975 level. Due to increasing NOx concentrations, oxidant concentrations in suburban and rural areas (where hydrocarbons are not limiting) will also increase. In addition, the acidification of precipitation will probably continue as SOx and NOx emissions increase.[9]

8/ Pushing Ahead the Frontiers of Plant Science, (no date) Boyce Thompson Institute

Investigations into the relationship of acid precipitation affecting apples are incomplete. Although on-going research is needed, some data suggests that variety-specific damages to apples can be incurred through acid precipitation. Potential negative impacts to apple production are reductions in pollen germination and fruit-set. Growth reduction of apple seedlings, relative to leaf injury may also be attributed to acid precipitation.

Research of the late 1970's conducted by Cornell's Department of Pomology and Viticulture, New York Agricultural Experiment Station has shown a relationship between increases in oxidant stipple[10] and decreases in soluble solids for "Concord" grapevines.[11] Since New York grapes are purchased on the basis of their soluble content, any reduction in soluble solids caused by oxidant stipple will have a negative economic impact on grape growers. Data indicate that relatively less ozone may be required to cause oxidant stipple injury when small additional increments of SO_2 (sulfur dioxide) are added to ambient air.[11]

Research was begun by Plant Pathology at the University of Minnesota in the late 1970's to study the effects of air pollution on soybean.[12] Long distance transport of ozone and/or its precursors from urban areas was documented as the most important regional air pollutant problem in Minnesota, followed by sulfur dioxide at the local level around point sources.

Soybean yield studies were conducted in rural areas. Due to ambient air pollutants, a 24 percent yield reduction was felt by soybean variety Hodgson in 1976. When no summer ozone-episodes occurred in 1977, no corresponding yield reduction in soybean variety Hodgson occurred.[12]

9/ Effects of Air Pollutants on Plant Pathogen Interaction, 1978. J. A. Laurence, Boyce Thompson Institute, for Presentation at the 71st Annual Meeting of the Air Pollution Control Assn.

10/ "Oxidant stipple": a result of photochemical ozone (O_3) phytotoxicity causing leaves to become necrotic and abscise prematurely.

11/ Effects of Sulfur Dioxide on Concord Grapevine Growth and Productivity, 1980. Progress Report, Dept. of Pomology & Viticulture, NYS Agricultural Experiment Station, Cornell University, Geneva, NY

12/ Air Pollutants And Their Effects on Crops In Minnesota With Emphasis on Soybean, 1979. U.S. Department of Agriculture, Science & Education Administration, Current Research Information System; Progress Report of S. V. Krupa, University of Minnesota, (research begun July 1978, termination date June 1983).

—AIR MOVEMENT

Initial air pollution discharges in the midwest are in a gaseous form (Sulfur Dioxide and Nitrogen Oxide). Geographically, New York is the most likely target area for the very highest concentration of air pollution from midwestern sources.[13] This is due to the chemistry and meterorology of the sulfate transport phenomena. Emissions within the Washington, D.C. to Boston, Massachusetts Corridor also contribute to the air pollution problem in metropolitan New York and provide pollutant precursors to the northerly moving ambient air currents which carry such products northward into various parts of upstate New York.[14] Sulfur dioxide reacts slowly (2-3 percent per hour) to form sulfuric acid and other sulfates. The slow reaction time and the tall stacks used at the emission sources aid in insulating the source regions. Southwesterly winds provide ideal transport of the highest concentrations of sulfate to New York.[13]

NYDAM-7 The importance of existing out-of-region emissions reaching the Northeast's ambient air, combined with additional in-region emissions is relevant to the proposals of the Draft Northeast EIS. Records of earlier research from studies of the 1960's performed in Connecticut explain that the occurrence of crop-damaging concentrations of ambient ozone are far more frequent than previously realized.[15] Weather fleck of tobacco had been reported in Connecticut in 1952 prior to knowledge that the symptoms were those of ozone injury. Once ambient ozone was established as the cause, other Connecticut crops were examined. Subsequently, symptoms of ozone toxicity have been found in the State on alfalfa, broad beans, green beans, carrots, celery, cucumber, gourd, oats, parsley, parsnip, petunia, pine, radish, spinach, squash and tomato.[15] The high ozone periods in Connecticut usually ocurred when the wind came from the southwest. A co lusion from the data, based on episodes of ambient ozone every four days during the growing season, was that such a rate of occurrence was one reason why attempts at protecting plants with antizonants had failed.[15]

NYDAM-7 Out-of-region emissions transported into the Northeast were included in the long-range transport modeling conducted as part of the DEIS. (See Section 5.1 of the DEIS and Topical Response 3.2.)

NORTHEAST EIS

—CREDIBILITY VIA MITIGATIVE MEASURES

NYDAM-8 We highly encourage the improvement of the Draft Northeast EIS, to the end that the Final EIS presents a credible document which soundly reflects the importance of protecting New York's (and the Northeast's) Agriculture from potentially adverse impacts. EIS provision for an on-going Agricultural plant-sensitivity monitoring network integrated directly with the coal conversion objectives and long-term energy management plan would help make a credible document and help institute a credible program. Such a network which continually monitors the relationship of emissions to the quality and quantity

NYDAM-8 The predicted effects of the conversion scenarios upon agriculture in the Northeast are considered to be minimal (see Topical Response 3.2). For this reason, the necessity to describe in depth the regional importance of agriculture, the necessity of protecting agricultural resources, recommendations of monitoring, and other similar issues was deemed to be outside the scope of this document.

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[13] NYS Department of Environmental Conservation, Agency Request Explanation Form, Division of Air; December, 1979.

[14] Pollutants and Meterological Conditions Associated With Acid Precipitation; In: Scientific papers From The Public Meeting on Acid Precipitation, 1978. New York State Assembly, (released, March 1979).

[15] Crop Damaging Periods of Ambient Zone in Connecticut, 1969; abstract in: Plant Disease Reporter, Vol. 53, No. 12, December, 1969.

of plants (fruits, field crops and vegetables, etc.) should be firmly linked with the process of institutional upgrading of air quality emission standards employed by Northeast's coal burning facilities. We recommend the incorprcation of this particular on-going mitigative measure into the EIS as a means of addressing Agricultural impacts.

Information in preceding sections of the comments provides legitimacy for this mitigative need. Likewise, the following recommendations, based on existing as well as omitted items of the Draft EIS are also furnished to improve the credibility of Final Northeast EIS.

—CREDIBILITY VIA REVISION

NYDAM-9 In addition to redressing Agriculture through citing the overall significance that it has on the State and throughout the State, specific EIS components are recommended: They are the locations and figures for orchard, vineyard and vegetable production in proximity with the generating stations proposed for conversion to coal. In addition to receiving ambient air pollutants out of the midwest, there are areas having the potential of receiving added quantities as a result of the proposed Northeast coal-conversion...

Apple Orchards: New York State ranks second nationally in Apple production. There are 67,000 acres in apple orchards in the State. Nearly 40 percent of the State's apple orchards are within or immediately adjacent to the Hudson Basin and on Long Island. Acreage and production for these apple orchards follows:

HUDSON BASIN-LONG ISLAND APPLE PRODUCTION

County	Acres	Production (Pounds)
Albany	571	(Unavailable)
Columbia	5,147	52,461,590
Dutchess	2,025	26,673,222
Greene	276	2,392,578
Orange	2,358	35,309,317
Rensselaer*	202	1,691,998
Rockland*	75	(Unavailable)
Schoharie	424	1,273,702
Suffolk (Long Island)	202	1,502,330
Ulster	13,528	144,387,860
Westchester	298	1,569,544
	25,106	267,262,141

Source: 1978 Census of Agriculture, U.S. Department of Commerce
*Indicates 1974 date of information.

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NYDAM-9 It is true that orchards and farm lands located in the proximity of coal conversion candidates may receive additional pollutant exposure due to fuel conversion. However, an analysis of the effects of pollutant exposure on agricultural productivity in the proximity of a converting powerplant is outside the scope of this EIS. This type of analysis will be conducted in the site-specific EIS prepared for each converting facility.

Vineyards: New York State ranks second nationally in grape production. There are 42,650 acres of grape vineyards in the State. 1,094 acres of vineyards are along the Hudson Basin and Long Island. Acreage and production for these vineyards follows:

HUDSON BASIN-LONG ISLAND GRAPE PRODUCTION

County	Acres	Production (Pounds)
Albany	7	2,255
Columbia	464	2,700,139
Ulster	404	1,695,091
Dutchess	101	470,487
Orange	42	204,870
Suffolk (Long Island)	64	233,690
Rensselaer	3	(Unavailable)
Greene	9	(Unavailable)
	1,094	5,306,532

Source: 1978 Census of Agriculture, U.S. Department of Commerce

Vegetables-Long Island: New York State ranks fourth nationally in the production of vegetables for fresh market and sixth nationally in the production of vegetables for processing.

Suffolk County Long Island ranks Number 1 economically in the State in the production of farm produce. In 1978 the market value of agricultural products of Suffolk County amounted to $78 million with potatoes representing $40 million of that total. Statewide, there are 3,994 vegetable producing farms. In Suffolk County, there are 488 farms which produce vegetables. Land requirements for annual vegetable production total 29,802 acres.

The variety of vegetables and the land area involved is provided below:

SUFFOLK COUNTY LONG ISLAND VEGETABLE FARMING - 1978

Vegetable	Total Harvested Farms	Total Harvested Acres	Irrigated Area Farms	Irrigated Area Acres
Asparagus	8	11	5	4
Beans-Green Lima	9	10	4	4
Beans-Snap	65	426	47	217
Beets	26	20	17	10
Broccoli	34	28	21	16
Brussels Sprout	4	18	3	a/
Head Cabbage	145	1,480	115	1,344
Cantaloupe	33	45	23	35
Carrots	16	10	8	5
Cauliflower	137	952	110	825
Celery	9	15	9	15
Escarole	4	a/	3	a/
Honeydew Melons	5	6	2	a/
Lettuce	37	211	27	177
Mustards Greens	8	a/	8	a/
Onions	18	65	13	a/
Peppers	74	166	56	126
Pumpkins	56	287	39	234
Radishes	20	82	12	a/
Spinach	29	286	21	229
Sweet Corn	91	1,257	61	855
Tomatoes	96	288	68	242
Subtotal	—	5,663	—	4,338
Potatoes	214	24,139	162	4.113
Total	—	29,802	—	8.451

a/ Figure unavailable

While all of this State's agriculture is subject to out-of-region ambient air pollutants, the proposed in-region conversions and the regional wind/weather patterns will intensify effects in the Hudson Basin and Long Island. Potential impacts and on-going mitigative measures for protecting agricultural production are firmly warranted.

NYDAM-10 Disposal: Waste collection and disposal as presently covered in the Northeast Draft EIS does not adequately detail the sites which are most desired. This is important. Clarification of disposal sites is necessary in order to assess potential conflicts of land use especially if lands in question are farmlands or are near farmlands. The Final EIS should specify the sites most desired for safely and adequately accommodating disposal needs of the facilities proposed for coal conversion, (e.g. abandoned quarries...). The Final EIS should cite the realtionship between disposal sites and lands which are near or are enrolled in the local Agricultural Districts of New York State; as well as identify the type of soil at such sites based on the State's Land Classification System for farm assessments to determine if important farmlands are being considered.

NYDAM-10 A detailed description and analysis of waste disposal sites is presented in the technical report on waste disposal (Saguinsin et al. 1981).

REFERENCES

Saguinsin, J.L.S., et al. 1981. Northeast Regional Environmental Impact Study, Waste Disposal Technical Report. DOE/RG-0058. Prepared by the Division of Environmental Impact Studies, Argonne National Laboratory, Argonne, Ill., for the Economic Regulatory Administration, U.S. Department of Energy, Washington, D.C.

NYDAM-11 Injury Threshold: The Northeast Draft EIS wrongly concludes that the level of sulfur dioxide to be emitted from the proposed coal-conversions will not affect vegetation. The Draft EIS cites a sulfur dioxide concentration of 470 ug/m3 as the low end of the range that has been reported to injure plants. It then states that the highest anticipated concentration of sulfur dioxide is 451 ug/m3. The Final EIS can be made more credible by revising such segments as these on plant injury to acknowledge and thereby integrate the significance of the sulfur dioxide component with the ambient air. Concentations of sulfur dioxide, far lower than 451 ug/m3, have injured crops of alfalfa, broccoli and others when mixed with ozone in the ambient air. Likewise, then combined with nitrogen oxide sulfur dioxide has injured beans, oats, radish and soybeans. A concentration of sulfur dioxide as low as 159.9 ug/m3 has been established to have damaged snap beans when mixed with ambient air for 24 days of the growing season.[16]

NYDAM-11 See Response NYDEC-48.

[16] Photochemical Oxidants Potentiate Yield Losses In Snap Beans Attributable to SO_2; in "Science," 123, 1981.

STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233

M. PETER LANAHAN, JR.
FIRST DEPUTY COMMISSIONER

APR 1[illegible] 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
U.S. Department of Energy
2000 M Street NW
Washington, D.C. 20461

Dear Ms. Goldberg:

The State of New York has reviewed the Draft Northeast Regional Environmental Impact Statement on the Potential Conversion of Forty-Two Power Plants from Oil to Coal or Alternative Fuels, dated October, 1981. We submit the following comments for consideration in preparation of a final environmental impact statement.

Although NEREIS is a well-structured document, its need to cover a very complex subject from a regional perspective has left many of us with reservations about the manner in which conversions should be achieved in the Northeast. There are a number of issues not adequately covered, and certain conclusions are not fully justified.

We have several major overall comments regarding the draft Northeast Regional Environmental Impact Statement (NEREIS) in addition to our attached comments. These are:

NYDEC-1

1. A number of the 42 plants appear to be unlikely candidates for conversion, especially since the Omnibus Budget Reconciliation Act of 1981 modifies the effect of the Fuel Act of 1978 (FUA) by allowing utilities, through certification of their own capabilities, to decide whether a federal conversion order should apply or not. Cumulative impacts may be considerably overstated in the draft NEREIS if a number of the proposed conversions never occur. The New York State Energy Master Plan (SEMP) adopted in March of 1980 leaves out three plant conversions proposed in NEREIS because they appear highly improbable. The final version of NEREIS should be modified to omit unlikely conversions or at least to provide impact analysis for the most likely number of plants which will be built (most probable case) as well as for all 42 plants (worst case).

NYDEC-1 See Response NYDEC-19.

NYDEC-2

2. Recent improvement in air quality should be taken into consideration in any NEREIS findings regarding the New York City Metropolitan Area. 1980 and 1981 air quality monitoring data in the New York City area show significant decreases in sulfur dioxide ambient air quality measurements, so that exceedance of the present federal annual ambient standard for SO_2

NYDEC-2 The changes in ambient air quality and predicted pollutant increases are presented in Topical Response 3.1.

of 80 ug/m^3 is much less likely than indicated in the NEREIS. The NEREIS air quality modeling analysis for the New York City area should be rerun to reflect these recent air quality improvements and the lesser number of likely plant conversions noted above. Probable reasons for present air quality improvements should be acknowledged---that is, increased industrial, commercial and utility use of gas---as well as the fact that it may be only a short-term event, because gas supplies and prices are uncertain.

NYDEC-3

3. Air Quality modeling and other data presented on acid precipitation should be expanded. In light of the very great concern expressed for acid deposition impacts within New York State and, in particular, the Adirondacks, such information should be presented with much further explanation regarding location and amount of deposition and impacts. Additional modeling and studies to gain further insight into nitrogen transport and acid conversion and to develop greater understanding of sulfur deposition would be very useful.

NYDEC-4

4. It is recommended that DOE adopt a production schedule and provide sufficient resources to issue a final NEREIS and accompanying technical reports by no later than mid-May, 1982. Such schedule and resource commitment should also allow for the rerun of certain analytical investigations where necessary. The material covered in the NEREIS is needed immediately to supplement individual conversion efforts which are currently commencing through the regulatory review process in this State. Additionally, the absence of a formal impact statement may be delaying the initiation of other planned conversions within New York. This delay may pose an immediate economic impact on the electric ratepayers of certain utilities within this State. Further, inordinate delay in issuing the final document may outdate the source data and subject it to challenge in site-specific conversion proceedings.

Attached are specific comments arranged by topical groupings: Air Quality, Acid Deposition, Ecological Impacts, Agricultural Impacts, Health Impacts, Water Quality and Miscellaneous Comments. Where appropriate these comments cite specific references to the NEREIS text.

Thank you for the opportunity to comment. We look forward to receiving the final impact statement.

Sincerely,

M. Peter Lanahan
First Deputy Commissioner

att.

NYDEC-3 No regional transport and deposition of pollutant nitrogen has been included in the report because such modeling is in a more preliminary state than modeling of pollutant sulfur. The assumption that the relative increase in pollutant sulfur deposition represents an estimate of the relative increase in acidity implies that pollutant nitrogen deposition increments are similar to these for pollutant sulfur. If nitrate deposition were modeled, the uncertainty would be even greater than for deposition of sulfur. See also Response CLF-8 and Topical Response 3.2.

NYDEC-4 USDOE has adopted a production schedule for the FEIS as well as for the remaining technical reports that will allow the thorough analysis of the issues raised during the public comment period. This schedule will not negatively affect any of the proposed conversions in the State of New York.

NEW YORK STATE AGENCY COMMENTS ON U.S. DEPARTMENT OF ENERGY DRAFT
NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT (NEREIS)
FEBRUARY 5, 1982

AIR QUALITY

Various New York State Agencies have expressed a wide range of concerns regarding the air quality analyses performed for the draft NEREIS. Questions are raised with respect to the appropriateness of models, the lack of sufficient data on results, and in particular, the input information used to develop modeled information. Specific comments follow:

NYDEC-5 -- It is indicated (pages 3-18 and 3-19) that the air quality predictions using the RAM model are "not highly accurate" but should reliably forecast trends in pollutant levels. The possible range of error which can be associated with the various numerical predictions could be quantified, and the text should reflect the range of uncertainty in the estimates presented, as well as the mitigating measures recommended.

NYDEC-6 -- Appendix F presents a superficial discussion of the RAM modeling effort. With the present level of detail contained in Appendix F, a reasonable review of air quality modeling analysis is not possible. A detailed account of air quality analysis and results such as contained in Kornegay, et al., 1981, (referenced in NEREIS page 5-75) should be added to the appendices.

NYDEC-7 -- The statement on p. 3-19, "In all cases, the assumptions used in the model were conservative---"is not true, since one important assumption (bottom of p. 3-18) used in the RAM dispersion model was to ignore the effects of terrain. This can result in significant underestimates of ground level concentrations resulting from power plants in such complex terrain as the Hudson Valley, since the ground level of terrain higher than the base level of the power plant will be closer to the air pollution plume centerline than predicted by the model. A better (although crude) approach for the regional scale analysis would be to assume an average topographic elevation for each combustion region. A somewhat more realistic approach would be to divide the regions into geographic sub-regions (i.e. Long Island, Hudson Valley) and average the results proportional to the emissions of each subregion. Of course, modeling done for specific coal conversion applications in complex terrain will have to include topography on a finer scale to be meaningful.

NYDEC-8 -- The draft NEREIS concludes that primary SO_2 standards will be violated in the NYC area as a result of conversion (p. 5-8). Further, the five mitigative cases investigated for this area still predict that violation of NAAQS would occur (Table 5.6, p. 5-10; also p. 5-12). The analysis leading to these conclusions should be revised in order to reflect recent trends in ambient levels of SO_2 in the NYC area and a more realistic number of conversions currently anticipated. Air quality modeling analysis for the NYC subregion should be rerun. (Specific air quality and plant conversion information prepared by the New York State Energy Office is appended to these "Air Quality" comments, as Appendix I.)

NYDEC-5 If the input data (stack parameters, capacity factors, number of converting plants, etc.) are correct, predicted annual average concentrations should be accurate to within a factor of 2 to 10.

NYDEC-6 See Topical Response 3.1.

NYDEC-7 The statement "All assumptions in the modeling analyses were conservative..." implies that in running the model and interpreting the output, the more conservative method was considered. For instance, for short-term impacts, all plants operate at 100% capacity factor (see also Response NEP-1) and short-term impacts are highest concentration, not second highest, even though five years of meteorological data were used.

The RAM code used in the DEIS is unable to incorporate the effects of terrain. No code capable of simulating the number of sources investigated in this study and estimating the effects of terrain on the regional flow field in a scientifically defensible manner is available at a reasonable cost. The effects of terrain on a cumulative scale are impossible to predict, for near-plant concentrations may be higher than estimated, but distant concentrations may be lower due to source depletion by near-plant terrain. Terrain will be handled in more detail for the site-specific analyses.

As stated in Appendix F of the DEIS, the RAM model does not include the effects of terrain. At the time of the analyses, the ISC model, which does contain a simple algorithm that simulates the effects of terrain, had not yet been released; and the only USEPA-approved multi-source model available was the RAM model, which does not treat terrain effects.

High ground-level concentrations due to terrain are a localized problem and are beyond the scope of this document. Terrain effects will be considered in the site-specific documents. The ISC model was used in preparing the document related to the conversion of the Lovett Generating Station, which is located in the Hudson valley.

NYDEC-8 The changes in ambient air quality and predicted pollutant increases are presented in Topical Response 3.2.

NYDEC-9

-- As displayed in Table 3.9 and discussed on p. 3-19 of the draft NEREIS, the difference between the Coal SIP scenario and the most stringent mitigative strategy is only 4 ug/m^3 at the most sensitive receptor point. Yet to obtain this reduction, the use of low to medium sulfur coal (1% to 2%) in conjunction with 90 percent efficient scrubbers on almost 3,420 MW of converted utility capacity was needed. The expense to achieve this reduction in terms of capital cost, incremental sludge disposal expenses and foregone opportunity cost savings to the rate-payers is expected to be considerable. The indication of an extremely low cost/benefit ratio when control strategies are limited solely to the plants themselves, suggests that other possibilities should be explored during specific conversion proceedings. Examples include emission off-set programs, gas substitution and enhanced compliance enforcement efforts for other low level stationary sources. It is suggested that the current text on pages 3-19 be expanded to cover these areas.

NYDEC-10

-- The draft NEREIS predicts that current nitrogen oxide (NO_x) emissions would increase by 2 percent within the region as a result of the conversion of 42 powerplants (p. 3-28)--a projected level which should not cause problems with attainment of NAAQS. The draft NEREIS further notes that the "...analysis of trends and sources of pollutants suggest that in terms of mitigative measures, the primary emphasis should be on nitrogen oxide emissions" (p. 3-29). But the draft NEREIS is silent on what mitigative measures may be available to reduce NO_2 emissions. The final NEREIS should remedy this oversight by expanded discussion especially in sections 3.2.2.3, 5.1.3.3 and 5.6.3. Suggested expanded discussion might note that research continues on the development of low NO_x burners which may have applicability for some coal conversions. In addition, Manny a/ has demonstrated an average 38 percent NO_x reduction in more than 35 utility boilers by using a combination of staged combustion, low excess air firing and other techniques.

NYDEC-11

-- The 1971 NSPS scenario described in Section 5.1.3.3 on p. 5-6 should define the lowest sulfur content coal generally available at a reasonable price on the East Coast. Again under "New York Subregion" on p. 5-12, the term "low sulfur coal" should be defined.

NYDEC-12

-- On p. 5-72, in the discussion of effects of NO_2 on the environment it is stated, "NO_2 emissions rates are assumed constant under all coal conversion scenarios; NO_2 cannot be predicted with accuracy due to complex chemical reactions, and NO_2 regional transport is not presently quantifiable (see Secs. 3.2.2.3 and 5.1.3.3)." Though it may be difficult to quantify emission rates and impacts, the draft NEREIS is certainly remiss in not including a table for all 42 powerplants which show NO2 emissions prior to conversion and NO_2 emissions with the four proposed scenarios on an annual basis. Such a table would identify the trends for NO_2 emissions for the reader.

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a/ Manny, E.H. 1980. Guidelines for NO_x Control by Combustion Modification for Coal-Fired Utility Boilers. Procedures for Reduction of NOx Emissions and Maximization of Boilers Efficiency. EPA-600/8-80-027. Prepared by Exxon Research and Engineering Co. Florham Park, NJ for the Industrial Environmental Research Laboratory, Office of Research and Development, USEPA, 102 pp.

NYDEC-9 Since passage of the Omnibus Budget Reconciliation Act of August 13, 1981, the Fuel Use Act is now strictly a voluntary conversion program. Any cost-benefit analysis relating to coal conversion will be done by the utilities, as it is their decision whether to convert. Currently no emission offset programs would be required because of the significant reduction in ambient air quality levels in the New York City area, which does not result in violation of air quality standards under any scenario.

NYDEC-10 Various methods that might be employed to control nitrogen oxides are excess air reduction, use of fuel with low nitrogen content, multistage combustion, water injection, tangential firing, derating of the boiler, and flue gas treatment. A non-traditional scheme is fluidized-bed combustion, which appears promising for future low-nitrogen-oxide applications. Except in southern Long Island, changes in nitrogen oxide levels are expected to be small, and in more than half of the Northeast, levels are anticipated to increase by an amount considered insignificant by the USEPA. In no area is the ambient air quality standard for nitrogen oxides threatened; therefore, major boiler modifications at many of the plants may not be needed.

NYDEC-11 The lowest sulfur coal content contemplated (1.04%) is shown in Table D.6 (p. D.13) of the DEIS. This sulfur content would produce 1.85 lb $SO_2/10^6$ Btu (using 22.4×10^6 Btu per ton as the conversion factor). In the analysis described, it is contemplated that in New York about 35% of the coal used would be scrubbed to meet the New Source Performance Standard of 1.2 lb $SO_2/10^6$ Btu (see Table D.7, p. D-14). The 1991 price of such coal is estimated to be about $5.75 per million Btu or (again, using 22.4×10^6 Btu per ton as a conversion factor) about $130/ton. All costs include scrubbing, where the scenario indicated such was necessary, and transportation costs. For the new scenario including only units that are expected to convert and using new information on operating parameters and SIPs (see Section 2 and Topical Response 3.1), no scrubbing will be required for the New York plants.

NYDEC-12 NO_2 emissions prior to and following conversion are given in Table 2.3.

NYDEC-13 -- Fine particle control by electrostatic precipitators, wet scrubbers and baghouses is discussed on page E-9. It is more appropriate that a discussion of the merits of each of these particular control strategies should occur in the main body of the text, than in Appendix E.

NYDEC-13 A discussion of fine particle control is included in Topical Response 3.7. As indicated in Topical Response 3.7.4, electrostatic precipitators do not remove approximately 30% of the particles less than 5 μm in diameter from stack gases (USEPA 1977). Fabric filter baghouses are much more efficient in this respect and are the most likely alternative for reducing respirable particle emissions from powerplants converting from oil to coal (USEPA 1977).

REFERENCES

U.S. Environmental Protection Agency. 1977. Compilation of Air Pollution Emission Factors, 34d Ed. AP-42. Research Triangle Park, N.D.

NYDEC-14 -- On p. E-9, it is stated that the amounts of trace elements emitted from coal-fired facilities are highly variable, based on the type of coal used and the engineering of the powerplant. The draft NEREIS, however, gives you no information as to what the variability is and what is to be expected. It is appropriate that this material be included in the final NEREIS since it can influence the potential impacts given by a coal conversion scenario. If it is known that the amounts of trace elements being emitted from a coal-fired facility is highly variable, there must be data which could be presented in the final NEREIS. Further, on p. E-11, it is stated that there is highly suggestive evidence that beryllium, nickel, cadmium, chromium, arsenic, floride, uranium, selenium, and mercury present the greatest potential problems. The draft NEREIS does not state, however, whether the coal conversion scenario will increase the emission of trace elements. It is reasonable to expect that the trace elements will increase with the coal conversion. The draft NEREIS also does not mention what methods are available to mitigate the impacts of these elements. Such discussion would be appropriate in the final NEREIS.

NYDEC-14 Many trace elements are associated with the respirable fraction of coal-fired powerplant emissions (see Response NYDEC-70). Thirty percent (by mass) of particles in this size class escape electrostatic precipitators and are emitted into the atmosphere (see Responses NYDEC-13 and -69). Fabric filter baghouses have higher collection efficiencies for respirable particles and therefore would reduce atmospheric emissions. See Table 3.7.2 and pertinent discussion in Topical Response 3.7.

NYDEC-15 -- It is not clear how the isopleths contained in Figures F-6 through F-8 (Appendix F) were determined. Annual average isopleths should be used rather than the 24-hour average isopleths, and should include the baseline case in the figures for comparison. The "year" emission selected for the baseline capacity of the facilities should be defined. Page F-1 refers to a 1978 capacity while p. F-7 refers to FERC (1979) which has data for 1976.

NYDEC-15 Short-term (24-hr) increases represent the greatest percentage of PSD or NAAQS increase throughout the region; therefore, the 24-hr isopleths were presented. Annual average concentrations also were calculated, but represented significant increases only in those areas where current ambient annual average concentrations are high. The reference at the bottom of page F-1 should have stated that the data were for the year ending December 31, 1978. This correction is included in Section 5, Errata and Addenda.

NYDEC-16 -- From footnote c, on p. 3-4, it looks as if the right two columns of Table 3.4 were mislabeled as Ia and Ib rather than the desired IIa and IIb.

NYDEC-16 The typographical error is corrected in the Errata and Addenda section. The right two columns of Table 3.4 should be labeled IIa and IIB, respectively.

APPENDIX I
RECOMMENDED AIR QUALITY MODELING CHANGES FOR THE NEW YORK CITY METROPOLITAN AREA

• Recent Trends in Ambient SO_2 Levels: The draft NEREIS used 1978 ambient data for SO_x in the NYC area to predict concentration resulting from coal conversion. The level selected for the SO_2 annual background was 80 ug/m3--which is the primary NAAQS. Consequently, any upward change in concentrations resulting from increased emissions, no matter how small, would result in contravention of NAAQS for SO_2. Appendix F (p. F-1) acknowledges that use of 1978 ambient levels to predict future concentrations is an "imprecise approach" repleat with "shortcomings." Because of this situation, Appendix F cautions that the air quality analysis should be "used to predict trends in pollution concentrations, not to predict specific areas of NAAQS violation." Notwithstanding this warning, the body of the draft NEREIS concludes that standards in the NYC area would be violated. High background levels in 1978 (p. 3-19) are suggested as being the major case of this situation.

NYDEC-17 The 1978 data is three years old and does not reflect more recent ambient data. For example, 1981 data for SO_2 annual measurements at two key monitoring stations display significant reductions from the 1978 levels as shown in Table I below. Such data clearly contrasts with the 1978 ambient data employed in preparing the draft NEREIS for NYC subregion. It is recognized that considerable debate can occur about the validity of using 1981 data to reflect future expectations of air quality. Simply stated, we have no guarantee that economic activity, fuel mix, meterology and heating degree days in 1991 will be identical to those in 1981. However, the same can be said for 1978 data used in the draft NEREIS and we believe the most recent

TABLE I

MONITORING SITE CONCENTRATION (u/m3)

12 month Average SO^2 Concentration, Ending	CCNY	Mabel Dean Bacon
December 31, 1980a/	70.8	76.1
March 31, 1981a/	70.8	76.1
September 30, 1981b/	70.8	68.1
December 31, 1981b/	65.6	65.6

a/Reported validated data NYDEC, Quarterly Evaluation of Ambient Air Quality and Compliance with Ambient Air Quality Standards June 1, 1981 and August 25, 1981.

b/Raw data, Source; New York State Department of Environmental Conservation, Division of Air Resources.

1/ These comments by the New York State Energy Office (SEO) are based upon the discussion material contained in the Draft Northeast Regional Environmental Impact Statement (DOE/EIS-0083-D). SEO reserves the right to supplement these comments upon receipt and review of the Air Quality Technical Report prepared by Oak Ridge National Laboratory in support of the Draft NEREIS

NYDEC-17 FERC (1979) has 1978 data for fuel consumption and station capacity factors. The stack parameters data are from 1976 since they are only reported every four years. Ambient data do vary, and may prove to be unrepresentative. However, these data are included to provide the reader with a basis for comparing predicted increases with present levels. The ambient data, as well as the predicted incremental increases, should be viewed only as rough approximations of regional trends in pollutant concentrations, not as absolute numerical values to be added together and compared with standards.

REFERENCES

Federal Energy Regulatory Commission. 1979. Steam-Electric Plant Air and Water Quality Control Data for the Year Ended December 31, 1978.

data is probably more representative of current conditions.

It is recommended that the final NEREIS concentrate on predicted changes only in the air quality analysis and avoid the use of any year ambient data to arrive at summary conclusions to convertability of any one powerplant. In the event this recommendation cannot be observed, then the final NEREIS should use the most recent ambient data available supplemented by appropriate discussion of factors which cause future variability in observed data.

• Non-Conversion Candidates Should be Deleted from the Air Quality Analysis: The air quality modeling in the NEREIS evaluated the emission impact of converting eighteen powerplants (with 8,663 MW of capacity) in the New York subregion. This level of conversion and specific conversion candidates appears inappropriate given recent changes in the Federal Powerplant and Industrial Fuel Use Act, and the announced intentions of certain utilities.

It is recommended that the air quality modeling effort for the New York subregion be rerun to analyze only those powerplants believed feasible for conversion. The first step should be for USDOE to immediately canvass all utilities to determine each company's position on conversion potential and the specific modeling assumptions to be employed in the RAM modeling. The results of the USDOE survey would produce a "utility conversion" scenario for inclusion within the final NEREIS.

NYDEC-18

For New York State, energy policy and the program plans of the New York Power Pool strongly support conversion of the following facilities:

Utility	Facility
Consoldiated Edison	Ravenswood 3
Consolidated Edison	Arthur Kill 2 and 3
Orange and Rockland	Lovett 4 and 5
Central Hudson	Danskammer 3 and 4
Niagara Mohawk	Albany 1 to 4
Long Island Lighting	Port Jefferson 3 and 4
Long Island Lighting	E.F. Barrett 1 and 2

The revised RAM model run for the final NEREIS should reflect the above listed plants as constituting the "utility proposed" conversion scenario. Within New York State, debate exists over the conversion potential for the following two additional facilities:

Utility	Facility
Consolidated Edison	Ravenswood 1 and 2
Long Island Lighting	Northport 1 to 4

NYDEC-18 At the public hearings on the Draft EIS that were held December 16-18, 1981, representatives of several of the utilities raised questions about some of the data used in the analysis. It was also noted that many of the conversions considered in the DEIS will not occur, and should not be considered in addressing the cumulative impacts of conversion. As a result of these concerns, a request for additional information on coal conversion plants was sent to each of the utilities involved on January 18, 1982 (see Appendix A). Utilizing these data, a new conversion scenario was analyzed (see Sec. 2 and Topical Response 3.1).

The Ravenswood Units 1 and 2 and Northport facility face difficult economic, technical and environmental considerations. Because of this situation, the above units have been assigned a lower priority then the seven facilities listed previously. However, this does not mean that the two facilities have been completely removed from conversion consideration within the context of State energy policy. Accordingly, it is requested that the revised modeling work be expanded to include a second scenario termed "utility conversion II" which would cover all nine proposed conversions noted above.

Efforts by USDOE to vigorously cull out non-conversion candidates in other states should also occur. Inclusion of non-variable candidates only serves to cloud the development of regulatory strategies to be applied to "firm" conversion candiates. USDOE should commence the canvass of all utilities immediately. Further, the response time period and analytical schedule should be established in a manner consistent with a May, 1982 completion date for the final NEREIS.

NEW YORK STATE AGENCY COMMENTS ON U.S. DEPARTMENT OF ENERGY DRAFT
NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT (NEREIS)
FEBRUARY 5, 1982

ACID DEPOSITION

NYDEC-19

It is stated on page 5-15 that the increase in overall sulfur deposition is on the order of 1 percent or less on a "subcontinental scale" depending on the emissions for a given scenario. It is further stated that in sensitive areas of the northeast, this increment could be as high as 6 percent (or a pH decrease of 0.03). In light of the very great concern expressed for acid deposition impacts within New York State and, in particular, the Adirondacks, such information should be presented with much further explanation regarding location and amount of deposition and impacts. There are both favorable and unfavorable factors regarding acid precipitation conditions which need clarification:

-- It is misleading to stress the 6 percent maximum increment in deposition calculated under the ASTRAP model because according to Table 5.11, this applies to dry deposition in Nova Scotia. Under ASTRAP modeling, the greatest Adirondack increments are 2 percent and Maine, 4 percent. The N.Y. State Energy Office notes that an acidity increase of 2 percent within the Adirondacks represents only (-)0.0086 change in pH value.

-- There are likely to be reductions in the modeled deposition increments if re-modeling is done using the "most probable" conversions instead of the original modeling of the "worst case" covering all 42 plant conversions proposed in NEREIS.

NYDEC-20

-- The increment values presented in NEREIS from the ASTRAP modeling are for an entire sub-region such as the Adirondacks, and do not reflect any site specific locations. Meso-scale modeling done in 1981 for the Consolidated Edison Company to cover site specific effects of Arthur Kill and Ravenswood coal conversions, shows potential pH reduction in regional water bodies of up to 0.38 units, meaning that much greater acid impacts are possible in certain specific locations than the 0.0086 to 0.03 overall pH reduction range determined under ASTRAP modeling. The models used in the Con Edison analysis cover shorter range transport than does the ASTRAP model and help to emphasize the non-uniformity of deposition and likelihood of serious site specific impacts in some sensitive locations.

NYDEC-21

-- On p. 5-15 it is stated that "---an increase in acid deposition of 6 percent corresponds to a rather minimal decrease of less than 0.03 in the pH of the receiving waters." The word "minimal" is misleading since it implies that there are no significant ecological impacts associated with a 0.03 (or even a 0.0086) change in pH in a receiving water. Given that an acid deposition problem already exists in the northeastern region, such a change may be very significant. Many waters in the northeast region are borderline in maintaining fish populations and continued additions of acidity are likely to jeopardize these fisheries. A 0.03 decrease in pH of receiving water should not be construed to be "minimal". If USDOE wants to continue to use the term "minimal", it should cite documents which would show that waters in the sensitive regions of the northeast are capable of withstanding this change in pH, or will not be subjected to it because of the location of the conversion plants. (More specific comments on acid rain impacts are covered under heading "Ecological Impacts" below.)

NYDEC-19 **Deposition modeling has been redone using new information (see Secs. 1 and 2). The results of the modeling are provided in Topical Response 3.2, and the percentage increments are presented as contour fields so that any area of the Northeast may be examined.**

NYDEC-20 **See Response NYDEC-19. Site-specific effects are outside the scope of this document and will be covered in the EISs prepared for each conversion candidate powerplant.**

NYDEC-21 The intent of the statement was not to mislead the reader into believing that the projected change in pH could not have an adverse ecological impact. However, it should be noted that the 6% increase in sulfur deposition mentioned is associated with the most polluting emissions scenario (Modified Coal SIP--see Sec. 5.1 of the DEIS). In addition, the 0.03 shift in surface water pH associated with the 6% sulfur deposition increase was calculated assuming the receiving water had no buffering capacity whatsoever (Sec. 5.2.4 of the DEIS). If such a rate of deposition actually occurred, the pH of surface waters would be likely to change even less due to dilution and buffering.

Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion (see Sec. 1). Long-range transport modeling (see Topical Response 3.2) indicates that maximum acid deposition following fuel conversion would be on the order of 3-4% in the New York City urban area and 1-2% in New England and the Maritime Provinces. This small increase in deposition is unlikely to cause an appreciable change in surface water pH. A subsequent adverse impact to aquatic ecosystems from this small addition to deposition is also unlikely.

NYDEC-22 -- It is recognized that very limited information is available on long range transport and that state-of-the-art models were used. Conclusions drawn from such modeling must be general and quite tentative until more knowledge is gained. The ASTRAP model or something comparable should be applied to gain insight into nitrogen transport and acid conversion as well as to gain further knowledge on sulfur deposition.

NYDEC-23 -- The present ASTRAP modeling for acid rain does not cover nitrates, yet the narrative states these may be "...almost as important during the winter..." as sulfates. Since this indicates there is a risk of adverse impacts, then for completeness of the draft NEREIS there should be some discussion of what these impacts are, what the worst case situation might be and its probability of occurence.

NYDEC-24 -- According to testimony by G.R. Hendrey, at hearings held with respect to conversion of Orange and Rockland Utilities' Lovett plant, October 16, 1981, most of northeastern North America has been receiving precipitation of pH 4.6 or less, more than ten times the acidity of "normal" rain for the past 20 to 30 years. This acidity was due almost entirely to sulfuric acid. These inputs of sulfuric acid in very acid-sensitive regions such as the Adirondacks may have removed much of the neutralizing and nitrate-utilizing ability of the soils and waters. Thus, these areas could now be more sensitive to atmospheric inputs of nitric oxides.

NYDEC-25 -- Although the draft NEREIS is careful to point out that sulfur deposition over eastern North America would increase by about 1 percent for the scenario with the greatest emission increment, it does not point out equally significant data from Tables 5.9 and 5.10. It is easy to show using data in Table 5.9 that 57 percent of the emissions deposited in Canada originate from the U.S. and that the Canadians only contribute 15 percent of the eastern North American sulfur budget. The NEREIS should mention this fact since it is of international significance that Canadian lakes now undergoing acid deposition problems receive their acid increments mainly from the U.S.

NYDEC-26 -- The draft NEREIS only gives recognition to part of the problems when it states on p. 4-5, "Concern has arisen in the U.S. and Canada over the deleterious effects of acid precipitation on sensitive ecological systems and its possible contribution to the corrosion of man-made structures." "Acid deposition" is a more appropriate term than "acid precipitation" because it covers the broader problem. This statement should give recognition to the broad regions that are affected by acid deposition in Canada and U.S. These regions are not isolated in terms of frequency of occurrence. The use of the term "possible contribution" is incorrect since the corrosion of man-made structures has definitely been documented from acid deposition and cost estimates have been made. USDOE should make similar estimates for the 42 powerplants. (Reference - Consolidated Edison's DEIS for Ravenswood)

NYDEC-27 -- In addition to expansion of the discussions of ecological and agricultural impacts (see Parts C and D of these comments), there should be more discussion of deterioration of cultural features than the brief mention under sub-section 5.5.4.

NYDEC-28 -- Along with particular references to impacts in the Adirondacks, note should be made of possible acid rain impacts upon other sensitive areas of the state such as the Catskills, Hudson Valley and eastern Long Island.

NYDEC-22 Because of the limited temporal and spatial resolution of the input meteorological data, the minimum resolution on the ASTRAP simulation is about 100 km. See also Response NYDEC-3 and Topical Response 3.2.

NYDEC-23 See Topical Response 3.2 and Responses NYDEC-3, CLF-8, and NOAA-1. It would be extremely difficult to separate the effects of the nitrate component of acid deposition from the effects of total deposition. At present, it is not possible to accurately model the long-range transport of nitrates. Therefore, it is unlikely that an appropriate worst-case scenario could be developed.

NYDEC-24 As noted in the comment, extended exposure to acid precipitation may eventually result in the expiration of soil buffering capacity. As a result, this area may become more sensitive to further acidic inputs. A discussion of the effects of acid precipitation on agricultural soils is contained in Topical Response 3.3. The air quality analysis performed as part of this assessment (see Sec. 5.1.3.3 of the DEIS) indicates that the proposed conversion of 42 powerplants to coal firing would result in an increase of NO_2 emissions in the Northeast Region of less than approximately 4% annually. This increase would be far less now that only 27 of the original 42 candidate powerplants are still being considered for fuel conversion. Thus, it appears rather unlikely that this small change in NO_2 emissions cold result in a significant impact to even potentially acid-sensitive ecosystems. (See Response NYPP-2 for discussion of the pH of "normal" rainfall.)

NYDEC-25 Several long-range transport models have produced deposition budgets indicating that about half of the sulfur deposited in Canada originates from U.S. sources. The increment from the most likely emission levels of the 27 plants involved (see Topical Response 3.2) appears to be about 3-4% in the New York City urban area and 1-2% in New England and the Maritime Provinces.

NYDEC-26 The statement was made as part of a discussion of rainfall acidity--thus, the use of the term "acid precipitation." In other parts of the document, the term "acid deposition" is used to describe acidic inputs from both wet and dry deposition processes. The extent of the acid deposition problem is discussed in the DEIS (for example, see Figs. 4.1, 4.2, 4.3, 4.9, and 4.10 and Sec. 4.2.4 of the DEIS). However, it should be noted that the scope of this EIS is limited to consideration of the cumulative, interactive, and regional impacts of the conversion of up to 42 powerplants to coal firing, in the areas impacted by this action. A detailed analysis of national acid deposition falls outside the scope of this document. (See also Topical Response 3.4 concerning the effects of acid deposition on cultural resources.)

NYDEC-27 The ecological impacts of acid deposition are discussed in Section 5.4 of the DEIS. See Section 3 of this FEIS for topical responses relating to the effects of acid deposition on agriculture (Topical Response 3.3) and cultural resources (3.4); and the responses to comments from the New York Department of Environmental Conservation.

NYDEC-28 The following sentence should be inserted after the first sentence of Line 10 on page 5-57:

"This problem is of particular concern in areas of low soil and watershed buffering capacity such as the Adirondacks, Catskills, Hudson Valley, and eastern Long Island."

NEW YORK STATE AGENCY COMMENTS ON U.S. DEPARTMENT OF ENERGY DRAFT
NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT (NEREIS)
FEBRUARY 5, 1982

ECOLOGICAL IMPACTS

A number of the reviewers of NEREIS have expressed dissatisfaction with the limited amount of coverage given to ecological impacts both in the "combustion" and "deposition" regional analyses. In particular, deletion of a thorough discussion of impacts related to acid precipitation seems to disregard the very major concern there is for this subject by the general public, as well as resource managers. Specific comments on ecological impacts follow:

NYDEC-29 -- On p. 4-54, Section 4.4.3.3 on rare, threatened and endangered species does not mention that certain states have their own endangered species acts. It is relevant that the states' acts on these animals should be included as well as the federal act. New York State in particular has additional species, other than those that occur on the Endangered Species Act of 1973 list.

NYDEC-30 -- On p. 5-52, it is stated, "On a regional basis, cumulative impacts, if any, would be restricted to surface waters with two or more powerplants proximally located." This statement is not necessarily true nor does it give recognition to the fact that many individual habitats may be affected and that the summation of these lost habitats may lead to the demise of a given species.

NYDEC-31 -- On p. 5-53, it is stated, "Because many of the powerplants would be increasing their capacity factors, thermal discharges could be expected to increase proportionately. The various regulatory agencies responsible for assessing impacts from thermal discharges may need to assess these increases." As part of a final NEREIS, it would be appropriate to include an assessment of thermal discharges on fisheries using Figure 1.1 on p. 1-3. It can be seen that most of the powerplants border bays or estuaries of the Atlantic Ocean, and have the potential for affecting mid-Atlantic fisheries such as the striped bass. This is particularly important because most of these facilities have been grandfathered in under the Federal Water Pollution Control Act, and are older facilities which do not have mitigative technologies to protect fishes from the intakes and discharges.

NYDEC-32 -- On p. 5-53, it is stated, "Even though plant capacity factors would be increasing at many of the plants, impingement and entrainment probably would not increase proportionately, the reason being most powerplants are designed to withdraw water based on 100 percent operation." A reference should be given to support this statement, since many plants do have the ability to turn circulating water pumps on or off.

NYDEC-33 -- On p. 5-54, it is stated, "To date, there is no evidence indicating that endangered or threatened species respond differently from other biota when exposed to acid precipitation, primary pollutants, or particulate deposition." Though this statement may be correct, it also may be instilling false confidence in the reader. Rare, threatened and endangered species are just that, because they do not withstand the impacts of man well. It is not reasonable to expect that these species will be able to cope as well as non-endangered species when subjected to further ecological insult.

NYDEC-29 Section 4.4.3.3 of the DEIS is expanded to include discussion of state endangered species legislation as follows.

"In addition to federal law, endangered and threatened species are also afforded protection through the endangered species protection acts of many Northeast Region states. In general, these various laws prevent the collection, possession, transfer, or other disturbances of endangered biota within each state. The state laws also establish procedures to designate species as endangered or threatened. This has led to the development of state endangered and threatened species lists that include biota not protected through federal law. Due to the large numbers of species designated as threatened or endangered in each state of the Northeast Region, a detailed discussion of each list is beyond the scope of this document. Environmental impacts to state-designated threatened and endangered species will be discussed in the site-specific EIS prepared for each conversion candidate powerplant.

NYDEC-30 The statement referred to was made in a discussion of impacts to aquatic biota and habitats from coal handling, processing, and storage activities at conversion candidate powerplants (Section 5.4.3.2 of the DEIS). The effects that can be expected from such activities result mainly from (1) runoff from coal storage piles, (2) coal pile leachates, and (3) fugitive dust emissions. Properly designed and managed coal handling, processing, and storage facilities include control systems required to minimize these effects. Control systems include dikes constructed around coal storage piles to collect runoff for treatment before discharge, impermeable liners placed beneath storage areas to prevent leachate movement into groundwaters, and dust suppression systems installed on coal handling systems to reduce fugitive dust generation. As a result, the impacts to aquatic biota and habitats from coal handling, processing, and storage facilities are expected to be quite small and very localized. For cumulative impacts to occur, plants would have to be located very close together (<0.5 mi). No conversion candidates are so proximally located (see Table 5.17 of the DEIS). It is also highly unlikely that the small impacts to aquatic biota of coal handling, processing, and storage activities at all the conversion candidate powerplants are sufficiently additive to result in the demise of a given species.

NYDEC-31 Section 5.2.3.3 of the DEIS contains an evaluation of the potential for cumulative impacts due to thermal discharges from candidate powerplants converted to coal. Two sets of plants--Arthur Kill and Sewaren, and Hudson and Kearny--were examined more carefully and it was concluded, based upon this analysis, that the thermal discharges of candidate powerplants would not interact. In addition, the Sewaren and Hudson plants are no longer conversion candidates. Thus, no cumulative impacts to fish of the Mid-Atlantic states are expected. The impacts of waste heat discharges from individual powerplants on estuarine/near-shore fish population and the regulatory status of each powerplant will be discussed in the site-specific EIS prepared for each conversion candidate.

NYDEC-32 While it is true that circulating water pumps can be turned on or off as noted in the comment, cooling water is typically withdrawn at or close to the maximum condensor flow rate to prevent biofouling and corrosion. The statement mentioned in the comment is based upon the design and operational characteristics typical of modern coal-fired powerplants.

NYDEC-33 The statement was made as part of a discussion of air pollutant impacts to biota (Sec. 5.4.3.3 of the DEIS). The intent of this statement is not to infer that endangered or threatened species cannot be adversely impacted by coal combustion emissions. Rather, its purpose is to indicate that the manner in which these species respond to pollutant exposure (e.g., reduced photosynthesis, increased susceptibility to disease or parasites, behaviorial modifications) is not likely to differ from that of other species. The pollutant concentration at which these species are adversely affected is a separate issue. In determining the impacts of the proposed conversion of up to 42 powerplants to coal firing, endangered and threatened species were always considered to be very sensitive to anthropogenic influences.

NYDEC-34 -- On p. 5-57, it is stated, "The influence of wet and dry deposition of oxides of sulfur and nitrogen on aquatic ecosystems is the eutrophication that can result from the input of these materials as nutrients in both freshwater and marine systems." A reference should be given for this statement since references do not exist to show that any water has suffered from eutrophication from sulfur or that any water is deficient in sulfur to the extent that it limits eutrophication.

NYDEC-35 -- On p. 5-67, it is stated, "Examples of studies of the effects of air pollutants and acid rain on the environment may be found in publications by Mendelsohn (1980), Wadell (1974), Ridker (1965), Ridker and Henning (1967), and Liu (1978)." The NEREIS recognizes that air pollutants are the major problem from coal conversion facilities, yet it fails to give brief reviews of studies of the effects of these pollutants. It is not appropriate to send the reader to references and not have any of the effects of air pollutants contained within the NEREIS. Acid rain is such a significant environmental impact that a discussion of the current situation should be mandatory part of the final NEREIS.

NYDEC-36 -- Nowhere in the draft NEREIS is a statement made that currently there is an overdose of acidic emissions being deposited in certain ecological areas. The Division of Fish and Wildlife in DEC maintains that the proposed emissions of converted power plants will have significant impacts. N.Y. State is already observing fisheries problems as a result of deposition of acid compounds whose origins were from utilities as well as other industries. In order to reverse its trends in failing fisheries, NYSDEC has made determination that emissions of sulfur dioxide must be decreased. It may not even be possible to maintain the status quo in fisheries with the current emission levels. The final NEREIS should give recognition to the fact that the proposed conversions if carried out will exacerbate the acid rain situation. Certainly no one has ever proposed that additions of a pollutant would tend to mitigate the ecological impacts of that pollutant.

NYDEC-37 -- In the continuation of Table C.5 on p. C-8, the American peregrine falcon is mentioned under the New York heading and it's commonly associated plant community column mentions that this bird is prevalent at coasts, mountains, woods. Since this column is essentially the birds' habitat, mention should be made that high buildings in cities are often utilized by this endangered species. In fact, NYSDEC has a hacking program which utilizes the skyscrapers of New York City as roosts.

NYDEC-34 The statement in question was in error. It is replaced with the following two paragraphs:

"Impacts associated with pH changes in aquatic systems are discussed in Section 5.4.3. The major consequence of wet and dry deposition of oxides of sulfur and nitrogen on poorly buffered aquatic ecosystems is to cause greater acidification and loss of fish populations. A less conspicuous effect is to cause changes in communities of algae, aquatic macrophytes, zooplankton, zoobenthos, and microdecomposers.

The predominant form of sulfur in lakes is the oxidized state (sulfate) and nearly all assimilation of sulfur is as sulfate. However, during decomposition of organic sediments, sulfur is released as hydrogen sulfide (Wetzel 1975). Metal sulfides are very insoluble at neutral or alkaline pH values, which is the case in a majority of natural waters. For an acidic anaerobic hypolimnion, the hydrogen sulfide (H_2S, HS^-) concentration may increase appreciably as a result of bacterial decomposition. These reduction reactions, mediated by various bacterial groups, play a significant role in the modification of conditions for numerous other nutrients, especially for the mobilization of phosphate (Ohle 1954)."

REFERENCES

Ohle, W. 1954. Sulfat als "Katalysator" des limnischen Stoffkreislaufes. Von Wasser 21:13-32.

Wetzel, R.G. 1975. Limnology. W.B. Saunders Co., Philadelphia, Pa.

NYDEC-35 The sentence in question should read "economic effects of air pollutants" to indicate that the literature cited deals with the economic effects of air pollution. The economic impacts of acid deposition are discussed later in Section 5.5.4. By clarifying the type of effects discussed, it can be seen that the sentence and citations are appropriate within the context of the economic analysis in Section 5.5.4 of the DEIS. It should be noted that incorporation of information by reference is acceptable under Council on Environmental Quality regulations for Environmental Impact Statement preparation (43 CFR Part 1502.21--Incorporation by Reference) when the effect is to cut down the bulk of a document without impeding agency or public review of the proposed action. Since the documents cited in this statement are available through the open scientific literature, review of the proposed action is not impeded by the use of references in this section.

NYDEC-36 Recognition of the adverse acid deposition impacts in the northeastern United States is given throughout the DEIS (see, for example, Secs. 5.1.4, 5.2.4, and 5.4.4). The conclusion drawn from the EIS analysis was that only a slight increase in atmospheric emissions of SO_2 and NO_2 would occur following fuel conversion of the original 42 candidate powerplants. Since the issuance of the DEIS, the USDOE has determined that 27 of these powerplants constitute a more likely conversion scenario (see Sec. 1), further reducing predicted emissions. As significant changes in the atmospheric loading of SO_2 and NO_2 will not occur as a result of the proposed action, it would appear that acid deposition would not increase greatly. This is confirmed by ASTRAP modeling results (DEIS Sec. 5.1.4.2). Therefore, the incremental increase in acid deposition associated with fuel conversion are unlikely to cause significant adverse impacts to biota (see also Topical Response 3.3).

NYDEC-37 An addition to Table C.5 has been made, and is included in Section 5, Errata and Addenda.

NYDEC-38

-- As noted in the comments on "Acid Deposition," even though very low overall pH changes---(-)0.0086 in the Adirondacks--are attributable to the conversion plants, such increments in acidity can be much higher in some specific locations or impact upon especially sensitive waters. An overview of impacts upon aquatic biota such as follows should be made a part of the final NEREIS:

Long-term changes of less than 0.5 pH units in the range of 6.0 to 8.0 are likely to alter the biota composition of freshwaters to some degree, but the significance of the changes is slight. However, a decrease of 0.5 to 1.0 pH unit in this range may cause detectable alterations in community composition. Productivity of competing organisms will vary, and some species could be eliminated. Decreasing pH from 6.0 to 5.5 may cause a reduction in species numbers and significant alterations in the ability of remaining species to withstand stress, with reproduction of some salamander species reduced and many species eliminated. Below a pH of 5.0, decomposition of organic detritus is severely impaired, debris accumulates rapidly, and most fish species would be eliminated. At pH 4.5 and below, all of the above changes are greatly exacerbated, and the lower limit for many algal species would have been reached.

NYDEC-39

-- In the first paragraph under "Combustion" on p. 5-5, reasons are set forth why NO_2 emissions are not investigated further. Additions of NO_2 and their transformation to nitric acid in an ecosystem subjected to acid precipitation is not expected to cause long-term acidification if sufficient reduction of the nitric acid takes place in the soils and waterways. However, during spring thaws in areas that have been impacted by acid rain for a number of years, nitric acid which has concentrated in the snow pack over the winter may cause ecological damage, especially to fish populations.

NYDEC-40

-- SO_2 at ambient levels damage both native and planted vegetation. Studies in the vicinity of the Arthur Kill plant in 1965 and 1966 showed that the existing SO_2 levels (in combination with ozone) injured indigenous vegetation. It has been known for years that the eastern white pine, an important timber species in the northeast, is being damaged by ambient air conditions. Studies have shown that chronic exposure to SO_2 at 135 $\mu g/m^3$ for less than 30 days causes a decline in photosynthesis in silver fir, Norway spruce, and Scotch pine. A review of the literature regarding oxidant air pollution impacts in western forests by Skelly and Johnston (1979) indicate that many indigenous species have already been detrimentally affected by previous high oxidant episodes. Comparable findings on SO_2 exposure levels with respect to agricultural crops may be found in the comments under "Agricultural Impacts."

NYDEC-41

-- The draft NEREIS assertion (p. 5-53) "The literature contains no major effects to wildlife resulting from ambient exposures to sulfur oxides, nitrogen oxides, or photochemical oxidants..." is misleading. Though no long-term studies have been conducted in the United States to test the effects of higher ambient exposures to these pollutants, studies in Czechoslovakia, indicate a possible adverse synergistic effect between ambient SO_2 and fly ash involving changes in urine pH, blood calcium/phosphorus ratio, and a general calcium deficiency in European hares (reviewed in Newman, 1980).

NYDEC-38 Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). A new analysis of the long-range transport of sulfur emitted by the remaining powerlants under the most-polluting emissions scenario (see Topical Response 3.2) suggests that most of the Northeast will receive an increase in sulfur deposition of 2% or less. It is not likely that this small increase in sulfur deposition will result in an appreciable change in surface water acidity, even in sensitive areas. An overview of the impacts of acid precipitation on aquatic biota is included in Section 5.4 of the DEIS. See also Response NYDEC-34.

NYDEC-39 In the paragraph in question, the factors that constrain the comparison of nitrogen dioxide concentrations between various air quality modeling scenarios are identified (see DEIS Sec. 5.1.3.3). The increase in nitrogen dioxide emissions caused by the proposed coal conversion were predicted using the RAM model. The results of the modeling study show that only a slight increase in nitrogen dioxide emissions can be expected following conversion of all 42 candidate powerplants (DEIS Tables 5.5 through 5.8). While the flush of acids contained in snow pack into surface waters during spring melts may adversely affect fish populations (perhaps by affecting reproduction), it does not appear that nitrogen dioxide emissions resulting from the proposed action will appreciably increase the amounts of acid contained in snow pack in the northeast. As the USDOE has now determined that 27 of the candidate powerplants constitute a more likely conversion scenario (see Sec. 1), the increase in emissions of nitrogen dioxide will be even smaller (see Sec. 2 and Topical Response 3.1). This, in turn, further reduces the potential for adverse impacts to aquatic biota.

NYDEC-40 Annual average SO_2 concentrations predicted to occur following fuel conversion of the original 42 candidate powerplants are in the range of 37 to 87 $\mu g/m^3$ for the most-polluting emissions scenario (see Tables 5.5 through 5.8 of the DEIS). Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). Predicted annual average SO_2 concentrations following conversion of the remaining powerplants would be in the range of 13-75 $\mu g/m^3$ (see Topical Response 3.1). It should be noted that the higher concentrations are predicted to occur near individual powerplants. These higher pollution levels will also be discussed in the site-specific EIS prepared for each conversion candidate powerplant. These predicted SO_2 concentrations represent only slight increases over presently existing conditions. The SO_2 concentrations involved are not expected to cause chronic damage to exposed vegetation (see Response NYDEC-49). The influence of pollutant mixtures is discussed in Response NYDEC-45. The proposed action is not expected to appreciably increase oxidant pollution levels.

NYDEC-41 The intent of this statement was not to mislead the reader, but rather to indicate the lack of research in this area. The potential for adverse long-term effects to wildlife through changes in plant communities or primary or higher trophic-level consumers is discussed in DEIS Section 5.4.3.3 (p. 5-53). The Czech research discussed by Newman (1980) is difficult to assess with only the data given in the review. In this review and previous reports (e.g., Newman 1979), little information describing the conditions of European hare (*Lepus europaeus*) exposure to SO_2 and fly ash is presented. Newman (1979, 1980) describes the location of this exposure as an area of "heavy industry with widespread air pollution by sulfur dioxide, nitrogen oxides, fly ash, and cement dust." European hares were collected from areas of "high sulfur dioxide emissions (up to 0.35 mg/m^3) and fly ash emissions (up to 301 $t/km^2/yr$)" (Newman 1980). The effects seen in these animals appear to be the result of extended exposure to rather high levels of sulfur dioxide and particulates. The measured background concentrations of sulfur dioxide and particulates in the Northeast region are far less than the levels noted by Newman. The proposed action will alter these concentrations only slightly (see DEIS Tables 5.5 through 5.8). Therefore, it seems unlikely that similar physiological effects would be seen in wildlife of the Northeast as a result of the changes in emissions caused by the proposed action.

REFERENCES

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NYDEC-42

-- Sulfur dioxide exposure has been shown to reduce foliar concentrations of such elements as selenium (Shaw, 1981). New York biota already suffer from a general selenium deficiency, and farmers in the northeast are advised to feed selenium supplements to their livestock to prevent white-muscle disease. Shaw concludes that excessive atmospheric SO_2 and acid rain SO_4 may increase the incidence of selenium deficiency disease. The final NEREIS should carefully evaluate the biological and economic implications of indirect air pollution effects of selenium, as well as the direct effects. While selenium deficiencies are of concern, there is also a potential for selenium toxicity near power plants, due to its high level in fly ash and the increased levels of selenium and other trace elements in plants growing on soils treated with fly ash and in organisms living in fly ash-contaminated aquatic systems (Furr, et al., 1979). This toxicity can occur in organisms living in these areas, and for higher level organisms which feed on these plants, insects, amphibians, fish, and mammals. Selenium, as with many elements, is both essential and toxic: the range between these levels is narrow. This question is further complicated by the fact that the presence of selenium produces a protective effect against the toxic action of mercury and cadmium, also emitted by coal burning (Furr, et al., 1979).

NYDEC-42

The influence of additions of sulfur and soluble sulfates to soil in inhibiting selenium uptake in certain crops (e.g., wheat, tobacco, soybean, buckwheat) has been known for some time (Hurd-Karrer 1934; Ganje 1966). The work of Shaw (1981) is the first report of this effect being caused by atmospherically deposited sulfur compounds. However, as this effect has only been seen in a limited number of crop species and one shrub (serviceberry), it would be premature to suggest that the small increase in sulfure emissions associated with the most polluting emissions scenario considered for the proposed action would result in a general decrease in plant-tissue selenium concentrations of livestock forage. The soils of the northeast region are considered to be deficient in selenium. Kubota and Allaway (1972) report that over 80% of the forage and grain grown in the region contains less than 0.05 μg Se/g of plant tissue. Tissue concentrations below the 0.05 μg/g level are not able to meet the nutritional requirements of animals. This results in farmers supplying selenium to livestock, in quantities sufficient to fulfill nutritional requirements. When this fact is considered along with the small increase in sulfur emissions predicted to occur following fuel conversion, it would seem unlikely that selenium deficiency would be induced in livestock of the region.

Selenium can enter the environment as a result of the coal combustion primarily through two pathways: stack emissions of fly ash containing selenium, and by fugitive dusting, runoff, or seepage of selenium from fly ash disposal sites. The long-term accumulation of trace elements in soils as a result of atmospheric deposition have been modeled or measured in the field in a number of investigations. The results of these studies are discussed in Respose MDAQC-14. The general conclusion of these studies is that following fly ash deposition over long periods (20-40 years), selenium enrichment of exposed soils will be only slight. No reports of toxicity to plants or animals have been made. In the northeast, where soils are deficient in selenium such enrichment may well be beneficial. Furr et al. (1979) did find elevated selenium levels in a farm pond located adjacent to an active fly ash landfill site. The authors indicate that this pond received fugitive dust emissions from nearby fly ash dumping operations. It would appear that this pond receives a rather heavy input of fly ash. However, no mention of selenium toxicity in the plants or aquatic biota is made in this report. Indeed, the "marked increase" in tissue selenium of aquatic organisms over a control pond may be due in part to the low ambient concentrations of selenium in soils and water of the northeast. The organisms of the control pond are likely to be slightly deficient in selenium.

Furr and his colleagues has conducted a number of studies (some long-term) in which a variety of organisms were fed fly-ash grown seleniferous vegetation or fly ash directly. Extremely high plant-tissue selenium concentrations have been reported for white sweet clover growing on acidic fly ash in New York (Gutenmann et al. 1976). When acidic fly ash-grown clover containing 66 μg Se/g dry wt. was fed as 23.5% of the diet (dry wt.) of adult goats, newborn kids, and lambs for 173 days (Furr et al. 1978a), high selenium concentrations were found in 11 body tissues, blood, goat's milk, and excreta when compared to control animals. No incidence of selenium intoxication was observed, despite the fact that the diet fed the experimental animals contained 16 µg Se/g dr wt, well within the 5-20 µg Se/g dry wt concentration range known to cause animal poisoning (Gough et al. 1979). No gross or histologic lesions were present in any of the experimental animals. In other feeding studies, guinea pigs (Furr et al. 1975), Japanese quail (Stoewsand et al. 1978), and sheep (Furr et al. 1978b) were fed diets which included ash-grown yellow sweet clover, ash-grown winter wheat, and fly ash, respectively. In all cases, elevated selenium levels in blood and tissues were noted, but no significant toxicological or histological effects were found. Woodchucks inhabiting fly ash landfills exhibited elevated selenium levels in liver and lung tissue when compared to selenium levels in woodchucks collected from other locations (control animals), but again no visible lesions were found in these animals (Fleming et al. 1979).

At appropriately designed and operated fly-ash disposal sites, the rate of release of selenium to the environment will be quite slow (Soholt et al. 1980). Since the feeding studies discussed above failed to induce selenium toxicity in animals exposed to sizeable amounts of selenium for extended periods, it is unlikely that the proposed action would induce selenium toxicity in plants or animals of the Northeast.

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Stoewsand, G.S., H.W. Gutenmann, and D.J. Lisk. 1978. Wheat grown on fly ash: high selenium uptake and response when fed to Japanese quail. J. Agric. Food Chem. 26(3):757-759.

NYDEC-43 -- p. 5-56 of the draft NEREIS infers that effects on terrestrial organisms would be indirect through changes in soil pH or vegetation. Though this is true, recent studies indicate a potential for reducing reproductive capabilities of the predators in a food chain through increased aluminum, mercury, or other toxic metals mobilized by acid rain (Nyholm, 1981) and for direct reproductive reductions in amphibians through acidification of breeding pools (Pough, 1976 and EPA, 1980).

NYDEC-43 Section 5.4.4 of the DEIS has been expanded to better identify potential acid deposition impacts on terrestrial biota (see Response NYDEC-28).

It should be noted that Nyholm (1981), who discusses only the effects of aluminum on pied flycatcher (Ficedula hypoleuca) reproduction does not identify the origin or route of transport of aluminum into affected birds. Indeed, the suggestion that the effect reported in this article is due to acid precipitation is merely conjecture. The author makes no attempt to determine (1) whether evaluated levels of aluminum exist in lake water, (2) whether elevated aluminum levels are present in the food items of the birds, (3) the pH of Lake Torneträsk, (4) the acidity of rainfall in the watershed of this lake, or (5) whether industrial effluents containing aluminum enter this lake. Without this information, it is extremely premature to conclude that impaired flycatcher reproduction is related to acid precipitation. In addition, if insect food items are of limited availability during the egg-laying period (as is indicated by the author) except along the lake shore, it is not obvious why only shore-nesting birds would exhibit impaired reproduction. Inland-nesting birds would also be likely to utilize this resource.

The research of Pough (1976) is also limited in its usefulness. While Pough does report a relationship between spotted salamander (Ambystoma maculatum) embryonic mortality and temporary pool pH, the author presents little evidence that this effect is the result of acid precipitation. The five ponds sampled in this study are located within a circle 1 km in diameter (Pough 1976). Thus, it seems likely that the pH of the rain and snow received at the locations of each temporary pool would be similar. Yet the pH of the five pools differs greatly (pH 7.0, 6.5, 5.5, 5.0, and 4.5). The author does indicate that the most acidic pools were associated with areas of acid soil (pH 5.0). The other pools are located in drainage areas with soil pH values of 6.8 to 7.2. It would appear that temporary pool pH is influenced principally by the characteristics of its drainage area soils, not acidic precipitation. It should also be noted that the "theoretical" pH of unpolluted rain is 5.6, a level of acidity associated with ~ 40% embryo mortality by Pough. See also Response NYPP-2.

REFERENCES

Nyholm, N.E.I. 1981. Evidence of involvement of aluminum in causation of defective formation of eggshells and of impaired breeding in wild passerine birds. Environ. Res. 26:363-371.

Pough, F.H. 1976. Acid precipitation and embryonic mortality of spotted salamanders, Ambystoma maculatum. Science 192:68-70.

NYDEC-44 -- The one-half sentence of discussion afforded to New York in the third paragraph on page 4-34 should be supplemented. Suggested addition could be:

> Environmental damages appears to be attributed to the phenomenon of acid deposition as has been described in New York by Pfeiffer and Festa (1980) and by Schofield (1977). Pfeiffer and Festa report that 3.7 percent of the total Adirondack lake acreage has a pH of less than 5.0. This 5.0 pH represents a "cut-off point" which coincides fairly well with loss of even more acid tolerant fish species such as brook trout. The 212 lakes in this category have a greatly impaired fishery. There is also a concern in New York State that much of the 22.4 percent of the Adirondack surface waters in the pH 5.0-6.0 class may slip into the critical category.

Literature Cited Above:

Con Edison, 1981, Draft Environmental Impact Statement for Coal Reconversion at Arthur Kill Units 2 and 3, Richmond County, NY, November. Prepared by Consolidated Edison Company of New York, Inc.

EPA, 1980, Acid Rain. U.S. EPA, Office of Research and Development. EPA-600/9-79-036, 36 p.

Furr, A. Keith, et al, 1979. Elemental Content of Aquatic Organisms Inhabiting a Pond Contaminated with Coal Fly Ash. New York Fish & Game J. 26 (2): 154-161.

Newman, James R., 1980, Effects of Air Emissions on Wildlife Resources. U.S. Fish & Wildlife Service, Air Pollution and Acid Rain, Rept. 1., FWS/OBS-80/40/I. 32 p.

Nyholm, N. Eric I., 1981, Evidence of Involvement of Aluminum in Causation of Defective Formation of Eggshells and of Impaired Breeding in Wild Passerine Birds. Envir. Res. 26: 363-371.

Pfeiffer, M.H., and P.J. Festa, Acidity Status of Lakes in the Adirondack Region of NY in Relation to Fish Resources, Bureau of Fisheries, Division of Fish and Wildlife, NY State Department of Environmental Conservation, Albany, NY, August 1980.

Pough, F. Harvey, 1976, Acid Precipitation and Embryonic Mortality of Spotted Salamanders, Ambystoma aculatum. Science 192: 68-70.

Schofield, C., Acid Snow-Melt Effects on Water Quality and Fish Survival in The Adirondack Mountains of New York. Research Project Technical Completion Project, Project No. A-072-NY, submitted to the Office of Water Research and Technology, Washington, DC, 1977.

Shaw, George G., 1981, The Effects of SO_2 on Selenium Concentration in Serviceberry. Proc. NE Fish & Wildlife Conf., 8 p.

Skelly, John M. and J. William Johnson, 1979, Oxidant Air Pollution Impact to the Forests of Eastern United States - A Literature Review. U.S. EPA Report EPA-600/3-79-045, 30 p.

NYDEC-44 The paragraph of concern is part of a discussion of the existing surface water quality of the Northeast Region (DEIS Sec. 4.2.4). It would be inappropriate to discuss the ecological implications of lake acidity in this section. However, to better describe the existing pH conditions of New York lakes, the following addition is made to this paragraph.

"Pfeiffer and Festa (1980) report that 3.7% of the total Adirondack lake acreage has a pH of less than 5.0. The 212 lakes in this category have greatly impaired fisheries. In addition, 22.4% of the Adirondock surface waters have pH levels of 5.0-6.0. The implications of increased lake acidity on fisheries are discussed in Section 5.4.4."

REFERENCES

Pfeiffer, M.H., and P.J. Thesta. 1980. Acidity Status of Lakes in the Adirondack Region of New York in Relation to Fish Resources. Bureau of Fisheries, Division of Fish and Wildlife, New York State Department of Environmental Conservation. 36 pp.

NEW YORK STATE AGENCY COMMENTS ON U.S. DEPARTMENT OF ENERGY DRAFT
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AGRICULTURAL IMPACTS

Several reviewers point out that the draft NEREIS fails to give sufficient coverage to the impacts of coal conversion upon agriculture, in particular to various conversion-related emission impacts upon crops, many of which are already being damaged by existing air quality. Comments by the Department of Public Service express these concerns:

NYDEC-45 Depression in productivity has been found to be occurring over wide areas in the northeast in our forests, orchards, and truck farms (Guderian, 1977). The draft NEREIS fails to reflect the fact that vegetation is reacting to the total pollution load. EPA (1973) warned against the single-pollutant type of impact evaluation "since ambient air is composed of many pollutants, interaction with other pollutants must be considered in analyzing the effects of SO_2 on vegetation." In this regard, adverse foliar and growth effects from pollutant mixtures may be of a larger magnitude than effects from exposures to SO_2 alone.

NYDEC-46 It is likely coal conversions being considered could add to the economic losses due to air pollution being experienced by farmers in the northeast. While few studies that quantify these losses are available, it does appear that such losses are of importance and should be addressed in the NEREIS.

NYDEC-47 As an example, air pollution injury to grapevines has become a common occurrence in New York vineyards in recent years, with no grape growing area of the State escaping damage to sensitive varieties (Musselman, 1980). Ambient air pollutants in New York have been shown to cause an average of 1 percent reduction in fruit-soluble solids of Concord grapes. This is equal to $14 a ton loss to the grape grower, on an average crop of better than 100,000 tons, valued at $1.5 million . This first level agribusiness impact does not represent the total loss to the New York State economy as it is but a small segment of the State's agricultural industry.

NYDEC-48 It is stated (page 5-53) that "... threshold levels of SO_2 as low as 470 $\mu g/m^3$ have been reported to injure plants during chronic exposure. The highest SO_2 concentrations predicted are 451 $\mu g/m^3$ for a 24 hour averaging period in one part of the New York Subregion." The conclusion is then drawn that there is no effect below the threshold. The stated threshold level is incorrect. Injury and damage from SO2 pollution have been reported at levels considerably

NYDEC-45 It is agreed that vegetation and crops react to the total pollutant loading that they are exposed to and that productivity can be reduced by such exposure. However, the focus of the Northeast Regional EIS has to be on how the total pollutant loading of the region will be altered by the conversion of a number of existing powerplants to coal firing. Therefore, emphasis is placed upon examining the effects of the principal pollutants released by coal combustion sources (i.e., SO_2, NO_2, particulates, and acid deposition). Analysis of the effects of exposure to pollutant mixtures would be the more realistic method of determining the impacts of the proposed action. Unfortunately, the understanding of the influence of exposure to pollutant mixtures on plant growth and development is poor. The effect of various environmental factors on plant response to pollutant mixtures is also poorly understood. While available experimental evidence suggests that interactions do occur between pollutants, it is difficult to relate this information to "real-world" exposure incidents.

NYDEC-46 The increase in atmospheric emissions, and in particular acid deposition, associated with the proposed conversion of 27 powerplants to coal firing are considered to be small (see Topical Responses 3.1 and 3.2). These increases are not expected to adversely impact agricultural production in the Northeast. Research describing the potential impacts of gaseous pollutants on vegetation and acid deposition on agronomic crops are discussed in Section 5.4 of the DEIS and Topical Response 3.3, respectively.

NYDEC-47 Comment noted. The effects of air pollutants on vegetation and crops are discussed in the DEIS (Section 5.4.3.3) and expanded in the FEIS (see Topical Response 3.3).

NYDEC-48 The statement in question is in error. The paragraph it was taken from has been amended to read as follows.

"Yield reductions in field-grown soybeans were obtained in absence of visible foliar injury following exposure to 240 $\mu g\ SO_2/m^3$ for 4.2 hr average fumigation periods on 18 days scattered from July 19 through August 27 of the soybean growing season (Sprugel et al. 1980). Bell and Clough (1973) reported significantly reduced growth in S23 ryegrass following exposure to 320 $\mu g\ SO_2/m^3$ for 9 weeks or 179 $\mu g/m^3$ for 26 weeks. No visible symptoms of injury were reported other than a slight chlorosis and an enhanced rate of leaf senescence. Alternately, Neely and Wilhour (1982) found increased yield of winter wheat cs. Yamill following exposure to 24 hr/day doses of 80 and 160 $\mu g\ SO_2/m^3$ (yield increases of 27% and 8%, respectively) for 30 days. These studies are representative of attempts to identify the lowest SO_2 concentrations eliciting yield responses in agronomic plant species following relatively long-term exposure. It should be noted that tolerance to SO_2 is influenced by a number of factors, including environmental, genetic and cultural considerations, as well as the stage of plant development involved. For example, fully developed leaves appear to be most sensitive (Glass 1979). Annual average SO_2 concentrations predicted to occur following conversion of the original conversion candidate powerplants is in the range of 37 to 87 $\mu g/m^3$ for the most polluting emissions scenario (see Tables 5.5 through 5.8). The predicted SO_2 concentrations represent only slight increases over existing conditions and are not expected to adversely impact agricultural production."

Peak, short-term, SO_2 concentrations predicted to occur following fuel conversion are likely to occur in the immediate vicinity of the powerplant. The impacts of peak pollutant concentrations on biota would therefore be site-specific, and will be considered at length in the EISs prepared for each conversion candidate.

below 470 ug/m^3. Foliar injury to beans, oats, radishes, alfalfa, and broccoli was observed when a concentration of 262 ug/m^3 SO_2 mixed with ozone was applied for only four hours. Hessestad and Bennett (1981) observed yield reductions in snap beans when SO_2 was added to ambient air at the rate of 159.9 ug/m^3 for only 24 days of the growing season. Further, ten years of Japanese research, reviewed by Ishikawa (1976) also substantiated SO_2 impacts on agricultural crops at chronic exposures of less than 470 ug/m^3.

NYDEC-49 Figures 5-1 through 5-6 and findings expressed elsewhere about the general direction of movement of sulfur deposition along the Northeast coast has led the New York State Department of Agriculture and Markets to express great concern about impacts upon fruit and vegetable crops throughout the state and in particular for Sulfolk County on Long Island. Sulfolk County is New York State's number one county in farm receipts, primarily on the basis of its vegetable crops. Its agricultural production may be severely jeopardized by its downwind location under the bulk of New York and New Jersey proposed coal conversion emissions. Agriculture in parts of the Hudson Valley may be affected similarily.

NYDEC-50 The final NEREIS should reflect the fact that economic losses to agriculture are already occurring due to existing air pollutants, and that monitoring and further study is greatly needed on the impacts upon agriculture that may occur due to the incremental increases to the air pollution load resulting from coal conversion.

Literature Cited Above:

EPA, 1973 Effects of Sulfur Oxides in the Atmosphere on Ve-etation; Revised Chapter 5 for Air Quality for Sulfur Oxides. EPA, Ecological Research Series - EPA-R3-73-030, 43 p.

Guderian, Robert, 1977, Air Pollution. Springer Verlag, NY, 122 p.

Hessestad, Howard E. and Jesse H. Bennett, 1981, Photochemical Oxidants Potential Yield Losses in Snap Beans Atributable to SO_2. Science 123: 1008-1010.

Ishikawa, Huruhiko, 1976, Sensitivity of Cultivated Plants to Air Pollutants. Report of the Bio-Environmental Lab., Central Res. Inst. of Electric Power Industry, October 1976, 19 p.

Musselman, Robert C., 1980, Air Pollution Injury to Grapevines. New York State Hort. Soc. Proc. 125: 129-137.

Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). The predicted increase in annual average SO_2 concentrations following conversion of these remaining powerplants would be much smaller than that discussed above (see Topical Response 3.1). This further reduces the potential for adverse impacts to vegetation and crops. The effects of pollutant mixtures on plant growth and development is discussed in the Response NYDEC-45.

REFERENCES

Bell, J.N.B., and W.S. Clough. 1973. Depression of yield in ryegrass exposed to sulfur dioxide. Nature 241:47-49.

Glass, N.R. 1979. Environmental effects of increased coal utilization: ecological effects of gaseous emissions from coal combustion. Environ. Health Perspect. 33:249-272.

Neely, G.E., and R.G. Wilhour. 1982. Yield response of Yamhill and Hyslop winter wheat cultivars to chronic SO_2 exposures. J. Air Pollut. Control Assoc. (In press).

Sprugel, D.G., J.E. Miller, R.N. Muller, H.J. Smith, and P.B. Xerikos. 1980. Sulfur dioxide effects on yield and seed quality in field-grown soybeans. Phytopathology 70:1129-1133.

NYDEC-49 Since the issuance of the DEIS, the USDOE has determined that 27 of the 42 candidate powerplants constitute a more likely conversion scenario (see Sec. 1). As a result, a new analysis of long-range transport and sulfur deposition has been prepared (see Topical Response 3.2). The results of this analysis indicate that the predicted increase in sulfur deposition associated with the most polluting emissions scenario is far smaller than originally thought. In the vicinity of New York City, and including Sulfolk County on Long Island, sulfur deposition would increase by only approximately 3-4% following conversion. Other areas of the Northeast would receive sulfur deposition increases of 2% or less. Increases of this magnitude are not expected to result in acid deposition rates that would be detrimental to agricultural production.

NYDEC-50 Comment noted. The adverse effects of air pollutants on vegetation and agriculture are discussed in the DEIS (e.g., Sec. 5.4) and Topical Response 3.3. The analysis of air pollutant dispersion modeling conducted as part of the DEIS indicates that atmospheric emissions will increase only slightly (see Topical Response 3.1) with the conversion of the 27 remaining candidate powerplants to coal firing. It is unlikely that this small incremental increase in coal combustion emissions will adversely affect agricultural production. Further research on the effects of ambient levels air pollutants on agricultural crops is warranted.

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WATER QUALITY

Most water quality findings in NEREIS, except as noted in comments under "Acid Deposition" are in agreement with conclusions developed by the DEC Division of Water. The Division does raise the following minor water quality questions.

NYDEC-51 -- p. 4-10, Section 4.2.1 - the first two paragraphs appear to be contradictory. In the first paragraph, it is stated that Pennsylvania has 2,000 miles of streams degraded by acid mine drainage and that by 1983, it is predicted that 90 percent of all stream miles will fail to meet State and Federal Water Quality Standards due to the discharge of Acid Mine Drainage (AMD). The second paragraph then states how these problems have been mitigated and that AMD has been successfully diluted to meet water quality standards. If these impacts are ameliorated so easily, explain why Pennsylvania has so many miles of polluted streams. See also Section 4.2.1.2 (p. 15-17) which further describes the impacts of acid mine drainage.

NYDEC-52 -- p. 4-31 Section 4.2.3.4 - explain how surface water provides 90 percent of water withdrawal, when groundwater provides 22 percent of public, 96 percent of rural and 11 percent of industrial supplies.

NYDEC-51 Section 4.2.1 is revised as follows:

"Historically, coal mining and processing have seriously degraded the quality and reduced the quantity of surface and groundwaters within the Northern Appalachian region. In 1969 the Federal Water Pollution Control Administration (FWPCA) stated that the pollution of streams in Appalachia by coal mine drainage qualified as the single most significant pollution problem in terms of the severity of damage to streams and the effort that would be required to abate the problem (FWPCA 1969; USEPA 1975). In 1980, of the 20,869 km (12,962 miles) of major streams in Pennsylvania about 4,500 km (2,795 miles) of major streams were polluted. Acid mine drainage is responsible for the pollution of 3,200 km (2,000 miles) of those major streams. Acid mine drainage, primarily from untreated effluents from abandoned mines (see Sec. 4.2.1.2) or unregulated mines (see Sec. 5.2.1), will be the principal or a contributing factor in about 90% of the 3,660 km (2,273 miles) of major streams that will not meet 1983 national water quality standards.

The impact of AMD on a supply region is dependent upon a number of site-specific characteristics. In some mined areas, AMD-polluted streams may be ameliorated somewhat by dilution due to the inflow of high-flow and -volume unpolluted tributaries or by natural buffering of the AMD within areas of alkaline overburden. With sufficient dilution of mine effluents by streamflow, suspended solids, total and dissolved iron, total manganese and trace metal concentrations may be sufficiently low to meet USEPA water quality standards (Tables 4.9 and 4.10) (Dvorak et al. 1977). Where dilution is small due to inflow of low-flow and -volume tributaries that are already polluted, AMD will be exacerbated.

The size of the mining operation relative to the size of the drainage area also strongly affects the impact of AMD on a stream system. For example, a large coal mining operation could greatly impact a small drainage system, whereas the AMD impacts associated with a similar coal mining operation within a large drainage area could be much less. Furthermore, the concentration of pyrite minerals in a mined area will also affect the amount of AMD produced as a result of mining operations.

A description of the impacts of coal mining activities presently affecting hydrology, water quality, and use in the coal mining regions is presented in the following text."

REFERENCES

Dvorak, A.J., et al. 1977. The Environmental Effects of Using Coal for Generating Electricity. NUREG-0252. Prepared by Argonne National Laboratory for the U.S. Nuclear Regulatory Commission. 221 pp.

Federal Water Pollution Control Administration. 1969. Stream Pollution by Coal Mine Drainage in Appalachia. NTIS PB 230 022. 261 pp.

U.S. Environmental Protection Agency. 1975. Inactive and Abandoned Underground Mines: Water Pollution Prevention and Control. EPA-440/9-75-007. Washington, D.C. 359 pp.

NYDEC-52 As explained in DEIS Section 4.2.3.4, in 1975, 90.8% of the total fresh water used in the Combustion Region was surface water and only 9.2% was groundwater. The percentage of groundwater supply for public, rural, and industrial uses was calculated based on the subtotal for each item. For instance, of the 7,309 Mgd of water used for public supply, 22% or 1,631 Mgd was groundwater.

NYDEC-53 -- p. 5-54 Section 5.4.3.4 - explain how high pH leachate would increase trace element concentrations in low pH soils, if trace elements are less soluble at higher pH. This conclusion appears to be contradictory to the following statement, "Ionic availabilities of most toxic elements tend to be lower in soils with a high pH and high CEC, and therefore there is less potential for trace element toxicity to plants."

NYDEC-54 -- On p. 4-19, the second paragraph under "Surface Water Hydrology" should mention the New York City reservoir system within the Catskill Mountains and Putnam and Westchester counties. Total surface areas of these reservoirs easily exceeds that of Scituate, if not Quabbin. In the list of natural lakes, the New York Finger Lakes should probably be included as a group.

NYDEC-55 -- On p. 4-19, the third paragraph under "Surface Water Hydrology" is misleading with respect to salt water intrusion. While the river is tidal to Green Island near Troy, salinity intrusion occurs only to a point near Poughkeepsie on the Hudson.

NYDEC-53 The paragraph from which the statement of concern is taken is amended to read as follows:

"It is difficult to predict the potential for plant toxicity resulting from uptake of pollutants of ash and sludge waste leachates, because of the great deal of variation in plant species tolerance to pH, salinity, and trace element concentrations (Dvorak et al. 1978). Among the trace elements of concern in ash and sludge leachate, which are of relatively high pH, are As, B, Mo, and Se. Most of what is known about phytotoxicity of the constituents from ash and sludge wastes is based upon studies in which plants were exposed to high concentrations of trace elements for short periods of time, i.e., acute exposure. These results are not directly applicable to the situation of long-term exposure to low concentrations (i.e., chronic exposure) of trace elements dispersed from ash or sludge storage sites. However, these studies indicate that soil characteristics, ability of plants to concentrate trace elements, and evolved tolerances are the primary factors in determining the phytotoxicity of elements that may be dispersed from these wastes (Soholt et al. 1980). See Dvorak et al. (1978) for a more detailed discussion.

Because of their influence on ion mobility and solubility, the pH and CEC of soils play a large role in determining the availability of trace elements in coal ash and FGD sludge waste leachates to plants. Most trace elements tend to be less soluble and less available for uptake in soils with a high pH and high CEC, and there is less potential for toxic effects to vegetation in these soils. However, even at high pH, such elements such as As, B, Mo, and Se are readily soluble, can be taken up by plants, and are potentially toxic (Dvorak et al. 1978; Soholt et al. 1980). In soils with low pH and low CEC, the addition of alkaline leachate could raise soil pH. This effect would also increase soil CEC (Brady 1974) and in turn, reduce the concentrations of trace elements in the soil solution. If the resultant soil pH was still neutral to acidic, the solubility and plant-availability of As, 8, Mo, and Se would also be reduced."

REFERENCES

Brady, N.C. 1974. The Nature and Properties of Soils. MacMillan Publication Co., Inc., New York. 639 pp.

Dvorak, A.J., et al. 1978. Impacts of Coal-Fired Power Plants on Fish, Wildlife and Their Habitats. FWS/OB-78-29. Prepared for U.S. Fish and Wildlife Service by Division of Environmental Impact Studies, Argonne National Laboratory, Argonne, Ill.

Soholt, L.F., et al. 1980. Handling of Combustion and Emission-Abatement Waste from Coal-Fired Power Plants: Implications for Fish and Wildlife Resources. FWS/OBS-80/33. U.S. Fish and Wildlife Service, Biological Services, Biological Services Program, National Power Plant Team. 184 pp.

NYDEC-54 Information provided in this comment has been incorporated into amended Section 4.2.3.1 of the DEIS. Page 4-19, lines 31-34 should read:

"The major reservoirs in the region are the Quabbin (in Mass.) and Scituate (in R.I.) reservoirs and the New York City reservoir system within the Catskill Mountains and Putman and Westchester counties."

NYDEC-55 The comment is noted. In Section 4.2.3.1, lines 38-40 should read:

"The tidal influence occurs in estuarine areas such as the Hudson River south of Green Island and the Delaware River south of Trenton."

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HEALTH IMPACTS

Comments of the New York State Department of Helath (DOH) also reflect those of other state agencies regarding the coverage of health effects in the draft NEREIS. DOH finds this coverage to be inadequate, noting:

NYDEC-56 -- Appendix E is a good summary of health effects research related to combustion air pollution, but it is a generic report and there is no direct reference made to the Northeast or to conversion of the 42 power plants. The brief health section in the body of the report contains a superficial discussion of health effects of sulfur dioxide, sulfates, nitrogen dioxide, and total suspended particulates, with the conclusion that no adverse effects are expected.

NYDEC-57 -- Partially addressed on Page 5-15, but in insufficient detail, is the fact that sulfate impacts of coal conversions are likely to be less than predicted by conventional analysis because such analysis does not account for the higher primary emissions of sulfate from oil burning nor for the higher rate of conversion of sulfur dioxide to sulfate in oil plumes. There exists a sufficient literature which could have been used to predict a more accurate impact of oil to coal conversions on ambient sulfate levels.

NYDEC-58 -- With regard to radionuclides, trace elements, and polycyclic organic matter (POM), beginning at the bottom of page 5-72 the NEREIS indicates they "may cause adverse health effects...(but) exposure information is not available." Then, making reference to Appendix E, it concludes that they are "not expected to cause adverse health effects." Again, since no data are given, the reader is expected to take this conclusion on faith. For ozone and fine particles, not even assurances are given.

NYDEC-59 -- There is no mention of the real possibility that acid rain may, by increasing the acidity of groundwater, lead to mobilization of metals from geological structures or household water pipes, with a resulting increased exposure to those drinking such water.

NYDEC-56 A new analysis of health effects has been conducted and is presented in Topical Response 3.7 and Appendices B and C.

NYDEC-57 In Topical Response 3.2, the primary sulfate emission factor is 1.5% for coal and 5.0% for oil. That is why the atmospheric concentration of sulfate can decrease in some localized areas even though total sulfur emissions increase.

NYDEC-58 Refer to Topical Response 3.7.7 and 3.7.8, Appendices B.9, B.10, C.9, and C.10, and Responses NJDEP-5 and -6, and NU-4.

See Topical Response 3.7.4 and 3.7.6.

NYDEC-59 The potential public health effects from consumption of heavy metals present in acidified potable water supplies has been identified as a concern by the Interagency Task Force on Acid Precipitation (ITFAP 1981). Acid precipitation may increase the metal content of surface waters by increasing the leaching of metals from watershed soils and lake and stream sediments (Haines 1981). Acidification of large drinking-water reservoirs and wellwater in both the U.S. and Europe has been documented with evidence from Sweden indicating concomitant increases in metal content (ITFAP 1981).

The Interagency Task Force on Acid Precipitation has identified manganese, zinc, copper, iron, boron, iodine, fluorine, bromine, aluminum, lead, nickel, cadmium, vanadium, mercury, and arsenic as elements with toxic potentials which are known to occur in watershed soils, bottom sediments and in wet and dry precipitation (ITFAP 1981). Increases above background levels of many of these substances, in addition to gold, silver, chromium, antimony and sulfates, have been reported in natural surface waters and in artificially acidified lakes and streams (Haines 1981; Driscoll 1978; Schofield 1978; Beamish and van Loon 1977; Schofield 1980; Hall and Likens 1980; and Schindler 1980). Of these, aluminum, mercury, manganese, zinc, iron and nickel have received the greatest attention as metals mobilized by increased acidity of waters (Driscoll 1978; Beamish and van Loon 1977; Schindler 1980). Driscoll (1978) identified aluminum as perhaps the most mobile metal to occur in acidified waters. Many of the other metals may enter lakes via atmospheric deposition (Haines 1981).

Driscoll (1978) proposed that aluminum is mobilized from soil during rainfall and snowmelt when amorphous aluminum forms in surface materials are solubilized by strong mineral acids and released to the surface waters as inorganic aluminum. Concentrations are typically higher in lakes in the northeast after spring snowmelts. Schofield (1980) has observed that at pH levels below 5, aluminum levels in lakes are generally elevated and fish are usually absent. The toxic level of aluminum in fish is 0.2 mg/L at pH levels down to 4.4 (Schofield 1980). Gill damage and mortality attributable to aluminum has been observed in experiments with water pH in the range of 4.4-5.2 (Schofield 1980).

Direct chronic human consumption of drinking water containing elevated levels of aluminum, mercury, manganese, zinc, iron or nickel may produce deleterious health effects. Of these, aluminum is the only metal not addressed by federal water quality criteria and/or standards for drinking water (see Table 4.9 of the DEIS). The Estimated Permissible Concentration for aluminum in water to protect health calculated by Cleland and Kingsbury is 73 μg/L (USEPA 1977).

Quantitative information on the pH and heavy-metal concentrations in surface and ground water sources of drinking water, and trends, are not known at the present time. Similarly, safe treatment methods for contaminated supplies of acidic water have not been identified (ITFAP 1981). Therefore, the potential impacts of this phenomenon cannot be predicted.

Plumbing systems contain both lead and copper which also may be mobilized by the increased acidity of drinking water supplies (ITFAP 1981). The pH levels required to liberate these metals from plumbing are not known but Beamish and

NYDEC-60 -- In the section on health impacts in the combustion region it is stated that SO_2 levels in the northeastern quadrant "are currently well below the NAAQ standards." (page 5-71) The statement goes on to the contention that sulfates, rather than SO_2, are likely to be causing health effects associated with SO_2/particulate pollution. The statement, however, contains no data on expected sulfate increments in populated areas of the Northeast. The emphasis is entirely on the sulfate increments in the Adirondacks which are "below threshold." This is clearly inadequate as an assessment of possible health effects on the population of the region, particularly since the appendix provides average sulfate levels in New York City which exceed the

NYDEC-61 "threshold" value quoted. Moreover, the statement in chapter 5 dismissing the possibility of a health impact from sulfates contains reasoning that is fallacious and improper for an impact statement. The argument (page 5-72) that any adverse health effects from sulfates would be "primarily a result of existing sulfate levels rather than the 1% increase expected as a result of the proposed action," is poor. Aside from the unacceptable attitude of "things are bad now so a little more can't hurt," there is no effort made to quantify either the present impact or the increment expected from coal conversions.

van Loon (1977) noted that high lead concentrations in precipitation were not maintained in a lake in Ontario with a pH of 4.8. In addition, Davis, et al. (1982) observed in the laboratory that significant desorption (greater than 5% of total) of lead in lake bottom sediment occurred only at pH levels less than 2.0-3.0. It is expected, therefore, that lead mobilization from plumbing will only occur in highly acidic waters.

REFERENCES

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U.S. Environmental Protection Agency (USEPA). 1977. Multimedia Environmental Goals for Environmental Assessment, Vols. I and II. PB 276-920. Research Triangle Park, N.C.

NYDEC-60 See Sections 3.7.2 and 3.7.9 in Topical Response 3.7 and Appendices C.1, C.3, and C.4.

NYDEC-61 Based upon the new analysis of sulfate levels for the Voluntary Conversion Scenario of 27 powerplants (Topical Response 3.2), the incremental worst-case increase in sulfate concentrations expected from conversion is 0.21 $\mu g/m^3$ (1.7% over background) in the winter. This maximum increase is expected to occur over New York City. This worst-case incremental increase is used in the analysis of health effects in Topical Response 3.7.9.

NYDEC-62 -- A similar difficulty exists with regard to nitrogen oxides and TSP. The draft NEREIS states, "...considering the general trend of increased nitrogen oxide emissions and the fact that nitrogen oxide levels already are high enough to warrant concern, the incremental nitrogen oxides emissions warrant some concern." (p. 5-72) Yet there is no effort made to discuss the possible health impacts that warrant such concern or to estimate the magnitude and extent of such impacts.

NYDEC-63 Similarly with TSP; standard violations are predicted, yet the NEREIS dismisses the possibility of adverse health impacts with reference to "documented studies that indicate that present TSP standards provide adequate protection for public health."

NYDEC-64 -- To satisfy information needs regarding health impacts, the final NEREIS should be quantitative to the greatest extent possible. At the least, it should provide data on current ambient concentrations of each pollutant considered in all areas of possible impact, and most importantly in major population centers such as the New York Metropolitan Region. Estimates should also be provided of the expected increase in concentration of every contaminant at these locations of primary concern. Finally, the statement should identify health effects associated with each contaminant and, wherever possible, indicate the order of magnitude of the adverse effect that can be associated with the pollution increments that have been estimated. Although, the methodology for making such estimates is not well developed in every case, it can certainly be applied for those contaminants expected to exceed national ambient air quality standards.

In addition to the above points raised by DOH, reviewers in DEC note the following health impact points:

NYDEC-65 -- On pg. 5-72, in a discussion of the effects of TSP it is stated, "Although the concern is over fine respirable particulates (See Section 4.6.3.2) and not TSP, the latter serves as a good index and there are documented studies (Ferris et al. 1971, 1973, 1976) that indicate that present TSP standards provide adequate protection for public health. Thus, there are no anticipated adverse health impacts from the TSP increment generated by the proposed fuel conversions alone." Why is USDOE segregating the increment of TSP out in determining health impacts? Isn't it appropriate to include the increment of TSP along with the current background in determining the proposed health impacts? Aren't there any incremental increases in health impacts due to additions of TSP?

NYDEC-66 -- Figure 5.5 on Page 5-22 shows a similation for eastern North America of sulfate concentrations for a one month period July 1978. Sulfate concentrations range from 1 to 13.1 ug/m^3. Page E-2 states that sulfate levels of 9 to 14 ug/m^3 were estimated to be the points at which increased acute respiratory disease in chronic bronchitis occur, and concentrations of 6 to 10 ug/m^3 of suspended sulfate were estimated to aggrevate asthma.

NYDEC-67 Based on Figure 5.5 in the above studies, it is clear that eastern North America has siginificant regions where sulfate levels may be contributing to bronchitis and aggrevating asthma. Also, Figure 5.3 on pg. 5-20 indicates that converting the 42 powerplants will increase sulfate emissions. A final NEREIS should mention that coal conversion may potentially be aggrevating a situation which already is contributing to chronic bronchitis and asthma problems.

NYDEC-68 -- On pg. E-2, in the discussion of the health effects of nitrogen oxides and photochemical oxidants, the draft NEREIS states that 10% of the cities in the United States with populations less than 50,000 and 54% of those with populations between 50,000 and 500,000 have a yearly average nitrogen dioxide concentration

NYDEC-62 See Topical Response 3.7.3 and 3.7.5, and Appendices C.2 and C.6.

NYDEC-63 See Response MDAQC-9 and Topical Response 3.7.

NYDEC-64 See Topical Response 3.7 and Appendices B and C.

NYDEC-65 See Response MDAQC-9 and Topical Response 3.7.3.

NYDEC-66 A discussion of current sulfate concentrations in the Northeast appears in Appendix B.

NYDEC-67 Many of the studies upon which this conclusion was based have been recently discredited by the USEPA Science Advisory Board in its recent analysis of the health data base for preparation of a revised criteria document for sulfur oxides and particulate matter. New conclusions have been reached, as discussed in Topical Response 3.7.9 and Appendix C, Section C.3 and C.4.

NYDEC-68 Current levels of NO_2 and nitrates and their health effects are described in Section 4.1 of the DEIS, in Appendix B.3 and B.7, and in the analysis of health effects in Topical Response 3.7.5 and 3.7.10. Additional information is provided in Appendix C.5 and C.6.

equal to or exceeding 113 micrograms per cubic meter, which is the lower limit at which health effects were noted in a community study in Chattanooga. Additionally, 85% of the cities in the 7,500,000 population class exceed this yearly average. The draft NEREIS also states that meeting the current Ambient Air Quality Standard for nitrogen oxide of 100 micrograms per cubic meter expressed as the yearly arithmetic mean concentration would be more difficult in the large population concentrations in the Northeast. Appendix F which discusses the health effects of nitrogen oxides and the main text are remiss in not stating that the nitrogen oxides from the potential conversion candidates will increase after conversion. The reader should be informed that in many regions of the Northeast an already tenuous nitrogen oxide situation may very likely be aggrevated by coal conversion.

NYDEC-69

-- In the first paragraph on pg. E-4, the draft NEREIS gives recognition to the fact that particles of .5u may seriously effect the functioning of alveoli, since alveoli have no cilia to remove the particles. Since these size particles may significantly effect health, there should be a prediction in the final NEREIS which states how coal conversion will effect the ambient concentrations of this size particle and how the emission of this size particles will be mitigated.

NYDEC-70

-- On pg. E-4, it is stated that approximately 50% of the total sulfur released is associated with the smallest size fraction particle and that most of the sulfur is thought to be in the form of sulfuric acid mists or metallic sulfate compounds. This statement appears to be incongrouous with Table E.3 on Page E-7 which says that for the particle size .65 to 1.1 um sulfur is 48.8 wt. % of the particle. This would indicate that the average molecular weight for this size particle would be 65.5 g. Since a sulfate molecular weight is 96 g, it is not possible that for this size particle that the sulfur is present in the form of sulfuric acid mists or metallic sulfate. The value "48.8 wt. %" occurring in Table E.3 should be checked for correctness since it indicates that almost 1/2 of the weight of this size particle is sulfur. The unit for concentration in Table E.3 is given as micrograms. This is not a unit of concentration. The unit of concentration would occur in terms of micrograms per gram, moles per liter, etc. but not just micrograms by itself. A correction is necessary for this table.

NYDEC-69 See discussion on respirable particle incremental increases from fuel conversion and the associated health analysis in Topical Response 3.7.4. Regarding how emission of 0.5-μ-sized particles will be mitigated, as indicated in Topical Response 3.7, electrostatic precipitators do not remove approximately 30% of the particles less than 5 μm in diameter from stack gases (USEPA 1977). Fabric filter baghouses are much more efficient in this respect and are the most likely alternative for reducing respirable particle emissions from powerplants converting from oil to coal (USEPA 1977).

REFERENCES

U.S. Environmental Protection Agency. 1977. Compilation of Air Pollution Emission Factors, 34d Ed. AP-42. Research Triangle Park, N.D.

NYDEC-70 Davison et al. (1974) acknowledged the discrepancy between particle composition and particle size for sulfur identified in this comment. In their discussion they noted that the high concentrations of sulfur obtained in the 0.65-1.1 μm size fraction could occur only if sulfur were present as the element. They observed that this contradicted the findings of Hulett, who showed with electron spectroscopy that sulfur predominates as sulfate. The authors, therefore, considered that their sulfur values (listed in Table E.3 of the DEIS; see Sec. 5, Errata and Addenda) were all proportionately high because of the lack of a fly ash standard having sulfur deposited on the surface of appropriately sized particles as is required for x-ray fluorescence analysis.

Assuming that the 0.65-1.1 μm size fraction is composed of sulfate and sulfuric acid (SO_4, H_2, SO_4), the maximum weight percent of sulfur would be 33%. If sulfur in this size range existed as metal sulfate, the maximum weight percent of sulfur would be lower. Assuming the proportional inaccuracies of the sulfur data as suggested by the authors, and that all of the sulfur in the smallest-sized particles exists as sulfates or sulfuric acid, the maximum weight percent sulfur in the smallest size fraction would be 67% of that stated in Table E.3. Applying the 67% figure to particles in other size ranges presented in Table E.3, the 2.1-3.3 μm range would contain 17 wt % S; the 4.7-7.3 μm range, 5.3 wt % S; and the > 11.3 μm range, 5.6 wt % S.

On the other hand, Davison et al. (1974) suggested that one possible mechanism for trace elements to preferentially concentrate in smaller-sized particles would be to exist as sulfides including $As_2 S_3$, Cd S, Co S, Cr S, Mg S, Pb S $Sb_2 S_3$, Sn S, and Zn S. The weight-percent S in these compounds ranges from 13 for Pb S to 57 for Mg S. In addition; pyritic sulfur ($Fe S_2$) with a sulfur content of 53 wt % may also exist as particulate in fly ash. Hypothetically then, if sulfides comprised of high percentages of sulfur were present in the smallest particles in the fly ash, sulfur could comprise 48.8 wt % of these particles, even in the presence of significant amounts of sulfate and H_2SO_4. Since no data to the contrary have been found, the sulfur data presented in Table E.3 will be maintained as presented originally by Davison et al. (1974) with the caveats that sulfur, either as SO_4 or H_2SO_4 is of a lower weight percent for each particle size category or that significant amounts of sulfur in the fly ash are present as metal sulfides.

REFERENCES

Davison, R.L., D.F. Natusch, and J.R. Wallace. 1974. Trace elements in fly ash. Environ. Sci. Technol. 8(13): 1107-1112.

NEW YORK STATE AGENCY COMMENTS ON U.S. DEPARTMENT OF ENERGY DRAFT
NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT (NEREIS)
FEBRUARY 5, 1982

MISCELLANEOUS COMMENTS

NYDEC-71 -- The terms "coal SIP" and "modified coal SIP" are used on the first two pages of the "Summary of Issues and Conclusions" section (pp. 1 & 2). It is not appropriate to use these terms in the summary section since no previous definition of these terms are given in the DEIS. Use of these terms at this point requires that a definition be given for them so that the reader can put the terms in context. They at least should be included in the List of Acronyms and Abbreviations on p. viii.

NYDEC-72 -- The footnote on p. 1-1 indicates that coal has been assumed to provide a "worst-case" situation for environmental impact analysis. This assumption should be defended in light of the possibility of using coal-oil mixtures as a fuel.

NYDEC-73 -- Figure 1.2 on page 1-5 is misleading and should be redrawn. The figure infers that only "natural" systems are in the deposition region, and that the only deposition is acid rain. The figure should include human activity such as agriculture and depict other air pollutants than acid rain in contact with people, buildings, and vegetation.

NYDEC-74 -- Table 1.3 on pages 1.6 and 1.7 should include agriculture as an area of concern, either by itself or within another heading and assess regional cumulative impacts from air emissions (see separate comment section entitled "Agricultural Impacts".) The air quality and water quality boxes should state that NO_x is not included in the conclusion (noted in 5.1.3.3, p. 5-5). The biotic resource box for the combustion region should recognize the impacts to vegetation from air emissions, and the biotic resources box for the deposition region should indicate the terrestrial impacts of the increase in acid rain.

NYDEC-75 -- The draft NEREIS focuses on but four categories of impacts (page 1-1). This should not preclude an evaluation of the impact on aesthetics and cultural resources. The adverse impacts on aesthetics and cultural resources should be identified and addressed. The New York State Office of Parks and Recreation (OPR) expresses concern over the impact of severe SO_2 concentrations on historic sites. Certain materials at such sites are expected to disintegrate or corrode more quickly when exposed to high concentrations of SO_2 -- namely, paint, marble, certain kinds of wood, etc. In addition, OPR is concerned about the visibility and effects of stack plumes in the vicinity of recreation areas and historic sites. They point out that archaelogical surveys should be undertaken at proposed plant expansion and quarry sites especially in the Hudson River Valley. (It is important that USDOE contact the NY State Division of Historic Preservation in order to comply with the Federal Historic Preservation Act.) In addition, consideration should be given to deterioration of other man-made materials such as oil based paints and automobile finishes.

NYDEC-76 -- Figures 3.4 and 4.21 should show the Delaware and Hudson Railroad route between central Pennsylvania and Albany/Schenectady. It could be a key link in supply of coal to plants in northern New England.

NYDEC-71 The acronym SIP should have been included in the list of Acronyms and Abbreviations; this change is included in the Errata and Addenda, Section 5.

NYDEC-72 The analytical approach taken in the Northeast Regional EIS was to focus on the fuel that would produce the most deleterious environmental effects. This provided the outer bounds of the impact assessment, which because of its scope could not address all the possible fuel combinations potentially available to the 42 plants included in the study. It was assumed that the burning of only coal (as opposed to coal mixtures) would generate these types of negative impacts; assuming that sulfur levels are equal, the transportation, fuel storage, and waste disposal impacts associated with mixtures are less than those associated with solid fuel.

NYDEC-73 The graphic should have been more clearly drawn both to indicate that human and manmade systems are affected, as well as to indicate that the Deposition Region is by definition at a great distance from the Combustion Region. The primary type of pollution associated with long-range transport is acid deposition.

NYDEC-74 See Topical Response 3.3. The results are included in the table under Land Use. The discussion of nitrogen oxides has been expanded in Topical Response 3.2. The impacts of acid precipitation to vegetation were determined to be too minor to be included in the table (Sec. 5.4.4 of the DEIS).

NYDEC-75 Adverse impacts of acid deposition on cultural resources are discussed in Topical Response 3.4. Impacts to archeological and historic sites will be evaluated on a site-specific basis as discussed in Response ACHP-1. Visibility effects will also be discussed on a site-specific basis.

NYDEC-76 At the time of the study, the possibility of merger of several railroads in the Northeast was not known. Because of the interlining required between these railroads to deliver coal to the conversion candidates, they were not considered as likely alternatives. Since that time, merger of railroads in the Northeast has become a reality. As part of this merger, the Delaware and Hudson Railroad would be a key link in supply of coal to northeastern utilities.

NYDEC-77 -- Figures 3.4 and 4.23 are misleading with respect to the direct linkage of distant port facilities to certain N.Y. (and possibly Connecticut and New Jersey) plants. It is most likely that fairly shallow draft barges will be the only waterborne equipment with access to some facilities. Direct transport from the ports of Norfolk or Newport News or Greenwich is unlikely.

NYDEC-78 -- The estimate of electric energy requirements in 1990 for the New York Power Pool appears much higher than similar State and utility projections. The summary statement on p. 3-30, "The results of this constrained analysis show that significant contributions from conservation, above those indicated by the powerpools would be unlikely..." is suspect and should be deleted. Readers of the final NEREIS should be warned in Section 3.3.3 and Appendix A not to extrapolate projected trends in generation to apply to trends in regional air quality levels. (Further discussion by the State Energy Office is contained in attached Appendix II, "Conservation and Energy Alternatives".)

NYDEC-79 -- On p. 3-38 under "Specific Impacts," the second paragraph correctly states that wind resources are significant along coastal areas. However, it should also state that the wind resource is even greater 50+ miles off-shore and aesthetic impact would be greatly reduced or eliminated.

NYDEC-80 -- In section 4.1.3.2, the New York subregion discussion contains a statement beginning, "As low-sulfur oil becomes less available---." With respect to residual oil, this statement appears to ignore existing trends in the refining industry to desulfuring crude oil in the initial step in the product refining process. (Appendix III, attached, entitled "Fuel Production and Consumption Trends" contains data by the New York State Energy Office regarding current trends in sulfur content of refined oil.)

NYDEC-81 -- The final NEREIS (in particular, Section 4.5.1.1, point #10) should provide appropriate cautions to reviewers regarding environmental impacts that may or may not be expected from the consumption of projected coal supplies. (Appendix III, attached, entitled "Fuel Production and Consumption Trends" contains data by the New York State Energy Office on coal consumption estimates in New York State. Appendix IV, also attached, entitled "Comparison of Utility and Total Coal Demands in the Northeast", was prepared by Department of Environmental Conservation staff.)

NYDEC-82 -- The conversion of approximately 16,000 MW of utility capacity would, in theory effect the dispatching of other sources connected to the electric grid. Long range transport modeling using the Advanced Statistical Trajectory Air Pollution (ASTRAP) model focuses on specific changes at 42 powerplants and then applies that result to observed existing conditions. A conversion of a plant that results in increased capacity levels may result in decreased energy output from other upwind sources that are interconnected with the electric system. This event upsets the existing emission budget both in terms of tonnage and location. It is suggested that this limitation of the modeling effort be discussed in appropriate sections on pp. 5-14 and 5-15.

NYDEC-83 -- The NEREIS should address the issues raised by carbon dioxide emissions from coal conversions even though there is great debate about world wide warming or cooling trends. Coal combustion appears to be a major source of world wide CO_2 accumulation.

NYDEC-77 Even with expansion of annual coal dumping capacity in New York Harbor to 17 million tons, there would be insufficient dumping capacity to supply all of the converting plants connected to New York harbor via the intracoastal waterway. Water shipments to these plants from other coal piers require outside shipments using either collier or ocean tug-barge. The Voluntary Conversion Scenario of 27 converting stations (see Sec. 1) relieves this situation, and the New York Harbor dumping capacity would be sufficient for all but one of these plants to take delivery by shallow-draft barge.

NYDEC-78 The estimates of energy requirements made by the New York Power Pool (DEIS, p. 3-30) were made to assess the effect of alternate technologies and conservation and results are expressed in terms of fuel used. It was done to show, comparatively, the effect of different fuel mixes on oil consumption. It is recognized that demand for electricity has dropped markedly for many reasons and that prices have increased at the same time. Some call this conservation. However, the plants scheduled for conversion are now operating (using oil and gas) and will continue to operate after conversion (using coal). Electricity demand will affect only the number of plants that will convert, and factors other than demand, such as plant age and coal type requirements, also will affect the decision whether or not to convert.

It is recognized that there is no direct relationship between changes in generating capacity type and air quality. Air quality will depend on other variables as well as the type of fuel burned. A regional study such as the Northeast Regional Environmental Impact Study can, at best, approximate the effects of individual sites on the air quality of the region involved, and some careful extrapolation will be necessary to do that.

NYDEC-79 This statement is correct. However, other environmental concerns would arise that would require analysis.

NYDEC-80 Comment noted. In Section 4.1.3.2, add after the second complete sentence: "There is a trend in the refining industry toward desulfurizing crude oil in the initial step of the product refining process."

NYDEC-81 All of Section 4 of the Draft EIS is devoted to a description of the current situation as required for assessing the impacts of conversion of the 42 plants. The impacts resulting from the incremental increase in coal use is assessed in Section 5--in particular, Section 5.5.3, in which is discussed the effects of coal demand and PSD consumption on the region in which combustion would occur.

NYDEC-82 The potential modifications in emissions resulting from a change in the power grid can be addressed only if a specific emission scenario is hypothesized. Such considerations are beyond the scope of this document.

NYDEC-83 Carbon dioxide is released during fuel oil combustion, also. The increase in carbon dioxide emissions if all 42 plants were to convert would be about 26% of current emissions from these plants, or an increase of 0.15% of global anthropogenic emissions or 0.002% of total global emissions. The conversions will have little effect on the atmospheric carbon dioxide budget.

NYDEC-84

-- In the discussion of the use of trucks between Long Island and Dutchess County at the top of p. 5-61, it is unclear what is being trucked and the quantities involved. The 3.4 percent increase in vehicular traffic is reported as "the largest potential impact in terms of tonnage" presumably anywhere within the Transportation Networks Region analyzed. This increase "---would be the case if all five Long Island plants were to truck wastes north along the Hudson River to Dutchess County to dispose of it in limestone mining areas, and in turn, were to obtain lime from the same county." Since "lime" (not limestone?) is being trucked back to the Long Island plants, does this mean FGD scrubber sludge is included in the tonnage being trucked north? It is not clear from descriptions of vehicles used to haul fly ash and sludge wastes on p. 4-61 and 4-65 whether they would be suitable for return trips with lime (or limestone).

NYDEC-85

-- The "no greater than 3.4 percent increase in vehicular traffic" reported on p. 5-61 for hauling minerals and wastes between Long Island and Dutchess County is really a significant increase because it is all heavy truck traffic. What would be the percentage of truck traffic increase, and what impacts would these heavy vehicles have on congestion, safety and highway maintenance? This is a very heavily developed urban corridor which passes through New York City, and includes bridge and tunnel limitations. Use of trucks for mineral and waste hauling is mentioned in a number of places throughout NEREIS and little acknowledgement is given to the problem of their use in highly urban areas. Their likely use and impacts should also be acknowledged in Table 1.2 under the "Transportation Networks Region" column.

NYDEC-86

-- Section 4.6.3.3, "Waste Collection Disposal" on p. 4-79 should note in the discussion on surface and groundwater contamination, that it is possible with suitable liners--in fact, a pozzolithic mixture of fly ash and FGD waste lime--to dispose of power plant wastes even below water-table level. (Such a disposal site is presently under consideration for approval with respect to conversion of one of the Hudson Valley plants.)

NYOEC-84

In general, impacts due to truck traffic will be site-specific in nature. The example of five Long Island plants was chosen because these were plants which had the possibility of contributing to the largest cumulative impact. The wastes being trucked include both ash and scrubber sludge. It has been assumed that the trucks used to ship ash will return with lime and limestone (see Sec. 5, Errata and Addenda, p. 5-61). These would be hopper semi-trailers with a maximum gross weight of 80,000 lb. The stabilized scrubber sludge would be hauled in semitrailer combination dump trucks with a maximum gross weight of 80,000 lb. Truck traffic for all five plants would be 103 round trips per day. Under the Voluntary Conversion Scenario (see Sec. 2), only two of the Long Island Stations would convert. In this case, there would be only 30 round trips per day.

NYDEC-85

Average daily traffic counts on Route 9 between New York city and Poughkeepsie ranged from a low of 6,100 in Putnam County (1978) to a high of 43,500 in Duchess County (1977) while data for 1979 from the two counties are 8,400 and 9,700, respectively (USDOE 1980). The 3.4% increase is with respect to the low count of 6,100. With respect to the highest count it is 0.5%. The actual congestion impact on this route is difficult to assess, since capacities must be known as well as traffic densities for all segments of the route.

It is unlikely that all five plants would choose Dutchess County for waste disposal and lime and limestone supply. There are alternatives for disposal sites, lime and limestone supplies, routings, and mode (barge). For cumulative impacts to occur it would require several plants selecting the right combination of alternatives to generate convergent traffic routes. The probability of achieving a traffic impact as high as 103 round trips a day is very low. Therefore, the very complex analysis required to identify and assess relative traffic impacts for all possibilities was deemed unwarranted.

In addition, under the Voluntary Conversion Scenario (see Sec. 2) only two of the five Long Island plants would convert. In this case, the maximum possible cumulative impact would be 30 round trips on Route 9. The likelihood of both of these plants using the same route is very small and so it is unlikely that cumulative impacts will occur. Analysis of the problems of the truck traffic from each of these plants will be addressed in the site-specific EISs.

REFERENCES

U.S. Department of Energy. 1980. Transportation Impact Statement, Mandatory Coal Conversion for Northeast Utilities. Prepared by Transportation and Economic Research Associates, Inc., Falls Church, Va., for the Office of Fuels Conversion Economic Regulatory Administration, Washington, D.C. (Draft).

NYDEC-86

The use of artificial liners to retain leachate and drainage from the pond and landfill was discussed in the EIS supporting technical report on solid waste disposal (Saguinsin et al. 1981).

Some applications of Poz-O-Tec^R as basin liners have been made in Arizona and Pennsylvania and are being closely watched. This material is a mixture of FGD scrubber sludge, fly ash, bottom ash, lime, and other additives. The permeability of this mixture was reported to be about 10^{-6} to 10^{-8} cm/s after curing. Use of this liner is attractive because the prime ingredients, sludge and fly ash, are available on site. A utility can, therefore, manufacture its own liner.

REFERENCES

Saguinsin, J.L.S., et al. 1981. Northeast Regional Environmental Impact Study. Waste Disposal Technical Report DOE/RG/0058. Prepared by the Division of Environmental Impact Studies, Argonne National Laboratory, Argonne, Ill., for the Economic Regulatory Administration, U.S. Department of Energy, Washington, D.C.

NYDEC-87 -- Section I-4 in Appendix I should be expanded to cover FGD mineral extraction sites as well as coal mines. Use of power plant waste material to reclaim many limestone quarries in New York State is under serious consideration. Such a program appears far more feasible than use of coal mines and would support New York's Mined Land Reclamation Act.

APPENDIX II

CONSERVATION AND ENERGY ALTERNATIVES

USDOE's effort to investigate the role of conservation and alternative technologies as a supplement or possible substitute for coal conversion is commended. However, USDOE's estimate of electric energy requirements in 1990 for the New York Power Pool (NYPP) appears much higher than similar State and utility projections. Accordingly, a summary statement contained on p. 3-30, "The results of this constrained analysis show that significant contributions from conservation above those indicated by the powerpools would be unlikely", is suspect and should be deleted. Additionally, the reviewer of the final NEREIS should be warned in Section 3.3.3 and also Appendix A not to extrapolate projected trends in generation to apply to trends in regional air quality levels. Differences in projection techniques, generation mix and emission profiles to new sources must be considered.1/

NYDEC-88

- Projected Generation Levels: Table A.4 indicates that USDOE's projected generation levels for the NYPP in 1990 range between 146,000 to 152,000 GWH2/ depending upon the projection case. In response to State law, 3/ members of the NYPP and the State Energy Office are required to project electric energy requirements for fifteen-year future periods. Forecasts, which are subject to a rigorous adjudicatory review process have recently been prepared. The NYPP4/ forecast 1990 generation requirements to be 135,574 GWH--a level considerably below the draft NEREIS projections.

  The forecasts of the State Energy Office (SEO) are also considerably below those of the draft NEREIS. SEO's projections5/ are made for various scenarios which appear to approximate some of the cases displayed in the draft NEREIS. A comparison of those scenarios is displayed below:

	Scenario: No Energy Alternatives-No Coal Conversion-NYPP 1990		Scenario: Energy Alternatives-Coal Conversion-NYPP 1990	
	USDOEa/	SEO	USDOEc/	SEO
Generation (GWh)	148,849b/	133,530	150,514	132,423
% Coal Based	26.4%	19.8%	41.4%	41.4%

1/These comments are based upon the discussion material contained in the Draft Northeast Regional Environmental Impact Statement (DOE/EIS-0083-D). SEO reserves the right to supplement these comments upon receipt and review of DOE's report entitled Conservation and Alternative Energy Contributions and Environmental Impacts in the Northeastern United States, prepared by Science Application, Inc.

2/The headings on Table A.4 of the NEREIS indicate that generation is expressed in MWh's; it is believed that the correct heading should be GWh's.

3/Section 5-112, New York State Energy Law.

4/Report of the Member Electric System of the New York Power Pool, Vol. 1 p.70, April 1, 1981.

5/Draft New York State Energy Master Plan II-Update, New York State Energy Office, August 1981.

a/Draft NEREIS, Appendix A, Table A. 4, Col. a.

b/Draft NEREIS, Appendix A, Table A.4, Col. a Total indicated as 148,849, arithmetic total of components is 146,819.

c/Draft NEREIS, Appendix A. Table A. 4, Col. e.

NYDEC-87 The discussion of the use of inactive portions of mines and quarries as landfills for the disposal of powerplant waste materials is presented in Section 6.4 of Saguinsin et al. (see References to Response NYDEC-86). In fact, as indicated in Topical Response 3.5 (Waste Disposal), several utilities in the State of New York (e.g., the Albany, Danskammer Point, and Barrett stations) are actively considering limestone quarries for the disposal of coal waste materials.

NYDEC-88 The potential for additional conservation is noted in Appendix D, Section D.5. Differences in USDOE and NYPP or NYSEO projections are the result of deferred capacity.

The above table, which compares approximately equal scenario assumptions, indicates a considerable difference in generation levels. As a result of the above, it is strongly recommended that the previous referenced quote on p. 3-30 be deleted from the final NEREIS. No support for the contention that conservation levels beyond those recommended by powerpools has been provided in the draft NEREIS.

NYDEC-89

- Draft NEREIS Generation Projections and Future Air Quality: The final NEREIS should caution reviewers not to project future air quality trends on the projected trends in electric energy requirements. As displayed in the previous table, a difference is 15,000 to 18,000 GWh exist between similar scenarios. This difference could be equated to an unresolved need, for approximately 2,900 MW of additional generation capacity. Simply stated, New York State and the NYPP believe that the need does not yet exist for this capacity and therefore environmental consequences from this additional capacity should not be expected.

NYDEC-89 See Response NYDEC-78.

APPENDIX III

FUEL PRODUCTION AND CONSUMPTION TRENDS

NYDEC-90

Certain statements within the draft NEREIS regarding the expected relationship between fuel production/consumption patterns and air quality trends are inaccurate and require appropriate qualification. The deficiencies should be corrected in the final NEREIS.

Low/High Sulfur Oil: In section 4.1.3.2 the New York subregion discussion contains the following statement:

"As low-sulfur oil becomes less available, facilities will consume natural gas, high-sulfur oil, or coal. If sufficient natural gas is not available in the region, higher-sulfur fuels will be burned, resulting in greater SO_2 emissions."

With respect to residual oil, the existing statement appears to ignore existing trends in the refining industry to desulfurize crude oil in the initial step in the product refining process. For example, a recent report of the National Petroleum Council[1/] indicates that the greatest drop-off in residual oil product demand during the period 1982-1990 will occur in 2+% sulfur category (projected -4.7%). Equal gains are expected in the 1 percent to 2 percent sulful residual oil category (projected +4.6%). Only modest declines are expected in the less than 1 percent sulfur residual oil class (projected -2.6%). Additional reports of refinery efforts to desulfurize crude oil also exist.[2/]

Coal Consumption Trends: Section 4.5.1.1, 4.5.1.2 and Appendix D describe the approach used to forecast coal supply and consumption within the Northeast region, including New York State. This effort and approach is appropriate to analyze the maximum impact on the supply base and transportation system. However, the reviewers should be cautioned not to assume that future air quality trends will vary inversely with coal consumption. As is the case with forecasted 1990 electric generation, the State Energy Office's (SEO) recent projections differ from those contained in the draft NEREIS (see attached Appendix III). A comparison of projected 1991 New York coal consumption is as follows:

1/National Petroleum Council, Refinery Flexibility for the USDOE, December 1980, p. E-30, Table III.

2/See Oil and Gas Journal Issues for March 30, 1981 (p. 63 50 81) and January 5 1981 (p. 43 to 48).

III-1

NYDEC-90 Comment noted. The potential for additional conservation is analyzed in Appendix D.3 and D.4. The differences in forecasts still do not change the conclusion of displacing significant amounts of oil through coal conversion. Further, the 27 plants or 42 plant conversion candidates are base-load plants that will be required in 1990 anyway, given increases in projected demand. Lowering of the 1990 forecasts (e.g., slower economic growth) will likely result in deferring nuclear or new coal plant construction.

1991 NYS Coal Consumption
(x10^6 Tons)

Sector	DOE[a/]	SEO[b/]
Utilities, including conversion	27.2	21.5
Industrial	7.3	3.1
Metallurgical	4.9	3.3
Miscellaneous (export, etc.)	0.3	2.7
	39.7	30.6

a/Draft NEREIS Appendix D p. D-10.
b/Draft New York State Energy Master Plan II-Update, New York State Energy Office, August 1981, including appendices.

SEO's estimate may even be viewed as optimistic by some parties. For example, utility consumption assumes demand occuring for one facility which, for reasons discussed previously, faces a difficult conversion situation. It also noted that the Data Resources Inc. (DRI) coal model "forecasts" New York's coal consumption in 1980 to be 15.4 x 10^6 tons.[1/] Recent reports from the Energy Information Administration of DOE indicate that New York's 1980 coal consumption for all sectors probably did not exceed 12.1 x 10^6 tons.[2/]

For the above reason, it is suggested that the final NEREIS (in particular, revised section 4.5.11, point #10) provide appropriate cautions to reviewers regarding environmental impact that may or may not be expected from the consumption of projected coal supplies.

[1/]Draft NEREIS, Appendix D. Table D.3

[2/]USDOE, Energy Data Report-Coal Distribution January- December 1980, DOE/EIA-0125 (80/4Q) April 7, 1981.

Appendix IV

COMPARISON OF UTILITY AND TOTAL COAL DEMANDS IN THE NORTHEAST[1/]

NYDEC-91 See Topical Response 3.8.

NYDEC-91

The following table is derived from data in Table D.4 on p. D-11. It shows a fraction of the coal demand due to the total utility demand relative to the net total for the Northeast Region. It also shows the relative demand due to the conversion utilities to the net total for the Northeast Region. The data given is for 1981 to 1991. From the table it is easy to see that the total utility demand in this time period is quite large, ranging from .53 to .62 of the total demand in the Northeast Region. Similarly, it can be seen from the table that the converted utilities demand in 1991 is a significant portion of the total Northeast Region demand. Twenty percent of the total demand in the Northeast Region in 1991 will be result of utility conversions. The information in Table D.4 and the above table should be summarized in the text for the reader. The reason for summarization in the text is that it clearly shows that the utility demand is the largest demand for coal in the Northeast Region and that the converted facilities would represent 20 percent of the total emissions in the Northeast Region from coal burning. However, it is probably not reasonable to expect that all other things will be equal. In fact, probably more realistic to expect that the converted facilities will contribute more than 20 percent to the total emissions that are given off from burning of coal in the Northeast Region. The reason for this is that the converted facilities will probably not be subjected to the new source performance standards. Therefore, their relative contribution to total emissions from coal burning in the 1980 to 1991 period will probably be greater than their relative amounts of coal demand.

UTILITY PORTION OF NORTHEAST COAL DEMAND
(Derived From Page D-11, Table D.4.)

YEAR	TOTAL UTILITY Net Total of NE Region	CONVERSION UTILITY Net Total of NE Region
1980	.56	0
1981	.56	0
1982	.54	0
1983	.53	0
1984	.55	0
1985	.55	.04
1986	.55	.08
1987	.57	.13
1988	.58	.17
1989	.60	.19
1990	.60	.20
1991	.62	.20

[1/] These comments have been prepared by staff of the Bureau of Environmental Protection, Division of Fish and Wildlife, New York State Dept. of Environmental Conservation.

On page 5-6, USDOE indicates that it is not the actual numerical values of the SIP limitations with regard to SO_2 emissions that are important, but the trends.

Table D.4 on p. D-11 can be looked upon as a simplistic model for determining the trends of SO_2 emissions from coal usage in the Northeast Region. Clearly from the table it can be seen that in the year 1980, the number of megatons of coal to be used in the Northeast Region will be 108. In 1991, this value will increase to 190. This indicates that there will be an almost doubling of coal usage in the Northeast Region over that 12 year period. All other things being equal, one would expect that emissions would double from coal usage also. Even if air emissions from coal usage over this 12 year period do not double, they most certainly will increase and therefore, the trend is for increases in SO_2 acid deposition and NO_x emissions. Since the facilities that are to be converted are of an older vintage, it can be expected that their contributions to emissions will be relatively higher than their contributions to coal demand.

NEW YORK STATE ENERGY OFFICE
ROCKEFELLER PLAZA
ALBANY, NEW YORK 12223
JAMES L. LAROCCA, COMMISSIONER

December 28, 1981

Ms. Marcia F. Goldberg
U.S. Department of Energy
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, NW, Room 3322
Washington, DC 20461

Dear Marcia:

We now understand that the written comment period established for the Draft Northeast Regional Environmental Impact Statement has been extended by one month for all parties. During this extended period, we anticipate the receipt of the Air Quality Technical Report prepared by Frank Korengay of Oak Ridge National Laboratory. The review of the material, which we believe to be present in the Technical Report, will be of great assistance to this Office in preparing constructive comments for the Final Impact Statement.

A more recent review of the draft document has revealed a need for three additional technical reports which appear to have been prepared specifically for the Draft Northeast Regional Environmental Impact Statement. This letter requests a copy of the following three documents:

U.S. Department of Energy. 1981. Conservation and Alternative Energy Contributions and Environmental Impacts in the Northeastern United States. Prepared by Science Applications, Inc., Oak Ridge, Tenn., for the Economic Regulatory Administration (DRAFT)

Walsh, P.J., et.al. 1981 Northeast Regional Environmental Impact Study: Reference Document for Health Effects of Air Pollution. Prepared by the Health and Safety Research Division, Oak Ridge National Laboaratory, Oak Ridge, Tenn., for the Office of Fuels Conversion, Economic Regulatory Administration, Washington, DC (DRAFT).

U.S. Department of Energy. 1980. Transportation Impact Statement Mandatory Coal Conversion for Northeast Utilities. Prepared by Transportation and Economic Research Associates, Inc., Fall Church, Va., for the Office of Fuels Conversion, Economic Regulatory Administration, Washington, D.C. (DRAFT)

NYSEO-1 As a follow-up to our verbal discussions in New York City on December 17, I would like some classification of information displayed in certain figures within Chapter 5 of the draft document. The question pertains to the relationship of Figure 5.3 to Figure 5.1 and also the relationship of Figure 5.4 to Figure 5.2. Specifically, are the numeric values displayed in Figures 5.3 and 5.4 incremental to the values displayed in the preceeding figures on pages 5-18 and 5-19?

NYSEO-2 Additionally, I would like to inquire about the relationship of Table 5.6 to Tables 3.9 and 3.10. We were of the impression that the predicted increases and total concentrations for SO_2 in the New York City area that are displayed in Table 5.6 should be replicated again in Tables 3.9 and 3.10. This does not appear to be the case for at least the Modified Coal SIP scenario. Clarification is requested.

In the interests of expediency, I would appreciate a phone call (518-473-0835) on the above two questions. Thank you for your assistance.

Sincerely yours,

Charles J. Kowalski
Energy Planner IV

CJK/kcd

NYSEO-1 The values in DEIS Figures 5.3 and 5.4 are incremental to the Figures 5.1 and 5.2, respectively, as the reviewer assumed.

NYSEO-2 The predicted increases and total concentrations for SO_2 in the New York City area that are displayed in DEIS Table 5.6 should have been repeated in Tables 3.9 and 3.10. The annual average values for the Modified Coal SIP should read 14 and 89, respectively, as in Table 5.6.

The Secretary

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
P.O. Box 2063
Harrisburg, PA 17120
(717) 787-2814

January 29, 1982

Ms. Marsha S. Goldberg
U.S. Department of Energy
Economic Regulatory Administration
Office of Fuels Conversion
2000 N. Street, N.W.
Washington, DC 20461

Dear Ms. Goldberg:

The Commonwealth of Pennsylvania has reviewed the Draft Environmental Impact Statement covering the conversion of forty-two powerplants from oil to coal or alternate fuels. We wish to point out several important issues we feel were not adequately addressed in the Statement.

1. There is likely to be a much higher sulfur deposition problem in the Northeast than is calculated in the Environmental Statement.

2. If the powerplants are permitted to pollute right up to current standards, it is our feeling that there will be little or no room for industrial growth in certain areas of the Northeast.

3. The cumulative impact of increased sulfur emissions on the pH of precipitation and ultimately surface water was not reviewed in the Statement.

The Commonwealth feels the Department of Energy should be assessing alternatives for permitting the conversion of powerplants to coal without an increase in the emission of air pollutants. Simply assessing the impact of conversions with limited emission controls is not an adequate assessment of the alternatives available in this proposal.

Attached please find a detailed staff review of the Environmental Statement covering the points I mentioned here and others we feel should be addressed in the Statement.

The Commonwealth would like to be involved in future stages of this program including any scoping meetings to be held on site specific Environmental Statements in Pennsylvania and neighboring states.

Thank you for the opportunity to review this Environmental Statement.

Sincerely,

PETER S. DUNCAN

Attachment

Staff Review
Draft EIS, Conversion of Forty-Two
Northeast Power Plants to Coal
by
Commonwealth of Pennsylvania

The Commonwealth of Pennsylvania has reviewed the Draft Northeast Regional EIS on the potential conversion of forty-two powerplants from oil to coal or alternate fuels. We wish to bring the following concerns to your attention for consideration in the future stages of this program.

Sulfur Emissions

PDER-1 On page 5-14 (last line of page) the Environmental Impact Statement states that "sulfur deposition over eastern North America would increase by about 1% for the scenario with the greatest emission increment, the Modified Coal SIP scenario, and correspondingly less for the other emission scenarios." The Department of Environmental Resources calculates that the increase in sulfur deposition would be 2.3% based on the numbers in Tables 5.9 and 5.10 rather than about 1%. The Commonwealth requests that the authors check this figure.

PDER-1 As stated on page 5-14 of the DEIS, the simulations summarized in Tables 5.9 and 5.10 indicate a worst-case, 42-plant deposition increase, for the whole of eastern North America, of less than 1%. Perhaps the reviewer added depositions for different scenaros.

PDER-2 On page 1 of the Summary of Issues and Conclusions, the Environmental Impact Statement states that "At the local scale, air pollution dispersion modeling predicts that conversion at the Coal SIP and at the Modified Coal SIP would contribute to an exceedance of the annual average SO_2 standard of 7 ug/m^3 near the Mason Station in Maine, and an exceedance of 4 ug/m^3 in New York City. Exceedances of the 24-hr. SO_2 standard of 30 ug/m^3 could also occur in the Boston subregion and of 76 ug/m^3 in the New York subregion. Mitigative techniques can, however, eliminate these potential exceedances." The tables (see Table 5.6) in the body of the report do not support the statement that "mitigative techniques can, however, eliminate these potential exceedances." These tables show that the concentration of SO_2 measured both as a daily and annual average, are slightly above the health related standards. Even if these marginal violations were mitigated to show marginal attainment, the Department of Environmental Resources wishes to raise the issue of source-by-source emission limitations (which the mitigative techniques represent). If these 42 power generating facilities are allowed to pollute right up to the standard, then there will be little or no room for industrial growth in certain portions of the northeastern United States. The extent of control which would be required on the power plants should be considered in relation to regional desires for growth and regional concerns regarding equity between the emission control of these power plants and the emission control of other sources many of which are still burning oil.

PDER-2 Many of the emission limits and ambient air quality levels have changed. The new modeling reflects these changes (see Topical Response 3.1). Industrial growth currently is limited in some areas of the Northeast. If the powerplant conversions do not use up the available increment, other industries may do so. In some states, the available increment is on a first-come basis. See also Response MCAQPC-1.

Change in pH

PDER-3 On page 2 of the Summary of Issues and Conclusions, the Environmental Impact Statement states that "At the regional scale, the modeling of long range transport phenomena predicts an increase in sulfur deposition of up to 6% under worst-case conditions. This increase represents a pH change of less than

PDER-3 The analysis done for the DEIS was based on four air quality scenarios. One of these scenarios, designated the Oil SIP, represents no change in the SO_2 emission rate from that which currently exists with the plants burning oil. Due to the assumption of no increases in emission rates and plants operating at 100% capacity, no changes in short-term concentrations for SO_2 are predicted. Annual average changes in SO_2 concentrations are due solely to the changes in capacity factors associated with switching from oil to coal.

0.03, lowering the pH of receiving waters from 4.20 to 4.17. A change of this magnitude is unlikely to generate any secondary or tertiary impacts". A change of 0.03 pH by itself is unlikely to have an observable impact. However, it has been the cumulative effect of many such changes which have taken place for many years that has caused the acidification of our precipitation. There comes a time when the state and the federal governments must ask not—"Is this impact by itself significant?"—but rather "How can coal conversion take place without increasing the emissions of air pollutants?" This has not been done for the issue of sulfur loading in the atmosphere. This Environmental Impact Statement is incomplete without such a discussion.

Modeling

PDER-4 Page 3-10 and F-7 mention that the RAM Dispersion Model is used to delineate the Deposition Region of the U.S. Eastern Seaboard and its intensities of pollution levels therein. The DEIS should acknowledge a model limitation in that the RAM Disperson Model is not sensitive to topographic and urban development effects.

PDER-4 The RAM code does not incorporate the effects of terrain on varying meteorological conditions, which do represent limitations on the usefulness of the predicted results throughout the entire region. (See also Responses USDDI-13 and MDNR-4).

Wildlife Habitat

PDER-5 The second paragraph of the Supply Region subsection on page 3-24 is somewhat contradictory. The first sentence implies that it is not possible to quantify the type and amount of wildlife habitat destroyed by mining operations. The third sentence states that increased mining activity will only have a minor impact on biotic resources because of habitat loss. How can the third sentence be supported if it is not possible to quantify habitat losses?

PDER-5 The intent of the first sentence is to indicate that the quantity of specific types of different wildlife habitats (e.g., mixed mesophytic forest) disturbed by an increase in surface coal mining cannot be predicted. It is estimated that the proposed fuel conversion of 42 powerplants will result in an increase of about 6% in the area of land disturbed by surface coal mining by 1990 (predicted total area disturbed: 440 ha). The conclusion that habitat loss will cause only minor impacts to biotic resources (third sentence) is based upon the small areal disturbance predicted to occur as a result of the proposed action relative to the total amount of wildlife habitat available.

Co-Generation

PDER-6 Page 3-40 identified coal-fired cogeneration as the only co-generation alternative considered. Are there other co-generation alternatives which could be considered?

PDER-6 Wood-fired cogeneration is considered in Tables A.3 through A.5 of the DEIS. Since the goal of the DEIS was to explore ways to save oil, liquid fossil fuels for cogeneration were not considered for cogeneration.

Stream Data

PDER-7 Section 4.2.1 on page 4-10 contains some misleading data about Pennsylvania's water pollution problems. Pennsylvania has 50,000 miles of streams of which 12,962 miles are major streams. About 2,795 of major streams are polluted. Acid mine drainage has polluted 2,000 miles of major streams. Acid mine drainage will be the principal or a contributing factor in about 90% of the 2,273 miles of major streams which will not meet 1983 national water quality standards.

PDER-7 See Response NYDEC-51.

EIS Process and Alternatives

PDER-8 The purpose of tiering in the EIS process is to provide for a well coordinated and efficient use of more specific levels of assessment. However, this DEIS is under development concurrent with several site-specific coal conversion EIS's covered by this generic DEIS. This would seem to defeat the purpose of the tiering process as a tool for making successive levels of environmental decisions.

The Pennsylvania Governor's Energy Council strongly encourages the use of renewable resources such as wind, hydro and photovoltaics, and would encourage a closer look in the site-specific EISs when they are undertaken.

PDER-8 Although some of the site-specific documents were developed concurrently with the regional EIS, no decision will be made on finalizing proposed site-specific prohibition orders until after the regional EIS has been finalized. The regional EIS was designed to provide the broadest framework for environmental decision-making. This translated into the identification of potential environmental "hot spots", particularly in the area of air quality. Mitigation of these "hot spots" was addressed in the regional EIS to some extent, but more detailed analysis of techniques for pollution reduction can realistically be addressed only at the site-specific level, where engineering options are considered. The identification of environmental "hot spots" does not disqualify a site, or group of sites, but rather suggests the best approach to individual conversions.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
P. O. Box 1467
Harrisburg, Pennsylvania 17120

(717) 783-9500

Office of the Deputy Secretary
Resources Management

February 5, 1982

In reply refer to
RM-CZM
CZ 8:PE

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M. Street, N.W.
Washington, D.C. 20561

Dear Ms. Goldberg:

We have reviewed the Draft North East Regional Environmental Impact Statement (EIS) for the potential conversion of 42 powerplants from oil to coal or alternate fuels and find it not complying with the intent of the regulations implementing the Federal Coastal Zone Management Act (FCZMA) and the Council on Environmental Quality Regulations on implementing the National Environmental Policy Act (NEPA) procedures.

PDER-9

The FCZMA requires that Federal agency activities directly affecting the coastal zone must be consistent with approved state Coastal Zone Management (CZM) programs to the maximum extent practicable. Since the Commonwealth of Pennsylvania has an approved CZM Program and has implemented review mechanisms to assure consistency of Federal activities with the enforceable policies of our program, it is, therefore, our interpretation that a consistency determination mu t be made and so stated in the EIS, Section 5.3 Land Use. Specifically, the Department of Energy is required to notify us at the earliest practicable time of plans to undertake an activity or development project directly affecting our coastal zone(s), and whether or not it is consistent to the maximum extent practicable with Pennsylvania's Management Program.

The Council on Environmental Quality Regulations on implementing the NEPA procedures, states in Section 1502.6, that in the EIS environmental consequences shall be addressed and shall include discussion of, "(C) possible conflicts between the proposed action and objectives of Federal, regional, State and local land use plans, policies and controls for the areas concerned." Additionally, in Section 1506.2 of these regulations it is stated, "to better intergrate environmental impact statements into State and local planning processes, statements shall discuss any inconsistency of a proposed action with any approved State or local plan and laws. Where an unconsistency exists, the statement should discribe the extent to which the agency would reconcile its proposed action with the plan or law."

PDER-9 The regional EIS is designed to address the potential impacts that might occur from multiple coal conversions. The conversion of 42 powerplants, the "federal action" assessed in the document, represented an analytical worst case. This approach was selected because USDOE had no way of knowing which of the 42 plants would actually convert. Not all of the plants included in the study had proposed prohibition orders issued to them; this group included Schuylkill and Southwark. Consequently, the "proposed action" was analytical, not real. Coordination with the Pennsylvania Coastal Zone Management Program is more appropriate to site-specific analysis than to the cumulative analysis done for this document. In the site-specific analysis, specific combustion and waste disposal options are discussed that can be compared more realistically with state coastal zone plans.

Based on a survey of the utilities included in the DEIS, additional analysis was done on a reduced number of conversion candidates. Schuylkill and Southwark are not included in this more realistic conversion scenario (see Sec. 2). The additional analysis is given in Section 3 of this FEIS.

Ms. Marsha S. Goldberg -2- February 5, 1982

Since Pennsylvania's CZM Program is Federally approved and the Schuylkill and Southwork power generating stations are both located within our coastal zone boundaries, there needs to be a consistency determination made in order to bring this action into compliance with the intent of the regulations implementing NEPA.

Therefore, since we have found nowhere in this document any reference to Pennsylvania's CZM Program or a consistency determination statement of any form we recommend that these issues be addressed in the content of the final draft document. In order to assure compliance with the previously mentioned regulations we offer our assistance and cooperation in this matter.

PDER-10 In addition to the above general comments we would like to make one specific comment on the Draft Environmental Impact Statement. This comment is out of our area of responsibility but in any case we felt it was important to bring to your attention. Figure 5.7 page S-31 shows an approximate alignment for the Allegheny River in Pennsylvania. Geographically the Allegheny River ends at Pittsburgh and does not extend to the State of Maryland as is indicated. This point (Pittsburgh) is located just south of the Springdale generating station. The Monongahela River will come up to this point from the south but not from an origin as far east as shown in figure 5.7. Also the Springdale generating station is on the west bank of the Allegheny River, not on the east bank as indicated in the figure 5.7.

If we can be of any help or if you have questions on the comments presented, please call me at the above referenced number.

Sincerely,

E. James Tabor, Manager
Coastal Zone Management Office

PDER-10 The comment is noted, and appropriate changes are made in Figure 5.7, which is included in the Errata and Addenda, Section 5.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
DIVISION OF PLANNING AND DEVELOPMENT
83 Park Street
Providence, R. I. 02903

December 10, 1981

Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, DC 20461

Subject: Draft Northeast Regional Environmental Impact Statement (DOE/EIS-0083-D)

Dear Ms. Goldberg:

The Department of Environmental Management has reviewed the DEIS for the conversion of forty-two (42) Northeast power plants from oil to coal, and also the following comments:

RIDEM-1

1) On page 1 of Appendix F, in discussing the assumptions and input data used in the modeling analysis, the following statement is made: "...Predicted total concentrations are given only to highlight areas of potential problems, not to give total values that could be measured following concentrations. The analyses are used to predict trends in pollutant concentrations not to predict specific areas of NAAQS violation..."

The modeling done does not indicate the South Street, Brayton Point, Montaup area as a "hot spot" of air pollution. However, some assumptions used in the modeling may not be totally correct and this area might possibly be an area for NAAQS violations. The two assumptions used in the modeling which may differ in actuality are as follows:

A. South Street was modeled at an emission rate of 1.1 lb $SO_2/10^6$Btu. All discussion to date has indicated that in any coal conversion South Street will actually emit in excess of that, probably more than twice that amount (2.42 lbs $SO_2/10^6$ Btu).

B. The air quality data base year was 1978. There is nothing anywhere to indicate what Brayton Point's contribution to that monitored data is. If with the conversions taking place, Brayton Point's contribution in later years (years when South Street and Montaup convert) was greater than in 1978, resulting in higher monitored values, this coupled with the above, could possibly lead to NAAQS violations in the area.

RIDEM-2

2) The Draft Environmental Impact Statement does not analyze the impacts associated with delayed compliance of air quality regulations relative to the conversion of the associated power plants. It is our understanding

RIDEM-1 See Topical Response 3.1.

RIDEM-2 See Response USEPA-1.

that many of these proposed conversions are being proposed is delayed compliance. Therefore, the impacts of higher emissions during the conversion is anticipated and this impact should be analyzed in the final environmental impact statement.

Thank you for the opportunity to review this statement. If you have any questions regarding these comments, please do not hesitate in contacting me at (401)277-2777.

Yours very truly,

Victor A. Bell
Sr. Environmental Planner

VAB:fmh
CC: Doug McVay

AIR QUALITY PLANNING COMMITTEE
OF THE
BOARD OF CHOSEN FREEHOLDERS
COUNTY OF MIDDLESEX
NEW BRUNSWICK, N.J. 08901

PLANNING BOARD STAFF LIASON
LINDA BUSCH
Principal Environmental Planner
(201) 745-4014)

REPLY TO
[illegible] COUNTY PLANNING BOARD
40 Livingston Avenue
New Brunswick, N.J 08901

January 7, 1981

Ms. Marsha S. Goldberg
Department of Energy
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

The Middlesex County Air Quality Planning Committee (AQPC) wishes to submit the following comments in regard to the Draft Northeast Regional Environmental Impact Statement which addresses the proposed action of converting up to 42 powerplants in the Northeast from oil or gas to coal.

MCAQPC-1

The AQPC is very concerned with the inequitable use of the available sulfur dioxide increment in the New Jersey-New York-Connecticut Air Quality Control Region. Future conversion of some oil or gas-burning power plants to coal in the Air Quality Control Region could severely limit major industrial development in Middlesex County.

Under the Clean Air Act Amendments of 1977, conversions are exempt from new source review and therefore do not have to apply under the PSD Permit process. However, for areas in which a baseline has already been established by a first application for a PSD permit, such a conversion may consume the increment. In Middlesex County, a baseline has been established for sulfur dioxide and total suspended particulates.

Coal conversions will significantly reduce if not totally eliminate the available increment under the Prevention of Significant Deterioration review process. This fact represents a significant potential impact on the economy of the New York Subregion and specifically on Middlesex County. The potential coal conversion could preclude greater economic growth in this area by making it more difficult and more expensive for new firms to locate or existing firms to expand in the region.

MCAQPC-1 Although coal conversions may consume PSD increment that might otherwise be available for growth, the development of an equitable allocation procedure for the PSD increment in the Tri-State area or in any area of the Northeast is not within USDOE's authority. The results of the air quality analysis done as part of the DEIS cannot be used to compute increment consumption as that term is understood in a regulatory context. Such an analysis must be done as part of the permitting process under the Clean Air Act New Source Review requirement and requires a detailed, site-specific examination of the local pollutant concentrations resulting from a new or modified source. This generally requires use of a relatively fine receptor grid in the immediate area surrounding the source. The methodology used for the analysis discussed in this document is not applicable for such a site-specific purpose. The methodology that was used incorporates the maximum practicable number of receptors spread over the subregional areas in order to predict the trends in concentration changes and to indicate a "consumption of increment."

The predicted pollutant concentrations shown in Table 5.6 (p. 5-10 of the DEIS) should be reviewed with this caveat in mind. The effect of the conversins on Northern New Jersey (which would include Middlesex County) is found in Column C. The numbers generally indicate that even under the Modified Coal SIP Scenario (the least stringent from an air quality perspective) the PSD increment for the New York Subregion is not totally consumed; and, under the 1971 NSPS Scenario there is a net improvement. The analysis of an additional scenario as part of the revisions to the DEIS presents a case of further reductions in the consumption of the PSD increment. This scenario is based on modeling a reduced number of conversion candidates (see Sec. 2).

Ms. Marsha S. Goldberg
January 7, 1982
Page Two

The AQPC is asking that the current policy of allocating the remaining increment on a first-come, first-served basis be eliminated. Instead, an equitable allocation procedure must be instituted by the States of New Jersey, New York, and Connecticut.

During the past year there have been unusually high short-term concentrations of sulfur dioxide recorded at the N.J. Department of Environmental Protection monitor in Perth Ambpy. The Committee is therefore very concerned about the health, safety, and welfare effects of higher levels of sulfur dioxide on the affected area.

We urge the U.S. Department of Energy to consider seriously the issue of the PSD increment consumption and the resulting economic consequences in relation to potential coal conversions in the Northeast. These potential conversions should occur within a rational and systematic allocation of the available increment of "clean air."

Sincerely,

John Wiley, Jr.

John Wiley, Jr., Chairman
Air Quality Planning Committee

Richard Brail

Richard Brail, Vice-Chairman
Air Quality Planning Committee
Chairman, Regional Strategy Subcommittee

JW/RB:gg

MIDDLESEX COUNTY PLANNING BOARD

40 LIVINGSTON AVENUE
NEW BRUNSWICK, NEW JERSEY 08901
(201) 745-3062

December 10, 1981

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

MCPB-1 The staff of the Middlesex County Planning Board requests that the closing date for comments on the draft Northeast Regional Environmental Impact Statement - The Potential Conversion of 42 Powerplants from Oil to Coal and Alternate Fuels be extended.

MCPB-1 The comment period was extended until February 5, 1982.

Serving the Middlesex County Planning Board are a number of specialized committees that deal with questions of air and water resource allocation. While these committees are meeting and analyzing the EIS throughout week of December 7, 1981, the Planning Board was unable to have the committees' comments available for review prior to the Planning Board meeting on December 8, 1981 The Planning Board will complete its review and formulate its position at its meeting on January 12, 1982.

MCPB-2 Also the staff notes that as of December 9, 1981 only one of the four supporting technical reports are available for review. We urge the immediate release of the three technical reports for our complete review.

MCPB-2 All four technical reports have been issued.

Considering possible local and regional impacts on Middlesex County and our involvement in the coal conversion process through the scoping meeting and now with this EIS, we request that the comment period be extended so that the forthcoming Planning Board statement can be included in the official package of comments.

Thank you for your continual cooperation.

Sincerely yours,

David M. Dischner

David M. Dischner
Principal Environmental Planner

DMD:gg

MIDDLESEX COUNTY PLANNING BOARD
40 LIVINGSTON AVENUE
NEW BRUNSWICK, NEW JERSEY 08901
(201)745-3062

February 5, 1982

Ms. Marsha S. Goldberg, U.S.D.O.E.
Office of Fuel Conversions
Economic Regulatory Administration
2000 M. Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

The Middlesex County Planning Board has reviewed the draft Northeast Regional Environmental Impact Statement (NREIS) for the potential conversion of 42 power plants from oil to coal or alternate fuels. Major concerns and shortcomings of the draft NREIS identified by the staff and advisory committees involve the following issues:

1) The inequitable use of the available sulfur dioxide increment in the New Jersey-New York-Connecticut Air Quality Control Region. The potential coal conversion could preclude greater economic growth in Middlesex County by making it more difficult and more expensive for new firms to locate or existing firms to expand in the region.

2) Possible contamination of surface and groundwater supplies from the transport, storage and disposal of coal, limestone and waste products along transportation networks, at port facilities and at landfills not environmentally secure.

AIR QUALITY ISSUES

MCPB-3 1) Modelling presented in the NREIS does not reflect the most probable scenario for coal conversion and the subsequent impact of these conversions in the Northeast and particularly in the New York Subregion.

MCPB-4 Modelling presented in the NREIS indicates that conversion to coal by all potentially feasible power plants in the New York Subregion (100 KM square) would contribute to contraventions of the annual average sulfur dioxide (SO_2) standard. Contraventions of the 24-hour SO_2 standard would also occur. Ambient levels in the New York Subregion currently are monitored at almost the standard and therefore

MCPB-3 Since the issuance of the DEIS, the USDOE has determined that 27 of the original 42 candidates constitute a more likely conversion scenario (see Sec. 1).

MCP8-4 The latest modeling analysis (see Topical Response 3.1) includes new ambient air quality data and a scenario based on those powerplants that have expressed a commitment to convert. The most recent data on ambient air quality in New York City are now sufficiently below the primary standard that projections under the mitigating scenarios in the DEIS do not exceed the primary standard. The second highest 24-hour SO_2 concentration of Perth Amboy for 1981 was 333 $\mu g/m^3$. New modeling indicates an incremental increase of less than 10 $\mu g/m^3$ in that area; therefore, there should be no major problem.

Ms. Marsha S. Goldberg, U.S.D.O.E.
February 5, 1982
Page Two

even small increases in the SO_2 level will result in exceedence of the primary standard. In addition, during the past year there have been unusually high short-term concentrations of SO_2 recorded at the N.J.D.E.P. monitor in Perth Amboy.

According to the analysis of mitigation measures identified in the NREIS, attainment of the standard will not be possible with any of the identified scenarios (pgs. 5-11, 12). The NREIS does not identify in any way a response to this finding. A logical scenario for additional modelling, that should be included in the EIS, would be based on those power plants which have expressed a commitment to a conversion. This approach would provide a more realistic assessment of the impacts on environmental resources and give decision-making groups a firm base on which to react. The affected utilities within Middlesex County and New Jersey have expressed a strong reluctance to meet the majority of the conversion orders. Planning for only a few conversions are underway.

2) Middlesex County is greatly concerned that the economic and air quality objectives of the County will not be reflected in conversion decisions because, under the present structure of the Clean Air Act Amendments of 1977, said conversion are exempt from new source review and the PSD Permit Process.

MCPB-5

The NREIS states "There is a potential for the consumption of the PSD increment by the converted power plants. This could limit industrial growth in a number of highly industrialized counties. The extent of the impact could not be quantified." If one coal conversion occurs in this region, it is quite possible that the entire increment will be consumed and along with it the opportunity for greater economic growth. This fact represents a significant potential impact on the economy of the New York Subregion and specifically on Middlesex County. The potential coal conversions could preclude greater economic growth in this area by making it more difficult and more expensive for new firms to locate or existing firms to expand in the region. The absence of any analysis of the use and impact of PSD increment consumption in the NJ-NY-CONN Air Quality Region is a major shortcoming of the NREIS and should be addressed prior to the release of the final NREIS. Consideration should be given to procedures to allow local governments (including Middlesex County) the opportunity to actively participate in the allocation of the remaining increment of "clean air".

Previous correspondence of the Middlesex County Air Quality Planning Committee to U.S.E.P.A. Region II offices, concerning the burning of higher sulfur fuels by Con Ed, voiced concern over the consumption of the sulfur dioxide increment and the impacts of elevated sulfur dioxide levels on both the citizens and industries of Middlesex County.

MCPB-5 Tracking the available PSD increment is beyond the scope of this study. Baseline concentrations needed to determine available increment are yet undefined in many areas of the Northeast. This document is intended to identify any potential impacts on the regional scale. For those areas where several plants are in close proximity, additional work was performed to identify potential "hot spots" and determine mitigating scenarios. Because the conversions will take place over many years, the available PSD increment and subsequent consumption of air resources is a matter better handled on a case-by-case basis, as will be done in the site-specific EISs. This is not to say that in some areas the PSD increments will not be consumed, but allocation of increments is not among the purposes of this document.

Ms. Marsha Goldberg, U.S.D.O.E.
February 5, 1982
Page Three

It is recommended that the current policy of allocating the remaining increment on a first-come, first-served basis be eliminated. Instead, an equitable allocation procedure must be instituted by the State of New Jersey, New York and Connecticut. Specifically, the Middlesex County Air Quality Planning Committee has requested that a meeting be organized with officials from New York, New Jersey, New York City, USEPA and Middlesex County to review the increment allocation issue. This meeting would serve as a forum to determine a fair resolution of these concerns.

WATER RESOURCE ISSUES

MCPB-6

1) Sites identified in the NREIS to receive waste products from coal converted power plants were not designed and do not have the necessary environmental safeguards to prevent contamination of surface/groundwater systems.

The improper disposal of a power plant's waste products may lead to further contamination of surface/groundwater systems utilizied for potable supply. While the NREIS states that "No unavoidable adverse effects on water resources due to combustion waste and disposal are expected to result if landfill sites are properly selected, designed and constructed", the disposal sites identified in the NREIS for the Sayreville and Sewaren plants, include Edgeboro, ILR, Global, and JIS Landfills. With the exception of Edgeboro, the landfills were not designed and constructed with any type of environmental safeguards. In addition, since no siting criteria were utilized when these landfills were established they presently interface with surface/groundwater systems utilized for potable supply.

The final EIS should include a survey of those landfills which are capable of accepting such wastes without harmful effects on water resource systems.

MCPB-7

2) There will be the need for environmentally secure disposal sites for the waste products generated at coal conversion power plants.

Sludges from facilities constructed to desulfurize flue gas will be a major new source of heavy metals which may contaminate surface/groundwater supplies if not properly stored and disposed. These sludges are normally stabilized in large ponds, which if not properly sites will impact the water resources of a region. An analysis of the capacity of existing storage ponds and the opportunities for the construction of new sites should be included in the final EIS.

MCPB-6 It is true that some of the disposal sites identified in the statement were not designed and constructed with proper environmental safeguards. However, the purpose of considering all the existing and potential disposal sites in the Northeast Region (see Sec. 4.3.3.2 and Table 4.16 of the DEIS) was to fully assess the potential cumulative or interactive impacts on surface- and groundwater due to combustion waste disposal. The final selection of a disposal site for each candidate plant and any suggested mitigation measures necessary to upgrade the disposal sites to meet the selected environmenal regulations will be discussed in detail in the site-specific EISs. Under the Voluntary Conversion Scenario, the number of plants requiring FGD is reduced. These changes result in great reduction of the quantities of sludge produced.

MCPB-7 The discussion of potential effects on water resources from the collection and disposal of combustion wastes including FGD sludge is presented in Section 5.2.3.4 of the DEIS and in Response CLF-11. The study indicated that although there may be site-specific impacts on water resource systems, the potential for cumulative or interactive impacts would be minimal because of the nature of the water bodies and the relative location of the candidate plants. Also, it was stressed in Section 5.2.3.4 that the design of waste-storage ponds would be a major determining factor in ensuring containment of sludge waste that may pose a threat to water environment. Future construction of holding ponds should follow the general design criteria outlined in Section 5.2.3.4.

Ms. Marsha s. Goldberg, U.S.D.O.E.
February 5, 1982
Page Four

MCPB-8

The NREIS presumes that current fly ash markets will absorb the millions of tons of fly ash collected at the converted power plants. Also it states that fly ash is an allowable intermediate cover material in N.J. at existing landfills. The NREIS does not provide any regional analysis to support its contentions as to the possible market for fly ash and it does not state that use as cover material is contingent upon an acceptable engineering analysis of the ash itself, and the geology and hydrology of the landfill. Again an analysis of the existing and proposed environmental secure disposal capacity should be included in the final EIS.

MCPB-9

3) Groundwater systems in the Lower Raritan/Middlesex County Region are overstressed and should not be considered as available for further use.

The NREIS states that coastal plain aquifers are capable of supplying additional quantities of water. While this may be true if you examine the supply issue based on regional geologic provinces; the location of the unused groundwater supplies does not coincide with the location of the power plants or other demand centers. The NREIS contends that the practice of interbasin diversions will grow as water requirements increase. This contention may not apply to groundwater supplies considering escalating energy costs, for pumping and the possibility of contamination of supplies due to over-pumpage and chemical dumping.

We appreciate this opportunity to comment on the Draft NREIS. Please continue to keep us informed of activities in regard to the conversion of power plants to coal use and other energy-related activities effecting our County.

Sincerely yours,

Hyman Center, Chairman
Middlesex County Planning Board

HC:gg
cc: John Wiley, Air Quality Planning Committee
John Korzun, LR/MC Water Resources Association

MCPB-8 The discussion of coal ash utilization is presented in Topical Response 3.5 (Waste Disposal).

MCPB-9 The interbasin diversions were developed in the Northeast Region for the purpose of trying to mitigate the uneven distribution of the region's surface water (not groundwater) supplies with regards to its major population and industrial centers. The practice of this water transfer scheme, as mentioned in DEIS Section 4.2.3.4, has in some instances caused interstate and/or intrastate controversy. However, the U.S. Water Resources Council expects that by establishing sound mechanisms for the equitable allocation of water resources, the practice of interbasin diversion will increase as water requirements grow.

FACSIMILE

TESTIMONY OF DR. PETER E. COFFEY
ON THE SUBJECT OF
DRAFT NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT

My name is Peter E. Coffey. I am Administrator of Air Quality Programs for the New York Power Pool. The member systems of the New York Power Pool are Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., Long Island Lighting Company, New York State Electric and Gas Corporation, Niagara Mohawk Power Corporation, Orange & Rockland Utilities, Inc., Power Authority of the State of New York, and Rochester Gas and Electric Corporation.

As an atmospheric scientist I have been involved in acid precipitation related research since 1973 and have written a number of technical papers on the subject.

I have reviewed those sections of the "Draft Northeast Regional Environmental Impact Statement" pertaining to atmospheric phenomena associated with acid precipitation.

NYPP-1

In general these sections reflect the present published state of knowledge regarding atmospheric processes. However there are several changes or additions which should be made.

The draft environmental impact statement utilizes the ASTRAP model (Shannon 1981) to predict a very small increase in the deposition of acidic pollutants resulting from the conversion of 42 power plants from oil to coal; however, the number of plants slated for conversion has been reduced from that number. In New York alone at least four of the plants indentified in the draft are not being considered for conversion (SEMP II). Therefore, the deposition values should be recalculated to reflect the smaller number of anticipated conversions.

Furthermore, a limitation not considered in the draft document which adds to the conservatism of this model in the deposition region is the assumption of first order chemistry. This implies a direct proportionality exists between emission changes and deposition changes. Such an assumption is generic to all of the long range transport models now in use since the actual chemistry of the acidifying processes is not known. However recently published articles (Hegg and Hobbs 1981), (Granat 1978), (Wilson et al 1981), and statements by highly respected atmospheric scientists (Cicerone 1981), (Lazrus 1981), (Mohnen 1981) reflect a growing awareness in the scientific community that these processes are less than first order. What has been observed is a lack of correspondence between emission changes and deposition changes in North America as well as in Europe.

Increased emissions have translated into no or much less than proportional increased deposition in the deposition regions. Research efforts are now underway to develop the appropriate atmospheric chemistry relationships. In conclusion this model, using first order chemistry would be expected to over-predict deposition changes by a factor dependent upon the nonlinearity of the chemical processes. This should be noted in the document.

NYPP-1 A reduced number of plant conversions, reflecting more recent information than that available for the DEIS, is discussed in Topical Response 3.1.

Although not always recognized as such, the question of nonlinearities in long-range transport, transformation, and deposition processes is a "two-edged sword." If precipitation scavenging is limited by the concentrations of other substances such as hydrogen peroxide, small increments of emissions of sulfur oxides may produce even smaller increments of sulfur wet deposition. On the other hand, if the neutralizing capacity of ammonia, for instance, is saturated by current sulfur and nitrogen oxide concentrations in parts of the Northeast, as might be indicated by increasing acidity of sulfate particles between Illinois and the east coast (Johnson et al. 1981), then an increase in emissions of sulfur oxides might lead to a somewhat higher relative increase in concentration and dry deposition of acidic sulfate particles. Thus, the linear assumptions involved in current state-of-the-science regional transport and deposition models may be regarded as a middle-of-the-road approach. If one increases the scales of spatial and temporal averages sufficiently, then linear assumptions must apply, since "what goes up must come down."

REFERENCES

Johnson, S., R. Kumar, P. Cunningham, and T.A. Long. 1981. MAP3S Aerosol Network: A Progress Report and Data Summary. ANL-81-63. Argonne National Laboratory, Argonne, Ill.

Section 4.14 "Deposition Region" should not refer to pH 5.6 as "a theoretical ideal" for rainfall pH. All precipitation processes are initiated by cloud condensation nuclei or ice forming nuclei. There is no apriori reason that the naturally produced nuclei should be of neutral pH. Furthermore, the initially formed droplets or ice crystals, as the case may be, will scavenge naturally occurring gases and particles from the atmosphere. These gases and particles can be strongly acidic or basic.

NYPP-2

Precipitation samples collected in remote areas of our globe show a wide range of pH's from the upper 3s to well above 7 (Gravenhorst et al 1980). Northern Hemisphere averages tend to be around pH 5 (World Meteorological Organization 1974). Historical data taken from glacial ice cores (Hammer et al 1980) also indicate that over the past millenia precipitation pH has averaged well under 5.6.

In general, I would conclude that the strong acids and alkaline agents, both natural and anthropogenic, control precipitation pH now and always have, not atmospheric CO_2. Also I believe that the "natural" or "theoretical ideal" pH to be expected in a given region has a wide variation which is strongly affected by climate changes and soil chemistry.

My overall assessment of the draft document with respect to acid precipitation is that with the inclusion of the suggested modifications it will present a view more consistent with the present technical literature.

REFERENCES

Cicerone, R., "Acid Pollutants: Hitchhikers Ride the Wind" C&EN September 14, 1981, P.21.

Gravenhorst, G., Beclke, S., Betz, M. and Georgii, H. "Sulfur Dioxide Absorbed in Rainwater" in: Effects of Acid Precipitation on Terrestrial Ecosystems", T. C. Hutchinson and M. Hayes Eds., Plenum Press NY PP 4155, 1980.

Hegg, D. and Hobbs, P., "Cloud Water Chemistry and the Production of Sulfates in Clouds" Atm. Env. Vol. 15, No.5, pg. 1957 1981.

Granat, L., "Sulfate in Precipitation as Observed by the European Atmospheric Chemistry Network" Atm. Env. Vol. 12, 1978.

Lazrus, A., "Acid Pollutants: Hitchhikers Ride The Wind" C&EN September 14, 1981, P. 27.

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SEMP II New York State Energy Master Plan II, Vol. 3, page 104 August 1981.

Shannon, J., "A Model of Regional Longterm Average Sulfur Atmospheric Pollutions, Surface Removal, and Net Horizontal Flux" Atm. Env. Vol. 15 No. 5 pp. 689-701 1981.

Wilson, W. E., Homolya, J. B., Husar, R. and Lazrus, A., "Atmospheric Processed Important to the Acidification of Rain", Presented to the 74th Annual Meeting of APCA Philadelphia, Pa. June 21-26, 1981 Paper 8130.2.

World Meteorological Organization, US E.P.A. and NOAA 1974 "Atmospheric Turbidity and Precipitation Chemistry Data for the World 1974" Prepared by the U.S. Environmental Data Service, Ashville, N.C.

NYPP-2

Since the publication of the DEIS, the "theoretical ideal" of rainfall pH as 5.6 has been questioned in several articles in the open literature. The statement that the ideal pH is 5.6 does not take into account natural or anthropogenic contamination and the subsequent chemical reactions that occur in raindrop formation and precipitation. Deviations from a pH of 5.6 are caused by either natural or man-made pollution, and it is not presently known which contributes more. It is true that the "natural" pH of rainfall may not always be 5.6, but the "theoretical ideal" is concerned only with atmospheric carbon dioxide, which is not considered a pollutant.

orange county
Louis Heimbach
County Executive

Department of Planning
& Economic Development
124 Main Street
Goshen, New York 10924
(914)294-5151

Peter Garrison, Commissioner
Richard S. DeTurk, Deputy Commissioner

December 23, 1981

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
U.S. Department of Energy
2000 M Street, N.W.
Washington, DC 20461

Re: Draft Northeast Regional EIS
(42 Powerplants)

Dear Ms. Goldberg:

OCDPED-1

The Tri-State Regional Planning Commission has transmitted a copy of your DRAFT EIS on powerplant conversion from oil to coal. Two of the plants (Danskammer and Lovett) service Orange County.

We have reviewed the draft EIS and find the conclusions you have reached to be acceptable for Orange County. The County Government strongly supports proposals by our utility companies to convert their powerplants at Danskammer and Lovett to coal. Such conversions will benefit the public and our economy in terms of reduced power costs.

Very truly yours,

Richard S. DeTurk

Richard S. DeTurk
Deputy Commissioner of Planning

RSD:rtt

OCDPED-1 No response required.

FACSIMILE

February 5, 1982

Marsha J. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 "M" Street, N.W.
Washington, D.C. 20461

Dear Ms. Goldberg:

The Port Authority of New York and New Jersey is taking this opportunity to comment on the Draft Northeast Regional Environmental Impact Statement -- The Potential Conversion of Forty-two Powerplants from Oil to Coal or Alternative Fuels (NEREIS), released October 1981.

The Port Authority of New York and New Jersey is a municipal corporate instrumentality of the States of New York and New Jersey. It was created in 1921 with the consent of Congress to plan, develop and operate terminals and other facilities of transportation and commerce, and to advance projects in the fields of transportation, economic development, and world trade that contribute to the promotion and protection of the commerce and the economy in the Port District. The Port District comprises an area of about 1,500 square miles in New York and New Jersey adjacent to New York Harbor. The Port Authority undertakes only those projects authorized by the two states.

In June 1980, the Port Authority established a coal transportation task force to investigate coal transportation and handling systems in the New York/New Jersey metropolitan region in response to recent developments in the domestic and international coal trade. Since then, the Port Authority has assessed the Northeastern coal market by means of a survey of utilities considering conversion from oil to coal. The Port Authority's survey was designed to obtain information regarding all facets of coal utilization in the Northeast: coal source and specifications, methods of transport, regulatory and environmental requirements and financial opportunities and constraints.

Our concern about energy is directly related to the ways which the cost and supply of energy has contributed to regional economic problems in recent years. The overwhelming dependence of this region on oil, especially imported oil, is the single overriding factor affecting our energy situation. Since almost two-thirds of the electricity in this region is oil-fired, the conversion of utilities to coal would result in a significant reduction in regional oil demand. The Port Authority recognizes the potential benefits to the economy and commerce of the New York metropolitan region of replacing expensive, unsecured foreign oil with less costly energy sources. The Port Authority also recognizes that a rapid conversion of utility boilers from oil to coal will speed the arrival of related economic benefits to the region.

While the Port Authority strongly supports the region's efforts to reduce its dependence on oil, we are concerned that this goal be attained in an environmentally sound manner. The analyses in the draft NEREIS form a solid basis for ascertaining the environmental impacts of regional coal conversions. Further, the document covers a full range of issues and, consequently, will surely aid in the development of well-balanced decisions. We do, however, have three concerns about the draft NEREIS:

1) the discussion about the utilities is factually inaccurate;
2) the discussion of the water transportation system in the Port of New York does not include projects presently under study;
3) the discussion of the rail transportation system in the Northeast region does not thoroughly describe the means by which many utilites prefer to transport coal to the units being converted.

NORTHEAST UTILITIES

PANYNJ-1

Events since the release of the draft NEREIS should have far-reaching consequences for the content of the final document. For example, provisions of the Omnibus Budget Reconciliation Act of 1981 which allow utilities to actively request prohibition orders instead of passively receiving a federal mandate should alter the scope and content of the final NEREIS. In addition, interviews of utilities in this region by the Port Authority indicate that many of the facts have changed since the draft NEREIS was released. As a result, we have recommendations for changes in two areas.

First, the lists of electric generating stations proposed for coal conversions (Tables 1.1 and 2.1) should be updated. According to the Port Authority survey, Far Rockaway, Sewaren, and Glenwood are not potential candidates for conversion. New England Electric's Salem Harbor facility is now burning coal, and therefore, is no longer a candidate. If an accurate number of plants is not computed, the environmental impacts of coal conversion in the Northeast region cannot be accurately assessed. We suggest that utilities be contacted to reconfirm their plans to utilize coal.

Second, apparently the U.S. Department of Energy eliminated units over 25 years of age from all lists of coal conversion candidates (p. 1-1). Tables 1.1 and 2.1, however, still contain units well beyond that age limit. Accordingly, the following units should be deleted from the tables: Albany (1,2,3,4); Burlington (7); Cromby (2); Danskammer (1,2); Deepwater (7,8); Devon (7); Edge Moor (1,2,3,4); Far Rockaway (4); Glenwood (4.5); Kearny (7,8); Mason (1,2,3,4,5); Middleton (1); Montville (5); Oswego (1,2,3,4); Port Jefferson (1,2); Riverside (4,5); Salem Harbor (1,2,); Sayreville (4); Schiller (4,5); Sewaren (1,2,3,4); Southwark (1,2); Springdale (7); Wagner (1).

PANYNJ-1 See Section 2. Plants over 25 years old have been eliminated except those that are possible conversion candidates as stated by the utilities (see Table 2.1).

WATER TRANSPORTATION SYSTEM

PANYNJ-2

The draft NEREIS correctly concludes that the existing coal handling capability in the New York metropolitan region may be insufficient to meet the needs of utilities in the area, unless expansion takes place. Indeed, bottlenecks at Port Reading could occur, and powerplants "...would be forced to receive coal via outside routes from piers in the Ports of Philadelphia, Baltimore, or Hampton Roads where interference with export shipments would be likely." (p. 5-60).

The situation has been observed by many others, who today are studying new coal handling proposals for Weehawken, South Amboy and Port Jersey/Greenville in order to improve on this situation. The Port Authority, for example, is studying the construction of a 10-20 million ton-per-year facility to serve both the domestic and international coal trades beginning in 1985 (Attachment 1). The Port Authority facility will utilize state-of-the art technology to provide maximum efficiency to its users. The facility design will incorporate

PANYNJ-2 See Response PSEG-14.

two key features missing from the prevailing coal shipping system: ground storage capability and high-speed train unloading and vessel loading. The capacity to service barges and ships simultaneously will assure users of flexibility and mitigate the possibilities of long queues.

We strongly recommend that the Summary of Issues and Conclusions and the "Water Transportation System" sections (4.5.2.2 and 5.5.2.2) be revised to properly reflect any and all facilities which may be located in the Port of New York. Proposed coalport facilities in the Port of New York would be able to handle the increased coal requirements of Northeast utilities. The Port Authority suggests that the text (p. 4-60) and Table 4-19 (p. 4-65) be corrected to show the Port of New York's potential coal handling capacity.

In addition, there are two other parts of the discussion on the Water Transportation System which merit further consideration. The first relates to uncertainty about the projected coal demand by utilities to be converted. For example, an annual demand of 26.8 million tons per year is quoted on p. 5-60 (date unspecified), while a 1990 demand for 35.9 million tons per year is quoted on p. 5-62. We recommend that ERA contact coal conversion candidates and determine what the anticipated coal demand will be.

The second area of consideration regards the draft NEREIS statement in Section 5.5.2.2: "Conrail has informally announced plans to purchase Port Reading..." For over one and one-half years, the Port Authority has been working closely with Conrail to develop the coal market in the Port of New York and we know of no such intention to purchase this area which they now lease from Public Service Electric and Gas. We recommend that ERA contact Conrail to confirm this intent to purchase Port Reading.

RAIL TRANSPORTATION SYSTEM

The discussion on coal delivery systems is incomplete with respect to the barge delivery system, because the assumption is made that coal would be delivered only by rail to many powerplants in the Northeast (p. 4-60).

PANYNJ-3

The waterside coal handling capabilities of many of the region's utilities was highly developed twenty years ago, so that there is an infrastructure to accept barge deliveries, albeit in need of refurbishment. Of the twelve utilities surveyed by the Port Authority, only two, Central Hudson and Orange & Rockland, anticipate receiving coal transported by rail only. Our survey reveals that rail-to-barge-to-plant is the most favored transportation scenario among northeastern utilities. Further, utilities have recognized the economies of scale from using a single facility to accept railed coal, store it, and load on a barge. For example, an official of the New England Electric System has testified before Congress that the cheapest way to get coal to Massachusetts is by rail from Pennsylvania to the Port of New York and New Jersey (Attachment 2).

The final document should show the symbiotic relationship between the rail and barge transportation networks in the coal handling industry. These forms of transport are complementary and, together become more cost-effective Consequently, the discussions should focus on integrating various transportation modes.

We appreciate your consideration of our comments and trust that they will be useful to you in preparing the Final NEREIS. If we at the Port Authority can be of further assistance to you, please feel free to contact me at (212) 466-8597.

Signed by

Frank N. Caggiano, Manager
Office of Energy

PANYNJ-3 The wording in Section 4.5.2.1 of the OEIS was incorrect and misleading, and is corrected as follows:

"One major mode for transporting coal to the powerplants that may convert to coal under FUA is railroad."

Impacts are presented in Section 5.5.2 for two scenarios--one including maximum use of water delivery and one including maximum use of rail delivery. (All water delivery shipments make use of rail-to-barge-to-plant.) These two scenarios were examined to obtain worst-case impacts. The most recent analysis using a detailed transportation network model indicates that 64% of the total tonnage of coal to the conversion candidates will use the rail-to-barge-to-plant combination.

Attachment 1

COAL TRANSFER FACILITY IN THE PORT OF NEW YORK

The Port Authority of New York and New Jersy is investigating the coal transportation and handling abilities in the port of New York and New Jersey in response to the recent developments in both the international and domestic coal trade markets. As exemplified by the experience of this port where coal exports are expected to increase from 1979 levels of 3,000 tons per year to 1981 levels of a million tons per year, the international demands for U.S. coal is immediate. While the domestic market is moving more slowly, utilities in the Northeast eventually could require as much as 16 million tons of coal per year, the equivalent of 56 million barrels of oil annually.

Consequently, the Port Authority envisions the construction of a facility initially handling 10-12 million tons per year gradually increasing to 20 million tons per year. While the facility will be capable of serving both markets from the very start, the Port Authority expects that international trade will predominate the first few years of business.

Expanding coal exports in the port is made feasible by four main characteristics:

FIRST IS DISTANCE New York is the closest of any U.S. ports to most European ports, and as much as a full day's steaming time could be saved sailing from New York instead of other Eastern ports. Assuming one roundtrip per vessel per month, this savings is estimated to amount to as much as $350,000 annually.

THE SECOND ADVANTAGE IS SPACE There is enough underutilized space in the New York/New Jersey Harbor for at least three separate coal handling facilities with direct rail access, each with a minimum throughout of 10 million tons of coal per year. Further, the acreage in each of the parcels is more than sufficient for unit train traffic and turn-around, and for on-ground storage of 1-2 million tons of coal.

THE THIRD ADVANTAGE IS ACCESS TO THE MINES VIA THREE MAJOR RAILROADS Conrail, N & W and Chessie are three major coal-hauling railroads with access to the New York/New Jersey waterfront either directly or via interchange at Hagerstown, Maryland or Lurgan, Pennsylvania. One of there--Conrail--has spent four years gearing up to haul coal as a source of revenue necessary for financial self-suffiency. Hauling increased volumes of steam coal to the Port of New York will clearly benefit Conrail--the major railroad in the Northeast.

THE FOURTH ADVANTAGE IS THE CAPACITY FOR DEEPWATER ACCESS Because of the absence of any permanent constrains to channel depth, and proximity to the open sea, the Port of New York and New Jersey can achieve greater channel depths more cheaply than any other U.S. port. Extending the current 45-foot depth to 60 feet would require an estimated expenditure of between $70 million and $140 million in 1980 dollars. This expenditure for New York Harbor is certainly much less than any other Harbor seeking deeper channels. Furthermore, according to the District Corps of Engineers, the deepening would likely involve mostly clean sand which could be put to multiple uses, thereby minimizing the environmental impact of this activity.

Such characteristics provide the opportunity to construct a new coal hauling and transportation facility with such features as:

- Dedicated facility for high volume coal shippers;
- High-speed ship and rail turnaround;
- Ground storage;
- Competitive rates;
- 60-foot channel depths.

The Port Authority believes that action by Congress and the Corps of Engineers to accelerate the approval and construction of channel deepening projects is prerequisite to carving out a leading role for the United States in the international coal trade. Large colliers requiring channel depths of 55 feet and greater currently cannot enter any U.S. port; because there are no channels deeper than 45 feet. Such vessels are the most cost-effective means of transportation over long distances. For example, chartering a 150,000 deadweight ton vessel out of New York and bound for Europe today would save more than $5 per ton over the costs of chartering a 72,000 DWT vessel.

The use of larger size vessels is not only desirable, but also imminently possible. New York's survey of large bulk carriers indicates the existence of over 480 vessels of 80,000 DWT or larger, with 81 vessels at 100,000 DWT or larger on order. Less than 5% of these existing vessels and though it features one of the nation's deepest channels.

The process of authorizing and constructing channel deepening projects historically takes 10-20 years to complete. In sharp contrast, a coal hauling facility could be constructed and operational within 2-4 years. Legislation has been introduced in both the House and Senate of the U.S. Congress to over-haul the system which funds and approves the construction and maintenance of channel projects. There is general consensus that the process should be cut back, but opinions divurge on the issue of how much local interest should pay and how much the federal government should pay. On December 3, 1981, the Senate Committee on the Environmental and Public Works approved a bill which features a 75% (federal/25% (local) cost split for funding the construction of channels. The House Sub-committe on Water Resources of the full Committee on Public Works and Transportation is taking up a new bill in the coming months.

Present Status

The Port Authority has been maintaining close contact with a large number of national and international producing and consuming companies interested in shipping coal through this harbor. They are enthusiastic about our competitive advantages and have stated that they would ship through New York if facilities can be put in place within a reasonable time period and the harbor deepening process can be expedited.

On January 8, 1981, the Port Authority's Board of Commissioners authorized a contract with ORBA Corporation to conduct a preliminary site analysis and cost study to better define the parameters of a coal transshipment facility. Based on a preliminary analysis by the Port Authority, the Authority asked ORBA to study four sites: Stapleton, New York; Port Jersey, New Jersey; Greenville, New Jersey; and a combination of Port Jersey/Greenville. This final report issued in July, recommended Port Jersey as the most feasible site with Greenville a close second. Subsequently, at its meeting of July 9, the Board further authorized the expenditure of one million dollars to conduct further environmental and engineering studies of both these sites. Also with the approval of the Board, the Port Authority has purchased the Greenville and Port Jersey properties to permit necessary soil and water tests to be performed and to assure the availability of the required land should a decision to build be forthcoming.

Speed is essential if the Port Authority is to capture a meaningful share of future coal trade for this region. Long-term contracts with coal shippers are important to provide a guaranteed throughput and minimize the risk of a facility of this type. To obtain these contracts, it is necessary to determine in detail the key operating parameters and begin the process which will lead to construction. The port which can put its package together quickly and effectively will have a decided edge.

The City of New York
WASHINGTON OFFICE
1725 Eye Street, N.W.
Washington, D. C. 20006
202-223-6694

February 5, 1982

Ms. Marsha S. Goldberg
Department of Energy
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Suite 6128
Washington, D.C. 20461

Dear Ms. Goldberg:

Enclosed please find comments prepared by the New York City Department of Environmental Protection in response to the Department's request for comments on the Draft Northeast Regional Environmental Impact Statement. I am pleased to submit them on behalf of the City for the record.

Sincerely,

Eve Lubalin
Legislative Representative

EL/lf

Enc.

The City of New York
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Francis X. McArdle, Commissioner
Edward F. Ferrand, Asst. Commissioner
Bureau of Science and Technology
51 Astor Place
New York, N.Y. 10003 Tel. 566-2717

Ms. Marsha S. Goldberg
Department of Energy
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Room 6128-0
Washington, D.C. 20461

January 15, 1982

Dear Ms. Goldberg:

I am enclosing a memo that lists some of the points that I had previously discussed with you. If you have any questions on the contents of the memo please don't hesitate to contact me.

encl.

Very truly yours,

Harold Nudelman

cc: Ferrand
Orentlicher

HN/ba

The air quality modeling presented by DOE in their draft EIS represents a useful first step in the analysis of the effects of regional coal conversion on ambient sulfur dioxide concentrations. The magnitude of predicted increments for various scenarios are not considered by DOE as being precise figures. DOE specifically states in Appendix F of the DEIS that the results are not highly accurate but are considered to accurately forecast trends in pollutant levels. We concur in their appraisal that while the magnitudes of increments are not precise the trend between different scenarios is useful to highlight potential problems.

NYCDEP-1 The modeling done by DOE showed a potential for violations of the ambient sulfur dioxide standard. This was in part due to their selection of a background (baseline) year of 1978 when levels were at the standard. Even if more recent air quality data had been used (through 7/81), although the annual standard would not have been contravened it would have been a borderline case. The results of the DOE EIS, therefore, supports the need for a more thorough and refined analysis of the impact of regional coal conversion. This would include a more refined modeling approach to eliminate the shortcomings mentioned by DOE in Appendix F.

NYCDEP-2 Note that it would have been useful for the shortcomings associated with the modeling and the limited usefulness of the results to have been mentioned in the summary.

We do have specific comments and questions relating to the DOE air quality analysis. These are summarized on the following pages.

NYCDEP-1 A new modeling analysis, based upon the same approach but with more reliable input data, has been done. These results, presented in Topical Response 3.1, indicate that all scenarios are well below the NAAQS for SO_2.

NYCDEP-2 Topical Response 3.1 contains a revised summary based on the new analysis. As part of the revision, the limitations associated with the modeling are presented.

NYCDEP-3 (1) More recent background levels could have been used as indicated by Ms. Goldberg (DOE) at hearings on 12/18/81. This would have reduced the potential for violations. This should be addressed in the more refined analysis.

NYCDEP-4 (2) The table of emissions F.2 is not adequate to assess the actual emissions rates used in modeling. Emissions rates in gms/sec for both the annual and daily calculations would have expedited comparison to other estimates of emissions.

NYCDEP-5 (3) There were some errors on Table F.1. Arthur Kill has a maximum exit velocity of 121 not 54 fps and the Ravenswood 3 exit temperature is too high. DOE has indicated that they already know of some errors but that they used the best available input data. It would have been useful to have the exit velocities used in the annual runs on Table F.1 as well as any adjustments to physical stack heights for any scenario.

NYCDEP-6 (4) The coal SIP produced impacts which appear to be very low. Comparison to EPA's previous run with CDM reinforces this fact. The five northern New Jersey power plants gave a higher impact than the 3 ug/m^3 for the coal SIP. A recent analysis by Con Ed, which is more sophisticated, indicated substantially higher impact for Bergen 1 and 2 alone than DOE predicted for all plants. The results for the Coal SIP predicted by DOE should be reviewed for possible errors.

NYCDEP-3 More recent background levels have been incorporated in the new analysis found in Topical Response 3.1.

NYCDEP-4 Table 2.3 of the FEIS shows peak SO_2 emission rates in g/s. Annual emission rates can be calculated by multiplying peak emission rates by the expected capacity factors, which also are listed in Table 2.3.

NYCDEP-5 The corrected values have been used in the latest modeling study (see Sec. 2 and Topical Response 3.1).

NYCDEP-6 Con Ed and USDOE had different objectives when designing each modeling analysis. USDOE's objective was to note basic trends in air pollutant concentrations that would occur following the conversions and identify areas that might be more highly impacted. Whether Con Ed's analysis is more sophisticated depends on how the program objective is viewed. The results of the latest USDOE modeling analysis are found in Topical Response 3.1. The RAM model was used again, in contrast to Con Ed's use of the CRSTER model; comparisons of predictions from these two models may vary by at least a factor of two under certain meteorological and stack conditions.

(5) For the modified coal SIP, DOE predicted an increase in impact from 3 to 9 ug/m^3. The only sites which changed from the coal SIP were Ravenswood 3, Northport, Lovett, Arthur Kill 2 & 3 and Barrett. These sources were predicted by EPA to have on the order of 1.0-1.5 ug/m^3 impact. Even the more sophisticated Con Ed analysis only had a ~4 ug/m^3 increment. This result for the modified coal SIP should also be reviewed for possible errors. Note Con Ed's recent analysis of fewer plants predicted levels twice as high as the 9 ug/m^3 predicted by DOE.

H. Nudelman
HAROLD NUDELMAN

HN:fr

CC: Dr. E.F. Ferrand
Mr. B. Nudelman
Mr. H. Tipping

Atlantic Electric
SERVING A MILLION PEOPLE
IN SOUTHERN NEW JERSEY

February 3, 1982

Marsha Goldberg
U. S. Dept. of Energy
Economic Regulatory Administration
2002 M. Street, N. W. - Room 6114
Washington, DC 20461

Dear Ms. Goldberg:

In response to Steven E. Ferguson's letter to Henry C. Schwemm, we have reviewed the data in the Draft Northeast Regional Environmental Impact Statement concerning our Deepwater Units #7, #8, and #9. The Company is proceeding with the coal conversion of these units on the following schedule:

	Complete Construction
Unit #7	May 31, 1982
Unit #8	November 29, 1982
Unit #9	April 15, 1982

AE-1 As to the current operating characteristics, we would suggest Table F-1 in Appendix F be updated as follows:

STATION	STACK I.D.	STACK HT. (Ft.)	STACK DIA. (In.)	GAS EXIT VELOCITY (FSP)	GAS EXIT TEMPERATURE (°F)
Deepwater	#7	175.2	168	33.8	400
	#8	223.5	128	52.2	290
	#9	225.5	132	53.5	340

The Company does not have any recent monitored background data for ambient concentrations of sulfur dioxide. However, data collected around Deepwater Station between July, 1976 and July 1979 indicate annual average concentrations of sulfur dioxide to be 20 to 25 ug/m^3.

The present State Implementation Plan limits the sulfur content of the coal burned at Deepwater to 1.0% sulfur by weight which we believe is available in sufficient quantities for Units #7, #8, and #9.

ATLANTIC CITY ELECTRIC COMPANY • 1600 PACIFIC AVENUE, ATLANTIC CITY, N.J. 08404 • 609—645-4100

AE-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

If you have any questions concerning the above information, please don't hesitate to contact me.

Very truly yours,

Edward A. Zimmerman
Project Engineer

EAZ/clc

cc: H. C. Schwemm
M. T. Morris, III

BALTIMORE GAS AND ELECTRIC

CHARLES CENTER • P.O. BOX 1475 • BALTIMORE, MARYLAND 21203

CHARLES A. HERNDON, JR.
ATTORNEY

301-234-5605

February 18, 1982

Ms. Marsha Goldberg
United States Department of Energy
Economic Regulatory Administration
2000 M Street, N.W.
Room 6114
Washington, D.C. 20461

Re: Comments on Draft
<u>Northeast Environmental Impact Statement</u>

Dear Ms. Goldberg:

Pursuant to Mr. Ferguson's request for comment on the Draft Northeast Regional Environmental Impact Statement, the following comments and data reflect recent developments and decisions affecting the current preliminary document.

Since the initial data was obtained, a number of changes have occurred with respect to Units 1 and 2 at the Charles P. Crane Station, Units 1 and 2 at Brandon Shores, Units 4 and 5 at Riverside, and Units 1 and 2 at the H. A. Wagner facility.

BGE-1 The first suggested revision is the elimination of the Riverside Units entirely, and the possible elimination of Wagner as well. BG&E has no plans at this time to convert any of these units to coal. The ESECA Prohibition Orders, placed upon them in 1975, have been allowed to expire under the Omnibus Budget Reconciliation Act changes to Section 301 of the Fuel Use Act.

However, the Brandon Shores and C. P. Crane Units are now committed to the burning of coal. Brandon Shores Unit No. 1 is scheduled for commercial operation on coal in 1984, Unit 2 in 1988. Both C. P. Crane Units are scheduled to complete their conversion and become operational on coal in 1983.

BGE-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

Therefore, Table 5.25 on p. 5-62 must change to indicate Brandon Shores and Crane burning coal in 1985. The following projections are made for Units 1 and 2 in both plants.

Annual Coal Burned (10^3 ton)

	1984	1985	1986	1987	1988	1989	1990	1981
Crane	891	964	980	954	962	913	949	921
Brandon Shores	1034	1445	1493	1534	2786	2482	2490	2685

Wagner 1 & 2 -- No coal burn anticipated at this time; we only have capacity factors for oil, not coal.

There are also changes in the SO_2 emission limitations at both plants. The draft SO_2 limitation for Brandon Shores is noted as .4 pounds SO_2 per million Btu. This should now read 1.2 pounds SO_2 per million Btu. Strangely, the S limitations are generally correct for Crane and Brandon Shores as they appear on Table G-2, p. G-3. As the result of an EPA approved change in the Maryland State Implementation Plan, the C. P. Crane emission limitation is now 3.5 pounds SO_2 per million Btu. This SIP change is peculiar to cyclone boilers, however, and is so worded as to preclude any expansion of this relaxed sulphur limitation.

Hearings before the Public Service Commission were necessary to effect changes both at Crane and Brandon Shores. Stack heights remain but exhaust velocities and temperatures are now different. At Brandon Shores, the stack temperature will be no less than 266°F with stack exit velocity no less than 23.77 m/sec at full load; design temperatures at reduced loads will be: 249°F at 75%, 228°F at 50%, and 196°F at 25% load. (Final Orders of the Hearing Examiner in the Crane and Brandon Shores hearings are attached for your further information.)

BGE-2 Figure 4.24, p. 4-68 indicates an apparent reversal of the positions of Wagner and Brandon Shores, an admittedly minor misplacement, since both plants are very close to each other.

BGE-3 Other omissions appear at pp. 3-9 and 4-64 in diagrams showing water and rail routes. Not shown, however, is the water route from Norfolk up the Chesapeake Bay to the Baltimore area which is to be used by coal barges serving Brandon Shores.

BGE-2 The reversal of the Wagner and Brandon Shores plants in Figure 4.24 (also Figures F.12 through F.14) is acknowledged. For modeling purposes, the plants were correctly located.

BGE-3 Figures 3.4 and 4.23 have been revised and are shown in the Errata and Addenda, Section 5.

BGE-4 At p. 4-47, it is stated that Wagner expects to use cleaned coal, although Units 1 and 2 of Wagner are not presently under active consideration for conversion. In that same paragraph, the Joy landfill is mentioned as a possible disposal site. Even if available, it should not be needed. Recently, property adjacent to Brandon Shores was acquired by BG&E to use fly-ash generated there and at Wagner III pursuant to a plan which contemplates gradual conversion of this area to an industrial-business park.

BGE-5 You also requested information on current operating characteristics of units still under consideration for conversion. Although not active candidates for conversion, Units 1 & 2 at the H. A. Wagner Station could, in the future, be so considered. With that caveat, we have noted below the requested data. Wagner II's characteristics in this area are the same.

	WAGNER 1
No. of Stacks	1
Stack Height (above ground)	286.8'
Stack Diam (at top)	122"
Exit Gas Velocity	75 fps
Exit Gas Temperature	365,000 cfm
Exit Gas Flow	278°F

Please let us know if this material is not adequate for your purposes or if other problems arise requiring further information.

Very truly yours,

Charles A. Herndon, Jr.

CAH:jdb

BGE-4 Information provided in this comment has been incorporated into Topical Response 3.5 (Waste Disposal). The Joy landfill has been permanently closed (see Comment MDNR-10).

BGE-5 The information supplied has been used to develop the scenarios described and discussed in Section 2.

U.S. Department of Energy
Draft Northeast Regional EIS Hearing
Boston, Massachusetts
December 16, 1981

Statement of
Dr. Lillian Morgenstern, Principal Environmental Planner,
Environmental Affairs Department
Boston Edison Company
800 Boylston Street
Boston, Massachusetts 02199

Good morning ladies and gentlemen. My name is Lillian Morgenstern and I am a Principal Environmental Planner with Boston Edison Company. As a utility quite cognizant of the pressing national need to reduce our dependence on expensive imported oil, we value this opportunity to be here with you today to stand in support of DOE's coal conversion efforts. The most serious problem facing the Company and the region is its heavy dependence on imported oil. Boston Edison is pursuing alternative supplies such as coal, refuse, hydro, wind, solar and conservation in a concerted effort to reduce systemwide use of oil to twenty percent. Our longstanding desire to achieve this goal has been strengthened by recent developments including the statement of the comptroller General of the United States to Congress in September, that "the U.S. Government is almost totally unprepared to deal with disruption in oil imports" as well as the American Petroleum Institute's calculation that total U.S. oil storage, including the Strategic Petroleum Reserve, would last little more than a month in the event of a serious import disruption.

BE-1 Preliminary engineering studies by the Company indicate that four of the five units included in DOE's EIS are suitable, with various modifications for coal conversion. These are Mystic #4, #5, and #6 and New Boston #1, with a combined potential for backing out some 7.7 million barrels of oil annually. The company is proceeding with engineering and planning studies for these conversions but any final corporate decision also depends on the outcome of Boston Edison's pending rate case in which a decision is expected by March.

BE-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

Preliminary air quality modeling data indicate that those units with new stacks not exceeding Good Engineering Practice (GEP) stack height, in conjunction with new precipitators, would be capable of firing a 1.5% low sulfur eastern coal without using flue gas desulfurization systems. In other words, we can meet the national ambient air quality standards (NAAQS) without scrubbers.

BE-2

For this reason we respectfully disagree with your statement on page 4-47 that Mystic and New Boston will require scrubbers. This difference in opinion may be the result of the very conservative nature, a true worst case scenario, inherent in the RAM model which we realize from page 5-5 was used only to predict trends. Because DOE's draft EIS did not model the Mystic and New Boston configuration presently under consideration, we have attached up-to-date modelling input data which provides a more accurate assessment of what the Company needs in order to make coal conversion practicable for these four units.

The Company is mandated by Massachusetts law to maintain a reliable supply of electricity, produced in an environmentally sound manner at a reasonable cost to the consumers. Boston Edison's fossil heat rate has been improved, through a concerted operating and maintenance program, to 10,014 BTU per KWH which places the Company well within the ten most efficient utilities nationwide. However, our fuel oil bill has gone from $75 million in 1973 to $400 million for the same amount of oil in 1980.

Environmentally sound coal conversion which protects the public health and ambient air quality standards is not an inexpensive proposition even without the unnecessary and burdensome addition of scrubbers. Scrubbers, as the draft EIS clearly points out, also add significant sludge disposal problems to existing ash disposal requirements especially in heavily settled and industrialized states such as ours. We will be able to handle the ash, but sludge disposal siting could prove to be an almost insurmountable task. Boston Edison economic studies indicate for the configurations shown on the attachment that conversion and the potential consumer savings of $110 million a year

BE-2 Comment noted. The information supplied has been used to develop the scenarios described and discussed in Section 2. Scrubbers will not be required under the Modified Coal SIP Scenario and the Voluntary Conversion Scenario (see Tables 2.5 and 2.6).

predicated on coal for these four units would only be possible if we continue to meet air quality standards without scrubbers.

Those from DOE who toured the New Boston and Mystic Stations a while back commented at that time how small the sites were. This observation was quite right. These stations are located near our load center and it is qui difficult to plan for local coal storage space sufficient to maintain the [nec-]essary 90 day coal supply even without having to utilize precious acreage [for] limestone for scrubbers. I infer also from discussions during DOE's visit, Mystic and New Boston are among the sites described on page J-3 as possibly having sufficient space available for flue gas desulfurization equipment.

BE-3 Further down that page you alluded also to the commitment of some of [the] lowest sulfur coals to metallurgical uses and stated that you had not [consider-]ed the specific availability of coals from various areas. The availability [of] this lowest sulfur coal, an NSPS coal, over the life of converting units [could] be critical for plants which could in the future be required to fire about 0.7 percent sulfur coal without scrubbers in order to meet a 1.2 pounds SO_2 per million BTU emission rate. To an electric utility which is dependent [on] the heating value of bituminous coal as well as on the tonnage, an accurate delineation of both <u>resources</u> and <u>reserves</u> with their sulfur content is imperative. Our information indicates that only 13.4% of total estimated U.S. coal <u>resources</u> less than 0.7% sulfur content are ranked as bituminous and we require bituminous coal for the existing units under discussion here. Furthermore, only 7.9% of all estimated lowest sulfur content resources are located in the Appalachians while 91.2% are in Rocky Mountain states. If [we] had to burn western coal, this would double our transportation distance and further increase our fuel costs. As a geologist, I am not all that assured by Table J-3 which presumes there would be enough of this NSPS type coal [avail-]able for the life of these units, especially at a "reasonable" price. I [can't] determine from the data if the "projected sources" listed are resources or reserves or even if they are bituminous. For example, you list West [Virginia]

BE-3 See Topical Response 3.8.

as a major "projected source" and yet our data indicate that only 12% of their identified resource is recoverable. My academic training requires me to believe that all coal is a finite commodity and that the lowest sulfur metallurgical coals must be used carefully because of their comparative rareness.

Because our data indicate that only 6.3% of the coal estimated to be in production in the east by the year 1985 will be NSPS type coal, I urge DOE to study this most carefully and thoroughly rather than simply to "believe that there is sufficient flexibility in Appalachia to meet the incremental demand added by the forty-two northeastern power plants."

We are geniunely encouraged that DOE is continuing its efforts to back out imported oil since Boston Edison is making a concentrated effort to balance its fuel use. Our single nuclear unit, Pilgrim Station, has provided both a significant customer savings of $713.3 million and a reduction of 50.5 million bbls of imported oil since coming on line in 1972. Because of economic and regulatory factors, however, the Company recently had to cancel plans for a second nuclear unit, Pilgrim 2. Had it not been for regulatory inaction at the federal level which delayed construction, Pilgrim 2 could have been in operation now replacing 11 million barrels of oil a year and saving customers some $400 million annually. Because the unit is cancelled, we are now looking even more diligently toward coal conversion to reduce the cost of fuel oil which is in the range of $5.25 per million BTU's compared to coal at $1.50 per million BTU's on a nationwide average and $2.30 per million BTU's in New England, where transportation costs are relatively more important. It is unfortunate that in 1620 the Pilgrims were looking more closely for food and firewood than for coal or oil when they settled at Plymouth, Massachusetts. It is indeed to our distinct disadvantage to be so distant from fossil fuel resources. Historically we have paid a price for this.

We note on page 5-41 that DOE expects no adverse impacts and no increased rainfall acidity from these conversions. This conclusion is important to New England utilities who have traditionally burned low sulfur fuels and have seen their fuel costs rise to more than twice that of the rest of the country because of it, while emitting only 2.2% of the [illegible] sulfur dioxide total. The Company calculates that emissions from Boston Edison units, burning 1.5% sulfur coal without scrubbers, would meet the national ambient air quality standards and would add less than three tenths of one percent to national sulfur dioxide annual emissions, thereby not significantly contributing to acid rain.

BE-4 I looked for but did not find any wind rose data in Chapter 5 for the Deposition Region and I suggest that the acid rain discussion found in 5.2.4 would be enhanced if such climatological data were included. The data we have for the last two decades illustrates conclusively that Boston area prevailing wind patterns blow eastward out to sea by far the majority of the time, rather than toward Nova Scotia.

In conclusion, I would like to compliment DOE on the overall thoroughness and scholarship of this draft, for your continuing commitment to the practical use of a secure energy supply, namely domestic coal, and for making available this opportunity to comment. Your coal conversion efforts continue to be of prime importance particularly to eastern utilities in light of continuing unrest in the Middle East.

Thank you for your attention. I would be happy to respond to any questions the panel might have at this time.

BE-4 Wind rose data can be found in the air quality technical report (Kornegay et al. 1982). However, ASTRAP, the model used to predict sulfate deposition, is a trajectory model, and wind rose figures would not be helpful in determining trajectories.

REFERENCES

Kornegay, F., et al. 1982. The Northeast Regional Environmental Impact Study: Air Quality Technical Report. ANL/ES-122. Prepared by Oak Ridge and Argonne National Laboratories for the U.S. Department of Energy.

BOSTON EDISON COMPANY
GENERAL OFFICES 800 BOYLSTON STREET
BOSTON, MASSACHUSETTS 02199

February 10, 1982

Marsha Goldberg
3814 W Street, N.W.
Washington, D.C. 20007

Dear Ms. Goldberg:

BE-5

I am writing in response to your request for updated information on Boston Edison Company coal conversion plans. As I indicated at the hearing in Boston last December, the Company is presently investigating the conversion to coal of the Mystic Station #4, 5, and 6 units as well as the New Boston #1 Unit in an effort to back out approximately 7 million barrels of oil annually, about half our electric generating oil use, as a means to achieving a diversification of fuel use. However, as my testimony stated, any final coal conversion decision is dependent on the outcome of our pending rate case in which a decision is due by April 30th.

I enclose in response to your request:

Attachment 1 - an update of operating characteristics delineating the new stack configurations and the most recent engineering estimates for the proposed conversion configuration.

Attachment 2 - the design coal specifications for the units originally. They are still considered representative of any coal which may be used in the future in these units.

Attachment 3 - our SO2 monitoring network data and summaries for the period January 1980 - December of 1981 from the East Boston, Dorchester, Long Island and Atlantic Avenue sites.

The Mystic units 4, 5, and 6 and New Boston unit #1 presently operate under an SIP limitation of 0.55 lbs sulfur/10^6 BTU's heat release. In order to burn coal in these units, Boston Edison will request a SIP change to 1.21 lbs sulfur/10^6 BTU's. The air quality modeling protocol for the proposed conversion was submitted to the U.S. Environmental Protection Agency, Region I on January 28, 1982 and is presently under review.

If you have any questions on the data, please do not hesitate to call me ((617)424-2975) or Jay Scheffer (424-2319) whom you also met at the Boston hearing.

Sincerely,

Lillian N. Morgenstern

Lillian N. Morgenstern, Ph.D.
Principal Environmental Planner

BE-5 The information supplied has been used to develop the scenarios described and discussed in Section 2.

CENTRAL HUDSON
GAS & ELECTRIC CORPORATION

284 SOUTH AVENUE, POUGHKEEPSIE, N. Y. 12602 (914) 452-2000

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D.C. 20461

December 29, 1981

Dear Ms. Goldberg:

I am enclosing the comments of Central Hudson on the Northeast coal conversion draft Environmental Impact Statement. They are relatively brief, and I hope you can accomodate our suggestions. Thank you.

Sincerely,

Samuel C. Rosenberry
Administrator,
Air Quality Programs

SCR/cw
Enclosure

Comments of
Central Hudson Gas & Electric Corporation
on the
Draft Northeast Regional
Environmental Impact Statement

Central Hudson Gas & Electric Corporation has reviewed the draft Environmental Impact Statement (EIS) of the potential coal conversion of up to 42 powerplants in the Northeast. It is a generally well written document, and DOE is to be commended on it. There are, however, two changes that should be made to the document. These both concern the number of units on the list of potential conversions.

CHGE-1 The draft report lists all four of the Danskammer units as candidates for conversion to coal. In fact, conversion is contemplated only for Units 3 & 4. Units 1 & 2 are not listed in the preliminary ESECA order, and are slated for retirement in 1986 and 1989, respectively, thus it would not be econmically feasible to convert them.

It is probable that there are other power plants on the DOE's list of 42 conversion candidates which are not intended by their owners to be converted. If the number of such deletions is significant, the air quality analyses of the conversions should be reevaluated to take this into account since the total impact will be lessened.

CHGE-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

CENTRAL HUDSON
GAS & ELECTRIC CORPORATION

284 SOUTH AVENUE, POUGHKEEPSIE, N. Y. 12602 (914) 452-2000

Ms. Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M Street N.W., Room 6114
Washington, D.C. 20461

February 2, 1982

Dear Ms. Goldberg:

In response to Mr. Ferguson's letter requesting additional information on Central Hudson's coal conversion plans, I am sending you the information requested.

The DEIR listed Units 1-4 of our Danskammer Point Generating Station as conversion candidates. In fact, only Units 3 & 4 are being considered for conversion. Units 1 & 2 are too old to make conversion economical. The operating characteristics for Units 3 & 4 are as follows:

CHGE-2

Unit 3			Unit 4		
Gross Load (Mw)	FGT (°F)	FGF (ft^3/min.)	Gross Load (Mw)	FGT (°F)	FGF (ft.^{3}/min.)
76.1	307	226,999	100.2	214	269,376
80.3	311	239,829	122.4	231	324,984
89.2	319	270,211	139.5	249	379,115
99.0	328	296,635	160.9	255	426,984
109.0	331	325,819	179.3	266	484,551
116.4	340	347,233	198.4	281	544,874
119.7	344	359,407	216.3	293	598,448
120.7	347	363,611			
133.0	352	409,201			
Stack Ht. (Ft.)		240.0		240.0	
Stack Dia. (Ft.)		12.4		16.0	

CHGE-2 The information supplied has been used to develop the scenarios described and discussed in Section 2.

After conversion, both units will be served by one double-liner stack 450' high, with diameters of 12.1' for Unit 3, and 15.5' for Unit 4.

The New York SIP for coal-fired boilers is 1.9 lb. Sulfur/MMBtu heat input. However, Danskammer is required to burn oil with a sulfur content that is less than the SIP allows, and upon conversion, would be limited to coal having a sulfur content of 0.53 lb. Sulfur/MMBtu. Therefore, the anticipated sulfur content of 1.2 lb. Sulfur/MMBtu would require a SIP revision.

I hope the information provided is sufficient for your purposes. If you need additional input, please contact me.

Sincerely,

Samuel C. Rosenberry

Samuel C. Rosenberry
Administrator,
Air Quality Programs

SCR/cw

Statement by Central Maine Power Company, Augusta, Maine
on the Draft Northeast Regional Environmental Impact Statement
DOE/EIS-0083-D Public Hearing: Boston, December 16, 1981

My name is Valmar S. Thompson and I am the Director of Environmental Studies for Central Maine Power Company. I am here today for Central Maine to comment on the Draft Northeast Regional Environmental Impact Statement sharing this opportunity with Joeseph D. LeBlanc, Project Manager for Central Maine for the Mason Station Coal Conversion Project.

Central Maine Power is currently in the final stages of licensing the conversion to coal of Units 3, 4 and 5 of Mason Station. Our purpose today is to make certain that there is a clear understanding of the differences between Central Maine's planned conversion and the conversion hypothesized by DOE, not only as to physical features and type of fuel, but also in terms of air quality impacts. The draft EIS states that potential exceedences of ambient air quality are possible by burning coal at Mason Station. Central Maine's coal conversion as designed will not violate ambient air quality or allowable increments. We recognize the constraining assumptions of the DOE air quality analysis and note that DOE, in addressing predicted concentration, state they are "given only to highlight potential problem areas and predict trends in pollution concentration, and not to give precise values or predict specific areas of NAAQS violations." Also that "The application of mitigative techniques...eliminate these potential projected exceedences" of violations of the ambient

4-158

SO_2 standard. Nevertheless, we feel obligated to dispel any idea that the planned conversion would yield violations as described in the draft EIS.

The methodology used by DOE to predict SO_2 concentrations in the subregions is clearly set forth in Section 5 and in Appendix F. As mentioned in the draft EIS the RAM model and certain underlying assumptions were conservative, that is, the predictions tend to be overstated. I wish to point out two assumptions in the analysis which clearly lead to excessively high resulting ambient air quality concentrations of SO_2.

CMP-1 The first assumption the draft EIS has acknowledged, that is, "coal SIP vary widely and in many states requests for revisions have been made." This has happened in Maine for current policy states that SO_2 emissions shall be not greater than 2.66 pounds of SO_2 per million BTU. Proposed Maine regulations would limit emission even further to a maximum of 1.2 pounds of sulfur per million BTU. In terms of SO_2 this is 2.4 pounds of SO_2 per million BTU or 57 percent of the figure of 4.17 used in the draft EIS. Central Maine in its application used the equivalent of 2.66 pounds of SO_2 per million BTUs (conforming to policy, but slightly higher than proposed regulations) and demonstrated that this level would not give rise to violations of ambient air quality or violate applicable increments. Even this rate is 63 percent of that used in the draft EIS. The clarification in the final EIS by the use of the required state policy or proposed state emission limitation regulation will bring the predicted ambient

CMP-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

annual SO_2 concentrations in the region surrounding Mason Station to well below the required standard.

One other assumption of the draft EIS dealing with air quality impact needs clarification. Table 5.5 (page 5-9) calls out measured background for SO_2 as 66 micrograms per cubic meter on an annual basis and 260 for the 24-hour period for the so-called Boston Subregion of which, for the purpose of this study, the Mason Station area is a part. These measured background figures are several times higher than actual background figures for the Mason Station area which could be characterized as a rural coastal environment. These figures probably are more representative of the urban industrial Boston area. By letter to Central Maine the Maine Department of Environmental Protection states that 13ug/m^3 represents annual background in Mason Station area, in contrast to the 66, and that 88ug/m^3 represents the 3-hour, in contrast to the 260 used in the draft EIS. Use of more realistic background figures in Table 5.5 would show Mason Station not violating ambient SO_2 standards.

CMP-2 In summary then, the RAM model analysis as used in the draft EIS should be revised for the final EIS so as to utilize current state policy (or proposed regulations) on allowable SO_2 emissions, and state-confirmed levels of ambient background SO_2 in the Mason Station area. By doing so predicted violations of SO_2 will be shown not to occur, a conclusion also arrived at by Central Maine in its analysis of a similar, but smaller coal conversion.

At this time I would like to introduce Joeseph D. LeBlanc, Project Manager for Central Maine's Mason Station Coal conversion, who will briefly describe the conversion project and the significant differences in the draft EIS example of a coal conversion at Mason Station and the actual project now in licensing.

CMP-2 **The information supplied has been used to develop the scenarios described and discussed in Section 2.**

Statement By Central Maine Power Company
Augusta, Maine
On The
Draft Northeast Regional Environmental Impact Statement
Regarding
Mason Station Coal Conversion
Wiscasset, Maine
DOE-EIS-0083-D Public Hearing: Boston, December 16, 1981

MY NAME IS JOSEPH D. LEBLANC, AND I AM PROJECT MANAGER OF THE MASON STATION COAL CONVERSION FOR CENTRAL MAINE POWER COMPANY. I AM HERE THIS MORNING WITH VALMAR THOMPSON, DIRECTOR OF ENVIRONMENTAL STUDIES TO COMMENT ON THE DRAFT NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT ON THE POTENTIAL CONVERSION OF 42 POWER PLANTS FROM OIL TO COAL OR ALTERNATE FUELS.

MY COMMENTS WILL BE GENERALLY CONFINED TO THE PHYSICAL ASPECTS OF THE COAL CONVERSION OF MASON STATION, AND SPECIFICALLY TO THOSE PARAMETERS WHICH AFFECT THE AIR MODELLING INPUTS AND THEREFORE THE OUTPUT RESULTS WHICH ARE THEN TESTED AGAINST STANDARDS AND INCREMENTS.

UNITS TO BE CONVERTED/MEGAWATTS (MW), TABLE F.2

CMP-3 CENTRAL MAINE POWER COMPANY, OR CMP, BEGAN AN ENGINEERING STUDY TO INVESTIGATE THE POTENTIAL OF CONVERTING THE MASON STATION FROM OIL BACK TO COAL IN FALL, 1979. PRIOR TO THIS, THE COAL CONVERSION WAS THE SUBJECT OF MUCH RECENT DISCUSSION WITH DOE WITH THE RESULTS THAT UNITS 1 AND 2 WERE DEEMED NOT FEASIBLE OR PRACTICAL FOR SUCH A CONVERSION, WHILE UNITS 3, 4 AND 5 WERE LIKELY CANDIDATES AND THUS BECAME THE SUBJECT OF A PRELIMINARY ENGINEERING STUDY.

CMP-3 The information supplied has been used to develop the scenarios described and discussed in Section 2.

FURTHER, UNITS 1 AND 2 BUILT IN 1941 AND 1947 RESPECTIVELY, HAVE POOR HEAT RATES (14,400 BTU/KW), ARE ON 48-HOUR CALL-UP, AND THEREFORE ARE DISPATCHED VERY INFREQUENTLY AS PART OF THE NEPOOL SYSTEM. IN FACT, THESE UNITS HAVE RUN AT AN APPROXIMATE 0.6-0.7% CAPACITY FACTOR OVER THE FIRST 11 MONTHS OF 1981.

THEREFORE, THE ACTUAL COAL CONVERSION WILL TAKE PLACE ON UNITS 3, 4, AND 5 ONLY, IF ALL APPROPRIATE LICENSES ARE OBTAINED, SO THAT ONLY AN APPROXIMATE 100 MWE WILL ACTUALLY BE THE SUBJECT OF A COAL CONVERSION VS THE 140+ MW INDICATED IN TABLE F.2, PLANT EMISSION CHARACTERISTICS, PAGE F-4. ALSO, AS INDICATED BEFORE, UNITS 1 AND 2 WILL BE OPERATED ON OIL ONLY, ARE EXPECTED TO RUN VERY INFREQUENTLY, AND IN ALL LIKELIHOOD WITH AN ANNUAL CAPACITY FACTOR $\leq$ 5%.

PLANT EQUIPMENT CHANGES

A SPRING, 1981, COST ESTIMATE INDICATED SOME $61.4 MILLION WOULD BE REQUIRED TO COMPLETE THE COAL CONVERSION (TABLE 1). OF THIS TOTAL, $25.3 MILLION OR OVER 40% OF THE TOTAL COST WILL BE SPENT ON POLLUTION CONTROL EQUIPMENT (TABLE 2).

THIS INCLUDES HIGH EFFICIENCY (OVER 99%) ELECTROSTATIC PRECIPITATORS DESIGNED FOR 0.08 lb/10^6 BTU, ASSOCIATED DUCTWORK, ASH HANDLING EQUIPMENT, WASTE TREATMENT, THE ASH DISPOSAL FACILITY (FIRST YEAR DEVELOPMENT COST), AND THE ASSOCIATED ELECTRICAL/CONTROL EQUIPMENT PLUS ENGINEERING AND INSTALLATION COSTS.

THIS $25.3 MILLION (41.2%) DOES NOT INCLUDE A GOOD ENGINEERING PRACTICE (GEP) STACK, COAL PILE RUN-OFF PONDS AND

ASSOCIATED PUMPING EQUIPMENT, FUGITIVE DUST SUPPRESSION SYSTEMS, NOISE ABATEMENT MODIFICATIONS, AND OTHER SIMILAR SYSTEMS WHICH WILL ALSO BE INCLUDED IN THE COAL CONVERSION, BUT WHOSE COSTS HAVE NOT YET BEEN IDENTIFIED.

THESE EXTENSIVE CHANGES WILL HAVE A SIGNIFICANT IMPACT ON POST-CONVERSION EMISSIONS, BUT ARE NOT REFLECTED AS MODELLING INPUTS, AND THUS THE OUTPUT RESULTS OF THIS DRAFT DOE STUDY SHOW MUCH HIGHER-THAN-EXPECTED EMISSIONS AND GROUND IMPACTS.

APPENDIX TABLE F.1 PHYSICAL PLANT PARAMETERS (p. F-2) LISTS 149 FOOT STACKS FOR UNITS 3, 4 AND 5. THE POST-CONVERSION GEP SINGLE STACK FOR UNITS 3, 4, AND 5 WILL BE 247 FT. (260 FT ABOVE SEA LEVEL), 113.8 IN. DIAMETER, AT AN EXIT GAS TEMPERATURE OF 360° F.

MODELLING CHANGES - PHYSICAL INPUTS

CMP-4 WE THEREFORE REQUEST THESE VERY SIGNIFICANT PHYSICAL PLANT CHANGES BE FACTORED INTO THE DOE MODEL TO REALISTICALLY REFLECT EXPECTED POST-CONVERSION CONDITIONS.

- UNITS 3, 4, AND 5 ONLY CONVERTED (TOTAL 100 MW).
- UNITS 1 AND 2 REMAINING ON OIL; EXPECTED CAPACITY FACTOR $\leq$ 5%.
- HIGH EFFICIENCY ELECTROSTATIC PRECIPITATORS ON UNITS 3, 4, AND 5 DESIGNED FOR 0.08 lb/10^6 BTU, TSP EMISSIONS.
- SINGLE GOOD ENGINEERING PRACTICE (GEP) STACK, 247 FEET (260 FEET ABOVE SEA LEVEL), 113.8 IN. DIAMETER FOR UNITS 3, 4, AND 5.

CMP-4 The information supplied has been used to develop the scenarios described and discussed in Section 2.

- COAL SO_2 EMISSIONS $\leq$ 2.67 LB/10^6 BTU FOR ANNUAL STANDARDS AND INCREMENTS.
- FUGITIVE EMISSIONS CONTROLS (TABLE 3)

SUMMARY

WE REQUEST THESE CHANGES, AND CHANGES IN ALL RELATED PORTIONS OF THE TEXT IN THIS DRAFT, SO THAT THE "DECISION-MAKERS" REFERENCED IN THE SUMMARY ON PAGE 1-1, PARTICULARLY THOSE WHO IN SOME WAY MAY IMPACT ON OUR COAL CONVERSION LICENSING PROCESS AT MASON STATION MAY BE APPRISED OF THE REALISTIC IMPACTS OF THIS BENEFICIAL FUEL CHANGE.

CMP-5

ABSENT SUCH CORRECTIONS, WE ARE CONCERNED THAT SUCH POLICY MAKERS COULD BE NEGATIVELY INFLUENCED BY ABBREVIATED SUMMARIES, AS RECENTLY APPEARED IN "COAL WEEK", WHICH INDICATED THAT THE MASON COAL CONVERSION WOULD INDEED RESULT IN ANNUAL VIOLATIONS.

CMP-5 The information supplied has been used to develop the scenarios described and discussed in Section 2.

CMP **Central Maine Power Company**
GENERAL OFFICE. EDISON DRIVE. AUGUSTA. MAINE 04336 (207) 623-3521
(TWIX NUMBER. CMP-AGUA 710-226-0195)

February 3, 1982

Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M St. N.W. Room 6114
Washington D. C. 20461

Dear Ms. Goldberg:

CMP-6 Attached is the information requested in the January 18, 1982 letter from Steven E. Ferguson, Fuels Conversion Division. This information describes the planned coal conversion of three units at Central Maine Power Company's Mason Station in Wiscasset, Maine together with other relevant information. Central Maine strongly supports DOE's effort to make the Final Northeast Regional Impact Statement as complete as possible by including the most recent planning of coal conversions by utilities.

If there are any questions on the enclosed information please call Val Thompson, Director of Environmental Studies, 207/623-3521.

Very truly yours,

Charles E. Monty
Senior Vice President
Engineering and Production

CEM:ad
Attach.

CMP-6 The information supplied has been used to develop the scenarios described and discussed in Section 2.

COM Electric

Commonwealth Electric Company
2421 Cranberry Highway
Wareham, Massachusetts 02571
Telephone (617) 291-0950

January 26, 1982

Ms. Martha Goldberg
U.S. Dept. of Energy
Economic Regulatory Administration
2000 M Street N.W., Room 6114
Washington, D.C. 20461

Subject: Draft Northeast Regional
EIS (DOE/EIS 0083D)

Dear Ms. Goldberg:

Recently we received a letter from Mr. Steven Ferguson of DOE's Fuels Conversion Division requesting that comments on Subject EIS be sent to you. We thank DOE for this opportunity to comment concerning our Canal Unit 1.

CEC-1

We have never agreed with the DOE contention that Canal Unit 1 was coal capable. Any forced conversion would have resulted in a major derating of the unit and a significant, if not insurmountable, financial problem to the Company. We have always believed that the extremely high efficiency of this unit when on oil fuel would dictate that conversion to coal would be a last resort effort.

Now that DOE is no longer enforcing conversion orders and has confirmed termination of the order affecting our plant, Canal Electric Company has elected to no longer actively consider conversion to pulverized coal. We are, however, continuing our pursuit of an alternate fuel in the form of SRC, a coal derived liquid being developed by ICRC.

Projected regional environmental impacts based on the conversion of Canal Unit 1 to pulverized coal firing should be eliminated from the Final EIS.

Very truly yours,

Stephen R. Hall, Jr
Manager, Environmental Group

SRH/kll

CEC-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

FACSIMILE

BEFORE THE
UNITED STATES DEPARTMENT OF ENERGY

Statement of Dr. Peter C. Freudenthal, Director of Air and Noise Programs, Consolidated Edison Company of New York Inc, Inc., at the public hearing on the Draft Northeast Regional Environmental Impact Statement, December 7, 1981.

My name is Peter C. Freudenthal. I am Director of Air and Noise Programs for Consolidated Edison Company of New York, Inc. As everyone by now is well aware, Con Edison has actively been attempting to reconvert its Ravenswood 3 and Arthur Kill 2 and 3 powerplants to coal burning since early 1979 as part of the Company's energy strategy for the 1980s for New York City and Westchester County. The Company has applied to the New York State Department of Environmental Conservation for permits to effect these conversions and those applications are now under review. We expect public hearings will begin early next year.

As part of the coal conversion licensing process, Con Edison has prepared draft environmental impact statements for the Ravenwood 3 and Arthur Kill 2 and 3 conversions. Included in each environmental impact statement is a cumulative air quality impact analysis of all powerplants in the New York City Metropolitan Area (i.e. within 50 km of the Arthur Kill and Ravenswood generating stations) that have at least some potential for being converted to coal within the next decade.

DOE's regional impact statement is broader in both scope and content than the Company's cumulative analysis. Thus, if issued in a timely manner, the DOE analysis will compliment the Company's environmental impact analysis and, hopefully, help to expedite favorable decisions on the Company's coal conversion permits.

However, to be useful, the regional impact statement must be revised both with respect to the list of candidate coal conversions and the background air quality data, particularly with respect to New York City. Also, modeling errors must be corrected and the conclusions relating to acid precipitation and health effects must be revised to reflect the current state of knowledge.

COAL CONVERSION CANDIDATE LIST

Con Ed-1

The first step in revising the regional impact statement should be to cull the units that are not likely to convert to coal from the modeling inventory. This involves several steps, including the deletion of older units and units that will not be converted by the utilities owning them.

The summary section of the regional impact statement states that "all units over 25 years of age" were eliminated by DOE from the list of potential coal conversions developed by the President's Coal Commission. Notwithstanding this age qualifier, Table 2.1, which lists the 42 powerplants included in the study, includes 46 units that have been in service for more than 25 years. Of the 46 units in service over 25 years, 9 units (Far Rockaway 4, Glenwood 4 and 5, Sewaren 1, 2, 3 and 4, and Kearney 4 and 5) are located in the New York City Metropolitan area. A review of the Power Pool's coal conversion program and the coal conversion program of Public Service Electric and Gas Company of New Jersey indicates that not one of these nine units have been indentified for conversion to coal. With respect to the other units over 25 years old on DOE's list, not one of these units has been indentified as a potential coal conversion candidate by the General Accounting Office in its September 8, 1981 Report to the Senate Committee on Energy and Natural Resources on voluntary coal conversions by utilities. I am confident that a telephone survey by DOE of the utilities involved will confirm that they have no intention of converting these other units to coal burning.

Con Ed-1 To ensure that the sites included in the FEIS are realistic, a survey of the utilities included in the draft document was conducted. The utilities were asked to respond to a series of questions (see Appendix A, Letter to Utilities) and the responses were incorporated into the revision of the EIS. Based on the January 1982 survey, the facilities listed in Table 1.1 of this FEIS are still included in the regional analysis. Those units over 25 years old that have been indicated by the utilities as conversion candidates have been retained in the list.

The information supplied has been used to develop the scenarios described and discussed in Section 2.

The only possible exception to the exclusion of all units over 25 years in service from the list of coal conversion candidates is Jersey Central Power and Light's 26 year old Sayreville Unit 4 which was placed in service in 1955. The GAO Report notes, however, that the conversion of this unit is "clearly doubtful" because of the financial condition of the parent company, GPU.

In addition to the deletion of the older units, DOE's list of coal conversion candidates must be revised to reflect the coal conversion programs of the utilities involved. For example, LILCO's E. F. Barrett Units 1 and 2 are indentified as coal conversion candidates in the New York Power Pool's 1981 Long-Range Electric Plan filing with the New York State Energy Office. However, LILCO has conditioned the conversion of these units on its Northport Units 1-4 not being prohibited from burning oil. Accordingly, DOE's list of coal conversion candidates must be revised to delete LILCO's Northport Units 1-4 which LILCO has no intention of converting to coal burning. The GAO report confirms LILCO's intention with respect to the Northport units. Similarly, United Illuminating Company's Bridgeport Harbor Unit 3 should be deleted from DOE's candidate list since this unit has been identified in the GAO report as one for which coal conversion is opposed by the utility.

Because the Fuel Use Act prohibition order program is now voluntary, the inclusion on the candidate list of any unit that a utility does not want to convert is unrealistic. Accordingly, it is imperative that DOE canvass the utilities that own powerplants identified in the candidate list to obtain current information on their respective coal conversion plans.

After deleting the older units and units that utilities have indicated will not be converted, there remain 14 coal conversion candidates in the New York City Metropolitan Area. These are Arthur Kill Units 2 and 3; E. F. Barrett Units 1 and 2; Bergen Units and 2; Lovett Units 4 and 5; Norwalk Harbor Units 1 and 2; Hudson Unit 1; Revenswood Unit 3 and Sayreville Units 4 and 5. Con Edison has included all of these units in its own cumulative impact analysis of regional coal conversions, which will be provided to DOE along with the Company's written comments on the regional impact statement.

As a further refinement of the regional impact analysis, DOE should, for purposes of preparing cumulative impact analyses, separate the candidates between those conversions being actively pursued and those for which convertion plans have been deferred. (In the New York area, the active conversions include Con Edison's three units and Lovett Units 4 and 5.) Unless such a distinction is made, regulatory strategies for coal conversions which are being actively pursued could well be determined by proposed coal conversions that may never materialize in the future. Such a result is untenable.

It makes no sense, to require very expensive FGD systems for units for which conversion authorization is being actively sought on the basis that conversion without an FGD system may interfere with the conversion of a unit which is scheduled for conversion in 1990 and which may, in reality, never be converted. Nevertheless, based on my conversions with representatives of city and state regulatory agencies there is a possibility that they will demand emission restrictions based on the impact of all coal conversions contemplated by DOE.

When I addressed this group at the July 14, 1980 Public Scoping Hearing, I recommended that the list of plants to be included in the DOE's Regional DEIS be shortened and that DOE establish priorities for coal conversions so that local pollution hot spots would be prevented. DOE did not heed this advice and the Regional DEIS under consideration today may therefore impede environmentally sound coal conversion plans, such as Con Edison's. Because DOE's cumulative analysis has that potential, I once again recommend both the shortening of the coal conversion candidate list to reflect reality and the establishment of priorities.

In preparing the aforementioned re-analyses of regional impacts, DOE should assume SO_2 emission limitations that are consistent with the proposals that have been made by the utilities as conditions under which they will convert to coal. In this regard, we note that DOE's "Modified Coal SIP," as described in Section 5 of the impact statement, does not reflect limitations proposed by the respective utilities but instead reflects New York State Public Service Commission emission limitations for at least the units located in New York. The appropriate information can readily be obtained through a canvass of the utilities, as I have previously recommended.

REVISION OF BACKGROUND DATA

Con Ed-2 In addition to revising the coal conversion candidate list, DOE must revise the background pollution data to reflect recent air quality monitoring. DOE has assumed for its regional impact statement an SO_2 background level of 80 ug/m_3. This is based on 1973 air quality data that does not reflect recent improvements in air quality in New York City. SO_2 concentrations for the 12 month period ending July 1981, for both the CCNY and the Mabel Dean Bacon monitors, where SO_2 levels were the highest in 1978, averaged only 71 ug/m_3. The reductions in SO_2 levels at these monitoring stations were due, at least in part, to Con Edison's affirmative air pollution abatement program which was conducted in conducted in conjunction with the Company's one-year test burn, and to over 1100 gas conversions in Manhattan since 1979 when the Company reentered the gas sales market. Average SO_2 data for the 12 month period ending Junly 31, 1981, obtained from the State Department of Environmental Conservation is attached.

Con Ed-2 Table 5.6 of the DEIS has been modified to reflect the latest available background air quality data and is included in Topical Response 3.1, Table 3.1.4. The information supplied has been used to develop the scenarios described and discussed in Section 2.

PUBLIC HEALTH IMPLICATIONS OF COAL BURNING

Con Ed-3 DOE has reached two conclusions with respect to environmental health impacts of coal conversions: 1) NO_2 impacts on health cannot be predicted, and 2) the existing sulfate "problem" will not be worsened. These conclusions are misleading in that minor adverse health effects are implied. The NO_2 discussion contains references to an epidemiological study (Shy, 1970a, 1970b) that has been discredited due, in part, to inadequate monitoring and also to a clinical study (Orehek, 1976) that EPA considers "controversial." The sulfate discussion is based on the discredited CHESS studies.

These discussions are also inconsistent with EPA's recently rewritten <u>Air Quality Criteria for Nitrogen Oxides</u> and <u>Air Quality Criteria for Particulate Matter and Sulfur Oxides</u>, both of which have been accepted by the Clean Air Act Scientific Advisory Committee. The <u>Particulate Matter and Sulfur Oxides Criteria (SO_x Criteria)</u> indicate that pulmonary function in healthy adults is "little affected" by sulfuric acid exposures of 100 ug/m_3 to 1000 ug/m_3. Sulfuric acid is far more toxic than the mixture of sulfates that actually form in the atmosphere, and the concentrations cited in the <u>EPA SO_x Criteria</u> are one to two orders of magnitude greater than the sulfate levels that are observed in American cities. With respect to NO_2, EPA staff has prepared a recommendation to the Administrator that the NAAQS be set between 0.05 and 0.08 ppm annual average, with no short term standard. Thus, the existing 0.05 ppm standard appears to have an adequate margin of safety to protect public health.

Con Ed-3 The discredited studies identified were not used in the updated health effects analysis presented in Topical Response 3.7 and supporting information in Appendix C. The USEPA Criteria Documents for Nitrogen Oxides and Particulate Matter and Sulfur Oxides have been useful in identifying issues and references for the analysis; however, since they are both draft documents, they have not been cited. Specific information on the effects of SO_2, sulfur oxides, H_2SO_4, and NO_2 is presented in Topical Response 3.7 and Appendix C. A discussion of current sulfate concentrations in the Northeast appears in Appendix B.6.

Con Ed-4 We believe that the regional impact statement must conclude that as long as NAAQS are met, the health effects of regional coal conversions will be extremely slight or nonexistent. Other conclusions are simply not supported by the latest criteria.

Con Ed-4 Refer to Topical Response 3.7. Generally this is true for the criteria air pollutants for which standards have been established although evidence indicates that asthmatics and persons with chronic obstructive pulmonary disease may experience increased symptoms at short-term levels of SO_2 and TSP below the AAQS. No short-term standard for NO_2 exists yet limited data show that hourly values associated with respiratory effects in laboratory studies with humans occur despite compliance with NO_2 annual standards.

The characteristics of atmospheric pollution have changed since earlier episodes and epidemiological investigations. For example, the respirable particle to total particle ratio is probably higher than in the past because of the size selectivity of emission controls. The concentrations of secondary pollutants such as ozone, sulfates, and nitrates may be greater because of changing source characteristics. These known variations must be acknowledged and their health consequences monitored. Finally, standard setting is a political process as well as a technical one. Balances and trade-offs must be made. Health is only one of the many variables considered.

MODELING ISSUES

Con Ed-5

The model used to assess the air quality impact of coal conversion in the various subregions is flawed in several respects:

1. The subregional models were based on a single meteorological station, which causes the models to add impacts of widely separate powerplants incorrectly. Since wind fields are not uniform within a region, DOE should remodel these regions using data from the nearest appropriate meteorological stations.

2. The subregional models extend impact calculations for distances substantially larger than that for which the models have been validated. Consistent with EPA's Guideline on Air Quality Models, impacts from any powerplant should not be calculated for distances greater than 50 km.

3. The Con Edison stack parameters used by DOE in its model are wrong. In particular, the actual Arthur Kill stack exit velocity is more than twice the value used by DOE. This understatement of the stack exit velocity tends to overstate the effect of Arthur Kill on ambient concentrations in the near-field.

Con Ed-5 The RAM model used in the analysis is limited to using a single source of meteorological data in each subregion. However, the subregions were chosen to incorporate those facilities that would be likely to routinely interact, and to encompass a geographical area that could be represented by a single meteorological station. This approach is not ideal, but represents the best compromise between computing costs and accuracy. Although the subregions are large, the computational grid does not extend past 50 km from all facilities. However, the predicted contribution of such a facility to the predicted concentration resulting from the operation of facilities located close to the affected receptor would be negligible, and would not affect the results of this study. The actual Arthur Kill stack exit velocity has been incorporated in the new model analysis (see Sec. 2 and Topical Response 3.1).

ACID PRECIPITATION

Con Ed-6

The acid precipitation modeling in the DOE Regional DEIS has substantially overstated the impacts that will actually occur. the factors which cause this overstatement include:

1. the inclusion in the model of many more powerplants than will acutally convert to coal;

2. the use of a linear model that overestimated SO_2 to sulfate conversion;

3. the assumption that there will be total rainout of suspended sulfates by 4mm of rain, which overstates actual impacts; and

4. the inclusion of low level winds in the model rather than cloud height winds which causes the area of predicted maximum acid deposition to be displaced northward. Had cloud height winds been used, this area would have been shifted from the acid-sensitive areas of the Northeastern U.S. and Canada toward the Atlantic Ocean.

Not only should the acid deposition be remodeled to correct these errors, but the conclusions should reflect the conservatism of the modeling. I am confident that this remodeling will show an impact substantially less than the 6% increase that DOE considers to be insignificant.

Con Ed-6 See Response NYPP-1. The wet removal parameterization for total sulfur has been changed somewhat from that described in the DEIS, in that a maximum of 80% of the sulfur burden can be deposited during any 6-hour period and the bulk removal rate for the removal requires a 6-hour rainfall of 10 mm.

The comment about the wind level used must arise from some misunderstanding of the model discussion in the DEIS, as simulations then and in this addendum utilize a mean planetary boundary layer wind (approximate depth of averaging 1.5 km in summer and 1.0 km in winter).

The sulfur deposition relative increment in remote areas resulting from the reduced number of conversions is reduced from the values in the DEIS. The presentation is somewhat different, in that the percentage increments are contoured over the region rather than listed at only three points.

CONCLUSION

Con Edison recognizes the substantial effort that has gone into preparation of the DOE's Regional OEIS. But it is now one and one-half years since the Scoping Hearing and there has still been only one coal conversion in the United States, and that one did not occur as a result of Fuel Use Act. The Regional FEIS can help get the coal conversion program moving, but only if the FEIS is realistic in scope and contains conclusions that are technically sound.

Con Edison

Consolidated Edison Company of New York, Inc.
4 Irving Place, New York, N Y 10003

January 11, 1982

Ms. Marsha S. Goldberg
Chief, Environmental Analysis Branch
Office of Fuels Conversions
Economic Regultory Administration
U.S. Department of Energy
2000 M Street, N.W.
Washington, DC 20461

Dear Ms. Goldberg:

At the DOE's December 17, 1981 public hearing, I presented Con Edison's comments on the DOE Draft Northeast Regional Environmental Impact Statement for the potential conversion of forty-two power plants from oil to coal or alternate fuels (Regional DEIS). This letter supplements my oral testimony by providing the following:

a. an update on New York City air quality;

b. stack parameters for Con Edison's Arthur Kill Generating Station, which were incorrectly presented in the Regional DEIS;

c. additional comments regarding the extent to which DOE's modeling of acid precipitation is overly conservative, and

d. Con Edison's cumulative air quality analysis of regional coal conversions.

UPDATE ON NEW YORK CITY AIR QUALITY

Con Ed-7

On December 17, 1981, I provided DOE with a table of 12 month average sulfur dioxide concentrations for the period August 1980 - July 1981 that showed substantially lower annual sulfur dioxide levels in Manhattan than the values used by DOE. This improvement has continued, and for the year ending December 31, 1981, the average sulfur dioxide levels in Manhattan are reported by New York State to be:

Mabel Dean Bacon	65 $\mu g/m^3$
CCNY	64 $\mu g/m^3$
Central Park	56 $\mu g/m^3$

Con Ed-7 The information supplied has been used to develop the scenarios described and discussed in Section 2.

Based on this more recent data, it is clear that sulfur dioxide levels in New York City are well below the NAAQS. Accordingly, the multiple conversion of utility boilers from oil to coal in the metropolitan area will not result in a NAAQS contravention, even assuming utility preferred coal. If the DOE's analysis is confined to only those plants likely to convert, as we have urged, not only will the sulfur dioxide NAAQS be maintained, but there will be a substantial margin under the standard to accomodate commercial and industrial growth.

ARTHUR KILL STATION STACK PARAMETERS

The stack parameters used in the regional DEIS for the Arthur Kill coal reconversion are incorrect. The impact from this station should be remodeled using the following parameters:

Stack Height (ft MSL)	516.2
Stack Diameter (in)	232
100% Gas Exit Velocity (fps)	149.4
100% Gas Exit Temperature (°F)	270
65% Gas Exit Velocity (fps)	95.1
65% Gas Exit Temperature (°F)	225

ACID PRECIPITATION

Con Ed-8

At the December 17, 1981 hearing, Dr. Peter Coffey of the New York Power Pool testified that linear models such as that used by DOE to assess chemical transport, transformation and deposition of atmospheric sulfur are incorrect and cause overestimates of these effects. DOE's own analysis of these models also indicate that linear models are unreliable. The DOE analysis, presented in a review of the Phase II report of Work Group 2 pursuant to the US/Canada Memorandum of Intent on Transboundary Air Pollution, is appended to a November 3, 1981 letter from A. W. Trivelpiece, Director of Energy Research, to Dr. Lester Machta, Director of the NOAA Air Resources Laboratories. It states that: "atmospheric transport and transformation of pollutants leading to acid deposition is not a linear phenomenon," and "averages of linear models may not adequately simulate real processes of long-range transport, transformation and episodic deposition of interacting species".

Dr. Coffey's conclusion that the linear model causes overestimate of actual effects is also supported by a comparison of predicted and measured sulfur deposition data. During 1979, for example, sulfur deposition at Whiteface Mountain was measured to be 6.05 Kg/hectare, while ASTRAP, the same model DOE used to calculate acid deposition from potential coal conversions, predicted 31 Kg/hectare, an overestimate of more than 500 percent.*

Con Ed-8 See Response NYPP-1 for comments on nonlinearities.

ASTRAP has not been applied with 1979 meteorology. A recent comparison of ASTRAP simulations of wet deposition of total sulfur with 1978 measurements adjusted for representativeness of regional precipitation indicated an underprediction of about one third. It should be pointed out that most of the observations were in Canada (i.e., not randomly distributed in the U.S. and Canada) and that the emission inventory estimates used in the simulation were 10-15% lower in the eastern U.S. than estimates used in previous simulations for the U.S./Canadian transboundary air pollution research effort. Natural sources were not included in simulations, and the omission could contribute to the underprediction, particularly in coastal areas.

Accordingly, the Regional DEIS should clearly indicate the conservatism of the predictions contained therein.

CON EDISON'S CUMULAIVE IMPACT ANALYSIS

Con Ed-9 Con Edison prepared a cumulative impact analysis of regional coal conversions as part of its Arthur Kill and Ravenswood Unit 3 coal conversion draft environmental impact statements. This analysis, which was submitted to the New York State Department of Environmental Conservation on September 1, 1981 and amended on December 3, 1981, includes several coal conversion scenarios and concludes that all coal conversions being actively pursued within the New York Metropolitan Area, namely Ravenswood Unit 3, Arthur Kill Units 2 and 3 and Lovett Units 4 and 5 can be accomplished without contravening NAAQS or PSD increments. It indicates that other coal conversions can also take place, even without taking into account the reduction in Manhattan annual average sulfur dioxide levels that has occurred since July 1981.

A copy of Con Edison's cumulative impact analysis, as amended, is attached.

Con Edison appreciates the opportunity to provide comments to the DOE on its Regional DEIS. We trust that these comments, along with my comments presented at the December 17, 1981 hearing will help DOE make the technical content of its EIS more realistic, and thus increase the usefulness of the EIS to the regulatory agencies that must decide whether coal conversion will be permitted.

Very truly yours

Peter C. Freudenthal
Director - Air & Noise Programs

PCF/mlh
Attach

*These data are presented in an 18 December 1981 draft final report by C. S. Burton, D. A. Stewart and M. K. Liu of Systems Applications, Inc., for the Atmospheric Modeling Committee of the Utility Air Regulatory Group.

Con Ed-9 It is apparent that Commonwealth Edison used different modeling assumptions that were less conservative than those used in the DEIS. The copy of the cumulative impact analysis is appreciated. Many of the comments received at the December 17, 1981, hearing have been incorporated into this FEIS. New modeling results are given in Topical Response 3.1.

There are some similarities between comparative cumulative effects study and the modeling done for the DEIS, but the two vary in several ways. The multiple meteorological stations used in the comparative study could not be input to the RAM code, which included impacts from all sources simultaneously. Due to the size of the study area, the DEIS modeling used a few monitors to represent the air quality trends in a region, while the comparative study uses more monitors and compares hourly data, both monitored and measured. The comparative study uses terrain input to a single-source code run for each plant, while RAM models all facilities at one run, with no terrain data. There also are variations in input parameters, due to differences in information sources and/or scenario assumptions. However, the trends shown by the two studies are quite similar, and the latest ambient data, incorporated in a modified DEIS Table 5.6 (Topical Response 3.1, Table 3.1.4), would lead the reader to conclusions similar to those reached in the comparative study.

Consolidated Edison Company of New York, Inc.
4 Irving Place, New York, N Y 10003

March 5, 1982

Ms. Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M Street, N.W. Rm. 6114
Washington, D.C. 20461

Dear Marsha:

Steve Ferguson asked several questions regarding Con Edison's coal conversion plans in his January 18, 1982 letter. We discussed these questions recently by phone, and I am writing to confirm our responses.

Con Ed-10

1. Plants Under Active Consideration for Coal Conversion

Response: Table 1.1 of the Regional DEIS correctly lists the plants for which Con Edison is actively seeking approval to convert to coal. Note, however, that the Ravenswood Unit 3 capacity (MW) in Draft EIS Table F-2 should be 928, not 972.

Con Ed-11

2. Stack Parameters

Response: Table 1, attached, gives the current operating characteristics for the coal conversion candidate units. The table format is the same as that of Draft EIS Table F-1. The entries for stack height refer to height above ground level, which is the stack height most appropriate for use with RAM. The heading "100% Gas Exit Velocity" means gas exit velocity when the unit is operating at the capacity shown in Table F-2. Similarly "100% Gas Exit Temperature" means the gas exit temperature when the unit is operating at the Table F-2 capacity. Operating characteristics are listed for three conditions. The characteristics in Subtable A apply to oil firing. The Subtable B characteristics apply to firing coal without FGD, and would apply to the 1971 NSPS and Utility Proposed SIP Scenarios. The Subtable C characteristics apply to firing coal with FGD, and would apply to the Coal SIP Scenario, the Modified Coal SIP Scenario, and all cases in the Mitigative Analysis. Our listing of Ravenswood 3 stack characteristics for coal firing with FGD is purely hypothetical. Con Edison believes that FGD at Ravenswood 3 is impractical and, therefore, that the 1971 NSPS emission limit is the most stringent possible coal SO_2 limit for Ravenswood Unit 3.

Con Ed-10 The error in the stated capacity of Ravenswood Unit 3 has been noted and the correct value, 928 MW, is replaced in Table 2.1 of Section 2.

Con Ed-11 The information supplied has been used to develop the scenarios described and discussed in Section 2.

Boiler designs impose no unusual coal requirements.

3. Monitored Background Data

Response: Annual sulfur dioxide background data measured in the New York Metropolitan Area for the 12-month period ending July 31, 1981 were presented in my testimony before your office on December 17, 1981. Table 2, attached, presents 12-month average SO_2 concentrations in New York City for the period February 1981 through January 1982. (The averages for the DEC stations include 4 months for which data have been reviewed but not officially released by the collecting agency. The official data for these months may differ slightly from the data included in the 12-month averages.)

4. SIP SO_2 Emission Limit

Response: The New York SIP limits the sulfur content of coal to 0.2 lb/10^6 Btu. Con Edison is requesting a SIP modification to permit the use of 1% (0.8 lb/10^6 Btu) sulfur coal at Ravenswood Unit 3 and Arthur Kill Units 2 and 3. We expect New York State DEC to issue a formal determination of completeness for Con Edison's coal conversion application in March and to schedule hearings by early May.

Please call me if you have any questions.

Very truly yours,

Peter C. Freudenthal

JCP&L / GPU

Jersey Central Power & Light Company
Madison Avenue at Punch Bowl R.
Morristown, New Jersey 07960
(201) 455-8200

EA-197
January 25, 1982

Ms. Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M Street N.W., Room 6114
Washington, D. C. 20461

Dear Ms. Goldberg:

Subject: Jersey Central Power & Light Company (JCP&L)
Proposed Sayreville Generating Station Coal Conversion

This letter represents JCP&L's response to Steven Ferguson's January 18 letter requesting information about our proposed plans for the Sayreville Coal conversion project. The request is broken up into four items, each of which is answered below:

1. JCP&L is still actively considering the conversion to coal of Sayreville Units 4 and 5. However, as we have previously stated to you, our financial position is not favorable in terms of the conversion. This problem is identified in the Draft EIS and has not changed.

JCP&L-1

2. The data listed in Table F.1 of the Draft Northeast Regional EIS for Sayreville Station is correct for the existing station. If Sayreville Station is converted to coal, both units will discharge to a new common stack with the following characteristics: stack height 385 ft.; stack I.D.=13.1 ft.; exit temperature approximately 150°F; and exit velocity approximately 90 ft./sec. for both units. The Sayreville Station boilers are of the Babcock and Wilcox cyclone furnace, wet bottom design and require a low ash fusion temperature coal which historically come from Western Pennsylvania or West Virginia, having a sulfur content of about 2-3%.

3. JCP&L's ambient air monitoring network was shut down in May 1979 as a cost saving measure following the Three Mile Island accident. Thus there is not monitoring data available after this date. These data were included in JCP&L's previous submittals.

Jersey Central Power & Light Company is a Member of the General Public Utilities System

JCP&L-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

JCP&L-2

4. If Sayreville Station were converted to burning coal it would be required to comply with SO_2 emissions of 0.6 lbs. $SO_2/10^6$ BTU heat input, since it is located in New Jersey zone 4 as defined in N.J.A.C. 7:27-9 & 10. In other words, JCP&L would expect to be required to comply with the most recent version of N.J.A.C. 7:27-10 (sulfur in coal regulations). JCP&L feels it is unrealistic to expect compliance with the proposed emission standard of 0.32 lbs $SO_2/10^6$ BTU heat input listed in N.J.A.C. 7:27-9. This proposed standard is intended to be used in conjunction with the proposed New Jersey incentive to convert to coal by allowing the use of a higher sulfur content fuel oil for up to two years during the conversion period. JCP&L believes this proposed standard of 0.32 lbs./10^6 BTU SO_2 emissions is certainly at the limit and may be beyond the limit of current "state-of-the-art" scrubber technology.

Very truly yours,

James E. Anderson, Manager
Environmental Affairs

1a

JCP&L-2 **The information supplied has been used to develop the scenarios described and discussed in Section 2.**

LONG ISLAND LIGHTING COMPANY

175 EAST OLD COUNTRY ROAD · HICKSVILLE, NEW YORK 11801

February 2, 1982

Ms. Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M Street N.W., Room 6114
Washington, D.C. 20461

Dear Ms. Goldberg:

LILCO-1

The draft Northeast Regional Environmental Impact Statement (EIS) presently includes five of LILCO's generating facilities. These include E. F. Barrett units 1 and 2, Far Rockaway unit 4, Glenwood units 4 and 5, Northport units 1-4 and Port Jefferson units 1-4. At the present time, the Far Rockaway unit is on cold standby status and there are no plans for converting either Port Jefferson units 1 and 2 or Glenwood units 4 and 5 facility. Therefore, these five units should not be included in the Regional EIS.

We presently are considering only Port Jefferson units 3 and 4 and E. F. Barrett units 1 and 2 for coal conversion. As an R&D project, the engineering, environmental and economic feasibility of using coal water slurry at the Northport facility is being studied, since conversion to direct coal firing is not feasible. The table below contains the stack operational parameters you requested. These compare closely with the values in the Table in Appendix F. While there are no plans for any kind of coal utilization at Northport, parameters for this plant are included for the sake of completeness.

Facility	Unit	Stack Ht (ft)	Stack Diam (inches)	Exit Velocity (ft/sec)	Exit Temperature (°F)
E. F. Barrett	1	250	192	52	300
	2	350	123	127	300
Northport	1	600	201	84	334
	2	600	201	84	334
	3	600	201	84	334
	4	600	201	84	334
Port Jefferson	3	425	123	132	309
	4	425	123	132	309

LILCO-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

The converted units would in general burn fuels with equivalent sulfur content to their present fuels. The table below therefore represents both present and converted fuel limitations.

Facility	Unit	Percent Sulfur (Oil)	lbs. S/10^6 Btu (Coal)	lbs. SO_2/10^6 Btu[1] (Coal)
E. F. Barrett	1	1.54	0.8	1.6
	2	1.54	0.8	1.6
Northport	1	2.8	1.54	3.08
	2	2.8	1.54	3.08
	3	2.8	1.54	3.08
	4	.75	0.60[2]	1.2
Port Jefferson	3	2.8	1.54	3.08
	4	2.8	1.54	3.08

LILCO-2 As a general comment, I would like to note that the material on health effects in Appendix E of the Regional EIS is very misleading. The appendix is a recitation of the results of a number of epidemological studies, many of which are actually discredited in the latest EPA criteria documents, and does not address the air quality standards at all. After reading this appendix, the layman would be particularly confused, since the air quality analysis concludes that all ambient standards could be met and all 42 of the conversions could go forward.

Thank you for the opportunity to review this power plant data and comment on the EIS.

Very truly yours,

Raymond J. Driscoll, P.E.
Manager
Environmental Engineering

MNM/cc

[1] Does not include credit for sulfur retention in bottom ash.

[2] Northport 4 is subject to 1971 NSPS which set an SO_2 emission limitation of 0.8 lb/10^6 Btu for oil and 1.2 lb/10^6 Btu for coal.

LILCO-2 **These discredited studies have not been incorporated into the revised analysis presented in Topical Response 3.7 and Appendix C (see also Response Con Ed-3).**

SYSTEM COMPANY

Montaup Electric Company

P.O. Box 391, Fall River, Massachusetts 02722 Telephone (617) 678-5283
General Offices and Generating Station, Riverside Avenue, Somerset, Massachusetts 02726

February 3, 1982

Ms. Marsha Goldberg
U. S. Department of Energy
Economic Regulatory Administration
2000 M Street, N.W., Room 6114
Washington, D. C. 20461

Dear Ms. Goldberg:

With regard to Mr. Steven Ferguson's letter sent to me requesting Eastern Utilities Associates assistance in providing input for the Northeast Regional Environmental Impact Statement (EIS), the following information is offered:

MEC-1

Somerset Station Units 5 and 6 are being considered for coal reconversion by Montaup Electric, a wholly owned subsidiary of Eastern Utilities Associates.

Current and anticipated future operating characteristics including stack information are listed in Table I.

Boilers under consideration for reconversion would most likely be burning eastern bituminous coal with a maximum ash content of 9 percent dry basis.

All total suspended particulates (TSP) and sulfur dioxide (SO_2) air quality data monitored within 20 km of the Somerset Station are presented in Table II and III respectively. There is no local NO_x ambient monitoring site within 20 km of Somerset Station.

The Somerset Station is operating under the present SIP emission limitation of 1.21 lb. sulfur/MM BTU. The units will operate under the same SIP emission limitation when burning coal, thus not requiring a SIP change in order to implement reconversion plans.

I trust the above information gives you sufficient information. If you have any further questions, please contact me.

Very truly yours,

W. R. Bisson
Vice President

WRB:sab

Printed on 100% recycled paper.

MEC-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

New England Power

New England Power Company
20 Turnpike Road
Westborough, Massachusetts 01581
Tel. (617) 366-9011

December 15, 1981

Ms. Marsha S. Goldberg
Department of Energy
Office of Fuels Conversion,
Economic Regulatory Administration
2000 M Street, NW.,
Room 3322
Washington, DC 20461

Dear Ms. Goldberg:

Re: Draft Northeast Regional Environmental Impact Statement

New England Power Company owns and operates the largest fossil fueled generating station in New England, the Brayton Point Station located in Somerset, Massachusetts. We are now converting three of the four generating units at Brayton Point to coal firing; two units are now burning coal and the third is scheduled to come on line later this month. The conversion project represents 1162 MW of capacity and will save approximately 12 million bbls. of oil annually. The project cost is approximately $180 million and will save our customers over $140 million per year in fuel charges. It is one of the first and probably the largest coal conversion project in the country. From the perspective of this experience, we offer some brief comments on the Department of Energy's Draft Northeast Regional Environmental Impact Statement for the potential coal conversion of 42 plants in the region.

In general, the report appears to be a professional and coherent presentation reflecting careful and extensive work. The report concludes that there are few regional cumulative or interactive impacts associated with coal conversion. The environmental results to date from the Brayton Point project support this conclusion since we see no adverse local impacts from coal conversion. There are, however, some areas of the report, including SO_2 and TSP emissions and solid waste disposal, where we believe that the assumptions used are too conservative.

NEP-I The RAM air quality model assumes that all 42 plants are converted to coal firing and they operate at a 100% capacity factor for the 24-hour SO_2 calculation and at 60-65% capacity to predict the annual average impact. It is extremely unlikely that all 42 plants will be converted or that all those which are converted will operate simultaneously at 100% load even for 24 hours. A survey of the utilities involved might provide a better picture of which plants are likely to be converted.

NEP-1 It is assumed that all plants are operating at 100% capacity factor for the 24-hour SO_2 calculation. This condition is extremely unlikely but not impossible, and therefore represents a worst-case analysis for the short-term SO_2 calculation. See Response NYDEC-19 for a discussion of the survey of utilities, and Topical Response 3.1 for the analysis of air quality impacts from a scenario consisting of only those plants likely to be converted.

NEP-2

In some cases, the SO_2 emissions shown on Table F-2 as Oil SIP rates appear to be based on the actual sulfur content of oil as burned, whereas the Coal SIP rates are based on the actual SIP limits. Our experience at Brayton Point indicates that SO_2 emissions are less while burning coal than oil. While the SIP limits for both fuels are the same, oil is a blended product and can be supplied at or near the SIP limit but coal is a non-homogeneous commodity and must be delivered with a sulfur content somewhat below the SIP limit to meet our purchase specification. The attached bar graph (Attachment A) shows that since conversion of Brayton Point Unit No. 1 in April 1981, SO_2 emissions have been 21% less with coal than with oil. If this aspect of coal conversion were incorporated into the EIS the projected impacts in the combustion and deposition region would be lower, perhaps even lower than the oil burning base case.

NEP-3

Under all the evaluation scenarios, TSP emissions are assumed to be at the Coal SIP level. Our experience at Brayton Point indicates this will not occur. In order to be sure of meeting the SIP limit, ash collection equipment must be designed to a more stringent limit. The compliance tests conducted on Brayton Point Units No. 1 and 2 indicate that actual TSP emission rates are roughly 1/3 of the SIP limit and are actually lower than rates experienced in the past with the same units burning oil. The attached graph (Attachment B) shows the result of TSP emission rate tests on Units No. 1 and 2 for coal and oil firing at Brayton Point.

NEP-4

The draft impact statement notes that solid waste disposal associated with coal conversion may tax disposal capacity. In areas where coal has always been the primary fuel, the utility industry has a long history of marketing coal ash as a resource rather than relying entirely on disposal. According to the National Ash Association, in 1979 15.7 million tons of coal ash were reused which represents 21% of the total produced in the United States. There is no reason why ash reuse could not be practiced in this region as an even higher percentage.

Again, our experience at Brayton Point is instructive. With the cooperation of the Massachusetts Department of Environmental Quality Engineering, coal ash has been approved as an intermediate cover material for sanitary landfills. It is a good cover material because its permeability is low when compacted and it sheds rain water better than gravel thus reducing the potential for leachate formation in the landfill. The attached test results (Attachment C) illustrates the low permeability of ash.

With two units now burning coal at Brayton Point, we are currently using 100% of the ash as landfill cover in nearby communities. This does not use up scarce landfill capacity because it only replaces other cover material. In the future we expect to continue this use as well as develop others such as roadbase material, cement additive and sandblast grit.

NEP-2 The SIP limits were used as emission limits since they represent maximum values and lead to more conservative predictions. The SO_2 emissions following conversion may fall below the SIP limits, but the emission rate cannot be accurately estimated. Unless the utility supplied emission rates, they were estimated using the appropriate SIP limits. In the case of Brayton Point, the estimated emissions were used in the Coal SIP Scenario and the actual emissions were used in the Modified Coal SIP Scenario. The results are discussed in Topical Response 3.1.

NEP-3 The SIP limits were used as emission limits since they represent maximum values and lead to more conservative predictions. The TSP emissions from the plants burning oil are probably below SIP limits also. Since TSP emission limits for burning either oil or coal are identical for the plants, no or little change in TSP emissions was assumed.

NEP-4 The discussion of coal ash marketing presented in Appendix I of the DEIS has been expanded in Topical Response 3.5 (Waste Disposal), incorporating the information provided in this comment.

NEP-5 Our coal conversion experience to date shows what can be done with a joint effort by industry and federal, state and local government. The potential problems cited in the draft EIR have either not occurred or have been solved. Without the installation of costly scrubbers, SO_2 and TSP emission rates are lower with coal than they were while burning oil and solid waste disposal has been a manageable problem. We believe this experience should be drawn upon in preparing the Final Regional EIS and we offer to make available any data you require to support the report.

Very truly yours,

Andrew H. Aitken
Director of Environmental Affairs

AHA:pd

Enclosures

NEP-5 Comment noted. The information has been received. The factors have been taken into account; however, the nature of an impact statement is to assess the worst-cast scenario, as is done in the Brayton Point Coal Conversion FEIS (USDOE 1979).

REFERENCES

U.S. Department of Energy. 1979. Coal Conversion Program, New England Power Co. DOE/EIS-0036-F. Washington, D.C.

New England Power

New England Power Company
20 Turnpike Road
Westborough, Massachusetts 01581
Tel.(617)366-9011

February 2, 1982

Ms. Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M Street, N.W., Room 6114
Washington, D.C. 20461

Dear Ms. Goldberg:

NEP-6 I am responding for J. F. Kaslow to S. E. Ferguson's letter of January 18, 1982, which requests additional supporting information for the Department of Energy's Draft Northeast Regional Environmental Impact Statement (EIS). As you note, the EIS will be a Supporting Document for site-specific coal conversion projects so we too would like the report to be as accurate and up-to-date as possible. Our response to specific questions follows:

1. Which Plants Included in the Draft EIS is your Company Considering for Coal Conversion?

We are actively considering coal conversion of New England Power Company's (NEP) Salem Harbor Units No. 1, 2 and 3 located in Salem, Massachusetts, and The Narragansett Electric Company's (NECo) a (NEP affiliate) South Street Unit 12 located in Providence, Rhode Island.

2. Provide Detailed Information on Current Operating Characteristics for Potential Conversion Candidates and Indicate any Planned Changes

Salem Harbor Station

Number of stacks	-	3
Stack heights	-	250'
Stack diameter	-	Unit No. 1 - 10' 6"
(inside, at top)	-	Unit No. 2 - 10' 4"
	-	Unit No. 3 - 13'
Exit gas velocity	-	Unit No. 1 - 53'/sec.
(at top, full load)	-	Unit No. 2 - 56'/sec.
	-	Unit No. 3 - 65'/sec.

Planned Changes - As part of long-term coal conversion (not the DCO period), NEP would construct a single new stack with three flues to accommodate the flue gas from Units No. 1, 2 and 3. The final parameters of the stack have not yet been established; however, it will be approximately 450' high with inside flue diameters at the top of 9', 9' and 11' for Units No. 1, 2 and 3, respectively. The new exit gas velocity is not known at this time.

A New England Electric System company

NEP-6 The information supplied has been used to develop the scenarios described and discussed in Section 2.

Design Coal - The design coal for this Station following coal conversion:

Btu/lb.	-	13,000
Sulfur	-	1.5%
Grind (Hardgrove)	-	60
Ash	-	10%
Moisture	-	8%
Ash Softening	-	2,450°F

Design coal is that which is optimum for use in the generating units although, in practice, some variability can be tolerated. Our experience with the Brayton Point Station coal conversion indicates that the sulfur content of coal as delivered is normally less than the design coal specification. The result has been that SO_2 emissions with coal-firing are approximately 20% less than while burning oil, although the SIP limits are the same for both fuels.

South Street Station

Number of stacks	-	1
Stack height	-	325'
Stack diameter (inside, at top)	-	12'
Exit gas velocity (at top, full load)	-	58'/sec.

Planned Changes - This project is still in the early planning stage. At this time, there are no changes planned for the stack parameters.

Design Coal - The design coal for this Station following coal conversion would be the same as that for Salem Harbor.

3. Provide Background Monitoring Data which would be Useful for DOE's Air Quality Analysis

Enclosed are annual summaries for the years 1978-1980 of ambient SO_2 and TSP data for the Salem, Massachusetts, and Providence, Rhode Island areas.

It should be noted that the Salem area data was collected during operation of the Salem Harbor Station with the existing stacks which may have had an impact on the data, particularly at the Green Street location. The new tall stack will significantly reduce that influence. Extensive modeling in preparation for coal conversion indicates that ambient air quality standards in the Salem area will be protected following long-term coal conversion at the Salem Harbor Station.

Preliminary modeling for the Providence, Rhode Island area indicates that ambient air quality standards will be protected following coal conversion at the South Street Station.

4. Indicate SO_2 Emission Limits under Current State SIP's and any SIP Modifications that will be Requested

Salem Harbor Area SO_2 SIP Limit

2.42 lbs. SO_2/MMBtu - 30-Day Average
4.62 lbs. SO_2/MMBtu - Daily Maximum

No modification will be requested

Providence Area SO_2 SIP Limit

1.10 lbs. SO_2/MMBtu - Maximum

The Narragansett Electric Company has requested a SIP change to:

2.42 lbs. SO_2/MMBtu - 30-Day Average
4.62 lbs. SO_2/MMBtu - Daily Maximum

If you have any further questions or need additional data to support the Final EIS, feel free to contact me.

Very truly yours,

Andrew H. Aitken
Director of Environmental Affairs

BHS:gv

Enclosure

NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST SYRACUSE N.Y. 13202/TELEPHONE (315) 474-1511

November 25, 1981

Ms. Marsha S. Goldberg
Department of Energy
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, NW, Room 3322
Washington, D. C. 20461

Dear Ms. Goldberg:

SUBJECT: Draft Northeast Regional Environmental Impact Statement

NMP-1

In July, 1980, in response to a request for comments regarding notice of scoping meetings for the above subject, Niagara Mohawk commented that our Oswego oil fueled electric generating units No.'s 1, 2, 3, and 4 (which were then more than 25 years old) should not be included in the list of powerplants comprising the air quality modeling/environmental impact scenarios of the subject report.

Apparently, that comment was disregarded since those units remain listed in the Draft Northeast Regional Impact Statement noticed as available for comment in the November 17, 1911 Federal Register.

We have reviewed the impact statement and although it does not appear that the inclusion of Oswego Units 1-4 affected the outcome of the DOE's analysis, we still believe it is misleading to include these units especially since they meet the basic criteria for exclusion, i.e., "units are more than 25 years old".

There are additional reasons for excluding these units from consideration for conversion from oil to coal fuel. The site on which Units 1-4 stand provides major and, in our judgement, sufficient justification to reject all efforts to conversion of these properties to coal. The Oswego Steam Station is located within the city limits of the City of Oswego, immediately adjoining the campus of a major segment of the State University of New York at Oswego. The remaining environment is made up of closely built homes, including an

NMP-1 The information supplied has been used to develop the scenarios described and discussed in Section 2. See also Response Con Ed-1.

Ms. Marsha S. Goldberg
Page 2
November 25, 1981

elementary school. The property reviewed for conversion to coal is inadequate to accommodate either the required coal pile or the residue from the generation in the form of flyash. Even if a clear land area were available, the introduction of coal handling equipment, coal storage piles, and associated ash disposal facilities would represent a serious inconvenience to the residents of the area.

When you combine the age of these units, the potential for community inconvenience and the unavailability of clear areas for the necessary coal storage and ash disposal facilities, we believe that Niagara Mohawk's determination not to undertake conversion is in the best interests of the citizens and community involved with very little negative impact on the critical fuel situation of the nation.

We would appreciate your consideration of this matter when the Final Northeast Regional Environmental Impact Statement is prepared.

Very truly yours,

JM Toennies

John M. Toennies
Environmental Affairs Director

JMT:jw

NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

February 2, 1982

Ms. Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M Street, N.W., Room 6114
Washington, D. C. 20461

Dear Ms. Goldberg:

SUBJECT: DOE Draft Northeast Regional EIS

NMP-2 The Niagara Mohawk Power Corporation recently received a letter from the Department of Energy (dated January 18, 1982 from Steven Ferguson of the DOE to John Toennies of Niagara Mohawk) offering utilities which may be affected by the DOE's Northeast Regional EIS an "additional opportunity to contribute to the data and assumptions necessary to complete the analysis". It is our understanding that this may be the final opportunity for comment on the DOE's Regional EIS and that the comments which have been provided below will be incorporated into the final document.

Niagara Mohawk has reviewed the four areas of concern as listed in the January 18 DOE letter. Our comments which follow are structured to correspond with the format of the DOE letter.

1. Table 1.1 on page 1-2 of the document, which lists the facilities included in the study, still contains a listing for Units 1, 2, 3, & 4 at our Oswego Steam Station. Niagara Mohawk has no plan to reconvert Oswego Units 1-4 because such conversion is not in the best interests of the surrounding community. Furthermore, Oswego Units 1-4 are more than 25 years old and thus meet the DOE's basic criteria for exclusion. Our position with regard to the Oswego plant was discussed at a meeting at the DOE's office in Washington, D. C. on April 29, 1980. Further documentation of our position was included in the attached letters to the DOE dated July 1, 1980 (J. Toennies to S. E. Ferguson) and November 25, 1981 (J. Toennies to M. S. Goldberg). Niagara Mohawk, therefore, again requests that Oswego Units 1-4 be removed from the list of facilities included in Table 1.1 on page 1-2 of the DOE's Northeast Regional EIS.

NMP-2 The information supplied has been used to develop the scenarios described and discussed in Section 2.

Ms. Marsha Goldberg
Page 2
February 2, 1982

2. With regard to the Albany Steam Station, which is a potential reconversion candidate, the current operating characteristics are summarized below.

   No. Units: 4
   Capacity of Each Unit: 100 MW
   No. Stacks: 4
   Stack Height: 336 feet (each stack)
   Stack Diameter: 13 feet (each stack)
   Exit Gas Velocity: 41 feet/sec. (each stack, estimated from current data and subject to revision pending outcome of more detailed studies)
   Boilers are dry bottom, designed for tangential firing of bituminous coal

3. For use in your air quality analysis, enclosed are two semiannual reports which contain 12 consecutive months (May, 1980 through April, 1981) of ambient air quality and meteorological monitoring data.

4. The current New York State SIP applicable to Niagara Mohawk's Albany Steam Station allows for the burning of coal with a three month average sulfur content of 1.9 pounds per M Btu (with daily maximum not to exceed 2.5 pounds sulfur per M Btu) providing the use of such fuel will not cause contravention of ambient air quality standards. If the use of the above coal is predicted to cause ambient air quality problems, then the New York State SIP would restrict the sulfur content of the coal to 1.1 pounds sulfur per M Btu. No changes to the New York State SIP would be required for the Albany plant if reconverted to coal.

We would appreciate your consideration of the foregoing comments when preparing the Final Northeast Regional Environmental Impact Statement. If you have any further questions, please contact either myself or Mr. Raymond Cummings at (315) 474-1511 in our Syracuse, New York office.

Very truly yours,

John M. Toennies
Environmental Affairs Director

RWC:jw
Attachments
xc: R. W. Cummings, Jr.
    S. E. Ferguson - DOE

NORTHEAST UTILITIES SERVICE COMPANY

COMMENTS ON DRAFT NORTHEAST REGIONAL

ENVIRONMENTAL IMPACT STATEMENT (DOE/EIS - 0083-D)

DECEMBER 16, 1981

Northeast Utilities Service Company, on behalf of Holyoke Water Power Company, Western Massachusetts Electric Company, The Hartford Electric Light Company, and The Connecticut Light and Power Company, offers the following comments on the Department of Energy's Draft Northeast Regional Environmental Impact Statement (DOE/EIS - 0083-D), referred to as NEREIS.

General

We endorse the concept of a three-tiered approach to the assessment of environmental impacts of conversion to coal in the electric-utility industry. We found the first-tier document (the programmatic coal conversion EIS published by DOE in 1979) to be a useful reference. We have found this second-tier document (a consideration of regional concerns) to be a thorough and comprehensive treatment of the potential environmental effects of coal conversion. We look forward to the third tier (site specific) environmental impact statements for our plants.

NU-1 Our plans for conversion to coal are different than those assumed for the Northeast Utilities' companies in the NEREIS. The NEREIS identifies ten Northeast Utilities' generating units as selected for conversion: Mt. Tom, West Springfield 3, Montville 5, Middletown 1, 2, 3, Devon 7 and 8, and Norwalk Harbor 1 and 2. The units selected for conversion by Northeast Utilities include Devon 7 and 8, and Norwalk Harbor 1 and 2 in

NU-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

Connecticut and Mt. Tom in Massachusetts. However, our list excludes the conversion of any units at Middletown station and Montville Unit 5 since the locations of these plants present both environmental and logistical difficulties for operation on coal. On the other hand, our plans for conversion do include all three units at West Springfield.

Northeast Utilities' planning for coal conversion is based upon a January 1981 report to the Connecticut Department of Public Utility Control entitled Northeast Utilities Conservation Program for the 1980s and 1990s, or in brief NU 80s/90s. The same document -- with respect to supply side planning -- was also filed with the Massachusetts Department of Public Utilities in February 1981.

A key objective of the NU 80s/90s program is to achieve a major reduction of the company's dependence on imported oil. Northeast Utilities' plan to convert eight of its oil fired units to coal, representing a total capacity of about 850 megawatts, will result in reducing consumers' costs by about $325 million in 1988 alone and the company's oil dependence by some 8.5 million barrels a year. Cumulatively, through 1993, we expect coal conversion to reduce our oil dependence by 70 million barrels, with an estimated total savings to customers of $2.9 billion.

Air quality model analyses conducted by the company have shown that the four Connecticut units proposed for reconversion can operate on coal containing 1.5 percent sulfur and remain in compliance with all National Ambient Air Quality Standards without the use of flue gas desulfurization devices. Similar analyses have also been conducted with regard to

our Massachusetts units selected for conversion with the Mt. Tom station being the first of the eight units to be converted.

As has been publicly announced, the reconversion of Mt. Tom has been recently completed and the plant started burning coal on December 3 of this year. Operating Mt. Tom on coal is expected to immediately reduce dependence on imported oil by 1.5 million barrels a year. Through an innovative financing arrangement developed by the company and the Commonwealth of Massachusetts the costs of the Mt. Tom reconversion are being recouped through the "Oil Conservation Adjustment". This arrangement permits two-thirds of the fuel savings realized through the use of coal to be collected in order to offset the cost of conversion, while one-third of the savings is passed on directly to consumers. Once the cost of the conversion is fully paid off, the entire amount of the savings will be passed to the company's customers. This arrangement is expected to save Mt. Tom's customers $6 million a year during the three years required to pay for the conversion and $18 million a year thereafter.

Studies are now underway to evaluate the environmental effects of burning coal at our West Springfield station so that the engineering plans for a conversion, which will meet state and federal environmental requirements, can be set in motion.

We concur with the general conclusions of the NEREIS that the conversions to coal planned for the region will not have a significant adverse environmental impact on the region. We further believe that the use of modeling which is more site specific will show that coal can be used and air quality can be maintained in full compliance with the NAAQS. This will be made possible by using clean coal, thus avoiding the excessive costs and waste disposal problems associated with currently available flue gas desulfurization technology.

Specific Comments

NU-2 The cost differential between oil and coal (presented in Table 3-1 and 3-4, Figure 3-1 and on Page 3-1) is a key factor affecting decisions to convert to coal. In view of the importance of that differential we feel the basis for projecting these costs into the future should be carefully documented. We see little in the text which provides such documentation. We suggest that an appendix be added to support cost projections. It is important that both the utilities and the public be able to assess the economic benefit that will accrue to consumers from stated assumptions about the future difference between the cost of coal and oil.

NU-2 The data presented in Table 3.1 and Figure 3.1 were collected from the price statistics available at the time of the study (1981). The source of these statistics is FERC Form 423. The FERC form and an updated version of Figure 3.1 are shown in Section 5, Errata and Addenda.

Tables 3.3 and 3.4 were obtained from a study done in 1980 by the Office of Electrical Systems, Policy and Evaluation, U.S. Department of Energy. The study is entitled "Staff Analysis of the Energy and Economic Impacts of the President's Program for Reducing Oil and Gas Consumption in the Utility Sector."

NU-3 Table 3-5 is confusing. The upper right-hand box states that the worst-case incremental sulfur deposition is 6%, and the text states that acid rain impacts are based on this increment. The lower right-hand box states that the incremental ambient air sulfate concentration is 1%, and the text states that health impacts are based on this increment. Conclusion 3 on page 5-15 states that there is an increase of up to 6% in sensitive areas for both concentration and deposition of sulfur. It is not clear why those people living in sensitive areas will not be exposed to 6% rather than 1% ambient air sulfate concentrations on a worst-case basis. There is insufficient explanation of this in the report. We suggest

NU-3 The lower right-hand boxes of Tables 3.5 and 1.2 should have quoted 6% rather than 1% and the referenced section should be Sec. 5.6.3 of the DEIS. Table 1.2 is an updated version of these tables. However, this is a moot point because the reanalysis of health effects in Topical Response 3.7, Section 3.7.9 uses the new values of a 1.7% increase in ambient sulfate concentrations in the summer and a 1.3% increase in the winter. These new values are derived in the reanalysis presented in Topical Response 3.2.

that the appropriate text and table(s) be rephrased to clarify the subject.

NU-4 Appendix E, on Page E-7, apparently ignores gaseous radon releases, which may contribute to the radiation doses estimated in Table E-9.

NU-5 Appendix E does not contain any perspective on the confidence with which health effects may be inferred from epidemiological studies. This is a significant omission. An appendix is a logical place to discuss such a detailed technical matter, but the only language we can find that expressly deals with it is in the second paragraph on page 4-72. The further statement in the fifth paragraph on that page that the state-of-the-art of health effects assessment does not permit quantitative conclusions is undoubtedly correct. However, various researchers (Lave and Seskin, Orcutt and Mendelsohn, etc.) have arrived at quantitative conclusions in relating regional excess mortality to airborne sulfates. These conclusions have received widespread attention, are known to the public, and are frequently cited by environmental groups. Some perspective on the confidence in such conclusions ought to be included in the NEREIS, probably in Appendix E, to place these matters in the appropriate perspective.

NU-6 The usefulness of Table 4-30 in its present abbreviated form is questionable; in many cases, there is more nickel, cobalt and vanadium in oil than in coal. We suggest that the Table be expanded to show the differences in trace metal content between coal and oil.

NU-4 McBride et al. (1978), in making their calculations, assumed that all of the radon present in the coal was released as airborne effluent. Even with this conservative assumption, Rn-220 and Rn-222 contributed insignificantly to their calculated whole-body and organ doses. Beck et al. (1980) did not consider the contribution of Rn-222 to population exposure based upon a calculated maximum increase in ground-level air activity around their model plant of less than 10 fCi/m^3. Using a soil exhalation rate of 50 aCi/cm^2/s, they calculated that the Rn-222 released from a typical 1000-MWe powerplant would be equivalent to radon released from approximately 0.1 km^2 of typical soil. The Rn-220 releases during coal combustion were not considered because of the short half-life of Rn-220.

REFERENCES

Beck, H.L., C.V. Gagolak, K.M. Miller, and W.M. Lowder. 1980. Perturbations on the natural radiation environment due to the utilization of coal as an energy source, pp. 1521-1558. In: T.F. Gesell and W.M. Lowder (eds.), Natural Radiation Environment III, Vol. 2.

McBride, J.P., R.E. Moore, J.P. Withrspoon, and R.E. Blanco. 1978. Radiological impact of airborne effluents of coal and nuclear plants. Science 202 (8):1045-1050.

NU-5 It would be inappropriate to discuss the validity and value of air pollution epidemiological studies and studies of multiple regression models in this EIS. Accepted epidemiological studies were used in the analysis of the health effects of coal conversion that is presented in Topical Response 3.7. Regression models were not used in the analysis because of the questionable premise upon which they are based (that chronic health effects from sulfates and other indices occur at relatively low pollution levels) and the temptation to interpret the results without recognizing this inadequacy. However, such quantitative models are valuable at this time in determining the relative health risks of similar activities. For further information on epidemiological and regression studies, refer to Wilson (1980), Ricci and Wyzga (1979) and USEPA (1981).

REFERENCES

Wilson, R., et al. 1980. Health Effects of Fossil Fuel Burning: Assessment and Mitigation. Ballinger Publishing Co., Cambridge, Mass.

Ricci, P.F., and R.E. Wyzga. 1979. The Health Effects of Reduced Air Pollution. Prepared for the National Commission on Air Quality.

USEPA. 1981. Criteria Document for Particulate Matter and Sulfur Oxides. Vol. V. Second draft.

NU-6 See Table 3.7-2 and pertinent discussion in Topical Response 3.7.8.

NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
THE HARTFORD ELECTRIC LIGHT COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices ● Selden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06101
(203) 666-6911

Ms. Marsha Goldberg
U. S. Department of Energy
Economic Regulatory Administration
2000 M Street, N.W., Room 6114
Washington, D.C. 20451

Reference: Letter from Mr. Steven Ferguson to P. M. Stern, dated January 13, 1982.

Dear Ms. Goldberg:

NU-7

As you are undoubtedly aware, the Mt. Tom Station of Holyoke Power Company commenced coal burning on December 3, 1981. Information similar to that requested for units being considered for conversion, as well as a complete environmental assessment of the conversion, is described in the enclosed Final Environmental Impact Report forwarded to the Executive Office of Environmental Affairs in response to the Massachusetts Enviornmental Policy Act. Other units within the Northeast Utilties (NU) system presently being considered for conversion are described in detail in the enclosed data booklets.

Enclosed also is background SO_2 data (including locator maps) from ambient mointors near the generating stations. There are three monitor locations for each station. Two monitors are located to provide maximum intercept of the plume while one monitor is located near the stack which is noted by (*) in the tables attached hereto.

The sulfur dioxide State Implementation Plans (SIP's) for Massachusetts and Connecticut allow SO_2 emissions as indicated below:

Massachusetts: 2.42 lbs/10^6 Btu
Connecticut: 1.1 lbs/10^6 Btu

The SIP's are applicable to both oil and coal fuels. Mt. Tom is complying with the Massachusetts SIP by burning 1.5 percent sulfur coal. We contemplate using that same type of coal at West Springfield Station if it is converted.

The present Connecticut SIP allows the use of 1.0 percent sulfur fuel. Our Connecticut conversion plans have not been developed in sufficient detail to determine whether NU would seek a change to the existing SIP.

I believe the information included in this letter and the attachments thereto provide the requested information. Clarifications or additional data can be obtained by calling our Mr. Donald R. Olsen, Generation Mechanical Engineer, on (203) 666-6911, extension 3149.

Very truly yours,

P. M. Stern, Vice President
Corporate and Enviornmental Planning

Enclosures

NU-7 The information supplied has been used to develop the scenarios described and discussed in Section 2.

1881 · 1981

PHILADELPHIA ELECTRIC COMPANY
2301 MARKET STREET
P.O. BOX 8699
PHILADELPHIA, PA. 19101
(215) 841-4000

February 5, 1982

Ms. Marsha Goldberg
U. S. Department of Energy
Economic Regulatory Administration
2000 "M" Street N.W., Room 6114
Washington, D.C., 20461

Ref: Letter from Steven E. Ferguson, DOE, to E. G. Boyer, Philadelphia Electric Company, dated January 18, 1982, on Draft Northeast Regional Environmental Impact Statement

Dear Ms. Goldberg:

In response to the above referenced letter, we are providing the following answers to the four (4) groups of questions in reference to Cromby Unit No. 2 only:

1. Philadelphia Electric Company is actively considering reconverting Cromby Unit #2 back to coal firing. No other units on our system are being considered.

2. Cromby Unit No. 2

PEC-I

	Oil	Coal
Stack Height (ft.)	300 ft.	300 ft.
Stack Diameter (ft.)	14 ft.	14 ft.
Exit Velocity (fps)	66.0	65.0
Exit Temperature (°F)	278	278
Discharge (cfh)	36.6 (10^6)	36.0(10^6)

Coal Characteristics

Heating Value	13,000 BTU/lb.
Sulfur Content	2.0 Wt.%
Ash Content	8-10 Wt.%
Moisture Content	5-8 %
Volatility	35 %
Grindability	55 Hardgrove

PEC-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

3. No meteorological data is being provided at this time.

4. To convert Cromby Unit No. 2 to coal would require a SIP change or an alternate emission reduction plan, such as a "bubble" pursuant to:

 Commonwealth of Pennsylvania
 Title 25 Rules and Regulations
 Department of Environmental Resources
 Section 127.81

In reference to the Draft Northeast Regional Environmental Impact Statement (EIS), we have no record of receiving the document in November 1981. Following receipt of the referenced letter, we requested a copy which we received on January 28, 1982. A cursory review has shown that the EIS contains numerous errors concerning the four (4) Philadelphia Electric Company units. Since the Company is actively considering converting only Cromby Unit 2, we have not undertaken a detailed review of the other Philadelphia Electric Company units treated in the Draft EIS. In the limited time available, we have not been able to complete a detailed review of the Cromby Unit 2 material. We anticipate being able to complete our review and provide you with our detailed comments relating to Cromby Unit #2 by March 1, 1982.

If you have any additional questions, please call Walter J. Lenard, 841-5179.

Very truly yours,

Walter J. Lenard for WBW

W. B. Willsey
Director
Environmental Affairs

WJL:htr

PHILADELPHIA ELECTRIC COMPANY
2301 MARKET STREET
P.O. BOX 8699
PHILADELPHIA, PA. 19101
(215) 841-4000

1881 . 1981

March 1, 1982

Ms. Marsha Goldberg
U. S. Department of Energy
Economic Regulatory Administration
2000 M St., N.W., Room 6114
Washington, D.C. 20461

Ref: Draft Northeast Regional Environmental Impact Statement
DOE/EIS-0083-D

Dear Ms. Goldberg:

In my letter of February 5, 1982, I indicated that we would be able to provide additional comments on the above referenced document as they related to Philadelphia Electric Company's Cromby Station.

PEC-2 In the course of reviewing that document, it has become evident to us that there may be some confusion in the Department between Cromby Unit #1 and #2. Cromby Unit #1 is presently operating under a Consent Order between the EPA, Pennsylvania Department of Environmental Resources and Philadelphia Electric Co.. Cromby Unit #2 is operating in compliance with the current federally approved SIP and has been issued a Prohibition Order under ESECA by the Department. Discussions had been held in 1980 with the Department and Science Applications, Inc. concerning the preparation of an individual Environmental Impact Report for Cromby Generation Station. The case manager at that time was Mr. Darshan Bhatti. Subsequently, we answered a list of questions and these were sent to the next case manager, Ms. Heather Gale, dated March 9, 1981.

Attached please find a list of errors contained in the Draft Northeast Regional Environmental Impact Statement concerning Cromby Unit #2. If you have any questions, please call W. J. Lenard, 215-841-5179.

Yours truly,

W. B. Willsey
W. B. Willsey
Director
Environmental Affairs

WJL:htr

PEC-2 The information supplied has been used to develop the scenarios described and discussed in Section 2.

ERRORS CONTAINED IN DRAFT NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT DOE/EIS-0083-D CONCERNING PHILADELPHIA ELECTRIC COMPANY'S CROMBY UNIT NO. 2

1. Page 3-16, Table 3.7

   Existing Coal SIP 0.6 lb. $SO_2/10^6$ Btu

   This is the limitation which existed prior to October 1, 1978. Current SIP is 0.90 lb. $SO_2/10^6$ Btu 30 day running average.

   Proposed Limitations 3.70 lb. $SO_2/10^6$ Btu

   This value is a temporary limitation contained in a court approved Consent Decree for Cromby Unit No. 1, not a proposed change to the SIP.

2. Page 5-6

   Same as 1.

3. Appendix F, Page 4, Table F.2

   Oil SIP 0.60 lb. $SO_2/10^6$ Btu

   Current SIP effective August 1, 1979 is:

   Oil 1.0% Sulfur by weight No. 6 Oil

   Coal SIP 0.60 lb. $SO_2/10^6$ Btu

   Current SIP effective August 1, 1979 is:

   Coal 0.90 lb. $SO_2/10^6$ Btu 30 day running average.

4. Appendix F, Page 6, Table F.3

   Oil SIP 0.6 lb. $SO_2/10^6$ Btu

   Current SIP effective August 1, 1979 is:

   Oil 1.0% Sulfur by weight No. 6 Oil

5. Appendix F, Page 6, Table F.4

   Coal SIP 0.6 lb. $SO_2/10^6$ Btu

   Current SIP effective August 1, 1979 is:

   Coal 0.90 lb. $SO_2/10^6$ Btu 30 day running average.

6. Appendix G, Page 2, Table G.1

   Oil SIP 0.60 lb. $SO_2/10^6$ Btu

   Current SIP effective August 1, 1979 is:

   Oil 1.0% Sulfur by weight No. 6 Oil

   Coal Burned per Year 444 (10^3 tons)

   It is estimated that with the unit generating at a capacity factor of 61% the amount of coal burned would be 400 (10^3 tons). (See correspondence to Ms. Heather Gale, DOE, dated March 9,1981, answer #1.)

7. Appendix G, Page 3, Table G.2

   Coal SIP 0.60 lb. $SO_2/10^6$ Btu

   Current SIP effective August 1, 1979 is:

   Coal 0.90 lb. $SO_2/10^6$ Btu 30 day running average.

8. Appendix G, Page 4, Table G.3

   Coal Burned per Year 444 (10^3 tons)

   It is estimated that with the unit generating at a capacity factor of 61% the amount of coal burned would be 400 (10^3 tons). (See correspondence to Ms. Heather Gale, DOE, dated March 9, 1981, answer #1.)

9. Appendix G, Page 5

   Emission Limitation 3.70 (lb. $SO_2/10^6$ Btu)

   This value is a temporary limitation contained in a court approved Consent Decree for Cromby Unit No. 1, not a proposed change to the SIP.

WJL/ct
3/1/82

PSNH PUBLIC SERVICE
Company of New Hampshire

February 3, 1982

U. S. Department of Energy
Economic Regulatory Administration
2000 M Street, N.W., Room 6114
Washington, D.C. 20461

Attention: Marsha Goldberg

Dear Ms. Goldberg:

The following information is submitted in response to Steven Ferguson's January 18, 1982 letter concerning the Northeast Regional Environmental Impact Statement for the conversion of 42 Power Plants from oil to coal. I will respond to Mr. Ferguson's questions in the order which they appeared in this letter.

PSNH-1

1. Public Service Company of N.H. is still actively considering coal conversion for Schiller Station Units No. 4, 5, and 6.

2. Operating charateristics of these 3 similar units will remain relatively unchanged after conversion to coal. Approximate values for the parameters you requested will be as follows:

   Number of stacks - 1 per unit
   Stack height - 226 feet above ground elevation
   Stack inside diameter at point of discharge - 8 feet
   Exit gas velocity - 74.2 feet per second

   The three boilers will be converted to dry bottom operation. Although the coal's ash content, sulfur content, and fusion temperature will have to meet certain restrictions, no specific type of coal will be required.

3. No recent background air quality monitoring data is available.

4. Sulfur dioxide emissions from the converted units will be controlled by controlling the coal sulfur content. A limitation of 1.3 pounds of sulfur per 10^6 BTU's has been established by the State of New Hampshire Air Resources Commission. This corresponds to .655 tons of sulfur dioxide per hour for each unit at full load. Alternately, at an 85% yearly capacity factor, each unit will omit 4,879 tons of sulfur dioxide per year. No change will be required in the New Hampshire SIP in order to implement these coal conversion plans.

If you have any questions, please contact Jeffrey B. Lander, Results Supervisor at (603) 669-4000, extension 2390.

Very truly yours,

Warren A. Harvey
Vice President

WAH/dd

1000 Elm St., P.O. Box 330 Manchester, NH 03105 Telephone 603/669-4000

PSNH-1 **The information supplied has been used to develop the scenarios described and discussed in Section 2.**

PSE&G

Public Service Electric and Gas Company 80 Park Plaza Newark, N.J. 07101 Phone 201/430-7000

January 29, 1982

Ms. Marsha S. Goldberg
Department of Energy
Office of Fuel Conversion
Economic Regulatory Administration
2000 M. Street, NW
Room 3322
Washington, DC 20461

Dear Ms. Goldberg:

COMMENTS ON DOE DRAFT NORTHEAST REGIONAL EIS
CONVERSION - 42 PLANTS TO COAL

PSE&G appreciates the opportunity to comment on the Draft Northeast Regional Environmental Impact Statement (EIS) "The Potential Conversion of 42 Powerplants from Oil to Coal or Alternative Fuels" and recognizes the difficult job of assembling the various sets of data and compiling it into an overall report on this complex subject. The Company agrees with the report's statement "that SO_2 concentrations per se do not present a serious problem with regard to health effects" and furthermore that "it is doubtful that the proposed fuel conversions will worsen the existing sulfate" levels.

The Company wishes to reemphasize a comment made on August 12, 1980 in a letter to Mr. Steven Fergenson of your agency on the pending Northeast Regional EIS. Our quote from that letter follows:

PSEG-1

> We urge that the EIS include different scenarios based upon varying the number of converted power plants. The conversion to coal of 42 power plants would be a maximum number and would in all probability not be the most likely case. It is highly unlikely that all 42 plants would receive final orders since some will receive exemptions from the order and others will be retired rather than converted. Hence, the EIS should be written for various scenaries including "most likely case" (equivalent to the list in the Senate version of the "Oil Backout" legislation) and also a scenario for a "minimum conversion case".

PSEG-1 See Section 2.

The Energy People

Currently, there is even a greater need than there was in August 1980 for the EIS to consider scenarios that include less than the 42 plants. With the decreasing emphasis in the Reagan Administration on the issuance of prohibition orders coupled with difficulty of raising capital being experienced by all companies, especially electric utilities, it becomes extremely improbable that anything close to 42 power plants in the northeast will be converted to coal. Plants have been included in the study despite company spokesmen having publicly stated the unlikelihood of those plants being converted. An example is the Northport Station operated by LILCO. Under the Omnibus Budget Reconciliation Act of 1981, DOE is not permitted to issue a prohibition order for a plant if the owner/operator has not certified to the technical and financial feasibility of conversion.

Hence the draft significantly overstates the environmental impacts. The "minimum conversion case" should include only those units for which utilities have filed permit applications for coal conversion with the remaining units continuing on oil.

The Company believes that since the report indicates that 42 plants can convert to coal with "very few regional cumulative or interactive impacts" that it can be assumed that a lesser number of plants could convert without affecting adversely the environment of the area.

In addition, we have the following specific comments on this report:

Page 1-1 and Table 1.1

The report indicates that the list of plants was reduced to eliminate "all units over 25 years of age" however, this does not seem to be the case. Applying this criteria should have resulted in the removal of the following PSE&G units: Kearny 7 & 8; Sewaren 1, 2, 3 & 4 as well as a number of units owned by other Companies.

Page 2-5 - Table 2.1

PSEG-2 The megawatt capacity of Kearny 7 is 146.

Page 3-2 - Fig. 3-1

PSEG-3 The graph appears to be based upon national average fuel prices, as from the FERC Form 423. We believe it would be more realistic to utilize data from the Northeast only, the region in question. This should be further broken down to examine prices paid for fuel of a specific quality, since this can vary considerably even within a particular region. This would result in both higher coal and oil prices.

PSEG-2 This error is acknowledged, and the information is given correctly in Table 2.1.

PSEG-3 Figure 3.1 of the DEIS is based on data from FERC Form 423, and represented the most current information available at the time of the study (1981). An updated version of Figure 3.1 is presented in Section 5, Errata and Addenda. Updated national average statistics were compared with individual state prices (also obtained from the FERC form) to ascertain the extent of the difference. The results indicated that since 1979, coal prices for Northeast utilities have risen from about 9% above the national average to nearly 25% higher than the national average. This is largely attributable to increased shipping costs by Con Rail, since F.O.B. mine cost should be the same for all large-volume utility purchasers.

Page 3-4 - Table 3.4

a. Capital costs for conversion to coal are low for both the non-FGD and FGD (scrubber) cases.

b. Caution should be expressed in this analysis since not only the capital cost but the cost of fuel, both oil and coal, will vary between states based on environmental regulations, transportation costs, etc.

c. Footnote (i) is not entirely correct, a clearer explanation would be: This simplified analysis assumes that the converted plant would only produce an equal amount of energy as it would if it remained on oil. In reality, the converted coal unit would generate more energy because of its lower operating cost and displace not only the energy as a non-converted oil burning unit, but energy from other units having higher operating costs than the converted unit.

d. It should be recognized that the capacity factor of a converted coal unit would be dependent on not only the characteristics of that unit, but on the generation mix of the utility system and of the associated power pool and the number of units converted. Therefore, although a unit may have a fairly high capacity factor when converted to coal and the conversion is economically justified, the law of diminishing returns may cause subsequent conversions to be uneconomic.

Oil prices in the Northeast base stayed at about the national level since 1979 and were substantially less than in the Midwest and western north-central states. They actually declined about 8% between December 1980 and December 1981.

Although natural gas prices in the Northeast were still 33% higher than the national average beginning 1982, the gap has closed substantially relative to December of 1980, when northeastern utilities paid a price of 61% higher than the national average.

Price Analogy for Coal, Oil, and Gas for Northeast Region versus Aggregate Prices for Total United States (¢/10^6 Btu)

	Coal	Oil	Gas
Dec. 1979			
New England	153.1	385.8	319.9
Middle Atlantic	128.4	420.1	242.9
United States	129.2	406.3	184.3
Dec. 1980			
New England	164.0	523.7	412.6
Middle Atlantic	145.8	527.6	316.8
United States	137.8	528.6	226.0
Dec. 1981			
New England	226.4	462.7	391.0
Middle Atlantic	164.6	508.0	379.5
United States	156.7	512.8	289.8

Net Average Price Differential for Northeast Region versus U.S. Average Price (¢/10^6 Btu)

	Coal	Oil	Gas
Dec. 1979			
Average U.S.	129.2	406.3	184.3
Northeast Region	140.8	403.0	281.4
Net Diff. as %	+8.9%	-0.8%	+52.7%
Dec. 1980			
Average U.S.	137.8	528.6	226.0
Northeast Region	154.9	525.7	364.7
Net Diff. as %	+12.4%	-0.55%	+61.4%
Dec. 1981			
Average U.S.	156.7	512.8	289.8
Northeast Region	195.5	485.4	385.3
Net Diff. as %	+24.8%	-0.5%	+33.0%

The capital cost figures used in DEIS Table 3.4 were obtained from the literature and from conversations with utility representatives, and represent an acceptable number for this type of analysis. It is understood that all costs used in the study are subject to variation between states as well as among individual sites. At the level of analysis that was undertaken, this type of detail could not be addressed, nor was it required.

Footnote i refers only to the efficiency (heat rate) of the unit. The assumption has nothing to do with the capacity factor, which is what the suggested revision addresses. The assumptions used in determining the capacity factor used in the analysis included those elements suggested by PSE&G in Comment d.

Page 3-5

PSEG-4 The environmental consequence of the "no action" alternative is not necessarily preservation of the status quo. Coal conversions may take place voluntarily.

PSEG-4 The comment is correct; coal conversions can occur voluntarily.

Page 3-19

One of our basic concerns is that in a changing world the data which is used as input to a study of this magnitude becomes outdated rapidly and hence the study is in constant need of revision.

Such is the case regarding predicted SO_2 air quality impact. In the draft the incremental predicted SO_2 impact is superimposed upon monitoring data for 1978. Updating can be and should be made to this analysis. It should utilize the most up-to-date monitoring data. Annual monitoring data for 1979 and 1980 as well as for most of 1981 are available and should be utilized.

PSEG-5

We are specifically concerned with the New York region and are aware that considerable changes have been made in emission sources since 1978 with the result being an improvement in ambient levels. For example, the annual SO_2 level at the CCNY monitoring site was 79 ug/m^3 in 1978, 76 ug/m^3 in 1979 and 71 mg/m^3 in 1980. Superimposing the projected increase for the coal SIP of 5 ug/m^3 on the 1980 annual average at CCNY would indicate compliance not violation.

PSEG-5 This is correct. See Topical Response 3.1 for more information.

PSEG-6 A second concern is that the draft superimposes the worst-case incremental analysis on the closest existing monitored data and assumes this to be the appropriate background data. This assumption is not appropriate given the geographic separation existing between the worst case increment and the existing monitoring point. Complexities existing within ambient air conditions in a highly developed urban area are of such a nature that utilizing a monitor that is "within 20 KM" is too remote for accuracy.

PSEG-6 To predict air quality impacts, the best available data were used to describe ambient air quality. Because there are few monitoring stations, it was assumed that a certain degree of homogeneity in levels of ambient air quality is valid on a scale of 20 km.

There are not sufficient monitoring data to determine the ambient pollution concentrations throughout the region. The use of monitors located farther than a few kilometers from an affected area to characterize that area may result in inaccurate estimates. However, to our knowledge these data are best available, and it is hoped that such monitors represent a reasonable value for an area. Such assumptions further require that the results not be used as point values for comparison with standards, but considered to represent realistic trends in regional air quality. Local air quality will be analyzed in detail in site-specific environmental studies, and the availability of more accurate and specific air monitoring data may be beneficial to those studies.

Page 3-20

PSEG-7 In the section on Deposition Region (reported later in Section 5.1.4), the authors discuss the ASTRAP model, its use in modeling sulfur transport and transformation to sulfate, and lack of ability to model long-range transport of nitrogen oxides and formation of nitrate. They go on to say "ASTRAP simulation of relative increases of sulfur deposited by wet processes are thus used instead for the relative increase of acid precipitation". On the next page (also repeated in Section 5.1.4) the authors directly contradict the previous discussion by stating, "As a result of the air quality modeling of the long-range transport of sulfate and nitrate (see Section 5.1.4), it is predicted that there will be an increase in acid deposition of up to 6% under worst case conditions (the modified coal SIP)".

PSEG-7 The reviewer is correct; nitrate deposition was not modeled. See Response CLF-8.

PSEG-8 Page 3-22 and 3-23

Table 3-11 and 3-12 are identical.

PSEG-8 Table 3.12 in the DEIS should be replaced with the correct Table 3.12 given in the Errata and Addenda section (Sec. 5) of this FEIS.

Pages 3-22 and 5-45

PSEG-9 The draft report recognizes the problems of disposal of combustion byproducts as well as the variety of possible disposal solutions in the State of New Jersey.

Disposal of fly ash and bottom ash can probably be accommodated in this State. However disposal of sludge from a nonregenerative scrubber, because of the larger volume and undesirable waste characteristics, could be a major problem. This concern would force utilities in New Jersey to use expensive and nonproven regenerative scrubber technology, if FGD systems were found to be necessary.

PSEG-9 The quantity of sludge previously estimated for the candidate plants in New Jersey has been reduced by about 30% because of the SIP changes (see Sec. 2). Under the Voluntary Conversion Scenario, which includes the conversion of only four instead of seven plants in New Jersey, the volume of sludge is much further reduced (see Sec. 2). Only the Sayreville station would be generating an estimated 3.3 x 10^6 ft^3 of sludge per year. Officials of Sayreville indicated that the utility intends to dispose of the waste materials offsite at a landfill about one mile from the plant. Therefore, disposal of scrubber sludge is not expected to be a problem in New Jersey.

Page 3-29

PSEG-10 The report states "an analysis of trends and sources of pollutants suggests that in terms of mitigated measures, the primary emphasis should be on nitrogen oxide emissions." This analysis appears not to be substantiated by any data in this document nor by existing air monitoring data for New Jersey and the New York City area. Annual levels of NO_2 are being met, the levels are trending down and the latest information is that the Federal government is not considering issuing a short term NO_x standard. Hence this reference should be deleted from the report.

PSEG-10 Comment acknowledged. It is agreed that the analysis does not support a conclusion that "primary emphasis ..." on nitrogen oxide emissions is warranted. However, the data do indicate a general trend of increase in nitrogen oxide levels and, furthermore, the Clean Air Act (Sec. 109c) requires USEPA to establish a short term NO_2 standard unless it can be established that "there is no significant evidence that such a standard for such a period is requisite to protect health."

Page 4-32 - Table 4.14

PSEG-11 Regarding footnote (d), significant quantities of water are used only for condenser cooling. Reactor coolant is circulated as a closed loop with minimal losses.

PSEG-11 Comment noted. Footnote (d) of Table 4.14 should read "Primary for condenser cooling."

Page 4-48

PSEG-12 Coal ash sale is highly dependent on construction activity.

Page 4-55 - Table 4.17

PSEG-13 Overpeck Creek is not a major river. Our Bergen Station should be grouped with the Hackensack River.

Page 4-65, Table 4-19

PSEG-14 The 1985 planned capacity for Port Reading is estimated at 17.0 million tons per year. This figure is far too high and leads, in later sections (i.e., 5.5.2), to overreliance upon expansion plans at Port Reading. PSE&G would estimate that less than five million tons per year is a more realistic figure. Additionally, no reference has been made to a large coal port which the New York/New Jersey Port Authority is actively planning for the New York Harbor.

PSEG-15 Also, on this table, 1980 actual tonnage is not presented for three Baltimore piers. Those piers did have 1980 capacity.

We question whether all the capacity presented on this table would be for domestic use, or if it will be constrained by export volumes. As export volumes increase, the capacity available for domestic use would decline.

Page 5-33

PSEG-16 The thermal analysis need not be as comprehensive as is given here, since the capacity factors of most units are not significantly raised by coal conversion.

Page 5-62 and 5-63 - Table 5.25 and Table 5.26

PSEG-17 The one or more year delay between the last oil burned and the first coal burned is unrealistic.

Page F-2 - Table F.1

PSEG-18 The Bergen Unit 2 stack is actually 17.5 feet (210 inches) diameter and the exit gas temperature with coal firing is 325°F. We plan on raising the stack height at Burlington No. 7 to 350 feet and it will have an 180 inch diameter.

Page F-4, F-5 and F-6 - Tables F.2, F.3 and F.4

The coal SIP for our Bergen, Burlington and Hudson Stations is 2.20 lb $SO_2/10^6$ BTU. The oil SIP for Burlington is .53 lb $SO_2/10^6$ BTU. Our Kearny 7 unit has a capacity of 146 MW.

Page G-2 - Table G.1

The Burlington 7 oil SIP is .53 LB $SO_2/10^6$ BTU.

PSEG-12 The discussion of coal ash marketing is presented in Appendix I of the DEIS and in the supporting technical report on solid waste disposal (Saguinsin et al. 1981). Further discussion on this issue is presented in Topical Response 3.5 (Waste Disposal).

REFERENCES

Saguinsin, J.L.S., et al. 1981. The Northeast Regional Environmental Impact Study: Solid Waste Disposal Technical Report. DOE/RG-0058. Prepared by Argonne National Laboratory, Argonne, Ill., for the U.S. Department of Energy, Washington, D.C.

PSEG-13 Table 4.17 is corrected in the Errata and Addenda, Section 5.

PSEG-14 At the time of the study, although there had been no public announcement, it was learned from Conrail staff that Conrail had been negotiating to purchase the Port Reading facility. After purchase, the facility was to be completely reconsructed with an estimated new capacity of 17 million tons per year (USDOE 1980). Since that time, the Port Authority of New York and New Jersey has planned the construction of a 10-20 million ton per year facility for the New York Harbor. This facility along with a much more modest expansion of Port Reading will give approximately the same capacity at the New York-New Jersey port as was assumed in the study.

REFERENCES

U.S. Department of Energy. 1980. Transportation Impact Statement Mandatory Coal Conversion for Northeast Utilities. Prepared by Transportation and Economic Research Associates, Inc., Falls Church, Va., for the Office of Fuels Conversion, Economic Regulatory Administration, Washington, D.C. (Draft.)

PSEG-15 One coal facility, the Conrail Pier, was omitted from DEIS Table 4-19. This is corrected in the Errata and Addenda, Section 5. This facility is used for domestic movements only. An ore facility at Port Covington has been used to load coal to deep draft ships from barges. The barges are loaded at the shallow draft side of the Curtis Bay terminal. The coal loading equipment at Port Covington has not been used since 1972. The Canton Terminal being built by Consolidation Coal is under construction but not on line. Island Creek Coal has purchased a pier and plans to build a new terminal.

A tariff provision at public coal transfer facilities provides that "vessels loading coastwise domestic coal shipments shall be given preference over vessels loading for foreign ports." In practice, it means that when there is a queue of vessels waiting to load, the coastwise vessel can go to the head of the line, but cannot displace a vessel that is already in berth and loading. All of the railroad operated transfer facilities have this provision. The provision has a long tradition, but it is too early to determine whether proprietary coal terminals will observe this tradition.

PSEG-16 It is true that the capacity factors of most units are not significantly raised by coal conversion. However, the purpose of the detailed thermal plume analysis is to determine the extent of the cumulative impacts on surface water quality resulting from heated water discharges from coal-conversion plants that are considered likely to create thermal plume interference.

PSEG-17 It is not clear whether the comment is meant to say whether one year is unrealistically short or long. The one year was picked arbitrarily for purposes of scheduling all of the plants to be on-line by 1991. Judgements as to the length of time for each plant were not made. However, it would seem reasonable to assume that 6 months or less would be the shortest time possible, and that it might take some plants as long as 1-2 years to make the final changes for coal use - hence an average of one year.

Page G-3 - Table G.2 and Page G-5

The coal SIP for our Bergen, Hudson and Burlington stations is 2.2 lb. $SO_2/10^6$ BTU with a maximum allowable sulfur content without scrubber in all our plants of 1.5%.

In conclusion we appreciate the opportunity to state our comments and are hopeful that you will give them complete and careful consideration.

Very truly yours,

William Wood

William Wood
Manager - Power Supply Planning

PSEG-18 The information supplied has been used to develop the scenarios described and discussed in Section 2.

PSE&G

Public Service Electric and Gas Company 80 Park Plaza Newark, N.J. 07101 Phone 201/430-7000

February 2, 1982

Ms. Marsha S. Goldberg
Department of Energy
Office of Fuel Conversion
Economic Regulatory Administration
2000 M. Street, NW
Room 6114
Washington, DC 20461

Dear Ms. Goldberg:

NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT
DOE REQUEST FOR ADDITIONAL INFORMATION

In response to your letter of January 18, 1982 concerning the Draft Northeast Regional Environmental Impact Statement we would like to concur with your office that it is crucial that the final statement reflect the most recent planning of the effected utilities.

Public Service in comments submitted on January 29, 1982 and previously on August 12, 1980 emphasized this point and therefore we appreciate this additional opportunity to revise the information from our system which we hope will assist in producing a more realistic final report. PSEG-19

The Company is actively pursuing two units for coal conversion. The NJ DEP air permits have been issued to convert Burlington No. 7. In addition, an air permit application has been submitted for the conversion of Bergen Unit No. 2. This application is awaiting approval. We are not actively working on the conversion of Bergen No. 1, Hudson No. 1, Kearny No. 7 and 8, Sewaren No. 1, 2, 3 and 4 units. For those two facilities that are active potential conversion candidates, Burlington 7 and Bergen 2, we have attached detailed information on the operating characteristics. Some of this data also appears in the previous letter of January 29, 1982.

PSEG-19 The information supplied has been used to develop the scenarios described and discussed in Section 2.

95-2001 (400M) 1-81

The Company does not have any ambient data which is sufficiently current to be applicable to this study. However, we refer you to recent data available both from the NJ DEP and NY DEC. We are very concerned that the recent downward trends in pollutant levels in the New York region be reflected in the final model to more realistically assess the impact of coal conversions. The results from the previous study including all 42 plants shows that the SO_2 addition does not present a serious problem. However, the ultimate results of fewer plant conversions superimposed on lower ambient levels would create a more acceptable scenario and a more encouraging climate for such changes.

In response to your final question, the conversion of Burlington No. 7 and Bergen No. 2 are both catagorized as existing sources which do not require a SIP change. The regulations allow a sulfur level coal of 1.5% provided certain justifications are submitted to the DEP as to acceptable fuel characteristics for the specific boiler. We have applied to burn coal with 1.3% sulfur at Bergen No. 2 and 1.5% sulfur at Burlington No. 7. As part of this justification the Company is required to report to the State semi-annually on efforts to obtain the lowest sulfur coal possible with the required characteristics. We have been able to maintain an average sulfur content coal to comply with these regulations.

We appreciate this opportunity to contribute to the data and assumptions for the EIS being developed for coal conversion in the Northeast.

William Wood

William Wood
Manager - Power
Supply Planning

4.6 PRIVATE ORGANIZATIONS AND INDIVIDUALS

AGA American Gas Association

1515 Wilson Boulevard, Arlington, Va. 22209
Telephone (703) 841-8400

George H. Lawrence
President

February 5, 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, NW
Washington, DC 20461

Dear Ms. Goldberg:

The American Gas Association (A.G.A.) is a national trade association which represents nearly 300 natural gas distribution and transmission companies serving over 160 million U.S. consumers in all 50 states. Natural gas consumed in the U.S., almost all of which is produced domestically, accounts for about 27% of our total energy usage and provides two and one-half times as much end use energy to consumers as electricity. We are pleased to give you our industry's comments on the Draft Northeast Regional Environmental Impact Statement which addresses the proposed action of converting up to 42 powerplants in the Northeast to coal.

AGA-1 We fully concur with the stated objective of the proposed action -- "to minimize or eliminate oil consumption in as many of these units as possible, in compliance with all environmental regulations". It would indeed be wise to shift the Northeast's unhealthy dependence on oil, much of which is foreign, to our most abundant fossil fuel -- coal. However, you have overlooked the potential contribution which natural gas could make in such a coal conversion effort. An alternative to the direct combustion of coal with expensive emission control equipment is to burn coal in conjunction with natural gas. The combustion of natural gas emits no sulfur and virtually no particulate matter; therefore, it is possible to burn some combination of gas and coal (without scrubbers) and maintain air quality. In fact, the combustion of gas and coal in a facility converted from oil could maintain or reduce air pollution levels formerly experienced with oil combustion. Such a combination of gas/coal burning, which we refer to as "select gas use", can be technically accomplished by either burning gas and coal simultaneously in the same boiler unit, or by burning gas and coal in separate boilers

AGA-1 USDOE agrees that in individual cases a mixture of coal and natural gas burned either alternately or concurrently is a viable option for a utility to pursue. Such mixtures might be used either permanently to meet emission requirements or temporarily while additional equipment is being installed to allow increased coal usage. However, such a decision would be plant-specific and would depend in part on such considerations as the economics of the conversion, the capabilities of the natural gas delivery infrastructure, local ambient air quality conditions, and applicable emission standards. As stated in the DEIS (Sec. 3.2.2.2), the four primary scenarios were designed to provide a range of potential cumulative impacts resulting from multiple conversions under various emission limitations, ranging from relatively stringent to less stringent. However, each of the limitations could represent a potential gas/coal mixture for the particular emission limitation assigned to that station. (For example, the 1971 New Source Performance Standards scenario [1.2 lb $SO_2/10^6$ Btu] could represent a 50% gas/50% coal mixture by heat input, using a coal of 2.4 lb $SO_2/10^6$ Btu, or approximately 1.5% sulfur by weight.) Thus, at the appropriate level of analysis for a cumulative study such as this one, the potential ramifications of a gas/coal mixture are adequately represented by the scenarios analyzed. In contrast, it would be a prohibitively complex and impracticable exercise to postulate plant-by-plant emission scenarios representing selective gas use for inclusion in this analysis. However, more detailed consideration of use of such mixtures might be appropriate for site-specific examination, depending on the considerations specified above.

at the same site. In either case, coal would be the primary fuel source with gas contributing probably 20% to 30% of the required energy input.

We have conducted a number of studies on the prospects for select gas use with coal to facilitate the conversion of electric powerplants (studies enclosed). A conversion to select gas use is generally a much less costly option than is continued oil-firing for power generation or conversion to coal with costly environmental clean-up equipment. The conversion of an oil-fired powerplant to select use of gas and coal will significantly lower fuel costs. Also, select use offers a number of advantages over a straight oil-to-coal conversion: lower pollutant emissions; lower capital costs for conversion; lower maintenance expenses; and, a much lower boiler derating factor. The select use concept also offers significant fuel reliability advantages over single fuel units because of the flexibility these units would offer during an emergency (e.g., frozen coal piles). Our views on the potential benefits of select gas use are supported by the recently published book of Professor Alex Green, Director of the Interdisciplinary Center for Aeronomy and (other) Atmospheric Sciences (ICAAS), entitled: An Alternative for Oil: Burning Coal with Gas.

The prospects for select gas use have been enhanced by the continued optimistic outlook for future gas supplies, and by increasingly successful conservation efforts in other sectors which free gas for premium applications, such as select use for environmental compliance. Natural gas exploration and drilling activity is currently at record levels, with gas production from conventional lower-48 states reservoirs leveling off at about 19 trillion cubic feet (tcf) and reserve additions in 1980 equalling nearly a 90% replacement rate. In addition, the outlook for supplemental gas supplies has continued to improve, including Canadian and Mexican gas, coal gasification, gas from unconventional formations and Alaskan gas (see enclosure: The Gas Energy Supply Outlook: 1980-2000). Therefore, adequate gas supplies should be available to satisfy any gas requirements resulting from the application of the select use concept.

In addition, the recent passage of the Omnibus Budget Reconciliation Act of 1981, including the repeal of Section 301 (a) of the Fuel Use Act (1990 off-gas ban for existing powerplants) and the automatic certification procedure for converting plants as regards New Source Performance Standards (NSPS) in the Clean Air Act, removes legislative barriers which might have hindered select use conversions.

Again, we feel the intent of the draft document is worthy. However, to ignore the select use concept while including consideration of conservation, solar, wind, hydroelectric, cogeneration, wood and geothermal options for oil-fired powerplant conversions is negligent. We strongly urge your consideration of this technically viable and economically attractive alternative -- select gas use -- in your final document.

Sincerely,

George H. Lawrence

GHL:dly

Enclosure

CLF

February 4, 1982

Ms. Marsha Goldberg
Department of Energy
200 M. Street, N.W.
Washington D.C. 20461

Dear Ms. Goldberg;

Enclosed are the original and five copies of the Conservation Law Foundation of New England, Inc.'s comments on the Draft Northeast Regional Environmental Impact Statement on the Potential Conversion of 42 Powerplants from Oil to Coal or Alternative Fuels.

Thank you for your attention in this matter.

Sincerely,

Linzee Weld
Energy Project Director

Conservation Law Foundation of New England, Inc., 3 Joy Street, Boston, Massachusetts 02108 (617) 742-2540

CLF

COMMENTS OF THE
CONSERVATION LAW FOUNDATION OF NEW ENGLAND INC.
ON THE
DRAFT NORTHEAST REGIONAL ENVIRONMENTAL IMPACT STATEMENT
ON THE POTENTIAL CONVERSION OF 42 POWERPLANTS
FROM OIL TO COAL OR ALTERNATE FUELS

FEBRUARY 3, 1982

It has taken almost a year and a half to issue this draft Environmental Impact Statement (EIS), and the product of this large amount of time and effort is disappointing. Although the EIS has no single glaring flaw, the number of inaccuracies, inconsistencies, and omissions in the document casts doubt on its usefulness.

Perhaps because of the amount of time it took to issue the draft EIS, some of the input data is out of date. For

CLF-1 example, Table 5.25 (p.5-62) assumes that the Mt. Tom station in Massachusetts will not convert until 1991; coal burning under a Federal Delayed Compliance Order began in December of 1981. Similarly, Table 5.28 (p.5-66) shows no coal use by Massachusetts utilities other than conversion candidates through 1991, even though a voluntary conversion to coal has been completed at the Brayton Point Station. These errors and others which may be found after more thorough examination reduce the reliability of estimates of important parameters such a coal demand and solid waste disposal needs.

CLF-2 Several of the charts in the draft EIS are misleading, especially Table 3.5, which summarizes the environmental impacts associated with the proposed action. (pp.3-12 to 3-13). For

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CLF-1 The information supplied has been used to develop the scenarios described and discussed in Section 2.

CLF-2 The summary table was designed to provide information on those areas where cumulative impacts could occur or where there is insufficient information to indicate that impacts would not occur. This does not negate the fact that there might be site-specific impacts associated with coal burning at a particular plant. These impacts will be addressed in site-specific EISs.

The waste disposal analysis cited in the comment represents a generic analysis of potential impact. The cumulative impacts would be likely to occur only if multiple sites were located on or near the same surface- or groundwater systems, and if the sites were not approved sites. The disposal sites considered in the impact analysis include both currently approved sites and sites with great potential for approval. The results of the analysis indicated that because of the natures of the water bodies, the relative location of the disposal sites, and the utilities' updatd disposal plans, the potential cumulative impacts on both surface- and groundwater systems would be minimal. In addition, the sites that eventually would be selected for waste disposal would be approved sites with minimal leaching problems. This would greatly lessen the likelihood of cumulative impacts. The potential for trace elements released by coal combustion or coal-combustion waste disposal to accumulate in ecosystems is discussed in Responses NYDEC-28 and MDAQC-14 and -17.

example, no site-specific impacts on biotic resources in the combustion region are listed other than possible loss of habitat due to increased limestone mining. The descriptive section presents a more worrisome analysis, however. The text of the EIS notes that "the impacts associated with storage and disposal of ash and FGD-sludge ponds or disposal sites may be unavoidable" (p.5-55) and that "potential long-term impacts on ecosystems could occur if trace elements persist or accumulate to toxic levels." (p.5-56) These concerns and possibly others are hidden from those who rely on the summary table for an accurate representation of the environmental consequences of the conversions.

These are just examples of the inconsistencies and inaccuracies which fill the EIS. In addition to these shortcomings, which will take some effort to correct, specific problems also require attention. Three such types of problems are discussed below.

Economics and Alternatives

The economic analysis in Section 3 concludes that "in all but the most complex and costly conversions, a reconversion to coal is more economical than a new baseload coal-fired facility." This conclusion may be incorrect because the cost analyses of new plants (Table 3.3) and conversions (Table 3.4) use different assumptions about capital charge rates, capacity factors, and operation and maintenance costs. These inconsistencies should either be eliminated or justified. CLF-3

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CLF-3 The "inconsistencies" in the cost analyses between new plants and conversions are explained below.

The capital charge rates for new plants (0.1) and for the conversions (0.15) are a function of plant characteristics. The number is constructed from information on the expected life of the plant and tax treatment. The differences in these elements between new plants and conversions is reflected in the rates indicated. The 0.15 rate for the converted plants theoretically should make conversion less attractive because it is more expensive.

The 0.65 capacity factor for the new plants is based on the assumption that they are base-loaded. The number is one generally accepted by analysts in the field. The 0.50 capacity factor for conversion candidates is an overall average capacity factor based on modeling. This number includes consideration of not only the characteristics of the unit, but also the generation mix of the utility system and of the associated power pool and the number of units converted. The average capacity factor reflects the fact that as more units are converted, the later ones may be run at lower capacity factors than the initial ones.

The operation and maintenance (O&M) costs for the new coal include scrubbing, as do two of the conversion scenarios. The differences in costs when scrubbing is assumed is due to differences in the fixed component of the O&M costs as well as to differences in the capacity factor. The real cost differences are associated with scrubbing versus nonscrubbing.

CLF-4 The EIS dismisses the role of conservation in reducing or eliminating the need for the proposed conversions despite a recent federally-funded study which concludes that the potential for demand reduction in New England remains large. The EIS concludes that "significant contributions from conservation above those indicated by the powerpools would be unlikely." (p.3-30) A June 1981 report of the General Accounting Office (EMD 81-58) found, however, that economically justified conservation measures could reduce 1990 demand to 82 million MWH, about 16% below the projection in the EIS. These results should be reconciled in the final EIS.

CLF-5 The estimated potential for replacing oil-fired generation with alternatives such as solar and wind power and cogeneration is similarly underestimated. The estimates in the EIS were derived using a complicated and perhaps overambitious process whose results are probably no more reliable than the New England Congressional Institute's simple extrapolations from well-developed estimates of current use of alternatives. The 1981 NECI report noted that there were 11,000 solar units operating in New England in 1980; the technical report on conservation and alternatives found that the 1990 penetration of photovoltaic and solar thermal units combined would be between 1,000 and 13,000 units. NECI's 1985 projections are generally higher than the 1990 figures in the EIS. Again, these discrepancies must either be resolved or explained.

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CLF-4 The large energy savings in the GAO study are obtained exclusively by strict regulatory and legislative actions. For example, the GAO study assumes that electric resistance space heating would be banned by legislation, not phased out as a consequence of economically justified conservation measures. The major portion of the savings is from higher efficiency appliances retrofitted into the residential sector. Higher-efficiency appliances may be purchased as the opportunity arises to replace an original, but not as retrofit due to a poor payback. Since refrigerators account for a major portion of 35-45% of NEPOOL appliance load, the evidence presented in EDF-1 argues against savings as high as the GAO report suggests.

CLF-5 The commentor's reading of NECI report is in error. On page 34, 6,200 active residential and 515 active commercial units were reported in 1980. The balance of the 11,000 total is passive solar. Since only 9% of NEPOOL, 7% of NYPP, and 10% of the PJM housing stock has electric water heaters, only a fraction of the 6,200 units will be on those homes. In NEPOOL, this is about 910 homes; in NYPP, 421; in PJM, 791. See Appendix D, Table D.5 and text for further discussion.

Air Quality

CLF-6 While the EIS does an adequate job of assessing increases in emissions of sulfur dioxide due to the conversions, the potential for rises in levels of particulates and nitrogen oxides is almost wholly ignored. This omission is especially troublesome because the EIS does describe the implications of such rises. According to the EIS, 30% of the particulates released from plants equipped with electrostatic precipitators will be fine particles and "the best available evidence indicates that inhalation of fine particles probably is harmful." (pp. E-8 to E-9) As for nitrogen emissions, the EIS notes that, in the winter, nitrates are as important as sulfates in contributing to acid precipitation.(p.3-20)

CLF-7 The EIS assumes that emissions of particulates will remain at the level of the coal SIP scenario. The total quantity of particulates released from oil-fired facilities, however, is typically 50 times less than that from a coal plant. (p. E-8) If actual emissions from oil units were far below the regulatory limit and emissions during coal-firing rise to the limit, increases in ambient particulate levels will occur. These increases should be estimated in the final EIS.

CLF-8 The draft does acknowledge that emissions of nitrogen oxides will rise 2% and suggests that the primary focus of mitigative measures should be on nitrogen oxides. (pp.3-28 to 3-29) The only mitigation discussed in the EIS is for sulfur dioxide, however. In addition, increased production of nitrates is omitted in assessing the effect of the conversions on acid precipitation. (p.5-14)

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CLF-6 **Particulate emissions are discussed in Response NJDEP-3. Nitrogen oxides have been modeled and the analysis is discussed in Topical Response 3.1.**

CLF-7 See Response NJDEP-3 and Topical Response 3.1.

CLF-8 The DEIS and Topical Response 3.2 have focused on the long-range transport and deposition of sulfur oxides rather than nitrogen oxides because the state-of-the-art in modeling the former is more advanced. The extrapolation of a percentage increase in sulfur deposition to a percentage decrease in rainfall pH is conservative, in the sense that sulfur compounds seem to account for only about two-thirds of the acid depoition in the Northeast, unless the relative increase in emission of oxides of nitrogen is significantly greater than that for sulfur (See Topical Response 3.2). Mitigative methods applicable to nitrogen oxide production are discussed in Response NYDEC-10.

Coal Supply and Waste Disposal

CLF-9 The EIS never addresses one of the major cumulative impacts of the conversions: increased demand for low sulfur coal. The initial discussion on coal supply notes that a 1.2 lb/MBtu sulfur-in-fuel limit "would potentially strain the search for low-sulfur coal" and contends that this problem was evaluated by the DRI model. (p.4-58) The discussion on combustion wastes presented later simply assumes that such coal will be available. (p. G-1) The discussion of the model provides no justification for either statement, however.

CLF-10 The appendix which describes sources of coal for the conversion states only that, with regard to lower sulfur fuel, "we believe that there is sufficient flexibility in Appalachia to meet the incremental demand." The EIS does caution that this assessment is based on a preliminary analysis which ignores factors such as "specific availability of coal from various regions."(p. J-3) The correct forum for determining whether enough low sulfur coal from Appalachia is available to meet the incremental demand over the life of the conversions is the regional EIS, not the site-specific documents. Such an evaluation must be added to the final EIS.

CLF-11 Additional evaluation is also needed on the impacts due to groupings of certain waste disposal sites. The EIS states that "three areas of glacial aquifer are considered to pose problems of cumulative or interactive impacts due to combustion waste disposal and would need more thorough investigation to define the extent of the impacts." (p.5-39) Where else but the regional EIS can such an analysis be conducted?

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CLF-9 See Topical Response 3.8.

CLF-10 See Topical Response 3.8.

CLF-11 The three areas of glacial aquifer previously considered to pose possibilities of cumulative or interactive impacts due to combustion waste disposal include the aquifers along the Connecticut River in Massachusetts and Connecticut, along the Hudson River near Albany, New York, and in northeastern New Jersey, respectively. Of all the disposal sites located on the glacial aquifer along the Connecticut River, only one (in Massachusetts) was considered a primary candidate site and is likely to be used by both the Mt. Tom and West Springfield stations. In addition, since coal ash has been approved in Massachusetts for use as cover material for sanitary landfills, both utilities have been actively considering marketing coal ash as an alternative rather than relying entirely on disposal. For these reasons, the glacial aquifer along the Connecticut River in Massachusetts would be unlikely to have cumulative groundwater impact problems.

All the disposal sites located along the Connecticut River in Connecticut are existing sites with limited capacity and would probably be used only by the Middletown station. However, this station is not now being actively considered for conversion (see Sec. 2).

Although several disposal sites located along the Hudson River can be used by the Albany station, officials of the utility intend to use an onsite area or an old disposal site about two miles south for waste disposal. Therefore, it is unlikely that there would be any cumulative groundwater impacts in this area.

Further study of the glacial aquifer in the northeastern part of New Jersey indicates that the sand and gravel deposits are distributed mostly as valley fill adjacent to streams and rivers. These deposits, although they have moderate yields, are not generally interconnected. Also, the only candidate plant being actively considered for conversion is the Bergen station (see Sec. 2). Utility officials indicated that the coal ash generated by Bergen would probbly be sold as an intermediate cover material and/or hauled to an offsite disposal area. Therefore, there should be no significant cumulative groundwater impacts in northeastern New Jersey.

Finally, it should be noted that the Voluntary Conversion scenario includes the conversion of only 27 of the 42 plants (see Sec. 1), many of which have SIP changes from those specified in the DEIS, thus greatly reducing the number of plants requiring FGD (see Sec. 2). This would result in a large reduction in quantities of sludge produced.

CLF-12 In all assessments of the impacts of the conversions, the EIS should heed its own warnings. The study finds that solid waste disposal will not cause significant cumulative or interactive impacts "if the disposal sites are properly selected, designed, and constructed." p.5-40) As noted earlier, however, "adequate regulation does not, by definition, imply compliance." (p.4-79) The final EIS should discuss the cumulative and interactive impacts which would result from noncompliance with selected environmental regulations.

CLF-12 As discussed in Section 5.2.3.4 of the DEIS and in Response CLF-11, evaluation of the groundwater and disposal site characteristics and the utilities' updated conversion and disposal plans (see Sec. 2) indicated that the disposal of combustion wastes in the Northeast Region would not likely have cumulative or interactive impacts on groundwater. Therefore, any impacts resulting from noncompliance with selected environmental regulations would be site-specific rather than cumulative.

ENVIRONMENTAL DEFENSE FUND

January 29, 1982

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street N.W.
Washington, D. C. 20461

Dear Ms. Goldberg:

This letter constitutes the comments of the Environmental Defense Fund on the Draft Northeast Regional Environmental Impact Statement on coal conversion. We shall comment on two sections of the DEIS, that dealing with alternative technologies and conservation, and that dealing with air quality impacts and acid rain.

EDF-1

In Section 3.3, alternative technologies and conservation are considered as alternatives to coal conversion. The DEIS notes in Section 3.3.1 that "significant contributions from conservation above those indicated by the powerpools would be unlikely." The EDF has performed two comprehensive studies of conservation and other alternatives, one in the New York Power Pool service area (A New Alternative To Completing Nine Mile Point Unit 2 Nuclear Station: Economic and Technical Analysis, November 1981). In both cases, EDF demonstrated that the utilities had seriously underestimated the potential for conservation penetration, as well as for the penetration of alternative technologies. In light of these studies, it appears that the DEIS has presented an unjustifiably pessimistic picture of alternatives to coal conversion.

EDF-2

In Chapter 5, air quality impacts of alternatives to the proposed action are discussed. The chapter is seriously deficient in its failure to consider any alternative which involves no SO_2 emissions increases. The Mitigative Analysis and Oil SIP alternatives involve more than 200,000 ton SO_2 increases, annually. In light of the regional acid deposition problem, this increase is intolerable. Furthermore, since the relationship of the proposed conversions to Clean Air Act NSPS requirements is unclear at this point, some of these conversions could be forced to apply these emissions limitations, which are far stricter than the "1971 NSPS" alternative. Therefore, an analysis of the impact of NSPS is appropriate, along with an analysis of a "no emissions increase case." All of these analyses should be accompanied by cost analyses which illustrate the relative advantages of FGD vs. burning low-sulfur coal.

Sincerely,

Michael Oppenheimer
Senior Scientist

MO/mlr

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EDF-1 The commentor assumes overly rapid penetration of residential and commercial conservation improvements. Some improvements suggest major changes in residential purchasing philosophy (e.g., incandescent lamp vs. 3-4 year payback flourescent). Obstacles to residential payback benefits such as occur for occupants of master-metered apartment dwellers are ignored. The refrigerator example was not representative of weighted average characteristics of stock purchased by the public. Further evidence presented in Appendix D.5 suggests that the refrigerator efficiency argument may be overstated. Consumers have shown a tendency to purchase newer units that have more volume or extra gadgets. While energy efficiency has improved, the actual electricity usage remains the same or in some cases actually increases. The utility and consumer acceptability of voltage reduction is overstated and is at best a temporary and controversial measure. Voltage reduction controls (e.g., light dimmers) are currently limited in end use potential and in terms of economic acceptability of a major portion of market.

EDF-2 The Oil SIP Scenario involves no increase in SO_2 emission rate, with all annual increases due solely to changes in unit capacity factors. For most of these facilities, the Oil SIP emission limitation represents a realistic lower limit of SO_2 emissions following conversions, given the present state-of-the-art in SO_2 emission abatement equipment.

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November 20, 1981

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street NW
Washington DC 20461

Dear Ms Goldberg:

I received the copy of your Draft Northeast Regional Environmental Impact Statement on the conversion of 42 power plants from oil to coal. It would appear that this impact statement must have cost a lot of money and I know it has taken a lot of time and it only confirms what was apparent before it was made.

MI-1 *It is surprising though, that the statement in its summary, does not mention the very substantial advantages derived from the conversion in question, which are as follows:*

1. Increase in employment in the coal fields.

2. The double effect of many hundreds of millions of dollars per year remaining in the US economy, along with the corresponding substantial improvement in the US balance of trade.

3. The lowering of the energy costs for the entire areas involved, which in itself has the dual effect of providing relief to the consumer and allowing for lower manufacturing costs. Naturally, this in turn will result in a down scaling of the inflationary pressures.

MI-1 All of these favorable economic effects are certain to occur to some extent. They would occur gradually and, on a regional basis, would be quite small, particularly in the regions affected directly by electricity generation facilities. The effect would be greater in the fuel supply regions. The effect of the conversion on electricity prices also would be small, since if all 42 plants converted, less than 15% of total generating capacity would be involved in conversion. Actually, it appears from recent information that less than 10% of the Northeast capacity will actually convert.

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November 20, 1981

Ms. Marsha S. Goldberg

Considering that there are no detrimental effects to speak of by the conversion and in view of the enormous advantages to be gained by it, it would seem to me that we should now proceed at once, as fast as possible with this conversion and for once I would hope to see the Governmental bureaucracy show that it can operate efficiently, and effectively.

I am afraid, however, that progress to a resolution of the situation will proceed at a snail like pace, (if we ever do carry out the conversion), during which time the Arabs will be getting rich at our expense. I hope I can be proved wrong.

Sincerely yours
MINIGRIP, INC.

Steven Ausnit
President

sa:fp

4-220

GUY V. MOLINARI
17TH DISTRICT, NEW YORK

COMMITTEES:
PUBLIC WORKS AND TRANSPORTATION
SMALL BUSINESS

Congress of the United States
House of Representatives
Washington, D.C. 20515

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December 29, 1981

Ms. Marsha S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street, N.W.
Washington, D. C. 20461

Dear Ms. Goldberg:

Enclosed are comments submitted with regard to the draft Environmental Impact Statement on the Conversion from oil to coal of 42 power plants in the Northeastern United States.

I would greatly appreciate your courtesy in making this part of the record for the preparation of the final EIS.

Thank you for your cooperation.

Very truly yours,

Guy V. Molinari
Member of Congress

GVM:law
Enc.

The draft Environmental Impact Statement addressing the potential conversion of up to 42 Northeastern power plants from oil to coal is cause for serious alarm. As the United States Congressman representing the 17th District in New York State comprising Staten Island and lower Manhattan, my District is affected by the proposed conversion of 2 Con Edison plants from oil to coal, as well as the construction of a new coal power plant by the Power Authority of the State of New York in the same area. While I understand that the purpose of this EIS is to address cumulative and interactive impacts of the coal conversions, I cannot help but feel that the needs of my area have been dispassionately evaluated with little or no regard to the health implications of the proposals being considered.

I make specific reference to statements made throughout the EIS that:

GVM-1
- Sulfur dioxide, particulate and ozone levels in the ambient air surrounding New York City will be at or above the air quality standards after the coal conversions will have taken place.

GVM-2
- There is no way to project the health impacts of the following emissions: nitrogen oxides, trace elements and polycyclic organics, and that EPA has not established standards for these substances.

GVM-3
- The future economic growth of our region may be hindered because these coal conversions will consume most or all of the increments permitted before violation of Clean Air standards.

GVM-4
- Health impacts of particulate emissions are expected to be minimal because of declining ambient levels and the use of pollution control devices.

I find it difficult to be comforted by DOE's assurances that the conversions will have little or no health impacts when New York City's ambient air quality is, by DOE's own admission,

GVM-1 The predicted pollutant concentrations, incorporating additional ambient air quality and source input data, are presented in Topical Response 3.1. These latest estimates indicated SO_2 concentrations at or below standards. Total particulate matter concentrations should not change after the conversions have taken place. It is impossible at this time to accurately predict changes in ozone concentrations.

GVM-2 Refer to Topical Response 3.7.5, 3.7.7, and 3.7.8.

GVM-3 The effects of these conversions on available PSD increments would depend upon site-specific determinations, and cannot be estimated at this time.

GVM-4 See Response MDAQC-9 and Topical Response 3.7.3.

GVM-5 on the verge of serious contraventions of health standards. It is important to add that the EPA is now also grappling with the issue of carbon monoxide levels in New York City, another pollutant which contributes to our horrendous air quality. I am also distressed at the statement that it is difficult to make health assessments for specific types of pollutants because this is an issue on which the EPA has

GVM-6 not responded. Because of this, pollution within my District has already exacted a serious toll on the health of my constituents.

GVM-5 Conversion to coal under the proposed action would not result in any significant increase in CO concentrations. The majority of these emissions are from motor vehicles. The interaction between the high levels of CO that occur along transportation corridors in urban areas of the Northeast with other pollutants released by coal-fired powerplants is discussed in Topical Response 3.7.11 and Appendix C.11. See the revised health analysis in Topical Response 3.7 and Appendix C for a complete discussion of the health effects of non-criteria pollutants.

GVM-6 According to the New York City Department of Health, age-adjusted respiratory cancer death rates for Staten Island, the Lower West Side of Manhattan, and portions of Western Brooklyn have been consistently higher than the rest of New York City and the State of New York. The rates in average annual age-adjusted respiratory cancer death rates in Staten Island in 1974-76 are higher than national averages during 1975. These areas have historically had high respiratory cancer rates.

Without demographic and socioeconomic data, information on smoking habits and type of employment, it is impossible to identify the etiologic agent.

Organic compounds, sulfur oxides, and trace metals present in air pollution have all been suspected of causing cancer in humans. Particulate matter emitted by a coal fired power plant subjected to *in vitro* mutagenesis assays resulted in the identification of mutagens (Crisp *et al.* 1978). Commoner et al. (1978) identified mutagens in air samples taken from Chicago. Particulate extracts have also produced carcinomas in mice upon skin painting (Kotin et al. 1954; Clemo et al. 1955). Extracts of particulates from gasoline engines, diesel engines and chimney soot have all showed carcinogenic activity in mammals (Brune 1977; Pott et al. 1977; Campbell 1939). Studies by Laskin et al. (1970, 1976) indicate a potential mutagenic effect in rodents upon exposure to test atmospheres containing 26.2 mg/m^3 SO_2 and 10 mg/m^3 benzo(a)pyrene. However inadequacies in experimental design make these conclusions highly tentative.

Beryllium, cadmium, cobalt, chromium, iron, nickel, lead, zinc and titanium have all been associated with carcinogenesis in animals (Walsh et al. 1981). Molybdenum and manganese are possible mutagens (Walsh et al. 1981). Several studies have found an association between B(a)P concentrations in the atmosphere and increased cancer rates in human populations. Several others have not (Walsh et al. 1981).

In summary, several constituents of air pollution have been associated with cancer induction in a variety of test systems, in human occupational settings and in community studies. However, the evidence is only suggestive that an association exists between community air pollution and human cancer and is often contradictory. As with occupational and community studies reported earlier, because of the long induction period of respiratory cancer, if air pollution does cause cancer it is likely that historical exposures have led to the excessive cancer rates presently occurring. Due to the small increase in SO_2 and particulate emissions from the coal conversion program resulting in atmospheric concentrations much lower than historical levels, no increased risk of cancer is expected to result from fuel conversion. For additional information see the discussion of organic compounds in Topical Response 3.7.

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GVM-7

Control techniques for particulate matter, particularly electrostatic precipitators, simply do not do the job. As indicated in the appendix to the EIS, these precipitators are inactive in removing from stack emissions the small particulates laden with toxic substances that are capable of penetrating the human respiratory tract. While control efficiency as a whole is approximately 99%, the control of this crucial group of respirable particulates is approximately 50%.

GVM-7 See discussion on respirable particle incremental increases from fuel conversion (Appendix C) and the associated health analysis in Topical Response 3.7.

GVM-8 The results of modeling on SO_2 emissions indicate contravention of federal ambient air quality standards. Yet, EPA has mandated in our region a test burn of high-sulfur oil to gauge the effects of future conversion to coal. Although EPA and Con Edison insist that the effects of this test burn are insignificant, The New York Times reported on September 20th that it has effectively used the entire allowable PSD increment at various locations in New York. What is even more significant is that they have reached these high levels even though they have been operating at only 38% of their capacity. This, indeed, suggests that the test burn, as designed, is not an accurate barometer and that in order to achieve consistency with the computer models developed through the DOE EIS, more extensive air quality monitoring and utilization of the plants in question should be required.

GVM-9 The community of Staten Island is directly adjacent to an area of New Jersey which is heavily industrialized and which harbors approximately 20% of the nation's petrochemical industry. The emissions of the refineries and factories across the Arthur Kill persistently are carried over the Island by prevailing winds thus bringing problems of odors and discomfort among many of my constituents. But the problems do not end there. The New York City Health Department has completed a study which strongly suggests that pollution levels on Staten Island are responsible for extremely high rates of respiratory disease which exist on the Island -- the highest rate for this type of disease in New York City, and much higher than the national average.

To add an additional burden such as the coal conversion suggested would be devastating. The EIS addresses at great length the interactive effects of coal combustion within a region, but I can refer to a report which all too graphically enunciates the problems we are going to be facing. This report was undertaken by EPA and analyzes the present and future impact of coal power plants on the citizens and environment of the Ohio River Valley. The report is entitled "The Ohio River Basin Energy Study" (U.S. Environmental Protection Agency, Office of Environmental Engineering & Technology, Washington, D. C., EPA 600/7-81-008 - January 1981).

GVM-8 More extensive monitoring would be reuired to unambiguously define the effects of the test burn.

GVM-9 See Response GVM-4.

See Response NU-5. The quantitative health analysis in the ORBES report was probably based upon regression models developed by Morris et al. at Brookhaven National Laboratory. Such an analysis is based upon the assumption that incremental increases of TSP, SO_2, sulfate, or some other indices of air pollution induce chronic respiratory and/or cardiovascular disease in exposed populations. The epidemiological studies upon which these conclusions are based have been discredited by the USEPA Science Advisory Board in preparation of the new Criteria Document for Particulate Matter and Sulfur Oxides and others as not providing reliable quantitative results either because of methodological, instrumentation or interpretive errors.

In addition, see Topical Response 3.7.

The evidence contained within this document is comprehensive and the conclusion shocking. This independent study, mandated by the U. S. Senate Appropriations Committee and conducted by over 100 university faculty members from Mideast colleges who consulted with labor, business and environmental groups, concluded that, if coal continued to dominate the area and pollution control requirements remained unchanged, 163,000 people in the affected area could die before the year 2000 from sulfate-associated respiratory disease. However, even if strict pollution control laws were in effect in the region, the mortality estimates only declined to 109,000 according to the study.

This is the policy that we are pursuing, and it is entirely unacceptable. To knowingly add the proven factors of sulfates and toxic-laden particulates to the already intolerable levels of pollution in our air, will have lethal consequences.

The use of coal in urban areas which are already heavily burdened is clearly inappropriate, but the conversion of up to 42 plants can create the same type of conditions that have caused untold mortality in the region of the Ohio River Basin.

The reduction of dependence on foreign oil is, indeed, a major concern. The scope of this EIS, however, demands that decisions be made as to the desirability of accelerating usage of coal.

DOE's obligations, under section 102 (C) of the National Environmental Policy Act, are to ensure that:

a) The environmental impacts of the proposed action are evaluated.

GVM-10 b) Alternatives to the proposed action are enumerated.

c) A statement is made as to any irreversible and irretrievable commitments of resources which would be required by the proposed action.

d) Study and development of alternatives are performed when unresolved conflicts arise concerning alternative uses of available resources.

GVM-10 The underlying purpose of an environmental impact statement is to provide decision-makers with information on the environmental effects of a range of potential actions so that trade-offs can be made. The Fuel Use Act was designed to promote a reduction in the use of oil by powerplants and industries, by prohibiting its use and by encouraging the use of coal and other alternate fuels. The Northeast Regional Environmental Impact Statement (NEREIS) provides USDOE with information on the environmental impacts associated with the burning of coal and other alternate fuels as well as information on approaches to reducing oil use.

The regional environmental analysis was designed to provide a broad environmental framework within which individual site-specific decisions can be made. The document focuses on identifying problem areas associated with multiple conversions and suggests techniques for mitigating the potential impacts. These techniques would be applied at the site-specific level.

The regional EIS also assesses the potential contributions that coal and alternate technologies can make to the overall reduction in oil demand. The analysis (pages 3-30 to 3-36) in the DEIS indicates that the contribution of conservation and alternative technologies to oil reduction is small, and that coal conversion results in the largest oil savings. The heavy oil dependence of New England and New York indicate that there is enough oil in those systems to accomodate economically coal conversion, conservation, and alternative technologies.

40 CFR 1500.2 (e) demands that NEPA is used to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects on the human environment, and to all practicable means to restore and/or enhance the human environment consistent with national policy.

40 CFR 1502.16 requires that DOE consider the energy requirements and conservation potential of various alternatives and mitigation measures, and the natural or depletable resources requirements and conservation potential of various alternatives.

The regulations and National Environmental Policy Act clearly indicate that it is DOE's responsibility to determine whether the proposed action is the best means available, in environmental terms, to meet the purpose and need of the proposed action -- that is, in reducing our dependence on foreign oil. There must, therefore, be an evaluation as to whether coal combustion is the best technology for the displacement of oil usage, whether any alternatives might achieve this end in a more environmentally acceptable manner, and whether any alternative might have more value in terms of resources depletion, conservation potential and energy requirements.

These comments shall, therefore, focus on the suitability for the combustion of coal in meeting the alleged needs of the proposed action and possible alternatives that may have been overlooked in addressing this need.

Integral to the discussion of oil savings is an evaluation of the relative efficiency by which power is generated for the use of utilities in our nation. Steam generation is a process which cannot, according to the tenets of the Second Law of Thermodynamics, provide for efficient recovery of the limited energy content of the coal resources. According to this law, one cannot obtain 100% efficiency when energy is changed in form. Electric-steam generation, however, is particularly inefficient because it requires a transfer of energy from chemical form to that of heat, to mechanical energy, and finally to electrical capacity. In essence, coal is burned and the heat is transferred to circulating water, which is transformed to steam. This steam is then used to turn turbines, and the turbines are then able to induce electric fields in a generator.

The conversion of energy in the boiler exists at 88% efficiency; at the turbines, 47%; at the generator, 99%. The maximum recoverable efficiency of power plants which generate steam is thus, with current engineering techniques, only about 41%. Plants currently in use operate at an average of only 33% efficiency. Such a situation foredooms us to a 60-67% waste of energy.

This type of waste is even more compelling when one considers the amount of energy that is used to mine and transport the coal, however. It has been estimated that the net energy yield becomes incredibly low, and that almost 30% of the energy value of coal is wasted in finding, mining and transporting it.

At the point of delivery of the electricity, more waste can certainly occur. Losses occur in transmission and in the wiring in homes and businesses. The very appliances or installations that are supplied with energy are also inefficient to some extent. For electric incandescent light bulbs, for example, 95% of the incoming energy is converted to useless heat and electromagnetic radiation. Fluorescent bulbs, however, provide a much improved 20% rate of recovery.

These figures, of course, are valid for oil plants as well as coal facilities.

According to the dictates of NEPA, we must treat coal as a finite resource in the same manner which oil has been classified. Electric generating power plants, however, are grossly inefficient and cannot be projected as the best means by which we can make greatest use of limited resources. As shall be seen in the subsequent section, resource utilization rates, and growth rates in use of energy, can make our reserves of coal shrink to insignificant amounts in the foreseeable future.

In order to compensate for lack of rapidly depleting oil resources, DOE is proposing to use coal in the same manner which led us into our present energy fix. Inefficient use of energy, however, will foredoom us to an energy-poor future.

DOE and the utilities of this nation, however, do not have as their primary interests the reduction in dependence on oil. Their interests, rather, are to grow and continue to provide a generous rate of return to investors. This objective, however, is inconsistent with the energy needs and conservation priorities that this nation must accept if we are able to leave posterity a brighter energy outlook.

In comparison with the combustion of fossil fuels in homes, the power plant generation of power uses nearly twice as much energy in order to obtain a measured amount of heating value. If the utilities had the consumers as primary interests, there would be encouragement for all consumers to convert to private oil or gas heat. In this manner, efficiency levels of 50-55% were obtained in the early seventies, and these figures are rapidly improving. It would not be in the financial interests of the utilities to encourage such moves, however, and the present structure of rates would enable the utility to charge its remaining customers higher rates to maintain its rate of return and continue generating profits.

The Environmental Impact Statement prepared by DOE is based upon the illusion that, as a nation, we can continue to use energy in the inefficient manner which has contributed toward the present crisis. Recent growth in our use of oil during the last several decades was based on the assumption that reserves were limitless and that our nation would continue in obtaining an inexpensive source of power. The realities of the global impacts of increased consumption have only recently come to the awareness of the public, and prospects for coal can easily face the same problems if we fail to recognize the dangers inherent in increased rates of energy consumption.

The life expectancy of world coal reserves is projected as approximately 2800 years at present rates of consumption. In order to illustrate what happens when rates increase, however, it must be understood that annual 5% increases in coal consumption will shrink our reserves to only 99 years in supply; 10% increases in consumption will reduce our supply to only 57 years. This is an optimistic appraisal because many claim that our reserves only comprise several hundred years.

It is important to note that our nation, despite recent conservation efforts, is still increasing consumption rates in alarming proportions. These increased consumption rates are inevitable when one considers population growth and economic expansion.

With nationwide shifts to coal, increased consumption rates will surely leave our descendants an energy crisis the likes of which we have never seen. The only answer is to make changes in the ways in which power is generated and used in the United States, and these changes do not require any reductions in our standard of living. Switching to home or business generated heat, as illustrated in the previous section, provides enormous increases in efficiency over that which prevails in coal or oil plants. Efficient appliances and lighting sources can surely make an important contribution in this regard.

Solar energy, however, along with energy supplied by natural gas, wind and hydroelectric sources, must ultimately provide the final answer to our energy problems in that each relies on renewable sources which are not depleted by increased consumption rates.

Although natural gas is specifically targeted by the Power Plant and Industrial Fuel Use Act, this statement should evaluate the possibilities for increasing natural gas usage particularly in environmentally-burdened areas. Regional planning in the State of New York has closely followed national policy in that potential imports of natural gas and hydroelectric power tend to be downgraded, as in the DOE EIS, while coal combustion is emphasized to an unusual degree. In fact, coal usage will account for almost two thirds of the oil use reductions planned by the State of New York, and most of these reductions will be made by the utilities.

The State of New York traditionally denies the downstate area of the hydroelectric power made available to upstate utilities; and in planning, has neglected the 12,000 megawatts of power that will be available from the James Bay hydro project.

The potential for hydro imports is enormous and must be fully tapped as this is a much cleaner source of energy. As stated earlier, there is a need to pursue energy alternatives that do not involve a waste of finite resources, but which rather are renewable in nature. The EIS downplays the role that solar, wind, hydro, conservation and other renewable sources will play in the future. Ambitious measures of these types, supported by all levels of government, would partially obviate the need for these conversions, preserve the environment, and circumvent the national depletion of natural resources. The ability of these levels of government to implement these changes is limited largely by force of will and lack of courage to overhaul our present system of energy delivery.

There is enough material in the literature on solar and wind energy as utilized today which demonstrates the potential for these sources.

The following excerpt from Energy: The Case For Conservation, by Denis Hayes, comments on the potential for conservation:

> "Transportation presently accounts for about 24 percent of our direct fuel consumption. Another 18 percent of our energy budget is used indirectly - to build and maintain vehicles, construct roads, etc. Sixteen percent of our direct fuel consumption and an additional six percent of our indirect consumption could be saved by gradually tripling the mileage performance of individual vehicles, substantially reducing average vehicle size, transferring half of commuter traffic to multiple passenger modes while reducing the number of automobiles accordingly, and systematically shifting freight to more efficient modes. These savings could be phased in over the next 25 years...
>
> Space heating currently comprises 18 percent of our energy use, water heating 4%, and air conditioning three percent. The combination thus totals 25% of the nation's direct fuel consumption. Strict insulation standards on new buildings, a vigorous program to increase insulation in existing residential and commercial buildings, the use of solar heating and cooling technologies (crossbred where appropriate with compatible technologies like heat pumps), the adoption of solar water heaters for virtually all residential and commercial hot water needs, and the widespread use of total energy systems in large complexes could reduce our energy budget by at least 16% over the next quarter century.
>
> The US food system uses more than 12 percent of the nation's fuel budget; farming uses 2.5%; and food processing, packaging and retailing and preparation account for the remainder. Improvements can be made at every stage of the food system-- especially at food processing and preparation. Technical improvements could save three percent of the national energy budget; home gardens, improved diets, and a switch away from fast foods could save an additional two percent.
>
> About 25 percent of the U.S. fuel budget goes into electricity generation, of which approximately one-third actually emerges as usable power. Two-thirds of the potential energy fed to power plants is cast off as waste heat. Alternative generating technologies currently being developed will be able to operate at much higher efficiencies. For example, laboratory-size fuel cells have operated at 75 percent efficiency, and combined cycle power plants can obtain a 55 percent efficiency. By increasing electrical conversion efficiency to 45 percent, we can save 3 percent of our fuel budget.
>
> Sweden manages to harness approximately one-third of the waste heat from its power plants for commercial purposes; the United States recaptures essentially none. Utilizing just 12 percent of this waste heat, we could reduce our fuel demand by 2 percent. Total Energy Systems are being designed toward this end for use in U.S. hospitals, shopping centers, and other large complexes. Similarly, the high-quality energy now used to produce industrial (low-grade) steam could be used to generate electricity during the conversion process. Generating 50,000 megawatts of electricity in this manner is economically attractive right now. As industrial electric rates increase rapidly in the years ahead, the economic attraction of this power source will grow commensurately.
>
> Other possibilities for industrial conservation abound. Many countries use more energy-efficient processes than the U.S. does, for industries ranging from the refining of ores to the manufacturing of final products. Important savings have been made in the last few years in the U.S. chemical industry (which uses one-fifth of all industrial energy and the primary

> metals industries (which use another fifth).
>
> Much usable energy is currently thrown away. If we were to extract the optimum level of potential energy from urban refuse, human excreta, agricultural residue, feed-lot wastes, and forest-product wastes; if we were to recycle 13 million tons of ferrous metals and 500,000 tons of aluminum, substitute standardized returnable bottles for most cans, and eliminate all the unnecessary packaging that so clutters up our lives, we could obtain more than 4 percent of our current energy needs.
>
> One-half of the 4 percent of our direct energy now spent on lighting is superfluous, and most "necessary" lights operate inefficiently. Currently, incandescent bulbs convert only one-twentieth of the energy in electricity into light; fluorescent bulbs convert over one-fifth. As a NATO-sponsored scientific committee on energy conservation reported, however, there is "no fundamental theoretical reason why a 100 percent conversion efficiency" of electricity into light should not be attained."

The comments that I have submitted, I believe, demonstrate the ill wisdom of proceeding with the policies that have been established. It is time to seriously reconsider the coal conversion program in light of the environmental and health impacts which are going to contribute toward increased morbidity and mortality rates throughout the region. I do hope that a more responsible statement of environmental objectives will be forthcoming.

women's city club
of new york, inc. 6 WEST 48 STREET, NEW YORK, N.Y. 10036 • [illegible]

February 23, 1982

Marcia S. Goldberg
Office of Fuels Conversion
Economic Regulatory Administration
2000 M Street NW
Washington, D.C.

Dear Ms. Goldberg:

The Women's City Club of New York is a non-partisan civic and educational organization founded in 1915. Our purpose is to promote the welfare of the people of the City of New York.

We appreciate the opportunity to comment on the Draft North East Regional Environmental Impact Statement which was sent us for review.

WCCNY-1

1. We note that the Statement does not take into account the existence of plentiful supplies of natural gas in this country. As gas has so many fewer environmental problems and is so much less polluting than coal, it would be preferable for utilities and other users to convert from oil to gas rather than from oil to coal. We recommend that existing legislation mandating conversion from oil to coal be amended to this end.

WCCNY-2

2. It is our position that in the event that coal is used in this densely populated and highly polluted region, the requirement of best available control technology be strictly enforced. Such technology should be required prior to the issuance of operating permits.

WCCNY-3

3. We approve the development of regional resource management. The New York, New Jersey and Connecticut region does not presently meet proper compliance standards of air quality. It should be noted that further serious degradation of air quality will arise should motor vehicle emission standards be relaxed as proposed. The combination of such emissions together with increased sulphur dioxide emissions will lead to augmented health hazards for the region's population and a considerable increase in acid rain.

WCCNY-1 The Powerplant and Industrial Fuel Use Act of 1978 specifies the cessation of the use of oil and natural gas as primary energy sources in powerplants and major fuel-burning installations. See also Response PSEG-6.

WCCNY-2 For new or modified sources in areas where ambient air quality standards are being achieved, it is USEPA policy to require Best Available Control Technology. In areas where the ambient air quality standards are being violated, a new or modified source must meet the requirements of Lowest Achievable Emission Rate and show a net reduction in emissions, which may be accomplished with emission offsets.

WCCNY-3 The revised health effects analysis includes data on the present air quality of the Northeast Region (see Topical Response 3.7, Sec. 4.1 of the DEIS, and Appendix B. The known effects of simultaneous exposure to several air pollutants are discussed in Appendix C.11 and Topical Response 3.7.11.

USDOE is not aware of any relaxation of automobile emission requirements to limitations higher than already exist. If such relaxations were to occur, emissions of carbon monoxide, nitrogen oxides, and hydrocarbons would increase. The increase would be gradual, as new cars slowly enter the vehicle fleet. This could result in increased CO levels along heavily travelled roadways, increased nitrogen dioxide concentrations in areas with dense motor vehicle traffic, and increased concentrations of ozone and other photochemical oxidants (from reactions between hydrocarbons and nitrogen dioxide). However, increased levels of these pollutants may be offset by concurrent reductions in hydrocarbon emissions from stationary sources, implementation of transportation control

WOMEN'S CITY CLUB letter to
Marcia S. Goldberg
Office of Fuels Conversion
February 23, 1982 page two

WCCNY-4 4. Further, it should be noted that the number of air-monitoring stations in this area has been drastically reduced, despite promises to the contrary from duly constituted authorities. There is no way of accurately measuring the regional impact of the proposed increases in air pollution with an inadequate air monitoring system.

WCCNY-5 5. A great increase in regional coal use will involve serious transportation problems, as well as those of storage and waste disposal, that should be solved before conversion is mandated.

In summary, it is our conviction that conversion to coal by public utilities and other large users in this region represents a dangerously retrogressive public policy that should not be implemented until all other alternatives have been more fully explored than in this Impact Statement. If a policy of regional coal conversion is finally implemented despite its many serious disadvantages, it should be permitted only with the strictest controls and the most careful planning and monitoring.

Sincerely yours,

Ruth Reichbart, Chairman
Environment Committee

RR/epk
cc: William Baker, USEPA
Commissioner Flacke, NYSDEC

measures, an increasing percentage of diesel-powered automobiles (which emit lower levels of these pollutants) in the vehicle fleet, and reduced rates of automobile travel.

The conversion of existing powerplants from oil to coal will result in significant increases in emissions of only nitrogen oxides (with respect to automobile emissions). Nitrogen oxides will oxidize to increase NO_2 concentrations, and will interact with hydrocarbons emitted by other sources, including automobiles, to produce ozone and other photochemical oxidants. Due to insufficient information on the alleged relaxation of automobile emissions, and the complexities of predicting levels of O_3 from precursor concentrations, the ultimate increase in O_3 levels from this action cannot be quantified at this time.

WCCNY-4 When new or modified sources apply for permits, the local air quality must be determined. This is done by estimating increases in air pollution concentration, which are independent of current ambient conditions, and identifying areas of major concern. A very fine grid of monitors is not necessary for this regional analysis; however, monitoring data will be required for the site-specific conversions.

WCCNY-5 These issues are discussed in Topical Responses 3.10 and 3.5, respectively.

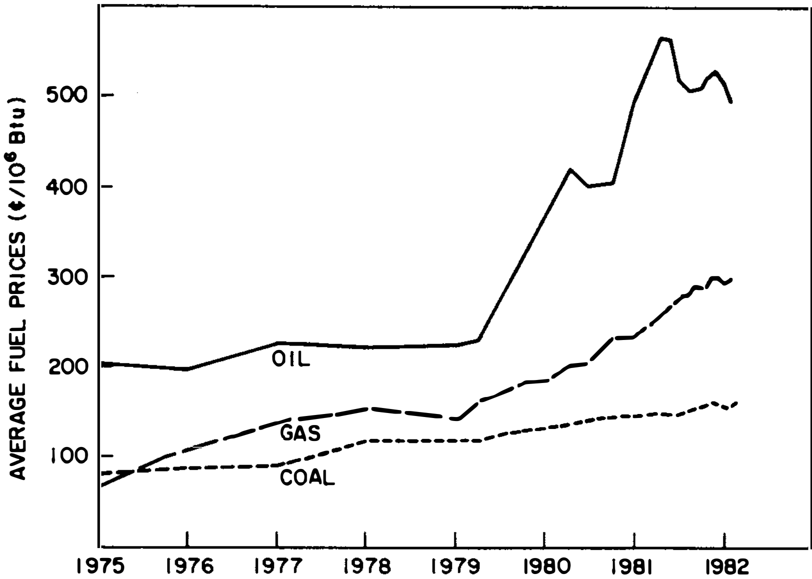
5. ERRATA AND ADDENDA

Page	Item	Correction or Addition
viii	Acronyms and Abbreviations	The acronym "SIP" (State Implementation Plan) should be included.
ix	Conversion Factors	The conversion factor from Mgd to m^3/s is 0.043813.
1-3	Fig. 1.1	The Danskammer Station should be labeled Danskammer Point, and the Brandon Shores and H.A. Wagner stations should be reversed. A corrected figure appears in Section 1 of this FEIS.
1-7	Table 1.2	The entry for Biotic Resources, Deposition Region, line 2, should read ". . . of less than 0.03 associated with . . ."
1-7	Table 1.2	The entry for Health Effects, Deposition Region, lines 4-6 should read ". . . levels rather than the 6% increase resulting from the conversions. (Sec. 5.6.3)."
2-4	Table 2.1	The utility listed for the Deepwater Station should be Atlantic City Electric Company.
3-2	Fig. 3.1	An updated version of Fig. 3.1 is shown on p. 5-5 of this Errata and Addenda section.
3-4	Table 3.4	The last two columns of the table (Ia, Ib) should be labeled IIa and IIb.
3-9	Fig. 3.4	A water route has been added (Chesapeake Bay) as shown on page 5-6 of this Errata and Addenda section.
3-13	Table 3.5	The entry for Biotic Resources, Deposition Region, line 2, should read ". . . of less than 0.03 associated with . . ."
3-13	Table 3.5	The entry for Health Effects, Deposition Region, lines 4-6 should read ". . . levels rather than the 6% increase resulting from the conversions. (Sec. 5.6.3)."
3-18	Table 3.9	The annual average value for the Modified Coal SIP in the New York Subregion should be 14 $\mu g/m^3$.
3-19	Table 3.10	The annual average value for the Modified Coal SIP in the New York Subregion should be 89 $\mu g/m^3$.
3-23	Table 3.12	This correct version of Table 3.12 is shown on page 5-7 of this Errata and Addenda section.
4-5	Sec. 4.1.3.2	The following sentence should be added to the first line of text between the two existing sentences: "There is a trend in the refining industry toward desulfurizing crude oil in the initial step of the product refining process."
4-7	Table 4.5	The Nonattainment Area Jersey City should be indicated as not meeting the secondary standard for TSP.
4-9	Table 4.7	The Nonattainment Area AQCR 45, Camden, should be indicated as not meeting the secondary standard for TSP.
4-9	Table 4.8	The values listed for Maryland should not be included.

4-10	Sec. 4.2.1	See Response NYDEC-51.
4-19	Sec. 4.2.3.1	See Responses NYDEC-54 and -55.
4-32	Table 4.14	Footnote d should read: "Primary for condenser cooling."
4-54	Sec. 4.4.3.3	See Response NYDEC-29.
4-55	Table 4.17	Line 4: the number of powerplants for the Hackensack River should be 3. Line 7, Overpeck River, should be deleted.
4-60	Sec. 4.5.2.1	See Response PANYNJ-3.
4-62	Fig. 4.21	The West Springfield station has been added and the Somerset station deleted, as shown on page 5-8 of this Errata and Addenda section.
4-64	Fig. 4.23	A water route has been added (Chesapeake Bay) as shown on page 5-9 of this Errata and Addenda section.
4-65	Table 4-19	Ports/Piers, Baltimore should include Conrail Pier, with a 1980 actual capacity of 3.0×10^6 tpy and 1985 planned capacity of 3.0×10^6 tpy.
4-68	Fig. 4.24	See Response BGE-2.
5-23	Sec. 5.2.1	Line 22: See Response USEPA-10.
5-28	Sec. 5.2.3.2	Lines 10-14: See Response USEPA-11.
5-31	Fig. 5.7	The location of the Allegheny River has been amended as shown on page 5-10 of this Errata and Addenda section.
5-41	Sec. 5.2.4	Line 16 should read: ". . .et al. (1977a). Typical levels of Adirondack Lake have ranged from 4.3 to 6.4. It has been. . ."
5-47	Sec. 5.4.1.1	Paragraph 4, add the following: "The major terrestrial impact of underground mining is subsidence. Subsidence is the settling of the ground surface due to downward movement of overburden into void space remaining after mining (Dvorak et al. 1977a). Large trees can be adversely affected . . ."
5-49	Sec. 5.4.2.1	The second paragraph, first sentence should read: "Chemicals used on rights-of-way to control the growth of vegetation (for safety and esthetic reasons) should be selected on the basis of low toxicity to non-target species and low persistence in the environment."
5-53	Sec. 5.4.3.3	See Response NYDEC-48.
5-54	Sec. 5.4.3.4	See Responses MDAQC-14 and NYDEC-53.
5-55	Sec. 5.4.3.4, Aquatic Biota and Habitats	The fourth paragraph, second sentence should read: "Trace elements can have a variety of effects on aquatic plants, including changes in physiology, productivity, plant community composition, and species abundance (Dvorak et al. 1978)." The fourth sentence should read: "This inhibitory action also is affected by pH, humic acid content of the water, copper tolerance of individual species, and population density."

5-56	Sec. 5.4.4	At the end of the first paragraph in the Section Terrestrial Biota and Habitats add the following: "Acid deposition impacts on wildlife will occur primarily as a result of changes in affected soils, plant communities, and food items (e.g., reduced protein content, increased metal content)." In the second paragraph of the Section Aquatic Biota and Habitats, the first sentence should read as follows: "Because of the relatively low buffering capacity of some lakes, ecological impacts of acid precipitation are recognized as a potential problem in the study area."
5-57	Sec. 5.4.4	See Responses NYDEC-28 and -34.
5-59	Sec. 5.5.2.1	Paragraph 6, Line 2 should read: ". . . corridor may be impacted by as much as 22 million tons of coal annually if Pennsylvania . . ."
5-60	Sec. 5.5.2.2	Paragraph 3, Lines 4-6 should read ". . . $32 million. Even at this level, the port could not serve all of the plants under study that are located on the intracoastal waterway connected to New York Harbor. These powerplants have a total demand for coal of 26.8 million tons annually. . . ."
5-61	Sec. 5.5.2.3	Line 10 should read: " . . .to obtain lime and limestone from the same county. . . ."
5-67	Sec. 5.5.3.2	See Response NYDEC-35.
C-8	Table C.5	Line 5, New York, Birds: Commonly Associated Plant Communities for the American peregrine falcon should read: "Coasts, mountains, woods, urban buildings (e.g., skyscrapers in New York City)."
E-7	Table E.3	The elemental concentrations listed should be given in units of μg/g, not μg.
E-16	Appendix E	The second paragraph, second line, should read: ". . . data exist for BaP. . ." The fifth paragraph, second line, should read: ". . . temperature coal tar products (Santodonato et al. 1979; National Academy of Sciences. . ."
E-17	Appendix E References	Amdur and Corn (1963) should read: "The irritant potency. . ."
E-20	Appendix E References	Parker and Ray should be cited as "Ray, S.S., and F.G. Parker. . ." throughout Appendix E. Santhanan et al. should be "Santhanam et al." throughout Appendix E. The following reference should be included: Santodonato, J., et al. 1979. Health Assessment Document for Polycyclic Organic Matter. EPA-600/9-79-008. Prepared by Syracuse Research Corporation for the U.S. Environmental Protection Agency, Research Triangle Park, N.C.
E-21	Appendix E References	Van Hook and Shults should be cited as 1977, not 1976. The report number is ERDA 77-64.
F-5	Table F.2	The report number for Walsh et al. is ANL/ES-121. The capacity of Ravenswood Unit 3 should be 928 MW.

F-7	Appendix F	See Response MDNR-4.
F-7	References	The reference to Federal Energy Regulatory Commission (1979), line 2, should read " . . .Data for the year ended December 31, 1978. . ."
F-19	Figs. F.12-F.14	See Response BGE-2.



(a)

1979	Oil	Gas	Coal
Jan	231.8	150.2	115.8
Feb	245.6	159.1	114.6
Mar	261.4	162.8	116.8
Apr	268.0	164.4	120.1
May	277.7	177.2	121.1
June	300.0	179.3	121.9
July	314.7	178.5	122.2
Aug	328.0	180.3	122.5
Sept	337.8	182.9	125.3
Oct	351.4	188.6	127.4
Nov	367.1	179.6	127.7
Dec	399.2	183.3	129.2

1980			
Jan	426.2	194.8	128.7
Feb	432.5	203.7	129.9
Mar	414.1	207.3	130.1
Apr	406.3	203.3	133.8
May	407.0	211.4	133.3
June	396.4	208.8	135.1
July	399.6	228.1	137.4
Aug	409.6	236.7	139.5
Sept	414.9	238.7	138.9
Oct	455.4	245.7	138.1
Nov	498.8	231.3	139.3
Dec	524.4	226.3	137.8

1981			
Jan	542.4	254.1	142.3
Feb	577.3	260.5	146.3
Mar	589.0	263.8	148.4
Apr	572.8	273.5	146.9
May	561.4	283.0	146.7
June	513.3	286.3	152.8
July	502.4	288.6	156.5
Aug	501.2	291.0	157.0
Sept	506.7	287.6	157.3
Oct	519.3	299.3	160.2
Nov	525.1	300.0	159.1
Dec	510.1	291.4	156.7
Jan	492.7	301.0	160.8

(b)

Fig. 3.1. (a) Average Yearly Prices of Fossil Fuels Delivered to Steam Electric Plants 25 MW or More. (b) FERC Monthly Report: Cost and Quality of Fuels for Electric Utility Plants. Costs = ¢ per million Btu's for monthly deliveries to utilities.

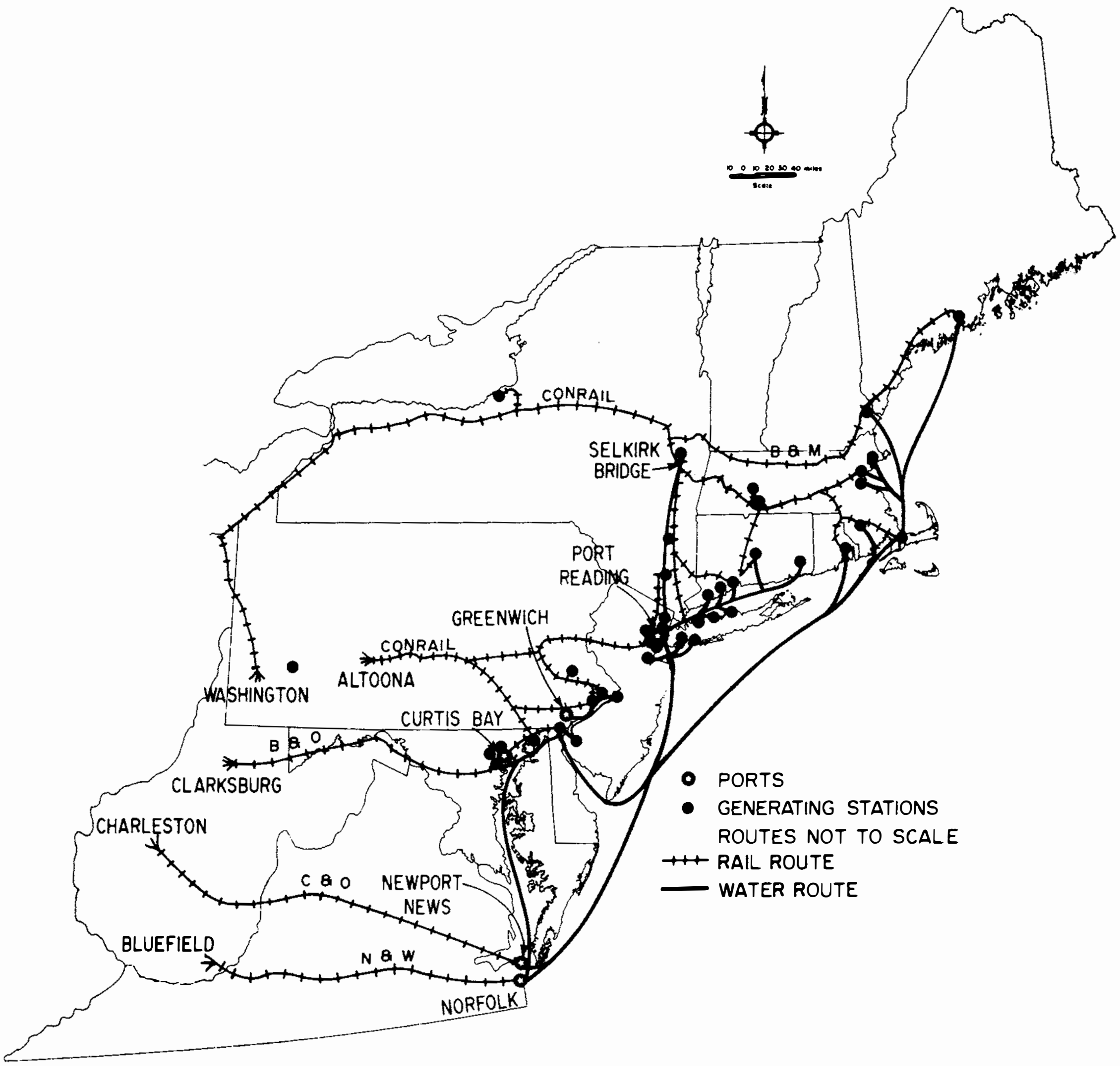


Fig. 3.4. Major Rail and Water Routes in the Transportation Network Region

Table 3.12. Aggregate Land Area Requirements for Disposal of Coal-Combustion Wastes

State	Ash Collected (acre-ft/yr)	Ash Disposal Area at 40-ft Depth - (acre/yr)	Volume of Sludge[a] Collected - Oil SIPs (acre-ft/yr)	Sludge Disposal Area at 40-ft Depth - Oil SIPs (acre/yr)	Volume of Sludge[a] Collected - Coal SIPs (acre-ft/yr)	Sludge Disposal Area at 40-ft Depth - Coal SIPs (acre/yr)
Connecticut	207	5.17	399	9.98	411	10.3
Delaware	61.8	1.54	111	2.77	0	0
Maine	29.7	0.74	39.5	0.99	0	0
Maryland	145	3.62	670	16.8	101	2.53
Massachusetts	376	9.39	409	10.2	66.6	1.67
New Hampshire	30.0	0.75	0	0	0	0
New Jersey	299	7.47	406	10.2	489	12.2
New York	1051	26.3	829	20.7	628	15.7
Pennsylvania	175	4.37	324	8.10	318	7.94
Rhode Island	21.5	0.54	38.6	0.96	38.6	0.96
Total	2400	59.9	3230	80.7	2050	51.3

[a]60% solids content, limestone scrubbing.

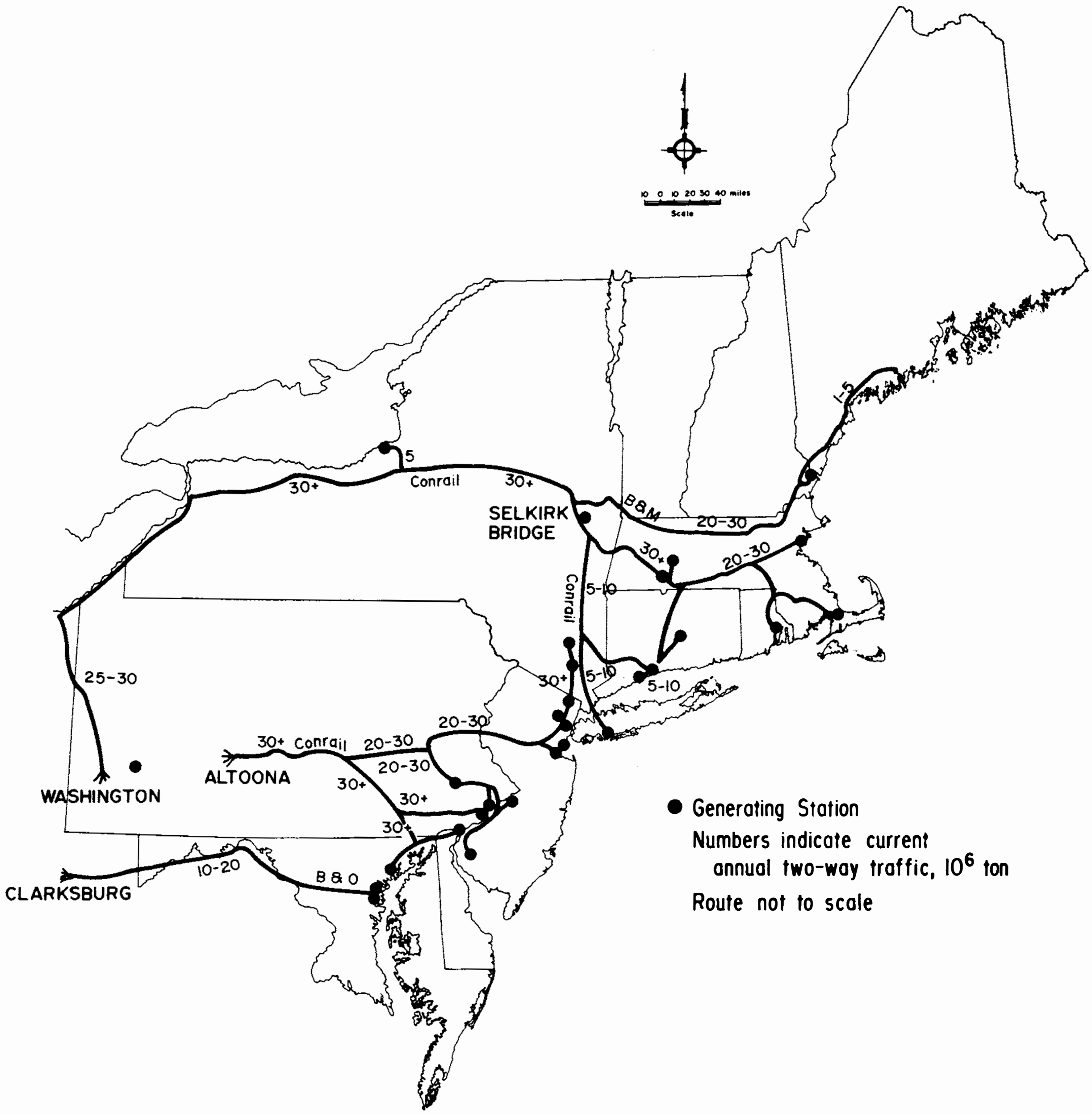


Fig. 4.21. Rail Routes to Generating Stations

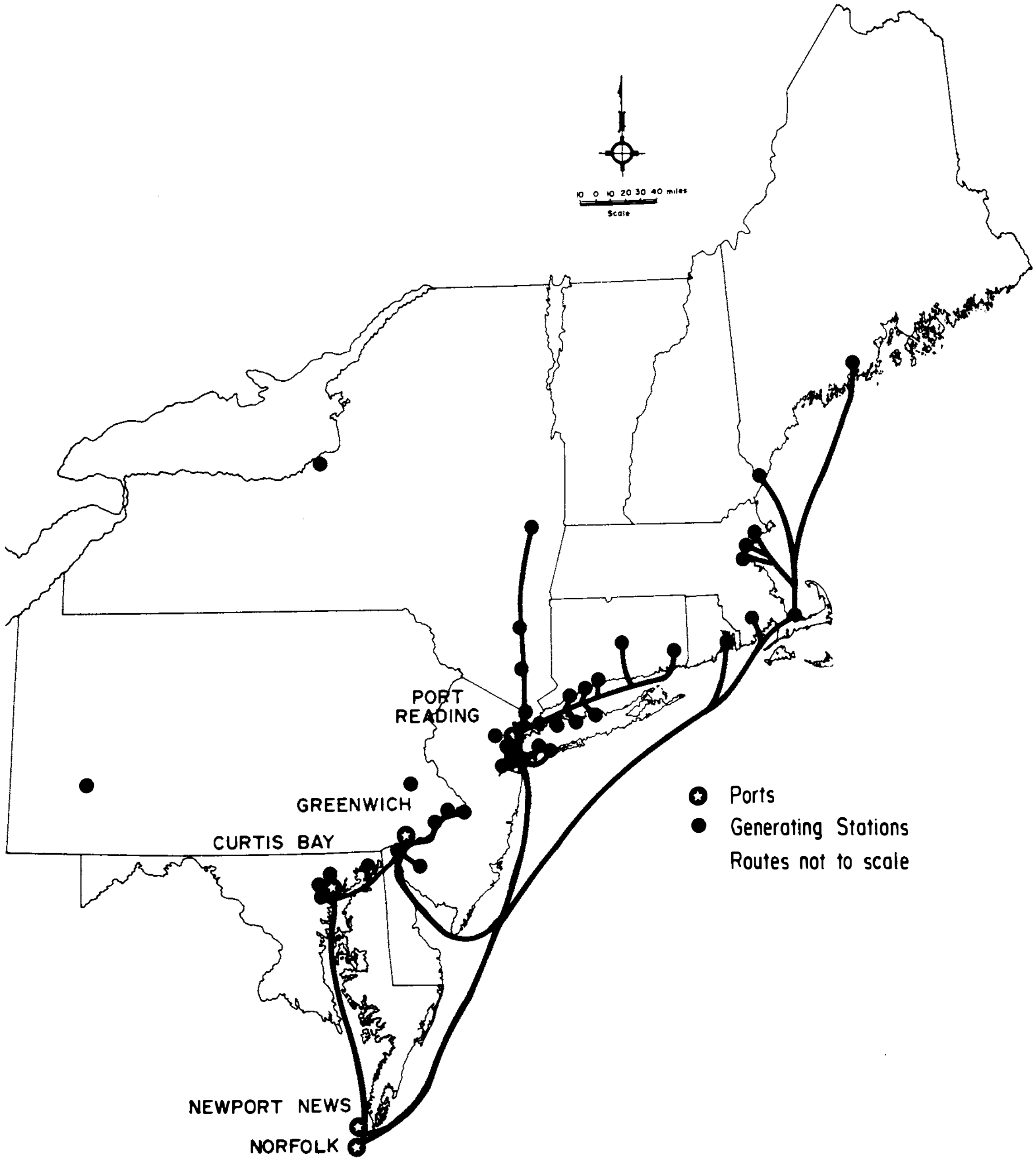


Fig. 4.23. Major Water Routes in Transportation Networks Region

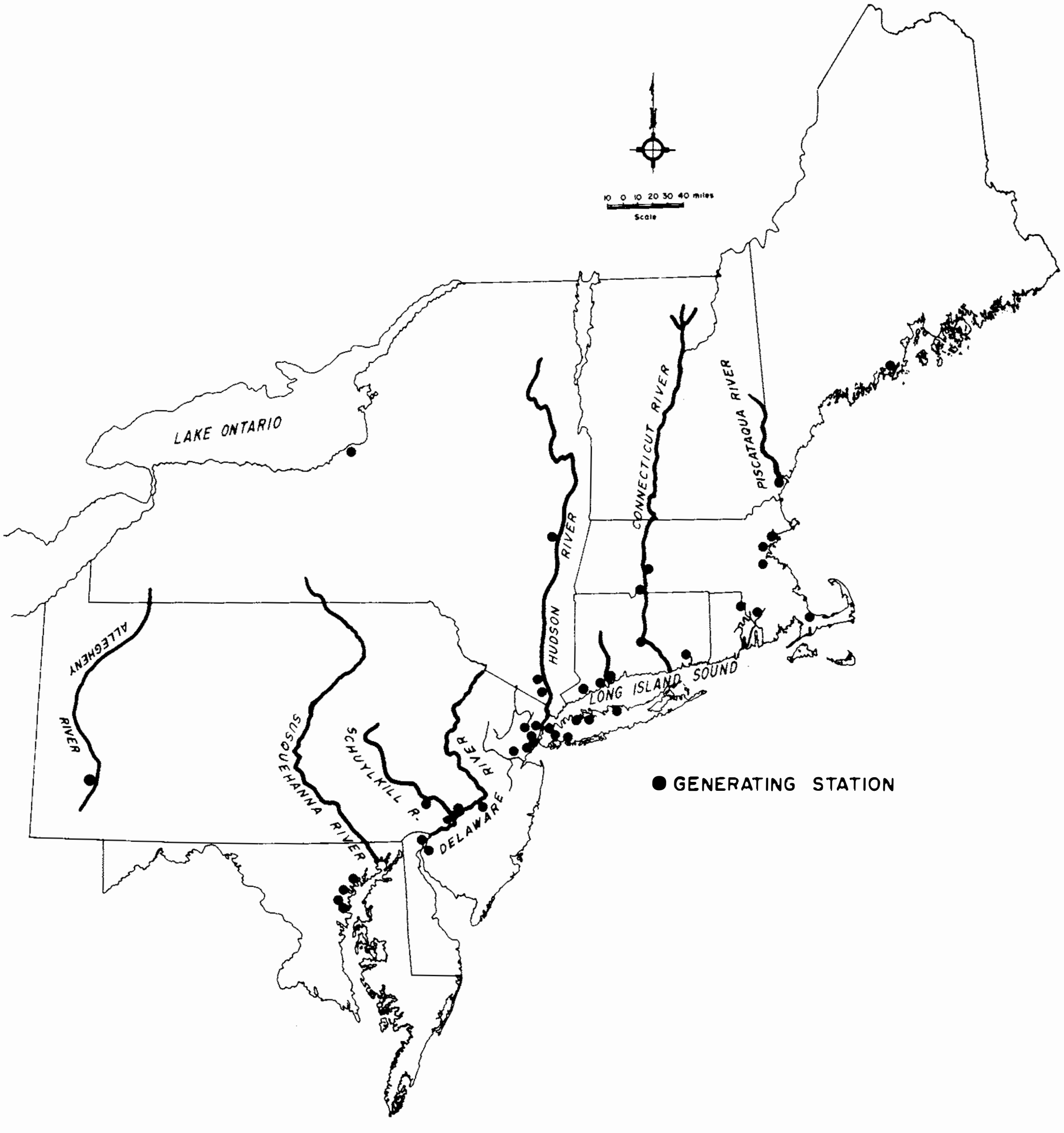


Fig. 5.7. Locations of 42 Candidate Powerplants in Relation to Their Their Water Sources

6. LIST OF PREPARERS OF THE FEIS

Name and Affiliation	Education/Expertise	Contribution to EIS
TECHNICAL PROJECT DIRECTOR		
U.S. Department of Energy, Economic Regulatory Administration		
Marsha S. Goldberg	B.A. Political Science M.C.P., City Planning	Overall Project Director.
PROJECT LEADERS		
Argonne National Laboratory		
Gary Marmer	Ph.D., Physics	Directed preparation of the FEIS.
TECHNICAL STAFF		
Argonne National Laboratory		
Lee S. Busch	B.S., Chemical Engineering	Responded to comments dealing with the macro-economic modeling of coal supply and demand; author of Topical Responses 3.8 and 3.9.
Margery C. Bynoe	M.S., Physical Geography B.A., Geology/Physical Geography	Responded to comments dealing with coal mining, processing, and the resulting impacts.
Clifton E. Dungey	M.S., Meteorology B.S., Mathematics	Analyzed dispersion modeling of impacts on air quality in Boston and Baltimore Subregions; responded to comments dealing with air quality; author of Topical Response 3.1 and Section 2.
Mark J. Knight	M.En., Applied Ecology B.A., Environmental Science	Responded to comments dealing with impacts on biotic resources; author of Topical Response 3.3.
William E. Pfanenstiel	Master's Degree of Public Health B.S., Biology	Responded to comments dealing with health effects; author of Topical Response 3.7 and Appendices B and C.
S. Matthew Prastein	J.D., Law Ph.D., Physics M.S., Physical Chemistry and Radiochemistry B.A., Chemistry	Responded to comments dealing with regulatory considerations of waste disposal.

Name and Affiliation	Education/Expertise	Contribution to EIS
Laurie J. Sawyer (Undergraduate Research Participant)	A.B., Mathematics	Performed dispersion modeling of impacts on air quality in Boston and Baltimore subregions; plotted computer graphics for all subregions.
Jack D. Shannon	Ph.D., Meteorology	Performed and analyzed long-range transport modeling for assessment of sulfur deposition; responded to comments dealing with long-range transport; author of Topical Response 3.2.
Ronald C. Sundell	M.U.P., Master of Urban Planning B.S., Business Administration	Responded to comments dealing wit effects of acid deposition on socioeconomic resources; author of Topical Response 3.4.
Roger L. Tobin	Ph.D., Operations Research M.A., Mathematics B.S.E., M.S.E., Industrial Engineering	Responsed to comments dealing with impacts of the proposed action on transportation systems. Author of Topical Response 3.10.
Steve Tsai	Ph.D., Civil Engineering M.S., Hydraulic Engineering B.S., Civil Engineering	Responded to comments dealing with impacts on surface- and groundwater. Author of Topical Responses 3.5 and 3.6.
Oak Ridge National Laboratory		
Frank C. Kornegay	B.S., M.S., Meteorology	Performed and analyzed dispersion modeling of impacts on air quality in New York and Philadelphia subregions; responded to comments dealing with air quality in those regions.
EDITORIAL STAFF		
Shari K. Zussman	B.A., Technical Communications	Overall editorial responsibility.

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J. Thomas Wolfe

Argonne National Laboratory

Anthony J. Dvorak

7. LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS WHO RECEIVED THE EIS

FEDERAL AGENCIES

Environmental Protection Agency
Department of Interior
Department of Commerce
Department of State
Department of Agriculture
Department of Defense
Department of the Army
Department of Housing and Urban Development
Department of Justice
Department of Labor
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Office of Management and Budget
Nuclear Regulatory Commission
Department of Energy
National Science Foundation
Advisory Council on Historic Preservation

STATE AGENCIES

Connecticut-	Department of Agriculture State Health Department Power Facilities Evaluation Council Department of Environmental Protection Department of Commerce Resource Recovery Authority Public Utilities Control Authority Council on Environmental Quality
Delaware-	Department of Natural Resources and Environmental Control
Maine-	Department of Environmental Protection Office of Energy Resources Soil and Water Conservation Commission
Maryland-	Department of Health and Mental Hygiene Department of Natural Resources State Highway Administration Environmental Health Administration Energy Policy Office Department of Transportation Department of Agriculture
Massachusetts-	Department of Environmental Quality and Engineering Department of Energy Executive Office of Environmental Affairs
New Hampshire-	Department of Health and Welfare
New Jersey-	Department of Environmental Protection Department of Energy
Pennsylvania-	Department of Environmental Resources Governor's Energy Council
Rhode Island-	Department of Environmental Management Rhode Island Energy Office

New York- Department of Environmental Conservation
State Public Services Commission
Power Authority of the State of New York
Department of Law
Port Authority of New York/New Jersey
State Board on Electric Generation and the Environment
State Health Department
State Energy Office
Department of Public Service
State Parks and Recreation Department

Governors and A-95 State Clearinghouses in all 11 states comprising the Northeast Region are included in the EIS distribution.

Private citizens, local and regional agencies, public utilities in the 10-state region, and all organizations who requested copies of the EIS are also included in the distribution.

Department of Energy
Washington, D.C. 20461

JAN 1 8 1982

On November 6, 1981 the Department of Energy (DOE) issued the Draft Northeast Regional Environmental Impact Statement (EIS) for public comment under the authority of the National Environmental Policy Act of 1969 (NEPA). This EIS assessed the potential effects of converting up to 42 powerplants from oil to coal. A copy was sent to your company at that time. At the public hearings on the Draft EIS that were held December 16-18, 1981, representatives of several of the utilities raised questions about some of the data used in the analysis. In order to ensure that the Final Northeast Regional EIS Statement is as complete and current as possible, we would like to offer the affected utilities an additional opportunity to contribute to the data and assumptions necessary to complete the analysis. We believe that it is crucial that the final statement reflect the most recent planning of those utilities, for the Regional EIS will be a supporting document for all site specific EISs which will be issued by DOE to aid utilities in the Northeast in their conversion efforts.

Since one or more facilities operated by your company was included in the analysis for the draft statement, we would appreciate your assistance in providing us with the following information about your plant(s):

- The forty-two powerplants analyzed in the document were selected because they were coal capable and were of a certain age and size. These forty-two powerplants represented DOE's best estimate of a conservatively large universe of possible conversion candidates in the Northeast, taking into account the NEPA mandate to perform a "worst case" analysis. Since the time the study began some utilities have indicated that they have no plans to convert certain plants on the list to coal, and that the forty-two station analysis therefore overstates the likely (as opposed to the theoretically possible) magnitude of the impacts of coal conversion. We are thus planning to include in the Final EIS an analysis of most probable impacts, based on utilities' indications of their present conversion plans for their facilities.

Could you please indicate whether your company is actively considering coal conversion at the plant(s) included in the Draft EIS. Please indicate which individual units are actively being considered. A list of those units included in the Draft EIS can be found on page 1-2 of the document.

- For those facilities that are potential conversion candidates, would you please provide detailed information on the current operating characteristics, including the number of stacks, stack heights and diameters, and exit gas velocities. If you are planning to change any of these parameters (e.g., change the height of the stack) as part of the conversion please provide this information. Also, if the boilers under consideration require a specific type of coal because of their design characteristics (e.g., "wet bottom"), please so indicate.

- Would you please provide us with any recent monitored background data (including appropriate documentation) which you believe should be used in our air quality analysis.

- Would you please indicate the sulfur dioxide emission limitation of the present State Implementation Plan (SIP) under which your plant would be operating when burning coal. If you will require a SIP change in order to implement your coal conversion plans please indicate the new level that you would be requesting and the status of this request, if appropriate.

Your input will be an important element in preparing the Final EIS. No response is necessary if you do not wish to have any of the assumptions regarding your plant(s) modified; it will be included using the same assumptions that were used in preparing the draft. Questions regarding the data items requested should be directed to Marsha Goldberg at 202/653-3374. We would appreciate having this data by February 5, 1982, so that we can complete the necessary revisions as soon as possible.

Please send the information to:

Marsha Goldberg
U.S. Department of Energy
Economic Regulatory Administration
2000 M Street N.W., Room 6114
Washington, D.C. 20461

Thank you for your assistance in this effort.

Sincerely,

Steven E. Ferguson
Fuels Conversion Division
Office of Fuels Program
Economic Regulatory Administration

APPENDIX B. EXISTING AIR QUALITY IN THE NORTHEAST REGION

In this appendix the existing air quality in the Northeast Region is described by type of pollutant.

B.1 SULFUR DIOXIDE

As indicated in Section 4.1 of the DEIS, there are few violations of primary or secondary air quality standards for SO_2 in the Northeast, although air quality in several locations in New York City approaches the Ambient Air Quality Standards (AAQS) and isolated locally caused violations occur in Philadelphia and Boston. Results from valid continuous monitors for 1978 show that USEPA Regions I, II, and III (only parts of which are included in the Northeast Region) have similar air quality for SO_2 (USEPA 1978, 1980). Air quality data for SO_2 in these regions for 1978 are shown below (USEPA 1978, 1980).

Region	Ann. Arithmetic Mean (μg/m^3)	Maximum (μg/m^3)
I	33	59
II	37	78
III	51	140

Buffalo, NY, and New York City contain monitoring sites recording some of the highest annual means in the U.S. during 1978, with levels of 78 and 77 μg/m^3, respectively. The maximum 24-hour averages recorded in these cities were 267 μg/m^3 for Buffalo and 296 μg/m^3 for New York City. Several central-city monitors in Philadelphia and New York City recorded 24-hour averages in excess of 250-300 μg/m^3 during this year. Newark, Delaware, reported at least one peak value in excess of 4000 μg/m^3 (USEPA 1978, 1980).

As indicated in Section 3.2 of the DEIS, historical data indicate that SO_2 concentrations are decreasing nationwide. These improvements in air quality have resulted from displacement of major sources from urban to rural areas, sulfur content restrictions on fuels, taller stacks, and emission controls (USEPA 1978). For example, data from the National Air Data Bank indicate that SO_2 levels in Philadelphia have decreased by more than 50% since 1962-67, with a 99th percentile value of 0.23 ppm. The maximum value for the period of study was 0.44 ppm.

B.2 TOTAL SUSPENDED PARTICULATES (TSP)

There have been a few recent violations of primary TSP AAQS in all four subregions (Sec. 4.1 of the DEIS), with many more violations of secondary standards. Regional summaries of valid 1978 TSP monitoring data (USEPA 1978, 1980) are shown below.

Region	Mean of Median Annual Value (μg/m^3)	Maximum μg/m^3)
I	49.2	100
II	43.2	114
III	59.8	171

In Regions I, II, and III the 75th percentile values in 1977 were less than 80 μg/m^3 and the 90th percentile values were less than 100 μg/m^3. Although decreasing annual TSP trends of approximately 8% were recorded between 1972 and 1977 nationwide, more progress has been made in controlling maximum values In the northeastern cities of Providence, RI, Baltimore, MD, and Philadelphia, PA, the annual geometric means for TSP decreased from 30% to 59% (USEPA 1978, 1980).

Although the mix of local sources greatly determines seasonal TSP trends, Trijonis et al. (1980) determined that levels peak slightly during May-September.

B.3 NITROGEN DIOXIDE (NO_2)

Emissions and atmospheric concentrations of nitrogen oxides are generally increasing nationwide (National Research Council 1977a). No violations of AAQS have been recorded in the Northeast

(Sec. 4.1 of the DEIS), but limited 1-hour average concentrations of NO_2 indicate great intercity variability (see table below) (National Research Council 1977a).

City	1-hr Mean (μg/m³)	1-hr Max. (μg/m³)
Boston	1888 (1970)[a]	9964 (1970, 1972, 1973)
Baltimore		320 (1971)
		921 (1972)
Philadelphia	85 (1973)	9474 (1973)
New York State (4 locations)		687 (1971)
		537 (1972)
		346 (1973)
New Jersey State (3 locations)		624 (1970)
		512 (1972)
		425 (1973)

[a]Data year is given in parentheses.

Analysis of CAMP (Continuous Air Monitoring Program) monitoring data in Philadelphia from 1962 to 1972 showed a 98% increase in annual values to 75 μg/m³ and a 141% increase in maximum values to 545 μg/m³ (National Research Council 1977a).

B.4 PHOTOCHEMICAL OXIDANTS AND OZONE

Ozone is measured as an indicator of photochemical oxidant pollution. Ozone violations occur over much of the Northeast (Federal Register, March 3, 1978, Pt. II). Levels of ozone are a function of temperature and sunlight, and therefore vary seasonally as well as diurnally. In the northeast ozone violations are generally limited to the period between May and September and are highest during the mid-afternoon. Ozone levels are declining throughout the entire United States (National Research Council 1977b).

B.5 CARBON MONOXIDE

Local violations of carbon monoxide standards are recorded throughout the Northeast in areas of high motor vehicle traffic (Federal Register, March 3, 1978, Pt. II). These violations generally coincide with high population densities. The highest concentrations occur during the fall and winter when motor vehicles do not operate at optimal efficiency (USEPA 1979). Carbon monoxide levels are generally declining in urban areas of the U.S. (USEPA 1979).

B.6 SULFATES

Atmospheric sulfates include ammonium sulfate, ammonium bisulfate, sulfuric acid, calcium sulfate, and a variety of metal salts. Ammonium sulfate and ammonium bisulfate appear to account for the major portion of atmospheric sulfates measured with TSP in urban areas of the Northeast (Lioy et al. 1980; Leaderer et al. 1980). This is presumably due to the large number of ammonia sources in urban areas.

Altshuller (1980) recently analyzed seasonal sulfate trends in the northeastern U.S., using 1968-1978 data from the National Air Surveillance Network. Altshuller determined that the three-year annual average sulfate concentrations in urban areas for this region for 1975-1977 were approximately 10 μg/m³. Three-year annual averages for nonurban areas were approximately 8 μg/m³. Broken down by season, urban levels for this period were greatest in the third quarter of the year (13 μg/m³), followed by the second quarter (11 μg/m³), the first quarter (10 μg/m³), and the fourth quarter (8 μg/m³). Quarterly levels also varied at nonurban sites: the third quarter had the highest levels (10 μg/m³), then the second quarter (8 μg/m³), first quarter (7.5 μg/m³), and fourth quarter (7 μg/m³).

Using data for 1965-1977 obtained at 11 rural site from Maine to Virginia to Indiana, Altshuller (1980) determined that a 24-hour sulfate concentration of 15 μg/m³ was equalled or exceeded during 12% of the total measurement days. The frequency with which 15 μg/m³ was exceeded varied from 4% at Acadia National Park in Maine to 18% in rural Indiana. Twenty-eight percent of these elevated concentrations occurred during the second quarter of the year and 53% occurred during the third quarter. Seventy-five and 88 percent of sulfate concentrations occurring in this region greater or equal to 20 μg/m³ and 30 μg/m³, respctively, occurred between June anJ August.

By comparing rural and urban sulfate concentrations, Altshuller (1980) concluded that during the first, second, and fourth quarters of the year, greater than 50% (if not 100%) of all excess urban sulfate (that above rural levels) was due to local primary sulfate emissions. Altshuller supported this conclusion with information on the relatively slow conversion rates of atmospheric SO_2 to SO_4 in northern climates during the cooler seasons. However, Altshuller also concluded that third-quarter urban excess sulfate was due primarily to regional influences.

Whelpdale (1978) reported geometric means of 10 μg/m³ for atmospheric sulfate during an in-depth study of southern Ontario. Whelpdale also found that during the study period, 24-hour sulfate concentrations as high as 40-50 μg/m³ occurred. These high levels were associated with meteorological conditions that favored pollution transport from the United States. Mueller et al. (1979) and Hidy et al. (1978) analyzed preliminary data from the Electric Power Research Institute (EPRI) SURE monitoring program and reported that sulfate levels exceeded 10 μg/m³ for 10 and up to 30 days in August 1977 for almost the entire Northeast Region.

Lynn et al. (1975) found differences in New York City annual sulfate levels ranging from 9 to 17 μg/m³. High concentrations during the winter were influenced by local SO_2 emissions. The highest SO_2 emissions were located in eastern New Jersey, Staten Island, Brooklyn, and Manhattan. Ten to fifty km from these sources, sulfate concentrations decreased by 30-40%. During the summer months, city-wide averages were elevated and intracity differences were reduced. Hidy et al. (1978) found strong correlations between sulfate levels in New York City and high ozone concentrations, mid-day relative humidity, and total atmospheric particulate loading.

Annual average sulfate trends in urban areas of the Northeast generally decreased by 17% between 1963 and 1978 (Altshuller 1980). This decrease varied by season from appproximately 0% in the third quarter to 50% during the first quarter. In nonurban areas the annual average increased during this period from approximately 7 μg/m³ to 8 μg/m³, or 15%. As in urban areas, this change varied with the season, ranging from approximately a 7% decrease in the fourth quarter to a 50% increase in the first. Despite generally decreasing trends in sulfate levels throughout the Northeast, the largest number of 24-hour sulfate concentrations greater than or equal to 30 μg/m³ from 1963 through 1977 occurred during the most recent three-year period. This indicates a continual increase in the frequency of the very highest sulfate concentrations.

Altshuller concluded that reductions in local sulfur oxide emissions were responsible for the substantial reduction of sulfate concentrations in the Northeast observed during the first, second, and fourth quarters of the year. The increase in third-quarter concentrations was attributed to regional transport and the importance of meteorological conditions conducive to SO_4 accumulation.

Lioy et al. (1980) and Leaderer et al. (1980) determined that most of the urban sulfate in the Northeast is ammonium sulfate and ammonium bisulfate. These same authors and Tanner (1980) reported increased acidity in aerosols in air near New York City in 6-hour samples taken between noon and 6 p.m. as compared to other periods of the day. This is the part of the day characterized by the highest photochemical activity. During the summer of 1977, 6-hour average H_2SO_4 concentrations reached 17.8 μg/m³ (Lioy 1980; Leaderer et al. 1980). Pierson et al. (1980) reported 12-hour average concentrations of H_2SO_4 as high as 17 μg/m³ in rural Pennsylvania during this same period.

B.7 NITRATES

Atmospheric nitrates include nitric acid (both gaseous and aerosol), ammonium nitrate, sodium nitrate, and lesser amounts of other compounds. Akland (1977) showed that annual mean nitrate concentrations have recently been approximately 4 μg/m³ near Phildalphia, 2-3 μg/m³ in southern New York and Massachusetts, and 1-2 μg/m³ in states to the north. Mean annual nonurban levels in the Northeast generally range between 0.6 and 1.2 μg/m³ (National Research Council 1979). Kneip et al. (1979) reported that EPRI SURE project data showed a monthly mean nitrate level for August and October 1977 of less than 0.6 μg/m³ in the Northeast. Daily levels occasionally exceeded 1.5 μg/m³. Some studies indicate that nitrate levels in the western United States are closely correlated with NO_2 concentrations (Appel et al. 1978; Courtney et al. 1980). These same studies and work in Japan (Kadawaki 1977) reveal that ambient nitrates occur in the fine particle fraction as ammonium nitrate and in the coarse fraction as sodium nitrate. Local areas of high NO_2 emissions may contain maximum nitrate values several times the national averages. Atmospheric nitrate levels are thought to be increasing (National Research Council 1977a).

B.8 RESPIRABLE PARTICLES

Because of concern that some particles may be more damaging to the environment than others, the U.S. Environmental Protection Agency is establishing a national network of sampling stations capable of discriminating particle size. Data from the first few years of monitoring activities have been gathered and are discussed below. Data from Whitby (1978) on particle volume versus diameter confirm the results of chemical analysis and physical theory that atmospheric aerosols commonly occur in two distinct modes: the greatest volumes of particles generally are in the range of 0.4-0.5 μm in diameter and also about 7 μm in diameter, and can be greatly influenced by local sources such as powerplants, fugitive emissions, and the age of the aerosol (National Research Council 1979; Whitby 1978).

Recent short-term studies by Dzubay et al. (1977) in St. Louis, Stevens et al. (1979) in Houston and (1980) in the Smokey Mountains, Courtney et al. (1980) in Denver, and Lewis and Macias (1980) in Charleston reveal that the ratios of respirable particles (fine = 0-2.5 μ in diameter, coarse = 2.5-15 μm in diameter) varies by location, season, time of day, and degree of background pollution. The average fine-to-coarse particle ratio measured in the studies cited above was 1.74, with a range of 0.88 to 4.36. The results from 1960 fine and coarse particle measurements obtained from across the U.S. reveal that with daily TSP values ranging from 33.2 μg/m³ to 474.4 μg/m³, inhalable (coarse and fine) measurements ranged from 28.7 μg/m³ to 267.5 μg/m³ (USEPA 1981). General conclusions from these data are that the average inhalable fraction of TSP values ranges from 40 to 100%. The higher percentages generally occurred during the winter when precipitation reduced concentrations of the largest particles. Daily percentages of the fine component versus the coarse component are even more variable, ranging from 20 to 66%. The mean coarse size concentration nationally was 12.55 μg/m³ (range 5.1-25.2 μg/m³) and the mean fine fraction concentration was 19.5 μg/m³ (range 13.3-25.9 μg/m³), for a fine-to-coarse ratio of 1.55 (USEPA 1981). This value is similar to the average of values determined in the short-term studies cited above.

Junge (1952) observed that sulfate, nitrate, and ammonia ions appeared predominately in fine particles. This has been confirmed more recently by Lewis and Macias (1980) and Dzubay and Stevens (1975). Dzubay (1980) also found that in St. Louis air, 75% of the Zn, S, Br, As, Se, and Pb were in the fine particle fraction, while 75% of the Si, Ca, Ti, and Fe were in the coarse fraction. Lewis and Macias (1980) found 85% of the S and NH_4 ions and 61% of elemental and organic carbon in the fine fraction. Stevens et al. (1978) concluded from data gathered at six sites throughout the country that sulfate must be present as ammonium salts or as sulfuric acid and generally not as metallic sulfate. Stevens et al. (1980) found that 61% of the fine particulate mass was sulfate, 12% ammonia, 5% elemental carbon, 10% organic compounds, and the remaining 12% various trace metals, mainly lead.

B.9 CARBON AND ORGANIC COMPOUNDS

The benzene soluble fraction (a useful representative of the organic fraction when its limitations are acknowledged) usually accounts for 10-20% of urban aerosol (by mass) and the benzo(a)pyrene (B(a)P) fraction generally is much smaller. Elemental carbon also is present in the ambient atmosphere. Historical data on the atmospheric levels of specific organic compounds are limited. Eisenreich et al. (1980) listed some atmospheric concentrations of polycyclic aromatic hydrocarbons (PAH), benzene, and toluene obtained throughout the world (see Table B.1). PAH generally are associated with particles of <1 μm diameter and several low-MW PAH are actually more dominant in the vapor phase. Therefore, true ambient concentrations of many of these compounds may be underestimated.

Elemental carbon comprises much of the total carbon and organic fraction occurring in the atmosphere, with the remainder being organic compounds. An "apparent" elemental carbon concentration in New York City of 13.3 μg/m³ was measured by Wolff et al. (1980). Stevens et al. (1980) found 14% of the inhalable fraction in Charleson, W. Va., to be total carbon (8.4 μg/m³), while in rural Smokey Mountains 3% of the inhalable fraction (1.1 μg/m³) was elemental carbon and 3.4 μg/m³ (12%)was organic compounds.

The levels of elemental carbon and organic compounds including B(a)P vary with meteorological conditions, location, season, and time of day (Hidy et al. 1975; Gordon 1976). National Air Surveillance Network 1969 observations in rural areas of Maine and New York recorded annual geometric mean TSP values of 18-29 μg/m³ that contained 1.2-1.8 μg/m³ organics (benzene soluble fraction) and 0.12-0.25 μg/m³ B(a)P. Urban concentrations in New York with TSP levels of 105 μg/m³ were 3.9 μg/m³ organics (benzene soluble fraction) and 3.63 μg/m³ B(a)P. Kneip et al. (1979) observed that winter samples from New York City in 1977 contained a total extractable organic fraction of 22 μg/m³ (average TSP of 96 μg/m³), while in August 1976 TSP was 86 μg/m³ and the organic extract fraction was 13.3 μg/m³.

National trends in B(a)P concentrations in the U.S. since the mid-1960s are downward, with 90 percentile quarterly averages being reduced from 7 ng/m³ to less than 2 ng/m³ (USEPA 1979). Walsh et al. (1981) reported that NASN data show average annual urban B(a)P concentrations decreased from 6 ng/m³ in 1958 to 0.5 ng/m³ in 1973. The concentrations in urban areas with coke ovens are 40-70% higher than in other areas. Daisey (1980), however, observed that these decreases do not occur everywhere. In central New York City, data indicate that while TSP levels at the site decreased 47% from 1968-1969 to 1977-1978, the organic fraction concentrations decreased only 16%. In 1977-1978, 8.8 μg/m³ of respirable (<3.5 μm diameter) organics were measured, which comprised 15% of the TSP values. The actual decrease noted by Daisey probably was less due to the different analytical methods used to measure the organic fraction. No other recent trend data for PAH are available.

Table B.1. Atmospheric Concentrations of Polycyclic Aromatic Hydrocarbons in Urban and Rural Environments

Compound	Urban V/P[a] (ng/m^3)	Urban R/S[b] (ng/L)	Rural V/P[a] (ng/m^3)	Rural R/S[b] (ng/L)
Benzene	600-30,000 (1,000- 2,000)			
Toluene	600-50,000 (1,000-10,000)			
Anthracene	0.2-10 (0.5-4)		0.01-013 (0.1)	
Phenantrene	10-50		0.02-6 (0.1-1)	
Fluoranthrene	0.1-13 (1-5)	300	0.2-7 (0.5-2)	60
Pyrene	0.2-10 (1-5)		0.1-10 (0.5-2)	
Benz(a)anthracene	0.06-5 (0.3-3)		0.04-5 (0.1-1)	
Chrysene*	0.04-5 (1-4)		0.1-12 (0.1-2)	
Benzo(k)fluoranthene	0.06-5 (0.1-1)		0.08-4	
Benzo(a)pyrene	0.03-10 (0.3-3)		0.01-5 (0.2-2)	
Benzo(e)pyrene	0.05-5 (0.5-2)		0.02-3 (0.2-2)	
Indeno[1,2,3-c-d]pyrene	0.03-3 (0.3-2)			
Perylene	0.01-14 (0.1-1)		0.01-2 (0.05-0.6)	
1,12-benzo-perylene	1-30 (1-10)	90	0.04-3	10
Benzo(g,h,i)perylene	0.2-20 (1-10)		0.06-1.9 (0.5-2)	
Coronene	0.2-20 (1-6)		0.02-0.2	
Total PAH				50-300

From Eisenreich et al. (1980).

[a]Vapor/particle.

[b]Rain/snow.

The organic fraction of atmospheric particles is known to contain: PAH, aromatic and aliphatic hydrocarbons, aza-arenes, aliphatic and aromatic aldehydes and ketones, quinones, phenols, polyols, phthalic acid esters, sulfur heterocyclics, aryl and alkyl halides, chlorophenols, nitro compounds, and alkylating agents (Hoffman and Wynder 1977; Daisey 1980; Lamb et al. 1980). However, much of the organic fraction has yet to be identified. There is substantial evidence that the concentration of certain organic compounds in air are related to photochemical oxidation processes (Grosjean and Friedlander 1975).

B.10 TRACE METALS

Akland (1976) reported urban and nonurban annual averages for selected trace metals for the period 1970-1974. The means for this averaging period and the 1974 values are listed in Table B.2. Generally, urban concentrations were much higher than rural levels, presumably due to the impact of local industrial sources. It was determined from two weeks of intensive sampling in Roane County, TN, that cadmium comprised 0.0003% of TSP, lead, 0.02%, and zinc, 0.01% (Lindberg et al. 1979). TSP values averaged 54.5 ng/m^3 for the two-week sampling period. An average 63% (0.11 ng/m^3) of Cd,93% (121 ng/m^3) of lead, and 77% of Zn (4.31 ng/m^3) had diameters of less than 1.2 μm.

Table B.2. Comparison of Five-Year Mean Urban and Nonurban Annual Average Concentrations of Selected Trace Metals, 1970-1974 (ng/m^3)

	1970-1974 Mean Maximum	Arithmetic Mean	1974 Maximum	Arithmetic Mean
Beryllium				
Urban	0.76	0.02	0.2	LD
Nonurban	0.096	0.002	LD[a]	LD
Cadmiun				
Urban	0.123	0.0024	0.077	0.002
Nonurban	0.00012	0.00012	0.0002	0.0002
Chromium				
Urban	0.149	0.072	0.073	0.006
Nonurban	0.05	0.0028	0.009	0.002
Cobalt				
Urban	0.0394	0.0004	0.029	LD
Nonurban	LD	LD	LD	LD
Iron				
Urban	9.94	1.44	6.2	1.1
Nonurban	1.49	0.314	0.69	0.24
Lead				
Urban	5.788	1.072	4.09	0.89
Nonurban	0.0252	0.099	0.534	0.111
Manganese				
Urban	1.164	0.054	0.35	0.04
Nonurban	0.0558	0.01	0.033	0.006
Nickel				
Urban	0.394	0.0128	0.639	0.009
Nonurban	0.1136	0.005	0.026	0.002
Titanium				
Urban	0.34	0.042	0.026	0.002
Nonurban	0.0808	0.021	0.22	0.04
Vanadium				
Urban	0.8092	0.030	0.248	0.019
Nonurban	0.1168	0.0046	0.023	0.02

[a]LD - less than detectable. These values were set equal to zero in the calculation of five-year mean values.

As mentioned in Section B.9, data from Miller et al. (1979) and Dzubay et al. (1977) indicate that lead, arsenic, and selenium are usually associated with fine (<2.5 μm) particles, while iron, calcium, titanium, magnesium, potassium, silicon, and aluminum usually are associated with coarse (2.5-15 μm) particles. Nickel, tin, vanadium, antimony, manganese, zinc, and copper were associated equally with both fine and coarse particles.

Interurban differences in atmospheric trace metal contamination exist and are influenced by the local industrial character in an area. Data for 1966 in Baltimore, Md., reveal that half of the metals studied by Akland (1976) (Table B.2) were present in higher concentrations and half in lower concentrations (Corn 1976). Faoro and McMullen (1977) determined from national monitoring data that concentrations of the combustion-related metals lead, nickel, and vanadium were decreasing, while Be levels were so low trends could not be identified and titanium concentrations were increasing. The decrease in nickel and vanadium were attributed to decreasing concentrations in residual oils. Lead concentrations are decreasing because of reduced levels in motor vehicle fuels and titanium concentrations are increasing because of increased use of coal by utilties. Trends in industrially related metals are downward for iron, cadmium, and manganese because of improved industrial emissions controls. Copper and chromium showed no trends; data are not available for cobalt (Faoro and McMullen 1977).

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APPENDIX C. HEALTH EFFECTS

C.1 SULFUR DIOXIDE

C.1.1 Acute

Sulfur dioxide is a colorless gas with a pungent, irritating odor. Human sensory detection occurs between 1.3 and 2.6 mg/m^3 (0.5-1 ppm) (Walsh et al. 1981). SO_2 is a potent pulmonary irritant at concentrations above 26-52 mg/m^3 (10 to 20 ppm). At lower levels, changes in pulmonary function have been observed in the laboratory (National Research Council 1978). Acute studies with a variety of animals generally indicate that SO_2 concentrations greater than 2.6 mg/m^3 (1.0 ppm) are necessary to produce changes in pulmonary function (National Research Council 1978). However, Amdur et al. (1978) have observed an increase in pulmonary flow resistance in guinea pigs exposed to only 0.84 mg/m^3 (0.32 ppm) SO_2 for 1 hour.

Clinical research with human subjects has indicated a wide range of sensitivity to SO_2 and the interdependence of factors including activity level, route of breathing (oral or nasal), timing of exposure and health status (National Research Council 1978). Exposures of normal, healthy, resting subjects to SO_2 concentrations of 13 mg/m^3 (5 ppm) or more for 2 hours have decreased pulmonary function and nasal mucus flow. Experimental results from exposures of healthy persons to SO_2 concentrations less than 13 mg/m^3 (5 ppm) are more variable. Several investigators have detected decreased lung function in normal subjects while breathing through a variety of regimes and equipment at concentrations as low as 1.95 mg/m^3 (0.75 ppm). Exercise and mouth breathing have generally enhanced the severity of response in these experiments. Asthmatics have reacted to lower concentrations of SO_2 than healthy subjects in many of these tests. In a series of recent experiments, mild asthmatics exposed to concentrations as low as 260 μg/m^3 (0.1 ppm) SO_2 experienced reduced airway resistance and increased symptoms such as wheezing (Sheppard et al. 1980, 1981). Several researchers have not detected adverse effects on pulmonary function at levels of SO_2 less than 13 mg/m^3 (5 ppm), however (National Research Council 1978). It must also be noted that at lower exposure levels both normal and asthmatic subjects demonstrate considerable variability in sensitivity to SO_2. For example, Jaeger et al. (1979) in their studies of 80 healthy nonsmokers and asthmatics, found a single healthy teenager and two asthmatics affected by 1.3 mg/m^3 (0.5 ppm) SO_2 after 3 hours of mouth breathing. Amdur (1973, 1974) and Horvath and Folinsbee (1977) have suggested that 10% of the total population may be especially sensitive to SO_2.

Epidemiological studies of past air pollution episodes have repeatedly demonstrated an association between acute high levels of SO_2 and particulate matter (PM) and increases in morbidity and mortality (Walsh et al. 1981). Attempts to separate out the effects of one pollutant or the other have not been successful. Reviews by Higgins (1974), Holland et al. (1979), and Shy et al. (1978), conclude that during major pollution episodes in London during the late 1940s and early 1950s increases in mortality were associated with SO_2 and PM (measured by the British smoke [BS] method) levels of 1000 μg/m^3 and above. Studies by Glasser and Greenberg (1971) and McCarroll and Bradley (1966) indicate that small increases in mortality among the elderly occurred in New York City in the early 1960s when SO_2 levels were in excess of 1000 μg/m^3 and PM was in the range of 5.0 to 7.0 coefficient of haze (CoH) units.

Lawther (1963) associated increased daily mortality with PM levels greater than 750 μg/m^3 (BS) and SO_2 in excess of 715 μg/m^3 (0.25 ppm) during a winter characterized by the presence of thick fog. Martin and Bradley (1960) found a readily identifiable increase in mortality when PM and SO_2 concentrations ranged from 500-1000 μg/m^3 (BS for PM). Martin (1964) again found a correlation between excess mortality during winter and PM levels of 500-600 μg/m^3 (BS) and above and SO_2 levels higher than 400-499 μg/m^3. Excess mortality was most dramatic at PM levels over 1200 μg/m^3 (BS) and SO_2 levels over 900 μg/m^3. Glasser and Greenberg identified substantial correlations between mortality and SO_2 levels over 786-1048 μg/m^3 with PM above 5.0-5.9 CoH. Based upon the analysis of these studies and others which show a qualitative relationship between PM, SO_2 and mortality, the World Health Organization adopted a figure of 500 μg/m^3 for each pollutant as the minima associated with short-term increases in mortality (Walsh et al. 1981). Excess deaths occurring during these episodes were primarily attributed to bronchitis, pneumonia and cardiac diseases and generally occurred amongst persons 45 years of age and older. At lower pollutant concentrations attempts to detect increased mortality have been difficult because of confounding variables such as temperature and influenza epidemics.

Other studies indicate no relationship between SO_2 concentrations and mortality but rather that PM plays the predominant role (Walsh et al. 1981). In any case, from the studies that have been conducted, it is impossible to relate adverse health effects to SO_2 alone.

Lawther et al. (National Research Council 1978) found SO_2 concentrations of 250-300 μg/m^3 and 350 μg/m^3 TSP (converted from BS data) to be the minimal daily concentrations associated with symptoms in patients with chronic bronchitis. The authors indicated that shorter-term fluctuations in pollution levels may have been responsible for the adverse effects detected, however. Emerson only found a weak association between similar daily TSP levels in conjunction with SO_2 concentrations of 722 μg/m^3 and decreased pulmonary function in chronic obstructive pulmonary disease patients (National Research Council 1978). Based upon these and other epidemiological studies in this countr, Great Britain and Europe, the National Academy of Sciences Committee on Sulfur Oxides (National Research Council 1977) concluded that 24-hour concentrations of 300 μg/m^3 SO_2 and PM (as TSP) appear as the levels above which acute morbidity apparently increases and that 180 μg/m^3 (0.07 ppm) SO_2 and 180 μg/m^3 PM (as TSP) should not be exceeded if the most sensitive asthmatic subjects are to be protected from increases in symptoms.

C.1.2 Chronic

No acceptable epidemiological studies quantitatively relate respiratory disease mortality to chronic (long-term) exposures to SO_2 or PM. Several researchers have reported correlations between annual 24-hour average SO_2 and PM concentrations in the range of 100 to 300 μg/m^3 (PM as TSP) and decreased phlegm production, prevalence of chronic non-specific respiratory disease and decreased pulmonary function in adults, and respiratory symptoms, decreased pulmonary function and increased lower respiratory tract involvement in children (National Research Council 1978). Ferris et al. found an association between 180 μg/m^3 of PM (as TSP) and approximately 56 μg/m^3 SO_2 and decreased respiratory function accompanied by symptoms in adults (National Research Council 1978). In a follow-up study no association was found between pulmonary function or symptoms and 131 μg/m^3 PM (as TSP) in combination with approximately 66 μg/m^3 of SO_2. Lambert and Reid (1970) found an association between the prevalence of cough and phlegm and PM concentrations in excess of 100 μg/m^3 (BS) and SO_2 concentrations over 150 μg/m^3 in postal workers in England. Becklake et al. (1979) reported significant differences in lung closing volume function test results associated with annual SO_2 levels up to 123 μg/m^3 and annual PM levels of 131 μg/m^3 (TSP).

In summary, chronic exposure to SO_2 as low as 150-275 μg/m^3 concurrent with PM levels between 100 and 300 μg/m^3 (BS) have been strongly associated with a greater prevalence of respiratory symptoms in adults and a likely increased frequency of lower respiratory symptoms and decreased lung function in children. 180 μg/m^3 of PM (measured as TSP) with very low levels of SO_2 has been related to decreased pulmonary function in adults. Several other studies indicate effects from chronic exposure to particulate matter and SO_2 at lower levels than those cited above but due to inadequacies in methodology little confidence can be placed in their results at this time.

C.2 PARTICULATE MATTER

Ambient particulate matter is often composed of sulfur compounds and identification of the effects of ambient aerosols and particles independent of sulfur compounds may be impossible. Atmospheric particles are also comprised of heavy metals as oxides or salts and a wide range of volatile organic compounds.

Information from occupational exposures indicate that health effects are highly dependent upon the physical and chemical characteristics of the particles. Mineral dusts are generally not fibrogenic and accumulate in the reticulum framework of the lung without provoking any inflammatory responses. These inert dusts generally only present adverse health impacts after excessive exposure to concentrations several-fold those which occur in the ambient environment (Hamilton and Hardy 1974). Other particles such as silica are capable of inducing a variety of pneumoconiosis-type diseases at lower levels of exposure, while metal particles can produce respiratory and systemic disease (Hamilton and Hardy 1974).

Few toxicological studies have been conducted on the complex particles that occur in ambient air. Since a large proportion of ambient aerosols are comprised of sulfur compounds the research that has been done has focused on sulfur containing particles and aerosols. The following discussion of acute and chronic effects of atmospheric particles and aerosols will address sulfuric acid (H_2SO_4), sulfates (sulfur oxides), nitrates (nitrogen oxides), and respirable particles. Hydrocarbons and other organic particles and trace metals are discussed separately.

C.3 SULFURIC ACID

C.3.1 Acute

Amdur (1952, 1971) identified that acute lethal toxicity in laboratory animals varies with species, age (being more toxic in the young), particle size (approximately 2 μm being the most toxic size), and temperature (toxicity increases with extreme cold). The acute toxicity of H_2SO_4 aerosols is more a function of concentration than length of exposure. Cockrell and Busey exposed guinea pigs to 25 mg/m^3 H_2SO_4 (MMD of 1 μm) for two days and reported segmented alveolar hemorrhage, Type 1 pneumocyte hyperplasia and proliferation of pulmonary macrophages. Extensive experimentation by Amdur and cohorts has revealed pulmonary functional effects at H_2SO_4 concentrations ranging from 0.11 to 43.6 mg/m^3, with particle size generally less than 2.5 μm MMD (National Research Council 1978). Recently, Amdur et al. reported a rectilinear relationship between H_2SO_4 concentrations and pulmonary flow resistance in guinea pigs at concentrations as low as 50-150 μg/m^3 (National Research Council 1978). Amdur (1978) described H_2SO_4 as producing six to eight times the pulmonary response as SO_2 did in other work conducted by her using similar experimental methodology.

Human respiratory effects from laboratory exposure to sulfuric acid mist in concentrations ranging from 0.35-5.0 mg/m^3 include increased respiratory rate and decreased maximal inspiratory and expiratory flow rates and tidal volumes (Amdur et al. 1952). Sim and Pattle (1957) determined that respiratory response to H_2SO_4 is directly proportional to relative humidity. Except for the work of Amdur cited above, acute exposures of healthy subjects have shown no effects on pulmonary function at H_2SO_4 concentrations up to 1000 μg/m^3, even during exercise (National Research Council 1978). Lippmann et al. (1980) found increaed mucociliary clearance in nonsmokers at H_2SO_4 levels of 100 μg/m^3 and above and decreased clearance distal to the trachea at 1.0 mg/m^3 and above. Utell et al. (1981) found exposure to H_2SO_4 at 1 mg/m^3 potentiated the bronchoconstrictor action of carbachol in healthy and asthmatic subjects. Asthmatic subjects have not shown changes in airway function after exposures up to 1.0 mg/m^3 of H_2SO_4 (Sachner et al. 1978).

Fairchild et al. (1975) revealed that concentrations of H_2SO_4 as low as 30 μg/m^3 shifted the deposition pattern of nonviable bacteria in the respiratory tracts of guinea pigs towards the upper respiratory tract. Schlesinger et al. (1978) demonstrated that 1 hour exposures to 0.3-0.6 μm H_2SO_4 aerosols at concentrations ranging from 0.19-1.36 mg/m^3 slowed particle clearance in the bronchi of donkeys.

C.3.2 Chronic

As with acute studies, chronic lethal toxicity investigations with animals reveal that the concentration of H_2SO_4 and not the duration of exposure is the most important parameter influencing toxicity. Subchronic continuous exposure to monkeys at concentrations between 0.38 and 4.79 mg/m^3 H_2SO_4 produced morphological changes in bronchiolar epithelia (Alaire et al. 1973). No changes were seen in dogs exposed to 0.89 mg/m^3 of predominantly 0.5 μm H_2SO_4 aerosols. Guinea pigs, highly sensitive to H_2SO_4 in acute experimentation, were not affected by 52 weeks of continuous exposure to up to 100 μg/m^3 H_2SO_4 (Alaire et al. 1973). Schlesinger (1978) showed development of persistently slowed bronchial clearance of particles after about 6 exposures to H_2SO_4 at 0.19-1.36 mg/m^3 in 2 of the four donkeys tested. Follow-up experiments using repeated 1 hour exposures to 0.1 mg/m^3 H_2SO_4 produced erratic bronchial clearance rates, again in donkeys (Schlesinger 1979). Sustained and progressive slowing of clearance was again produced in 2 of 4 test donkeys. Studies with dogs found similar results while studies with sheep found no alterations in lung clearance rates at H_2SO_4 concentrations of 14 mg/m^3 (Wolff et al. 1979; Sackner et al. 1978).

No information is available on chronic exposures to H_2SO_4 in humans but it has been hypothesized based upon both acute and chronic animal test results and acute studies with humans that chronic exposure to 100 μg/m^3 H_2SO_4 could produce persistent changes in mucociliary clearance in previously healthy individuals and exacerbate conditions in those with existing respiratory disease (Walsh et al. 1981).

C.4 SULFATES

C.4.1 Acute

The effects on pulmonary function produced by sulfate aerosols are similar to those produced by sulfuric acid (National Research Council 1978). Amdur has ranked the relative irritancy of a number of sulfate aerosols administered to guinea pigs using similar experimental methodology and found zinc ammonium sulfate ($Zn(NH_4)_2$ $(SO_4)_2$) to be most toxic (National Research Council 1978). Its irritant effects on pulmonary function were stated to be approximately one-third of those detected with H_2SO_4 using aerosols in a similar size range. Table C.1 lists the relative irritancy of other sulfates tested by Amdur et al. (1978).

Table C.1. Relative Irritant Potency of Sulfates in Guinea Pigs Exposed for One Hour[a]

Sulfuric acid	100
Zinc ammonium sulfate	33
Ferric sulfate	26
Zinc sulfate	19
Ammonium sulfate	10
Ammonium bisulfate	3
Cupric sulfate	2
Ferrous sulfate	0.7
Sodium sulfate (at 0.1 μm)	0.7
Manganous sulfate	- 0.9

From Amdur et al. (1978).

[a]Data are for 0.3-μm MMD particles unless where noted. Increases in airway resistance were related to sulfuric acid which was assigned a value of 100.

Based on Amdur's work it is difficult to assess the relative irritancy of sulfur compounds in ambient air because of the importance of particle size. For example, if ferric sulfate is present in the atmosphere in particles with diameters less than 1 μm while H_2SO_4 is associated with particles having diameters greater than 1 μm, ferric sulfate would be more toxic to exposed animals because of greater penetration of this compound. On the basis of sulfur equivalents, the same amount of sulfur as zinc ammonium sulfate is sixteen times as toxic as it would be in H_2SO_4, which in turn is four times as toxic as the same amount of sulfur would be if it existed as SO_2.

Hackney (1978) reported pulmonary function effects in monkeys after 1-hour exposure to $(NH_4)_2SO_4$, $ZnSO_4$, and NH_4HCO_4 at concentrations of 2.5 mg/m^3, but not from NH_4SO_4 or NH_4NO_3 at the same concentrations. Ehrlich et al. (1978, 1979) found no significant alterations of host defense mechanisms in mice after 3-hour exposures to ammonium sulfate, ammonium bisulfate, NO_2SO_4, $Fe_2(SO_4)_2$ or $Fe(NH_4)_2SO_4$ at concentrations ranging from 2.5 to 6.7 mg/m^3 SO_4. Similar exposure to generally lower levels of cadmium sulfate, copper sulfate, zinc sulfate, aluminum sulfate, zinc ammonium sulfate, and magnesium sulfate between 0.2 and 3.6 mg/m^3 SO_4 enhanced bacterial induced mortality over controls by 20%. These results suggest that the ammonium ion decreases sulfate toxicity to mice respiratory tract defense mechanisms while toxicity is associated with the cation.

Utell et al. (1981) exposed 16 normal subjects and 17 asymptomatic asthmatics to $NaHSO_4$, $(NH_4)_2SO_4$ and NH_4HSO_4 and then to the bronchoconstrictive agent carbachol. Concentrations of 1 mg/m^3 NH_4HSO_4 potentiated the effects of carbachol in asthmatics. Lower sulfate exposures produced no effect. Kleinman and Hackney (1978) and Avol et al. (1979) evaluated the effects of a variety of sulfates on normal subjects, those identified as ozone-sensitive and asthmatics. The subjects exercised during their 2½-hour exposure periods and the test conditions were 88°F and 40% or 85% relative humidity. Pulmonary function was unaffected in the subject pool after NH_4HSO_4 exposures of 100 μg/m^3 and ammonium sulfate concentrations of 85 μg/m^3. Asthmatics exposed at 40% RH to 372 μg/m^3 $(NH_4)_2SO_4$ similarly showed no reaction.

General conclusions from human acute experimentation indicate that concentrations less than 1 mg/m^3 sulfate produce only infrequent slight or transient changes in pulmonary function (National Research Council 1978).

Ispen and coworkers could find no correlation between sulfate levels and absences due to illness in working populations at ambient concentrations reaching 35 μg/m^3 (National Research Council 1978). Investigations by Lave and Seskin, Winkelstein et al., and Winkelstein and Kantor have associated ambient sulfate concentrations to excess mortality (National Research Council 1978). A series of CHESS studies conducted in the U.S. in the late 1960s and early 1970s similarly associate ambient sulfates with excess mortality and a variety of morbidity endpoints (USEPA 1974). However, the limitations of these studies reduce their usefulness beyond providing qualitative evidence of an association between air pollution and adverse health effects and identifying the many difficulties in conducting community air pollution health effects research (National Research Council 1978; USEPA 1980).

C.5 NITRATES

C.5.1 Acute

No significant pulmonary effects were found in healthy and asthmatic volunteers after laboratory exposure to 7 mg/m^3 Na NO_3 for 16 minutes. The particles had a MMD of 0.49 μm (Walsh et al. 1981). Epidemiological studies have demonstrated an association between atmospheric nitrate levels and exacerbation of pulmonary symptoms in elderly and asthmatic persons at nitrate levels of 2 to 7.2 μg/m^3 (Walsh et al. 1981). As with sulfate epidemiological research, these results may suffer from interference of confounding environmental variables. No information on the effects of chronic exposure to nitrates in animals or humans has been found.

C.6 NITROGEN DIOXIDE (NO_2)

C.6.1 Acute

Respiratory illness from acute exposure to low levels of nitrogen dioxide (NO_2) ranges in severity from slight irritation to burning and pain in the chest to violent coughing and dyspnea. Exposure to higher levels can produce chronic lung disease and death (Walsh et al. 1981). Laboratory research has shown that pre-exposure to NO_2 reduces the resistance to respiratory infection in laboratory animals (Walsh et al. 1981). This effect has occurred after exposures to 3.6 mg/m^3 (2.0 ppm) NO_2 (National Research Council 1977). Reduced resistance to bacterial infection is thought to result from interference of alveolar macrophage activity and may occur in humans (Walsh et al. 1981).

Clinical studies with human volunteers by von Nieding, and Rokaw and Suzaki indicate that reversible increases in airway resistance occur after 15 to 45 minute exposures to NO_2 at concentrations of 2.8-3.8 mg/m^3 (1.5-2.0 ppm) (National Research Council 1977). Orehek et al. reported increased airway resistance in 3 of 20 asthmatic subjects and increased sensitivity to carbachol, a bronchoconstrictor, in 13 of 20 asthmatics exposed to 200 μg/m^3 (0.11 ppm) NO_2 for 1 hour (Walsh et al. 1981). This has been the only adverse health effect reported in humans clinically exposed to NO_2 concentrations less than 2.82 mg/m^3 (1.5 ppm).

C.6.2 Chronic

The chronic health effects of NO_2 are less well documented (National Research Council 1977). Continuous or prolonged intermittent exposure for 3 or 6 months to 940 μg/m^3 (0.5 ppm) NO_2 reduced the resistance to bacterial infection of laboratory animals. Pathological and physiological abnormalities of increasing severity have been seen in animals exposed to higher concentrations. Epidemiological studies indicate the presence of excess acute infectious respiratory disease in healthy human populations after exposure to 100 to 580 μg/m^3 (0.053-0.31 ppm) NO_2. Other epidemiological studies found changes in ventilatory function in populations exposed to greater than 150 μg/m^3 (0.08 ppm). The results from these epidemiological studies must be interpreted with caution, however, because other air pollutants capable of inducing the observed effects were also present.

C.7 OZONE AND PHOTOCHEMICAL OXIDANTS

C.7.1 Acute

Ozone is the major component of photochemical oxidant mixtures and has recently been recognized as a reliable indicator of the adverse health effects due to this group of pollutants (USEPA 1978). Ozone and the other constituents in photochemical smog generally cause biological effects in animals and humans similar to those associated with nitrogen dioxide. While the toxicological and health endpoints are similar, ozone (O_3) is considerably more toxic than NO_2.

Acute experiments with animals indicate a range of effects from exposure to O_3 concentrations of 392-1960 μg/m^3 (0.2-1 ppm) including altered pulmonary function, morphological changes in pulmonary tissue, biochemical effects and alterations of genetic material (USEPA 1978). Increased susceptibility to bacterial infection has been detected in a number of investigations with animals upon short-term exposure to 196 μg/m^3 (0.10 ppm) O_3 and lower (USEPA 1978; National Research Council 1977).

Data from clinical experimentation with humans is highly suggestive that alterations in pulmonary function occur upon acute exposure (hours) to 1.47 mg/m^3 (0.75 ppm) O_3 in lightly exercising subjects. Experimental results are more variable at lower levels of exposure. Several researchers have identified changes in pulmonary function after 2-hour exposures to 730 $\mu g/m^3$ (0.37 ppm) in subjects exercising intermittently (USEPA 1978). Another researcher detected changes only in known O_3-sensitive subjects (persons who have demonstrated an abnormally high susceptibility to the irritating properties of O_3) at this level. This same researcher, in another study, found Canadian subjects to react to 730 $\mu g/m^3$ (0.37 ppm) O_3 while Californian subjects similarly exposed were not affected (USEPA 1978). This result indicates development of tolerance to O_3-induced physiological changes which are detected by pulmonary function. De Lucia and Adams observed changes in lung function and respiratory patterns in 2 of 6 healthy adults undergoing strenuous physical exercise after 1-hour exposures to O_3 levels of 590 $\mu g/m^3$ (0.30 ppm) and again at 290 $\mu g/m^3$ (0.15 ppm); two other researchers have detected alterations in pulmonary function in a portion of subjects tested at 200 $\mu g/m^3$ (0.1 ppm) O_3 (USEPA 1978). Hackney et al., however, were unable to detect any effects at 490 $\mu g/m^3$ (0.25 ppm) O_3, even in "reactive subjects" (USEPA 1978). All changes in lung function detected in the above research have been reversible. These laboratory experiments have also detected self-reported symptoms including throat tickle, substernal tightness, pain upon deep inspiration and cough in exposed subjects at levels associated with altered pulmonary function (USEPA 1978). The symptoms are proportional to dose. During strenuous exercise, symptoms occasionally prevented subjects from completing the tests. Ozone irritates the major bronchi of test subjects at 490 $\mu g/m^3$ (0.25 ppm) (USEPA 1978).

Researchers have detected increased lysis of blood erythrocytes in healthy human subjects following O_3 exposure to concentrations as low as 730 $\mu g/m^3$ (0.37 ppm). There is conflicting evidence whether or not acute exposure at this level produces chromosome abnormalities in lymphocytes of healthy subjects. Other biochemical changes in the blood of human subjects exposed to O_3 at levels less than 980 $\mu g/m^3$ (0.5 ppm) have been determined but the clinical significance of these effects is unknown (USEPA 1978).

Epidemiological research has associated total oxidant exposures in the range of 200-290 $\mu g/m^3$ (0.10-0.15 ppm) and greater with failure of high school cross country runners to improve running performance (Wayne et al. reported in USEPA 1978). These results have been verified by reanalysis. Hammer et al. found an association in students between chest discomfort and maximum hourly oxidant levels of 490-570 $\mu g/m^3$ (0.25-0.29 ppm); cough and oxidant levels of 590-760 $\mu g/m^3$ (0.3-0.39 ppm); and headache and levels of 590-760 $\mu g/m^3$ (0.3-0.39 ppm) (USEPA 1978). These findings correlate well with clinical research results. Japanese researchers found higher rates of respiratory symptoms and headaches in students exposed to oxidants at concentrations greater than 200-290 $\mu g/m^3$ (0.1-0.15 ppm) (USEPA 1978). These results are difficult to interpret because of the possible presence of confounding variables and the potential for oxidant pollution in Japan to be characteristically different from that which occurs in the U.S. Epidemiological investigations link oxidant exposure above 200-880 $\mu g/m^3$ (0.10-0.45 ppm) to eye irritation. The quantities of O_3 present in these epidemiological studies is difficult to determine but results from clinical studies indicate that O_3 is not responsible for eye irritation. Peroxyacetyl nitrate (PAN) and peroxubenzoyl nitrate (PB_2N) are probably responsible for the eye irritation effects observed (Walsh et al. 1981). No research has conclusively associated daily oxidant levels to increased mortality (USEPA 1978).

C.7.2 Chronic

Chronic exposure of animals to O_3 has produced a variety of morphological changes at levels less than 1970 $\mu g/m^3$ (1 ppm) (USEPA 1978). Emphysematous changes and damage to terminal bronchioles and alveoli have been detected after repeated, intermittent exposure to 784-1058 $\mu g/m^3$ (0.4-0.541 ppm) O_3 for as little as 3 months. No experiments have assessed the long-term effects of ozone/oxidant exposure in humans. Epidemiological results showing associations with respiratory mortality and increased incidence of chronic obstructive pulmonary disease are inconclusive (USEPA 1981).

C.8 RESPIRABLE PARTICLES

It has become increasingly apparent that particles in the smallest size range are at least partially responsible for the adverse health effects associated with atmospheric particulate matter (Walsh et al. 1981). Particles less than 2.5 μm in diameter easily penetrate into the distal portions of the respiratory tract where they contact relatively unprotected tissue and can remain for long periods of time. Particles less than 2.5 μm in diameter also contain a large percentage of the sulfates, nitrates, sulfuric acid, heavy metals and organic species that occur in ambient air.

Amdur (1952, 1971) has identified the importance of particle size in human and animal toxicity research indicating that particles with approximately 2 μm mass mean diameter (MMD) are the most toxic to rodents. Experiments with inert dusts and powders less than 1 μm in diameter produced pulmonary functional changes and impaired gas exchange after brief exposure in both healthy and asthmatic human subjects (Walsh et al. 1981). The groups of subjects responded at different times with the time lag between exposure and respiratory response being greater in healthy subjects.

Epidemiological research to date has been largely insensitive to the potential role played by respirable particles in causing adverse effects on human health. The British data are probably more indicative of the impact of respirable particles than are American results since the BS monitoring method primarily detects particles in a smaller size range. The only conclusion that can be reached with available evidence is that inhalation of fine particles may be responsible for at least a portion of the adverse respiratory-related effects that occur in animals and humans but that no quantitative relationship can be established at this time.

C.9 HYDROCARBONS AND ORGANIC MATTER

Hydrocarbons and other organic matter present in the ambient atmosphere include a variety of potentially harmful agents. The two classes of compounds of most concern on the basis of health are polynuclear aromatic hydrocarbons (PNAs) and their neutral nitrogen analogues. These classes of compounds contain several carcinogenic agents including the potential carcinogen benzo(a)pyrene. Many studies indicate that PNAs and other polycyclic organic matter are primarily associated with particles in the respirable size range (Walsh et al. 1981). Information on the health impacts of these substances is derived primarily from occupational data. Extrapolation of this information to the public is difficult because of known differences in sensitivities to effect between working populations and the general public and variations in type and degree of exposure.

C.9.1 Acute

The large number of PNAs released during coal combustion and/or present in the atmosphere produce a wide variety of biological effects. The primary focus of past and current research into these effects has been their mutagenicity, cytotoxicity and carcinogenicity (Walsh et al. 1981). These effects have been studied in subcellular and cellular investigations with animals and correlated with occupational and community exposures in humans. A variety of PNAs are capable of inducing mutations in a number of accepted in vitro test systems (Walsh et al. 1981). Mutagenic effects may occur directly or indirectly after metabolic activation. Metabolic activation subjects the initial test compound to enzyme action which degrades the chemical into biologically more useful forms. Oftentimes, the metabolites, and not the original compound, induce the mutagenic effects. Perylene, benzo(a)pyrene, dibenz(a,c)anthracene, cyclopenta(c,d)pyrene, 3-methylcholanthrene, chrysene and 7, 12-dimethylbenz(a)anthracene are amongst the strongest mutagens identified in studies conducted to date (Walsh et al. 1981). Cytotoxicity testing may also require metabolic activation for certain compounds. Tests for cytotoxic effects are generally conducted in cultures of rodent or occasionally human cells. In general, 7, 12-dimethylbenz(a) anthracene, 3-methylcholanthrene, benzo(a)pyrene, and dimethyl and diethylnitrosamine are among the most cytotoxic polynuclear aromatic hydrocarbons identified thus far (Walsh et al. 1981).

The ability of PNAs to produce morphological transformations in mammalian cells has been suggested to indicate carcinogenic potential (Walsh et al. 1981). Several acute investigations in rodent cell systems have identified cellular transformations with the same compounds as have been positively correlated with mutagenicity and cytotoxicity as discussed above (Walsh et al.).

The lowest concentration required to produce any of these effects in cellular systems is 5 ng/mL of solution for 72 hours. Extrapolating this dosage directly to atmospheric exposure in humans cannot be done for a variety of reasons.

Acute exposures to high levels of PNAs and other polycyclic organic matter has produced non-neoplastic skin and eye responses in a number of clinical and occupational settings (Walsh et al. 1981). Skin application of coal tar and coal tar solutions in the laboratory has produced phototoxicity, erythema, decreased mitotic activity and induction of enzyme activity related to cancer initiation (Walsh et al. 1981). Occupational exposure to coal tar and coal tar products, pitch, creosote, asphalt and petroleum products has produced non-allergic and allergic dermatitis, phototoxicity and photoallergic reactions, folliculitis, acne, and pigment disturbances (Walsh et al. 1981).

C.9.2 Chronic

Skin carcinomas have been observed in working populations exposed to unquantified levels of high temperature coal tar products (Walsh et al. 1981). Several epidemiological investigations of working populations have correlated long term exposure to products of coal distillation with elevated rates of lung cancer and occasionally cancer at other sites (Walsh et al. 1981). Because exposure data are generally not available from these studies the only conclusion that can be made is that the risk of cancer increases with pollutant concentration and duration of exposure, hence total dose. An occupational study by Hammond et al. of roofers and waterproofers found excess lung, bladder and skin cancer and leukemia in these workers (Walsh et al. 1981). Calculations of exposure of these workers to organic matter using benzo(a)pyrene (B(a)P) as a surrogate were equivalent to ambient air concentrations of 2.088 $\mu g/m^3$. However, the incubation period of cancer is very long and exposure conditions may have been different (probably worse) during the period prior to this study. For example, B(a)P concentrations measured in the vicinity of coal pitch roofing operations in 1967 were 14 $\mu g/m^3$, seven times higher than those detected by Hammond et al. during the early 1970s. In summary, the range of B(a)P concentrations (used as an indicator of PNA exposure) associated with increased cancer risks in working populations is 1.2 to 200 $\mu g/m^3$ (Walsh et al. 1981). These data must be interpreted cautiously, however, because past exposures to B(a)P for these workers are likely to have been greater than the measurements taken at the time the excess cancer was detected actually indicate. Higher exposures at earlier times may have contributed disproportionately to the doses leading to cancer induction.

Several community studies indicate that urban dwellers are at increased risk of lung cancer when compared with their rural counterparts. The association between this increased risk and PNAs in the atmosphere (generally using B(a)P as an indicator) has not been conclusively established (Walsh et al. 1981). This is significant again because of the dramatic decreases in ambient levels of PNAs (measured as B(a)P) that have occurred throughout the U.S (see Appendix B.9). If an association exists between PNA air pollution and excess lung cancer amongst the public, it is likely due to historical and not present levels of contaminants.

C.10 TRACE ELEMENTS

Several trace elements in ambient air represent potential hazards to public health. Human exposure to metals in the atmosphere may result from direct inhalation or indirectly from contact with or ingestion of contaminated surface waters. Ingestion of contaminated aquatic organisms or of crops grown on contaminated soils is also possible but of lesser importance. Walsh et al. (1981) have identified arsenic, beryllium, cadmium, chromium, mercury, nickel, selenium and thallium as being the trace metals of primary concern which are released by coal combustion sources. Most of these are preferentially concentrated in coal fly ash or are discharged as vapors. Many have been found to be concentrated on the smallest particles in power plant flue gas (Walsh et al. 1981). In general, environmental trace metals are associated with, or suspected of causing, human illness through chronic, low-level exposures. Acutely toxic concentrations are not common, especially in association with coal combustion. A discussion of the trace elements of concern from coal combustion is presented in Walsh et al. (1981) and summarized below.

C.10.1 Arsenic

Arsenic poisoning can result from inhalation, ingestion and absorption through the skin. Elemental and certain organic and inorganic forms are capable of producing toxic reactions. Trivalent arsenite is more toxic than pentavalent forms of the element. The estimate of the maximum tolerable daily intake for humans is 14-20 mg. Arsenic has been associated with genotoxic effects in humans. Workers exposed to high levels of arsenic had an abnormally high frequency of chromosomal aberrations in their lymphocytes. Arsenic exposure to levels between 254-696 $\mu g/m^3$ has been weakly associated with cancer in sheep dip workers. Orchard sprayers exposed to 140 $\mu g/m^3$, and other groups of workers exposed to approximately 100 $\mu g/m^3$ for under 25 years, showed no increased risk of cancer, however. Other adverse health effects associated with arsenic occur at higher exposures than those associated with cancer. The daily intake for humans has been calculated to be from 0.137-0.40 mg/person. The "acceptable air concentration" of arsenic III established by the panel of health experts chaired by Morrow is 1×10^{-5} $\mu g/m^3$. The estimated Permissible Concentration for ambient air based on health protection calculated by Cleland and Kingsbury as part of their Multimedia Environmental Goals is 5×10^{-3} $\mu g/m^3$ for both arsenic III and V (USEPA 1977).

C.10.2 Beryllium

Beryllium is a highly toxic metal which upon inhalation is retained by the lungs. Industrial exposures of 0.31-1310 $\mu g/m^3$ have caused chronic lung disease (berylliosis) in a portion of exposed workers. Many of these victims also developed hypoxia. Animals exposed to 50-100 $\mu g/m^3$ experienced acute lung distress and lung damage. Beryllium produces cancer in animals upon exposure to air concentrations of 10 $\mu g/m^3$ and higher but this disease has not been associated with humans. Skeletal damage can result from ingestion.

The National Institute of Occupational Safety and Health (NIOSH) recommended an atmospheric standard of 0.01 $\mu g/m^3$ to protect community health in neighborhoods near beryllium-using industries. The "acceptable air concentration" identified by Morrow, et al. is 5.0×10^{-3} $\mu g/m^3$. The Estimated Permissible Concentration derived by Cleland and Kingsbury to protect public health is 1.0 $\mu g/m^3$ (USEPA 1977).

C.10.3 Cadmium

Cadmium occurs as a particulate in the atmosphere, with approximately 60 percent falling within the respirable size fraction. Subcellular, cellular and animal tests indicate that cadmium is cytotoxic, genotoxic and causes anemia, hypertension, cardiovascular disease and a variety of biochemical effects of uncertain consequence. Acute exposures in animals have also produced progressive and permanent lung damage. Certain of these effects have been verified to occur in humans. Human exposures to 3000-15000 $\mu g/m^3$ cadmium dusts over 20 years may result in some chronic lung damage. Acute exposures to dusts in the range of 30-690 $\mu g/m^3$ were not associated with any adverse effects. Estimates for the minimum atmospheric exposures necessary to produce renal damage in humans in 20 years range from 1.6-21 $\mu g/m^3$ and 0.8-2 $\mu g/m^3$ for 50 years of exposure. Epidemiological studies linking cadmium concentrations in air to hypertension and arteriosclerotic heart disease are suggestive but not conclusive. Several occupational studies have associated cadmium exposure with increased scrotal and/or respiratory cancer. Average adults intake 50-75 μg/day of cadmium, less than 2% of which is inhaled. Morrow et al. set the "acceptable air concentration" for cadmium at 0.05 $\mu g/m^3$, while the atmospheric Estimated Permissible Concentration calculated by Cleland and Kingsbury to protect health is 0.12 $\mu g/m^3$ (USEPA 1977).

C.10.4 Chromium

Atmospheric chromium is in particulate form. Subcellular, cellular and animal experimentation have found chromium to induce biochemical, mutagenic and carcinogenic effects. Occupational evidence indicates that relatively high exposures (0.5-1.5 mg/m^3) to chromium for 6-9 years increase the risk of lung cancer while even higher exposures cause severe acute irritation of nasal tissue. Chromium IV is thought to be more toxic than chromium III (the form that predominates in the atmosphere). Most of chromium uptake by humans occurs via ingestion. The "acceptable air concentration" set by Morrow et al. is 0.05 $\mu g/m^3$. The Estimated Permissible Concentration for air to protect health is 0.12 $\mu g/m^3$ (USEPA 1977).

C.10.5 Mercury

Mercury is capable of accumulation and passage through the food chain. Environmental human exposure may either be direct or through contaminated food sources. Inhalation of elemental mercury vapor can be harmful to humans and inhalation of alkyl mercurial compounds at levels of 1 mg/m^3 for several months has reportedly caused human fatalities. Some symptoms of organic mercury poisoning have been reported to occur after exposures to air levels between 0.1-1 mg/m^3. Monthly average exposure to 0.03-0.1 mg/m^3 produced no significant effects.

Inorganic mercurials from power plant emissions are not expected to be an inhalation risk, however. Occupational data reveal that exposure to inorganic mercury in atmospheres containing less than 10 $\mu g/m^3$ have not been associated with significant adverse health effects. Increasing levels of exposure are directly associated with effects on the central nervous system. Ingestion of organic mercury can produce nervous and other symptoms and death. The U.S. Environmental Protection Agency has established a maximum allowable concentration for ambient air of 1 $\mu g/m^3$ for mercury. "Acceptable air concentrations" set by Morrow et al. are 0.1 $\mu g/m^3$ for inorganic mercury and 0.01 $\mu g/m^3$ for organic mercury. The Estimated Permissible Concentration for air is 0.024 $\mu g/m^3$ (USEPA 1977).

C.10.6 Nickel

As with several other trace elements, the chemical species of nickel affects its toxicity. Subcellular, cellular and animal experimentation has revealed nickel to be cytotoxic, mutagenic and genotoxic. Direct contact with human skin produces skin reactions in certain individuals. Other effects of nickel particles have been reported in both mammals and humans. Nickel carbonyl is the most toxic of all nickel compounds in humans and is generally acknowledged as a potential carcinogen. It has been correlated with nasal and respiratory cancers. Nickel oxide and sulfide are considered potential carcinogens.

Inhalation accounts for approximately 1-2% of nickel intake by humans. Amounts absorbed into the body via this and other pathways are not known. Morrow, et al. set the "acceptable air concentration" at 0.01 $\mu g/m^3$ for nickel and 1×10^{-6} $\mu g/m^3$ for nickel carbonyl. The Estimated Permissible Concentration for air is 0.24 $\mu g/m^3$ for nickel and 0.8 $\mu g/m^3$ for nickel carbonyl.

C.10.7 Selenium

Selenium is associated with respirable particles in the atmosphere. Chronic industrial exposures at relatively high concentrations cause nasal bleeding, loss of smell, dermatitis, headache and irritation of mucous membranes. The effects of chronic exposure to selenium are unknown. Although little is known about the toxicology of the element, the respiratory pathway is not seen as a major route of entry into the body with normal daily dietary uptake ranging from 15 to

50 μg/day. Morrow, et al. estimated an "acceptable air concentration" for selenium of 0.1 $\mu g/m^3$ while the Estimated Permissible Concentration for air is 0.5 $\mu g/m^3$ (USEPA 1977).

C.10.8 Thallium

Thallium is highly toxic upon acute administration to animals. Occupational exposures have led to thallium poisoning after inhalation, ingestion, or skin contact. It accumulates in tissue. Like mercury, the passage of thallium through the food chain to humans is of concern. Morrow's acceptable air concentration is 0.01 $\mu g/m^3$. Cleland and Kingsbury's Estimated Permissible Concentration for air is 0.24 $\mu g/m^3$ (USEPA 1977).

C.11 COMBINED EXPOSURES

Many residents of the northeast are simultaneously exposed to relatively high levels of several criteria air pollutants including various mixtures of SO_2, TSP, NO_2, O_3, and CO. In addition, they are exposed to several non-criteria air pollutants such as sulfates, nitrates, sulfuric acid, trace metals and polynuclear aromatic hydrocarbons. Atmospheric concentrations for many of these substances will increase as a result of coal conversion. The interaction of these substances in the atmosphere and in human tissue may result in additive, synergistic or antagonistic effects upon human health. Besides the extensive epidemiological data base for particulate matter and SO_2, little research has been conducted on the health effects of exposure to multiple atmospheric contaminants. The available information is discussed below.

C.11.1 Acute

Amdur (1961), Amdur and Underhill (1968), Amdur (1974) and Amdur et al. (1978) reported results from experiments with animals that indicated simultaneous exposure to SO_2 and aerosols capable of converting SO_2 to H_2SO_4 had a greater effect on respiration than did either SO_2 or the aerosol alone. Since simultaneous exposure to SO_2 and solid aerosols not capable of interacting with SO_2 did not exhibit potentiation (Amdur and Underhill 1968), the theory developed that increased effects were not due to potentiation but to H_2SO_4 aerosols. These results have been reported in studies with human volunteers (Nakamura 1964; Toyama 1962; Snell and Luchsinger 1969). Snell and Luchsinger (1969) found simultaneous exposure of human subjects to 5 ppm SO_2 and NaCl aerosol (7 μm average diameter) to be the lowest level of SO_2 at which decrements in pulmonary function were noted. Significant effects on pulmonary function were observed after exposure to 0.5 ppm SO_2 in combination with distilled water aerosol (0.3 μm diameter).

Toxicological exposures of H_2SO_4 and O_3 have produced equivocal results. Last and Cross (1978) reported synergistic effects upon histopathological examination of rats simultaneously exposed to 0.78-0.98 mg/m^3 O_3 and 1 mg/m^3 H_2SO_4. Grose et al. (1980) on the other hand, reported antagonistic effects upon ciliary beating frequency in hamster trachea after sequential exposure to first 0.196 mg/m^3 O_3 and then 0.88 mg/m^3 H_2SO_4. Gardner et al. (1977) reported an additive effect between H_2SO_4 and O_3 in tests of susceptibility to bacterial infection with mice. When 0.196 mg/m^3 O_3 was administered immediately followed by 0.9 mg/m^3 H_2SO_4 increased susceptibility to infection was noted. This effect did not occur after a reversal of the sequence of pollutant administration was made.

Bates and Hazucha (1973) reported a synergistic effect upon pulmonary function in human subjects acutely and simultaneously exposed to 0.37 ppm O_3 and SO_2. Kagawa and Tsuru (1979) reported a similar synergy in exercising humans after simultaneous exposure to 0.15 ppm O_3 and SO_2. Bell et al. (1977) and Horvath and Folinsbee (1977) could not replicate these results and suggested that the effects noted by Bates and Hazucha may have been due to H_2SO_4 aerosol formation in the exposure chamber. Von Nieding et al. (1979) did not find evidence of pollutant interaction in human subjects exposed to 5 ppm SO_2, 5 ppm NO_2 and 0.1 ppm O_3.

Simultaneous ozone and NO_2 exposure resulted in an additive effect by reducing the resistance to bacterial infection in mice (National Research Council 1977a). A combination of O_3, 0.3 ppm NO_2, and 30 ppm CO produced no effects on male volunteers beyond those attributed to O_3 alone (National Research Council 1977b).

C.11.2 Chronic

Subchronic exposure to SO_2, H_2SO_4 and fly ash either singularly or in various combinations in guinea pigs resulted in no potentiation of the effect of fly ash on either pulmonary function or lung morphology (Alaire et al. 1975). Morphological changes were observed in monkeys exposed to 2.6 mg/m^3 SO_2 plus 0.88 mg/m^3 H_2SO_4, however. Chronic experiments with beagle dogs revealed that mixtures of 1.1 mg/m^3 SO_2 and 0.09 mg/m^3 H_2SO_4 produced anatomic alterations after 61 months of exposure (Hyde et al. 1978). These effects occurred at levels lower than necessary for either SO_2 or H_2SO_4 to produce the changes alone. Stara et al. (1980) reported on this same series of experiments and concluded that simultaneous exposure to irradiated and nonirradiated auto exhaust (containing CO, HC, NO_2 and O_3) in conjunction with SO_2 and/or H_2SO_4 did not reveal potentiation upon pulmonary function for any combinations of the pollutants studied.

Zarkower (1972) found greater effects in the pulmonary and systemic immune systems of mice after simultaneous exposure to SO_2 and carbon than were attributable to either pollutant alone. These results were similar to those of Fenters et al. (1979) who exposed mice to 1.5 mg/m^3 H_2SO_4 and 1.5 mg/m^3 carbon. Schiff et al. (1979) found more epithelial damage in the trachea of hamsters after exposure to 1.1 mg/m^3 H_2SO_4 and 1.5 mg/m^3 carbon than was due to either chemical alone.

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APPENDIX D. ENERGY CONSERVATION AND ALTERNATIVE ENERGY TECHNOLOGIES

D.1 INTRODUCTION

In the DEIS, conversion to coal was contrasted with the oil saving potential of conservation and alternative energy technologies in the three powerpools of the Northeast. This Appendix is an expanded version of that discussion, and reflects the comments of DEIS reviewers. It contains revised projections of conservation impacts and reflects recent forecasts of regional electricity demand.

The findings of the revised analysis are:

- Conservation activities are significant in all three sectors (e.g., insulation in the residential sector, relamping in the commercial, and housekeeping in the industrial) and are generally reflected in utility electricity forecast demand.
- The commercial sector has new major opportunities for conservation not included in utility forecasts.
- Utility oil displacement by solar is insignificant.
- Significant amounts (3%-10%) of oil could be displaced by commercial sector conservation, even with plant conversions to coal.
- If further reductions occur in load growth (e.g., lower economic growth or aggressive utility conservation programs), new capacity will be deferred. The need to service existing load (1980-1990) will require use of plants targeted for coal conversion. Coal conversion is still economically attractive.

For this revised analysis, the following steps were taken: (1) studies referred to in the reviewer's comments and other recent reports were reviewed; (2) the most recent statistics on electricity consumption and use of solar and conservation measures in the Northeast were obtained; (3) revised electric demand forecasts for the Northeast were developed and the role of conservation in these forecasts was determined; (4) market potential for significant conservation options in the residential, commercial, and industrial sectors was assessed; and (5) the degree of complementarity and competition between conservation and coal conversion was determined.

In conducting the penetration studies for conservation measures, three scenarios are considered. The first two scenarios, no coal conversion (Base Case) and coal conversion of 42 oil-fired plants (Coal SIP), were identified in the DEIS. The third scenario is coal conversion for the 27 plants included in the Voluntary Conversion Scenario (see Sec. 1). No legislative scenario is considered in this analysis, which emphasizes free-market response to opportunities (price-induced) for implementing conservation measures.

The appendix is organized into five sections. In Section D.2, revisions in the Base Case assumption about electricity demand are discussed. The discussion begins with recent demand and then extends to projections for 1990. Revised technical candidates for conservation are discussed at the beginning of Section D.3, with updated market potential estimated at the end of Section D.3. Section D.4 is a summary of the study findings and a discussion of the projected load impacts of conservation in the Northeast. Section D.5 is a summary of market potential and load impact analysis methodology. In Section D.6, references on conservation suggested by reviewers of the DEIS are discussed.

D.2 ELECTRICITY DEMAND

This section contains updated estimates of electricity consumption, conservation and solar activities, and end-use characteristics for the three Northeast power pools, as well as reviews of selected conservation studies.

D.2.1 Electricity Consumption and Characteristics for the Northeast Power Pools

Using the U.S. Department of Energy's State Energy Data System (SEDS) (Energy Information Admin. 1981a), residential, commercial, and industrial electricity consumption were estimated for each power pool (Table D.1). The variation in the pools is noteworthy. The residential sector is dominant in the New England Power Pool (NEPOOL), the commercial sector in the New York Power Pool (NYPP), and the industrial sector in the Pennsylvania-New Jersey-Maryland Interconnection (PJM).

Table D.1. Estimated[a] 1978 Electricity Consumption (10^6 MWh) in Three Northeast Power Pools

End Use	NEPOOL	NYPP	PJM
Residential	28.1	30.2 (32.6)[a]	48.7
Commercial	24.9	41.1 (42.5)	45.7
Industrial	22	32.9 (28.1)	63.4
Other (railroad)	-	2.3 (2.8)	-
Transmission losses	-	10.4 (10.6)	10.4
Total	75.0	113.5 (116.6)	168.2

[a]Numbers in parentheses are from New York State Energy Office (1980).

D.2.1.1 Historic End-Use Electricity Consumption

Current electric end-use characteristics are presented by power pool in Table D.2. The residential sector is dominated by the "other" category, which includes electric ranges, refrigerators/freezers, clothes dryers, and other appliances. The refrigerator/freezer subcategory accounts for 25-40% of the "other" end use. In the commercial sector, lighting is dominant in NYPP and NEPOOL and is a close second to air conditioning in PJM. Note that the PJM air conditioning load is increased dramatically over that of NEPOOL. The industrial sector's end use is dominated by electrolytic processes, other process heat, and machine-drive end uses. This sector is especially important in PJM.

Table D.2. Historical Electrical End-Use Consumption (%) by Power Pool (1978)

	NEPOOL		NYPP		PJM	
	% Sector Load	% Total Load	% Sector Load	% Total Load	% Sector Load	% Total Load
Residential						
Space heating	19.0	6.9	6.2	1.8	16.2	5.3
Water heating	12.0	4.0	7.7	2.2	13.3	4.3
Air conditioning	2.8	1.0	6.8	1.9	6.9	2.3
Other	64.9	23.6	75.0	21.8	63.6	20.8
Total residential		36.4		29		32.7
Commercial						
Space heating	2.0	0.5	10.6	4.5	2.7	.7
Air conditioning	11.1	4.0	22.9	9.7	46.8	12.9
Water heating	-	-	1.7	.7	2.7	.7
Lighting	59.2	15.7	48.5	20.4	41.9	11.5
Other	28.3	7.5	16.3	6.8	5.9	1.6
Total commercial		26.6		42		27.5
Industrial						
(Space conditioning,) lighting, water heating	30	8.5	30	7.5	30	11.9
Process heat, machine drive	70	19.9	70	17.5	70	27.8
Total industrial		28.4		25		39.7
Transportation/Other		9.4		4.0	-	-

From New York State Energy Office (1980); U.S. General Accounting Office (1981); and Synergic Resources Corp. (1980).

D.2.1.2 Other Fuels Competing with Electricity

Electricity in the three Northeastern power pools is used primarily for electric motor drive (industry, air conditioning) and lighting end uses, as opposed to space and water heating (Table D.3). For example, 86% of the residential space heating load in NEPOOL is accounted for by fuel oil or natural gas. In NYPP and PJM, 97% of the space heating load is supplied by fossil fuels. In the commercial sector, fossil fuels account for 91% of New England's space heating supply. In NYPP and PJM the comparable figures are 96% and 80%, respectively. Residential water heating shows a similar pattern (New York Energy Office 1980; U.S. General Accounting Office 1981; Synergic Resources Corp. 1980; New England Energy Congress 1979; New Jersey Dept. of Energy 1981).

Table D.3. Relative Energy[a] Shares for Three Northeastern Power Pools 1978 (10^{12} Btu)

	NEPOOL			NYPP			PJM		
	E	O	NG	E	O	NG	E	O	NG
Residential									
Space heating	18	472	135	7	455	256	89	282	289
Water heating	19	20	15	7	42	44	23	28	30
Commercial									
Space heating	1	359	85	15	357	92	4	310	197
Water heating		14	10	3	28	10	4	33	20

From New York State Energy Office (1980); U.S. General Accounting Office (1981); Synergic Resources Corp. (1980); New England Energy Congress (1979); New Jersey Dept. of Energy (1981).

[a] E - Electricity
O - Oil
NG - Natural gas

D.2.2 Current Levels of Conservation and Solar

Conservation activities are already well underway in all three sectors in three powerpools. The degree of responsiveness to higher energy prices within a sector is a function of price sensitivity and capital availability.

D.2.2.1 Current Conservation

In the residential sector, the level of insulation and weatherization varies widely; however, available evidence indicates that the level of insulation and weatherization in electrically heated homes is substantially greater than that in the overall housing stock. Data from Northeast Utilities and General Public Utilities (GPU) suggest that the level of insulation in electrically heated homes equals or exceeds ASHRAE 90-75 standards (Burbank 1979; GPU 1980a, 1980b). In Northeast Utilities' service area, for example, the ASHRAE standards translate to minimum values of R-19 in ceiling, R-11 in walls, R-7 in floors, and double glazing.

In the GPU service area (eastern Pennsylvania and western New Jersey), virtually all 130,000 electrically heated homes met or exceeded the ASHRAE 90-75 standard. Further, 50% of the new all-electric homes in the Pennsylvania Electric Co. service territory exceed the ASHRAE 90-75 standard. For the other two GPU operating subsidiaries, Metropolitan Edison and Jersey Central Power & Light Co., the corresponding values are 20% and 10%. It is worth noting, however, that new single-family homes consume electricity for space heating at only 60% of the rate of pre-1970 homes.

For NEPOOL, the New England Regional Commission (NERCOM) constructed estimates of housing stock energy characteristics, as shown in Table D.4 (New England Congress 1979). A very small fraction of the overall stock (electric heated is included) is close to the 1978 building code energy standards of R-19 attic insulation, R-11 walls, R-7 floors, and 100% storm windows, storm doors, and weatherstripping. However, at the annual retrofit conservation activity rate (10% per annum) suggested in a recent USDOE survey, the weatherstripping and storm door/window retrofit activity could be finished by 1985. Addition of attic insulation could take until 1990 to complete.

Table D.4. Estimates of New England Housing Stock Characteristics

Category	Walls	Ceiling	Ground Floor	% Storm Windows	% Storm Doors	% Weather-Stripping
Single-Family Detached, Single-Family Attached, Multi-Family Low Rise						
Post-1965 (28% of housing stock)						
Electric	R-7	R-15	R-0	60[a]	60	30
Fossil	R-7	R-12	R-0	45[a]	50	25
1940-1965 (27% of housing stock)						
	R-3	R-7	R-0	65	65	25
Pre-1940 (45% of housing stock)						
Ins. (20%)	R-11	R-9	R-0	70	70	25 Unins. (80%) R-OR-OR-07070 25
Multi-Family High Rise						
Electric	R-4	R-7	-	30[a]	70	25 FossilR-OR3-- 20*70 20
Mobile						
Electric	R-7	R-11	R-11	80[a]	80	80 FossilR-7R-11R- 1170*50 30

From New England Energy Congress (1979).

[a]Adjusted for thermopane windows.

The New York State Energy Office (1980) estimates that owners of 60% of the single-family homes voluntarily undertook envelope retrofits by June 1, 1979. New homes are required by the New York Energy Conservation Construction Code to reduce their space heating by 15% compared with a pre-code home. New low- and high-rise buildings are required to show 30% energy reductions.

Finally, the largest sector in the Northeast powerpools, appliances, is expected to improve its stock efficiency by 1990. However, the efficiency gains of the 1970s are not likely to be repeated for refrigerators, which account for up to 40% of the appliance load.

In the commercial sector, a significant portion of the building stock has been retrofitted since 1974 (Table D.5) (Energy Information Admin. 1981b). Although it would appear that additional opportunities still exist, this observation may be misleading, since some retrofits are not economic or lack market incentives. For instance, the ability to economically retrofit ceiling insulation is limited by the building's design (plenum used as air return), and the willingness to retrofit ceilings is affected by the diverse responsibilities and needs of the building owner and tenants.

For the PJM commercial sector, some new buildings use less than one-fifth as much energy per square foot as those of a decade ago (Governor's Energy Council 1981). While the level of retrofit activity is difficult to ascertain, new buildings in the major subregions of PJM and NYPP are subject to minimum energy consumption standards. Additional opportunities for economic conservation still exist in this sector, however.

Where end uses are similar, conservation in the industrial sector parallels that of the commercial sector. As in the commercial sector, however, much remains to be done. For example, a recent assessment of rapid payback conservation improvements showed that only 35% of the potential in New England and only 41% in New York and PJM was realized (Gas Research Institute 1979). For industrial process applications, energy efficiency will continue to increase as energy-consuming durables are replaced.

Table D.5. Northeast Commercial Sector Conservation Retrofit Activity, 1974-1978

Activity	% of Buildings
Weatherstripping or caulking	43
Insulation	33
Treated glass	
At construction	12
After construction	16
Outside shading	
At construction	5
After construction	8

From Energy Information Admin. (1981b).

D.2.2.2 Current Solar

Solar usage in the three Northeastern power pools has been confined to passive heating for homes and domestic hot water (DHW) systems. Solar passive homes number only 5,000, an insignificant fraction of the 11-million unit single-family housing stock. Solar domestic hot water installations make up 80% of all active solar systems (Table D.6) (Applied Management Sciences, Inc. 1981). The balance are space heating or pool heating systems scattered throughout the residential and commercial sectors.

Although displacement of electricity is the most economical use for solar, it cannot be assumed that all or even most current solar installations are paired with conventional electric systems. Since early adopters of new technologies often base their purchase decisions on non-economic criteria, a more random distribution of conventional backup heating sources is likely. If we assume that random purchases occur, then the distribution of solar DHW approximates the distribution of energy sources used for conventional water heating. Solar DHW installations will thus augment 10% or less of the electric systems in each of the three power pools.

D.2.3 Projections to 1990

Projections for each power pool were developed based on information from USDOE, utilities, and economic consulting firms (Table D.7). As in the DEIS, the "Business as Usual" (BAU) Scenario was developed by the USDOE's Office of Fuels Conversion in the fall of 1980. The other projections were compared and contrasted for synthesis into alternative scenarios. The alternative scenario, the Low Scenario, is based on the most recent forecasts and reflects the continued downward trend of demand projections.

D.2.3.1 NEPOOL Electricity Projection for 1990

The NEPOOL 1990 BAU Scenario (20,595 MW) is very close to the North American Electric Reliability Council 1981 forecast presented in the DEIS. The Low Scenario is based on a Data Resources, Inc. (DRI) spring 1982 forecast (DRI 1982) and the Energy Information Administration's 1981 Annual Report to Congress (Energy Information Admin. 1982). NEPOOL's 1980 projections and a study for the General Accounting Office also were considered (USGAO 1981; Load Forecasting Task Force 1980). The BAU and Low scenario projections are displayed in Figure D.1.

The difference between the two projections making up the composite low scenario may be explained by examining projected economic growth rates for NEPOOL at different times. For example, DRI's spring 1982 projections show an 18% reduction in real disposable income for 1990 compared with the winter 1980-1981 projections. It is very likely, therefore, that the BAU projections (completed in the fall of 1980) used a much higher economic growth rate than did the more recent projections.

The 1981 ARC medium oil price escalation rate (3%/yr) projections are based on electricity consumption growth rates for 1979-1990 applied to 1978 consumption by sector. The growth rates are 1.7% for residential, 2.8% for commercial, and 0.9% for industrial. The growth rates account for (1) decreases in household energy use reflecting price-induced efficiency gains in equipment and structures, changes in energy consumption behavior and attitudes, and near total saturation of many household appliances by the mid-1970s; (2) the growing importance of the commercial

Table D.6. Current Solar Usage Estimate in Northeast Powerpools

Power Pool	Pre-1980 Installations	1980 Installations	DHW[a] Solar Installations	Total	Fraction of Electric DHW Housing Stock	All-Electric Housing Stock with Solar DHW
NEPOOL	5079	4280	7705	9359	0.09	908
NYPP	2943	3079	5023	6022	0.07	421
PJM	4582	3326	6150	7908	0.10	791

From Applied Management Sciences, Inc. (1981).

[a]DHW - domestic hot water.

Table D.7. Sources Used for Projected 1990 Electricity Consumption (10^6 MWh) in Three Northeastern Power Pools[a]

R	C	I	TL	Total	Reference
			NEPOOL		
				110.2	NEPOOL (1980)
			10.1	111.1	NERC (1981)
36.4	26.6	28.4	9.4	100.8	USGAO (1980)
34.0	33.1	27.7	8.6	103.4	DRI (1982)
34.4	34.7	24.5	8.5	102.1	ARC (1981)
			NYPP		
37.4	52.4	37.4	12.9	140.1	NYSEO (1980)
---------121.6---------			13.9	133.5	NERC (1981)
36.5	52.1	40.2	12.9	141.7	DRI (1982)
37.1	52.7	32.9	12.3	135.0	ARC (1981)
			PJM		
---------215.4---------			15.3	230.7	NERC (1981)
59.6	57.9	79.5	13.0	21.0	DRI (1982)
63.8	63.1	77.6	13.4	219.9	ARC (1981)
---------224.7---------			15.8	239.6	EPM (1981)
---------209.3---------			14.7	22.4	EPM (1981)

[a] R - Residential
C - Commercial
I - Industrial
TL - Transmission loss

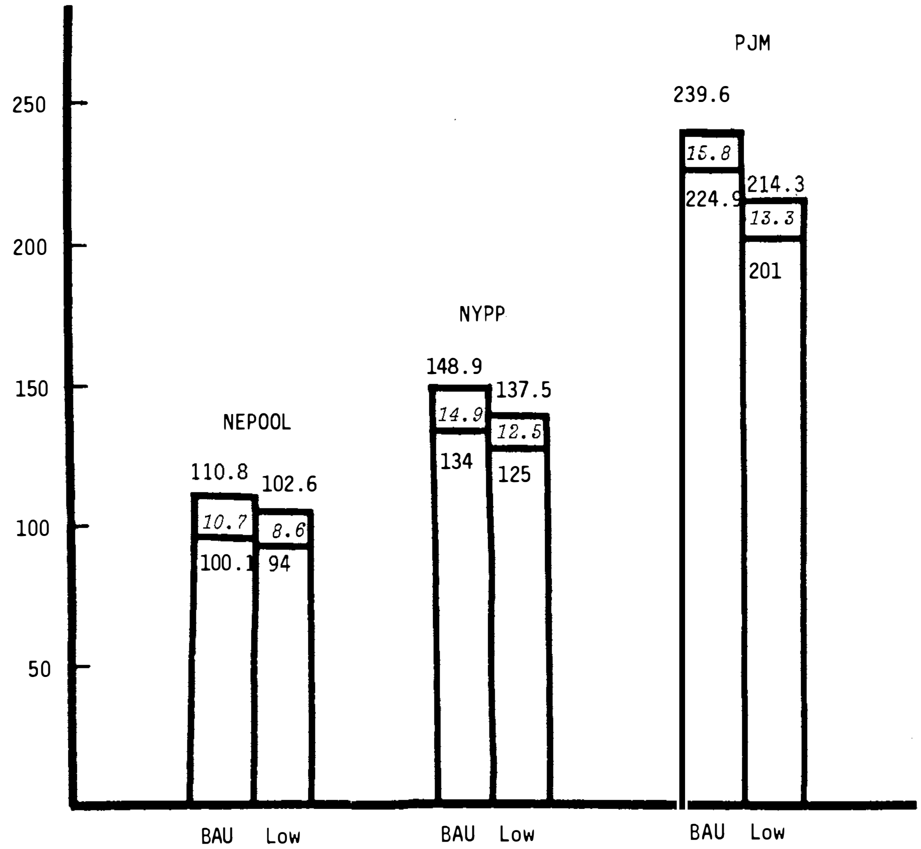


Fig. D.1. Projected 1990 Electricity Consumption under BAU and Low Scenarios for Three Northeastern Power Pools. Transmission losses are set in italic type.

sector, preference for electricity, and expected improvements in the thermal integrity of buildings; and (3) and continued growth of the industrial sector, the energy intensity per unit output and the expansion of electricity uses.

The other half of the composite Low Scenario, the DRI spring 1982 projections, used a 1.4% per annum growth rate for residential consumption, 2.7% for commercial, and 2.0% for industrial. Except for the commercial sector, these growth rates are significantly lower than DRI's winter 1980-1981 projections.

The NERC 1981 projection is based on the latest power pool projections. The slight difference between it and the pool projection is due to different estimates and different times of preparation.

Although pool and reliability council data are composites of projections, it is useful to note how one utility forecasts. Northeast Utilities, representing 33% of NEPOOL, estimates future sales based on minimum weatherization standards (discussed in Section D.2.1) and the market saturation of 16 appliances. The level of this detail demonstrates their progress at incorporating appliance efficiency improvements, gradually improved insulation levels, and market penetration of new devices (for example, electric cars) into its forecasts.

The GAO 1981 projections assume a 2.5% annual growth rate over the 12-year period. According to the report, one explanation for the difference in the NEPOOL and GAO projections is that the models used different demographic and economic assumptions.

Finally, it is worth noting that the five projections considered here were made over a two-year period in which national economic conditions were extremely unsettled.

D.2.3.2 NYPP Electricity Projections for 1990

The NYPP BAU case from the DEIS (25,830 MW) is 9.8% higher than the NERC July 1981 forecast (DEIS, National Electric Reliability Council 1981). The Low Scenario is composed of the DRI spring 82 and ARC 1981 forecasts (see Table D.7) (DRI 1982; USDOE 1982). The other forecast assessed was the New York State Energy Office's (1980) Energy Master Plan for 1980 SRC. The BAU and Low scenario projections are shown in Figure D.1.

As with the NEPOOL BAU forecast, the NYPP BAU forecast is most likely based on optimistic assumptions. For example, the DRI spring 1982 forecast for growth real disposable income for the Mid-Atlantic region is 1.5% per year versus 1.9% in the DRI winter 1980-81 report.

The DRI spring 1982 projection is based on the growth for the Middle Atlantic (New York, Pennsylvania, and New Jersey) region. The similar economic structure of these states suggests that regional growth rates (1.7% annually for residential, 2.0% for commercial, and 1.9% for industrial) can be used for NYPP without modification. The commercial and industrial projections reflect a small increase over the DRI winter 1980-81 projections and a halving of the residential growth rate.

The ARC 1981 projections (1.8% per annum for residential, 2.1% for commercial and 0.2% for industrial) are based on medium consumption growth rates for the New York-New Jersey region. As with the DRI forecasts, the New York-New Jersey growth projections are used to represent NYPP without modification. The assumptions behind the growth rates are detailed in Section D.3.1.1. Differences in regional growth are functions of economic mix and opportunity.

The NERC 1981 projection reflects a total load growth rate of 2.3% per annum in NYPP. No information was available detailing the growth on a sector-by-sector basis.

The NYSEO 1980 projection is based on state energy office projections of 1.6% annually for residential, 2.1% for commercial, and 2.6% for industrial. Growth in housing units will follow anticipated moderate economic growth. The increased use of electricity for appliances, air conditioning in existing homes and, to a lesser degree, space heating, will add to growth from incremental stock. The commercial sector will experience steady growth, particularly in the service area, space conditioning, ventilation systems, and data processing. Industrial firms are assumed to have realized the limits of low cost housekeeping improvements. Thus, the rate of improvement in energy consumption in this sector depends on the rate of investment in new, more efficient capital stock. Non-energy-intensive industries are expected to increase their consumption as growth occurs. In particular, machinery-intensive industries requiring electricity will lead the growth.

D.2.3.3 PJM Electricity Projections for 1990

The PJM BAU case (see Table D.7) from the DEIS (43,310 MW) is very close to the NERC July 1981 forecast (National Electric Reliability Council 1981; DRI 1982). The low case is based on the DRI 1982 and ARC 1981 forecasts (USDOE 1982; DRI 1982. The other forecasts considered are from July 1981 and December (Energy Information Administration 1981c, 1981d). The BAU and Low scenario projections are shown in Figure D.1.

Details are not available on the BAU scenario except that it was formulated in the fall of 1980 and reflects economic growth projections at that time. As noted earlier, however, DRI projections for real growth in disposable income for 1990 has been lowered substantially for the Pennsylvania, New Jersey, New York area and thus electric load growth is likely to be lower as well.

The ARC 1981 projections, 2.25% for residential, 2.75% for commercial, and 1.7% for industrial, are based on the average of the NY/NJ region and Mid Atlantic region medium growth rates (PJM straddles the two regions). The assumptions behind the growth rates are described in Section D.3.1.1. Differences in regional growth are functions of economic mix and opportunity.

The DRI spring 1982 projections for the Mid Atlantic Region, residential 1.7% annual, commercial 2.0%, and industrial 1.9%, were used for PJM. The latter two are slightly higher than the DRI winter 1980-81 projection while the former is halved.

The NERC 1981 projection is based on the latest power pool projections. The 1990 level of consumption reflects a 3.2% annual load growth rate. No other details on assumptions are available.

The December 1981 projection (Energy Information Admin. 1981d) for the coordinating council comprising PJM reflected a 2.9% annual growth rate. This rate is slightly lower than projected in July 1981. Details on the assumptions of the projections are not available, but were taken from monthly utility forecasts submitted to USDOE.

D.2.3.4 Projected End-Use Electricity Consumption

Electric use evolves as appliance saturation, fuel competition, and uses change. Projected 1990 end uses for the three power pools are shown in Table D.8.

Table D.8. Projected 1990 Electrical End Use Consumption % by Power Pool

	NEPOOL		NYPP		PJM	
	% Sector Load	% Total Load	% Sector Load	% Total Load	% Sector Load	% Total Load
Residential						
Space heating	22.0	8.0	10.9	3.2	20.0	6.6
Water heating	11.0	4.0	8.3	2.4	14.0	4.6
Air conditioning	3.0	1.0	6.8	2.0	7.0	2.3
Other	64.0	23.7	74.0	21.7	59.0	19.5
Total residential		36.7		29.3		33.0
Commercial						
Space heating	4.3	1.0	11.3	4.5	3	.8
Air conditioning	12.0	3.0	26.2	10.4	50.0	13.5
Water heating	N/A	-	1.5	.5	2.0	.5
Lighting	57.3	14.9	44.8	17.7	39.0	10.5
Other	26.6	6.9	17.1	6.8	6.0	1.6
Total commercial		25.8		39.9		26.9
Industrial						
Space conditioning, lighting, water heating	30.0	8.7	30	8.1	30	12.0
Process heat, machine drive	70.0	20.3	70	19.0	70	28.0
Total industrial		29.0		27.1		40.0
Transportation/other		8.0		4.0	-	-

Sources: NYSEO (1980); USAGO (1981); State of New Jersey (1981); and Governor's Energy Council (1981).

D.2.3.5 Sources of Electric Demand Growth

Based on Tables D.1 and D.6, the sources of electrical consumption for all three power pools to 1990 can be explored (Table D.9). For NEPOOL, appliance electricity requirements are the main components of the residential sector electricity demand, with electrical usage in the industrial process sector close behind. Residential electric space heating for residences is third, and commercial electric space heating a close fourth. This pattern parallels the economic growth expected in New England, with a transformed industrial base, growing commercial sector and expansion of electric space heating into the residential and commercial markets.

A similar pattern unfolds for NYPP (Table D.9) with the "other" residential sector leading the growth with higher appliance saturation, especially in non-electric homes. The industrial process heat and machine drive end-use sector again is second with the growth in air conditioning in the commercial sector third. These three sectors account for 60% of the growth in electricity consumption 1978-1990 in NYPP.

PJM's pattern of growth (Table D.9) is significantly different, with its strong industrial sector particularly important in process heat and machine drive. The next most important source of electricity growth is the "other" commercial sector. This is a miscellaneous end-use sector for electro-mechanical devices, business machines, computers, etc. and probably reflects growth in the office services portion of the commercial sector. The third largest growth category is the "other" residential sector, which again reflects the wider saturation of all appliances in non-electric homes. These three categories compose over two-thirds of the projected 1978-1990 PJM growth in electricity consumption.

Table D.9. Projected End Use Demand Changes for NEPOOL, NYPP, and PJM[a]

Sector/ End Use	1978						1990						1978-1990		
	% Total Demand			10^6 MWh			% Total Demand			10^6 MWh			Increase (10^6 MWh)		
	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM
Residential															
Space heating	6.9	1.8	5.3	5.2	1.9	8.4	8.0	3.2	6.6	8.0	4.3	14.8	2.8	2.4	6.4
Water heating	4.2	2.2	4.3	3.2	2.3	6.8	4.0	2.4	4.6	4.0	3.2	10.3	1.8	0.9	3.4
Air conditioning	1.0	1.9	2.3	0.8	2.0	3.6	1.0	2.0	2.3	1.0	2.7	5.2	0.2	0.7	1.6
Other	23.1	21.8	20.8	17.5	22.5	32.8	23.7	21.7	19.5	23.9	29.1	43.6	6.4	6.6	10.8
Commercial															
Space heating	0.5	4.5	0.7	0.4	4.6	1.1	3.0	4.5	0.8	3.0	6.3	1.8	2.6	1.7	0.7
Air conditioning	4.0	9.6	12.9	3	9.9	20.4	3.0	10.4	13.5	3.0	13.9	30.2	0	4.0	9.8
Water heating	-	0.7	0.7	-	0.7	1.1	-	0.5	0.5	-	0.7	1.1	-	0	0
Lighting	15.5	20.4	11.5	11.7	21.0	18.2	14.9	17.7	10.5	14.9	23.8	23.5	3.2	2.8	5.3
Other	7.4	6.8	1.6	5.6	7.0	2.6	4.9	6.8	1.6	4.9	9.3	3.6	(0.7)	2.3	1.0
Industrial															
Space conditioning, lighting, water heating	8.5	8.5	11.9	6.4	8.8	18.8	8.7	8.1	12.0	8.7	10.9	26.9	2.3	2.1	8.1
Process heat, machine drive	19.6	19.9	27.8	14.8	20.5	43.9	20.3	19.0	28.0	20.5	25.0	62.7	5.7	4.5	18.8
Transportation/other	9.3	4.0	-	7.0	4.1	-	8.0	4.0	-	8.0	4.8	-	1.0	0.7	-
Total	100	100	100	75.6	105.3	157.7	100	100	100	99.9	134.0	223.7	25.3	28.7	66.0

[a]The source for NEPOOL is USGAO (1981); for NYPP, the source is NYSEO (1981); and for PJM, the sources are New Jersey Dept. of Energy (1981) and Governor's Energy Council (1981).

D.3 ASSESSMENT OF CONSERVATION OPTIONS

The electricity demand projections in Section D.2.3 reflect recent actual conservation levels and trends. Projections also can include expected conservation activity through the use of (1) increasingly price-sensitive coefficients (price-induced conservation), (2) non-price regulation (FHA housing insulation standards), or (3) accounting for efficiency improvements in appliances and other energy-using durable goods. The purpose of this section is to investigate conservation options that have a high probability of being excluded from these projections and that have large near-term conservation potential.

D.3.1 Summary of Conservation Options

The options considered here are limited to major sector end uses. For example, although additional economic conservation may be feasible in the commercial sector's electric water heating load, it is a very small portion (less than 1%) of the overall annual electric demand in NYPP. Thus, it is not considered here. Second, only options with a high degree of economic attractiveness (2-3 year payback) to large segments of a sector are considered.

D.3.1.1 Residential Conservation Options

Undeveloped market opportunities for electricity conservation in the residential sector are limited by economic acceptability. Long-payback improvements are unacceptable, while short-payback improvements are already largely reflected in utilities' plans (see Sec. D.2.2).

Space conditioning/building thermal envelope. Electrically heated homes (new and old) are usually much better insulated and weatherized than homes heated by fossil fuels (see Sec. D.2) (New York State Energy Office 1980; Burbank 1979; General Public Utilities 1980). While retrofits of homes that underinsulated or underweatherized are expected to continue, utility forecasting procedures are increasingly accounting for this activity. Heat pumps are penetrating the residential market even in New England. However, the small share of electric space heating demand and the even smaller share of heat pump electric demand preclude further consideration in this analysis.

Water heating. Although water heating conservation activity (e.g., wraparound insulation) lags far behind building thermal envelope improvements, utility forecasting procedures are accounting for improved energy efficiencies expected in newer models in the 1980s. For example, in New York, the State Energy Conservation Code mandates improved efficiencies in newly installed water heaters. For GPU's PJM service area (which has the largest Maryland water heating projected end use percentage), the utility is considering time of day rates and water heating storage as conservation measure. Thus, no additional study effort is required for this end use.

Lighting. Improved incandescent lamps and screw-in fluorescent lamps are available. However, stringent residential purchase criteria will prevent a massive, voluntary relamping until lamp prices come down.

Appliances. The "other" end use category in Tables D.1 and D.9 accounts for major and minor appliances and a significant portion of the residential load. Of all the sub-end use categories, refrigeration is the largest (25-40% of total appliances) and is briefly considered here. Increased refrigeration efficiency is an important aspect of many residential conservation studies, mainly because the energy consumption of refrigerators relative to other appliances. Over the past decade, the efficiency of refrigerators has improved greatly, with average efficiency increasing by 20% from 1972 to 1978, and it is expected to increase a further 10% through 1980. At the same time, however, the average volume of refrigerators shipped increased by almot 10% and the trend toward more energy-consumptive frost-free refrigerators continued.

It is important to note that while the trend toward more energy-consumptive refrigerators is likely to continue, the big efficiency gains recorded in the 1970s are not likely to be repeated. First, by 1980, virtually all manufacturers had shifted from fiberglass to foam insulation. This technological change accounted for a large portion of the efficiency improvement and will not be repeated. Second, since USDOE has abandoned government pressure on industry to increase efficiency, manufacturers will devote less attention to energy efficiency. Additionally, individuals have not displayed a strong preference for more expensive, energy-efficient refrigerators, preferring instead more voluminous, option-laden units. It is therefore unlikely that the bulk of new refrigerators purchased in the 1980s will be the most efficient models available. By 1990, new unit energy consumption will be about 1200 kWh/yr, with one-half of the 1980 stock having been replaced, virtually all of it by frost-free machines. The net effect of the shift to more effective but more energy-consumptive units is that little or no electricity savings are likely.

D.3.1.2 Commercial Conservation Options

A large number of measures could be taken by commercial building owners and occupants to reduce electricity consumption. Because of the nature of commercial building use, the most significant of these measures address energy consumed for heating, ventilation, and air conditioning (HVAC) and building lighting. HVAC improvements are typically applied on a building-wide basis, while many of the lighting improvements can be applied on a lamp-by-lamp basis.

Five conservation measures were evaluated in detail for their impact on commercial sector electricity consumption. These five, ranked in order in Table D.10, appear to have the greatest unaccounted-for potential for reduction of future utility loads. The technological characteristics of the five measures are summarized in Table D.11, and their assumed savings profile is presented in Figure D.2.

High-frequency electronic ballasts. The replacement of standard fluorescent ballasts with electronic ballasts can result in an electricity savings of about 30%

Reduced ventilation rates. ASHRAE Standard No. 62-73 suggests commercial building ventilation rates of 5 to 10 cfm per person. Old designs usually maintained 0.2 cfm/ft^2 of building. By changing fan speed, motor horsepower can be reduced in retrofit applications.

HVAC scheduling. Building energy consumption can often be reduced by microprocessor control of the HVAC system. In this instance, changes in building demand are met by computer-directed equipment scheduling. Energy for cooling may be reduced by 5-10% and for heating, 45-55%.

HVAC scheduling (electric cooling only). Reductions of 5-10% in energy use for cooling may be realized by microprocessor control of HVAC systems in commercial buildings.

Wall insulation (electric heating and cooling). The incremental cost of increasing the specified building wall insulation from R-10 to R-15 is small enough that this option yields a payback of less than two years, for installations that are electrically heated and cooled. For electric cooling only, the payback is greater than six years.

Table D.10. Commercial Conservation Options Screened and Ranked for Use in Analysis

Commercial Conservation Measure	Ranking	Ratio of Initial Cost to First-Year Savings (@ $0.07/kWh)
HVAC scheduling		
Electric cooling only	1	0.20
Electric heating & cooling	2	0.07
Wall insulation	3	1.0
Electronic ballasts - replace at life	4	2.0
Reduced ventilation rates	5	2.1
Relamp 40-watt fluorescents with 35-watt	6	3.6
Relamp incandescents with screw-in fluorescents	7	3.7
Variable air volume systems - Electric heating & cooling	8	3.9
Chill water reset/tube fouling	9	5.9
Roof insulation	10	3.0
Electronic ballasts - relamp	11	8.9
Variable air volume systems - electric cooling only	12	11.1

Table 0.11. Characteristics of Selected Commercial Conservation Options Used in the Analysis

Technology	Application	Potential Electricity Savings	Installed Cost (1980 dollars)	O&M Cost	Cost/Savings Ratio†[1]	Special Installation Requirements	Availability	User Acceptance and Performance
HVAC scheduling	Automatic or manual scheduling to coincide with building energy demand.	Cooling 3-10%; heating 45-55%	$\$50/1000\ ft^2$	Small systems-$0; larger buildings ($10^6$ ft^2)-$20,000/yr	NEPOOL HC = 0.06 C = 0.17 NYPP HC = 0.06 C = 0.17 PJM HC = 0.06 C = 0.19	Should use authorized dealer	More than 100 firms producing. Highly competitive.	Generally good. Some difficulties with improper installation.
Wall insulation	Increase R10 (ASHRAE 90-75) to R15	(MW/hr/1000 ft^2) NEPOOL H = 314 C = 90 NYPP A = 280 C = 75 PJH H = 280 C = 90	$\$60/1000\ ft^2$	None	NEPOOL = 0.85 NYPP = 1.0 PJM = 0.90	None	Excellent	Excellent
High-frequency electronic ballasts	Replace standard ballasts as they wear out	26 W/ballast (370 W/100 ft^2 of building)	$37.50/ballast ($540/100 ft^2)†[2]	Replace after 12-15 years ($12.50/ballast)	NEPOOL = 1.8 NYPP = 1.8 PJM = 2	None	Good; at seast three manufacturers	New product historically high failure rate. Newest generation performs well. May be standard in 5 yr.
Reduced ventilation rates (retrofit)	From 0.2 cfm/ft^2 to 5-10 cfm/ft^2 per person (ASHRAE 62-73)	∼ 12%	$\$30/1000\ ft^2$	Some reduction over that of systems with old flow rates	NEPOOL = 2.1 NYPP = 2.1 PJM = 2.4	None	Good	Good

†[1] NEPOOL and NYPP ratios based on electricity cost of $0.08 kWh; PJM ratio based on electricity cost of $0.07 kWh.

†[2] Differential cost = $5/ballast ($71 ft^2).

	Electronic Ballasts				Wall Insulation Electric Cooling Only				HVAC Scheduling Elec. Heating & Cooling				HVAC Scheduling Elec. Cooling Only				Reduced Ventilation			
	W	S	S	F	W	S	S	F	W	S	S	F	W	S	S	F	W	S	S	F
0-1	0	0	0	0	0.0	0.0	0.0	0.0	.66	1.0	1.0	1.0	.66	1.0	1.0	1.0	0	0	0	0
1-2	0	0	0	0	0.0	0.0	0.0	0.0	.83	1.0	1.0	1.0	.83	1.0	1.0	1.0	0	0	0	0
2-3	0	0	0	0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0
3-4	0	0	0	0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0
4-5	0	0	0	0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0
5-6	0	0	0	0	1.0	0.0	.44	0.0	.33	.67	.6	.75	.33	.67	.60	.75	0	0	0	0
6-7	1.0	1.0	1.0	1.0	.90	0.0	.42	0.0	.17	.67	.5	.75	.17	.67	.5	.75	1.0	1.0	1.0	1.0
7-8	1.0	1.0	1.0	1.0	.52	0.0	.53	0.0	.17	.44	.3	.63	.17	.44	.3	.63	1.0	1.0	1.0	1.0
8-9	1.0	1.0	1.0	1.0	.37	.10	.63	.10	.17	.44	.2	.63	.17	.44	.2	.63	1.0	1.0	1.0	1.0
9-10	1.0	1.0	1.0	1.0	.25	.4	.76	.40	.17	.44	.2	.63	.17	.44	.2	.63	1.0	1.0	1.0	1.0
10-11	1.0	1.0	1.0	1.0	.20	.6	.84	.60	.17	.44	.2	.63	.17	.44	.2	.63	1.0	1.0	1.0	1.0
12-13	1.0	1.0	1.0	1.0	.19	.8	.84	.80	.17	.44	.2	.63	.17	.44	.2	.63	1.0	1.0	1.0	1.0
13-14	1.0	1.0	1.0	1.0	.09	.9	1.0	.90	.17	.44	0.0	.63	.17	.44	0.0	.63	1.0	1.0	1.0	1.0
14-15	1.0	1.0	1.0	1.0	.07	1.0	.98	1.0	.17	.44	0.0	.63	.17	.44	0.0	.63	1.0	1.0	1.0	1.0
15-16	1.0	1.0	1.0	1.0	.05	.9	.97	.90	.17	.44	0.0	.63	.17	.44	0.0	.63	1.0	1.0	1.0	1.0
16-17	1.0	1.0	1.0	1.0	.04	.7	.94	.70	.17	.44	0.0	.63	.17	.44	0.0	.63	1.0	1.0	1.0	1.0
17-18	1.0	1.0	1.0	1.0	.04	.5	.90	.50	.17	.55	.20	.63	.17	.55	.20	.63	1.0	1.0	1.0	1.0
18-19	0	0	0	0	0.0	0.0	0.0	.50	.78	.50	.88	.50	.78	.50	.88	1.0	0	0	0	0
19-20	0	0	0	0	0.0	0.0	0.0	0.0	.67	1.0	1.0	1.0	.67	1.0	1.0	1.0	0	0	0	0
21-22	0	0	0	0	0.0	0.0	0.0	0.0	.67	1.0	1.0	1.0	.67	1.0	1.0	1.0	0	0	0	0
22-23	0	0	0	0	0.0	0.0	0.0	.67	1.0	1.0	1.0	.67	1.0	1.0	1.0	1.0	0	0	0	0
23-24	0	0	0	0	0.0	0.0	0.0	0.0	.67	1.0	1.0	1.0	.78	1.0	1.0	1.0	0	0	0	0

(a)

		Electronic Ballasts	Wall Insulation Elec. Cooling Only			HVAC Scheduling Elec. Heating & Cooling			HVAC Scheduling Elec. Cooling Only			Reduced Ventilation Rates
		All Power Pools	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	All Power Pools
Winter	December	1.0	.79	.79	.79	.31	.31	.31	0	0	0	1.0
	January	1.0	1.0	1.0	1.0	.39	.39	.39	0	0	0	1.0
	February	1.0	.80	.80	.80	.31	.31	.31	0	0	0	1.0
Spring	March	1.0	.43	.43	.43	.67	.69	.69	.14	.01	.14	1.0
	April	1.0	.60	.60	.60	1.0	1.0	1.0	.40	.32	.43	1.0
	May	1.0	.07	.07	.08	.20	.19	.21	1.0	.84	1.0	1.0
Summer	June	1.0	.09	.08	.10	.13	.11	.14	.75	.63	.75	1.0
	July	1.0	.09	.08	.10	0.0	0.0	0.0	0	0	0	1.0
	August	1.0	.10	.09	.11	0.0	0.0	0.0	0	0	0	1.0
Fall	September	1.0	.09	.08	.10	0.0	0.0	0.0	0	0	0	1.0
	October	1.0	.05	.05	.05	.07	.07	.07	.17	.15	.18	1.0
	November	1.0	.75	.75	.75	.58	.59	.59	.05	.03	.04	1.0

(b)

Fig. D.2. (a) Hourly and (b) Monthly Normalized Performance Profiles for Commercial Conservation Options by Season

Several energy reduction options were considered that are currently the focus of conservation attention. Some of these options were eliminated from further consideration because their payback was too long, because their implementation would have a negligible effect on utility loads, or because they are already widely accepted. The more important of these options ranked in Table D.10 along with the options chosen, are:

Relamping of 40-watt fluorescent fixtures. Existing lamps are replaced with 35-watt fluorescent tubes, either on a group relamping or a replacement on failure schedule. The latter is significantly less costly, resulting in paybacks of about one month. An estimated one-half of all existing flourescent fixtures have already been retrofitted. Since relamping is an established conservation measure, it is included in utility forecasts.

Relamping of incandescent fixtures with fluorescent screw-type fixtures. Recently, screw-in fluorescent fixtures have been developed as low-wattage replacements for incandescent bulbs. They reduce electricity consumption 60%. For the commercial sector, however, incandescent use is so small (less than 10%) that the impact on utility loads would be negligible.

Variable air volume (VAV) HVAC systems. HVAC systems normally operate at their peak design point. New designs allow HVAC systems to operate at variable air volumes, with flexibility to operate down to 60% of peak. Because VAV systems cost 25% more than conventional systems, their payback period is greater than five years. For this reason, these systems are not considered further here.

Chilled-water system modifications. This option encompasses chill water reset and tube fouling prevention. The former is an adjustment in chiller head pressure in accordance with the measured return water temperature in the chiller header. Tube fouling is prevented by automatically pushing small brushes through the heat exchanger tubes, thus increasing their efficiency. These options together can save up to 20%, but paybacks of 8-10 years are expected.

Roof insulation. An increase in roof insulation from the ASHRAE standard 90-75 of R-9 to R-21 has the potential for saving considerable electricity. To achieve this increase, however, either the structure must be modified or the new insulation laid on top of the roof. Insulation that is structurally strong enough for the latter application costs ten times more than comparable wall insulation. Either method (structurally strong insulation or structural changes to accept less costly insulation) has a payback period of about eight years.

D.3.1.3 Industrial Conservation Options

Industry has made remarkable progress in responding to price-induced opportunities for conservation. Most of those conservation opportunities have resulted from reduction of natural gas and petroleum consumption through fuel switching (coal), process modification, or heat recovery. In all projections of industrial energy use, electricity use is projected to grow 2-3% while natural gas and petroleum use is not expected to grow. There are conflicting opinions, however, on the amount of "easy" conservation still available. Interviews with plant managers in the Northeast suggest that numerous cost-effective conservation opportunities remain (Gas Research Institute 1979). However, the New York State Energy Office believes that the easy conservation measures have been exhausted and that further energy savings will coincide with equipment or process replacement. The most likley case is that the unaccounted-for "easy" savings are too small a part of the industrial picture to warrant attention.

Most of the industrial load is in machine-drive or process heat (electrolytic) applications. In these applications, conservation retrofits are capital-intensive and will occur only where there is an extremely quick payback or during normal equipment replacement cycles. Major investments that improve energy efficiency are generally accounted for in utility industrial load projections. No radically new and unanticipated energy-efficient processes are expected in the Northeast by 1990.

D.3.1.4 Other Conservation Considerations

Conservation concepts other than those listed here are also being considered by utilities under aggressive load-management or load-reduction programs. Many of these concepts were ignored in the earlier analysis because of end-use size and consequent market impact. However, in an aggressive utility program with the utility's purchase decision criteria (life-cycle cost) and capital accessibility, the cumulative impacts are often significant. A utility program also allows certain market segments that are not price-responsive to implement conservation actions. Two examples of this sub-market are (1) master-metered apartment buildings where utility costs increases are passed through to renters, who in turn have no real incentive to invest in conservation options; and (2) low-income families who are capital-constrained but are price-sensitive.

Time-of-day pricing was covered in the DEIS; however, interest in this measure is growing, and it merits additional consideration here. Time of day (TOD) pricing is an increasingly popular means of allocating service costs. The theory behind TOD pricing is straightforward (Samuels

1980). The cost of serving customers differs according to the time of service. Customers that demand a disproportionate amount of power at the time of the utility's peak impose costs on the utility far beyond those reflected in the rates they pay. TOD pricing thus has the goals of increasing rate equity and allocational efficiency while attempting to lower the utility's overall costs of service by reducing the utility's need for peak capacity and energy and peak capacity on the transmission and distribution system.

Equitable and practical allocation of costs, however, is far from straightforward. First, TOD pricing can be based on short-run marginal costs, long-run marginal costs, or something in between. The costing method can range from unit-specific to system probabilistic. These types of costing questions make it difficult to reach specific agreement on the appropriate cost-of-service method. Second, TOD pricing imposes additional metering costs. Standard bidirectional meters cost about $20 for a residential customer. TOD meters cost $50 to $450 depending on the utility's metering requirements. For small customers, including most residential customers, the added costs of sophisticated TOD meters may outweigh the benefits to the utility. Third, however TOD pricing is arranged, some customers will face increased electric bills. Adversely affected groups will raise political objections. Indeed, some commissions have talked about lifeline rates at one end of the residential scale and TOD rates at the other. It must be explicitly recognized that the more customers exempted from TOD by lifeline rates, the greater the cost burden on the remaining TOD customers. Political considerations such as these make it likely that any broadly applicable TOD rate is far from ideal from an economic perspective.

As of October 1980, 56 U.S. utilities were using TOD or other forms of load control (Energy Information Admin. 1981c). Most of the TOD rates were experimental and restricted to selected subgroups in a particular customer class, e.g., high-usage residential. The rather limited empirical evidence on TOD pricing in the U.S. tends to support the idea that the pricing schemes do reduce peak demand and also reduce energy consumption (Lande 1979; Caves and Christensen 1980). In one study reporting the results from four one-year tests for residential customers, reductions ranged from 27% of peak to 46% of peak but several reasons were presented why the test figures overstated the results likely in long-run cases. It was suggested that a 10% reduction was highly probable and that a 20% reduction was likely.

While U.S. utilities, including several in the Northeast, have rapidly increased their TOD activities in the past few years, the only detailed, long-run evidence on TOD pricing comes from Europe, where TOD pricing has been used successfully for decades (Mitchell et al. 1978; Schnell 1979; Burchnell, undated; O'Donnell, undated). Limited U.S. experience suggests, however, that loads will aso respond to peak rates, though the magnitude of the response and the applicability of load control to certain utilites is uncertain (Acton and Mitchell 1980, 1981; Nissel 1980; USDOE 1981).

Other Load Management/Reduction Activities. Utilities throughout the three Northeastern Power-pools are also experimenting with or slowly implementing other load management activities, some of which may significantly reduce load growth. These activities generally take the form of end use storage or remote control. For instance, Long Island Lighting Co. (LILCO) has demonstration programs for storage units and radio controls. The Orange and Rockland Uilities Co. is experimenting with direct load control by power line signals. Consolidated Edison Co. currently has 565 MW of customer load under energy management systems (HVAC scheduling) and reports load reductions of 14%. The most ambitious program is the General Public Utilities Co.'s Conservation and Load Management Master Plan. In that plan, the combined residential, commercial, and industrial programs could save 1300 MW of winter peak by 1990. Components of that effort include advanced weatherization, storage/space water heating, solar water heating, direct load controls, heat recovery, cogeneration, and annual cooling storage. While not all utilities have the appropriate daily load characteristics and capacity mix to justify a load management program, the evidence is mounting that many do, so that additional conservation is possible.

D.3.2 Market Assessment

The market assessment for conservation options consists of estimates of total available market, market potential, and market penetration level for 1990 (see Sec. D.5 for an explanation of the methodology). These estimates are shown in Table D.12 and D.13 for the four options considered. As in Section D.3.1, only commercial sector options are considered.

D.3.2.1 Electronic Ballasts

The available market for electronic ballasts has been estimated by considering the commercial subsector fraction expected to continue using fluorescent lamps. These subsectors, which account for 68% of commercial building space, are Offices, Retail-Wholesale, Educational, Government and Hospitals (Jackson and Johnson 1978). Assuming that 95% of the space is fluorescent-lamped (the balance incandescent), the total market for electronic ballasts is as shown in Table D.12.

Using the market probability of investment curve shown in Figure D.14 of Section D.5, 90% of the available market will consider investing, as shown in Table D.12 as the potential market.

Table D.12. Total Available and Potential Market for Selected Conservation Options in the Commercial Sector by Northeast Powerpool (10^6 ft^2)

Powerpool	Total Market	Available Market	Potential Market
Electronic Ballasts			
NEPOOL	1700	1100	1050
NYPP	3000	1880	1790
PJM	3300	2150	2040
HVAC Scheduling			
NEPOOL	1700		
Heating & cooling		90	90
Cooling only		320	320
NYPP	3000		
Heating & cooling		190	190
Cooling only		1740	1740
PJM	3300		
Heating & cooling		50	50
Cooling only		2590	2590
Extra Wall Insulation			
NEPOOL	1700	90(13)†[1]	13
NYPP	3000	190(21)	21
PJM	3300	50(6)	6
Reduced Air Ventilation			
NEPOOL	1700	462	416
NYPP	3000	2138	1924
PJM	3300	2877	2589

†[1] Numbers in parentheses are new HVAC heating and cooling.

Table D.13. Market Penetration of Selected Conservation Options into Three Northeast Powerpools, Commercial Sector, by 1990 (10^6 ft^2)

Powerpool	Low	High
Electronic ballasts		
NEPOOL	290	440
NYPP	500	760
PJM	170	870
HVAC Scheduling		
NEPOOL		
Heating & cooling	30	50
Cooling only	90	155
NYPP		
Heating & cooling	50	90
Cooling only	430	840
PJM		
Heating & cooling	10	20
Cooling only	790	1390
Extra Wall Insulation		
NEPOOL	4	7
NYPP	7	11
PJM	2	3
Reduced Air Ventilation		
NEPOOL	58	115
NYPP	267	589
PJM	359	713

Market penetration is based on a normal replacement cycle of the current coil and core ballast. Assuming a ballast life of 15 years, the maximum replacement would be 7% of the stock per year. Capital constraints and other considerations make it unlikely that the maximum 7%/year will be realized. Consequently, low-and high-penetration scenarios of 4% and 6%, respectively, were developed. The penetration estimates yield cumulative penetrations by 1990 of 32% and 48% (current penetration is essentially zero). These cumulative penetration levels are then adjusted by a transmission loss factor of 0.9.

The penetration results are consistent with percentages obtained by Bass (1969) for consumer durables (8-64% in 10 years) and Mansfield et al. (1977) for industrial products (25% in 5.9-15 years) and are shown in Table D.13.

D.3.2.2 HVAC Scheduling

The available market for HVAC scheduling (Table D.12) has been estimated by dividing the projected powerpool space heating load by 29 $kWh/ft^2/yr$, and by dividing the projected powerpool cooling load by 6.5 $kWh/ft^2/yr$. Since the electrically heated floor space is also assumed to be electrically cooled, the HVAC scheduling available market is the cooled floor space. As a check, the DRI spring 1982 Energy Review projects New England region (NEPOOL) electrically heated floor space at 117 million ft^2 and the Middle Atlantic region (NY, PA and NJ) at 268 million ft^2.

Market potential is based on the same investment criteria as in Section D.3.1. The extremely attractive economics dictate a very high probability of investment; consequently, the potential market equals the available market.

The estimated market penetration (Table D.13) is based on retrofit only since most new construction has at least manual or semiautomatic HVAC scheduling equipment. The rate of market acceptance should be on the high side of the range shown in Section D.3.1 because of the attractive economics (less than 1 year payback) and attractive installation terms (for example, shared energy savings with no down payment). Current levels of penetration are considered minimal so that by 1990 the low scenario assumes 40% penetration while the high scenario assumes 70% penetration. The penetration levels are again adjusted for reduced transmission losses.

D.3.2.3 Wall Insulation

The available market for wall insulation (Table D.12) was estimated in the same way as HVAC scheduling for heating and unestimated cooling. However, only new construction was considered. For the 1982-1990 time period the commercial sector is expected to grow from 1.2 to 1.55%, depending on the power pool. Consequently, the available market is only 10-13% of the available 1990 market for electric heating and cooling.

As with HVAC Scheduling, the quick payback for wall insulation suggests that most of the available market will consider investing. Consequently, the potential market is the available market.

The market penetration estimates (Table D.13) are developed using the same procedures as in the other sections. Favorable economics, and good market acceptance suggest a strong penetration rate by 1990. The low scenario cumulative penetration is 30% while the high scenario penetration is 60% by 1990.

D.3.2.4 Reduced Air Ventilation

The available market for reduced air ventilation (Table D.12) is the total HVAC market as developed in Section D.3.2.2. The potential market for this retrofit concept is determined by the probability of purchase criteria. Although this concept has the longest simple payback, it still accounts for 90% of potential purchasers. The payback is at the lower end of the most attractive range, however, as shown in Figure D.16.

The penetration estimates (Table D.13) were developed similar to other retrofit markets in Section D.3.2.2. The 3.3-year payback is not as attractive as others considered here. Consequently, the low scenario assumes a 20% cumulative penetration by 1990 while the high scenario assumes a 40% cumulative penetration. Both levels of penetration are well bracketed by the studies cited in Section D.3.2.1.

D.4 CONSERVATION AND COAL CONVERSION: COMPETITORS OR COMPLEMENTS

D.4.1 Introduction

Initially, the effect of conservation on the utility fuel mixes was determined for the no-conversion case, and then for the two coal conversion scenarios -- coal SIP Scenario (42 stations) and Voluntary Conversion Scenario (27 stations; see Sec. 1). Expected oil and coal capacities in 1990 for the three conversion scenarios are shown in Table D.14. If conservation were to displace significant amounts of coal-generated power, then a detailed trade-off between the two

Table D.14. Oil- and Coal-Fired Capacities in 1990
Under Conversion Scenarios (MW)

Scenario	NEPOOL Oil	NEPOOL Coal	NYPP Oil	NYPP Coal	PJM Oil	PJM Coal
Base Case	10,787	2,015	14,366	4,390	16,176	14,000
Coal SIP (42 stations)	7,346	5,150	9,602	8,160	11,550	17,900
Voluntary Conversion (27 stations)	8,408	4,178	11,447	7,112	13,921	16,098

oil reduction methods would be required. As discussed in this section, this displacement does not occur, thus conversion and conservation are both useful for reducing oil consumption.

For this analysis, the potential oil displacement for business-as-usual demand and capacity was computed. However, with a lower load growth, new generating capacity would be likely deferred. Because the deferred plants would have been baseload nuclear or coal, the same fraction of oil or coal is displaced by conservation measures under the low-growth scenario.

D.4.2 Conservation Impacts Under Base Case (No Coal Conversion)

Under the Base Case (no oil-fired utility stations are converted to coal), the five commercial conservation techniques described in Section D.3 will displace 1.0, 1.6, and 1.6% of the projected 1990 electricity demand in NEPOOL, NYPP, and PJM, respectively. The effects of the five options and their equivalent generating capacities are shown in Table D.15. The generating capacities represent the peak outputs that might be achieved, but do not imply that utility capacity could be reduced by these amounts.

Table D.15. 1990 Energy Displacement and Equivalent Peak Generating Capacity
of Conservation Options under Base-Case Scenario

Conservation Technology	Energy Displacement (GWh)			Equivalent Peak Generating Capacity (MW)		
	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM
HVAC scheduling						
Elec. cooling only	360-630	1380-2700	3100-5440	290-150	1200-2350	2610-4580
Elec. heating & cooling	340-600	590-1050	160-270	195-340	340-600	90-160
Wall insulation-elec. heating & cooling	2-3	3-4	0.8-1.2	2-4	3-5	1-1.4
Electronic ballasts	390-580	650-1000	230-1150	90-130	50-240	50-260
Reduced ventilation rates	23-45	110-230	140-280	5-10	23-52	31-62
Total	1115-1858	2693-5004	3631-7141	582-994	1616-3247	2782-5063

HVAC scheduling provides the greatest opportunity for energy displacement (Table D.15). In NYPP and PJM, the reductions in energy use for electric cooling account for 55% and 80% of the pool-wide energy savings, respectively. These large displacements reflect the large savings (in percentage terms) realizable in HVAC operating costs and the relatively high importance of cooling demand in the commercial sector.

The second largest energy reduction results from the electronic ballast option. This option is cost-effective to the user and a large benefit to the utility. For the lower penetration levels shown in Table D.15, electronic ballasts could reduce the commercial sector lighting loads in NEPOOL, NYPP, and PJM by 1.1, 0.4, and 0.2% respectively.

The reduction of ventilation rates provides a small savings in electricity, while providing the building owner with a rapid payback. Similarly, wall insulation for electrically heated and cooled buildings displaces small quantities of electricity. The wide difference between wall insulation and HVAC scheduling in energy displacement results from the fact that the insulation option applies only to new buildings and therefore has a much smaller potential market.

D.4.3 Conservation Impacts For Coal Conversion Scenarios

As was shown in the previous subsection, commercial conservation efforts could reduce utility energy requirements by approximately 1%. Of particular interest in this study is the quantity of oil that would be displaced by conservation. Other fuels used by the utilities are occasionally displaced, but in much smaller quantities. Detailed breakdowns of the oil and coal savings by technology are given in Table D.16.

Table D.17 gives the percentages of oil savings and coal additions under the Coal SIP and Voluntary conversion scenarios. Conservation displaces only a small percentage of the oil that coal conversion would otherwise displace. In other words, conservation alone cannot reduce oil consumption; rather, conservation and conversion are complementary.

D.5 METHODOLOGY FOR ESTIMATION OF MARKET POTENTIAL AND LOAD IMPACT

The methodology and assumptions used to estimate market potential for the conservation and alternative energy technologies considered in the DEIS and revisions to the FEIS are described in this section. Topics addressed include (1) an overview of the approach, (2) expected results, (3) system cost and performance estimates, (4) procedures for calculation of value in use (breakeven price), and (5) assumptions. The last two topics are discussed for each major sector: utility, commercial/industrial, and residential. The computational approaches and assumptions are applied under the Base Case Scenario (no conversions) and under the Conversion Scenario (conversion of specified oil-fired plants to coal). Also, the sensitivity of results to different tax credits or other financial incentives can be assessed.

D.5.1 Overview of Approach

The approach for estimating market potential uses published information, forecasts, and "first principles" analysis procedures. It provides a consistent set of market potential estimates for each alternative energy system. Figure D.3 is an outline of the four steps in the approach. The steps are indicated by boxes. Interactions between each step are shown by the arrows on lines between boxes, either from the boxes for a previous step or from a circle indicating data bases taken from published reports. The output from each step is shown within the box below the title of the step.

Step 1. Performance Characterization. Performance of each alternative energy system is characterized in terms of average daily output profiles for each month of the year. Other information developed includes projected installed cost, O&M cost, alternate fuel type and cost (if used), forced outage rates, and planned maintenance requirements. This information is developed from results in existing studies. Technology operating performance is characterized in sufficient detail to show daily and seasonable variations of power availability for intermittent technologies.

Step 2. Value in Use. The value in use of an alternative energy system is calculated in terms of the installed cost (e.g., \$/kWe) that makes the cost of the alternative energy equal to the value of the conventional energy being displaced. It is estimated as a function of the required internal rate of return or payback period for non-utility users. For utility users, it is estimated using an appropriate fixed charge rate and weighted cost of capital. Benefits of each alternative technology result from reduced conventional energy consumption, reduced conventional O&M costs, and (for cogeneration) the value of process steam produced. Costs include the fuel used by the alternative technology, O&M costs, etc. Assumptions regarding depreciation, tax credits, property taxes and insurance, marginal income tax rates, and other financial factors are then used to estimate value in use. Conventional energy cost projections based on high- and mid-range oil and coal prices are used in the analyses.

Step 3. Total Available Market. Total available market is determined both by the useable amount of the resource and by the amount of electricity demand. For example, the estimation of the market for solar hot water heating must take into account the amount of electricity used for heating hot water and the amount of solar energy that is available for water heating. Considerations in the analysis include available insulation, roof orientation, and energy storage limitations. The segment of the water heating market demand now met by gas is not considered. Another example is the utility wind system market. Utility stability requirements limit total utilization of any intermittent technology. These are examples of physical constraints that absolutely prevent greater use of the technology considered. For example, constraints such as manufacturing capacity are not considered in the estimation of the available market but are considered in the estimation of market penetration.

Table D.16. Projected Fuel Savings through Conservation under the Three Scenarios

Conversion Scenario	Conservation Technology[a]	Commercial Market Penetrated (10^6 ft^2)			Fuel Displaced (10^3 MMBTu)											
					Residual			Distillate			Coal			Total		
		NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM
Base Case	WI-HC	4-7	7-11	2-3	16-28	23-36	2-7	0.5-1	-	0.4-0.7	0.7-1.3	5-7	3-5	17-30	28-44	8-12
	HVAC sched.															
	HC	25-45	50-90	14-24	2,890-5,000	3,820-6,740	600-1,030	55-95	-	2-3	310-540	2,130-3,760	980-1,680	3,250-5,630	5,950-10,500	1,580-2,710
	C	90-155	430-840	790-1,390	2,330-4,060	7,580-14,800	9,190-16,100	0-0	-	-	1,090-1,890	6,200-12,200	21,900-38,300	3,420-5,950	13,780-27,000	31,000-54,400
	RVR	60-115	270-580	360-710	200-390	940-2,050	860-1,700	10-18	-	140-290	15-30	130-290	440-870	220-440	1,070-2,330	1,440-2,860
	EB	290-440	500-760	175-870	3,340-5,020	6,050-9,270	1,520-7,640	190-290	-	225-1,130	210-320	610-930	550-2,760	3,740-5,620	6,660-10,200	2,290-11,530
	Total				8,800-14,500	18,400-32,900	12,200-26,500	250-400	-	370-1,420	1,600-2,800	9,080-17,100	23,800-43,600	10,700-17,700	27,500-50,100	36,400-71,500
Coal SIP (42 stations)	WI-HC	4-7	7-11	2-3	11-19	18-28	3-4	1-1.8	0.3-5	0.6-0.9	6-11	12-19	5-7	18-32	30-50	8-12
	HVAC sched.															
	HC	25-45	50-90	14-24	1,440-2,490	2,500-4,410	270-470	85-150	1.5-3	10-17	1,850-3,200	3,830-6,760	1,290-2,210	3,370-5,840	6,330-11,200	1,570-2,690
	C	90-155	430-840	790-1,390	1,240-2,150	4,880-9,550	2,960-5,190	5-9	-	170-300	2,380-4,140	9,630-18,900	28,700-50,400	3,620-6,300	14,500-28,400	31,900-55,900
	RVR	60-115	270-580	360-710	140-280	810-1,780	520-1,030	18-35	24-53	220-430	70-140	370-820	680-1,350	230-460	1,210-2,660	1,410-2,810
	EB	290-440	500-760	175-870	2,530-3,790	5,460-8,360	900-4,530	340-510	150-230	350-1,750	1,030-1,540	1,950-2,900	1,010-5,080	3,890-5,840	7,560-11,590	2,260-11,360
	Total				5,400-8,700	13,700-24,100	4,650-11,200	450-700	170-280	740-2,500	5,300-9,000	15,800-29,500	31,700-59,000	11,100-18,500	29,600-53,900	37,100-72,700
Voluntary Conversion (27 stations)	WI-HC	4-7	7-11	2-3	12-21	18-30	4-6	1-2	-	0.6-0.8	4-7	11-8	4-6	17-30	30-46	8-12
	HVAC sched.															
	HC	25-45	50-90	14-24	1,640-2,840	2,760-4,870	440-750	80-140	-	3-5	1,560-2,700	3,480-6,100	1,130-1,930	3,280-5,680	6,200-11,000	1,570-2,690
	C	90-155	430-840	790-1,390	1,450-2,530	5,560-10,900	6,490-11,400	5-9	-	25-43	2,110-3,670	8,770-17,200	25,200-44,100	3,570-6,210	14,300-28,100	31,700-55,500
	RVR	60-115	270-580	360-710	160-320	830-1,840	690-1,380	16-30	-	190-370	50-105	330-720	540-1,070	230-450	1,160-2,560	1,420-2,820
	EB	290-440	500-760	175-870	2,850-4,290	5,660-8,660	1,240-6,230	270-410	-	270-1,360	710-1,060	1,580-2,420	750-3,800	3,830-5,760	7,230-11,080	2,260-11,380
	Total				6,100-10,000	14,800-26,300	8,860-19,700	400-600	-	490-1,780	4,400-7,500	14,200-26,500	276-50,900	10,900-18,100	29,000-52,800	37,000-72,5000

[a]WI-HC - wall insulation-heating and cooling
HVAC - heating, ventilation, and air conditioning
HC - heating and cooling
C - cooling only
RVR - reduced ventilation rates
EB - electronic ballasts

Table D.17. Projected Oil and Coal Displacement by Commercial-Sector Conservation in Three Northeastern Power Pools (10^6 MMBtu)

Scenario	Oil Use without Conservation			Oil Displacement with Commercial Conservation			Coal Use without Conservation			Coal Displacement with Commercial Conservation		
	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM
Base Case (No conversion)	299	332	245	9.0-14.8	18.4-32.9	12.6-27.9	168	365	1040	1.6-2.8	9.1-17.1	23.8-43.6
Coal SIP (42 stations)	125	157	108	2.9-4.3	13.7-24.1	5.4-13.7	362	563	1220	5.3-9.0	15.8-29.5	31.7-59.0
Voluntary Conversion (27 stations)	169	202	164	3.2-4.7	14.8-26.3	9.3-21.4	310	517	1140	4.4-7.5	14.2-26.5	27.6-50.9

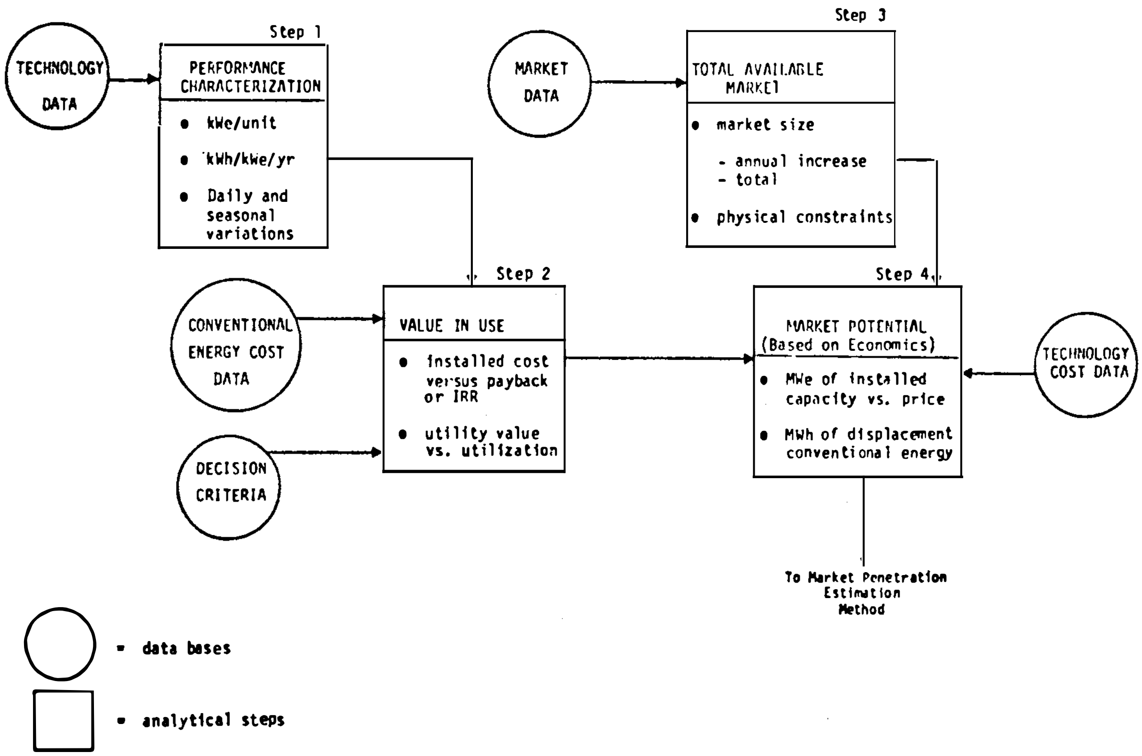


Fig. D.3. Schematic Illustration of Approach

Step 4. Market Potential (Based on Economics). The value in use ($/kWe) from Step 2 is given as a function of purchase decision criteria (e.g., rate of return). Therefore, using the alternative technology cost data ($/kWe) it is possible to determine the purchase decision point at which the technology "breaks even." Knowing the fraction of the decision-makers with criteria equal to or less demanding than this point makes it possible to scale the available market from Step 3 to determine the market potential. For example, assume the technology cost is $1000/kWe and that Step 2 indicates that the value in use is $1000/kWe for the alternative technology for a required internal rate of return (IRR) of 20%. If 25% of the purchasers demand IRRs of 20% or less, then 25% of the available market would be the market potential. This market potential is not a sales forecast. It represents an estimate of total utilization occurring in the absence of other "real world" constraints, like capital availability, production capacity limits, time lags in user acceptance, legal and institutional barriers, and planning lead times. Market potential estimates provide measures of the overall utilization potential for each alternative energy system in 1990.

D.5.2 Expected Results

The purpose of the calculations outlined here is to provide estimates of the time frame for initial economic attractiveness and 1990 market potential for each alternative energy system. These estimates provide a basis for the market penetration estimates described in Section D.5. Figure D.4 summarizes the types of information provided by this analysis.

The top portion of Figure D.4 illustrates a comparison of value in use for an alternative energy technology with its projected installed cost over time. The principal sources of variation include the likely range of performance characteristics of the alternative technology, conventional energy cost (high versus medium oil prices and escalation rates), uncertainties in O&M costs, and fuel costs. It is during this time frame when value in use exceeds projected prices that the first significant commercial sales are most likely to occur.

The bottom portion of Figure D.4 illustrates market potential versus unit cost for the alternative technology in 1990. As shown in the table, higher conventional energy costs are likely to increase the market size for the alternative technology. Depending upon the degree of definition of the data, the curves either have the shape shown in the table or are step functions. As an example, the form of the market potential curves for cogeneration owned by an industrial user is

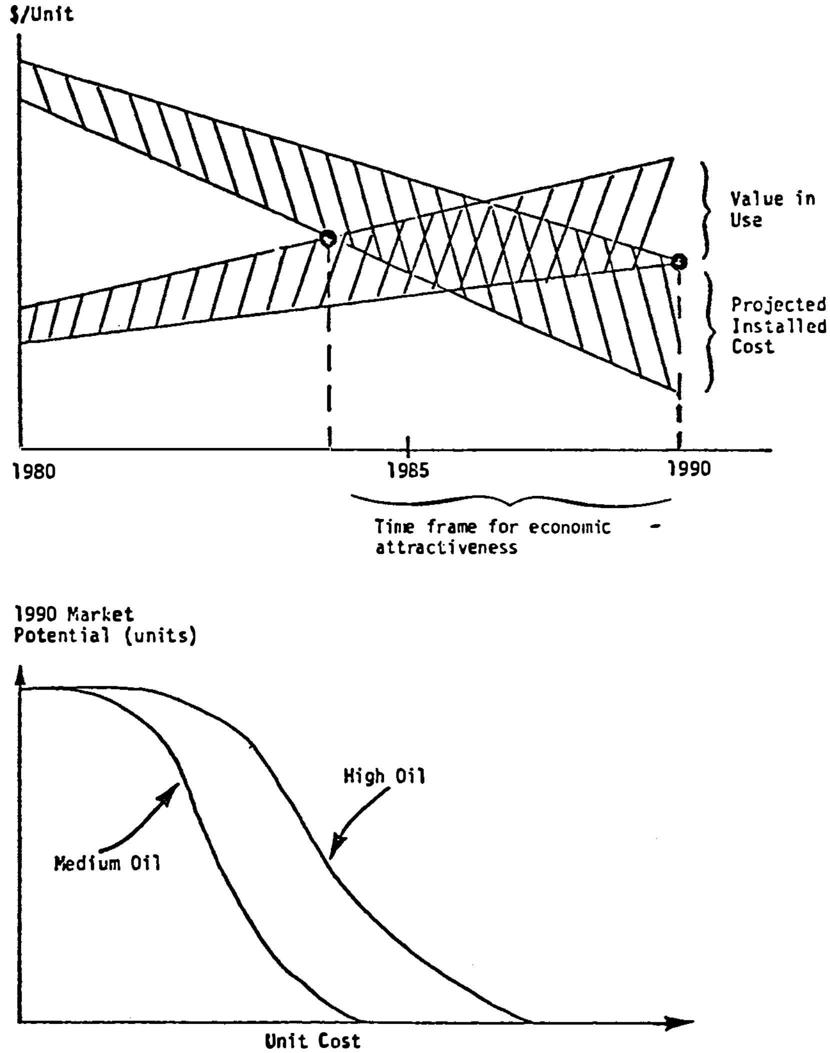


Fig. D.4. Cost Versus Value in Use Trade-Off Curves likely to be similar to those shown in the graph. Sufficient information is available on industrial purchase decisions to permit estimation of the probability of purchase as a function of increasing unit cost. On the other hand, central station photovoltaic systems are likely to have a curve more nearly approximating a step function, unless increasing penetration of photovoltaics into the utility generating capacity mix results in a rapidly declining worth of the power generated.

D.5.3 Alternative Energy System Cost and Performance Estimates

Alternative energy system cost and performance estimates are required to compute the value in use. Data sheets providing necessary information are provided for each alternative. The Technology Cost/Performance Data Sheet includes the following:

- Name of the technology
- Unit rating
- Range of installed costs
- O&M costs (fixed and variable)
- Description of the alternate fuel type and costs (if any)
- Sales benefit value of process steam generated by cogeneration systems
- Forced outage rate (in percent)
- Planned maintenance requirements (in weeks per year)
- Annual capacity factor

All costs are reported in January 1980 constant dollars.

The items included in the Output Data Sheet are listed below:

- Average hourly output profiles for each alternative system operating in the specified power pool(s).
- Average hourly output data for typical days during winter, spring, summer, and fall (normalized, with one representing the average daily peak during each season and zero representing no output). These profiles are scaled to provide typical daily profiles for each month using the data provided in the following item.
- Ratio of the peak average hourly output for each month to the rated capacity of the unit. For example, a cogeneration system operating year-around would have a set of ones for the hourly profile and ones in the monthly variation data set (assuming continuing availability). On the other hand, a photovoltaic system would have positive output profile data only during the daylight hours for each season. Also, the ratio of peak average hourly output to rated capacity of a unit is likely to always be less than one, since cloudy days will prevent achievement of peak output.

D.5.4 Value In Use And Market Potential For a Utility-Owned System

D.5.4.1 Calculation of Value in Use

This section describes the computation of value in use and market potential for an alternative energy system owned by a utility. The costs and benefits considered in estimating the value, V, of an alternative energy system are shown in Figure D.5. Benefits include the present value of conventional fuel savings, conventional O&M cost savings, and benefits (if any), from sale of by-products (e.g., process steam). Costs include O&M for the alternative system, fuel (if any), and fixed charges. The present value of each of these factors is estimated over a 30-year time frame, using the weighted cost of capital as a discount rate. The value in use of the alternative system is the installed cost for this system resulting in the present value of fixed and variable costs for the alternative equaling the present value of the benefits from using the system. Equation 6 in Figure D.5 defines this calculation.

Use of a levelized fixed charge rate represents the fraction of the initial cost that must be recovered each year for depreciation, income taxes, property tax, insurance payments, return on investment, sinking fund depreciation, and tax preference allowances. The definition of the weighted cost of capital, which is used as the discount rate, is provided in Figure D.6. The equation in this figure also defines computation of the capital recovery factor and fixed charge rate. The 1979 EPRI Technical Assessment Guide is the source of this formula for the fixed charge rate (EPRI 1979).

(1) Present value of fuel savings

$$PVF = \sum_{t=1}^{N} AFS \left(\frac{1+e_f}{1+d}\right)^t$$

(2) Present value of conventional O&M savings

$$PVC = \sum_{t=1}^{N} COM \left(\frac{1+e_c}{1+d}\right)^t$$

(3) Present value of alternative systems costs

$$PVO = \sum_{t=1}^{N} AOM \left(\frac{1+e_s}{1+d}\right)^t$$

(4) Present value of alternative systems fuel costs

$$PVA = \sum_{t=1}^{N} AFC \left(\frac{1+e_a}{1+d}\right)^t$$

(5) Present value of by-product sales

$$PVB = \sum_{t=1}^{N} BPS \left(\frac{1+e_b}{1+d}\right)^t$$

(6) Estimation of value (V)

$$\sum_{t=1}^{N} \frac{FCR\ V}{(1+d)^t} = PVF + PVC - PVO - PVA + PVB$$

or

$$V = \frac{CRF}{FCR} \cdot (PVF + PVC - PVO - PVA + PVC)$$

Definition of other variables:

Annual costs and benefits in first year on-line (1980 $/unit)

AFS = annual fuel savings

COM = conventional O&M savings

AOM = alternative O&M savings

AFC = alternative system fuel cost

BPS = by-product sales benefit

Corresponding escalation rates are:

e_f, e_c, e_s, e_a, e_b

N = time horizon

d = weighted cost of capital (also discount rate)

FCR = fixed charge rate

FRF = capital recovery factor

Fig. D.5. Estimation of Value in Use for a Utility-Owned System

FINANCIAL PARAMETERS
Weighted Cost of Capital (d) $d = dr \cdot DC + pr \cdot PC + cr \cdot CC$
Capital Recovery Factor (CRF) $CRF = \frac{d \cdot (1 + d)^N}{(1 + d)^N - 1}$
Fixed Charge Rate (FCR) $FCR = CRF + RD + \frac{T}{1-T}\left[(CRF + RD - \frac{1}{N}) \cdot (1 - \frac{dr \cdot DC}{d})\right] + PTAX + INS - TPA$

DEFINITION OF VARIABLES
dr = debt ratio
DC = debt cost
pr = preferred stock ratio
PC = preferred stock cost
cr = common stock ratio
CC = common stock cost
N = book life of plant = 30 years
T = income tax
PTAX = property tax rate
INS = insurance rate
TPA = tax preference allowances (accelerated depreciation, income tax credit, etc.)
RD = retirement dispersion

Fig. D.6. Calculation of Financial Parameters

Figure D.7 illustrates the method used to compute average fuel savings and conventional O&M benefits resulting from use of alternative energy systems. The procedure involves estimating the cost of providing fuel for generating units and the variable O&M costs of operating these units for each hour of an average weekday and weekend day during each month. These calculations are repeated for different assumed penetrations of each alternative energy system. The difference in conventional fuel consumption and variable O&M costs is summed over each hour of the day and adjusted for the number of days per month. This provides an estimate of the average annual fuel and conventional O&M savings benefits.

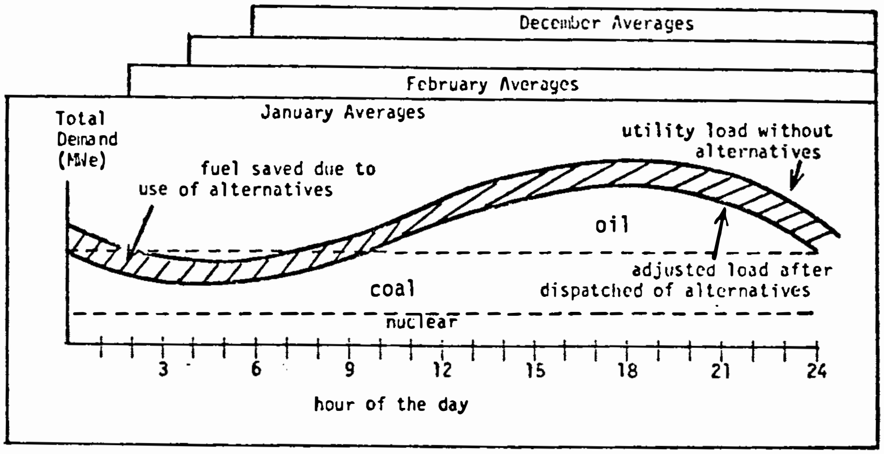
The conventional fuel displacement benefits vary with the alternative energy system output profile. For example, an alternative energy system may provide most of its energy output in the spring when the load is least, i.e., small-scale hydro. Thus, it may displace a fairly large portion of coal fuel. On the other hand, a solar power system having maximum output in the summer and daily peak outputs closely correlated with peak demand may displace mostly oil fuel.

D.5.4.2 Strengths and Limitations of Approach

This computational approach approximates actual fuel displacement benefits. It provides a more realistic appraisal of the value of an alternative energy technology than simply assuming that the entire energy displacement benefits result from oil fuel savings or the average mix of fuels consumed by generating units in the power pool. Also, this method estimates changes in the mix of fuels displaced as penetration of an alternative technology increases or if the conventional mix changes (e.g., coal conversion occurs).

This approach is still a simplification, for the following reasons:

- The fuel mix displaced in 1990 or any other analysis year is assumed to remain constant over a 30-year time frame. This will result in an overstatement of the value of an alternative system if a major transition to coal and nuclear (or other relatively low-cost fuel) occurs during this 30-year period.
- Average load profiles are used to represent each weekday and weekend of the month, and average daily power output profiles are used for the alternative technologies. These average profiles only approximate the actual situation.
- No conventional capacity displacement/deferral benefits are assumed. Estimation of these benefits (if any) is dependent upon the existing and planned generating capacity mix and on the characteristics of the output of the alternative energy system. Conventional generating capacity displacement/deferral could provide additional benefits for alternatives.



(1) Estimate of average fuel savings

$$AFS = \sum_{m=1}^{12} \sum_{i=1}^{2} D_{mi} \sum_{t=1}^{24} [F_m(L_{tmi}) - F_m (L_{tmi} - A_{tmi})]$$

(2) Estimate of conventional O&M savings

$$COM = \sum_{m=1}^{12} D_m \sum_{t=1}^{24} [C_m (L_{tmi}) - E_m (L_{tmi} - A_{tmi})]$$

Definition of Variables:

D_{mi} = number of days during month m (i=1 for weekdays and i=2 for weekend days and holidays)

$F_m(x)$ = fuel cost of supplying x MWh of energy for one hour during month m ($)

L_{tmi} = projected average load (MWe) at hour of day t of month m (i=1 for weekdays and i=2 for holidays)

A_{tm} = average output of alternative energy system at hour of day t of month m (MWe) (A_{tm} = # of units of alternative x output/unit)

$C_m(x)$ = variable O&M cost of supplying x MWh of energy for one hour during month m

Fig. D.7. Estimation of Fuel and Conventional O&M Saving Benefits for an Alternative Energy Technology

D.5.4.3 Calculation of Other Costs and Benefits

Figure D.8 summarizes computation of the annual alternative energy system O&M costs, fuel costs, and by-product sales benefits. Annual O&M is a sum of fixed O&M, which is proportional to total capacity and variable O&M, which is proportional to total energy production.

Alternative energy system fuel costs are equal to the heat rate times the annual energy output times the alternative system fuel cost in dollars per million Btu. Fuel is consumed only by utility-owned cogeneration systems and wood-fired powerplants.

By-product sales benefits result from the process steam sold by utility-owned generation systems. A credit based on the avoided cost of generating this steam by other methods is included.

D.5.4.4 Assumptions

Figure D.9 summarizes the assumed values for the utility financial parameters. Most of these assumptions are taken from the 1979 EPRI Technical Assessment Guide (EPRI 1979). The Technical Assessment Guide capital cost data have been adjusted upwards by 1% to reflect a 7% rather than 6% general inflation rate. A 10% investment tax credit is assumed for the base case analyses. Effects of a financial incentive resulting from a 25% investment tax credit are also analyzed.

Typical hourly load data for utilities in the Northeast are provided in Table D.18. Separate data sets are provided for the winter, spring/fall, and summer. These data were developed by EPRI for synthetic utility models (EPRI 1977, 1979). The units in the figure are fractions of peak weekly demand for each hour of the day.

Monthly peak load estimates are provided in Table D.19. Peak demands for 1990 are provided for each power pool. Also, the corresponding weekly profile is indicated.

The assumed generating capacity mixes, electricity generation, fuel consumption and cost are provided in Table D.20 for NEPOOL, NYPP, and PJM for the Base and conversion cases. The 1990 assumed capacity mix is scaled down to reflect availability (forced outages and planned maintenance) to provide adjusted capacity. Procedures described in this appendix were used to estimate the total energy output in 100 MWh and fuel consumption by fuel type. Production cost is provided in 1980 dollars by fuel types. Results must be escalated from a January 1981 reference date to 1990. Assumed escalation rates are:

Fuel Type	High Esc. Rate (Real)	Mid Esc. Rate (Real)
Nuclear	0.03	0.025
Coal	0.03	0.03
Purchased power	0	0
Wood	0.03	0
Oil	0.055	0.031

D.5.5 Value In Use And Market Potential for Industrial/Commercial Users

The value in use for alternative energy systems owned by industrial and commercial users is estimated for three investment hurdle rates. These hurdle rates are associated with different probabilities of purchase by industrial and commercial firms. Figure D.10 outlines the computational procedures. Equation 1 in the figure includes the cost elements that scale linearly with the installed cost of the alternative technology. These costs are the initial cost, investment tax credits taken at the end of the first year the system is on-line, depreciation, property tax, and insurance. It is assumed that the user has sufficient taxable income to utilize the benefits of the investment credit and depreciation as they become available. Equation 2 is used to compute the other after-tax costs and benefits. Benefits result from reduced annual electricity consumption and sales of by-products (if any). Additional costs include the expenditures for fuel (if any) used by the alternative energy system and the annual O&M costs.

Figures D.11 and D.12 summarize the assumed purchase decision criteria for industrial and commercial users, respectively. Industrial weighted cost of capital hurdle rates are 12, 20, and 32% in nominal terms. The equivalent real values are adjusted for an assumed seven percent general inflation rate: 5, 12, and 23%, respectively. Other assumptions include depreciation, marginal income tax rates, investment tax credits, and property tax and insurance as a fraction of installed cost. The curve at the bottom of Figure D.11 summarizes probability of purchase versus required rate of return on investment. A number of studies were reviewed to develop

(1) Annual Alterative Energy System O&M

$$AOM = FAOM \cdot UNITS \cdot CAPA + VAOM \cdot AENER \cdot UNITS$$

(2) Alternate Energy System Fuel Cost

$$AFC = AENER \cdot HR \cdot ACS \cdot UNITS$$

(3) By-product Sales Benefits

$$BPS = AENER \cdot THRT \cdot CRT \cdot UNITS$$

Definition of Variables:

FAOM = fixed O&M ($/MWe/year)

UNITS = # of alternative energy system units

CAPA = Rated capacity of a unit (MWe)

VAOM = Variable O&M costs ($/MWh)

$$AENER = \sum_{m=1}^{12} D_m \sum_{t=1}^{24} A_{tm}/\text{Units}$$

HR = Alternative system heat rate (mmBtu/MWh)

ACS = Alternative system fuel cost (1980 $/mmBtu)

THRT = Conventional energy saving from production of by-product (mmBtu/MWh)

CRT = Credit for by-product sales (1980 $/mmBtu)

Fig. D.8. Estimation of Alternative Energy System Cost and Benefits

FINANCIAL VARIABLE	SYMBOL	VALUE FOR IOU
DEBT RATIO	dr	.518 (1)
DEBT COST	DC	.090 (2)
PREFERRED STOCK RATIO	pr	.118 (1)
PREFERRED STOCK COST	PC	.095 (2)
COMMON STOCK RATIO	cr	.364 (1)
COMMON STOCK COST	CC	.145 (2)
WEIGHTED COST OF CAPITAL	d	.111
CAPITAL RECOVERY FACTOR	CRF	.116
INCOME TAX	T	} .50 (3)
PROPERTY TAX RATE	PTAX	} .02 (3)
INSURANCE RATE	INS	
TAX PREFERENCE ALLOWANCES	TPA	.1 (4)
RETIREMENT DISPERSION	RD	.0056 (3)
FIXED CHARGE RATE	FCR	.174

(1) 5 year average for Aa utilities using normalized accounting. "Electric Utility Industry, Credit and Equity Analysis," E. Oelsner, et. al., First Boston Corp., June 1980.

(2) Assumptions in 1979 EPRI Technical Assessment Guide increased by 1% to reflect 7% rather than 6% general inflation rate.

(3) 1979 EPRI Technical Assessment Guide.

(4) Standard 10% credit; 25% used to examine effects of incentives.

Fig. D.9. Financial Parameter Assumptions

Table D.18. Assumed Hourly Load Profile Data for Each Power Pool (units are fraction of weekly peak load)

Typical Winter Week

Hour	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	.5927	.5627	.6220	.6561	.6624	.6452	.5986
2	.5510	.5419	.5823	.6180	.6283	.6112	.5819
3	.5271	.5257	.5726	.6042	.6083	.5999	.5807
4	.5065	.5160	.5650	.6015	.5999	.5918	.5650
5	.4998	.5153	.5679	.5927	.6035	.5938	.5989
6	.5038	.5392	.5873	.6132	.6211	.6177	.5609
7	.5047	.6112	.6594	.6872	.6906	.6872	.5733
8	.5129	.7436	.7943	.8182	.8119	.7379	.5954
9	.5493	.8191	.8667	.8575	.8545	.8060	.6299
10	.5807	.9118	.9387	.9684	.9445	.9438	.6964
11	.6148	.9299	.9562	.9856	.9547	.9522	.7197
12	.6274	.9290	.9608	.9671	.9497	.9346	.7158
13	.6502	.9159	.9423	.9502	.9208	.9100	.6976
14	.6536	.9217	.9547	.9691	.9384	.9249	.6836
15	.6617	.9111	.9590	.9389	.9274	.9066	.6730
16	.6700	.9118	.9398	.9332	.9001	.8958	.6733
17	.7055	.9538	.9682	.9468	.9409	.9226	.7161
18	.7325	.9793	.9804	1.0000	.9770	.9594	.7772
19	.7400	.9375	.9795	.9795	.9628	.9400	.7621
20	.7359	.9235	.9565	.9603	.9371	.9242	.7465
21	.7212	.8992	.9143	.9310	.9172	.8994	.7307
22	.7052	.8530	.8762	.8863	.8730	.8568	.7140
23	.6468	.7785	.8130	.8164	.8036	.7668	.6710
24	.6074	.7032	.7309	.7305	.7161	.7161	.6193

Typical Spring/Fall Week

Hour	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	.6054	.5729	.6405	.6468	.6595	.5991	.5515
2	.5727	.5454	.6224	.6301	.6235	.5725	.5282
3	.5475	.6369	.5965	.6118	.6028	.5541	.5040
4	.5321	.5813	.5911	.6056	.5532	.5454	.4922
5	.5313	.5304	.5934	.6082	.5948	.5395	.4868
6	.5336	.5565	.6094	.6282	.6127	.5424	.4849
7	.5304	.6249	.6704	.6944	.6654	.6419	.4920
8	.5301	.7553	.7887	.8938	.7861	.7626	.5066
9	.5506	.8567	.9273	.9092	.8612	.8376	.5624
10	.5706	.9389	.9784	.9638	.9339	.9104	.6268
11	.5906	.9506	1.0000	.9802	.9635	.5400	.6708
12	.5958	.9501	.9944	.9840	.9485	.9249	.6826
13	.5982	.9808	.9758	.9565	.9104	.8968	.6793
14	.5882	.9522	.9958	.9612	.9191	.8955	.6758
15	.5821	.9520	.9873	.9487	.9071	.8835	.6722
16	.5694	.9332	.9767	.9136	.8805	.8569	.6574
17	.5732	.9132	.9588	.8779	.8449	.8214	.6489
18	.5708	.8998	.9322	.8588	.8209	.7974	.6511
19	.5767	.8984	.9151	.8395	.7951	.7715	.6438
20	.6271	.9261	.9355	.8741	.8259	.8024	.6713
21	.6908	.9233	.9374	.9042	.8638	.8402	.7019
22	.6845	.8889	.8786	.8805	.8153	.7139	.6725
23	.6595	.8242	.8278	.7948	.7802	.6548	.6536
24	.6033	.7386	.7409	.7028	.6911	.6071	.6054

Table D.18. Continued

Typical Summer Day

Hour	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	.7161	.6288	.6257	.6135	.5635	.6096	.5820
2	.6631	.5939	.6080	.6020	.5418	.6059	.5657
3	.6251	.5575	.5576	.5706	.5304	.5767	.5302
4	.6024	.5504	.5369	.5573	.5176	.5616	.5020
5	.5996	.5416	.5337	.5500	.5051	.5527	.6006
6	.5812	.5476	.5329	.5576	.5147	.5390	.4951
7	.5551	.5767	.5620	.5880	.5361	.5894	.4822
8	.5639	.6782	.6647	.6925	.6967	.6816	.5151
9	.5967	.8153	.7867	.7894	.7557	.8118	.5651
10	.6496	.8710	.8567	.8476	.8449	.8896	.6157
11	.6927	.9237	.9041	.8839	.8798	.9382	.6551
12	.7375	.9461	.5225	.8933	.9067	.9775	.6682
13	.7655	.9563	.9302	.8645	.9112	.9869	.6606
14	.7749	.9775	.9494	.8845	.9373	.9990	.6637
15	.7731	.9812	.9502	.8794	.9461	1.0000	.6633
16	.7824	.9765	.9639	.8782	.9390	.9865	.6543
17	.7535	.9582	.9478	.8506	.9009	.9512	.6424
18	.7194	.9178	.9071	.8051	.8665	.9010	.6412
19	.7049	.8759	.8708	.7796	.8565	.8643	.6169
20	.7065	.8414	.8502	.7606	.8449	.8422	.6096
21	.7445	.8602	.8571	.7802	.8765	.8412	.6347
22	.7535	.8480	.8418	.7676	.8492	.8127	.6394
23	.7296	.7804	.7796	.7116	.7382	.7073	.6029
24	.6790	.7041	.7300	.6402	.7096	.6424	.5627

From EPRI (1977, 1978).

Table D.19. 1990 Projected Monthly Peak Loads by Power Pool (MWe)

Month	Seasonal Load Profile[a]	NEPOOL	NYPP	PJM
January	W	20,147	23,592	37,342
February	W	19,632	22,268	36,025
March	S/F	17,619	21,497	35,072
April	S/F	16,186	19,998	32,214
May	S/F	15,786	22,389	35,289
June	S	17,813	23,644	39,620
July	S	17,478	25,024	43,310[b]
August	S	18,317	25,830[b]	41,604
September	S/F	15,386	23,000	38,910
October	S/F	17,231	20,551	33,310
November	S/F	19,117	23,320	36,753
December	W	20,595[b]	23,637	38,563

[a] W - winter
S/F - spring/fall
S - summer

[b] Annual peak.

Table D.20. Assumed Fuel Mix and Production Cost for NEPOOL, NYPP, and PJM Under the Base Case and Coal SIP Scenarios

	1990 Capacity (MWe)		Assumed Available	Adjusted Capacity (MWe)		1990 Generation (1000 MWh)		Assumed Heat Rate (mmBtu/MWh)		1990 Consumption (1000 mmBtu)		Fuel Cost (1980 $/mmBtu)[a]		Production Cost[a] (millions of 1980 dollars)	
Fuel Type	NEPOOL	NYPP/PJM	NEPOOL/NYPP/PJM	NEPOOL	NYPP/PJM	NEPOOL	NYPP/PJM	NEPOOL	NYPP/PJM	NEPOOL	NYPP/PJM	NEPOOL	NYPP/PJM	NEPOOL	NYPP/PJM
							BASE CASE								
Hydro	1,366	1,175	0.95	1,298	1,116	11,400	9,800	---	---	---	---	0	---	---	---
Nuclear	8,840	14,529	0.73	6,453	10,616	56,700	93,300	10.6	10.60	600,000	989,000	0.58	0.58	348	573
Purchased power 1	0	1,000	---	0	1,000	0	8,800	---	---	0	---	---	20[b]	---	132
Coal	2,583	18,420	0.78	2,015	14,000	17,000	104,000	9.85	10.00	168,000	1,040,000	1.79	1.54	300	1,860
Purchased power 2	145	800	1.	145	800	1,100	3,600	---	---	---	---	25[b]	32[b]	28	90
Wood	46	0	0.91	42	0	300	---	12.0	12.00	3,600	---	1.90	2.4	7	---
Residual	11,392	13,046	0.82	9,341	10,176	30,400	23,700	9.83	10.00	300,000	237,000	4.06	4.35	1,210	961
Distillate	2,009	7,181	0.72	1,446	5,000	60	600	12.17	14.00	800	8,400	6.53	6.97	5	55
							CONVERSION								
Hydro	1,366	1,175	0.95	1,298	1,116	11,400	9,800	---	---	---	---	0	---	---	---
Nuclear	8,840	14,529	0.73	6,453	10,616	56,700	93,300	10.6	10.60	600,000	989,000	0.58	0.58	348	573
Purchased power 1	0	1,000	---	0	1,000	0	8,800	---	---	---	---	---	20[b]	---	132
Coal	6,602	23,547	0.78	5,150	17,900	35,700	119,000	10.14	10.20	362,000	1,220,000	1.79	1.54	647	2,180
Purchased power 2	145	800	1.	145	800	650	2,300	---	---	---	---	25[b]	32[b]	16	59
Wood	46	0	0.91	42	---	190	---	12.0	12.00	2,200	---	1.90	2.4	4	---
Residual	7,191	7,109	0.82	5,900	5,550	12,300	9,700	10.02	10.20	123,000	95,000	4.06	4.35	498	386
Distillate	2,009	7,181	0.72	1,446	5,000	150	900	12.17	14.00	1,800	13,000	6.53	6.97	12	84

[a]For January 1981.

[b]$/MWh for purchased power.

(1) Present value of factors scaled by installed cost

$$A_1 = 1 - \frac{ITC}{1+d} - T \sum_{t=1}^{N} \frac{DP_t}{(1+d)^t} +$$

$$+ (1-T) \sum_{t=1}^{N} \frac{(PTAX_t + INS_t)}{(1+d)^t}$$

(2) Present value of other costs and benefits

$$PV = (1-T) \sum_{t=1}^{N} \Bigg[AENER \cdot RATES \left(\frac{1+e_r}{1+d}\right)^t$$

$$- AENER \cdot HR \cdot ACS \left(\frac{1+e_a}{1+d}\right)^t + AENER \cdot THRT \cdot CRT \left(\frac{1+e_b}{1+d}\right)^t$$

$$- AOM \left(\frac{1+e_s}{1+d}\right)^t \Bigg]$$

(3) Value in use, V, satisfies

$$V = \frac{PV}{A_1}$$

Definition of Variables:

- d = required internal rate of return on an investment
- ITC = investment tax credit as fraction of installed cost
- T = marginal income tax rate
- DP_t = depreciation in year t as fraction of installed cost
- N = time horizon
- $PTAX_t$ = insurance in year t as fraction of installed cost
- AENER = annual energy output (MWh/unit)
- RATES = electric power rates (1980 $/MWh)
- HR = heat rate of alternative energy system (mmBtu/MWh)
- ACS = alternative energy fuel cost (1980 $/mmBtu)
- THRT = benefits in conventional fuel savings for process steam (mmBtu/MWh)
- CRT = credit for sale of by-product (1980 $/mmBtu)

Fig. D.10. Computation of Value in Use for Industrial and Commercial Users

Purchase Decision Criteria

PARAMETER	COMMERCIAL/INDUSTRIAL L	E	H
Weighted Cost of Capital Hurdle Rate:			
• Nominal	.12	.20	.32
• Real	.05	.12	.23
Period: (Years)	←	20	→
Depreciation Type (years)	Double declining balance** (16 years)		
Marginal Income Tax Rate	←	.48	→
Investment Tax Credit	←	.10*	→
Property Tax and Insurance	←	.025	→

* Application specific energy tax credits may be available.
** Cogeneration will use a 20 year life.

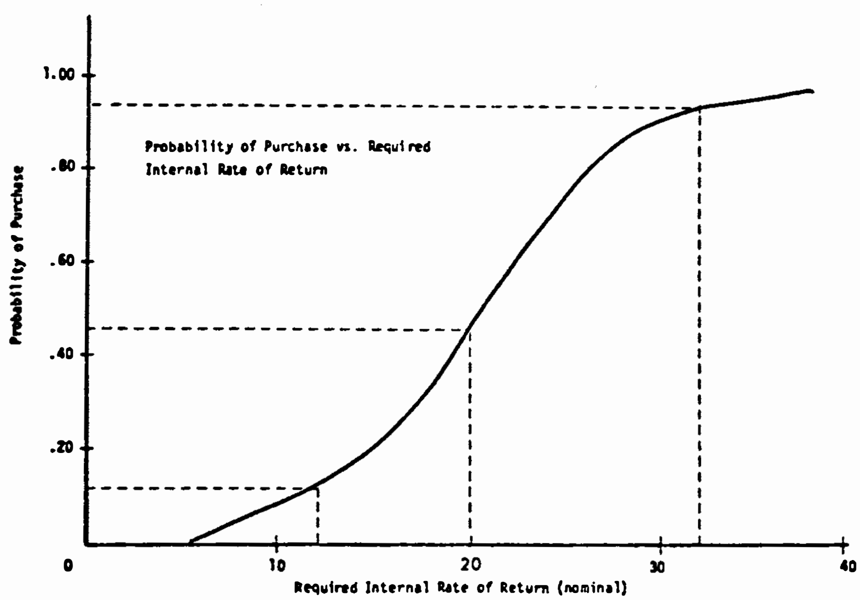


Fig. D.11. Industrial Purchase Assumptions

Purchase Decision Criteria

Parameter	L	E	H
Payback Period	3	5	8
Depreciation	Double Declining Balance* (16 years)		
Marginal Income Tax	←.48→		
Investment Tax Credit	←.10→		
Property Tax and Insurance (fraction of cost)	←.025→		

*Energy tax credits may be available for solar and wind.

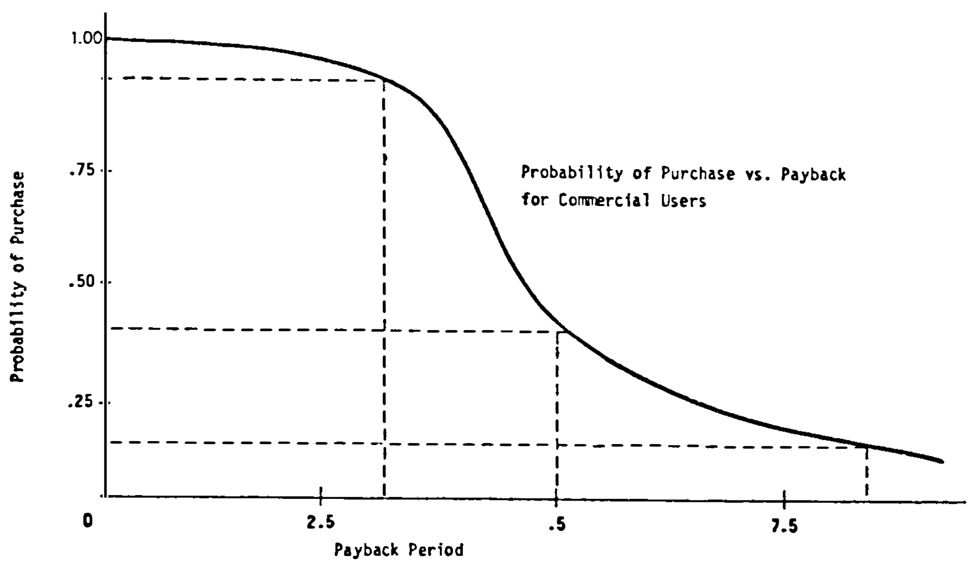


Fig. D.12. Commercial User Purchase Assumptions these data (Gas Gesearch Institute 1979; Energy and Environmental Analysis, Inc. 1977; Thermo-Electron Corp. 1976; Resource Planning Associates, undated; ICF, Inc. 1978). Information in these studies was adjusted to reflect the assumed general inflation rate of 7%.

A similar curve was developed for commercial users (see Figure D.12). Commercial users are assumed to use payback as a decision criterion. The data for this curve were extracted from Ultrasystems, Inc. (1975); Booz, Allen, and Hamilton (1980); and Urban Institute (1980).

Energy Information Administration (EIA) procedures are used to estimate electricity rates for commercial and industrial customers. These rates reflect the production cost estimates in Table D.20; fixed costs associated with the generating capacity mix; and EIA sectoral variation estimates. The EIA procedure accounts for the capital cost of new plants, operations and maintenance costs, fuel costs, required revenue associated with the undepreciated portion of existing plants, and transmission and distribution costs. Finally, a price wedge is added to those costs to differentiate among residential, commercial, and industrial users.

The algorithm used to estimate electricity rates for this study first estimates the electricity production cost for 1980. Based on the power pool projections of generation in 1990 and the real escalation in production (fuel) costs, the 1990 electricity rates are calculated in 1980 dollars. It is assumed that there will not be any change in real terms for the fixed generation, transmission, and distribution cost components. The production cost (fuel) is assumed to escalate at the rates defined in Section D.5.4. The EIA cost estimates corresponding to USDOE Regions 1, 2 and 3 are assumed to represent NEPOOL, NYPP, and PJM, respectively.

To obtain the 1980 estimate of electricity sector/region cost, the fixed costs were adjusted for transmission and distribution losses. These fixed generating, transmission, and distribution costs were added to the fuel cost adjusted for transmission and distribution losses to obtain total costs per MWh.

The levelized fixed capital cost is obtained through levelizing capital costs provided by EIA for various generating technologies (EPRI 1979). These costs are weighted by the 1990 MWh generating mix estimates of each power pool to develop a weighted average levelized fixed capital cost. This cost was scaled to reflect transmission and distribution efficiency.

Transmission and distribution costs were obtained by dividing the estimate of the fixed capital cost by the 1990 generation and adding to the annualized fixed cost and variable cost associated with transmission and distribution operations and maintenance. The data for these calculations were also from EIA/MEFS personnel (O'Brien 1979).

Sector price "wedges" were obtained from Edison Electric Institute for 1975 (through EIA). They represent the difference between generating, production, transmission, and distribution cost data and the average price paid by residential, commercial, and industrial users. These data were converted to 1980 dollars and added to average electric generation costs to obtain the rates by sector.

Electricity prices for the three power pools in January 1, 1981, are given in Table D.21 for the energy mixes with and without conversion to coal. These prices escalated to 1990, assuming the same energy mix but escalated fuel prices.

Table D.21. Electricity Prices for January, 1981
(1980 Dollars)

	Without Coal Conversion[a] ($/kWh)			With Coal Conversion[a] ($/kWh)		
	NEPOOL	NYPP	PJM	NEPOOL	NYPP	PJM
Residential	0.0808	0.0838	0.0687	0.0735	0.0839	0.0665
Commercial	0.0798	0.0788	0.0668	0.0725	0.0726	0.0646
Industrial	0.0608	0.0458	0.0478	0.0535	0.0396	0.0456

[a]Fuel mix for 1990 assumed. Electricity prices for dates after 1981 escalated according to fuel price escalation rates given in Section D.5.4.4 and long-term fuel mix.

D.5.6 Estimates of Value in Use for Residential Users

Value in use for alternative energy systems owned by residential users is determined using simple payback. Mortgage financing is also considered. Figure D.13 summarizes procedures used for the mortgage financing case. It can be converted to simple payback by setting principal and interest charges equal to zero and the down payment fraction equal to 1.

Equation 1 in Figure D.14 sums the terms that scale linearly with the initial cost of the system. These include the down payment fraction, tax credit (if any), principal and interest payments on a mortgage, property tax, and insurance. All costs represent after-tax values. Thus, property tax and interest are scaled by one minus the marginal income tax rates for the user.

Equation 2 provides the present value of the energy savings benefits, alternative system O&M costs, and fuel costs (if any) for the alternative system. Factors in Equations 1 and 2 are combined in Equation 3 to compute the value in use.

Figure D.13 provides the financial criteria used in the analysis. The decision criteria consist of probability of purchase versus payback period (Hausman 1980; General Electric Co. 1977).

D.6 REVIEW OF CONSERVATION REFERENCES

The following studies suggested by DEIS reviewers were reviewed: Environmental Defense Fund, undated, A New Alternative to Completing Nine Mile Point Unit 2 Nuclear Station; Seattle City Light Department, 1981, Energy Resources Data Base; U.S. General Accounting Office (USGAO), 1981, New England Can Reduce Its Oil Dependence through Conservation and Renewable Development; Williams and Ross, A New Prosperity, Building a Sustainable Energy Future (a recent SERI study); New Jersey Department of Energy, 1981, Draft Revisions to the New Jersey Energy Master Plan); New England Congressional Institute Energy in New England: Transition to the 80s; and various documents by the California Energy Commission and Seattle City Light. Detailed comments on the first three are presented; these comments are followed by a brief discussion of important points in the remaining reports.

D.6.1 EDF Study

The Environmental Defense Fund's (EDF's) study compares the cost of completing Nine Mile Point #2 with the cost of cancelling the station and using conservation to eliminate the need for replacement generation. The energy displacement envisioned by EDF is predicated on residential and commercial efficiencies (each representing almost 30% of the displaced generation) and voltage reduction on the Niagara Mohawk system (5% of savings). Cogeneration and small hydro replace the remainder.

EDF's conservation projections are believed to be overly optimistic for several reasons. First, EDF ignores the realities of the marketplace. EDF assumes that if a particular energy saving technology is "cost-effective" it will rapidly penetrate the market. In the residential lighting area, for example, EDF has 40% of existing homes in the service area retrofit 3 incandescent bulbs with fluorescent bulbs over a 4-year period. EDF's calculations amount to a 3-year payback on replacement. EDF assumes very heavy saturation, over a longer period, for low-flow showerheads, water heater insulation, and all commercial sector improvements. For water heater blankets, for example, EDF assumes 60% saturation by 1996. Standard analysis indicates that penetration and saturation of the residential market is likely to be a more laborious process than EDF assumes (Bass 1969). Further, standard analysis indicates that consumer purchase decision criteria is far harsher than is commonly reported in the theoretical economic literature. Although EDF chose only conservation improvements with rapid paybacks, payback rapidity alone is not sufficient. The purchase decisions of individuals reflect a very low level of knowledge and sophistication about energy (Hausman 1979, 1980; Gately 1980). Further, individuals perceive a number of capital constraints that limit purchase of conservation items defined as attractive (NJDOE 1981). A different obstacle to purchase is the lack of economic incentives for renters and dwellers in master-metered apartments. Neither renters nor dwellers in master-metered apartments receive the same benefit, if any at all, from capital intensive conservation improvements. EDF does not distinguish this very large fraction of the residential market from the single family market.

A second reason that EDF's projections are believed overly optimistic is that in the key area of refrigerator efficiency, EDF includes a $30 incentive to individuals purchasing the highest efficiency models. Presumably, the utility will fund this program. The DEIS does not assume any new incentives. While increased refrigerator efficiency is a benefit for all parties, EDF does not address the very likely possibility that individuals persuaded by the $30 grant to buy an efficient refrigerator will buy a larger or more energy-consumptive (albeit more efficient) refrigerator. Without incentives, however, there is little reason to expect any significant price-induced penetration of higher cost, high-efficiency refrigerators (Hausman 1979, 1980; Gately 1980). Further evidence on refrigerators suggests that the efficiency argument may be overstated for other reasons. First, according to sales records, the continuing shift to larger, Mortgage Financing Cases

Parameter	LOW	EXP	HIGH
Discount Rate	.12	.20	.32
Marginal Income Tax	←	.30	→
Fractional downpayment	←	.2	→
Term of Loan (years)	←	30	→
Property Tax	←	.02	→
Insurance	←	.025	→
Years to net positive present value of cash flows	5	8	12
Years to positive annual cash flow	1	4	8

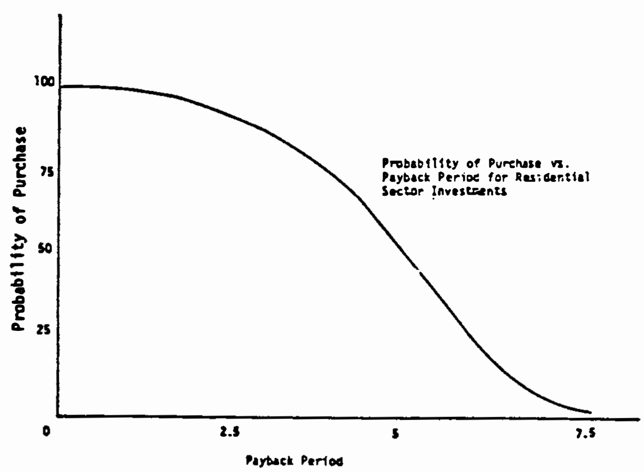


Fig. D.13. Residential Purchase Decision Criteria

(1) Present Value of Factors Scaled By Installed Cost

$$A1 = DP - \frac{ITC}{1+d} + \sum_{t=1}^{N} \left[\frac{P_t + (1-T) \cdot (IT_t + PTAX_t) + INS_t}{(1+d)^t} \right]$$

(2) Present Value of Other Costs and Benefits

$$PV = \sum_{t=1}^{N} \left[AENER \cdot RATES \left(\frac{1+e_r}{1+d}\right)^t - AOM \left(\frac{1+e_s}{1+d}\right)^t - AENER \cdot HR \cdot ACS \left(\frac{1+e_a}{1+d}\right)^t \right]$$

(3) Value In Use, V

$$V = \frac{PV}{AT}$$

Note: Also, require that annual benefits in year N+1 exceed annual costs.

Definition of Variables

DP = Fractional down payment
ITC = Tax credit
d = Discount rate
N = Time to produce cumulative positive net cash flow
P_t = Payment of principal on loan in year t
T = Marginal income tax rate
IT_t = Payment of interest on loan in year t
$PTAX_t$ = Property tax payment in year t
INS_t = Insurance payment year t
AENER = Annual conventional electric energy displacement (MWh)
RATES = Residential electricity rates (1980 \$/MWh)
AOM = Alternative energy system annual O&M costs.
HR = Heat rate of alternative per displaced conventional MWh (mmBtu/MWh)
ACS = Alternative fuel cost (1980 \$/mmBtu)
e_r, e_s, e_a = Escalation Rates

Fig. D.14. Estimates of Value in Use for Residential Users more consumptive refrigerators and energy-inefficient frost-free refrigerators will offset efficiency gains. Second, the elimination of federal standards will ease the manufacturer's push towards higher efficiency. Third, the easy energy savings - a switch from fiberglass to foam in the wall of the refrigerator - have already been made for most new models. Further energy reductions are likely to be more difficult.

Third, EDF attributes about 5% of its electricity savings to voltage reductions by the utility. This procedure has decidedly mixed results. Lights and other time-related energy consuming devices will consume less power at a lower voltage. Of course, they will also produce less light, thus, there is a reduction in service. Motors and work-related devices will overheat and run less efficiently at a lower voltage level. Since the amount of work an electric motor performs is a function of current times voltage, the reduced voltage must be offset by increased current or else output suffers and the meter overcharges the user for power delivered. Individuals are unlikely to notice the slight brownout effect of a voltage reduction but commercial and industrial users will. Utilities are studying the subject (Seattle Light Dept. 1981).

D.6.2 Seattle Light Department Planning Document

According to Seattle's 1981 Energy Resources Data Base, the planning document of Seattle City Light Department, conservation and energy efficiency items endorsed by the utility and city account for about 430 MW/year of savings by 2000 (Seattle). These savings compare with an expected average load of 1500 MW in 2000. Most of the savings result from price-induced conservation and changes in the Seattle Energy (building) code. The utility does not explicitly state how the price-induced savings will occur.

For building code-related changes, the utility estimates the greatest improvement in building envelope efficiency (64%). The utility estimates that the code changes will improve lighting efficiency by 15%. The DEIS review of lighting improvements for the Northeast is shown in Section D.3.1.2.

It is important to note that Seattle City Light considers a project economical based on the life-cycle cost of the project at the utility's financing costs. This is an appropriate evaluation technique where the utility is financing the investments. Where a utility is evaluating the investments, projects that are life-cycle cost-effective to the utility in a relatively risk-free and certain environment will not be undertaken by individuals and businesses subject to risk and uncertainty. This concern for risk and uncertainty results in a short time frame; hence, the prevalence of payback as a generic investment criteria. This distinction makes it imperative to distinguish projects that are financed by the utilities from those that are merely evaluated and advocated by the utilities or other parties.

D.6.3 USGAO Report

The USGAO report, prepared by Energy Systems Research Group, found that aggressive conservation and alternative generation measures could reduce oil consumption substantially over the next 20 years, and that aggressive conservation (compared to business as usual) could reduce the region's oil consumption by 38% by 2000, three-quarters of which would be in electric generation.

To accomplish these savings, the report recommends (1) state and federal regulations and economic incentives oriented towards energy efficiency in buildings, residences, and appliances; and (2) state public utility commission review of utility conservation efforts and development of regulations and incentives to shift utilities towards conservation.

The conclusions in the report are based on the assumption that a conservation investment is cost-effective if it has an acceptable life-cycle cost. However, this is true only if the utility (or the government) makes the investment. On their own, individuals will not make purchase decisions based on life-cycle cost.

Page 19 of Volume I of the GAO report states that "the purpose of our conservation case is to see how much oil could be saved by vigorously implementing feasible, socially acceptable, cost effective measures which are not likely to be implemented without additional government action." The report then incorporates 16 legislative and regulatory measures designed to increase energy efficiency and decrease energy consumption. The obvious question is why government action is needed to implement measures that are defined as "cost-effective." The answer is that cost effectiveness is relative to the decision criteria of the residential, commercial, or industrial user and that the government is being used to force an admittedly distorted electricity market (marginal cost pricing currently not used) to accept more conservation than it would otherwise accept.

Who pays for this extra conservation? If the government or utilities finance life cycle cost-effective measures (that would not be financed by individuals) current consumers are forced to buy more conservation than they would otherwise buy with the benefits accruing to future consumers. While this subsidization is often justifiable, it must be explicitly recognized that (1) current consumer's rates will be higher as a result; (2) the political climate does not favor it; (3) the argument used to defend conservation is the same argument the conservationists reject--it applies to including construction work in progress in the rate base; and (4) conservation savings cannot be based on imputing programs to utilities that have not accepted them. The report does not address these real-world obstacles.

On a technical level, the report considers the beneficial effects of conservation improvements in isolation and then sums the results. Users of this method must recognize that some conservation improvements save energy in one process but increase energy requirements in another process. As an example of the first concern, reduced lighting levels, which are generally considered an absolute benefit, serve to increase heating loads and decrease cooling loads. This interactive effect is not discussed in the USGAO report. Tighter building envelopes, another strong conservation measure, may increase ventilation and air handling requirements. As our discussion of commercial building conservation indicates, these offsetting factors can be significant. Ignoring them may result in a misstatement of the impact of the primary electric conservation.

The authors state that nearly half the conservation savings in the residential sector are derived through rapid penetration of energy efficient appliances. It is clear from the report and from logical inferences that this penetration depends on government regulations forcing inefficient appliances off the market. Based on market forces alone, there is strong evidence to suggest that consumers will not choose more expensive, more energy-efficient appliances (Hausman 1979, 1980; Gately 1980). Even if a government ban on relatively inefficient appliances is assumed, it is not clear how the savings mentioned at the top of page 71 can be obtained. Using simple mathematics, the incremental energy savings and the appliance life times (Vol. II, technical report I, page 86) do not produce a 9% savings in 1988 if the standards are implemented in 1983. Indeed, if all appliances in the residential sector are immediately brought up to the 1983 standards offered on page 70 of Volume 1, it is not apparent how a 9% overall savings can be achieved. Also, the base efficiency assumed by the authors already includes the voluntary efficiency standards targeted by the government.

D.6.4 Other Literature

In general, the most critical errors in the studies cited at the introduction to this section is in the area of purchase criteria and assumed incentives to purchase. The SERI study, which is representative of many studies in this area (though more comprehensive and thorough) uses life-cycle cost at a low discount rate to determine cost-effectiveness.

Unlike the Seattle document, most conservation studies either do not state why or under what circumstances anyone would invest in conservation improvements or they use inappropriate purchase decision criteria (EDF, SERI, USGAO). Where purchase decision criteria for residential and commercial consumers is made explicit, it is invariably life-cycle cost. Life-cycle cost, as generally set forth, is inappropriate for individuals, and to a lesser extent commercial consumers, for four reasons: (1) the degree of sophistication required for a proper life-cycle analysis is not present at the residential level; (2) the discount rate assumed by life-cycle analysis is much too low; (3) the time frame for the analysis, equal to the life cycle of the durable, is too long; and (4) perfect riskless markets are nonexistent, as is perfect knowledge of the future (Hausman, 1979, 1980; Gately 1980; NJDOE 1981; Olshavsky and Grandbois 1979; USDOE 1980; Solar Energy Research Institute 1981). The investment criteria is only appropriate for perfect riskless markets, and where perfect knowledge of the future is available. Empirical evidence that commercial and industrial users shun life-cycle cost in favor of shorter-run evaluation methods is similarly abundant (Statman 1982). In brief, the prime concern in the DEIS is not over the technical merit of the technologies typically outlined in conservation studies but over the purchase criteria of the intended buyers of the products.

In this regard, it is worth noting that two of the reports reviewed--the New Jersey Energy Plan and Our Energy: Regaining Control--do note the short-run purchase behavoir of individuals. The New Jersey report, a general policy statement on energy goals, includes an illuminating survey of consumers regarding willingness to invest in energy conservation. The results indicate that a great many individuals are unwilling to invest, despite seemingly attractive return, say 5- to 7-year paybacks. Interestingly, among nonpurchasers, the most frequently cited reason for not purchasing is "I don't have the money to invest right now." This response implies a problem of capital availability or capital access that is completely at odds with the theory underlying life-cycle analysis.

For the most part, the DEIS findings agree with those of the authors of the various studies about the conservation value of the improvements. However, there is some disagreement with the superficial reviews of some items, especially residential appliances, and some question of the acceptability of certain space conditioning and lighting changes, but in general the technical arguments are acceptable. Disagreement is over their likely implementation, absent some currently unplanned utility or government initiatives.

Of the energy policy documents reviewed, the New Jersey DOE, the New England Congressional Institute, the California Energy Commission and others are mostly broad frameworks for action, not specific analyses of well-defined actions. These reports were reviewed with interest, but it should be that only the impact in the Northeast of measures that will penetrate the market can be evaluated, not measures that are broadly acceptable or encouraged by policymakers but unlikely to be adopted without further extra market actions.

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