HR. 602

25
1-29-80

ENVIRONMENTAL ASSESSMENT

MASTER

**Allocation of Petroleum
Feedstock**

**Algonquin SNG, Inc.
Freetown SNG Plant**

Bristol County, MA

January 1980

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U.S. DEPARTMENT OF ENERGY

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Microfiche: \$3.00

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Preamble

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The supply/demand data contained in Chapter #3 of this environmental assessment (EA) was obtained during the period September 1977 through January 1978 and represents the best information available at that time. Subsequent to January 1978, the gas supply situation changed to the extent that projected service area impacts at various allocation levels, as described in the Chapter #4 of the EA, probably would not occur at this time or would occur to a lesser extent.

On February 28, 1979, Algonquin filed with the Federal Energy Regulatory Commission a proposed one-year modification of Rate Schedule SNG-1 to increase customer flexibility on an experimental basis. Algonquin states in this filing that certain of its SNG customers "anticipate a temporary improvement during the 1979-80 winter of the supply/demand relationship for gas, to the point that available supplies might be larger than the demand for gas." This request is indicative of the general improved gas supply situation.

It is recognized that due to the changed gas supply situation, the EA presents a worst case situation of greater gas shortages than are now anticipated will actually occur. Since the economic and environmental impacts at the allocation levels analyzed would be less than as set forth in the EA, the Department of Energy has determined that the EA does encompass a range of impacts that may be associated with levels of reduced allocation. If supplies of gas from other sources are adequate, no adverse impacts will be associated with the 100 percent allocation or at the reduced levels of 87 percent and 49 percent.

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EXECUTIVE SUMMARY

Description of the Proposed Action

The proposed administrative action by the Office of Fuels Regulation (OFR), Economic Regulatory Administration (ERA), Department of Energy (DOE) to deny, grant or modify the Algonquin SNG, Inc. (Algonquin) petition for an adjusted allocation of naphtha feedstock may significantly affect the human environment. The volume of feedstock requested is 4,425,571 barrels (bbls) per year of naphtha to be used in Algonquin's Freetown, MA synthetic natural gas (SNG) plant. Algonquin originally filed its petition on 31 October 1974. The petition has undergone a number of reviews, remands, and court challenges by interested parties such that DOE has decided to review the petition and associated environmental considerations under current DOE regulations.

If DOE grants the allocation in full, the Freetown plant will continue to operate at its present capacity during the five winter months of each year.

Description of the Environment Affected by the Proposed Action

Plant Site Environs

Algonquin's SNG plant is located in Freetown, Bristol County, MA, at the confluence of the Taunton and Assonet Rivers. Freetown has a population of over 5,458 and over 1,427 housing units. Algonquin's local tax payments make up 21% of Freetown's tax base. The plant occupies 120 of the 579 acres of the plant property that includes a forest buffer on three sides of the plant. No habitat indicative of rare or endangered wildlife occurs on the site. Access to the site is provided by South Main Street, a two-lane secondary road that has the capacity to handle additional traffic.

The plant uses the catalytic rich gas (CRG) process to produce 18.12 billion cubic feet (Bcf) of SNG from 4,425,571 bbls of naphtha feedstock in 151 operating days during the five winter months of the year. Algonquin has a temporary allocation of 4,425,571 bbls of naphtha per year supplied by Exxon Company U.S.A. (Exxon) from facilities in

New Jersey. The naphtha is shipped by tanker to the Shell Oil dock facilities in Fall River, and from Fall River the naphtha is pumped three miles by pipeline into two 265,000-bbl storage tanks at the plant site. In producing the SNG, approximately 1,152,000 gallons per day (gpd) of water from the Assonet River are used, and 236,000 gpd are discharged to the saltwater portion of the Taunton River.

With regard to air quality, the plant vicinity is designated an attainment area for total suspended particulate (TSP) and sulfur dioxide (SO_2) emissions, an unclassified area for nitrogen oxides (NO_x), and a nonattainment area for oxidants. Naphtha and product gas are used to fire the process boilers and heaters. Air emissions are quite low because the naphtha produces no ash when burned and has less than 30 parts per million (ppm) of sulfur. The plant emits 1.63 tons of SO_2 per year, 226.5 tons of NO_x per year, 14.56 tons of hydrocarbons (HC) per year, and virtually no particulates. CRG catalyst and zinc oxide used in the process are reprocessed by the manufacturer.

Permanent employees, numbering 102 and working year-round, represent an annual payroll of \$1,777,000.

No sites of historic or archaeological significance occur on the plant property or close enough to be affected by the plant. Noise generated by the plant is not estimated to interfere with activities near the plant site. The plant has full-time fire protection and security services and a Certified Spill Prevention Control and Countermeasures Plan to mitigate any such hazards.

Service Area Environs

Algonquin Gas Transmission Company (Algonquin Gas), which owns Algonquin SNG, Inc. (Algonquin) and purchases the entire output of the SNG plant, is a pipeline company selling gas to 23 distribution companies (gas utilities) in five states: Connecticut, Massachusetts, New Jersey, New York, and Rhode Island. In 1976-77, Algonquin Gas sold the energy equivalent of 74,129,050 million British thermal units (MMBtu) of gas, of which 16.4% was SNG, to a service area with a population of approximately 7,767,662. The air quality in the service area generally

meets National Ambient Air Quality Standards (NAAQS), although oxidant concentrations exceed the NAAQS throughout the area, and the major cities are classified nonattainment areas for other pollutants as well.

Environmental Impact of Alternative Feedstock Allocations

Three feedstock allocation levels were evaluated:

- 100% = 4,425,571 bbls per year (bpy) of naphtha (17,848,200 MMBtu/year of SNG),
- 87% = 3,865,178 bpy of naphtha (15,527,934 MMBtu/year of SNG), and
- 49% = 2,184,000 bpy of naphtha (8,745,618 MMBtu/year of SNG).

These levels represent 100%, 75%, and denial of the requested allocation adjustment because previously, DOE permanently assigned Algonquin 49% of the requested feedstock allocation.

This assessment considers impacts that can be directly attributed to possible DOE action. Gas supply and demand projections by Algonquin Gas, based on forecasted supplies of pipeline gas, estimated curtailments, and SNG production, indicate that shortages will probably occur even with a full allocation. Past gas shortages have been compensated for by emergency purchases and propane-air injections, neither of which are long-term resources. No shortages occurred in 1976-77 for end-users in Federal Economic Regulatory Commission (FERC) Priority-of-Service Categories 1, 2, and 3.

The assessment considers operational impacts in the winter of 1978-79 and 1980-81. No construction impacts are considered because the plant was completed some years before the baseline year for the analysis (1976-77).

100% Allocation

The full allocation of naphtha would allow Algonquin to continue SNG production at the 1976-77 level with no incremental site-related impacts in 1978 or 1980.

Service area impacts on air quality and the economy from gas shortages forecasted for 1978 and 1980, even with the full allocation, are not directly attributable to the DOE action. Gas shortages are projected to increase in 1978 and 1980 over 1976 levels because of increased curtailments of pipeline gas supplies. Shortages for all priority of service categories are projected to occur in 1978 and 1980 by Algonquin Gas.

87% Allocation

The 87% allocation would result in reduced plant operation with reduced water consumption (13%), reduced air emissions, and reduced state and federal income tax revenues (\$392,724). The reduced air emissions and water consumption will produce slightly, though not significantly, improved environmental conditions. The same number of plant personnel will be required to operate the SNG plant as that required in the 100% case.

Service area-related impacts on air quality and the economy are anticipated to occur because Algonquin Gas has estimated that the reduced SNG production would increase gas shortages by 2,320,266 MMBtu in 1978-79 and 2,327,627 MMBtu in 1980-81. The range of economic impacts can be estimated by assuming curtailed customers 1) switch to an alternate fuel or 2) close businesses. Business closings are assumed to last five months during the winter heating season when the gas shortages are most severe, although some firms may go out of business permanently. If all curtailed customers switched to one of these three alternate fuels, the cost differential between these fuels and natural gas are as follows for 1978-79:

- No. 6 fuel oil - \$275,415 savings over gas,
- No. 2 fuel oil - \$2,408,529 more than gas, and
- electricity - \$11,827,695 more than gas.

Alternately, assuming the curtailed customers are commercial and industrial businesses and they close for the five-month winter, 44,196 workers would be laid-off in 1978-79 and 44,336 in 1980-81. These numbers translate to losses of employee income as follows:

- 1978-79 - \$244,850,000 and
- 1980-81 - \$271,560,000.

Air quality impacts were estimated using an emissions burden approach, assuming all customers switch to either No. 2 or No. 6 fuel oil. The SO₂ emissions increase over that which would occur if natural gas or SNG were available is as follows:

- No. 2 oil
 - 1978-1979: 974 tons per year
 - 1980-1981: 977 tons per year
- No. 6 oil
 - 1978-1979: 1,641 tons per year
 - 1980-1981: 1,647 tons per year

The increases are important because they are anticipated to occur in and around cities that are already experiencing violations of the NAAQS.

49% Allocation

If DOE denies the requested adjustment, Algonquin will still receive the 2,184,000 bbls that were previously permanently assigned. Since the plant can be adjusted to operate at this reduced feedstock level, certain beneficial site-related impacts will occur: reduced air emissions, and water consumption and discharge, although not in direct proportion to the reduced SNG production. The same number of employees will probably be required as that required for the 100% case. Losses in state and federal income tax revenues will be \$1,540,687.

Service area impacts directly related to the DOE action are about four times greater than those for the 87% allocation. Gas shortages resulting from denial of the allocation adjustment are projected by Algonquin Gas to be 9,102,582 MMBtu in 1978-79 and 9,131,461 MMBtu in 1980-81. Economic impacts from fuel switching in 1978-79 range as follows, assuming all customers switch to each of the fuels:

- No. 6 - \$1,080,476 saving over gas,
- No. 2 - \$9,448,844 more than gas, and
- Electricity - \$46,400,959 more than gas.

Employee income losses resulting from closing of businesses for five months are estimated as follows:

- 1978-79 - 173,383 workers, \$960,540,000 income and
- 1980-81 - 173,933 workers, \$1,065,300,000 income.

The range of impacts on air quality in the service area were estimated by calculating the increased emissions of pollutants assuming all curtailed customers switch to either No. 2 or No. 6 fuel oil. The total emissions burden increase in tons per year over that which would occur if gas were available is as follows:

- No. 2 oil
 - 1978-79: 3,825 tons per year
 - 1980-81: 3,837 tons per year
- No. 6 oil
 - 1978-79: 6,439.5 tons per year
 - 1980-81: 6,460 tons per year

Summary of Unavoidable Adverse Impacts of Alternative Feedstock Allocations

Gas shortages are projected for all feedstock allocation levels: 100%, 87%, and 49%. This report only assesses the impact of shortages that would result from DOE action.

The site-related impacts for all alternatives are similar and vary only in magnitude. Tax revenue losses would be as large as \$1,540,687 for the 49% case. Air and water quality in the plant vicinity would increase slightly resulting from decreased pollutant emissions and wastewater discharge associated with decreased allocation levels.

Service area-related impacts on air quality and the economy would increase with decreased SNG production. The 100% assignment would result in SNG production at the current level and, therefore, would not cause any direct incremental impact on the service area economy or air quality.

The 87% assignment would reduce SNG supplies and cause a number of impacts. If fuel switching occurred, between 974 and 1,641 more tons of SO₂ would be emitted in 1978-79. For that period, economic impacts

of fuel switching would range from a savings of \$275,000, if all curtailed customers switched to No. 6 oil, to a loss of \$11,828,000, if customers switched to electricity. Alternately, if all the curtailed customers closed business for the five winter months, the lost employee income would range between \$245 (1978) and \$272 (1980) million.

The estimated service area impacts of the 49% allocation in 1978 and 1980 are similar to the 87% case except that the impacts would be about four times greater. Fuel switching to No. 6 oil would cause emissions of SO₂ to increase 6,439.5 and 6,460 tons per year in 1978-79 and 1980-81, respectively. The economic costs of fuel switching in 1978-79 would range from a savings of \$1,081,000 if No. 6 oil were used, to a loss of \$46,401,000 if electricity were used. Economic losses from business closings or failures would be about \$961 million in 1978-79 and about \$1,065 million in 1980-81.

In summary, these worst-case analyses bracket the likely impacts of the various allocation levels. In general, the probability that these impacts would occur is greater with decreased allocations because the gas shortages would be larger and more difficult to offset with emergency measures. Furthermore, the larger the shortage, the greater the potential for severe secondary impacts such as fuel switching costs and the multiplier effect of foregone income of furloughed industrial employees.

Summary of Irreversible and Irretrievable Commitments of Resources

The proposed action will allocate an additional 2,241,471 bbls of naphtha per year to SNG production by Algonquin for a total allocation of 4,425,571 bpy. In addition, as much as 1.7 million gallons per year of propane may be required for enrichment if plant operating problems occur. Water is consumed at the rate of 1.15 million gallons per day from the Assonet River, and 135,000 pounds of zinc oxide and 120,000 pounds of CRG catalyst are used and recycled each year. The plant emits air pollutants that consume a portion of the atmosphere's dispersion and self-cleaning capability. The building materials from which the plant is constructed have been irreversibly committed.

Note that Algonquin has been previously assigned a permanent allocation of naphtha equal to 49% of the consumable resources (naphtha) described above.

Summary of the Relationship between Local Short-term Use of the Environment and the Maintenance and Enhancement of Long-term Productivity

The purpose of granting the requested feedstock allocation is to maximize the probability that high priority customers who depend on natural gas will receive their fuel requirements on a continuing basis. Granting the requested allocation would allow Algonquin to produce SNG to offset pipeline gas curtailments. Because of governmental approvals and contractual arrangements, the plant is expected to operate for nine years, if not longer. The plant's operation is not expected to have significant long-term effects on environmental productivity of the site or the surrounding area. This site could be used for some other purpose after the plant is dismantled; consumable, renewable resources such as air and water would be available to others when the plant ceases operations.

Long-term effects on the service area depend largely on future pipeline gas curtailments. The operation of the plant would benefit service area air quality by providing a clean burning fuel, especially when alternative fuels are considered. The economic benefits of eliminating fuel conversion costs and possible layoffs is evident. The magnitude of these effects, as discussed earlier, depends on the availability of pipeline gas.

Algonquin Gas has pursued other sources of domestic gas, but because of a nationwide shortage, has been unable to obtain firm supplies on a continuing basis. Alaskan gas will not be available until after mid-1980 and thus will not be in supply during the study period. Efforts to import liquified natural gas (LNG) have met with licensing and contractual problems and have been abandoned. Furthermore, the LNG alternative presents certain environmental risks: the possibility of fire and explosion during transport and storage. As a result, careful siting studies for storage and associated facilities must be made.

Conservation is not considered a viable means to offset the projected gas shortages. Because of the time required to install

insulation throughout Algonquin's service area and the uncertain availability of adequate supplies, massive conservation efforts of this kind would be difficult. Algonquin Gas is a pipeline company, not a distributor, and therefore has limited opportunities to make improvements such as installing insulation and modernizing equipment; it has already taken many such measures. The gas utilities that Algonquin Gas serves have also made a number of efforts at conservation and consumer education. .

The longer-term implications of the conservation alternative are certainly more positive. While conservation should be encouraged, it cannot be considered sufficiently reliable to be a complete and viable alternative. Conservation can be made more attractive and reliable when combined with other alternatives, such as conversion from gas to coal or electricity.

Conservation through economic incentives applied by pricing measures may be an alternative to increased gas production. Of four pricing structures available, demand/commodity, flat rate, declining block, and/or inverted block rate, a Federal Energy Administration (FEA) analysis concluded that the demand/commodity and inverted block structures were superior as conservation incentives. Algonquin Gas already uses a demand/commodity rate structure during most of the year. While gas companies should be encouraged to price their gas in a manner that encourages efficient use of gas, whether a change in pricing policy could provide an effective and reliable substitute to the continued operation of the SNG plant is doubtful.

The use of alternative feedstocks in the SNG plant would be difficult. The plant is designed for naphtha, and costs of converting to other fuels such as liquid petroleum gases, natural gas liquids, or methanol range from \$5-\$50 million. Also, Algonquin Gas would have to seek FERC approval of a new rate structure to finance the modification. Other constraints include uncertainty of fuel supply, down time for conversion, and lack of economic advantage.

Summary of Considerations Offsetting Adverse Effects of the
Proposed (100%) Allocation

The 100% allocation potentially has the least aggregate adverse impact of the allocations considered. Since plant production would not change, no incremental site-related impacts would occur. Available information suggests that the proposed action would help to minimize economic dislocations and increased air pollution in Algonquin's service area that could otherwise be caused by additional projected pipeline gas curtailments. Thus, the proposed actions could:

- 1) help prevent industrial and commercial customers from having to expend funds for fuel switching,
- 2) limit the further deterioration of regional air quality, which would occur as a result of fuel substitutions, and
- 3) minimize the probability of plant closings, associated lay-offs, and foregone income.

1. INTRODUCTION

Algonquin SNG, Inc. (Algonquin), a wholly owned subsidiary of Algonquin Gas Transmission Company (Algonquin Gas), operates a plant producing synthetic natural gas (SNG) from naphtha feedstock in Free-town, MA. The U. S. Department of Energy (DOE), which regulates the use of naphtha and other hydrocarbon feedstocks in SNG plants under the provisions of 10 CFR 211.29,* is evaluating Algonquin's request for an adjustment to its base-period supply volume of naphtha. This requested adjustment would permit Algonquin to continue to operate its Free-town, MA, plant at virtually the same level of output [17,848,200 million British thermal units (MMBtu) per year] as during the most recent complete operating season for which data were available (the winter of 1976-77).

This environmental assessment (EA) has been prepared to determine whether approval of the requested adjustment would constitute a major federal action that could significantly affect the quality of the human environment as specified in Section 102(2)(C) of the National Environmental Policy Act (NEPA). This document has been prepared in accordance with 10 CFR 208, promulgated by FEA to comply with NEPA and provides information to be used by DOE to determine whether an environmental impact statement (EIS) would be required before acting on the requested adjustment to Algonquin's base-period supply volume of naphtha. DOE can either require an EIS or issue a negative determination.

Section 2 of this EA describes the proposed DOE action in detail, including a background discussion of the reasons for Algonquin's request, DOE's statutory authority in reviewing this request, and a brief history of the events leading to the preparation of this document.

*10 CFR 211.29 is a section of the Mandatory Petroleum Allocation Regulations promulgated pursuant to the Emergency Petroleum Allocation Act of 1973, P.L. 93-159, as amended. This regulatory authority was formerly vested in the Federal Energy Administration (FEA), the functions of which were subsumed within DOE on October 1, 1977, in accordance with the provisions of the Department of Energy Organization Act, P.L. 95-91, and Executive Order 12009 (42 FR 46267, September 15, 1977).

Section 3 describes the existing environment that may be affected by the proposed action, including the existing SNG plant and facilities, environmental characteristics of the plant site and vicinity, as well as information concerning the firms that purchase the SNG, their service areas and pertinent environmental characteristics of these service areas.

Section 4 compares the anticipated environmental impacts of DOE's approval of the requested adjustment with the environmental impacts of approval of two reduced levels of feedstock allocation. This section then contrasts environmental conditions in the base analysis period, the winter of 1976-77, with potential environmental impacts of the reduced allocation levels during two future periods: the winters of 1978-79 and 1980-81.

Section 5 describes unavoidable adverse impacts of the alternative feedstock allocations. Section 6 assesses the irreversible and irretrievable commitments of resources involved in the alternative feedstock allocations and Section 7 discusses the relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. Section 8 addresses other alternatives to granting the requested adjustment including environmental consequences of options not within DOE's authority or responsibility to implement. Issues evaluated include alternatives for increasing gas supplies, reducing gas consumption and using alternative feedstocks. Section 9 summarizes considerations that offset the potential adverse effects of the requested adjustment.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Nature of the Proposed Action

On 3 October 1974, Algonquin submitted to the Federal Energy Administration (FEA) a petition for an assignment to establish an adjusted base-period supply volume of 4,425,571 barrels (bbls) of naphtha per year for use in the manufacture of SNG at its existing Freetown, MA, plant. The petition further requested that Exxon Company USA (Exxon) be assigned as supplier for this volume of naphtha.

The SNG plant's output would be sold to Algonquin Gas, an interstate pipeline company, for resale to approximately 21 gas utility companies. This SNG would supplement Algonquin Gas' purchases of pipeline gas from its sole supplier, Texas Eastern Transmission Corporation.

The SNG plant would operate for the equivalent of 151 days per year during the winter season. Plant start-up would begin about 16 October and shutdown would occur around 15 April, although actual full-scale operations would occur from 1 November through 31 March. With a nominal daily design capacity of approximately 118,200 MMBtu, the plant would produce 17,848,200 MMBtu during the operating season if the requested adjustment is granted. This volume of SNG currently represents roughly 20% of Algonquin Gas' total gas supply during the winter season.

The SNG plant has operated during each winter season since 1973-74. Approval of the requested adjustment in the base-period allocation of naphtha would permit Algonquin SNG to continue the past pattern of SNG production.

2.2 DOE's Statutory Authority

Under 10 CFR 211.29, as amended, the DOE (previously FEA) has regulated the allocation of petroleum feedstocks for production of SNG since 1974. The regulation requires that operators of SNG plants must petition DOE for assignment of a base-period supply volume of feedstock and a supplier for this feedstock.* This regulation was instituted

*This requirement has been established pursuant to provisions of the Emergency Petroleum Allocation Act of 1973, as amended.

because of potential conflicts between competing users of a particular feedstock within a given market area. Naphtha has historically been a basic feedstock for production of gasoline and other petrochemicals.

2.3 History of the Proposed Action

In 1969, Algonquin Gas was advised by its sole supplier of pipeline gas, Texas Eastern Transmission Corporation, that it would not be able to obtain additional firm supplies for the foreseeable future. Subsequently, in 1971, Algonquin Gas applied to the Federal Power Commission (FPC) for authorization to purchase SNG from its wholly owned subsidiary, Algonquin SNG, Inc., for resale in interstate commerce. While FPC ruled that construction and operation of the SNG plant did not come under its jurisdiction, the resale of the SNG in interstate commerce required modification of Algonquin Gas' existing Certificate of Public Convenience and Necessity (FPC 1972). The FPC granted Algonquin Gas authority to transport and sell the SNG on 28 March 1972. Shortly thereafter, construction of the SNG plant began, and the plant began operating in December 1973. The plant has operated for each winter season since 1973-74.

As noted in Section 2.2, the allocation of petroleum feedstocks for the production of SNG has been regulated since 1974. On 10 July 1974, Algonquin submitted a petition to establish a base-period supply volume of 4,425,571 bbls of naphtha per year for its SNG plant. Algonquin met the requirements for a "grandfathered" facility* for a portion of the requested base-period volume, in that a contract for 2,184,000 bbls of naphtha per year had been previously executed with Humble Oil (Exxon). For this reason, on 31 October 1974, FEA issued an assignment establishing a base-period supply volume equal to this contracted amount. Several months later, FEA granted an upward adjustment and assigned a base-period supply volume of the requested 4,425,571 bbls of naphtha per year by a Decision and Order dated 29 August 1975.

*Specified in paragraph 4 of Special Rule No. 1, the Appendix to 10 CFR 211.29, published in 39 FR 35521, 1 October 1974.

As a result of a petition filed by the Petrochemical Energy Group, FEA's Office of Exceptions and Appeals remanded the Order of 29 August 1975 to the Office of Regulatory Programs for reevaluation of the assignment of 4,425,571 bbls per year in an Order dated 28 June 1976. The basis for this remand was that 10 CFR 211.29, Statement of Policy and Special Rule No. 1, had not been considered fully when making the assignment. Algonquin filed an appeal for stay or rescission of the remand by the Office of Exceptions and Appeals, but this appeal was denied on 16 November 1976. Algonquin also filed an appeal from the opinion of the Office of Exceptions and Appeals with the U. S. District Court in Boston. This legal proceeding is still pending. Notwithstanding the pending court action, the remand of 28 June 1976 by FEA's Office of Exceptions and Appeals, in requiring a reevaluation of the adjusted base-period supply volume, has necessitated this analysis of the nature of any environmental considerations associated with possible feedstock allocation actions.

2.4 Gas Company Actions That Would Result from Assignment of Base-Period Supply Volumes of Naphtha Feedstock

DOE's approval of the requested base-period allocation of naphtha feedstock would not result in any known action by Algonquin with respect to the physical facilities at the plant or the volume of SNG produced, since the requested allocation is equivalent to the volume purchased by Algonquin and processed at its plant during the most recent operating season for which data were available, the winter of 1976-77. Algonquin anticipates no modifications or additions to its Freetown SNG plant to enhance its capacity. Furthermore, SNG output and sales would be approximately the same as during the 1976-77 plant operating season, or about 17,848,200 MMBtu.

3. DESCRIPTION OF THE ENVIRONMENT

3.1 Description of Existing Plant Facilities

3.1.1 Plant Location and Site Layout

Algonquin's SNG plant is located in Freetown, Bristol County, MA. As shown in Figure 3-1, this town is due north of the City of Fall River in southeastern Massachusetts. Figure 3-2 shows that the site is situated at the confluence of the Taunton and Assonet Rivers, which form the western boundary of the property. The parcel consists of 579 acres, of which 120 acres are devoted to physical facilities. The remaining wooded land constitutes a buffer zone between the plant facilities and residential areas to the north and east. A general plot plan identifying the arrangement of the plant facilities is presented in Figure 3-3.

3.1.2 The SNG Production Process

Algonquin's Freetown plant uses the British Gas Corporation's catalytic rich gas (CRG) process, in which naphtha feedstock reacts with steam over a high nickel-content catalyst to produce a methane-rich gas. A schematic diagram of this CRG production process is shown in Figure 3-4. The major steps in the process include: (1) desulfurization, (2) gasification, (3) methanation, and (4) purification. These steps are described in greater detail below.

Desulfurization

Since sulfur compounds poison the catalyst used in the gasification process, desulfurization is necessary after the feedstock has been prewashed to remove soluble salts. Note that the naphtha used by Algonquin is very low in sulfur content. The process of desulfurization is completed in one step by removing the sulfur by catalytic conversion of zinc oxide compounds to zinc sulfide.

Figure 3-1 Regional Siting of Algonquin SNG's Plant

Figure 3-2 Location of SNG Plant

Figure 3-3 General Plot Plan

Schematic Flow Diagram
Synthetic Natural Gas Plant
CRG-Hydrogasification Process

Figure 3-4 Schematic Diagram of CRG Process for SNG Production

Gasification

After desulfurization, steam is added to the purified feedstock, elevating the temperature of the mixture, which is then sent to a catalytic reactor. When the gas mixture first enters the catalytic bed, the predominant reactions are: (1) those that crack the feedstock and form carbon monoxide and hydrogen and (2) the water-shift reactions. These reactions result in a temperature drop, and steam must be added to prevent the formation of carbon. As the mixture continues through the reactor, methane and carbon dioxide are formed. The volume of gases leaving the reactor are approximately 70% methane, 20% carbon dioxide, 10% hydrogen and trace volumes of carbon monoxide.

Methanation

Methanation is essentially a continuation of the gasification stage, though it is performed at lower temperatures to promote formation of methane. The technique employed at the Freetown plant is slightly different from that generally used in Britain, where the CRG method was developed, in that a double methanation process is used to produce a gas with a heating value, before propane enrichment, of about 985 Btu per standard cubic foot.

Purification

The mixed gases leaving the methanator are cooled to a temperature at which most of the water is condensed. The gases are then introduced in an absorber, which removes carbon dioxide. The carbon dioxide is vented to the atmosphere after being cooled and dried. The product gas stream is also cooled and dried, and propane may be added to raise the heating value of the final product to match that of the gas delivered throughout Algonquin Gas' system. After this enrichment with propane, the composition of the synthesized gas is 96.3% methane, 0.9% hydrogen, 0.3% carbon dioxide, 0.1% carbon monoxide, and 2.4% propane.

3.1.3 Plant Operating Characteristics

The information presented below is based on data supplied by Algonquin (Kane 1977) for the 1976-77 winter operating season except where otherwise noted. While the basic operating period for the SNG plant extends for 151 days, from November through March, Algonquin Gas' tariff, as approved by the Federal Energy Regulatory Commission (FERC), formerly the FPC, permits partial deliveries of SNG during the last 16 days of October to permit the plant to come on-stream in an orderly manner and also permits deliveries of make-up gas during April if the full quantity has not been delivered during the preceding winter months.

SNG Production

During the 1976-77 operating season, Algonquin produced 17,848,200 MMBtu of SNG, which is equivalent to 18.12 billion cubic feet (Bcf), based on a heating value of 985 Btu per cubic foot. This output represents the maximum quantity of gas that Algonquin Gas could tender to its distribution company (gas utility) customers purchasing SNG (as specified in the FERC tariff described above) and equals the nominal design capacity of the plant, 118,200 MMBtu [120,000 thousand cubic feet (mcf) per day multiplied by 151 days]. The volumes of SNG purchased by each of Algonquin Gas' customers is discussed in Section 3.3.3.

Plant Feedstock

The SNG plant uses naphtha as feedstock, and during the 1976-77 operating season, 4,253,364 bbls of naphtha were consumed (Kane 1977a). This figure is slightly (4%) less than the 4,425,571 bbls requested by Algonquin in its petition for adjustment of its assigned base-period supply volume. The major reasons given by Algonquin for this slight difference are that (1) the naphtha received was "heavier" than that specified in the contract with the supplier and (2) propane was used to raise the Dtu content of the gas as a result of an equipment malfunction, resulting in a reduction in naphtha use (Kane 1978). The "heavier" the naphtha is, the less is needed to produce a given quantity of SNG.

The specifications for the naphtha used in Algonquin's plant are as follows:

- API gravity: 67.8,
- higher heating value: 20,250 Btu/lb, and
- sulfur content: 25 to 30 ppm.

The naphtha feedstock used is supplied by Exxon from its facilities at Baytown, TX, and Baton Rouge, LA. It is shipped by barge from Exxon facilities in New Jersey, received at dock facilities in Fall River, MA, approximately three miles south of the SNG plant, and delivered to the plant by pipeline. Further information on transport and delivery of feedstock is provided in Section 3.2.8. The feedstock is stored on-site in two above-ground tanks, 50 ft high and 200 ft in diameter, each with a capacity of 265,000 bbls.

Other Process Requirements

The hydrogen required in the desulfurization process is manufactured on-site in a hydrogen generation unit by reforming a portion of the gas stream produced in the CRG Unit (see Figure 3-4 for details). Approximately 970,000 Mcf of hydrogen is used each heating season in the desulfurization process.

Propane is occasionally added to the product gas stream for enrichment (to increase the Btu content of the end-product) when operating problems prevent manufacturing product gas containing a minimum of 985 Btu per cubic foot. During the 1976-77 operating season, 1,726,116 gallons of propane were used.

All of the heaters and boilers at the plant are fired on natural gas, either pipeline or product gas, or on naphtha feedstock. The quantities of fuel used by these boilers and heaters are described in Table 3-1.

Employment

There are 102 permanent employees who work at the SNG plant year-round. When the facility is not operational, these workers are engaged in maintenance and repair activities. In 1976, the annual payroll for this workforce was \$1,777,000. (Kane 1977b).

TABLE 3-1

SIGNIFICANT EMISSION SOURCES AT THE SNG PLANT

Type of Unit	Number	Fuel	Total Average Daily Fuel Use (tons)	Particulates lb/hr	Emissions		Hydrocarbons lb/hr
					NO _x lb/hr	SO ₂ lb/hr	
Steam Boiler	3	Naphtha	227	nil	72	0.56	3.3
Direct-fired Heaters	2	Naphtha	136	nil	43	0.34	2.0
Direct-fired Heaters	4	Natural gas	31.1	nil	10	0	1.0
Naphtha Storage tank	2	-	-	-	-	-	0.72 lb/hr
Total Annual Average Emission					125	0.9	7.02 lb/hr*

*When converting to annual emission, note that plant runs 151 days/year and storage tanks operate 365 day/year.

Emission factors from: Compilation of Air Pollutant Emission Factors, AP-42, U.S. EPA, 1977
Part II, 3rd edition.
Air Pollution Engineering Manual, Dontelson, J.A. (ed.), U.S. EPA, 1973.

Source: Algonquin Gas Transmission Company, August 1978.

Air Emissions

Plant emission sources include three naphtha-fired steam boilers, two naphtha-fired direct process heaters, four natural gas-fired direct process heaters and two naphtha storage tanks. Estimated plant emissions by contaminant and source type are presented in Table 3-1. The emissions are based on feedstock specifications and average planned firing rates. On the basis of a 151-day operating season, estimated total annual plant emissions by contaminant are as follows:

- sulfur dioxide (SO_2): 1.63 tons,
- total suspended particulate matter (TSP): nil,
- hydrocarbons: 14.56 tons, and
- nitrogen oxides (NO_x): 226.5 tons.

Data on other plant-related emission sources are not available; however, none of these sources are anticipated to be significant for several reasons. No emissions are produced by the desulfurization process since this process takes place in a sealed vessel in which zinc oxide is converted to zinc sulfide. Carbon dioxide (CO_2), a harmless gas, along with trace quantities of water and methane too small to be significant, are vented from the plant during the production process. The flare system, which burns temporary discharges of process waste gases, operates infrequently and only for short periods. Emission quantities from this source are so small as to be insignificant.

Algonquin will have to undergo a major source review under the Clean Air Act Amendments of 1977 for nitrogen dioxide (NO_2) emissions once the standards have been reviewed and methods developed to implement them. Algonquin will be a major source for NO_2 emissions with or without the additional requested naphtha allocation.

Water Consumption and Discharge

The water required for plant operations is drawn from the Assonet River and pumped by pipeline to the site. The maximum water requirement is 1,584,000 gallons per day (gpd), while the normal or average water requirement is 1,152,000 gpd.

The effluent, after treatment in on-site settling basins, is discharged into the Taunton River. The average daily effluent flow from the plant is 220,000 to 236,000 gpd, while the maximum or peak discharge is 329,000 gpd. The water quality of both influent and effluent is shown in Table 3-2.

Solid Waste

The amount of spent CRG catalyst and zinc oxide produced each year varies with the level of plant operation, catalyst experience and the sulfur content of the feedstock. During the 1976-77 operating season, 120,000 pounds of spent CRG catalyst and 135,000 pounds of spent zinc oxide were produced. These materials were returned to the manufacturer for metals recovery.

3.2 Characteristics of the Site and Vicinity

Figure 3-2 shows the SNG plant site and the surrounding area. The following sections describe the existing environmental conditions on and adjacent to the site. Since Algonquin's plant has been operating since December 1973, the discussion of existing conditions considers the SNG facility as a component of the environment of the site and vicinity.

3.2.1 Land Use

The site is located in the western portion of Freetown along the eastern shores of the Assonet and Taunton Rivers, directly at their confluence, and consists of 579 acres of former forest land. The physical plant facilities occupy 120 acres.

General Land Use Patterns

As shown in Table 3-3, Freetown is heavily forested. Forested lands, however, declined from 81.3% of all lands in 1951 to 73.6% in 1971. The Freetown-Fall River State Forest accounts for about 3,370 acres. Agricultural use also declined in that 20-year period (from 11.2% in 1951 to 8.3% in 1971). Residential lands, however, showed substantial gain, rising from 466 to 1,260 acres in these two decades.

TABLE 3-2
ESTIMATED PROCESS WATER QUALITY

Constituent	Influent (mg/l)	Effluent (mg/l)
Alkalinity	33	--
Chloride	5	--
Nitrogen	--	--
Total Hardness	20	~30
Fluoride	--	--
Silica	4.9	25-30
Chlorine	none	0
Sodium	--	--
Sulfate	--	20

Source: Algonquin Gas Transmission Company, 21 September 1977.

TABLE 3-3
DISTRIBUTION OF LAND USES IN FREETOWN, MASSACHUSETTS
(1951 vs. 1971)

Use	Acres			
	1951		1971	
	Number	Percent	Number	Percent
Forest	18,276	81.3	16,549	73.6
Wetland	1,176	5.2	1,774	7.9
Agricultural	2,507	11.2	1,866	8.3
Industrial	10	**	47	0.2
Commercial	13	0.1	61	0.3
Residential	466	2.1	1,260	5.6
Transportation	0	-	272	1.2
Open and Public	24	0.1	128	0.6
Mining and Waste	*	-	501	2.2
Outdoor Recreation	*	-	14	0.1
Total	22,472	100.0	22,472	100.0

*Category not used in analysis

**Less than 0.1%.

Source: MacConnell, William P. and Alan Mueller, Remote Sensing 20 Years of Change in Bristol County 1951-1971, Planning and Resource Development Series No. 24, undated.

Most structures are single-family homes concentrated at the eastern and western extremes of the town. Those straddling South Main St. are the closest to the SNG plant. Many summer homes are also located along Assonet Bay and Long Pond. Industrial firms are primarily located along Route 79, while commercial establishments are scattered throughout the town. Very little developed outdoor recreation land exists in the town, although a state wildlife sanctuary is located about two miles southeast of the site. No hospitals are located in town, and the Freetown Elementary School is located about four miles to the east-southeast.

While there are no zoning regulations, Article XI of the Town By-Laws does specify lot size in Freetown. A recent amendment increased the minimum area for a new improved lot from 30,000 to 40,000 square feet. Structure location on the lot is also controlled. In addition, a permit is required from the Board of Selectmen to erect or enlarge any building.

A survey conducted by the Southeastern Regional Planning and Economic Development District, the regional planning agency, indicated that residents consider commercial growth within the "village center" desirable. An Industrial Development Commission has been founded, but has not as yet prepared plans for the direction of growth. Also, no local or regional comprehensive land use plans have been identified.

Cultural Resources

The National Register of Historic Places does not list any historic resources in Freetown. However, several places are located near by. These include:

- DIGHTON ROCK in Dighton Rock State Park, about two miles north of the site;
- ACADEMY BUILDING on S. Main St. in Fall River and
- U.S.S. JOSEPH P. KENNEDY JR., U.S.S. LIONFISH, and U.S.S. MASSACHUSETTS at Battleship Cove in Fall River.

The Massachusetts Historical Commission's inventory of archaeological resources includes one site, The Peace Haven Site, that is

within the plant boundary. As shown in Appendix A, the inventory form for this finding indicates that the site is of transitory value (not significant). An adjacent site, known as The Barnaby's Cove Site, is also considered to be of transitory value.

Transportation

The immediate vicinity of the plant site has a low density road network. South Main St., a two lane secondary road, forms a portion of the site's eastern boundary. Roughly parallel to this road is State Route 24, a four lane, divided, limited access highway. To the north-northeast is a small, high density pattern of local and collector roads.

The only average daily traffic (ADT) counts done by the Massachusetts Department of Public Works in the area include:

- Route 79 at the Berkley Freetown line (1,400 in 1976),
- Route 79 just south of its intersection with Route 24 (6,550 in 1976), and
- Route 24 north of Wilson Road in Fall River (10,600 in 1975).

Conrail's New Bedford-Taunton line runs through Freetown and the tracks form part of the site's southern boundary at one point. Only one train passes in each direction per day.

Pertinent Public Services

The Freetown Police Department currently operates from a station in Town Hall and is staffed by 9 full-time and 10 reserve officers working from three marked and one unmarked cruisers. Two fire stations are located in town, one in Assonet on Elm Street having three pumpers and one boat with one full-time firefighter and 19 volunteers, and the other in East Freetown on Country Road having three pumpers, two ambulances, and one boat with a staff of two full-time firefighters and 17 volunteers. The SNG plant has on-site fire protection and security services and a certified Spill Prevention Control and Countermeasure Plan. Public aid would only be required in the event of a major emergency.

3.2.2 Social and Economic Characteristics

Population

The population of the Town of Freetown rose from 3,039 people in 1960 to 4,270 in 1970, a 40.5% gain. The 1975 population is estimated to have increased still further to 5,458, a 27.8% rise in five years. The population density increased from 124 persons per square mile in 1970 to 159 in 1975. Freetown's population is projected to increase to 6,200 by 1980 and 8,550 by 1995.

Demographic Characteristics

The social and economic characteristics of the town must be examined using the 1970 census data, which, although somewhat dated, is the only available detailed source of information. As shown in Table 3-4, less than 10% of Freetown's residents were in each of the extreme age groups ("under 5" and "65 and over"), and 30% were aged 5 to 17 years. The age group that forms the bulk of the labor force, those 18 to 64 years old, composed the remaining 52% of the population.

The plurality of those who were employed (46.4%) held blue collar jobs, while white collar occupations were the next most predominant group (38.7%). The service sector accounted for 12.4% of the positions, and only 2.5% of the labor force was involved in farming. These occupations provided the average family with an income of \$10,779, and 6.7% of all families earned incomes below the poverty level.

Housing

In 1970 there were 1,427 housing units in Freetown, of which 191 (13.4%) were seasonal. Over 80% of the year-round housing units were owner-occupied. The median value of owner-occupied structures was \$17,000 and the median contract rent was \$66 per month.

Taxes

In 1976-77, the SNG plant generated \$317,000 in real estate and \$122,584 in personal property tax payments to Freetown. The combined

TABLE 3-4

SELECTED SOCIOECONOMIC CHARACTERISTICS OF FREETOWN AND
BRISTOL COUNTY, 1970

Population	Freetown		Bristol County	
	Number	Percent	Number	Percent
Total Population	4,270	100.0	444,301	100.0
Under 5	421	9.9	37,064	8.3
5-17	1,282	30.0	108,597	24.5
18-64	2,241	52.5	246,731	55.5
65 and over	326	7.6	51,909	11.7
White	4,200	98.4	436,982	98.3
Black	56	1.3	5,154	1.2
Other	14	0.3	2,165	0.5
In Families	4,010	93.9	405,472	91.3
Primary Individuals	140	3.3	27,653	6.2
In Group Quarters	120	2.8	11,176	2.5
Native*	4,168	97.2	393,401	88.6
Foreign Born*	118	2.8	50,635	11.4
Total Population, 25 Years Old and Over	2,194	100.0	252,831	100.0
Less than High School	1,206	55.0	156,422	61.9
High School Only	730	33.3	63,456	25.1
Beyond High School	258	11.7	32,953	13.0
Labor and Income				
Civilian Labor Force, 16 Years Old and Over	1,697	100.0	191,530	100.0
Total Employed Persons, 16 Years Old and Over	1,593	100.0	183,208	100.0
White Collar Occupations	616	38.7	69,435	37.9
Blue Collar Occupations	740	46.4	91,100	49.7
Service Occupations	197	12.4	21,328	11.7
Farm Occupations	40	2.5	1,345	0.7
Mean Family Income (\$)	10,779		10,319	
Median Family Income (\$)	9,676		9,487	
Families with Incomes Below Poverty Level	72	6.7	9,289	8.1

*Census data in this category do not coincide with other breakdowns.
Percents shown reflect the portion of that which is given.

TABLE 3-4 (Continued)

Housing	Freetown		Bristol County	
	Number	Percent	Number	Percent
Total Year-Round Units	1,236	100.0	146,161	100.0
Owner Occupied	1,011	81.8	79,629	54.5
Renter Occupied	179	14.5	61,920	42.4
Vacant	46	3.7	4,612	3.1
Lacking Some or All Plumbing Facilities	116	9.4	5,548	3.8
Total Occupied Year-Round Housing Units	1,190	100.0	141,549	100.0
1.01 or More Persons Per Room	106	8.9	8,761	6.2
Population per Occupied Units	3.5		3.1	
Structures Built	1,214	100.0	146,161	100.0
Year Built				
1960 to March 1970	298	24.6	20,007	13.7
1940-1959	350	28.8	28,752	19.7
1939 or Earlier	566	46.6	97,402	66.6
Median Value, Owner Occupied (\$)	17,000		17,800	
Median Contract Rent, Renter Occupied (\$)	66		62	

Source: U.S. Bureau of the Census, 1970 Census of Population and Housing.

sum of these monies represented 21% of the total taxes collected by the town.

3.2.3 Air Quality

Ambient Air Quality

The SNG plant is located within the Southeastern Massachusetts Air Pollution Control District in Bristol County. This county is currently designated by the U.S. Environmental Protection Agency (EPA) as an SO₂ and TSP attainment area and as a nonattainment area for oxidants. No classifications have been assigned for carbon monoxide (CO) and NO_x at the present time. These EPA determinations are currently undergoing evaluation by the Massachusetts Department of Environmental Quality Engineering (DEQE) pursuant to the federal Clean Air Act Amendments of 1977. The results of the evaluation may result in certain revisions in attainment classifications and/or the boundaries of classified areas.

The nearest public air quality monitoring station to the plant site is located in Fall River, MA, approximately 7 miles to the south-southwest. Monthly SO₂ concentrations at this station during 1975 are shown in Table 3-5.

Estimated annual TSP and SO₂ levels at the plant site can be derived from isopleth maps prepared by the Massachusetts DEQE (1976). The most recent of these maps are based on the 1975 air quality inventory and indicate annual TSP and SO₂ levels in the Freetown area of 45 to 50 µg/m³ and 0.004 to 0.006 ppm, respectively.

Applicable Standards

National Ambient Air Quality Standards (NAAQS) established pursuant to the Clean Air Act of 1970 are presented in Table 3-6. State standards promulgated by the Massachusetts DEQE are the same as the federal standards.

TABLE 3-5
MONTHLY SULFUR DIOXIDE CONCENTRATIONS AT FALL RIVER MONITORING
STATION (ppm*), 1975

Month	3-hour Maximum	Daily Maximum	12-Month Arithmetic Mean
January	0.111	0.054	-
February	0.068	0.039	-
March	0.192	0.060	0.012
April	0.086	0.020	0.012
May	0.041	0.012	0.012
June	0.026	0.007	0.012
July	0.016	0.008	0.012
August	0.030	0.010	0.012
September	0.038	0.017	0.011
October	0.026	0.011	0.010
November	0.043	0.018	0.010
December	0.053	0.023	0.009

*ppm is parts per million

Source: Massachusetts Department of Public Health, 1976. Monthly (1975)
Summary of Continuous Data. Division of Environmental Health,
Bureau of Air Quality Control.

TABLE 3-6

NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Period of Measurement*	Primary Standard		Secondary Standard	
		$\mu\text{g}/\text{m}^3$ **	ppm**	$\mu\text{g}/\text{m}^3$ **	ppm**
Carbon Monoxide (CO)	8 hours	10,000	9	Same	Same
	1 hour	40,000	35	Same	Same
Hydrocarbons (HC) (nonmethane)	3 hours	160	0.24	Same	Same
Nitrogen Oxides (NO_x)	1 year	100	0.05	Same	Same
Photochemical Oxidants (O_3)	1 hour	160	0.08	Same	Same
Sulfur Oxides (SO_x)	1 year	80	0.03	None	None
	24 hours	365	0.14	None	None
	3 hours	None	None	1,300	0.5
Total Suspended Particulates (TSP)	1 year	75	-	60	-
	24 hours	260	-	150	-

*Concentrations are averaged over each period of measurement. The annual TSP concentration is a geometric mean of 24-hour samples; all other concentrations are arithmetic mean values. Standards for periods of 24 hours or less may not be exceeded more than once per year.

**Units of measurement are micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and parts per million (ppm).

3.2.4 Water Resources

The site is located in the Taunton River Basin adjacent to the confluence of the Taunton and Assonet River Estuaries. The Taunton River and its complex of tributaries drains 530 square miles. Major urban centers within the watershed include Brockton, Taunton, and Fall River. In addition to the Assonet, major tributaries entering the Taunton River include the Winnetuxet, Nemasket, Mill, and Three Mile Rivers.

Southwest of the plant site, the Taunton River estuary enters Mount Hope Bay in the northeast portion of Narragansett Bay. The tidal portion of the Taunton River extends north of the plant site to East Taunton. The lower Assonet forms a broad estuarine finger of the Taunton River north and northeast of the site.

Plant Water Use

The normal and maximum daily water requirements for plant operation are 1,152,000 and 1,584,000 gpd, respectively. This water is drawn from the Assonet River northeast of the site in Assonet, Freetown, MA. The river is not currently used as a source for public water supplies. The cities of Taunton and Fall River do use surface water within the Taunton River basin, but these supplies are not affected by withdrawals from the Assonet River.

Water Quality

Numerous municipal and industrial discharges enter the Taunton River above the plant site. Nonpoint pollution sources in the Taunton River include sewer overflows and stormwater run-off (Massachusetts Water Resources Commission 1973). Table 3-7 shows the results of water quality analyses of samples taken from the Taunton River adjacent to the southern limit of the plant site. River water at this location is brackish with a relatively low dissolved oxygen content. Daily fluctuation in salinity is greatest during periods of maximum river flow. As indicated by the chloride concentrations shown in Table 3-7, only a minor daily fluctuation in salinity occurs during the low flow (late summer) period.

TABLE 3-7

WATER QUALITY DATA: TAUNTON RIVER
 ADJACENT TO THE ALGONQUIN SNG PLANT SITE, 1975

Date	Tide	Dissolved Oxygen (mg/ℓ)			Ammonia Nitrogen (mg/ℓ)	Total Phosphorous as P (mg/ℓ)	Chlorides (mg/ℓ)
		Max.	Min.	Avg.			
6/24/75	High	-	-	-	0.12	0.13	12,250.0
	Low	-	-	-	0.32	0.18	5,500.0
6/26/75	High	-	-	-	0.16	0.05	14,000.0
	Low	-	-	-	0.30	0.15	8,500.0
8/12/75	High	-	-	-	0.35	0.28	14,000.0
	Low	-	-	-	0.46	0.31	11,500.0
8/14/75	High	-	-	-	0.22	0.17	13,000.0
	Low	-	-	-	0.37	0.37	11,600.0
6/10 - 6/13/75		6.8	4.1	5.2			
7/22 - 7/25/75		6.2	3.5	4.6			

Source: Massachusetts Water Resources Commission 1975. Taunton
River Basin Part A Water Quality Data. Division of Water
 Pollution Control.

The Taunton River Basin has been divided into effluent limitation and water quality class segments by the Massachusetts Division of Water Pollution Control. The Taunton River Estuary at the plant site has been classified as effluent limiting, indicating that water quality is now being met or that water quality will probably be met by the application of effluent limitations required by the federal Water Pollution Control Act (Massachusetts Water Resources Commission 1973). The water use classification goal assigned to the Taunton River at the plant site is Class 5B, which indicates waters that are suitable for bathing and recreational purposes, such as water contact sports and industrial cooling, and that have good aesthetic value, are an excellent fish habitat and are suitable for certain shell fisheries when purified somewhat. Class 5B water quality criteria are shown in Table 3-8.

Plant Effluent Discharges

Algonquin's SNG plant discharges a daily average of 220,000 to 236,000 gpd of effluent to the Taunton River. Plant wastewater consists of blowdown from boilers, the boiler feedwater treating unit (demineralizer regeneration) and the cooling tower. All wastewater is diverted to the retention pond and released into the Taunton River at approximately ambient temperature.

In compliance with the federal Water Pollution Control Act and the Massachusetts Clean Waters Act, the plant is authorized to discharge to the Taunton River under the National Pollution Discharge Elimination System (NPDES). Effluent limitations and monitoring requirements specified in the NPDES permit for the plant are shown in Table 3-9.

3.2.5 Noise Levels

The ambient noise environment within approximately one-half mile of the plant site is influenced predominantly by plant operation. From a community noise perspective, the contribution of an industrial plant to off-site sound levels tends to be dominated by a few major on-site noise sources. In the case of an SNG plant, typical sources of community noise are:

TABLE 3-8

CLASS 5B WATER QUALITY CRITERIA

Item	Criteria
Dissolved Oxygen	Not less than 5.0 mg/l at any time.
Sludge deposits-solid refuse-floating solids-oils-grease-scum	None other than of natural origin or those amounts that may result from the discharge from waste treatment facilities providing adequate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l.
Color and turbidity	None in concentrations that would impair any uses specifically assigned to this class.
Total coliform bacteria per 100 ml	Not to exceed an average value of 700 and not more than 1,000 in more than 20% of the samples.
Taste and odor	None in such concentrations that would impair any uses specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish.
pH	6.8 to 8.5
Allowable temperature increase	None, except where the increase will not exceed the recommended limits on the most sensitive water use.
Chemical constituents	None in concentrations or combinations that would be harmful to human, animal or aquatic life or that would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same or impair the water for any other use.
Radioactivity	None in concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

TABLE 3-9

NPDES EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS
(Algonquin's Freetown SNG Plant)

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)		Measurement Frequency	Sample Type
	Daily Avg.	Daily Max.	Daily Avg.	Daily Max.		
Flow m ³ /Day (mgd)	-	-	2650 (0.7)	-	monthly	daily average
Temperature	-	-	90°F	90°F	3 times monthly	grab
Oil and Grease	-	-	-	15 mg/l	3 times monthly	grab
Total Suspended Solids	53(117)	-	20 mg/l	40 mg/l	monthly	24 hour composite
Phosphorus (Total)			monitor only		monthly	24 hour composite

Notes: During the period beginning 1 September 1975 and lasting through 1 August 1979 the permittee is authorized to discharge from outfall(s) serial number(s) 001.

These discharges shall be limited and monitored by the permittee as specified above.

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored 3 times monthly grabs, reporting daily average and range.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): point of discharge.

- sources of combustion including the reformer furnace, the boiler plant, superheaters and the reactor feed heater;
- air cooler fans, furnace induction fans, and boiler preheater fans;
- rotating equipment - pumps and compressors;
- safety and relief "popping" valves; and
- flare operation at high emergency load.

On-site noise level data are currently unavailable for Algonquin's SNG plant. On the basis of other known SNG plant-generated noise levels, the steady-state noise level during normal plant operation is estimated to be about 65 A-weighted decibels (dBA) at approximately 500 feet from the plant (noise source) center. Three major factors determine the effect of plant-induced noise levels on the community noise environment:

- the distances of the plant noise source elements from sensitive off-site receptors;
- noise levels caused by sources not associated with the facility; and
- the presence or absence of intervening structures that block the source-receptor "line-of-sight."

Noise Receptors

A number of single-family residences are located along South Main St. within one-half mile of the plant. The closest of these is approximately 550 feet southeast of the estimated plant center. An automobile junk yard extends from South Main St. westward to within 200 feet of the estimated plant center.

Nonplant Noise Sources

Nonplant noise sources in the vicinity of the site include:

- single-family residences;
- an automobile junkyard;

- occasional rail traffic on the Conrail New Bedford-Taunton line;
- vehicular traffic on South Main St. and Route 24; and
- air traffic associated with the Fall River Municipal Airport located approximately one mile south of the site.

While data on nonplant-generated noise levels are not available for the site vicinity, numerous studies have related noise levels to land uses. Table 3-10 presents the results of three recent studies comparing median noise levels (levels exceeded 50% of the time) to various land use categories. On the basis of this information the nonplant noise environment would be characterized by median noise levels of between 45 and 50 dBA.

Existing Noise Levels at Off-Site Receptors

Median noise levels at residences closest to the estimated plant center are estimated to be between 50 and 60 dBA during normal plant operation. Noise levels at the automobile junkyard along the eastern site boundary may exceed 60 dBA.

The plant process involves one elevated flare and one ground flare for the purpose of burning off excess gaseous products. During emergency situations, when maximum burnoff rates are required, combustion roar and noise from steam injection results in significantly higher noise levels at the nearest community receptors. Such high levels, however, are of short duration (on the order of several minutes) and occur very infrequently.

Applicable Standards

The Massachusetts DEQE has promulgated guidelines for the submittal of noise data and established noise impact criteria. Approval for a facility is generally granted if the installation or modification of primary noise sources does not:

- increase the broad band noise level in excess of 10 dBA above background or
- provide a puretone condition.

TABLE 3-10

QUALITATIVE DESCRIPTORS OF VARIOUS LAND USE CATEGORIES* AND APPROXIMATE DAYTIME MEDIAN NOISE LEVEL (L_{50});
COMPARISON OF THREE INDEPENDENT REFERENCES

U.S. EPA (1971)	L_{50} (dBA)	Beranek (1971)	Midpoint of Range (dBA)	Forman et al. (1974)	L_{50} (dBA)
Grand Canyon	20				
Farm in Valley	39				
Quiet Suburban Residential	43	Quiet Residential	45	Residential-Single Family	53
Normal Suburban Residential	48	Average Residential	55	Residential-Institutional	57
Urban Residential	53	Semi-Commercial	55	Residential-Multiple Units	57
Noisy Urban Residential	58	Commercial	60	Residential-Industrial	58
Very Noisy Urban Residential	63	Industrial	65	Residential-Commercial	63
		Sidewalk, Commercial Area	75		

*Categories in this list are from the sources cited and reflect a degree of subjectivity.

Generally, these criteria apply to locations either at the nearest inhabited building or at the property line of the proposed facility.

The SNG plant was constructed before these guidelines were promulgated and is therefore "grandfathered" from their specifications. No federal standards on existing community noise levels can be applied. The U.S. EPA has published a document, however, entitled Information on the Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (1974). This document states that "...levels of 45 db indoors and of 55 db outdoors in residential areas are identified as the maximum levels below which no effects on public health and welfare occur due to interference with speech or other activity." The basis for this statement is presented in Table 3-11, reproduced from this EPA document.

3.2.6 Geology

The site is located at the southeastern edge of the Narragansett basin of Massachusetts and Rhode Island. Topography at the site is characterized by a rolling variable covering of glacial materials. Elevations range from sea level along the Taunton and Assonet River estuaries to a maximum of approximately 90 feet above mean sea level (msl) along the northern site boundary. The site drains to the west into the Taunton River estuary.

Major Geologic Units

The bedrock and surficial geology of the Freetown area has not been mapped by the United States Geological Survey (USGS) to date. Emerson (1917) mapped the bedrock geology of the Narragansett basin as predominantly shales, sandstones, and conglomerates of Pennsylvanian age. The following description of the geology of the site is based on the summary of findings from soil borings conducted by Lambe Associates Inc. (1972).

A cover of glacial deposits of variable thickness mantle the bedrock at the plant site. In the area of the naphtha storage tanks the glacial deposits consist of a relatively thin layer of fine sand with some gravel overlying boulders and bedrock. Fine gray sand and silt are predominant in the process area and are capped by coarse sand and gravel

TABLE 3-11

SUMMARY OF HUMAN EFFECTS IN TERMS OF SPEECH COMMUNICATION
 COMMUNITY REACTION, COMPLAINTS, ANNOYANCE AND
 ATTITUDE TOWARDS AREA ASSOCIATED WITH AN OUTDOOR DAY/NIGHT
 SOUND LEVEL OF 55 dBA re 20 MICROPASCALS

Type of Effect	Magnitude of Effect
Speech - Indoors	100% sentence intelligibility (average) with a 5 dB margin of safety
Outdoors	100% sentence intelligibility (average) at 0.35 meters*
	99% sentence intelligibility (average) at 1.0 meters*
	95% sentence intelligibility (average) at 3.5 meters*
Average Community Reaction	None evident; 7 dB below level of significant "complaints and threats of legal action" and at least 16 dB below "vigorous action" (attitudes and other nonlevel related factors may affect this result)**
Complaints	1% dependent on attitude and other nonlevel related factors
Annoyance	17% dependent on attitude and other nonlevel related factors
Attitudes Towards Area	Noise essentially the least important of various factors

*Refers to the distance between the receptor and the speaker as opposed to the distance between the receptor and the noise source.

**Noise levels where significant "complaints and threats of legal actions" resulted ranged from approximately 69 to 76 dB. "Vigorous Action" was taken when noise levels ranged from approximately 75-85 dB.

SOURCE: U.S. Environmental Protection Agency, 1974, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, U.S. Government Printing Office, Washington.

near the propane storage area. Soil borings penetrated siltstone bedrock at a minimum depth of 20 feet (near the present naphtha storage area) and a maximum depth of 90 feet (near the present process area).

Soils

Soils inventory data are unavailable for the site vicinity. On-site soils investigations (Lambe Associates 1972) indicate that soils in the process area are predominantly poorly drained, gray inorganic silt with limited areas of coarser, more permeable brown sandy soils. Granular soils consisting largely of sand and gravel are present in the propane storage area.

Seismicity

The plant site is located within a Zone 2, moderate expected damage, seismic risk area as classified by the National Oceanic and Atmospheric Administration (U.S. Dept. of Commerce 1973). In addition to being affected by some of the more severe historical earthquakes of the St. Lawrence River region and the Newfoundland earthquake of 1929, Massachusetts and Rhode Island have had a number of moderate or major earthquakes recorded since 1638 (U.S. Dept. of Commerce 1973). In colonial times, many earthquakes occurred in northeastern Massachusetts, and several were widely felt. Numerous minor earthquakes have been centered in southeastern Massachusetts and Rhode Island.

3.2.7 Ecological Resources

Terrestrial Ecology

Before development, the 5/9 acre site was heavily forested with a minor portion of land devoted to agricultural use. A substantial portion of the site remains forested, particularly the western portion and areas along the perimeter of the plant facilities. These areas contain low- and high-density stands of hardwoods and softwoods with hardwoods predominating. Most trees on the site are between 40 and 60 feet tall.

Approximately 70% of Freetown is wooded. Although wild land is abundant in the town, too much of the town's forest is middle aged, and too little of the town is used for agriculture to provide a good balance of habitat types suitable for wildlife (MacConnell and Mueller 1973).

No detailed ecological field surveys have been conducted at the plant site. However, the vegetative cover and habitat types existing at the site are similar to those of the surrounding area and, therefore, resident species at the site are probably those common to the Freetown area.

A natural resource inventory conducted in 1971 (Natural Resources Technical Team 1971) indicates that Freetown is primarily a habitat for woodland game species such as white tail deer, snowshoe hare, cottontail rabbit, gray squirrel, raccoon, ruffed grouse, and woodcock. Some native pheasant and quail live in areas of open fields and marshes. Native wild ducks, such as mallards and blackducks, nest along the rivers, marshes, and swamps of Freetown. In addition, large numbers of migrating ducks and geese are attracted each fall and winter to the water areas of the town. The Taunton and Assonet River estuaries adjacent to and near the plant site are important winter feeding areas for diving ducks such as the Canvasback Duck (Turner 1977).

Rare and Endangered Species

Terrestrial species currently listed as rare or endangered in Massachusetts by the Massachusetts Division of Fish and Wildlife are shown in Table 3-12. As previously noted, detailed ecological field surveys have not been conducted on the plant site. On the basis of the distribution data and habitat requirements of the species listed in Table 3-12, the possibility of rare or endangered wildlife species existing at or near the plant site is considered very slight. The state of Massachusetts does not currently list rare or endangered plant species.

TABLE 3-12

RARE OR ENDANGERED WILDLIFE SPECIES IN MASSACHUSETTS

Species	Distribution	Estimated Numbers	Typical Habitat	Status*
Eastern cougar <i>Felis concolor cougar</i>	(?) Inconclusive, un- verified sight reports from central and western MA	If present, cannot be more than a few.	Isolated mature or second growth wood- lands and mountainous areas	Endangered
Gray seal <i>Halichoerus grypus</i>	Muskeget and Tuckernuck Islands, Nantucket County and adjacent waters	12 to 18	Turbulent waters near rocky shores, cliffs; but in MA restricted to shallow seas, adjacent to sand bars and low islets.	Rare
Indiana bat <i>Myotis sodalis</i>	Scattered western MA locations	Unknown, but probably few.	Limestone caves, sub- terranean excavations, hollow trees, houses, beneath bridges.	Endangered
Beach meadow vole <i>Microtus breweri</i>	Known only on Muskeget Island, Nantucket County	5,000 to 15,000	Sandy beaches over- grown with beach grass (<i>Ammophila breviligulata</i>)	Rare
Southern bald eagle <i>Haliaeetus l. leucorhophalus</i>	Migrants regularly at Mt. Tom; summer visitors at Quabbin Reservation; irregulars statewide	No breeders. A few have wintered at Quabbin Reservation since 1950.	Isolate woodlands near large bodies of water coastal and interior.	Endangered
American peregrine falcon <i>Falco peregrinus anatum</i>	Coastal areas	No breeders, migrants usually number less than a dozen annually.	Nests on high cliffs or ledges frequently over- looking water bodies or valleys.	Endangered
Plymouth red-bellied turtle <i>Chrysemys rubiventris bangsi</i>	Scattered ponds in Plymouth County, Naushon Island and possibly Ipswich.	Probably less than 200.	Quiet, shallow warm- water ponds.	Endangered

TABLE 3-12 (Continued)

Species	Distribution	Estimated Number	Typical Habitat	Status*
Bog turtle <i>Clemmys muhlenbergii</i>	Known only from Pittsfield, Berkshire County	Unknown, but only one colony known.	Wet meadows and sphagnum.	Endangered
Timber rattlesnake <i>Crotalus t. horridus</i>	Scattered colonies in southern Berkshire Hampden and Hampshire Counties and Blue Hill Reservation, Norfolk County.	Unknown	Rocky fields, wood- lands and mountainsides.	Endangered
Blue-spotted salamander <i>Ambystoma laterale</i>	Recorded from various areas of Middlesex County; Springfield, Hampden County; and a few Essex County towns.	Unknown	Lives underground in moist woodland.	Endangered
Atlantic leatherback <i>Dermochelys c. coriacea</i>	Atlantic coastal waters from New Hampshire to Rhode Island.	Unknown	Open ocean in northern migration, often in- shore during autumn.	Endangered

*Rare - not immediately in peril and possibly stable at present, but existing in such low numbers or with such a restricted distribution that the entire species population could be seriously jeopardized by catastrophic events occurring within its range.

Endangered - in immediate danger of extinction or extirpation from the state because of critically low or drastically declining populations brought about by habitat modification, overexploitation, pollution, diseases or other factors.

Source: Mugford, Paul S. 1976. Fish and Wildlife Existing in Limited Numbers in Massachusetts. Massachusetts Division of Fisheries and Wildlife, Boston, MA.

Aquatic Ecology

In the area of the plant site, the Taunton and Assonet Rivers are tidal. Currently available data preclude a definitive statement on the aquatic ecology of these estuarine environments at the plant site. Assonet Bay, approximately one mile north of the site, was studied by the Estuarine Research Team of the Massachusetts Division of Marine Fisheries. Predominant fin fish collected from otter trawls in Assonet Bay in 1969-70 included white perch, winter flounder, and cod. Other important sport fish noted were bluefish, striped bass, tautog, weakfish, and eels (Natural Resources Technical Team 1971).

3.2.8 Safety

Accidents in the SNG production system can occur at many points in the process. These accidents can be caused by equipment failure, human error, and natural phenomena. The consequences of these accidents can include ecological damage, property damage, and personal injury or deaths. The following safety discussion has been separated into three sections:

- delivery of feedstock to the Shell Oil Company's Fall River Oil Terminal;
- transportation of naphtha by pipeline from the terminal to the on-site naphtha storage tanks at the SNG plant; and
- the Algonquin plant.

Delivery of Naphtha

The Algonquin plant will require approximately 4,425,571 bbl per year of naphtha as feedstock for the SNG process. Naphtha will be delivered by barge at the Shell Oil Company Fall River docks. Deliveries are made by 225 barges per year, and all of this traffic will travel up the Taunton River from Narragansett Bay. The Army Corp of Engineers (COE) indicates that traffic on the Taunton River consists of pleasure craft only and does not compile their numbers. However, the Shell Oil

dock is on the river as is a pier operated by Firestone. The percentage of traffic attributable to Algonquin cannot be determined.

During 1976 and 1977 only three accidents were reported in Fall River by the Coast Guard where:

- actual physical damage to property was in excess of \$1,500,
- material damage affected the seaworthiness or efficiency of a vessel,
- stranding or grounding occurred (with or without damage),
- loss of life occurred, or
- injury caused one or more persons to remain incapacitated for a period in excess of 72 hours (except injury to harbor workers not resulting in death and not resulting from vessel casualty or vessel equipment casualty).

These accidents included the following: a naphtha barge punctured by a submerged object, with no naphtha spilled and no lives lost; a fire caused by vandalism occurring on an unattended vessel with no loss of life; and fire occurring in the pump room of a vessel unloading naphtha at the Shell Oil dock with no loss of life (the fire was extinguished with on-board equipment).

Because of limited availability of data, the frequency of accidents cannot be predicted. However, none of these accidents would be considered serious. Furthermore, since naphtha is already being shipped through the dock facility at the volume anticipated to be allocated, no additional risk will be incurred by the community if the allocation is approved. Shell Oil Company is required to have an oil spill contingency plan for its dock facilities to control a spill should one occur.

Naphtha Pipeline

Naphtha is delivered to the Algonquin plant by a 3-mile-long, 20-inch pipeline. This pipeline is subject to accidents that could be caused by a number of factors, including farm or construction equipment rupturing the line, internal and external corrosion, structural defects (seams, welds, repairs), human operating errors, vandalism, and adverse

natural events. In 1975, over half of all pipeline accidents were caused by equipment rupturing lines (28.6%) and external corrosion (22.4%) (EPA 1977). During 1975, 255 liquid pipeline accidents occurred, causing the loss of 319,423 bbls of product. Approximately 200,000 miles of pipelines existed in 1975 (Turner 1974), yielding an accident rate of 0.0013 leaks per mile per year and an average spill size of 1,250 bbls. Based on these data, the 3-mile-long pipeline would be expected to have one accidental leak in a 225-year operating period. This estimate is probably high, since most of the external corrosion accidents included in the data cited above were in older pipelines that lacked the protective coatings used today. Furthermore the Algonquin pipeline is only used on an intermittent basis. The pipeline facilities require about 6 hours to empty each of the 225 barges per year.

The Algonquin Plant

The Algonquin facilities contain a number of process units that could be the source of major accidents. SNG production resembles refinery operations (such as catalytic cracking and reforming) more than natural gas processing. The accident incidence rates for refineries are 6.81 injuries and 0.0035 fatalities per 100 person years worked (FEA 1977). When applied to the Algonquin facilities, which employ 102 people, 7 injuries and 0.0036 fatalities can be expected each year (1 fatality in 240 years).

The probability of accidents that could affect the safety of off-site populations are relatively low, but possible. A worst-case accident might be a leak or structural failure (caused by sabotage or earthquake) in the 265,000-bbl naphtha storage tank. If some of the naphtha then ran out of the tank, covered the diked area around the tank, and was subsequently ignited, a large fire would result. The intensity and dimensions of such a fire would depend on the composition of the naphtha and local weather conditions; however, flames could be 300 ft high or more, and the radiant heat 900 ft from the tank could be of such intensity that unshielded locations would be uninhabitable (Raj et al. 1974; Factory Mutual Engineering Corp. 1967).

No data on fires have been published for SNG plants as a group (FEA 1977) from which to determine probabilities. Table 3-13 presents the results of a survey of fires at petrochemical facilities. These data are not specifically applicable to SNG plants, but they do give a reasonable estimate of what can be expected for an SNG plant. The most pertinent data in Table 3-13 are those that described the frequency of fires per 100 properties for tank farms, natural gasoline plants, and oil refineries. In 1975, 2.6 fires occurred per 100 tank farms, 3.6 fires per 100 natural gasoline plants, and 121.6 fires per 100 refineries. Of seven tank farm fires in 1975, two spread to other property. These data indicate that a fire in the tank area at the SNG plant could be expected every 38 years, approximately the expected life of the plant. This estimate is probably conservatively high because only two tanks are allowed at the Algonquin plant site. As stated previously, Algonquin's naphtha tanks have been designed to applicable standards and are provided with automatic foam fire extinguishing systems. Therefore, any fire that occurs will probably be small and quickly extinguished.

The only fire that has occurred at the Algonquin plant was small and resulted in no personal injury or property damage. The fire occurred because of a valve failure during repairs and was extinguished by shutting off the source of naphtha.

In addition to naphtha, propane is stored on site in mounded storage tanks. This procedure is the safest way to store propane and as such is not expected to significantly change the risk of fire mentioned above. Propane, used for Btu enrichment when the product gas has a low heating value because of plant malfunction, is delivered to the plant by rail or truck on an intermittent basis. No propane was received during 1977-78.

In summary, the SNG plant is located in a relatively remote area and does not represent a high risk to a large number of people. The plant is existing and has operated for five years without a major incident.

TABLE 3-13

NUMBER OF FIRES REPORTED AT PETROCHEMICAL FACILITIES FOR 1975 AND 1974

Class of Property		Total Number of Properties Reported to Have Been Owned or Operated	Originating on Oil-Company Properties		Originated Outside but Spread to Oil- Company Prop- erty	Number of Fires Reported					Total Number of Fires	Frequency Fires Per 100 Properties
			Confined to Prop- erty	Spread to Other Prop- erty		No.	No.	No.	No.			
						\$1,000 to 10,000 Loss	\$10,000 to 100,000 Loss	\$100,000 to 500,000 Loss	over \$500,000 Loss			
Oil leases (offshore)	1975	686	10	0	0	6	2	0	2	10	1.458	
	1974	3,233	6	0	0	1	0	2	3	6	0.186	
Oil leases (inland)	1975	85,403	102	0	0	81	18	2	1	102	0.119	
	1974	77,788	77	0	1	55	20	3	0	78	0.100	
Tank farms	1975	268	5	2	0	4	0	3	0	7	2.612	
	1974	202	5	0	0	3	1	1	0	5	2.475	
Pipeline Stations	1975	2,096	11	1	0	5	4	3	0	12	0.573	
	1974	1,861	3	0	0	5	1	2	0	8	0.430	
Natural-gasoline plants	1975	572	21	0	0	10	10	1	0	21	3.671	
	1974	630	26	0	0	12	13	0	1	26	4.127	
Refineries	1975	153	185	1	0	96	50	26	14	186	121.569	
	1974	157	157	1	0	68	49	16	5	138	87.898	
Bulk terminals (shore)	1975	790	10	2	0	7	4	1	0	12	1.508	
	1974	806	3	0	0	1	2	0	0	3	0.372	
Bulk plants (inland)	1975	10,127	13	0	0	8	4	1	0	13	0.128	
	1974	11,078	13	0	1	7	6	1	0	14	0.126	
Service stations	1975	80,850	87	0	0	59	27	1	0	87	0.108	
	1974	82,432	71	3	1	51	23	1	0	75	0.091	
Tank trucks	1975	12,724	8	3	0	3	7	0	1	11	0.087	
	1974	12,863	8	0	0	2	6	0	0	8	0.062	
Tankers and barges	1975	291	2	0	0	1	0	0	1	2	0.687	
	1974	299	2	0	0	1	1	0	0	2	0.669	
Unclassified properties	1975	17,114	24	1	2	18	7	1	1	27	0.158	
	1974	18,232	23	4	0	15	6	3	3	27	0.148	
All properties	1975	211,080	478	10	2	298	133	39	20	490	0.232	
	1974	209,631	379	8	3	221	128	29	12	390	0.186	

Note: The reporting of fires for 1974 and 1975 was restricted to those resulting in losses of \$1,000 or more.

Source: American Petroleum Institute (1976).

3.3 Service Area Characteristics

3.3.1 Description of Algonquin Gas' Customers

During the 1976-77 SNG plant operating season, the base analysis period for the purpose of this report, Algonquin Gas sold natural gas (pipeline gas and/or SNG) to 23 distribution company (gas utility) customers that provided service in five states. One of these companies, Pottsville Gas et al., was an off-system customer; that is, a utility not connected to Algonquin Gas' pipeline distribution system. Sales of SNG were made to Pottsville Gas on a one-time basis, since a small volume of SNG that had not been contracted for by Algonquin Gas' on-system customers was available. Another of Algonquin Gas' customers, Consolidated Edison Company of New York, Inc., was excluded from further analysis since this utility does not purchase SNG. As shown in Table 3-14 and Figure 3-5, the remaining 21 customers serve an area including all or part of 18 counties in the five northeastern states of Connecticut, Massachusetts, New Jersey, New York and Rhode Island.

3.3.2 Profile of Ultimate End Users

Table 3-15 presents statistics regarding the amounts of gas sold during the 1976-77 SNG season (1 November to 31 March) by FERC Priority-of-Service Category for both pipeline gas and SNG supplied by Algonquin Gas. These figures on ultimate end-use are based on data obtained by Algonquin Gas from its customers in response to the Texas Eastern Data Verification Committee Questionnaire of February 22, 1974 as required by the FPC. The base data were prepared by Algonquin Gas' customers from actual sales by month for the 12 months ending April 30, 1973. (Large customers, those with maximum daily requirements greater than 10,000 MMBtu, adjusted the sales figures for normal weather.) These aggregated end-use profiles were prorated downward to reflect sales by each customer attributable to volumes purchased from Algonquin Gas. In addition, these customers also provided similar end-use profiles for the quantities of gas that Algonquin Gas could have made available had it not been curtailed by its sole supplier of pipeline gas, Texas Eastern Transmission Corporation. The data in Table 3-15 under the heading "requirements"

TABLE 3-14

COUNTIES SERVED BY GAS UTILITY COMPANY CUSTOMERS OF ALGONQUIN GAS
DURING 1976-77 WINTER SEASON*

Customer	State	County
The Connecticut Gas Company	Connecticut	Hartford Litchfield New Haven Tolland Windham
Connecticut Natural Gas Corporation	Connecticut	Hartford Tolland
Hartford Electric Light Company	Connecticut	New London
City of Norwich	Connecticut	New London
The Southern Connecticut Gas Company	Connecticut	New Haven
Bay State Gas Company	Massachusetts	Bristol Norfolk Plymouth
Boston Gas Company	Massachusetts	Middlesex Norfolk
Cape Cod Gas Company	Massachusetts	Plymouth
Commonwealth Gas Company	Massachusetts	Middlesex Norfolk Worcester
Fall River Gas Company	Massachusetts	Bristol
Town of Middleborough	Massachusetts	Plymouth
New Bedford Gas and Edison Light Company	Massachusetts	Bristol Plymouth
North Attleboro Gas Company	Massachusetts	Bristol
New Jersey Natural Gas Company	New Jersey	Morris
Central Hudson Gas and Electric	New York	Westchester
Orange and Rockland Utilities, Inc.	New York	Rockland
Bristol and Warren Gas Company	Rhode Island	Bristol
Providence Gas Company	Rhode Island	Bristol Providence Newport
South County Gas Company	Rhode Island	Washington
Tiverton Gas Company	Rhode Island	Newport
The Pequot Gas Company	Rhode Island	Washington

*Does not include off-system sales to Pottsville Gas, et al., which served part of Hunterdon County, New Jersey or sales to Consolidated Edison Company of New York, Inc; which does not purchase SNG.

Source: Algonquin Gas Transmission Company FPC Form 16 - Report of Gas Supply and Requirements, September 29, 1977.

Figure 3-5 Counties Served by On-System Gas Utility Company
Customers of Algonquin Gas Transmission Company that
Purchased SNG in 1976-77 Winter Heating Season

TABLE 3-15

END-USE PROFILE FOR CUSTOMERS OF ALGONQUIN GAS,
WINTER 1976-77* (MMBtu)

FERC Priority-of- Service Category	Requirements**	Pipeline [†] Gas Sales	SNG Sales	Total Sales	Shortage
1	64,020,453	61,378,581	2,641,872	64,020,453	0
2	10,949,377	544,520	9,146,066	9,690,586	1,258,751
3	557,480	32,586	385,425	418,011	139,469
6-9 ^{††}	453,795	0	0	0	453,795
Subtotal	75,984,388	61,955,687	12,173,363	74,129,050	1,852,015
Sales to Compensate for Other Supplies [§] (Categories 1-3)	-	-	5,496,237	5,496,237	-
Total	75,984,388	61,955,687	17,670,600	79,626,287	1,852,015

*Winter 1976-1977 constitutes the months of November through March though some SNG was delivered during the latter half of October and the first half of April (see Section 2.1 of this report for further information on the SNG plant operating season).

**"Requirements" are the amounts customers are entitled to receive under the terms of Algonquin Gas' FERC-approved tariff.

[†]"Pipeline Gas Sales" represent the difference between requirements and the amount curtailed by Algonquin Gas due to its supplier's (Texas Eastern's) curtailments.

^{††}Algonquin Gas' customers supply no end-users in FERC Priority of Service Categories 4 and 5.

[§]Sales to Compensate for Other Supplies consist of sales of SNG over and above the volume required to offset pipeline gas curtailments by Algonquin Gas. These sales replace other sources of supply including LNG, propane, pipeline gas curtailed by other suppliers, and so forth (see Appendix B).

Source: Based on data supplied by Algonquin Gas Transmission Company, January 19, 1978. (Detailed versions of these data are included in Appendix B.)

represent a profile of end use for the sum of actual sales and curtailed volumes.

The "shortage" column shows that SNG sales in 1976-77 were sufficient to avoid shortfalls in Category 1, but were not large enough to offset pipeline gas curtailments for end users in Categories 2, 3, and 6 through 9. Algonquin Gas personnel, however, indicated that all of the company's customers were able to avoid curtailing current priority end users in Categories 2 and 3 by using propane and/or making spot purchases of gas from other suppliers (Jaques 1978). Thus, the data in Table 3-15 overstate the extent of shortages during the 1976-77 winter season.

This table illustrates the major shortcoming of the available end-use data: the information does not reflect the overall supply and demand conditions for each of Algonquin Gas' customers. For the purposes of the EA, attempting to obtain such information from each of 21 utility companies of interest was not feasible.

This problem is illustrated further by the row in Table 3-15 titled "Sales to Compensate for Other Supplies." Each of Algonquin Gas' customers had the opportunity to purchase the amount of SNG it preferred (up to the plant's capacity, of course). Some of the utilities chose to buy enough SNG to compensate for pipeline gas curtailments by Algonquin Gas, others purchased less and some purchased more. The 5,497,237 MMBtu shown in the next to last row of the table represents the total amount of SNG purchased by utility customers beyond the amount required to offset their individual pipeline gas curtailments from Algonquin Gas. These additional purchases replaced propane, LNG, and other seasonal supplies and were also used to compensate for curtailments by other pipeline suppliers. (This issue is explained further in Appendix B, a submission by Algonquin Gas that discusses the methods used to derive the 1976-77 end-use data and the projections included in Section 4 of this report.) To understand Table 3-15, note that some of the utility company customers bought more SNG than required to compensate for pipeline gas curtailments by Algonquin Gas while others purchased less, thus explaining why shortages could be shown at the same time sufficient

quantities were available to compensate for other supplies. These figures are the result of the decisions of individual firms and have been derived by using aggregated rather than individual data.

All of the SNG purchased to compensate for other supplies were used by customers in FERC Priority-of-Service Categories 1 through 3, as verified by Algonquin Gas in letter responses from individual customers that have been forwarded to DOE (Jaques 1977a, Jaques 1977b, Kane 1978).

3.3.3 Population

In 1975, the population of the 18 counties in the service areas of Algonquin Gas' customers was 7,767,662. Between 1970 and 1975 the population of this area was almost constant, declining by 0.1%. Population data for the counties served in whole or in part by Algonquin Gas' customers are presented in Table 3-16.

3.3.4 Ambient Air Quality

The service areas of Algonquin Gas' customers are located within eight federal Air Quality Control Regions (AQCRs): 118, 119, 121, 120, 41, 44, 42, and 43. Figure 3-6 shows the boundaries of these AQCRs with respect to the service areas. A summary of the air quality conditions in each of the counties in which Algonquin Gas' customers distributes gas is provided in Table 3-17.

TABLE 3-16

POPULATION OF COUNTIES SERVED BY CUSTOMERS OF
ALGONQUIN GAS
(1970 and 1975)

State	County	1970	1975	Percent Change
Connecticut	Hartford	816,737	822,900	0.8
	Litchfield	144,091	149,600	3.8
	New Haven	744,948	760,900	2.1
	New London	230,654	240,600	4.3
	Tolland	103,440	112,100	8.4
	Windham	84,515	90,500	7.1
Massachusetts	Bristol	444,301	463,800	4.4
	Middlesex	1,398,397	1,399,000	*
	Norfolk	604,854	620,000	2.5
	Plymouth	333,314	379,800	13.9
	Worcester	637,037	648,100	1.7
New Jersey	Morris	383,454	391,900	2.2
New York	Rockland	229,903	249,100	8.4
	Westchester	894,406	877,000	-1.9
Rhode Island	Bristol	45,937	45,600	-0.7
	Newport	94,228	75,700	-19.7
	Providence	581,470	577,800	-0.6
	Washington	85,706	79,800	-6.9
	Total	7,857,392	7,767,662	-0.1

*Less than 0.05 percent

SOURCE: U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 709, "Estimate of the Population of Counties and Metropolitan Areas, July 1, 1974 and 1975," USGPO, Washington, DC, 1977.

Figure 3-6 Air Quality Control Regions within Service Area of Algonquin Gas' Customers

TABLE 3-17

AIR QUALITY BY SERVICE AREA COUNTY

State and County	Attainment Status by Pollutants			
	TSP	SO ₂	NO _x	Oxidants
Connecticut				
Hartford	NA	A	UC	NA
Litchfield	NA	A	UC	NA
New Haven	NA	A	UC	NA
New London	S	A	UC	NA
Tolland	NA	A	UC	NA
Windham	S	A	UC	NA
Massachusetts				
Bristol	S	A	UC	NA
Middlesex	NA	A	UC	NA
Norfolk	S	A	UC	NA
Plymouth	UC	A	UC	NA
Worcester	NA	A	UC	NA
New Jersey				
Morris	A	A	UC	NA
New York				
Westchester	A	A	UC	NA
Rockland	A	A	UC	NA
Rhode Island				
Bristol	UC	A	UC	NA
Newport	A	A	UC	NA
Providence	NA	A	UC	NA
Washington	A	A	UC	NA

A - attaining primary National Ambient Air Quality Standards (NAAQS)
 UC - unclassified as to attainment, attainment status questionable
 NA - not attaining NAAQS
 S - not attaining secondary (NAAQS) but attaining primary NAAQS; is close to violation.

Source: U.S. Federal Register, Friday, 3 March 1978, Part II,
 Page 8962 and following.

4. ENVIRONMENTAL IMPACTS OF ALTERNATIVE FEEDSTOCK ALLOCATIONS

This section describes the potential impacts associated with three alternative courses of action that DOE may take in response to Algonquin's petition for an adjustment to its base-period allocation of naphtha feedstock. DOE may approve the total requested adjustment, that is, a 100% allocation, or it may grant a reduced allocation. For the purposes of this EA, two alternative reduced allocation levels are examined: 75% of the requested adjustment and no adjustment. Since, as described in Section 2.3, Algonquin's SNG plant meets the requirements of a "grand-fathered" facility for a portion of its base-period supply volume of feedstock, it would continue to be entitled to an allocation of 2,184,000 bbls of naphtha even if no adjustment were granted. Thus, the no-adjustment alternative represents an allocation equivalent to 49% of the requested level, while the 75% adjustment alternative would result in an allocation of 87% of the requested level.

The figures in Table 4-1 represent the relative quantities of feedstock and SNG output that would be available under each of the three allocation options. The 100% allocation alternative is virtually the same as actual conditions during the most recent complete operating season (1976-77) for which data was available. The 87% and 49% allocation alternatives would result in reduced output of SNG.

Since the Freetown plant is an operational facility, DOE's approval of the requested allocation adjustment would not result in any construction. For this reason, the impact analysis is limited to considering effects of plant operations at the three alternative allocation levels. The analysis addresses potential effects of such operations in the near-term (winter of 1978-79) and in the mid-term (winter of 1980-81), considering both site-related impacts (those that could occur on and adjacent to the plant site or that otherwise pertain to the facility's use) and service area impacts (those that could occur in the areas served by Algonquin Gas' utility company customers).

TABLE 4-1

AVAILABLE FEEDSTOCK AND SNG OUTPUT FOR THREE
ALTERNATIVE ALLOCATIONS

Alternative	Feedstock (bbls/yr)	SNG Output (MMBtu/yr)
100% Allocation	4,425,571	17,848,200
87% Allocation	3,865,178	15,527,934
49% Allocation	2,184,000	8,745,618

4.1 Impact of Requested Allocation (100%)

4.1.1 Site-Related Impacts

Approval of the requested allocation (100%) would allow Algonquin to continue to purchase and reform 4,425,571 bbls of naphtha feedstock during each plant operating season. Because this allocation is the same as that used during the base analysis period (winter 1976-77 plant operating season), existing plant operating characteristics would continue unchanged. Therefore, adopting this alternative would not have any incremental effect on environmental conditions of the site and vicinity.

4.1.2 Service Area Impacts

As described in Section 2.3, Algonquin's SNG plant was constructed to offset a shrinking supply of pipeline gas. The availability of SNG permitted Algonquin Gas' utility company customers to forestall shortages to end-users in FERC Priority-of-Service Categories 1 through 3. However, estimates furnished by Algonquin Gas indicate that increased pipeline gas curtailments, which could result in substantial supply shortages to these priority end users, are expected in the future even if the 100% feedstock allocation request were approved by DOE (Kane 1978). The estimates furnished by Algonquin Gas were based on data reported by Texas Eastern Transmission Corporation, Algonquin Gas' sole pipeline gas supplier, in its Form 15 filed with the FERC in April 1977. This forecasted insufficiency is consistent with estimates of projected gas deliveries to interstate pipeline companies through 1979 reported in the FEA's 1976 National Energy Outlook (FEA 1976).

Table 4-2 presents an analysis of the projected supply shortfalls for two future winter heating seasons: 1978-79 and 1980-81. The plant is assumed to produce SNG at its maximum level of output (as would be the case if DOE approved 100% of the requested allocation). The data illustrate the widening gap between projected pipeline gas sales and requirements. Furthermore, compared to the 1976-77 season during which no end users in FERC Priority-of-Service Category 1 experienced supply

TABLE 4-2

PROJECTED END-USE PROFILE FOR CUSTOMERS OF ALGONQUIN GAS
UNDER THE REQUESTED ALLOCATION (100%) (MMBtu)

FERC Priority- of-Service Category (No.)	Requirements	Pipeline Sales	SNG Sales	Total Sales	Shortage
1978-79					
1	64,023,736	57,591,930	6,047,007	63,638,937	384,799
2	10,949,377	47,455	7,219,539	7,266,994	3,682,383
3	557,480	0	423,303	423,303	134,177
Subtotal	75,530,593	57,639,385	13,689,849	71,329,234	4,201,359
Sales to Compensate for Other Supplies (Categories 1 through 3)	-	-	4,158,351	4,158,351	1,338,886*
Total	75,530,593	57,639,385	17,848,200	75,487,585	5,540,245
1980-81					
1	64,023,739	50,304,087	11,131,598	61,435,685	2,588,051
2	10,949,377	0	4,605,485	4,605,485	6,343,892
3	557,480	0	202,803	202,803	354,677
Subtotal	75,530,593	50,304,087	15,939,886	66,243,973	9,286,620
Sales to Compensate for Other Supplies (Categories 1 through 3)	-	-	1,964,939	1,964,939	3,532,298**
Total	75,530,593	50,304,087	17,904,825	68,208,912	12,818,918

* Shortage computed as difference between Sales to Compensate for Other Supplies in 1978-79 season vs. 1976-77 season, the base analysis period for the purposes of the EA.

**Shortage computed as difference between Sales to Compensate for Other Supplies in 1980-81 season vs. 1976-77 season, the base analysis period for the purposes of the EA.

Source: Attachment to letter from Algonquin Gas Transmission Company, 19 January 1978.

curtailments (See Table 3-15), customers in this category, which includes residential and small commercial end users, may suffer growing shortages in 1978-79 and 1980-81 unless supplemental gas purchases can be made from other suppliers or if propane is used. The gas deficit for large commercial and small industrial customers in Category 2 is estimated to be even larger.

These possible deficits can cause serious adverse environmental and economic effects including:

- higher energy costs and increased air emissions associated with switching to alternative fuels and/or
- the shutdown of firms and employee lay-offs if fuel switching is not possible.

These issues are treated in greater detail in Sections 4.2.2 and 4.3.2, which describe the incremental environmental impacts of reduced feedstock allocations (the 87% and 49% allocation alternatives). However, economic dislocation and reduced air quality may result even under the 100% allocation alternative because of projected increases in pipeline gas curtailments.

Available information suggests that allocation of feedstock to Algonquin will not affect other users of naphtha in the service area. Algonquin's supplier, Exxon, also provides naphtha for Brooklyn Union's SNG plant in New York. Exxon sold the requested volume of naphtha to Algonquin in 1976-77 while furnishing supplies to Brooklyn Union. No information was available to indicate that naphtha sales to Algonquin would adversely affect any other naphtha users.

4.2 Impact of Reduced Allocation (87%)

If DOE were to approve only 75% of the adjustment to Algonquin's base-period supply volume, 3,865,178 bbls of naphtha would be available for use as feedstock in the Freeport SNG plant. Because this volume represents 87% of the total requested allocation, the facility could not produce the maximum design output for the 5-month operating season. The 15,527,934 MMBtu of SNG that could be produced at the 87% allocation level would result in modifications to plant operating procedures. In

addition, the reduced amount of SNG available could cause significant adverse impacts in the service areas of Algonquin Gas' customers. These issues are discussed in detail below.

4.2.1 Site-Related Impacts

Algonquin could adjust plant operations in either of two ways in response to an 87% allocation of feedstock: (1) by reducing daily production rates or (2) by operating the plant for fewer days each season. Reduced daily production levels would probably be selected.

Because the plant would continue to operate during the same period each heating season, and since the proportionate reduction in the feedstock allocation would be only 13%, impacts on environmental conditions of the site and adjacent area are expected to be negligible. The few potential effects associated with the reduced level of daily production are discussed below.

Economic Characteristics

Algonquin Gas estimates that it would lose \$742,485 per year in revenues if annual SNG sales were reduced to 15,527,934 MMBtu. The resulting state and federal income tax loss of \$392,724, as well as the net income effect on Algonquin Gas are shown in Table 4-3.

Air Quality

The effect of a reduced allocation on air pollutant emissions is not certain. Logically, a reduction in production would be expected to cause lower emissions. However, some industrial facilities can generate greater emissions per unit output under these conditions because of lost operating efficiency. Although lowered emissions are considered more likely, evidence is not currently available to substantiate either possibility.

Water Resources

Water consumption would probably be somewhat lower at reduced production levels. Therefore, effluent volumes would probably also diminish. Whether pollutant concentrations in the plant effluent would

TABLE 4-3

CORPORATE INCOME AND TAX EFFECTS OF
AN 87% ALLOCATION VS. A 100% ALLOCATION

Variable	100% Allocation	87% Allocation
SNG Sales (MMBtu)	17,848,200	15,527,934
Revenues not related to feedstock*		
Fixed Cost Demand Charge (\$0.725 per MMBtu)	\$12,939,945	\$12,939,945
Fixed Cost Commodity Charge (\$0.320 per MMBtu)	5,711,424	4,968,939
Total Revenues	18,651,369	17,908,884
Revenues Lost		742,485
State Income Tax Effect @ 9.41%		69,868
Federal Income Tax @ 48%		322,856
Total Reduction in income taxes		392,724
Net income effect on Algonquin Gas		\$349,761

*Under Algonquin Gas' rate settlement filed with FERC, the rate for SNG sales consists of three parts: (1) a fixed-cost demand charge of \$0.725 per MMBtu, (2) a fixed-cost commodity charge of \$0.320 per MMBtu and (3) a feedstock commodity charge of \$3.853 per MMBtu. Increases or decreases in the base feedstock commodity charge caused by changed levels of feedstock use and, hence, SNG output are recovered or refunded by Algonquin Gas from or to its customers. Return and related taxes would be recovered through a fixed-cost commodity charge. Consequently, Algonquin Gas would lose \$0.320 per MMBtu for each unsold MMBtu under its FERC tariff. The fixed-cost demand charge, however, would remain constant regardless of the level of SNG output.

Source: Attachment to letter from Algonquin Gas Transmission Company, 19 January 1978.

change significantly is unknown. However, the NPDES permit controlling plant discharges specifies maximum allowable pollutant concentrations. Thus, the reduced volume of effluent would probably result in a small beneficial impact on water quality in the Taunton River.

4.2.2 Service Area Impacts

Section 4.1.2 indicates that gas shortages may exist in the area served by Algonquin Gas' customers even if a 100% allocation were approved by DOE. Thus, approval of an 87% allocation could generate shortages in addition to those possible under the 100% alternative. This estimated incremental gas deficit by FERC Priority-of-Service Category is presented in Table 4-4. These figures show that ultimate end users in Categories 1 through 3 would face an incremental shortfall of 2,320,266 MMBtu during the 1978-79 winter season and 2,327,627 MMBtu during the 1980-81 winter season under an 87% allocation. While examining potential impacts within the service areas of each of the 21 utility companies that purchase SNG from Algonquin Gas is beyond the scope of this EA, the potential for system-wide socioeconomic and air quality impacts is discussed below. This analysis focuses on aggregate socioeconomic and air quality impacts that might occur if an 87% allocation were approved.

Socioeconomic Impacts

The data in Table 4-4 indicate that DOE approval of an 87% allocation for Algonquin's Freetown plant could result in additional gas shortages during the winters of 1978-79 and 1980-81. The significance of the impacts of this incremental deficit depend on a number of factors including:

- the degree to which curtailed firms depend on a gaseous fuel for temperature and impurity control;
- the extent to which equipment for burning alternative fuels are already in place;
- the availability and relative costs of alternative fuels and

TABLE 4-4

ESTIMATED INCREMENTAL GAS DEFICITS UNDER AN 87% ALLOCATION
DURING THE 1978-79 AND 1980-81 WINTER SEASONS

1978-79			
FERC Priority- of-Service Category (No.)	Estimated Gas Deficits (MMBtu)		Incremental Deficit (Δ100%-87%)
	100% Allocation	87% Allocation	
No. 1	384,799	626,052	241,253
No. 2	3,682,383	4,315,588	633,205
No. 3	134,177	245,948	111,771
Subtotal	4,201,359	5,187,588	986,229
Sales to Compensate for Other Supplies (No.1-3)*	1,338,886	2,672,923	1,334,037
Total	5,540,245	7,860,511	2,320,266
1980-81			
No. 1	2,588,051	2,893,796	305,745
No. 2	6,343,892	7,577,036	1,233,144
No. 3	354,677	354,677	0
Subtotal	9,286,620	10,825,509	1,538,889
Sales to Compensate for Other Supplies (No.1-3)*	3,532,298	4,321,036	788,738
Total	12,818,918	15,146,545	2,327,627

*Shortage computed as difference between Sales to Compensate for Other Supplies in 1978-79 season vs. 1976-77 season, the base analysis period for the purpose of the EA.

Source: Computed from data furnished by Algonquin Gas Transmission Company, 19 January 1978.

- the ability of curtailed firms to absorb or pass on the capital costs associated with fuel switching (for those without the necessary equipment in place).

Essentially, the options available to curtailed firms range from switching to some alternate fuel to shutting down facilities. Somewhere in the middle are options that might involve some fuel switching combined with a shorter work schedule and/or temporary plant closings. In the event residential users are curtailed as predicted, their choices are somewhat similar. They can convert to oil, electricity, solar energy or some other fuel, or they may temporarily or permanently move from their homes.

To evaluate potential economic consequences of the projected incremental gas shortage under the 87% allocation alternative, the sections that follow address the economic penalties associated with fuel switching as well as the employment and income ramifications of plant shutdowns. The analysis is hypothetical and assumes that effects are distributed evenly throughout the service areas of Algonquin Gas' customers. Furthermore, even though the gas deficit projections indicate that users in Category 1 would be curtailed, for the purposes of the economic analysis, the total incremental deficit in Categories 1 through 3 were assumed to be borne by industrial users. This assumption is consistent with the fact that deficits shown in Table 3-15 for the 1976-77 season were actually compensated for by emergency purchases of gas (See Section 3.3.2). That is, deficits in Categories 2 and 3 caused by pipeline gas curtailed during that heating season were compensated for by the utility companies by emergency, spot purchases. The possibility that such purchases will completely compensate for pipeline gas curtailments is less certain in the future, however, because of the increased magnitude of the projected shortfall.

Fuel Switching Impacts

Of the range of alternatives available to industrial gas users, switching to an alternate fuel, where possible, would probably have the least significant adverse economic impacts. Certain economic penalties would result from such an action, including the potential increase in

expenditures for fuel, the added capital expenditures necessary for equipment changes and/or modifications and the potential employment and production losses resulting from plant downtime while conversion takes place.

Estimates of the added fuel and conversion costs required to offset a 2,320,266 MMBtu incremental gas deficit (that projected under an 87% allocation for the winter of 1978-79) are shown in Table 4-5. The fuel consumption estimates in Column 2 have been equalized to take into account the differences in heat content and operating efficiency characteristics of the various alternatives to gas. Table 4-6 provides the equivalency factors used to prepare these estimates. The energy cost figures in Column 3 are based on projected New England average industrial rates for 1978 as reported by the FEA in 10 CFR 450.

The information on fuel costs in Column 3 shows that No. 6 (residual) oil would actually be about \$0.5 million less expensive than gas, while No. 2 (distillate) oil and electricity would be approximately \$2 million and \$11 million more costly than oil, respectively. The data in Column 4 are based on estimates of average capital costs for industrial fuel switching recently developed by National Economic Research Associates (NERA). NERA (1977) estimates that capital conversion and storage costs are approximately \$3.00 per MMBtu to switch from gas to electricity, \$2.00 per MMBtu to switch to No. 2 oil and \$1.00 per MMBtu to switch to No. 6 oil. The figures in Column 4 were developed assuming annual costs at 10% of total capital costs for a period of ten years. The results show that capital costs would vary from \$232,027 per year for No. 6 oil to \$696,080 per year for electricity. The costs of conversion will probably vary substantially from firm to firm because of differences in physical plant characteristics and process needs.

Columns 5 and 6 present figures representing total annual conversion costs and the differentials between gas and the three alternatives studied. These annual cost differences are summarized below:

- No. 6 oil: \$275,415 less than gas,
- No. 2 oil: \$2,408,529 more than gas, and
- electricity: \$11,827,695 more than gas.

TABLE 4-5

ESTIMATED COST OF FUEL SWITCHING

(87% Case, 1978-79)

(1)	(2)	(3)	(4)	(5)	(6)
Type of Energy	Quantity*	Energy/ Cost (\$)**	Annual Capital Cost of Conversion and Storage (\$)†	Total Cost (3 and 4) (\$)	Cost Differential vs. Gas (\$)
Gas (MMBtu)	2,320,266	6,543.150	-	6,543,150	
No. 2 Oil (gal)	19,467,032	8,487.625	464,053	8,951,679	2,408,529
No. 6 Oil (gal)	15,476,174	6,035.703	232,027	6,267,735	(275,415)
Electricity (Kwh)	477,696,360	17,674.765	696,080	18,370,845	11,827,695

*All figures have been equalized for differences in heat content per measurement unit and for differences in efficiency at the burner tip. Equivalency factors are presented in Table 4-7.

**Based on New England Industrial rates as specified in 10 CFR 450 - Energy Audits:

Gas - \$2.82/MMBtu (1 MMBtu/Mcf); No. 2 Oil - \$0.436/gal (\$18.31 per bbl); No. 6 Oil - \$0.390/gal (\$16.39 per bbl); Electricity - \$0.037/kwh (\$36.85 per Mkwk).

†Based on assumed capital costs of \$3.00/MMBtu equivalent for electricity, \$2.00/MMBtu equivalent for No. 2 oil and \$1.00/MMBtu for No. 6 oil with annual cost computed at 10% of total initial investment (NERA 1977).

TABLE 4-6
EQUIVALENCY FACTORS

Type of Energy	Unit Heat Content	Units per MMBtu	Operating Efficiency	Equivalent Units per MMBtu of Gas
Gas	1,000,000 Btu/Mcf	1 Mcf	0.70	-
No. 2 Oil	139,000 Btu/gal	7.19 gal	0.60	8.39 gal
No. 6 Oil	150,000 Btu/gal	6.67 gal	0.70	6.67 gal
Electricity	3,400 Btu/Kwh	294.12 Kwh	1.00	205.88 Kwh

Source: Federal Power Commission 1977. Curtailment Strategies.

These estimates are based on the presumption that the entire incremental gas shortfall is compensated for by converting to a single alternative energy source. In reality, individual industrial customers could be expected to select the fuel that was most suited to their particular circumstances. That is, the incremental gas shortfall would probably be compensated for by a combination of No. 2 oil, No. 6 oil, and electricity, and other energy sources, as well as by conservation and modernization.

Although fuel switching represents a less costly alternative than plant shutdowns as demonstrated in the following section, its feasibility in the short- to medium-term (to about 1980) is questionable. The time required to design, construct, and install new equipment could prove to be a serious constraint. Moreover, the actual availability of equipment could pose additional problems, particularly if a large number of customers choose a similar fuel conversion process during the same time period. Finally, as discussed later in Section 4.2.2, fuel switching also has associated environmental consequences, particularly with respect to air quality.

Employment and Income Effects

The estimated incremental gas deficits presented in Table 4-4 indicate that under an 87% allocation, customers in FERC Priority-of-Service Categories 1 through 3 would be curtailed by 2,320,266 MMBtu and 2,327,627 MMBtu during the winters of 1978-79 and 1980-81, respectively. As noted previously, for the purposes of assessing impacts on employment and earnings, these shortages have been assumed to be borne by industrial users only. Under the worst-case assumption that fuel switching is not a practical alternative because of any of a number of possible technical, economic or other reasons, the curtailed industrial firms could be forced to shut down. The economic effects of such potential plant closings have been roughly estimated using data on average gas consumption and wages per manufacturing employee. Again, these estimates assume that no fuel switching takes place and that firms would only close down during the 5-month winter season. In reality, some and perhaps even many firms might very well shut down permanently, with concomitantly more serious consequences than those described below. Based on the estimated average national gas consumption per manufacturing

employee of 126 MMBtu per year, or 52.5 MMBtu per 5-month winter season*, worst-case lay-off estimates are as follows:

- 1978-79: 44,196 workers and
- 1980-81: 44,336 workers.

These worst-case job loss estimates can be translated into income loss estimates by examining average wages for manufacturing employees. In 1975, the average annual salary for such workers in Connecticut and Massachusetts, the two states accounting for over 80% of all sales by Algonquin Gas, were \$12,161 and \$11,119, respectively (Bureau of the Census 1977). Taking the approximate midpoint of \$11,500 per annum and assuming a 5% annual growth rate, the wages of these manufacturing employees would average about \$13,300 in 1978 and about \$14,700 in 1980. Comparable statistics for the 5-month operating season are \$5,540 in 1978 and \$6,125 in 1980. Using these figures, the personal income losses that might occur because of plant shutdowns and associated lay-offs are estimated to be:

- 1978-79: \$244,850,000 and
- 1980-81: \$271,560,000.

These estimates represent direct effects only; that is, they do not reflect secondary or indirect impacts attributable to the multiplier effects of these income losses. While estimating these secondary impacts is beyond the scope of this EA, it can only be assumed that providers of the goods and services that would otherwise have been purchased by the manufacturing workers would also forego a substantial amount of income.

*Bureau of Labor Statistics, U.S. Department of Labor 1976. Report on Natural Gas Disruption and Use of Employment as a Criteria for Allocating Natural Gas as cited in Curtailment Strategies (FPC 1977). Using input-output analysis, the average manufacturing firm in the United States was found to consume \$166.40 of natural gas per employee in 1970. The average industrial price for gas in 1970 was \$1.32 per MMBtu (American Gas Association 1977). Therefore, average gas use per manufacturing employee was 126 MMBtu per year, or on a prorated basis, 52.5 MMBtu per 5-month winter season.

Air Quality Impacts

To estimate the impact of an 87% allocation of feedstock on regional air quality, emissions burdens have been calculated for two different scenarios: (1) all of the end users convert to No. 6 oil and (2) these end users switch to No. 2 oil. Table 4-7 compares the calculated emissions from fuel switching with emissions from an equivalent quantity of natural gas, but does not correlate these emissions with local air quality concentrations. A change in the quantity of air emissions is difficult to relate directly to a change in air quality without detailed modeling. Many factors, such as the characteristics of the flue gases, amounts of emissions from each individual source, topography, arrangement of nearby buildings and local atmospheric dispersion characteristics, to name a few, influence the way in which emissions affect air quality. In general, of course, an increase in emissions of air contaminants tends to produce a deterioration in air quality.

The significance of the increased pollutant emissions that would result from fuel switching can best be understood by referring to Table 3-17, which lists each of the counties falling partially within the area served by Algonquin Gas' customers. Of the 18 counties that potentially would be directly affected by fuel switching, all are non-attainment areas for one or more of the four pollutants considered. Seven of the counties are nonattainment areas for particulates and six are close to violating NAAQS. Serious implications are also indicated for SO_2 and NO_x , which can contribute to creation of oxidants, a pollutant for which all counties are classified as nonattainment areas.

If fuel switching were to occur in these areas, current environmental problems associated with the observed air quality violations would be exacerbated. Since year-by-year reductions in emissions for nonattainment areas has been mandated by the Clean Air Act, this potential adverse impact could be quite serious. Examples of the consequences of this problem are as follows:

- expensive emissions control equipment may be required to implement fuel switching;
- emissions offsets, which could affect existing consumers of fuels other than gas, may be required, and
- poor air quality could worsen in some locations.

TABLE 4-7
ESTIMATED REGIONAL EMISSIONS CAUSED BY
FUEL SWITCHING UNDER AN 87% ALLOCATION
(1978-79 and 1980-81)

		Air Emissions (tons/yr)**		
Fuel Type	Quantity*	SO ₂	Particulates	NO ₂
1978-79				
Natural Gas (MMBtu)	2,320,266	1	12	203
No. 2 Oil (gal)	19,467,032	460	146	584
No. 6 Oil (gal)	15,476,174	1,215	178	464
1980-81				
Natural Gas (MMBtu)	2,327,627	1	12	204
No. 2 Oil (gal)	19,528,791	462	146	586
No. 6 Oil (gal)	15,525,272	1,219	179	466

*Fuel consumption estimates have been equalized for differences in heat content and efficiency at the burner tip. The specific assumptions are outlined in Table 4-6.

**Industrial emission factors were derived from values cited in AP-42 (U.S. EPA 1973). It is further assumed that No. 2 oil will have a sulfur content of 0.3%, while No. 6 oil will have a sulfur content of 1.0%. Specific emission factors used are as follows:

	Natural Gas (lbs/MMBtu)	No. 2 oil (lbs/1,000 gal)	No. 6 oil (lbs/1,000 gal)
SO ₂	0.0006	47.3	157
Particulates	0.01	15	23
NO ₂	0.175	60	60

Note: Natural gas emissions are presented for comparison.

These problems could influence some firms to relocate rather than to switch fuels, thus increasing the seriousness of the described employment and income impacts.

4.3 Impact of Reduced Allocation (49%)

If DOE granted none of the adjustment requested by Algonquin to the base-period supply volume of naphtha available for use in its Freetown plant, 2,184,000 bbls of the feedstock would still be allocated to that facility. This volume represents 49% of the total requested allocation and the plant could produce 8,745,618 MMBtu of SNG during each winter heating season. The environmental and economic effects of this alternative are discussed below.

4.3.1 Site-Related Impacts

Under the 49% allocation alternative, Algonquin SNG would probably modify its plant's operating schedule, as in the case of the 87% allocation alternative, by reducing daily production. The environmental consequences of this action for the plant site and surrounding area are expected to be relatively insignificant, since the facility would still continue in operation during the entire 5-month winter heating season. The specific effects anticipated are described below.

Economic Characteristics

With SNG sales reduced to 8,745,618 MMBtu per season, Algonquin Gas estimates that it would suffer a loss of \$2,912,826 in revenues annually. The resulting state and federal income tax loss of \$1,540,687, as well as the net income effect on Algonquin Gas, are shown in Table 4-8.

Air Quality

While the effect of halving the SNG output of the plant on air pollutant emissions is not certain, the quantity of emissions would be lower than at full output. The possible beneficial impacts on air quality would be slight, however, because of the relatively small quantity of pollutant emissions that are currently generated by the facility.

TABLE 4-8

CORPORATE INCOME AND TAX EFFECTS OF
A 49% ALLOCATION VS. A 100% ALLOCATION

Variable	100% Allocation	49% Allocation
SNG Sales (MMBtu)	17,848,200	8,745,618
Revenues not related to feedstock*		
Fixed Cost Demand Charge (\$0.725 per MMBtu)	\$12,939,945	\$12,939,945
Fixed Cost Commodity Charge (\$0.320 per MMBtu)	5,711,424	2,798,598
Total revenues	18,651,369	15,738,543
Revenues lost		2,912,826
State Income Tax Effect @ 9.41%		274,097
Federal Income Tax @ 48%		1,266,590
Total Reduction in Income Taxes		1,540,687
Net income effect on Algonquin Gas		\$1,372,139

*See note to Table 4-13

Source: Attachment to letter from Algonquin Gas Transmission Company,
19 January 1978.

Water Resources

Comments made with respect to the 87% allocation alternative are generally applicable to the 49% alternative. The reduced volume of effluent expected to be generated at the lowered output level could cause a slight improvement in the water quality of the Taunton River.

4.3.2 Service Area Impacts

The incremental gas shortages that might result under the 49% alternative could be almost four times as great as those that could occur if DOE approved the 87% allocation alternative. The estimated incremental deficit by FERC Priority-of-Service Category is shown in Table 4-9. The figures show that ultimate end users in Categories 1 through 3 would face an additional shortfall of 9,102,582 MMBtu during the 1978-79 winter season and 9,131,461 MMBtu during the 1980-81 season compared to the 100% allocation alternative. The potential socioeconomic and air quality impacts associated with these shortfalls are discussed below. Again, it is important to understand that the analysis addresses aggregate effects throughout the 18 counties served in whole or in part by Algonquin Gas' utility company customers.

Socioeconomic Impacts

As noted in Section 4.2.2, the options available to curtailed firms range from switching to alternate fuels to shutting down operations. For the purposes of assessing economic impacts of the 49% allocation alternative, two hypothetical examples were selected:

- 1) all affected firms would choose to switch to an alternate fuel (No. 2 oil, No. 6 oil or electricity) or
- 2) all affected firms would shut down their plants during the 5-month winter season.

By examining these two extremes along a continuum of options open to industrial customers facing gas shortages, the worst-case impacts have been identified. The assumptions and limitations of this approach have been previously specified in Section 4.2.2.

TABLE 4-9

ESTIMATED INCREMENTAL GAS DEFICITS UNDER A 49% ALLOCATION
DURING THE 1978-79 AND 1980-81 WINTER SEASONS

FERC Priority-of- Service Category (No.)	1978-79		Incremental Deficit (Δ 100%-49%)
	Estimated Gas Deficits (MMBtu) 100% Allocation	49% Allocation	
1	384,799	1,336,532	951,733
2	3,682,383	7,720,867	4,038,484
3	134,177	440,887	306,710
Subtotal	4,201,359	9,498,286	5,296,927
Sales to Compensate for Other Supplies (No. 1 through 3)*	1,338,886	5,144,541	3,805,655
Total	5,540,245	14,642,827	9,102,582
1980-81			
1	2,588,051	5,522,728	2,934,677
2	6,343,892	10,535,454	4,191,562
3	354,677	503,115	148,438
Subtotal	9,286,620	16,561,297	7,274,677
Sales to Compensate for Other Supplies (No. 1 through 3)*	3,532,298	5,389,082	1,856,784
Total	12,818,918	21,950,379	9,131,461

*Shortage computed as difference between Sales to Compensate for Other Supplies in 1978-1979 season vs. 1976-1977 season, the base analysis period for the purposes of the EA.

Source: Computed from data furnished by Algonquin Gas Transmission Company, 19 January 1978.

Fuel Switching Impacts

Fuel switching, where it is technically and economically possible, would probably result in the least economic dislocation of all available options. The financial impacts of purchasing alternate fuels and modifying or replacing existing equipment to accomplish conversion under the 49% allocation alternative are shown in Table 4-10. These data are based on three scenarios in which all of the affected firms choose to switch to one alternative energy source as indicated. The estimate of fuel requirements in Column 2 have been equalized to take into account the different heat content and operating characteristics of the three alternatives to gas.

The figures in Column 3 indicate that the quantity of No. 6 oil required in lieu of 9,102,582 MMBtu of gas (the anticipated incremental shortfall in 1978-79 given approval of the 49% allocation alternative) would cost almost \$2 million less than gas, while equivalent quantities of No. 2 oil and electricity would cost about \$7.6 million and \$43.7 million more than gas, respectively. As shown in Column 6, when the annualized capital costs of conversion and storage are added to these annual operating cost differences, the total cost differences are:

- No. 6 oil: \$1,080,476 less than gas,
- No. 2 oil: \$9,448,844 more than gas and
- electricity: \$46,400,959 more than gas.

Electricity is substantially more expensive than natural gas or either of the two kinds of oil studied. The figures suggest that the size of the projected shortfall under the 49% alternative and the high costs associated with switching to electricity make electricity prohibitively expensive as an alternate energy source except to those firms that currently use very small quantities of energy or that can pass on or otherwise transfer the costs of conversion to the ultimate consumers.

As explained in Section 4.2.2, the feasibility of fuel switching before the projected shortfall occurs is complicated further by the limited amount of lead-time available for engineering design studies and construction. In addition, the environmental impacts of fuel switching, as indicated below, could also limit its desirability.

TABLE 4-10

ESTIMATED COST OF FUEL SWITCHING
(49% Case, 1978-79)

(1)	(2)	(3)	(4)	(5)	(6)
Type of Energy	Quantity*	Energy Cost (\$) **	Annual Capital Cost of Conversion and Storage (\$) †	Total Cost (3 and 4) (\$)	Cost Differential vs. Gas (\$)
Gas (MMBtu)	9,102,582	25,669,281	-	25,669,281	-
No. 2 Oil (gal)	76,370,663	33,297,609	1,820,516	35,118,125	9,448,844
No. 6 Oil (gal)	60,714,222	23,678,547	910,258	24,588,805	(1,080,476)
Electricity (Kwh)	874,039,600	69,339,465	2,730,775	72,070,240	46,400,959

*All figures have been equalized for differences in heat content per measurement unit and for differences in efficiency at the burner tip. Equivalency factors are presented in Table 4-7.

**Based on: New England Industrial rates as specified in 10 CFR 450 - Energy Audits:

Gas - \$2.82/MMBtu (1 MMBtu/Mcf); No. 2 Oil - \$0.436/gal (\$18.31 per bbl); No. 6 Oil - \$0.390/gal (\$16.39 per bbl);
Electricity - \$0.037/Kwh (\$36.85 per MKwh).

†Based on assumed capital costs of \$3.00/MMBtu equivalent for electricity, \$2.00/MMBtu equivalent for No. 2 oil and \$1.00/MMBtu for No. 6 oil with annual cost computed at 10% of total initial investment (NERA 1977).

Employment and Income Effects

By assuming that none of the potentially affected firms can switch to an alternate form of energy, the worst-case impacts of the incremental gas shortage on employment and personal income have been evaluated. If DOE were to select the 49% allocation alternative, the magnitude of potential lay-offs is very large as noted below:

- 1978-79: 173,383 workers and
- 1980-81: 173,933 workers.

The estimated 1975 population of the 18 counties served in whole or in part by utility company customers of Algonquin Gas was 7,767,662 (see Table 3-16). The number of employees who could possibly find themselves out of work represents about 2.2% of the total population or about 1 out of every 50 persons. If this level of unemployment were to be concentrated in any one metropolitan area, the effects could be extremely serious.

The gravity of the potential economic dislocation is further illustrated by considering the costs of this unemployment in terms of foregone earnings. By using the method described in Section 4.2.2, the personal income losses that would be associated with the projected worst-case unemployment levels are:

- 1978-79: \$960,540,000 and
- 1980-81: \$1,065,300,000

These very rough estimates of possible worst-case, directly induced income effects are based on the assumption that the workers would only be layed off temporarily; that is, during the 5-month winter season. However, the size of the projected gas shortfalls and the difficulties associated with fuel switching might very well cause some firms to close permanently. If only 25% of the employees were affected by such permanent shut downs, the additional economic loss caused by foregone earnings during the remainder of the year would equal \$336,360,000. Furthermore, these estimates do not consider the indirect, multiplier effects of this level of unemployment.

Air Quality Impacts

Emissions burden calculations have been prepared for the 49% allocation alternative assuming that all end users switch to No. 2 oil, and a similar set of computations have been prepared assuming that all end users switch to No. 6 oil. Table 4-11 compares the calculated emissions from these two fuels with those from an equivalent quantity of natural gas. The data clearly indicate the substantial difference in the volume of emissions generated by the alternate fuels. As an example, SO_2 emissions from No. 2 oil are 602 times that from natural gas, while SO_2 emissions from No. 6 oil would be almost 1,600 times that from the natural gas. Particulate emissions from the two types of oil are roughly a power of ten greater than emissions of this pollutant from natural gas. Finally, NO_x emissions are about two to three times greater for the No. 6 and No. 2 oils, respectively.

While as indicated in Section 4.2.2, it is difficult to correlate changes in emissions with changes in air pollutant concentrations, the potential for adverse impacts on air quality can be understood by referring to Table 3-17. This table indicates that 7 of the 18 counties that are partially included in the service areas of Algonquin Gas' customers are currently designated as nonattainment areas for particulates; that is, violations of NAAQS have been observed in these areas. In addition, six other counties are close to violating NAAQS. Increased emissions of particulates caused by fuel switching would aggravate the observed air quality violations. Serious implications for SO_2 , NO_x , and oxidant standards are also indicated.

The desires of industry to switch to an alternate fuel would probably conflict with the year-by-year reductions in emissions mandated by the Clean Air Act for nonattainment areas. Some of the consequences of the federal mandate have been discussed in Section 4.2.2. These factors would serve to make fuel switching more difficult and costly and could force some firms to close. The potentially very serious economic consequences of these actions have been considered previously.

TABLE 4-11
ESTIMATED REGIONAL EMISSIONS CAUSED BY
FUEL SWITCHING UNDER A 49% ALLOCATION
(1978-79 and 1980-81)

		Air Emissions (tons/yr)**		
Fuel Type	Quantity*	SO ₂	Particulates	NO ₂
1978-79				
Natural Gas (MMBtu)	9,102,582	3	46	796.5
No. 2 Oil (gal)	76,370,663	1,806	573	2,291
No. 6 Oil (gal)	60,714,222	4,766	698	1,821
1980-81				
Natural Gas	9,131,461	3	46	799.0
No. 2 Oil	76,612,958	1,812	575	2,298
No. 6 Oil	60,906,845	4,781	700	1,827

*Fuel consumption estimates have been equalized for differences in heat content and efficiency at the burner tip. The specific assumptions are outlined in Table 4-6.

**Industrial emission factors were derived from values cited in AP-42 (U.S. EPA 1973). It is further assumed that No. 2 oil will have a sulfur content of 0.3%, while No. 6 oil will have a sulfur content of 1.0%. Specific emission factors used are as follows:

	Natural Gas (lbs/MMBtu)	No. 2 oil (lbs/1,000 gal)	No. 6 oil (lbs/1,000 gal)
SO ₂	0.006	47.3	157
Particulates	0.01	15	23
NO ₂	0.175	60	60

Note: Natural gas emissions are given for comparison.

5. SUMMARY OF UNAVOIDABLE ADVERSE IMPACTS OF ALTERNATIVE FEEDSTOCK ALLOCATIONS

This section compares the possible unavoidable adverse environmental impacts of the three alternative feedstock allocations. The three alternatives examined include approval of a 100% allocation, an 87% allocation and a 49% allocation. These alternatives are equivalent to granting Algonquin all of its requested adjustment to the base-period supply volume of naphtha for the Freetown plant, 75% of the requested adjustment, and none of the requested adjustment.

The impacts of choosing one alternative over another are extremely difficult to predict, since these effects will largely depend on decisions made by the individual end users affected by projected gas shortfalls. The analysis presented in Section 4, however, uses worst-case assumptions to facilitate assessment of the potential for adverse effects. The following general conclusions may be drawn from this analysis regarding the comparative potential for creating unavoidable adverse impacts.

- With respect to site-related impacts, only a few significant differences between the three alternatives exist.
 - Unavoidable adverse economic effects on Algonquin Gas' earnings would result from either of the reduced allocations, thus causing concomitant reductions in state and federal income tax payments.
 - Air and water quality, however, would probably improve to a limited extent if the allocation were at a reduced level.
- With respect to service area impacts, significant increases in the potential for unavoidable adverse socioeconomic and air quality impacts would occur if DOE were to select the 87% or 49% allocation alternatives.
 - If fuel switching were implemented by all potentially affected firms, the costs incurred would be a function of the alternate energy source selected. Using No. 6 oil instead of gas would result in net savings of \$275,415

for the 87% alternative and \$1,080,476 for the 49% alternative. At the other extreme, using electricity, the most expensive alternate energy source evaluated, to offset the projected incremental gas shortages would generate additional costs of \$11,827,695 for the 87% alternative and \$46,400,959 for the 49% alternative. Switching to No. 2 oil would cause increased costs of about one-fourth the magnitude of those associated with electricity.

- Fuel switching could also generate adverse impacts on regional air quality because of increased pollutant emissions associated with combustion of No. 6 or No. 2 oil instead of gas. This impact would be particularly adverse since seven of the counties in Algonquin Gas' service area are nonattainment areas for particulates, two are nonattainment areas for SO_2 and one is a nonattainment area for NO_x . The emissions generated by the fuel switching could be reduced by installing pollution control devices and similar measures, but such actions would add to the costs of conversion. Furthermore, the federal Clean Air Act mandates year-by-year reductions in emissions in nonattainment areas. This legal requirement would conflict with and constrain the extent of fuel switching and thus could serve to increase the potential for plant closings and lay-offs.
- If the entire incremental gas shortage were shifted to industrial users that could not switch to alternative fuels, the effects on employment and personal income could be extremely serious. Under a 49% allocation, an estimated 173,000 to 174,000 workers might be laid off during the 5-month winter season as a direct result of plant shutdowns. The loss of earnings could exceed \$1 billion annually and concentration of such impacts in any one metropolitan area could generate secondary economic

dislocation of even greater magnitude. While this estimate is based on worst-case assumptions, the potential severity of the problem is clear.

Some of these potential adverse impacts may be avoided to the extent that alternative supplies of gas are available. As explained in Sections 3 and 4, even though the end-use profiles furnished by Algonquin Gas indicated shortfalls in FERC Priority-of-Service Categories 2 and 3 during the 1976-77 season, the utility companies were able to secure additional supplies of gas to avoid curtailments to priority customers. To the extent that additional gas supplies can be obtained in the future, the adverse environmental and economic impacts described above can be avoided. Some further information regarding this issue is presented in Section 8. However, the magnitude of the shortfall under reduced allocations, particularly the 49% alternative, are so substantial that it is questionable to what extent purchases of additional gas could mitigate potential adverse impacts.

6. SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The approval of the requested adjustment would result in an additional allocation of 2,241,571 bbls of feedstock for use in Algonquin's Freetown SNG plant. The total annual use of 4,425,571 bbls of naphtha for producing SNG represents the major irretrievable commitment of resources associated with the proposed action (the 100% allocation alternative). Available information indicates that this volume of feedstock would not necessarily be available or suitable for use by others in the area served by Algonquin Gas' customers.

Other resources that would be irreversibly and/or irretrievably committed include the following.

- Propane is occasionally required to enrich the product gas. During the base analysis period (the 1976-77 winter season), 1,726,116 gallons of propane were added. The precise amount needed in future years is a function of the frequency and magnitude of plant operating problems.
- Process water requirements average 1,152,000 gpd during the 151-day plant operating season. Of this volume, an average of 220,000 gpd are discharged after treatment. However, this resource is not recovered because it is discharged to the saltwater reaches of the river.
- The plant uses two catalysts in the production process. During the 1976-77 operating season 135,000 lbs of zinc oxide catalyst were used in the desulfurization process and 120,000 lbs of CRG catalyst, a high nickel-content catalyst, were used in the gasification process. The spent catalysts were returned to the manufacturer for metals recovery.
- The SNG plant will continue to require 102 permanent employees, and thus the labor of these individuals will be irretrievably committed.

Since the plant is operational and has received temporary allocations of the requested volume of feedstock in previous years, DOE approval of the requested allocation would result in a continuation of the historical pattern of resource use as described above. A water permit committing local resources for use by the plant has already been issued, and the construction materials have already been irreversibly committed to the plant facilities.

7. SUMMARY OF RELATIONSHIPS BETWEEN LOCAL SHORT-TERM
USES OF THE ENVIRONMENT AND THE MAINTENANCE
AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The purpose of the proposed action (the 100% allocation alternative) is to maximize the probability that priority customers who currently depend on natural gas will receive their fuel requirements on a continuing basis. If DOE approves the requested allocation, Algonquin's Freetown SNG plant will be able to continue operations at a level of output comparable to the level that occurred during the 1976-77 winter season. The production of SNG would compensate for additional projected pipeline gas curtailments and minimize the potential for adverse environmental and economic impacts as described in Sections 4 and 5.

Algonquin Gas has executed FERC-approved service agreements with its customers for sales of SNG through the 1986-87 winter season and continuing thereafter on a year-to-year basis (Kane 1977a). Thus, plant operations would continue for at least nine additional heating seasons. During this time, the environment of the site and adjacent area, as well as the environment of the areas served by Algonquin Gas' utility company customers would be affected by plant operations.

Plant operations are not expected to have significant adverse long-term effects on the environmental productivity of the site and adjacent area provided that, as expected, the facility continues to comply with applicable federal, state and local regulations. At some point in the future, the site could be used for other purposes if the facility were dismantled and removed.

Other long-term effects of the proposed action would largely depend on the degree to which SNG production offsets pipeline gas curtailments. The analysis of potential adverse environmental and economic consequences of alternative allocations indicates that increasing pipeline gas curtailments are anticipated. If the availability of SNG minimizes the number of plant closings and associated layoffs, the proposed action might have long-term beneficial effects on economic conditions in the region. At the same time, the proposed action could prevent further deterioration of regional air quality, which would result from

fuel switching. The extent of such beneficial impacts is a function of the magnitude of future pipeline gas curtailments and the availability of alternative sources of energy.

8. SUMMARY OF ALTERNATIVES TO ALLOCATING THE REQUESTED FEEDSTOCK

This section describes and evaluates several nonadministrative alternatives to the approval of Algonquin's SNG feedstock petition. These alternatives involve actions that are not within DOE's authority to initiate, but constitute potentially viable options to the proposed action (approval of a 100% allocation). The specific alternatives addressed can be arranged in three categories:

- 1) alternatives for increasing gas supplies;
- 2) alternatives for reducing gas consumption; and
- 3) alternative feedstocks for SNG production.

Each of these alternatives, where appropriate, is discussed with respect to (1) feasibility at the time the SNG plant was constructed, (2) present feasibility, and (3) comparative environmental effects.

8.1 Alternatives for Increasing Gas Supplies

Algonquin Gas has studied several ways to increase its gas supplies to offset past, present, and projected future curtailments of pipeline gas from its sole supplier, Texas Eastern Transmission Corporation. In this regard, two major options have been considered: (1) purchasing pipeline gas from other suppliers and (2) importing LNG. For a variety of reasons, neither of these alternatives can be individually considered as a feasible or reliable alternative to the proposed action, although some alternative may be necessary to supplement SNG production, especially in the context of projected additional curtailments of pipeline gas supplies in the future.

8.1.1 Gas Purchases from Other Pipeline Suppliers

As explained in Section 2.3, Algonquin Gas was advised in 1969 by its sole supplier of pipeline gas, Texas Eastern Transmission Corporation, that additional firm gas supplies could not be provided in the foreseeable future. Subsequently, in 1971, Texas Eastern announced that it

would have to curtail Algonquin Gas' firm requirements by at least 100,000 Mcf per day during the upcoming winter period. Since that time Algonquin Gas has incurred increased curtailments of its pipeline supply.

Faced with a shrinking supply, Algonquin Gas began examining alternative supply sources in 1969. Attempts were made to secure additional volumes from suppliers that had not previously furnished pipeline gas to Algonquin Gas. These attempts included contacts with firms in both the United States and Canada, and the results were negative.

Continued reduction of domestic gas output makes this option even less feasible at present, though future national policies regarding natural gas production could reverse this situation. While additional supplies are expected to be available from Alaska, it is very unlikely that this production will provide a significant supply in the near- to mid-term (approximately 1980). The lead-time required for such new production makes it difficult to do more than speculate about possible delivery dates. Furthermore, technical obstacles exist, and the potential for significant environmental impacts associated with the construction of pipelines to transport natural gas from Alaska to the eastern United States is present.

8.1.2 Imported LNG

Algonquin Gas began investigating the possibility of obtaining liquified natural gas (LNG) in 1969 (Thorn 1971). Approaches studied included buying foreign LNG directly or from an importer (for example, Distrigas Corporation of Boston). Algonquin Gas had been a participant in the Eascogas LNG, Inc. project, a group seeking to import LNG for subsequent resale and distribution. However, Algonquin Gas sold its equity interest in the project on 10 June 1977 as a result of licensing and contractual problems that delayed the initial delivery date for the LNG and consequently reduced the confidence of Algonquin Gas and its intended customers in the feasibility and reliability of the project.

Subsequently, Algonquin Gas had been negotiating with a group of distribution companies, several of which are present customers, for use of its LNG storage facilities in Providence, RI (Kane 1978). These

gas utilities formed a venture known as Gazcol LNG that sought to import Columbian LNG (Maleowski 1977). However, the Gazcol LNG consortium was unable to obtain the imported LNG.

Algonquin Gas is currently leasing capacity at its Providence LNG storage facility to Providence Gas Company, a distribution company customer, and two other gas utilities have requested to use this facility. All three of these gas utilities purchase the LNG from Distrigas Corporation of Boston and Algonquin Gas' role simply involves providing a location to store some of this LNG. Note that the LNG storage tank was developed by Algonquin Gas as part of its planned participation in the Eascogas LNG project. But since Algonquin Gas is no longer a participant in this project, as is explained above, other possible uses for this LNG storage are being explored.

Data furnished by Algonquin Gas indicate that, by 1985, LNG or some other additional source of supply may be necessary as a supplement to the SNG in order to supply all customers in FERC Priority-of-Service Categories 1 and 2 (Jaques 1976). The need for such additional supplies is expected to be generated by projected increases in pipeline gas curtailments.

For reasons described above, LNG is not considered a feasible short-term alternative to SNG, but rather may be viewed as a possible long-term source of supply to avoid curtailing priority customers in Categories 1 and 2.

The potential hazards associated with shipping and storing LNG have recently received extensive attention. Major environmental concerns relate to the risks of fire or explosion, and extreme care would have to be exercised in selecting a site for storage and associated facilities.

8.2 Alternatives for Reducing Gas Consumption

8.2.1 Conservation

Potential Gas Savings

Conservation is one of the measures available to reduce gas consumption. Reducing a thermostat setting from 72 to 68°F may save about 12% of the energy used to heat a home or office, and lowering the

thermostat to 63°F at night could produce an additional 7% savings (Mueller 1974). Reducing the temperature of a gas water heater from 140 to 110°F can yield a 15% gas savings (Shelton 1976); caulking and weatherstripping can produce a 10% gas savings (Ackerman 1977); the addition of six inches of attic insulation can result in a 20% fuel savings (Mueller 1974) and the addition of storm windows and doors an 11% savings (Mueller 1974).

Conservation may also be accomplished through increased energy efficiency, particularly on the part of nonresidential users. Energy efficiency standards are currently being developed under the Energy Conservation and Production Act for all new residential and commercial buildings. If these standards are as strict as those developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHREA 90-75) and could be uniformly adopted by 1981, commercial gas consumption could possibly be reduced by 9% in 1985 (FEA 1977). Energy efficiency improvement measures available for use in existing commercial and industrial buildings include the installation of heat recuperation equipment that can yield a 20% gas saving in terms of space heating (FPC 1974). Substantial gas savings could also be achieved in industry by adding insulation to furnaces, monitoring boiler efficiency and adding sophisticated controls and energy monitoring equipment.

Conservation Efforts by Algonquin Gas and Its Customers

As a gas transmission company, Algonquin Gas has a limited capability to directly reduce gas consumption. It has cut gas use in its buildings and facilities by reducing thermostats and adding additional insulating materials (Jaques 1976a). The primary opportunity to conserve gas, however, rests with the ultimate end users of gas supplied by Algonquin Gas. Each of Algonquin Gas' utility company customers has implemented a program to promote energy conservation. Some of the actions taken by these firms include the following:

- repair of leaks in gas distribution systems and replacement of obsolete equipment;
- conservation efforts in company-owned facilities;

- television, radio, and newspaper advertisements on the benefits of and methods for conserving gas;
- distribution and tabulation of conservation questionnaires to residential, commercial, and industrial customers to (1) identify the feasibility and appropriateness of various conservation efforts and (2) design a program in response to these identified needs;
- initiation of programs involving free or low-cost checks and adjustments to heating and ventilating equipment;
- lectures and film presentations at various public forums and
- preparation and distribution of "do-it-yourself" pamphlets and brochures for homeowners.

Feasibility of Conservation

The potential for long-term gas savings through conservation is substantial. However, a number of economic and motivational barriers together or separately limit the feasibility of achieving significant gas savings in the near-term (by 1980). Most conservation activities require that either a capital investment or a comfort-related sacrifice be made. Without the availability of proper and sufficient incentives, certain conservation investments can represent a poor investment choice.

A potential supply problem also exists, particularly with home insulation. Insulation shortages are commonly found in many parts of the country. Even if aggressive expansion on the part of manufacturers were to occur, it would not be expected to ease the growing supply problem for at least 12 to 18 months (Wall Street Journal 1977). In view of these constraints, the feasibility of conservation as a means of offsetting projected near-term gas shortfalls in the service area is questionable. These gas deficits are expected to occur in spite of conservation programs. The longer-term implications of the conservation alternative are certainly more positive. While conservation should be encouraged, it cannot be considered sufficiently reliable to be a complete and viable alternative. Conservation can be made a more attractive and reliable option when combined with other alternatives, such as conversion from gas to coal or electricity.

Environmental Effects

Using conservation as an alternative to the production of SNG may have both positive and negative effects on local and regional environmental quality. If less gas were consumed in 1980 compared to the base period, fewer air contaminants would be emitted. On the other hand, conservation could also have several negative ramifications. Economic costs associated with conservation include (1) costs of purchasing new equipment or modifying old equipment and (2) costs associated with temporary shutdowns required for equipment installation or modification. While some of these costs will eventually be offset by annual gas savings, conservation may still represent an uneconomical investment to some user groups, for rates of return and length of payback periods are both integral parts of the investment decision. A strong emphasis on gas conservation may induce certain users to switch fuels. If fuel switching were to occur, additional environmental impacts would probably result. The magnitude of these impacts depends on the extent to which fuel switching occurs and the specific alternative fuels used.

8.2.2 Pricing Policies

Another potential approach to decreasing gas use in an effort to offset the effects of curtailments is to modify the rate structure. By pricing gas at a level that discourages wasteful and uneconomic use and encourages conservation, total gas consumption could be decreased.

Current Rate Structure of Algonquin Gas

Algonquin Gas basically sells its pipeline gas using a demand/commodity rate structure as specified in Rate Schedule F-1, General Service (firm) of its FERC Gas Tariff. Under the demand/commodity structure, there is an initial charge representing the portion of the equipment required during the system's period of peak use (the demand charge) and a second charge for the actual quantity of gas delivered (the commodity charge). This latter charge is made only on a flat-rate basis. From November 16 through April 15, Algonquin Gas also sells

pipeline gas on a strictly flat-rate basis under the terms of Rate Schedule WS-1, Winter Service. The rate structures of Algonquin Gas' utility company customers are unknown and probably vary between customers and states. The SNG sold by Algonquin Gas is priced incrementally on a demand/commodity basis under Rate Schedule SNG-1 as specified in the FERC-approved tariff. Utility companies pay a rate for SNG that is substantially higher than the rate for pipeline gas. These utility companies, however, roll-in the costs of the SNG; that is, they do not price it incrementally, but rather pass on the SNG's higher cost by averaging the costs of all its supplies on a weighted basis.

Alternative Pricing Policies

Algonquin Gas could substitute three alternative pricing systems for its predominantly demand/commodity structure: the flat rate, the declining block rate and/or the inverted block rate. An FEA analysis of rate structures concluded that the declining block rate is the least favorable structure because it encourages the wasteful use of gas by allowing costs to the user to decline with additional consumption. As for the other pricing options, the FEA analysis indicated that the inverted block and the demand/commodity rates are superior to the flat-rate schedule. According to the FEA, "the flat rate does not reflect the varying cost of different gas supplies and can disguise the real cost of the incremental demand, especially during peak-demand periods" (FEA 1977). Passing on the higher incremental costs of SNG to ultimate end users would theoretically reduce consumption.

Environmental Impact of Alternative Rate Structures

The potential environmental impacts that could result from a rate structure change are discussed in FEA's Final Programmatic EIS on the Allocation of SNG Feedstocks, August 1977. This report indicates that the probable impacts would be a consequence of both the net reduction in total gas consumption and SNG production. These impacts would include the following.

Reductions in air pollution would likely result from a reduction in gas consumption. Provided that fuel switching did not take place, the net reduction in air pollution would be directly proportional to the amount by which gas consumption was reduced. However, if gas prices were raised to a level that made oil or coal more profitable, either little change or net increases in air pollution could occur. If demand reductions eliminate the need to construct or operate SNG plants, other positive environmental impacts (including reductions in air and water pollution emissions from such facilities) would occur (FEA 1977).

Although a modified rate structure could have fewer negative environmental consequences than those expected to occur under the proposed action, an additional limitation must be considered. While changes in state or federal laws might not be necessary for rate restructuring (FEA 1977), necessary studies and hearings could involve several years of delay. In the meantime, gas shortages would continue. On the basis of these considerations, a change in the current rate structure would probably have little effect in offsetting the short-term (about 1980) gas shortages projected for the area served by Algonquin Gas' customers. While gas companies should be encouraged to price their gas in a manner that discourages inefficient use, whether changes in pricing policy could provide an effective and reliable substitute to the continued operation of the SNG plant is doubtful.

8.3 Alternative Feedstocks

The Freetown SNG plant was not designed for feedstocks other than naphtha. Estimates of conversion costs to modify the plant for other feedstocks are as follows:

- liquid petroleum gas (LPG): \$5-7 million;
- natural gas liquids (NGL): \$10-20 million;
- Methanol:
 - @ 50% current capacity: \$8-12 million and
 - @ Current capacity: \$30-50 million (Kane 1977b)

These cost estimates suggest that Algonquin Gas would have to obtain FERC's approval for new SNG rates in order to pass on costs to customers. A number of other considerations concerning alternative feedstocks include: (1) uncertainty about supplies of such feedstocks, (2) the downtime required to convert the plant and (3) the lack of any apparent environmental or economic advantages.

9. SUMMARY OF CONSIDERATIONS OFFSETTING ADVERSE EFFECTS
OF THE PROPOSED (100%) ALLOCATION

The summary of unavoidable adverse impacts in Section 5 indicates that the proposed allocation (100%) has the least potential for causing negative impacts. Since this alternative would permit the Freetown plant to operate at the same production level as during the 1976-77 heating season, no incremental environmental effects on the site and adjacent area would occur. While reduced allocations might generate decreases in the SNG plant's emissions of air and water pollutants, this potential benefit may be more than offset by the possibility of adverse environmental and economic effects in the regions served by Algonquin Gas' utility company customers.

Available information suggests that the proposed action would help to minimize the economic dislocation and increased air pollution that would otherwise be caused by additional projected pipeline gas curtailments. The SNG produced at the Freetown plant would partially offset these expected future pipeline gas shortages and, therefore, fewer end users would be faced with the difficult choice of switching to alternative fuels or closing down operations. Thus, the proposed action could:

- 1) help prevent industrial and commercial users from having to expend funds for fuel switching;
- 2) limit the further deterioration of regional air quality, which would occur as a result of fuel substitution and
- 3) minimize the possibility of plant closings and associated layoffs.

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APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION INVENTORY

FORM FOR ARCHAEOLOGICAL SITE

ON ALGONQUIN SNG PLANT SITE

Archaeological and Historic Sites - Form D
MASSACHUSETTS HISTORICAL COMMISSION
Office of the Secretary, State House, Boston

I. Town/City Freetown

II. Location: MAS# 74 USGS Assonet

III. OWNER

A. Private ☒ Federal
State Local (Town, etc.)

B. Available for investigation ☒
Not available for investigation

IV. CULTURAL PERIOD

A. Prehistoric-Aboriginal ☒
1. Paleoindian
2. Archaic ☒
3. Woodland-Ceramic ☒
4. Unknown

B. Historic
1. Aboriginal - Contact
2. European - Colonial - Modern
Historic Themes

Agriculture Literature
Architecture Local Development
Art/Sculpture Military Affairs
Commerce/Industry Music
Education Religion/Philosophy
Government Science/Invention
Travel/Communications

Description of Historic Importance

V. VALUE

A. Permanent
1. National
2. State
3. Local

B. Transitory ☒

VI. IMPORTANCE

A. Known

B. Unknown ☒

Explain The Peace Haven Site. Probably not all occupied at the same time/ Archaic traits appear over the whole while the Woodland-Ceramic is restricted to a few comparatively small areas. No excavation has ever been done here but there has been much surface collecting. 2496 artifacts are in the Athearn collection at 5105 No. Main St. Fall River Mass.

VII. RESEARCH: Advanced ☒ Initiated Possible

VIII. ESTIMATED TIME NEEDED FOR RESEARCH:

IX. RECORDS Location record at Bronson Museum, Attleboro. M39-SE
DOCUMENTATION

X. IF SITE IS NOT RECORDED BY MAS, GIVE DETAILS OF EXACT LOCATION.

Freetown Mass. A large area of farm land (about 20 acres) sloping southwest to the Taunton River opposite the village of Somerset. About 1 mile south of the mouth of Assonet River.

Original Recorder R.C.Athearn
For Mass. Arch. Soc. (Organization)
Date 11/17/67 File Date 11/17/67

APPENDIX B

CURRENT AND PROJECTED END-USE DATA BY ALLOCATION ALTERNATIVE
FOR THE 1976-77, 1978-79 AND 1980-81 PLANT OPERATING SEASONS

The attached information was submitted by Algonquin Gas Transmission Company on 19 January 1978. End-use profiles were prepared for the most recent complete SNG plant operating season, 1976-77, for which data was available, and by allocation alternative for each of two future seasons, 1978-79 and 1980-81. An explanation of the methods used to develop these end-use profiles precede the tabular data.

The statistics in Tables 1, 2 and 3 have been modified to reflect the fact that no SNG was actually used by customers in FERC Priority-of-Service Categories 6 through 9 nor are any such sales anticipated in the future. This is the only modification of the data as submitted by Algonquin Gas.

Algonquin Gas Transmission CompanySNG Market

Algonquin Gas Transmission Company ("Algonquin Gas") purchases synthetic gas from its subsidiary, Algonquin SNG, Inc. ("Algonquin SNG") and resells it on an incremental basis to various distribution companies and communities in New Jersey, New York, Connecticut, Massachusetts and Rhode Island. All of Algonquin Gas' customers have additional sources of gas supply such as liquefied natural gas ("LNG"), propane, synthetic natural gas ("SNG") other than from Algonquin Gas and other pipeline suppliers. Therefore, no customer of Algonquin Gas is fully dependent upon Algonquin Gas for its entire gas supply.

By offering to sell the SNG on an incremental basis, Algonquin Gas gave each customer the opportunity to assess its own individual situation and to purchase the quantity of SNG which would best fulfill its needs. Some customers purchased SNG only to make up for part or all of the projected curtailment of pipeline gas while other customers purchased SNG not only to offset pipeline curtailment but to also reduce their reliance on other sources of gas supply.

As can be seen from the attached schedules, the majority of requirements in Algonquin Gas' market area during the base period (i.e., 12 months ended April 30, 1973) for which the information was obtained are high-priority requirements. Algonquin Gas' customers have no requirements in priorities 4 and 5 and their requirements from Algonquin Gas during the SNG season by priority are as follows:

<u>Priority</u>	<u>Quantity</u> (MMBtu)	<u>Percent</u>
1	64,023,736	84.3
2	10,949,377	14.4
3	557,480	0.7
4	-0-	0.0
5	-0-	0.0
6	61,795	0.1
7	195,532	0.2
8	75,642	0.1
9	<u>120,826</u>	<u>0.2</u>
Total	75,984,388	100.0

The obtaining of this end-use data by Algonquin Gas from its customers took over one year and, although Algonquin Gas has not obtained updated end-use profiles from its customers, some information as to the type of markets being served has been obtained. By letters dated March 4, 1977, and July 29, 1977, to Mr. George E. Hall, Jr., Director, Product Allocations, Algonquin Gas obtained responses from its customers to certain information requested by Mr. Hall's letter of January 21, 1977. As part of the information supplied, Algonquin Gas' customers indicated that, generally, they are not serving retail customers in FPC priorities 3 through 9, nor will such customers be served in the future, during the SNG season. The individual letters from Algonquin Gas' customers should be considered in evaluation the environmental impact of full SNG sales in the areas served by each of these customers.

Requirements

The requirements as set forth on the attached schedules were based on data obtained by Algonquin Gas from its customers in response to the Texas Eastern Data Verification Questionnaire dated February 22, 1974, in Docket Nos. RP71-130, et al. As part of the response, Algonquin Gas obtained end-

use profiles from each of its large customers (MDQ's in excess of 10,000 MMBtu per day) based on actual sales by month for the 12 months ended April 30, 1973, adjusted for normal weather, and end-use profiles from each of its small customers (MDQ's of less than 10,000 MMBtu per day) based on actual sales, by month, for the 12 months ended April 30, 1973, based on actual weather. These end-use profiles were prorated downward to reflect the sales by each customer attributable to Algonquin Gas. Algonquin Gas also obtained end-use profiles from each of its customers, by month, which sets forth, by priority of service, how each customer would have used the quantities of gas which Algonquin Gas could have made available if Algonquin Gas had not been curtailed by Texas Eastern Transmission Corporation ("Texas Eastern").

Algonquin Gas then added these two profiles together for each customers to obtain, by priority of service, how the total quantities of gas would have been utilized if Algonquin Gas received its full contract entitlement from Texas Eastern. Algonquin Gas then took the monthly requirements for the winter period, i.e., November through March, adjusted to a pressure base of 14.73 psia from 15.025 psia, as the total requirement from Algonquin Gas, by customer, during the SNG season. These total requirements were held constant for each of the analysis periods.

Pipeline Supply

The supply of pipeline gas projected to be available to Algonquin Gas from its sole supplier, Texas Eastern, was obtained from Texas Eastern's latest Form 15 which was filed with the Federal Energy Regulatory Commission in April, 1977. Texas Eastern's Form 15 contains the projected annual requirements, supply and deficiency on the Texas Eastern system. Algonquin

Gas calculated the average day deficiency for the Texas Eastern system for each month of the future analysis periods and, by comparing Algonquin Gas' end-use profile with the profiles of all customers of Texas Eastern, calculated the projected curtailment to Algonquin Gas for each month. Algonquin Gas then calculated the curtailment to each of its customers utilizing each customer's end-use profile and the procedures set forth in Section 14 under the General Terms and Conditions of Algonquin Gas' FERC Gas Tariff, First Revised Volume No. 1.

Method of Allocation

Using the curtailments derived above for each customer and applying it to the end-use profile which would have resulted if Algonquin Gas had received its full entitlement from Texas Eastern, the curtailed quantities for each customer were first allocated to the requirements set forth in priority 9, and were continued to be allocated to the remaining priorities in ascending order until the entire curtailed quantities were allocated.

The quantities of SNG available at each level of naphtha allocation were then allocated on a customer-by-customer basis to the highest priority up to that customer's requirement in each category and were continued to be allocated to the outstanding requirements in other categories in descending order until the entire quantities of SNG had been allocated. If, after allocating the available SNG to the total requirements up to the curtailed quantities, there remained quantities of SNG still unallocated, such quantities were then classified as "offset to other supplies". These quantities are available to reduce each customer's reliance on supplemental supplies or to offset curtail-

ment from other pipeline suppliers. It is assumed that these quantities are part of their overall system supply and, since their requirements from Algonquin Gas are in proportion to each customer's total requirements, they would be used in proportion to such requirements.

TABLE 1

ALGONQUIN GAS TRANSMISSION COMPANY
1976-77 ACTUAL SNG SALES (MMBtu)

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	Priority 6	Priority 7	Priority 8	Priority 9	Total - All Categories	Offset to Other Supplies
<u>Bay State</u>											
Requirements	5 293 319	674 369	-	-	-	-	-	-	-	5 968 288	
Curtailement	(476 227)	(674 369)	-	-	-	-	-	-	-	(1 150 596)	
SNG	476 227	674 369								1 150 596	1 265 404
Total Sales	5 293 919	674 369								5 968 288	
<u>Boston Gas Co.</u>											
Requirements	18 379 671	2 657 430	-	-	-	-	-	56 572	-	21 093 673	
Curtailement	(349 162)	(2 657 430)	-	-	-	-	-	(56 572)	-	(3 063 164)	
SNG	349 162	1 591 293	-	-	-	-	-	-	-	1 940 455	-
Total Sales	18 379 671	1 591 293						-0-		19 970 964	-
<u>Central and Warren</u>											
Requirements	303 488	3 487	-	-	-	-	-	-	-	306 975	
Curtailement	(51 314)	(3 487)	-	-	-	-	-	-	-	(54 801)	
SNG	51 314	3 487	-	-	-	-	-	-	-	54 801	35 799
Total Sales	303 488	3 487								306 975	
<u>Cape Cod Gas</u>											
Requirements	1 779 423	170 445	-	-	-	-	-	-	-	1 949 928	
Curtailement	(163 146)	(170 445)	-	-	-	-	-	-	-	(333 591)	
SNG	163 146	170 445	-	-	-	-	-	-	-	333 591	276 653
Total Sales	1 779 423	170 445								1 949 928	
<u>Comingsworth & Co.</u>											
Requirements	7430 398	850 871	111 771	-	-	-	165 677	-	-	8 558 717	
Curtailement	(729 694)	(850 871)	(111 771)	-	-	-	(165 677)	-	-	(1 858 013)	
SNG	729 694	720 306	-	-	-	-	-	-	-	1 510 000	-
Total Sales	7430 398	720 306	-0-				-0-			8 210 704	
<u>The Connecticut Gas Co.</u>											
Requirements	5 106 897	2 376 014	46 199	-	-	-	-	-	-	7 529 110	
Curtailement	-	(2 112 651)	(46 199)	-	-	-	-	-	-	(2 158 850)	
SNG	-	2 112 651	46 199	-	-	-	-	-	-	2 158 850	340 025
Total Sales	5 106 897	2 376 014	46 199							7 529 110	
<u>Connetquot Natural</u>											
Requirements	5 265 712	679 566	94 756	-	-	-	-	-	-	6 060 039	
Curtailement	-	(529 492)	(94 756)	-	-	-	-	-	-	(624 254)	
SNG	-	529 492	94 756	-	-	-	-	-	-	624 254	852 842
Total Sales	5 265 712	529 492	94 756							6 060 039	

649 566

TABLE 1 CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total - All Categories	Offset to Owner/Supplier
Fall River Gas Co									
Requirements	2312276	233373	-	-	-	-	-	2545649	
Curtailement	(226696)	(233373)	-	-	-	-	-	460069	
SIG	226696	233373	-	-	-	-	-	460069	631462
Total Sales	2312276	233373						2545649	
The Hartford Electric Light Co									
Requirements	497697	29913	-	2413	-	-	-	530023	
Curtailement	-	(6262)	-	(2413)	-	-	-	(8675)	
SIG	-	6262	-	-	-	-	-	6262	144738
Total Sales	497697	29913		-0-				527610	
Town of Milford									
Requirements	102793	31388	-	-	-	-	-	134181	
Curtailement	-	(11407)	-	-	-	-	-	(11407)	
SIG	-	11407	-	-	-	-	-	11407	18793
Total Sales	102793	31388						134181	
New Bedford Gas									
Requirements	3173967	178382	48438	9813	-	-	-	3510600	
Curtailement	(146092)	(178382)	(148438)	(9813)	-	-	-	(482725)	
SIG	146092	178382	148438	-0-	-	-	-	472912	282088
Total Sales	3173967	178382	148438	-0-				3500787	
New Jersey Natural									
Requirements	822649	139837	3024	4722	-	4869	-	975301	
Curtailement	-	(107238)	(3024)	(4722)	-	(4869)	-	(122653)	
SIG	-	107238	3024	-	-	-	-	112862	503663
Total Sales	822649	139837	3024	-0-		-0-		965510	
North Milford									
Requirements	126818	8513	-	-	-	-	-	135331	
Curtailement	(13378)	(8513)	-	-	-	-	-	(21891)	
SIG	12080	-	-	-	-	-	-	12080	-
Total Sales	125520	-0-						125520	
City of Norwich, CT									
Requirements	580649	136653	-	-	-	-	-	717302	
Curtailement	(1243)	(136653)	-	-	-	-	-	(137696)	
SIG	1243	29157	-	-	-	-	-	30200	-
Total Sales	580649	29157						609806	

TABLE 1 CONTINUED.

	Priority 1			Priority 2			Priority 3			Priority 4			Priority 5			Priority 6			Priority 7			Priority 8			Priority 9			23 Total - All Categories		Offset to Other Supplies	
Orange & Rockland																															
Requirements	427	837		37	458		54	365		26	559		29	855		14	201		120	826					711	101					
Curtailement	-			-			(21)	779		(26)	559		(29)	855		(14)	201		(120)	826					(213)	220					
SNL	-			-				21	779																21	779		431	221		
Total Sales	427	837		37	458		54	365		- 0 -			- 0 -			- 0 -			- 0 -						519	660					
The Pequot Gas Co.																															
Requirements	74	806		15	929		-			-			-			-			-						90	735					
Curtailement	(20)	351		(15)	929		-			-			-			-			-						(36)	280					
SNL	20	351		15	929		-			-			-			-			-						30	200		-			
Total Sales	74	806		15	929																				84	655					
Providence Gas Co.																															
Requirements	7	802	652	1	706	579		84	954		2	912		-		-		-		-					9	597	097		-		
Curtailement	(2)	504	443	(1)	706	579		(84)	954		(2)	912		-		-		-		-					(2)	044	888		-		
SNL	2	504	443	1	706	579		84	954					-		-		-		-					2	015	487		-		
Total Sales																															
South County Gas Co.																															
Requirements	180	609		11	712		5	310		-			-			-		-		-					197	631					
Curtailement	(29)	487		(11)	712		(5)	310		-			-			-		-		-					(46)	509					
SNL	29	487		11	712		5	310		-			-			-		-		-					45	300		-			
Total Sales	180	609		11	712		5	310																	146	432					
Southern Conn. Gas Co.																															
Requirements	4	334	844	987	458		8	663		15	176		-			-		-		-					5	346	141				
Curtailement	(1)	79	342	(987)	458		(8)	663		(15)	176		-			-		-		-					(1)	190	639				
SNL	1	79	342	987	458		8	663					-			-		-		-					1	175	463		694	549	
Total Sales	4	334	844	987	458		8	663		- 0 -															5	332	965				
Tiverton																															
Requirements	26	566		-			-			-			-			-		-		-					26	566					
Curtailement	(8)	780		-			-			-			-			-		-		-					(8)	780					
SNL	8	780		-			-			-			-			-		-		-					6	795		-			
Total Sales	24	581																							24	581					
Total - All Customers																															
Requirements	64	023	736	10	949	377	557	480		61	795		195	532		75	642		120	826					75	984	388				
Curtailement	(2)	645	155	(10)	404	857	(524)	894		(61)	795		(195)	532		(75)	642		(120)	826					(14)	028	701				
SNL	2	645	155	10	404	857	524	894																	12	173	363		5	492	237
Total Sales	64	023	736	10	949	377	557	480		- 0 -			- 0 -			- 0 -		- 0 -		- 0 -					74	129	050				

TABLE 2A

ALGONQUIN GAS TRANSMISSION COMPANY

1978-79 AT 100% SNG

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
<u>Bay State Gas</u>									
Requirements	5 293 919	674 369	-	-	-	-	-	5 968 288	
Curtailement	(520 410)	(674 369)	-	-	-	-	-	(1 194 779)	
SNG	520 410	674 369	-	-	-	-	-	1 194 779	1 523 221
TOTAL SALES	5 293 919	674 369						5 968 288	
<u>Boston Gas Co.</u>									
Requirements	18 379 671	2 657 430	-	-	-	56 572	-	21 093 673	
Curtailement	(2 176 414)	(2 657 430)	-	-	-	(56 572)	-	(4 890 416)	
SNG	1 812 000	-	-	-	-	-	-	1 812 000	-
TOTAL SALES	18 015 257	- 0 -				- 0 -		18 015 257	
<u>Bristol and Warren</u>									
Requirements	303 488	3 487	-	-	-	-	-	306 975	
Curtailement	(49 674)	(3 487)	-	-	-	-	-	(53 161)	
SNG	49 674	3 487	-	-	-	-	-	53 161	37 439
TOTAL SALES	303 488	3 487						306 975	
<u>Cape Cod Gas</u>									
Requirements	1 779 483	170 445	-	-	-	-	-	1 949 928	
Curtailement	(167 564)	(170 445)						(338 009)	
SNG	167 564	170 445						338 009	239 830
TOTAL SALES	1 779 483	170 445						1 949 928	
<u>Commonwealth Gas</u>									
Requirements	7 430 398	850 871	111 771	-	165 677	-	-	8 558 717	
Curtailement	(778 217)	(850 871)	(111 771)		(165 677)			(1 906 536)	
SNG	778 217	850 871	111 771					1 740 859	71 141
TOTAL SALES	7 430 398	850 871	111 771		- 0 -			8 393 040	
<u>The Connecticut Gas Co.</u>									
Requirements	5 106 897	2 376 014	46 199	-	-	-	-	7 529 110	
Curtailement	(442 073)	(2 376 014)	(46 199)					(2 864 286)	
SNG	442 073	1 973 927	-	-				2 416 000	-
TOTAL SALES	5 106 897	1 973 927	- 0 -					7 080 824	
<u>Connecticut Natural</u>									
Requirements	5 265 717	699 566	94 756	-	-	-	-	6 060 039	
Curtailement	(585 637)	(699 566)	(94 756)					(1 379 959)	
SNG	585 637	699 566	94 756					1 379 959	232 872
TOTAL SALES	5 265 717	699 566	94 756					6 060 039	

TABLE 2A CONTINUED

	Priority 1		Priority 2		Priority 3		Priority 6		Priority 7		Priority 8		Priority 9		Total		Offset to Other Supplies
<u>Fall River Gas Co</u>																	
Requirements	2	312 276	233	373	-	-	-	-	-	-	-	-	-	-	2	545 649	
Curtailement	(233	785)	(233	373)											(467	158)	
SNCG	233	785	233	373	-	-	-	-	-	-	-	-	-	-	467	158	589 842
TOTAL SALES	2	312 276	233	373											2	545 649	
<u>The Hartford Elect. Light Co</u>																	
Requirements	497	697	29	913	-	-	2	413	-	-	-	-	-	-	530	023	
Curtailement	(54	215)	(29	913)			(2	413)							(86	541)	
SNCG	54	215	29	913											84	128	66 872
TOTAL SALES	497	697	29	913			-0-								527	610	
<u>Town of Middleborough</u>																	
Requirements	102	793	31	388	-	-	-	-	-	-	-	-	-	-	134	181	
Curtailement	(8	120)	(31	388)											(39	508)	
SNCG	8	120	22	080											30	200	-
TOTAL SALES	102	793	22	080											124	873	
<u>New Bedford Gas</u>																	
Requirements	3	173 867	178	382	148	438	9	813	-	-	-	-	-	-	3	510 600	
Curtailement	(277	320)	(178	382)	(148	438)	(9	813)							(613	953)	
SNCG	277	320	178	382	148	438									604	140	452 860
TOTAL SALES	3	173 867	178	382	148	438	-0-								3	500 787	
<u>New Jersey Natural</u>																	
Requirements	822	649	139	897	3	024	4	922	-	-	4	869	-	-	975	301	
Curtailement	-		(125	400)	(3	024)	(4	922)			(4	869)			(138	215)	
SNCG	-		26	425	-	-	-	-			-	-			26	425	-
TOTAL SALES	822	649	40	862	-0-	-0-					-0-				863	511	
<u>North Attleboro Gas</u>																	
Requirements	126	818	8	513	-	-	-	-	-	-	-	-	-	-	135	331	
Curtailement	(13	636)	(8	513)											(22	149)	
SNCG	13	590	-												13	590	-
TOTAL SALES	126	772	-0-												126	770	
<u>City of Norwich, CT</u>																	
Requirements	580	649	136	653	-	-	-	-	-	-	-	-	-	-	717	302	
Curtailement	(50	539)	(136	653)											(187	192)	
SNCG	30	200	-												30	200	-
TOTAL SALES	580	310	-0-												580	310	

TABLE 2A CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
<u>Orange & Rockland</u>											
Requirements	427 837	37 458	54 365	26 559	29 855	14 231	120 826	711 101			
Curtailement	-	(4 446)	(54 365)	(26 559)	(29 855)	(14 201)	(120 826)	(250 246)			
SNG	-	4 440	54 365	-	-	-	-	58 805			394 195
TOTAL SALES	427 837	37 458	54 365	-0-	-0-	-0-	-0-	519 660			
<u>The Regvot Gas Co.</u>											
Requirements	74 806	15 929	-	-	-	-	-	90 735			
Curtailement	(5 721)	(15 929)	-	-	-	-	-	(21 650)			
SNG	5 721	15 929	-	-	-	-	-	21 650			8 550
TOTAL SALES	74 806	15 929	-	-	-	-	-	90 735			
<u>Providence Gas Co.</u>											
Requirements	7 802 652	1 706 579	84 954	2 912	-	-	-	9 597 097			
Curtailement	(656 038)	(1 706 579)	(84 954)	(2 912)	-	-	-	(2 450 483)			
SNG	656 038	1 337 162	-	-	-	-	-	1 993 200			-
TOTAL SALES	7 802 652	1 337 162	-0-	-0-	-	-	-	9 139 814			
<u>South County Gas Co.</u>											
Requirements	180 609	11 712	5 310	-	-	-	-	197 631			
Curtailement	(20 760)	(11 712)	(5 310)	-	-	-	-	(37 782)			
SNG	20 760	11 712	5 310	-	-	-	-	37 782			7 518
TOTAL SALES	180 609	11 712	5 310	-	-	-	-	197 631			
<u>Southern Conn. Gas</u>											
Requirements	4 334 844	987 458	8 663	15 176	-	-	-	5 346 141			
Curtailement	(388 591)	(987 458)	(8 663)	(15 176)	-	-	-	(1 399 888)			
SNG	388 591	987 458	8 663	-	-	-	-	1 384 712			427 288
TOTAL SALES	4 334 844	987 458	8 663	-0-	-	-	-	5 330 965			
<u>Tiverton Gas Co.</u>											
Requirements	26 566	-	-	-	-	-	-	26 566			
Curtailement	(3 092)	-	-	-	-	-	-	(3 092)			
SNG	3 092	-	-	-	-	-	-	3 092			6 723
TOTAL SALES	26 566	-	-	-	-	-	-	26 566			
<u>Total</u>											
Requirements	64 023 736	10 949 377	557 480	61 795	195 532	75 642	120 826	75 984 388			
Curtailement	(6 431 806)	(10 901 922)	(557 480)	(61 795)	(195 532)	(75 642)	(120 826)	(18 345 003)			
SNG	6 047 007	7 219 539	423 303	-	-	-	-	13 689 849			4 158 351
TOTAL SALES	63 638 937	7 266 994	423 303	-0-	-0-	-0-	-0-	71 329 234			

TABLE 2B

ALGONQUIN GAS TRANSMISSION COMPANY

1978-79 AT 87% SNG

	Priority 1			Priority 2			Priority 3			Priority 6			Priority 7			Priority 8			Priority 9			Total			Offset to Other Supplies	
Bay State Gas																										
Requirements	5	293	919	674	369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	968	288		
Curtailment	(520)	410		(674)	369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1	194	779		
SNG		520	410		674	369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	194	779	1	169 881
TOTAL SALES	5	293	919	674	369																	5	968	288		
Boston Gas Co																										
Requirements	18	379	671	265	7430	-	-	-	-	-	-	-	-	-	-	56	572	-	-	-	-	21	093	673		
Curtailment	(2	176	414)	(265	7430)	-	-	-	-	-	-	-	-	-	-	(56	572)	-	-	-	-	(4	890	416)		
SNG		1	576	440	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	576	440	-	
TOTAL SALES	17	779	697	-	0	-										-	0	-				17	779	697		
Bristol and Warren																										
Requirements		303	488		348	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	306	975			
Curtailment		(49	674)		(348	7)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(53	161)			
SNG			49	674		348	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	161	25	661	
TOTAL SALES		303	488		348	7																306	975			
Cap Cod Gas																										
Requirements		1	779	483		170	445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	949	928		
Curtailment		(167	564)		(170	445)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(338	009)			
SNG			167	564		170	445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	338	009	251	711	
TOTAL SALES		1	779	483		170	445															1	949	928		
Commonwealth Gas																										
Requirements		7	430	398		850	871		111	771	-	-	165	677	-	-	-	-	-	-	-	8	558	717		
Curtailment		(778	217)		(850	871)		(111	771)	-	-	-	(165	677)	-	-	-	-	-	-	-	(1	906	536)		
SNG			778	217		798	223		-	-	-	-	-	-	-	-	-	-	-	-	-	1	576	440	-	
TOTAL SALES		7	430	398		798	223	-	0	-			-	0	-							8	558	717		
The Connecticut Gas Co																										
Requirements		5	106	897		2376	014		46	199	-	-	-	-	-	-	-	-	-	-	-	7	529	110		
Curtailment		(442	073)		(2376	014)		(46	199)	-	-	-	-	-	-	-	-	-	-	-	-	(2	864	286)		
SNG			442	073		1659	847		-	-	-	-	-	-	-	-	-	-	-	-	-	2	101	920	-	
TOTAL SALES		5	106	897		1659	847	-	0	-												6	766	744		
Connecticut Natural																										
Requirements		5	265	717		699	566		94	756	-	-	-	-	-	-	-	-	-	-	-	6	060	039		
Curtailment		(585	637)		(699	566)		(94	756)	-	-	-	-	-	-	-	-	-	-	-	-	(1	379	959)		
SNG			585	637		699	566		94	756	-	-	-	-	-	-	-	-	-	-	-	1	379	959	23	204
TOTAL SALES		5	265	717		699	566		94	756												6	060	039		

TABLE 2B CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplier
Fall River Gas Co									
Requirements	2312276	233373	-	-	-	-	-	2545649	
Curtailment	(233785)	(233373)	-	-	-	-	-	(467158)	
SNG	233785	233373	-	-	-	-	-	467158	452432
TOTAL SALES	2312276	233373						2545649	
The Hartford Electric									
Requirements	497697	29913	-	2413	-	-	-	530023	
Curtailment	(54215)	(29913)	-	(2413)	-	-	-	(86541)	
SNG	54215	29913	-		-	-	-	84128	47242
TOTAL SALES	497697	29913		-0-				527610	
Town of Middleboro									
Requirements	102793	31388	-	-	-	-	-	134181	
Curtailment	(8120)	(31388)	-	-	-	-	-	(39508)	
SNG	8120	18154	-	-	-	-	-	26274	-
TOTAL SALES	102793	18154						120947	
New Bedford Gas									
Requirements	3173967	178382	148438	9813	-	-	-	3510600	
Curtailment	(277320)	(178382)	(148438)	(9813)	-	-	-	(613953)	
SNG	277320	178382	148438					604140	315450
TOTAL SALES	3173967	178382	148438	-0-				3500787	
New Jersey Natural									
Requirements	822649	139837	3024	4922	-	4869	-	975301	
Curtailment	-	(125400)	(3024)	(4922)	-	(4869)	-	(138215)	
SNG	-	22990	-	-	-	-	-	22990	-
TOTAL SALES	822649	37427	-0-	-0-		-0-		860076	
North Attleboro									
Requirements	126818	8513	-	-	-	-	-	135331	
Curtailment	(13636)	(2513)	-	-	-	-	-	(22149)	
SNG	11823	-	-	-	-	-	-	11823	-
TOTAL SALES	125005	-0-						125005	
City of Norwich, CT									
Requirements	580649	136653	-	-	-	-	-	717302	
Curtailment	(50539)	(136653)	-	-	-	-	-	(87192)	
SNG	26274	-	-	-	-	-	-	26274	-
TOTAL SALES	556384	-0-						556384	

TABLE 2B CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplier
Orange & Rockland											
Requirements	427 837	37 458	54 365	26 559	29 855	14 201	120 826			711 101	
Curtailement	-	(4 440)	(54 365)	(26 559)	(29 855)	(14 201)	(120 826)			(250 240)	
SAG	-	4 440	54 365							58 805	335 305
TOTAL SALES	427 837	37 458	54 365	-0-	-0-	-0-	-0-	-0-	-0-	519 660	
The Pequot Gas Co.											
Requirements	74 806	15 929	-	-	-	-	-	-	-	90 735	
Curtailement	(5 721)	(15 929)	-	-	-	-	-	-	-	(21 650)	
SAG	5 721	15 929	-	-	-	-	-	-	-	21 650	4 624
TOTAL SALES	74 806	15 929								90 735	
Providence Gas Co.											
Requirements	7 802 652	1 706 579	84 954	29 12	-	-	-	-	-	9 597 097	
Curtailement	(656 038)	(1 706 579)	(84 954)	(29 12)	-	-	-	-	-	(2 450 483)	
SAG	656 038	1 078 046	-	-	-	-	-	-	-	1 734 084	-
TOTAL SALES	7 802 652	1 078 046	-0-	-0-						8 880 698	
South County Gas Co.											
Requirements	180 609	11 712	5 310	-	-	-	-	-	-	197 631	
Curtailement	(20 760)	(11 712)	(5 310)	-	-	-	-	-	-	(37 782)	
SAG	20 760	11 712	5 310	-	-	-	-	-	-	37 782	1 629
TOTAL SALES	180 609	11 712	5 310							197 631	
Southern Conn Gas Co.											
Requirements	4 334 844	987 458	8 663	15 176	-	-	-	-	-	5 346 141	
Curtailement	(328 591)	(987 458)	(8 663)	(15 176)	-	-	-	-	-	(1 399 888)	
SAG	328 591	987 458	8 663	-	-	-	-	-	-	1 384 712	191 728
TOTAL SALES	4 334 844	987 458	8 663	-0-						5 346 141	
Tiverton Gas Co.											
Requirements	26 566	-	-	-	-	-	-	-	-	26 566	
Curtailement	(3 092)	-	-	-	-	-	-	-	-	(3 092)	
SAG	3 092	-	-	-	-	-	-	-	-	3 092	5 447
TOTAL SALES	26 566									26 566	
Total											
Requirements	64 023 736	10 949 377	557 480	61 795	195 532	75 642	120 826	75 984 388			
Curtailement	(6 431 806)	(10 901 922)	(557 480)	(61 795)	(195 532)	(75 642)	(120 826)	(18 345 003)			
SAG	5 805 754	6 586 334	311 532	-	-	-	-	-		12 703 620	2 824 314
TOTAL SALES	63 397 684	6 633 789	311 532	-0-	-0-	-0-	-0-	-0-		70 342 975	

TABLE 2C

ALGOQUIN GAS TRANSMISSION COMPANY

1978-79 AT 49% SNG

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
<u>Bay State Gas</u>									
Requirements	5 293 919	6 74 369	-	-	-	-	-	5 968 288	
Curtailement	(320 410)	(6 74 369)	-	-	-	-	-	(1 194 779)	
SNG	520 410	6 74 369	-	-	-	-	-	1 194 779	137 041
TOTAL SALES	5 293 919	6 74 369						5 968 288	
<u>Boston Gas Co</u>									
Requirements	18 379 671	2 657 430	-	-	-	56 572	-	21 093 673	
Curtailement	(2 176 414)	(2 657 430)	-	-	-	(56 572)	-	(4 890 416)	
SNG	887 880	-	-	-	-	-	-	887 880	-
TOTAL SALES	17 091 137	- 0 -				- 0 -		17 091 137	
<u>Bristol and Warren</u>									
Requirements	303 488	3 487	-	-	-	-	-	306 975	
Curtailement	(49 674)	(3 487)	-	-	-	-	-	(53 161)	
SNG	44 394	-	-	-	-	-	-	44 394	-
TOTAL SALES	298 208	- 0 -						298 208	
<u>Cape Cod Gas</u>									
Requirements	1 779 483	170 445	-	-	-	-	-	1 949 928	
Curtailement	(167 564)	(170 445)	-	-	-	-	-	(338 009)	
SNG	167 564	164 577	-	-	-	-	-	332 141	-
TOTAL SALES	1 779 483	164 577						1 944 060	
<u>Commonwealth Gas Co</u>									
Requirements	7 430 398	850 871	111 721	-	165 677	-	-	8 558 717	
Curtailement	(778 217)	(850 871)	(111 721)	-	(165 677)	-	-	(1 906 536)	
SNG	778 217	109 663	-	-	-	-	-	887 880	-
TOTAL SALES	7 430 398	109 663	- 0 -		- 0 -			7 640 061	
<u>The Connecticut Gas Co</u>									
Requirements	5 106 897	2 376 014	46 179	-	-	-	-	7 529 110	
Curtailement	(442 073)	(2 376 014)	(46 179)	-	-	-	-	(2 864 286)	
SNG	442 073	741 767	-	-	-	-	-	1 183 840	-
TOTAL SALES	5 106 897	741 767	- 0 -					5 848 664	
<u>Connecticut Natural</u>									
Requirements	5 265 717	699 566	94 756	-	-	-	-	6 060 039	
Curtailement	(585 637)	(699 566)	(94 756)	-	-	-	-	(1 379 959)	
SNG	585 637	204 650	-	-	-	-	-	790 287	-
TOTAL SALES	5 265 717	204 650	- 0 -					5 470 367	

TABLE 2C CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
Fall River Gas Co									
Requirements	2312271	233373	-	-	-	-	-	2545649	
Curtailment	(233785)	(233373)	-	-	-	-	-	(467158)	
SNG	233785	233373	-	-	-	-	-	467158	50772
TOTAL SALES	2312271	233373						2545649	
The Hartford Elect. Lgt. Co									
Requirements	497697	29913	-	2413	-	-	-	530023	
Curtailment	(54215)	(29913)	-	(2413)	-	-	-	(86541)	
SNG	54215	19775	-	-	-	-	-	73790	-
TOTAL SALES	497697	19775		-0-				517472	
Town of Middleborough									
Requirements	102793	31388	-	-	-	-	-	134181	
Curtailment	(8120)	(31388)	-	-	-	-	-	(39508)	
SNG	8120	6678	-	-	-	-	-	14798	-
TOTAL SALES	102793	6678						109471	
New Bedford Gas									
Requirements	3173967	178382	148438	9813	-	-	-	3510600	
Curtailment	(277320)	(178382)	(148438)	(9813)	-	-	-	(613953)	
SNG	277320	178382	62228	-	-	-	-	517930	-
TOTAL SALES	3173967	178380	62228	-0-				3714577	
New Jersey Natural									
Requirements	822649	139837	3024	4922	-	4869	-	975301	
Curtailment	-	(125400)	(3024)	(4922)	-	(4869)	-	(138215)	
SNG	-	12948	-	-	-	-	-	12948	-
TOTAL SALES	822649	27385	-0-	-0-		-0-		850034	
North Attleboro Gas									
Requirements	126818	8513	-	-	-	-	-	135331	
Curtailment	(13636)	(8513)	-	-	-	-	-	(22149)	
SNG	6659	-	-	-	-	-	-	6659	-
TOTAL SALES	119841	-0-						119841	
City of Norwich, CT									
Requirements	580649	136653	-	-	-	-	-	717302	
Curtailment	(50539)	(136653)	-	-	-	-	-	(187192)	
SNG	14798	-	-	-	-	-	-	14798	-
TOTAL SALES	544908	-0-						544908	

TABLE 2C CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
<u>Orange & Rockland</u>									
Requirements	427 837	37 458	54 365	26 559	29 855	14 221	120 826	711 101	
Curtailement	-	(4 446)	(54 365)	(26 559)	(29 855)	(14 221)	(120 826)	(250 246)	
SNIG	-	4 440	54 365	-	-	-	-	58 805	163 165
TOTAL SALES	427 837	37 458	54 365	-0 -	-0 -	-0 -	-0 -		
<u>The Reguot. Cos Co.</u>									
Requirements	74 806	15 929	-	-	-	-	-	90 735	
Curtailement	(5 721)	(15 929)	-	-	-	-	-	(21 650)	
SNIG	5 721	9 077	-	-	-	-	-	14 798	-
TOTAL SALES	74 806	9 077						83 883	
<u>Providence Cos Co.</u>									
Requirements	7 802 652	1 706 579	84 954	2 912	-	-	-	9 597 097	
Curtailement	(6 56 038)	(1 706 579)	(84 954)	(2 912)	-	-	-	(2 450 483)	
SNIG	6 56 038	320 630	-	-	-	-	-	976 668	-
TOTAL SALES	7 802 652	320 630	-0 -	-0 -				8 123 282	
<u>South County Cos Co.</u>									
Requirements	180 609	11 712	5 310	-	-	-	-	197 631	
Curtailement	(20 760)	(11 712)	(5 310)	-	-	-	-	(37 782)	
SNIG	20 760	1 437	-	-	-	-	-	22 197	-
TOTAL SALES	180 609	1 437	-0 -					182 046	
<u>Southern Conn. Inc.</u>									
Requirements	4 334 844	987 458	8 663	15 176	-	-	-	5 346 141	
Curtailement	(328 591)	(987 458)	(8 663)	(15 176)	-	-	-	(1 399 888)	
SNIG	328 591	499 289	-	-	-	-	-	887 880	-
TOTAL SALES	4 334 844	499 289	-0 -	-0 -				4 834 133	
<u>Tiverton Cos Co.</u>									
Requirements	26 566	-	-	-	-	-	-	26 566	
Curtailement	(3 092)	-	-	-	-	-	-	(3 092)	
SNIG	3 092	-	-	-	-	-	-	3 092	1 718
TOTAL SALES	26 566							26 566	
Total									
Requirements	64 023 736	10 949 377	557 480	61 795	195 532	75 642	120 826	75 984 388	
Curtailement	(6 431 806)	(10 901 922)	(557 480)	(61 795)	(195 532)	(75 642)	(120 826)	(18 345 003)	
SNIG	5 095 274	3 181 055	116 593	-	-	-	-	8 392 922	352 696
TOTAL SALES	62 687 204	3 228 510	116 593	-0 -	-0 -	-0 -	-0 -	66 032 307	

TABLE 3A

ALGONQUIN GAS TRANSMISSION COMPANY

1980-81 AT 100% SNG

	Priority 1			Priority 2			Priority 3			Priority 6			Priority 7			Priority 8			Priority 9			Total			Offset to Other Supplies	
Bay State Gas																										
Requirements	5	293	919	674	369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	968	288		
Curtailement	(1	127	770)	(674	369)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1	802	139)		
SNG	1	127	770	674	369																	1	802	139	915	861
TOTAL SALES	5	293	919	674	369																	5	968	288		
Boston Gas Co.																										
Requirements	18	379	671	2	657	430	-	-	-	-	-	-	-	-	-	56	572	-	-	-	-	21	093	673		
Curtailement	(4	207	521)	(2	657	430)	-	-	-	-	-	-	-	-	-	(56	572)	-	-	-	-	(6	921	523)		
SNG	1	812	000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	812	000	-	
TOTAL SALES	15	984	150	-	0	-										-	0	-	-	-	-	15	984	150		
Bristol and Warren																										
Requirements	303	488		3	487		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	306	975			
Curtailement	(81	912)		(3	487)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(85	399)			
SNG	81	912		(3	487)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	85	399	5201		
TOTAL SALES	303	488		3	487																	306	975			
Cape Cod Gas																										
Requirements	1	779	483	170	445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	949	928		
Curtailement	(374	588)		(170	445)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(545	033)			
SNG	374	588		170	445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	545	033	58	967	
TOTAL SALES	1	779	483	170	445																	1	949	928		
Commonwealth Gas																										
Requirements	7	430	398	850	871	111	771	-	-	165	677	-	-	-	-	-	-	-	-	-	-	8	558	717		
Curtailement	(1	615	064)	(850	871)	(111	771)	-	-	(165	677)	-	-	-	-	-	-	-	-	-	-	(2	743	383)		
SNG	1	615	064	347	936	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	963	000	-	
TOTAL SALES	7	430	398	347	936	-	0	-	-	-	0	-	-	-	-	-	-	-	-	-	-	7	778	334		
The Connecticut Gas Co.																										
Requirements	5	106	897	2	376	014	46	199	-	-	-	-	-	-	-	-	-	-	-	-	-	7	529	110		
Curtailement	(1	036	225)	(2	376	014)	(46	199)	-	-	-	-	-	-	-	-	-	-	-	-	-	(3	458	438)		
SNG	1	036	225	1	379	775	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	416	000	-	
TOTAL SALES	5	106	897	1	379	775	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	6	486	672		
Connecticut Natural																										
Requirements	5	265	717	699	566	94	756	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	060	039		
Curtailement	(1	241	903)	(699	566)	(94	756)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(2	036	225)		
SNG	1	241	903	117	097	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	359	000	-	
TOTAL SALES	5	265	717	117	097																	5	382	814		

TABLE 3A CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
Orange & Rockland											
Requirements	427 837	37 458	54 365	26 559	29 855	14 201	120 826			711 101	
Curtailement	(21 992)	(37 458)	(54 365)	(26 559)	(29 855)	(14 201)	(120 826)			(305 256)	
SNG	21 992	37 458	54 365							113 815	339 185
TOTAL SALES	427 837	37 458	54 365	-0-	-0-	-0-	-0-	-0-	-0-	519 660	
The Pequot Gas Co.											
Requirements	74 806	15 929	-	-	-	-	-	-	-	90 735	
Curtailement	(14 465)	(15 929)	-	-	-	-	-	-	-	(30 394)	
SNG	14 465	15 735	-	-	-	-	-	-	-	30 200	-
TOTAL SALES	74 806	15 735	-	-	-	-	-	-	-	90 541	
Providence Gas Co.											
Requirements	7 802 652	1 706 579	84 954	2 912	-	-	-	-	-	9 597 097	
Curtailement	(1 549 571)	(1 706 579)	(84 954)	(2 912)	-	-	-	-	-	(3 344 016)	
SNG	1 549 571	4 738 29	-	-	-	-	-	-	-	2 023 400	-
TOTAL SALES	7 802 652	4 738 29	-0-	-0-	-	-	-	-	-	8 276 481	
South County Gas Co.											
Requirements	180 609	11 712	5 310	-	-	-	-	-	-	197 631	
Curtailement	(41 044)	(11 712)	(5 310)	-	-	-	-	-	-	(58 066)	
SNG	41 044	4 256	-	-	-	-	-	-	-	45 300	-
TOTAL SALES	180 609	4 256	-0-	-	-	-	-	-	-	184 865	
Southern Conn. Gas Co.											
Requirements	4 334 844	987 458	8 663	15 176	-	-	-	-	-	5 346 141	
Curtailement	(882 816)	(987 458)	(8 663)	(15 176)	-	-	-	-	-	(1 894 113)	
SNG	882 816	929 184	-	-	-	-	-	-	-	1 812 000	-
TOTAL SALES	4 334 844	929 184	-0-	-0-	-	-	-	-	-	5 244 028	
Tiverton Gas Co.											
Requirements	26 566	-	-	-	-	-	-	-	-	26 566	
Curtailement	(6 111)	-	-	-	-	-	-	-	-	(6 111)	
SNG	6 111	-	-	-	-	-	-	-	-	6 111	5 214
TOTAL SALES	26 566	-	-	-	-	-	-	-	-	26 566	
Total											
Requirements	64 023 736	10 949 377	557 480	61 795	195 532	75 642	120 826	75 984 388			
Curtailement	(13 719 649)	(10 949 377)	(557 480)	(61 795)	(195 532)	(75 642)	(120 826)	(25 680 301)			
SNG	11 131 598	4 605 425	202 803	-	-	-	-	15 939 886		1964 939	
TOTAL SALES	61 435 685	4 605 425	202 803	-0-	-0-	-0-	-0-	66 243 973			

TABLE 3B

ALGONQUIN GAS TRANSMISSION COMPANY
1980-81 AT 87% SNG

	Priority 1			Priority 2			Priority 3			Priority 6			Priority 7			Priority 8			Priority 9			Total			Offset to Other Supplies		
Bay State Gas																											
Requirements	5	293	919	6	74	369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	968	288			
Curtailement	(1	127	770)	(6	74	369)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1	802	139)			
SNG	1	127	770	6	74	369																1	802	139	562	521	
TOTAL SALES	5	293	919	6	74	369																5	968	288			
Boston Gas Co.																											
Requirements	18	379	671	2	657	430	-	-	-	-	-	-	-	-	-	56	572	-	-	-	-	21	093	673			
Curtailement	(4	207	521)	(2	657	430)	-	-	-	-	-	-	-	-	-	(56	572)	-	-	-	-	(6	921	523)			
SNG	1	576	440	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	576	440	-		
TOTAL SALES	15	748	590	-	0	-										-	0	-	-	-	-	15	748	590			
Bristol and Warren																											
Requirements	3	03	488	3	487	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	06	975			
Curtailement	(8	1	912)	(3	487)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(8	5	399)			
SNG	78	822	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78	822	-	-		
TOTAL SALES	300	398	-	0	-											-	-	-	-	-	-	300	398	-			
Cape Cod Gas																											
Requirements	1	779	483	1	70	445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	949	928			
Curtailement	(3	74	588)	(1	70	445)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(5	45	033)			
SNG	3	74	588	1	50	892	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	25	480	-		
TOTAL SALES	1	779	483	1	50	892										-	-	-	-	-	-	1	930	375			
Commonwealth Gas																											
Requirements	7	430	398	8	50	871	111	771	-	-	-	-	165	677	-	-	-	-	-	-	-	8	558	717			
Curtailement	(1	615	064)	(8	50	871)	(111	771)	-	-	-	-	(165	677)	-	-	-	-	-	-	-	(2	743	383)			
SNG	1	615	064	92	746	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	707	810	-		
TOTAL SALES	7	430	398	92	746	-	0	-					-	0	-							7	523	144			
The Connecticut Gas																											
Requirements	5	106	897	2	376	014	46	199	-	-	-	-	-	-	-	-	-	-	-	-	-	7	529	110			
Curtailement	(1	036	225)	(2	376	014)	(46	199)	-	-	-	-	-	-	-	-	-	-	-	-	-	(3	458	438)			
SNG	1	036	225	1	065	695	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	101	920	-		
TOTAL SALES	5	106	897	1	065	695	-	0	-				-	-	-							6	172	592			
Connecticut Natural																											
Requirements	5	265	717	6	99	566	94	756	-	-	-	-	-	-	-	-	-	-	-	-	-	6	060	039			
Curtailement	(1	241	903)	(6	99	566)	(94	756)	-	-	-	-	-	-	-	-	-	-	-	-	-	(2	036	225)			
SNG	1	182	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	182	330			
TOTAL SALES	5	206	144	-	0	-	-	0	-				-	-	-							5	206	144			

TABLE 3B CONTINUED

[illegible]

TABLE 3B CONTINUED

	Priority 1			Priority 2			Priority 3			Priority 6			Priority 7			Priority 8			Priority 9			Total			Offset to Other Supplier	
Orange & Backland																										
Requirements	427	837		37	458		54	365		26	559		29	855		14	201		120	826		711	101			
Curtailement	(21	992)		(37	458)		(54	365)		(26	559)		(29	855)		(14	201)		(120	826)		(305	256)			
SNG	21	992		37	458		54	365														113	815		250	295
TOTAL SALES	427	837		37	458		54	365		-0-			-0-			-0-		-0-				519	660			
The Peugeot Gas Co																										
Requirements	74	806		15	929		-			-			-			-			-			90	735			
Curtailement	(14	465)		(15	929)		-			-			-			-			-			(30	394)			
SNG	14	465		11	809		-			-			-			-			-			26	274		-	
TOTAL SALES	74	806		11	809																	86	615			
Providence Gas Co.																										
Requirements	7802	652		1706	579		84	954		29	12		-			-			-			9597	097			
Curtailement	(1549	571)		(1706	579)		(84	954)		(29	12)		-			-			-			(3344	016)			
SNG	1549	571		210	787		-			-			-			-			-			1760	358		-	
TOTAL SALES	7802	652		210	787		-0-			-0-												8613	439			
South County Gas Co																										
Requirements	180	609		11	712		5	310		-			-			-			-			197	631			
Curtailement	(41	044)		(11	712)		(5	310)		-			-			-			-			(58	066)			
SNG	39	411		-			-			-			-			-			-			39	411		-	
TOTAL SALES	178	976		-0-			-0-															178	976			
Southern Conn. Gas Co.																										
Requirements	4334	844		987	458		8	663		15	176		-			-			-			5346	141			
Curtailement	(882	816)		(987	458)		(8	663)		(15	176)		-			-			-			(1894	113)			
SNG	882	816		693	624		-			-			-			-			-			1576	440		-	
TOTAL SALES	4334	844		693	624		-0-			-0-												5628	468			
Tiverton Gas Co.																										
Requirements	26	566		-			-			-			-			-			-			26	566			
Curtailement	(6	111)		-			-			-			-			-			-			(6	111)			
SNG	6	111		-			-			-			-			-			-			6	111		3742	
TOTAL SALES	26	566																				26	566			
Total																										
Requirements	54023	736		10949	377		557	480		61	795		195	532		75	642		120	826		75	984	388		
Curtailement	(13719	649)		(10949	377)		(557	480)		(61	795)		(195	532)		(75	642)		(120	826)		(25	680	301)		
SNG	10	825	853	3372	341		202	803														14	400	997	1176	201
TOTAL SALES	61	129	940	3372	341		202	803		-0-			-0-			-0-		-0-				64	705	084		

TABLE 3C

ALGONQUIN GAS TRANSMISSION COMPANY

1980-81 AT 49% SNG

	Priority 1			Priority 2			Priority 3			Priority 6			Priority 7			Priority 8			Priority 9			Total			Offset to Other Supplies		
<u>Bay State Gas</u>																											
Requirements	5	293	919	674	369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	968	288			
Curtailement	(1	127	770)	(674	369)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1	802	139)			
SNG	1	127	770	204	050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	331	820	-		
TOTAL SALES	5	293	919	204	050																	5	497	969			
<u>Boston Gas Co</u>																											
Requirements	18	379	671	2657	430	-	-	-	-	-	-	-	-	-	-	56	572	-	-	-	-	21	093	673			
Curtailement	(4	207	521)	(2657	430)	-	-	-	-	-	-	-	-	-	-	(56	572)	-	-	-	-	(6	921	523)			
SNG	887	880	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	887	880	-	-		
TOTAL SALES	15	060	030	-0	-											-0	-					15	060	030			
<u>Bristol and Warren</u>																											
Requirements	303	488	-	3	487	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	306	975	-			
Curtailement	(81	912)	-	(3	487)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(85	399)	-			
SNG	44	394	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	394	-	-		
TOTAL SALES	265	970		-0	-																	265	970				
<u>Cape Cod Gas Co.</u>																											
Requirements	1	779	483	170	445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	949	928			
Curtailement	(374	588)	-	(170	445)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(545	033)	-			
SNG	295	960	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	295	960	-	-		
TOTAL SALES	1	700	855	-0	-																	1	700	855			
<u>Commonwealth Gas</u>																											
Requirements	7	430	398	850	871	111	771	-	-	165	677	-	-	-	-	-	-	-	-	-	-	8	558	717			
Curtailement	(1615	064)	-	(850	871)	(111	771)	-	-	(165	677)	-	-	-	-	-	-	-	-	-	-	(2	743	383)			
SNG	961	870	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	961	870	-	-		
TOTAL SALES	6	777	204	-0	-	-0	-			-0	-											6	777	204			
<u>The Connecticut Gas Co.</u>																											
Requirements	5	106	897	2	376	014	46	199	-	-	-	-	-	-	-	-	-	-	-	-	-	7	529	110			
Curtailement	(1	036	225)	(2	376	014)	(46	199)	-	-	-	-	-	-	-	-	-	-	-	-	-	(3	458	438)			
SNG	1	036	225	147	615	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	183	840	-		
TOTAL SALES	5	106	897	147	615	-0	-															5	254	512			
<u>Connecticut Natural</u>																											
Requirements	5	265	717	699	566	94	756	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	060	039			
Curtailement	(1	241	903)	(699	566)	(94	756)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(2	036	225)			
SNG	665	910	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	665	910	-	-		
TOTAL SALES	4	689	724	-0	-	-0	-															4	689	724			

TABLE 3C CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
<u>Fall River Gas Co.</u>									
Requirements	2312276	233373	-	-	-	-	-	2545649	
Curtailement	(498527)	(233373)	-	-	-	-	-	(731900)	
SNIG	498527	19403	-	-	-	-	-	517930	-
TOTAL SALES	2312276	19403						2331679	
<u>The Hartford Electric</u>									
Requirements	497697	29913	-	2413	-	-	-	530023	
Curtailement	(114484)	(29913)	-	(2413)	-	-	-	(146810)	
SNIG	73990	-	-	-	-	-	-	73990	-
TOTAL SALES	457203	-0-		-0-				457203	
<u>Town of Middleborough</u>									
Requirements	102793	31388	-	-	-	-	-	134181	
Curtailement	(19954)	(31388)	-	-	-	-	-	(51342)	
SNIG	14798	-	-	-	-	-	-	14798	-
TOTAL SALES	97637	-0-						97637	
<u>New Bedford Gas</u>									
Requirements	3173967	178382	148438	9813	-	-	-	3510600	
Curtailement	(647872)	(178382)	(148438)	(9813)	-	-	-	(984505)	
SNIG	628915	-	-	-	-	-	-	628915	-
TOTAL SALES	3155010	-0-	-0-	-0-				3155010	
<u>New Jersey Natl</u>									
Requirements	822649	139837	3024	4922	-	4869	-	975301	
Curtailement	(93107)	(139837)	(3024)	(4922)	-	(4869)	-	(245759)	
SNIG	-	-	-	-	-	-	-	-	-
TOTAL SALES	729542	-0-	-0-	-0-		-0-		729542	
<u>North Attleboro</u>									
Requirements	126818	8513	-	-	-	-	-	135331	
Curtailement	(28016)	(8513)	-	-	-	-	-	(36529)	
SNIG	7399	-	-	-	-	-	-	7399	-
TOTAL SALES	106201	-0-						106201	
<u>City of Norwich, CT</u>									
Requirements	580649	136653	-	-	-	-	-	717302	
Curtailement	(116707)	(136653)	-	-	-	-	-	(253360)	
SNIG	14798	-	-	-	-	-	-	14798	-
TOTAL SALES	478740	-0-						478740	

TABLE 3C. CONTINUED

	Priority 1	Priority 2	Priority 3	Priority 6	Priority 7	Priority 8	Priority 9	Total	Offset to Other Supplies
<u>Orange & Rockland</u>									
Requirements	427 837	37 458	54 365	26 559	29 855	14 201	120 826	711 101	
Curtailment	(21 992)	(37 458)	(54 365)	(26 559)	(29 855)	(14 201)	(120 826)	(305 258)	
SNG	21 992	37 458	54 365	-0-	-0-	-0-	-0-	113 815	108 155
TOTAL SALES	427 837	37 458	54 365	-0-	-0-	-0-	-0-	519 660	
<u>The Reguot Gas Co.</u>									
Requirements	74 806	15 929	-	-	-	-	-	90 735	
Curtailment	(14 465)	(15 929)	-	-	-	-	-	(30 394)	
SNG	14 465	333	-	-	-	-	-	14 798	-
TOTAL SALES	74 806	333						75 139	
<u>Providence Gas Co.</u>									
Requirements	7 802 652	1 706 579	84 954	2 912	-	-	-	9 597 097	
Curtailment	(1 549 571)	(1 706 579)	(84 954)	(2 912)	-	-	-	(3 344 016)	
SNG	991 466	-	-	-	-	-	-	991 466	-
TOTAL SALES	7 244 547	-0-	-0-	-0-				7 244 547	
<u>South County Gas Co.</u>									
Requirements	180 609	11 712	5 310	-	-	-	-	197 631	
Curtailment	(41 044)	(11 712)	(5 310)	-	-	-	-	(58 066)	
SNG	22 197	-	-	-	-	-	-	22 197	-
TOTAL SALES	161 762	-0-	-0-					161 762	
<u>Southern Conn. Gas Co.</u>									
Requirements	4 334 844	987 458	8 663	15 176	-	-	-	5 346 141	
Curtailment	(882 816)	(987 458)	(8 663)	(15 176)	-	-	-	(1 894 113)	
SNG	882 816	5 064	-	-	-	-	-	887 880	
TOTAL SALES	4 334 844	5 064	-0-	-0-				4 339 908	
<u>Tiverton Gas Co.</u>									
Requirements	26 566	-	-	-	-	-	-	26 566	
Curtailment	(6 111)	-	-	-	-	-	-	(6 111)	
SNG	5 549	-	-	-	-	-	-	5 549	
TOTAL SALES	26 004							26 004	
Total									
Requirements	64 023 736	12 949 377	557 480	61 795	195 532	75 642	120 826	75 984 388	
Curtailment	(13 719 649)	(12 949 377)	(557 480)	(61 795)	(195 532)	(75 642)	(120 826)	(25 680 301)	
SNG	8 196 921	413 923	54 365	-0-	-0-	-0-	-0-	8 665 209	108 155
TOTAL SALES	58 501 008	413 923	54 365	-0-	-0-	-0-	-0-	58 969 298	