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NEW YORK STATE ENERGY-ANALYTIC INFORMATION SYSTEM: FIRST-STAGE IMPLEMENTATION

JACK ALLENTUCK, OWEN CARROLL, LINDA FIORE, NEIL KATZ,
ROBERT MALONE, ROBERT NATHANS, MICHAEL OWEN, DRAZEN PRELEC,
ROBERT RAYMOND, ANN REISMAN, AND HAROLD ROSTOKER

September 1979

Prepared for the
NEW YORK STATE ENERGY OFFICE
by the
INSTITUTE FOR ENERGY RESEARCH
STATE UNIVERSITY OF NEW YORK
AT STONY BROOK
STONY BROOK, N.Y. 11790
and the
NATIONAL CENTER FOR ANALYSIS OF ENERGY SYSTEMS
DEPARTMENT OF ENERGY AND ENVIRONMENT

BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK 11973

DISCLAIMER

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ABSTRACT

So that energy policy by state government may be formulated within the constraints imposed by policy determined at the national level yet reflect the diverse interests of its citizens, large quantities of data and sophisticated analytic capabilities are required. This report presents the design of an energy information/analytic system for New York State, the data for a base year, 1976, and projections of these data.

At the county level 1976 energy-supply demand data and electric generating plant data are provided as well. Data base management is based on System 2000. Three computerized models provide the system's basic analytic capacity. The Brookhaven Energy System Network Simulator provides an integrating framework while a price-response model and a weather sensitive energy demand model furnished a short term energy response estimation capability. The operation of these computerized models is described in the report as well.

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CHAPTER I

POLICY FORMULATION AND THE NYS ENERGY INFORMATION SYSTEM

1.1 INTRODUCTION

The urgent need for a national energy plan has been evident since the early 1970's. The inability of the Executive and the Congress to reach a consensus reflects the conflicting interests of diverse constituencies, some regional and others, cutting across geographical regions, deriving from common economic interests, environmental attitudes and social viewpoints.

The effects at the state government level of the continuing controversy as to the shape of a national energy policy are twofold. On the one hand state government must assure that the interests of the people of the state are reflected in the details of national energy policy as it develops. On the other hand, it must, within the limits of its authority, formulate and implement state energy policy not only with the enhancement of the welfare of its citizens as a goal but also with a view to its compatability with emerging national energy policy.

The complexities of policy formulation within such constraints cannot be overstated. This is especially true when one considers that interests of individuals and groups within the state reflect to a greater or lesser degree those that exist at the national level.

As at the national level, there are regional differences within the state. Serious policy making on energy at the state level must therefore be informed by vast quantities of data in sufficient detail to assess not only the consequences of policy for the state as a whole but its likely effects on various regions and interest groups within the state. In addition to data, an analytic capability must be available to provide objective indications of the likely impact of energy policy on the state as a whole as well as on regions within the state. In the sections of this chapter which follow, we present first an overview of New York's energy situation within the national context. This is followed by a brief description of the energy issues confronting the state. Here we will underscore the several levels at which energy policy must be considered. In a subsequent section we shall review the evolution of the New York State Energy Information Analytic System (NYS EIAS)[1] as a tool for energy policy formulation.

1.2 THE NEW YORK ENERGY SITUATION IN THE NATIONAL CONTEXT

The essential structure of the current U.S. energy situation is portrayed in Figure 1.* On the right-hand side of the figure are indicated the final uses of energy and the amounts of energy (in 10^{15} or quadrillion Btu) going to each use in 1976. The numbers in parentheses in the figures refer to the efficiency (or more precisely the "relative effectiveness")** of the various processes of energy conversion incorporated in the system. In tracing back (to the left in the figure) one gets to the amount of primary resources required to supply the demand for energy with the current system.

Table 1 presents a summary of the data of the figure. Here the amount of each fuel used by each consuming sector is indicated. Note that electricity (at 3413 Btu/Kwh) is included as a "fuel" under each sector. Fuels going to produce electricity are indicated in the "Utility" column. The total resource consumption indicated in Table 1 is lower than that indicated in Figure 1 because it is measured at the point of consumption. Taking all system inefficiencies into account the total resource consumption in 1976 was 73.98 x 10^{15} Btu.

Table 1

U.S. ENERGY CONSUMPTION IN 1976

(Btu x 10^{15})

	Resid.	Comm.	Ind.	Trans.	Utility	Total
Electricity	2.02	1.42	2.46	.02	-	5.92*
Petroleum Products	2.94	1.75	5.30	17.70	3.15	30.84
Natural Gas	5.24	2.14	6.84	-	3.14	17.36
Coal	-	0.12	3.75	-	8.93	12.80
Nuclear	-	-	-	-	1.89	1.89
Hydro	-	-	-	-	3.20	3.20
Total	10.20	5.43	18.35	17.72	20.31	66.09*

*Electricity not included in column total to avoid double counting. Fuels used to produce electricity are shown under column labeled "Utility."

*The BNL Reference Energy System (RES) is fully described in Chapter II.
**This term is defined on page 15.

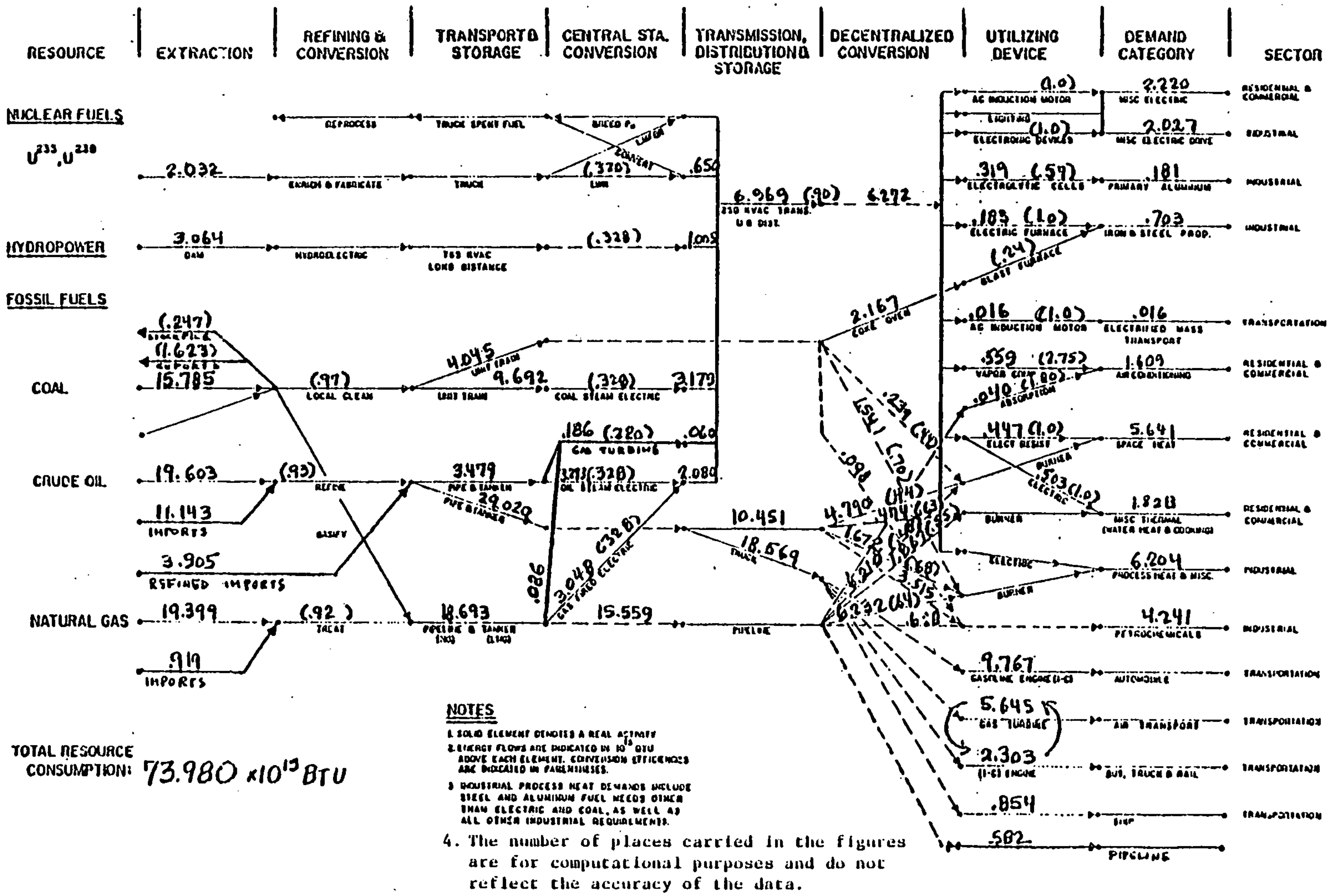

Figure 1. U.S. REFERENCE ENERGY SYSTEM, 1975 (preliminary).

In Figure 2 we display a similar representation of the 1976 energy situation for New York State. Some comparisons between the U.S. and New York situations are noteworthy. In Figure 3 we present a summary of primary energy resources used in 1976 in the U.S. and New York State. The much greater proportion of oil consumed in New York State when compared to the nation as a whole is striking as is the opposite relationship for natural gas. Interesting as well, is the relatively small proportion of coal used in New York State when compared to national use.

Turning to the demand side, in Figure 4 we display a comparison between New York State and the United States of 1976 energy demand per capita in several final demand sectors. Of note are the significantly smaller per capita energy demands in New York's manufacturing and transportation sectors when compared to the national picture. In the manufacturing sector this reflects the passing of New York to a post-industrial society with increasing emphasis on services rather than manufacturing. In the transportation sector lower per capita energy consumption is a consequence of New York City's highly developed mass transit system.

Finally in our brief survey of New York's energy situation in the national context we present in Table 2 a comparison of energy prices in New York with national average prices.

Table 2

REPRESENTATIVE 1976 ENERGY PRICES IN NEW YORK STATE

	N.Y. State ($/$10^6$Btu)	U.S. Average ($/$10^6$Btu)	Ratio NY/US
Electricity - Residential		10.8	
New York City	23.7		2.19
Buffalo	15.3		1.42
Natural Gas - Residential		1.79	
New York City	3.02		1.69
Buffalo	1.95		1.09
Oil - Residential		2.88	
New York City	3.05		1.06
Buffalo	3.06		1.06
Oil to Utilities	2.08	1.94	1.07
Con Edison	2.29		1.18
Niagara-Mohawk	1.76		0.91
Coal to Utilities	1.16	0.85	1.36
Rochester Gas and Electric	1.35		1.59
N.Y. State Elec. and Gas	1.00		1.18

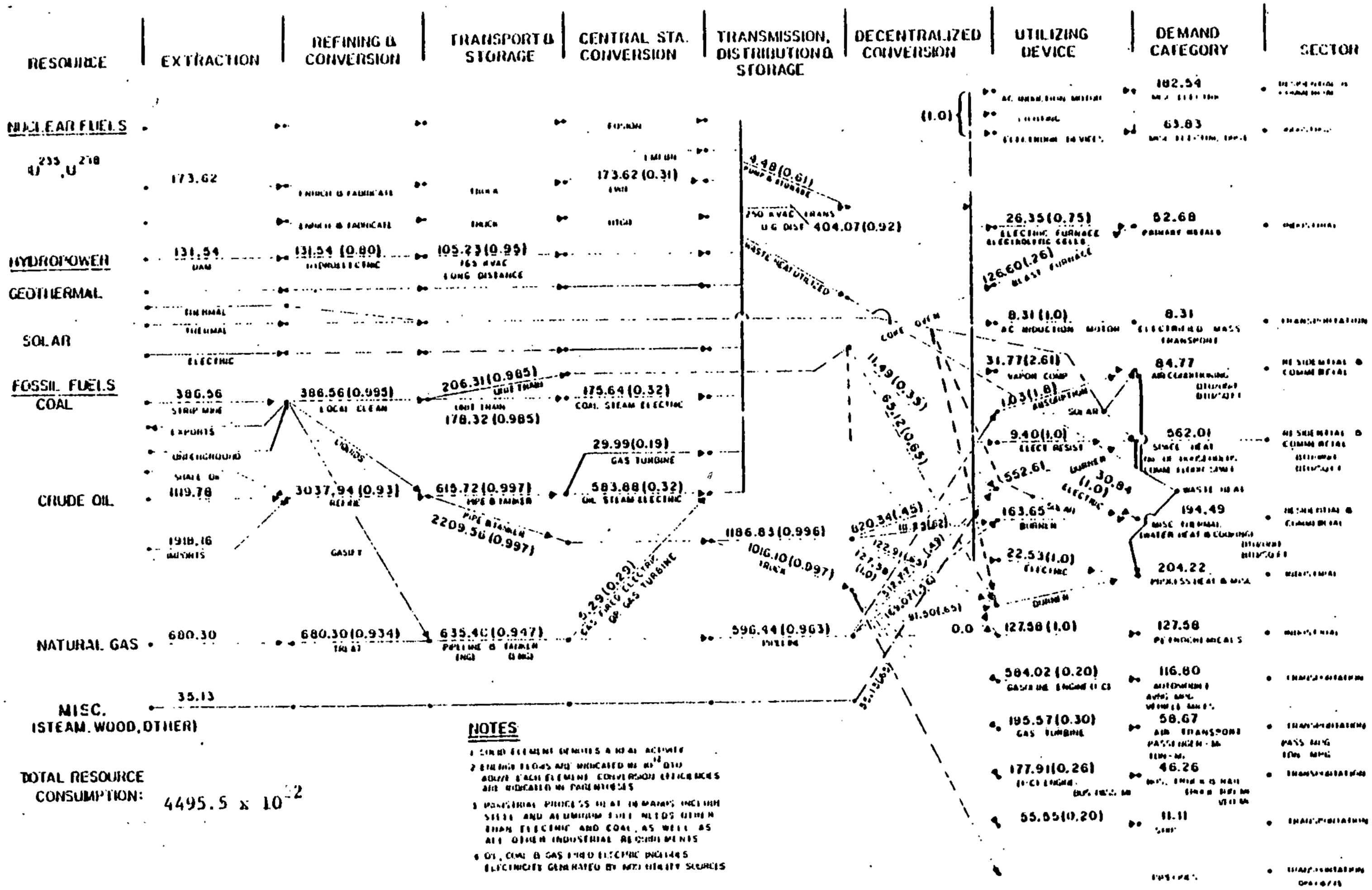

Figure 2. N.Y.S. REFERENCE ENERGY SYSTEM, 1976.

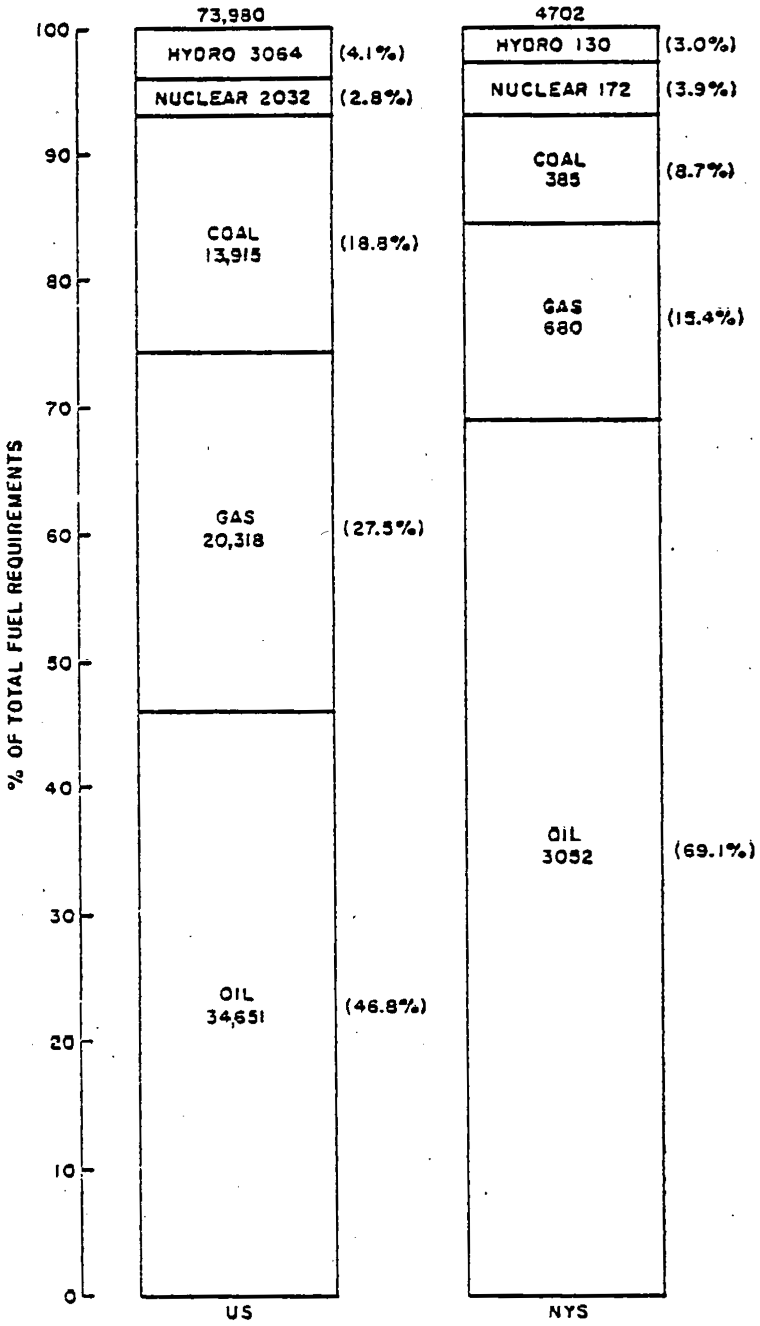

Figure 3. PRIMARY ENERGY SOURCES - 1976 (Btu x 10^{12}).

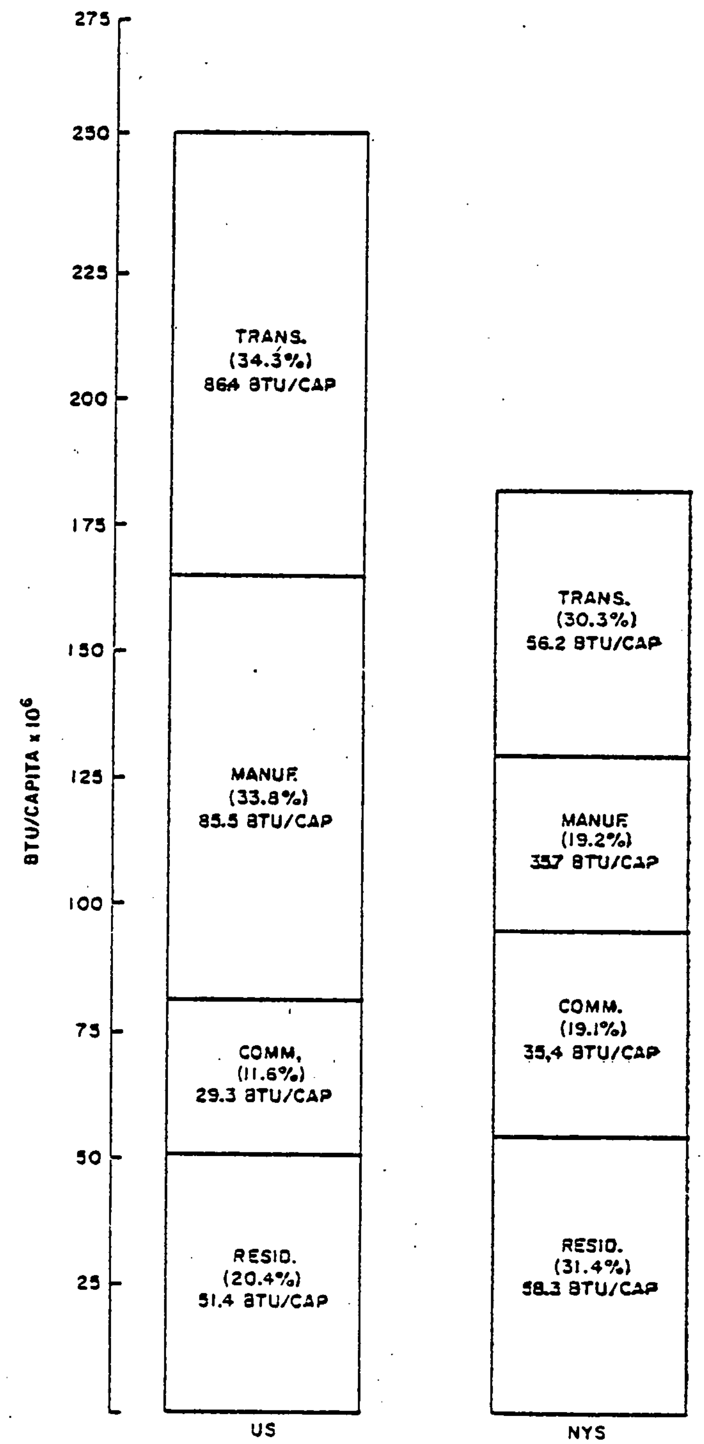

Figure 4. PER CAPITA ENERGY CONSUMPTION - 1976.

The comparisons presented above underscore some of the basic considerations which engage the attention of New York energy planners. These considerations and others are summarized below:

- To a larger extent than many states in other sections of the country, New York's energy supplies are derived from oil and gas fuels for which the uncertainty in future supply and price is greatest. As shown in Figure 2, in 1976 69 percent of New York's total primary energy supply was derived from oil and 15 percent from natural gas. For the United States as a whole these statistics were 47 percent and 28 percent, respectively.
- Coal played a much smaller role in supplying the energy needs of New York than for the entire nation. New York derived only 8.7% of its energy needs from coal while for the United States this figure was 18.8%.
- Energy demands per capita of the manufacturing and transportation sectors in New York State were substantially smaller than in the United States as a whole. For the former these figures were 35.7 Btu/capita and 56.2 Btu/capita respectively, for the latter 85.5 Btu/capita and 86.4 Btu/capita.
- Virtually all of the oil and gas used by the state is imported, with 64% of the oil coming from foreign sources.[2] The state is thus vulnerable to supply disruptions both domestically and internationally. Unless prescribed by Federal legislation, the energy producing regions of the country furthermore can be expected to use their energy resources to capture related manufacturing activity away from those states which import fuels.
- Energy prices in the Northeast, and in New York in particular, tend to be higher in general than most other regions of the country.[3] This is particularly true of electricity prices. In some of the most populated parts of the state these were more than 100% higher than the national average. This is due in part to the mix of fuels used to produce electricity and in part to the prices of those fuels. These factors add to other elements in the state such as higher labor costs to reduce the state's relative economic competitiveness.

1.3 ROLE OF AN ENERGY INFORMATION ANALYTIC SYSTEM (EIAS) IN NEW YORK STATE*

In the previous section we outlined briefly the considerations facing New York energy planners. In this section we examine the role of the NYS EIAS in policy formulation.

We have already discussed the state energy planner's need to consider not only the welfare of the state as a whole but also the needs of separate constituencies, some based on common regional interest, and others founded on economic motivations.

An EIAS has two parallel roles in support of energy planning, policy analysis and policy implementation in the state. In the first instance it is an assembly of current energy data providing timely information on energy supplies and demands in the state as a whole and to political or regional subdivisions at a reasonable level of disaggregation. In the second instance it provides an analytic capability which enables the assessment of the effect of policy on the state's energy supply/demand situation. Since policy planning and implementation is undertaken in the context of a future year an analytic capability of the type required must be based on a view of the future as it is expected to exist absent perturbations arising from policy changes.

It must however be understood that data banks and computer programs do not solve energy problems. They do provide important information and a set of tools that can be used by analysts to examine the implications of alternative energy decisions. Thus, in designing the New York Energy Information/Analytic System one must start with a conception of how such a system fits into the decision making process of government.

The relationship between the system and its users is indicated in Figure 5. The basic conception is that the Information/Analytic System, and the assessments performed by the analysts that are using the system, are objective and politically neutral. Issues or questions are formulated by the users or by the staff of the analytical group. In some cases there will be a relatively simple flow of information from the system to the questioner (in response, for example, to the question, "how much oil was consumed for space heating in single family dwellings in 1976"). In other cases, and the more important ones, an assessment will have to be performed. In general the

*Much of the material in this chapter appeared previously in Reference 1.

intent of that assessment will be to analyze the impacts of alternative policies. For example, alternative incentive systems for homeowners to install solar heating systems would be compared in terms of the direct cost to the state (say in reduced tax revenues), effects on industrial and commercial activity, effects on employment, and impact on the state's environment. The analysis may incorporate information that is not part of the system (such as experience in other states with similar policies).

The analysis then supplies the decisionmaker with a set of evaluated options regarding the policy in question. Even in the simple example chosen, the analysis may not be able to identify the "best" policy, for that requires a comparison between very different criteria. The trade-off between environment and jobs, for example, is a political decision. Furthermore, there may be non-technical considerations that enter the decision making process. For the solar incentive case, for example, the existence of an active public interest group supporting solar energy might enhance the feasibility of certain types of incentives.

As shown in Figure 5, issues may be formulated by the users of the system or they may be formulated by the analytical group. The analytical group, or an office to which it is attached, may also be given the responsibility of preparing on a regular basis reports on aspects of energy in the state.

The point to be emphasized in this discussion is that in all of these modes of operation the system can be operated in an objective, non-political manner. Policy analysis can be distinguished from policy making and the effectiveness of an Energy Information and Analytic System will be significantly increased if that distinction is maintained in its design and implementation.

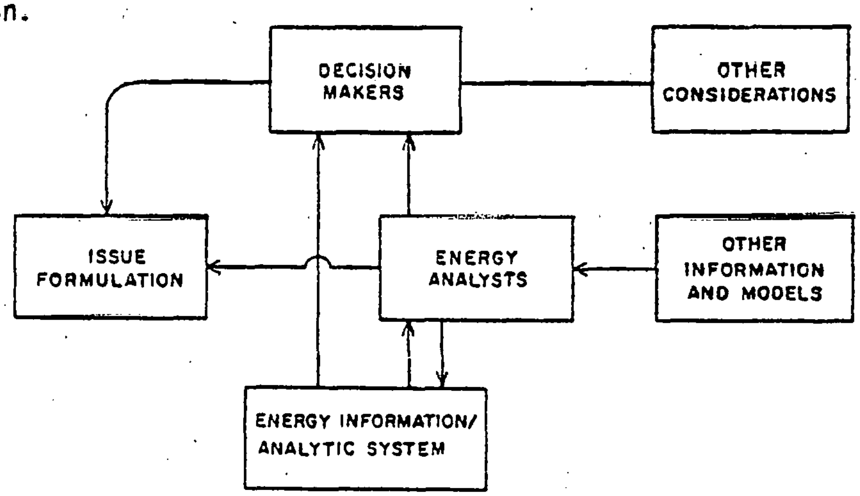

Figure 5. SCHEMA OF ROLE OF THE NEW YORK ENERGY INFORMATION/ANALYTIC SYSTEM.

1.4 THE NATURE OF ENERGY POLICY ISSUES

The design of a New York EIAS is based on the issues that the system must address and the criteria used to evaluate those issues. Some representative issues or questions that the system might be required to address are:

1. What would be the effect on the state of alternative federal policies on natural gas price regulation?

2. Should the state encourage natural gas production from Lake Erie and if so under what conditions?

3. Under conditions of another oil embargo what petroleum product allocation scheme produces least impact on the overall state welfare?

4. What would be the effect on the state of a moratorium on the construction of new nuclear power plants?

5. What would be the effect on energy costs and availability within the state of proposed changes in federal environmental regulations (such as ammendments to the Clean Air Act)?

6. What are the most important areas for the state to invest in energy research and development?

7. What effect would mandatory lighting efficiency standards for public buildings have on projected 1985 energy consumption?

8. What would be the effect of alternative residential and commerical building codes?

9. What regions of the state would be most affected by natural gas curtailments?

10. What benefits and costs would accrue to the state from investment in alternatives to automotive transport?

11. What are the possibilities for, the impacts of, and barriers to increased coal use in the state?

12. What is the potential for combined waste-coal fluidized bed boilers in New York City?

13. What effect would an LNG terminal in New York harbor have on the availability and cost of natural gas to the state?

14. What effect would development of Atlantic Outer Continental Shelf (OCS) gas and oil resources have on state supplies? What Federal and state regulations regarding OCS development are of most benefit to the state?

These issues are broadly representative of the types of questions that the system may be called upon to address. Some of the issues are fairly narrow and relatively easily dealt with. Others, to be properly addressed, require extensive in-depth analysis. Question No. 6, for example, is the basis for determining the program of the Energy Research and Development Authority. Answering that simple question requires careful and extensive analysis, drawing on a wide range of expertise and is central to the planning function of the Authority. The analysis of Issue No. 7 is one element of a state energy conservation plan as called for if the state is to receive federal funding under the State Energy Conservation Program administered by the Department of Energy.

The range of issues and the basic concerns to be dealt with can be represented schematically as in Figure 6. This scheme is based on the observation that New York's energy situation derives from its geographic and other relationship to the country as a whole, while communities, businesses and individuals experience varying effects depending on their spatial location within the state. It also reflects three basic analytic concerns: effects on energy supply-demand, economic activity, and environmental quality. These categories define the structure into which energy policy issues fall and through which they must be analyzed.

	GEOGRAPHICAL FOCUS		
EFFECT FOCUS	US/NY STATE RELATIONS	NEW YORK STATE AS AN ENTITY	REGIONS WITHIN NEW YORK STATE
ENERGY SUPPLY/DEMAND			
ECONOMIC ACTIVITY AND WELFARE			
ENVIRONMENTAL QUALITY			

Figure 6. NEW YORK STATE ENERGY POLICY ISSUE MATRIX.

1.5 SYSTEM DESIGN CRITERIA

In designing an Energy Information/Analytic System to deal effectively with the issues discussed above, certain basic criteria must be considered:

1. Responsiveness: the system must be able to respond quickly to the needs of various parties in the state who are responsible for energy related decisions.

2. Inclusiveness: the system must be able to deal in adequate depth with the wide range of issues and effects that are of potential concern.

3. Cost: the system should be implemented at lowest possible cost to the state.

Since these simple criteria are almost mutually exclusive, the design and implementation of the system must consider the best means of accommodating them.

Obviously not all energy policy issues are of equal concern at any one time. In fact, the focus of energy planning is continually changing. Newspaper headlines in the past few years have declared a succession of crises; gasoline shortages, electricity prices, natural gas supplies, offshore oil development, energy conservation, and nuclear power have succeeded each other in the public and political consciousness. Clearly, an Energy Information/Analytic System must be able to respond quickly to supply reliable analyses on a wide variety of issues as they become politically important. In order to accomplish that, however, data and analytical techniques must be constructed in anticipation of future issues of concern and not in response to current issues. At the same time, it would be impractical to invest large amounts of time and funds into the construction of a completely general and universal system that would only be available after some considerable length of time and then probably be incapable of answering some previously unanticipated question. The sensible approach to the development of the system would thus be to put together the most important basic information and analytic tools and then to introduce further information and methods are required to address central continuing policy issues. This implies that the system must be designed to accept, digest, and utilize new information with ease. It implies a dynamically growing, increasingly effective system. In a subsequent section we examine the way in which the system may be fuller developed to satisfy the needs of energy planners.

REFERENCES TO CHAPTER I

1. J. Allentuck, et. al., "An Energy Information and Analytic System for New York State," Draft Final Report (August 1976) Brookhaven National Laboratory, Upton, New York.

2. About 5.0 x 10^{12} Btu of oil were produced in the state in 1975, corresponding to less than 0.2% of consumption. Gas production (6.8 x 10^{12} Btu) corresponded to about 1% of consumption.

3. Although some natural gas prices have been maintained relatively low (somewhat of an anomaly in the Northeast), policies to normalize interstate and intrastate gas rates promise to eliminate that advantage in the future oil prices under current regulatory policies have little interregional variation.

4. J. Allentuck, et. al., "An Assessment of Energy Research Development and Demonstration Priorities for New York State," BNL-50735 (November 1977), Brookhaven National Laboratory, Upton, New York.

CHAPTER II

CHARACTERIZATION OF ENERGY DEMANDS

2.1 INTRODUCTION

The Brookhaven Reference Energy System (RES)[1] is a convenient way of representing the energy system of a state. Figure 2 is the New York 1976 RES and is included again in this chapter for ease of reference. This system, and the detailed technological, economic, and environmental assumptions which comprise the supporting data base, have been developed to program the kind of technology and policy assessment required by numerous studies which BNL has undertaken for the U.S. Department of Energy as well as the 1977 study for NYS Energy Research and Development Authority (NYS ERDA).[2] It forms the principal analytic component of the NYSEIAS in the form of its computerized version, the ESNS Model.[3] In the paragraphs which follow we describe the construction and use of the RES while in a subsequent section we discuss ESNS. In Chapter VI we examine a short term price response model of energy demand and a model for determining the effects of temperature variations on NYS energy demand.

2.2 CONSTRUCTION OF THE REFERENCE ENERGY SYSTEM

The format for the Reference Energy System (RES) is a network diagram which indicates energy flows and associated conversion efficiencies, along with the reference technologies used to accomplish the energy conversion. The system indicates the reference conversion processes used in the following activities, where each applies to a specific energy resource or form.

1. Extraction
2. Refining and/or conversion
3. Transport of primary energy source
4. Centralized conversion (e.g., electricity generation)
5. Transport or transmission and storage of secondary energy form
6. Decentralized conversion
7. Utilization in an end use device

A single path through the network reflects the application of a specific energy resource to a given demand category. Alternate paths and branches reflect the amount of substitutability that is feasible among different resources. Demand figures are exogeneously estimated for each reference year.

Associated with each energy flow or link in the RES are two sets of coefficients: efficiency and environmental. The RES's developed for visual dis-

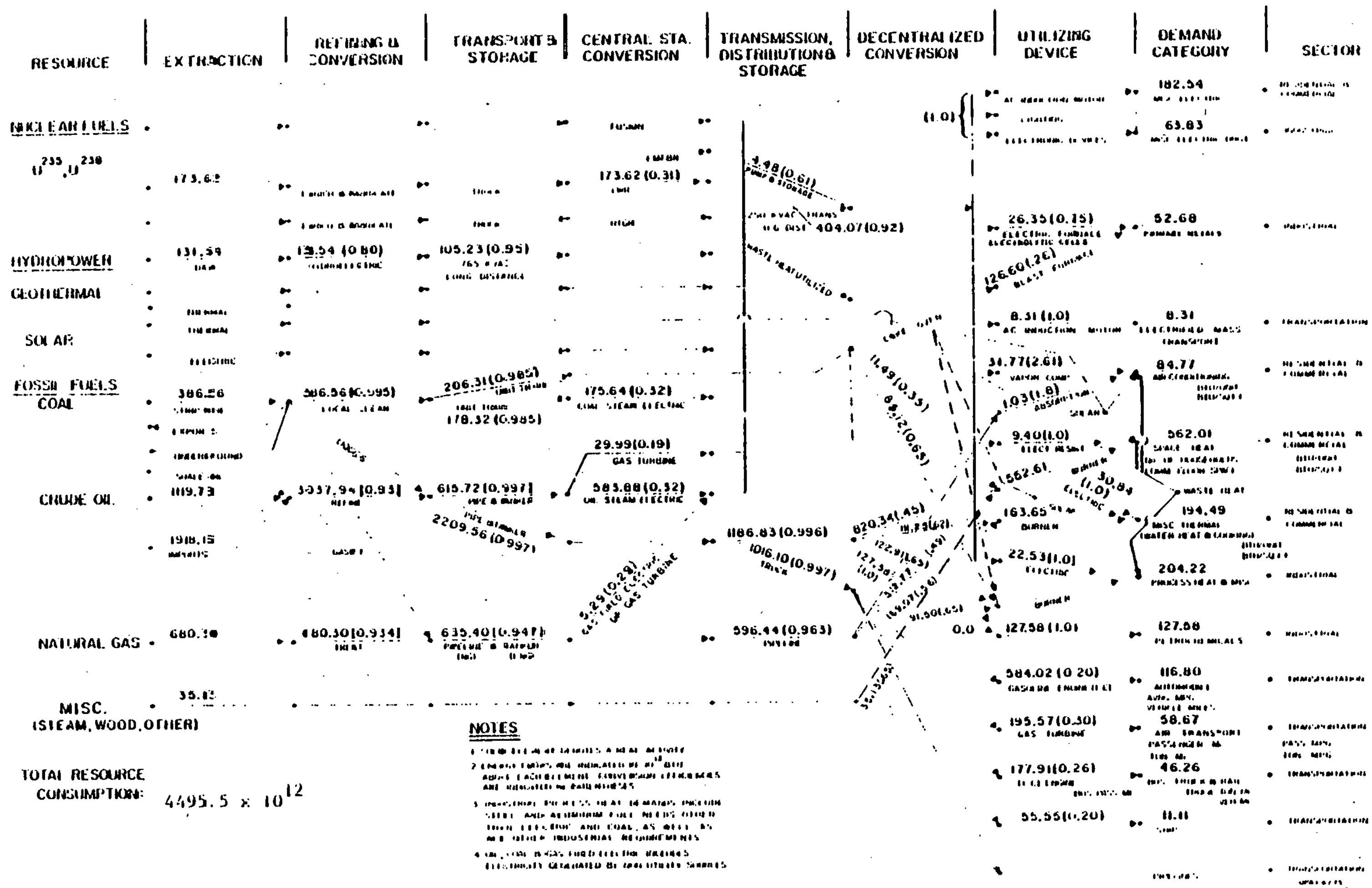

Figure 2. NEW YORK STATE REFERENCE ENERGY SYSTEM, 1976

play purposes in this report depict only the efficiency coefficients (shown in parentheses). The environmental coefficients, which at this point include only air pollutant emissions, are discussed in Section XIII of this report.

The RES representation allows one to calculate the amount of a particular energy resource (e.g., oil) used to satisfy a particular demand (e.g., space heating) either through a particular intermediate fuel form, such as electric or directly. It also allows one to calculate the gross environmental impacts (emissions) associated with a particular supply pattern or set of patterns.

2.3 DATA INCLUDED IN THE DATA BASE

Total demands for oil and oil products, natural gas, coal and electricity are aggregated from specific demand in the residential, commercial, industrial transportation, governmental and agricultural sectors of New York State. The electrical sector supplies electric energy to the six sectors listed above and requires fuel inputs already mentioned in addition to uranium and hydro-power. The energy requirements of a small utility steam sector are considered as well.

Future energy demand is projected by considering the underlying determinants of demand--the energy services required and then the efficiency with which various fuels are used to provide those services. More explicitly, the data listed below are included under the following heading.

1. Subsector — for example, in the transportation sector, passenger or freight; in the residential sector, single family or high-rise dwellings.

2. Basis — B, a projection variable which conveniently characterizes change in the subsector: for example, in the commercial sector the principal determinant of energy use is the amount of floorspace.

3. Fuel Demand — D_i is the quantity of a fuel i, actually consumed in a specific demand category, such as residential space heating or commercial air conditioning.

4. Total Fuel Demand — D_s is the total fuel required to satisfy the requirements of a specific demand category. Electricity is considered as a fuel in this sense and

$$D_s = \sum_i D_i \ .$$

5. Relative System Efficiency — e_i, is the relative effectiveness with which fuel i, is used in a demand category. This parameter depends on the utilization technology employed. For space heating, e_i is defined as

		1.0 for existing electrically heated homes. The values of e_i for other structures are given in the fuel mix tables.
6.	Degree of Saturation	S, is the fraction of the potential demand for a particular energy use actually being fulfilled at a given time. For example, if 95% of all households have refrigerators and the potential demand for refrigerators is taken to be one per household S = 0.95.
7.	Unit Energy Demand	E_u, is the amount of energy per unit that would be required for a specific end use, assuming a relative system efficiency, e_i, of 100% for each fuel employed. Thus, for a given end use, the actual fuel demand per unit is E_u/e_i. where e_i is the actual relative system efficiency.
8.	Technology Fraction	f_i is the number of energy consuming units satisfied by fuel i, $\Sigma f_i = S \cdot B$.

By specifying the technology fraction f_i, and relative system efficiency e_i, the fuel demand D_i, can be derived by the equation:

$$D_i = E_u \times f_i \div e_i$$

The data described above appear in the Fuel Demand Tables displayed in Appendix A for each subsector of the six energy consuming sectors.

2.4 SAMPLE CALCULATIONS

The following is a sample calculation for space heating of commercial office space fuel demands.

$$E_u = \text{Unit Demand} = 142.00 \times 10^3 \text{ Btu/sq. ft.}$$

Fuel	Technology Fraction f_i,(x 10^6)	Efficiency e_i
Oil	346.71 sq. ft.	.52
Gas	68.43 sq. ft.	.53
Steam	41.06 sq. ft.	.65

Fuel Demand = $D_i = E_u \times f_i \div e_i$

For oil: $D_1 = (346.71 \times 10^6 \text{ sq. ft.}) \times (142.00 \times 10^3 \text{ Btu/sq. ft.}) \div (.52)$
$= 94678.5 \times 10^9$ Btu

For gas: $D_2 = (68.43 \times 10^6 \text{ sq. ft.}) \times (142.00 \times 10^3 \text{ Btu/sq. ft.}) \div (.53)$
$= 18334.1 \times 10^9$ Btu

For steam: $D_3 = (41.06 \times 10^6 \text{ sq. ft.}) \times (142.00 \times 10^3 \text{ Btu/sq. ft.}) \div (.65)$
$= 8970.0 \times 10^9$ Btu

Total Fuel Demand = $\Sigma D_i = 121,982.6 \times 10^9$ Btu

2.5 THE ESNS VERSION OF THE NEW YORK STATE RES

The NYS-ESNS model, using the RES framework developed for New York State, describes quantitatively the flow of energy within the state from resources (indigenous and imported) through the refining, conversion, and transportation processes to the ultimate consumers of the final products (see Figure 7). In addition, the monetary cost of each pathway, as well as its environmental impacts as measured by the air and water residuals generated by the energy flows, can be specified and summed over all pathways to provide a total system view. The current New York State Data Base provides information on seven air residuals (particulates, oxides of nitrogen, oxides of sulfur, hydrocarbons, carbon monoxide, carbon dioxide, and aldehydes) for major energy supply and end use categories. The capability to incorporate information on water pollutants, toxic substances, and energy facility costs exists and can be utilized as data become available in the future.

The NYS-ESNS model representation of the New York State RES is designed to be used in the following way: A projection is made of the fuels or energy services to be provided in some future reference year. (By energy services are meant the levels of energy-using activities, such as vehicle-miles traveled or number of households heated). Assumptions are then made about the technologies which use these fuels to supply energy services. (Alternatively one can start with estimates of the energy services themselves and then determine the fuel mix required to supply them). Engineering economic assumptions are made about the energy supply and conversion processes within the energy system so that a complete supply and conversion picture is assembled for the future year. The model then can be used to analyze the implications--in terms of resource consumption, costs,* capital requirements,* etc.--of alternative resource and technological assumptions. For example, one can examine the impact on resource consumption of a change in the level of energy services, or the impact on the environment of increases in process efficiencies at various points in the system, or the system-wide impacts of the introduction of solar energy technologies.

In one sense the RES/NYS-ESNS framework should not be considered a "model"in that there are no decisions made internal to the framework. Allocations of different energy forms or fuels would be specified exogenously. Nonetheless the term model may be applied to the framework in that it is a quantitative representation of New York State's energy system.

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*Costs and capital requirements are not presently available in the NYS-ESNS model.

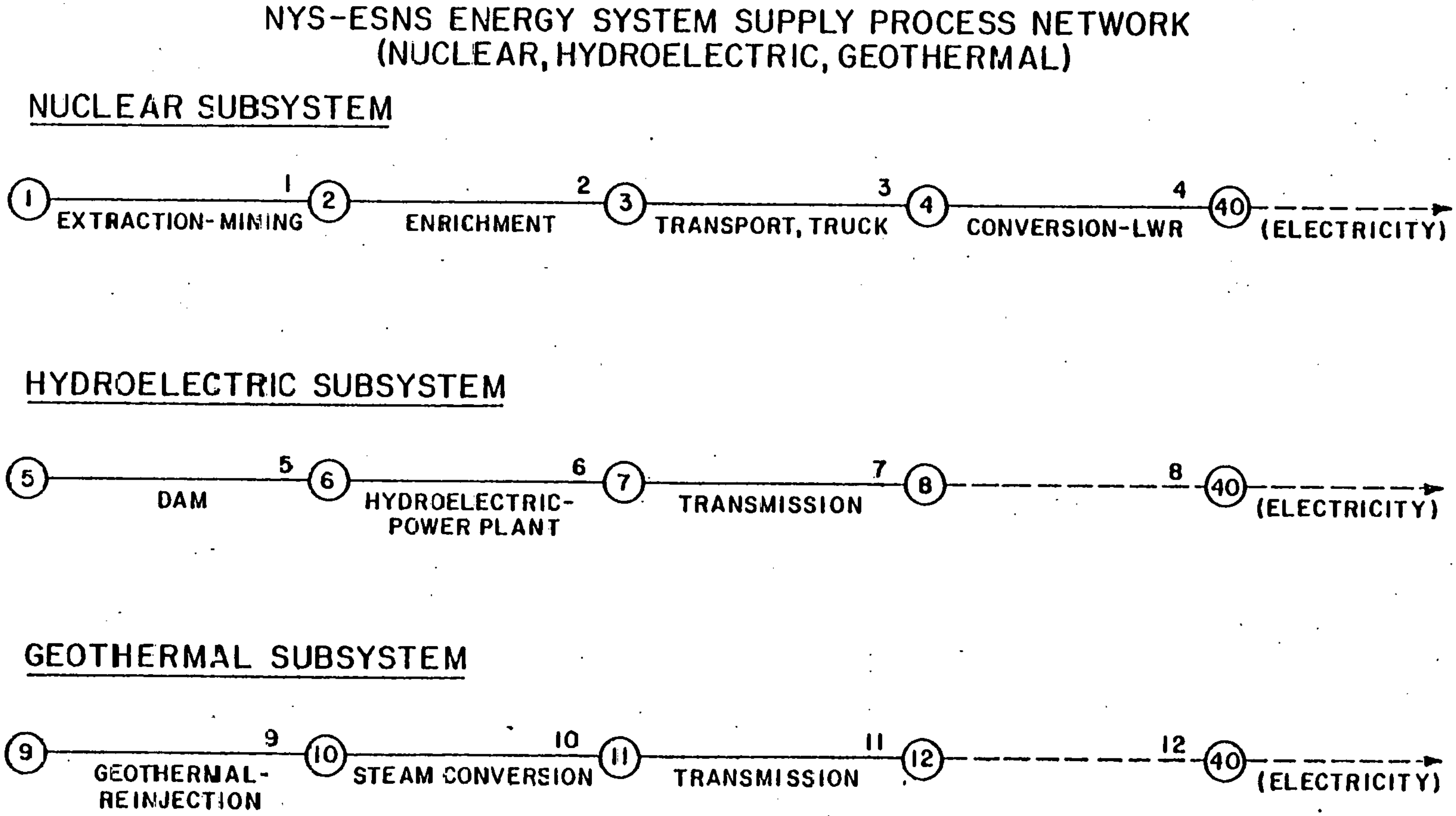

Figure 7.1 NYS-ESNS ENERGY SYSTEM SUPPLY PROCESS NETWORK (Nuclear, Hydroelectric, Geothermal)

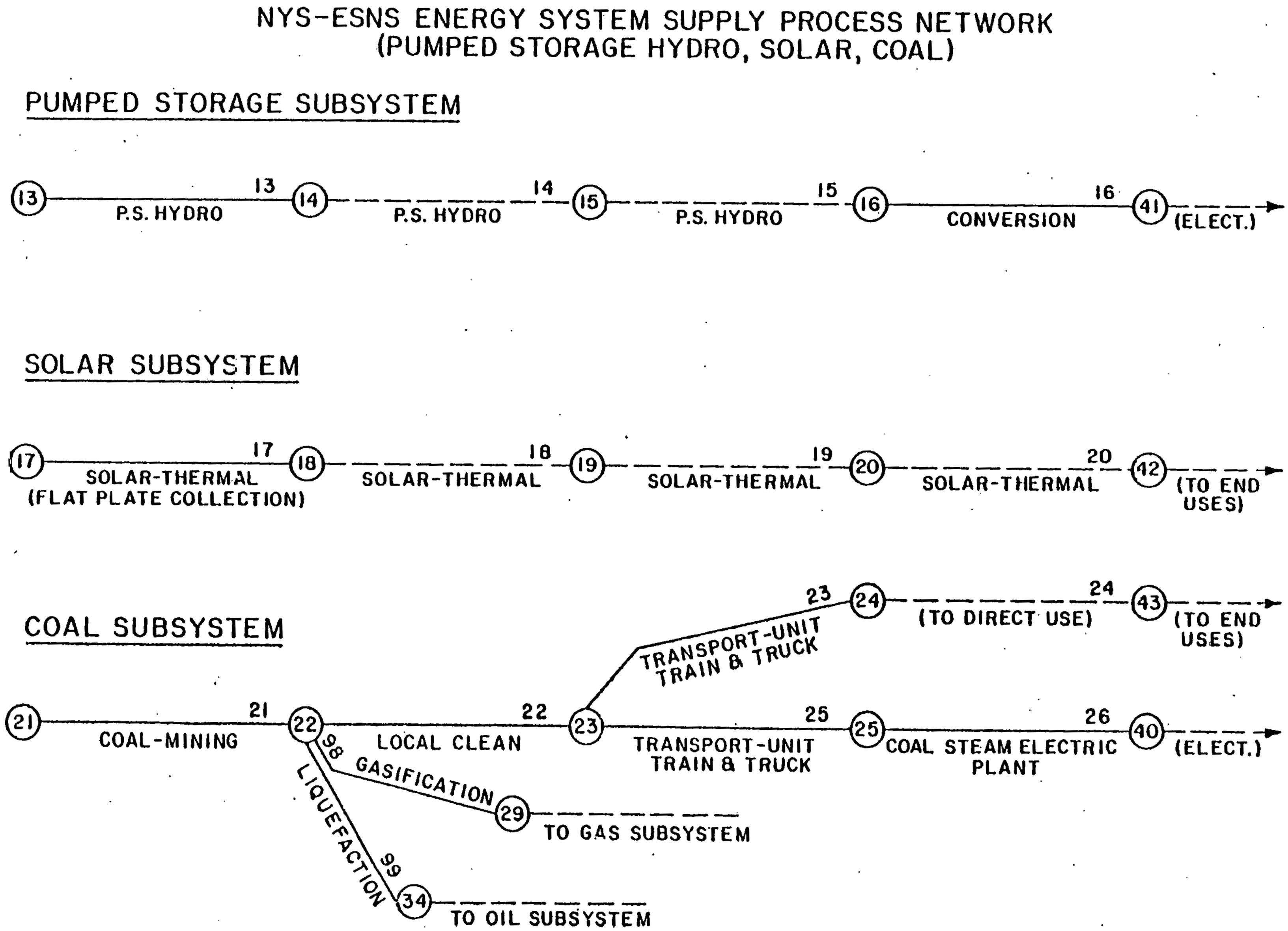

Figure 7.2 NYS-ESNS ENERGY SYSTEM SUPPLY PROCESS NETWORK
(Pumped Storage, Hydro, Solar, Coal)

NYS-ESNS ENERGY SYSTEM SUPPLY PROCESS NETWORK
(OIL, NATURAL GAS, OTHER)

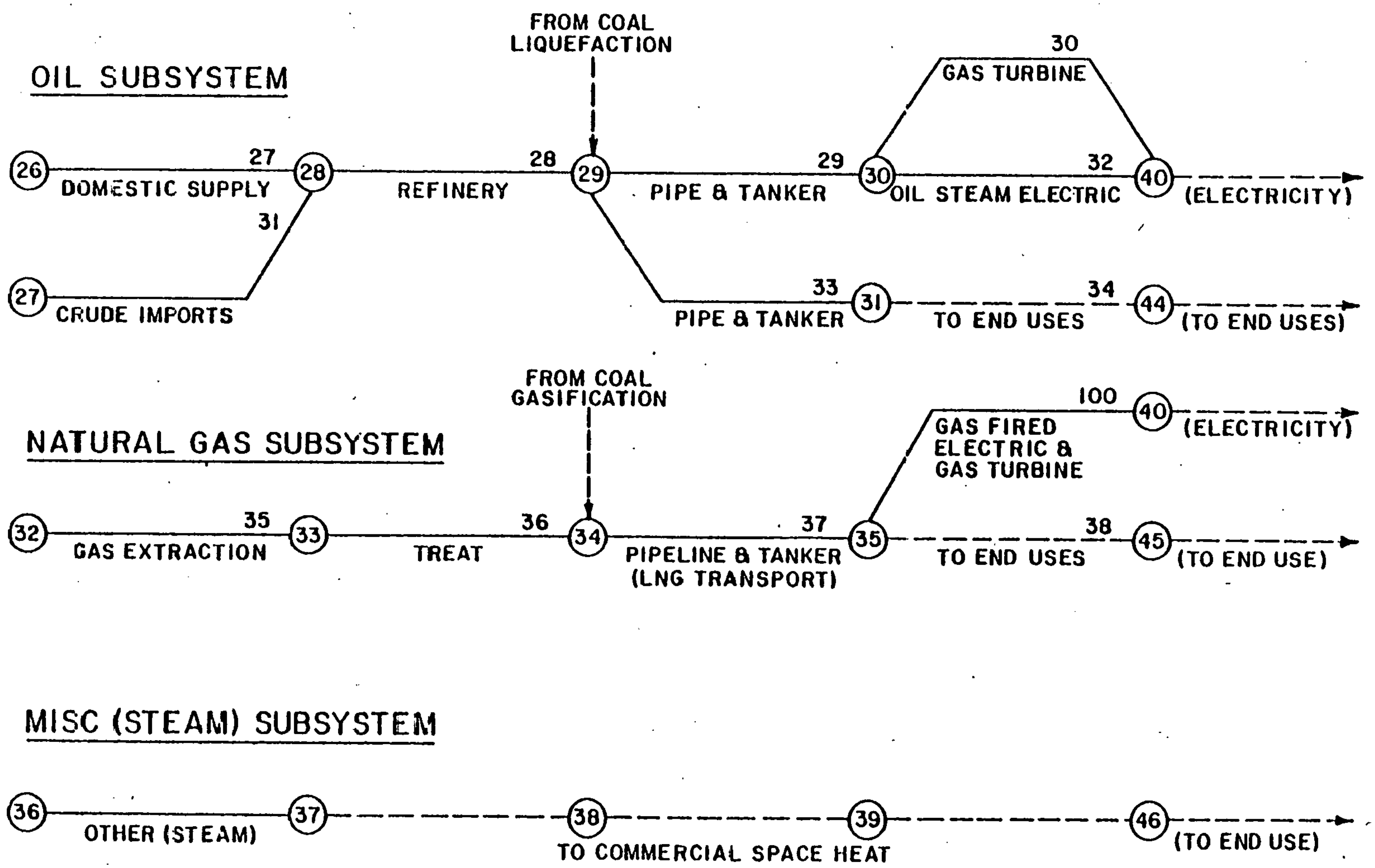

Figure 7.3 NYS-ESNS ENERGY SYSTEM SUPPLY PROCESS NETWORK
(Oil, Natural Gas, Other)

INTERMEDIATE LINKS

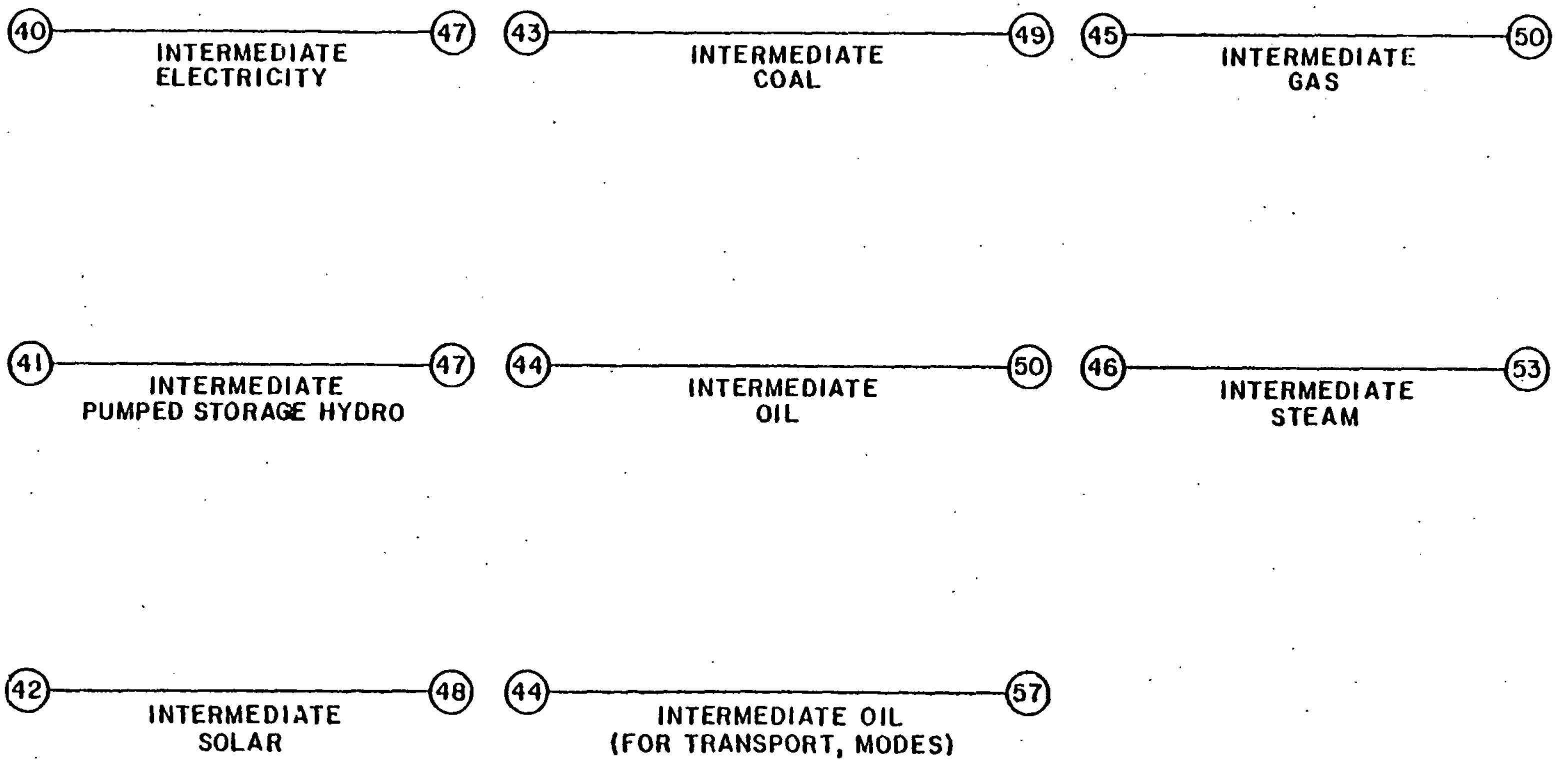

Figure 7.4 NYS-ESNS INTERMEDIATE LINKS

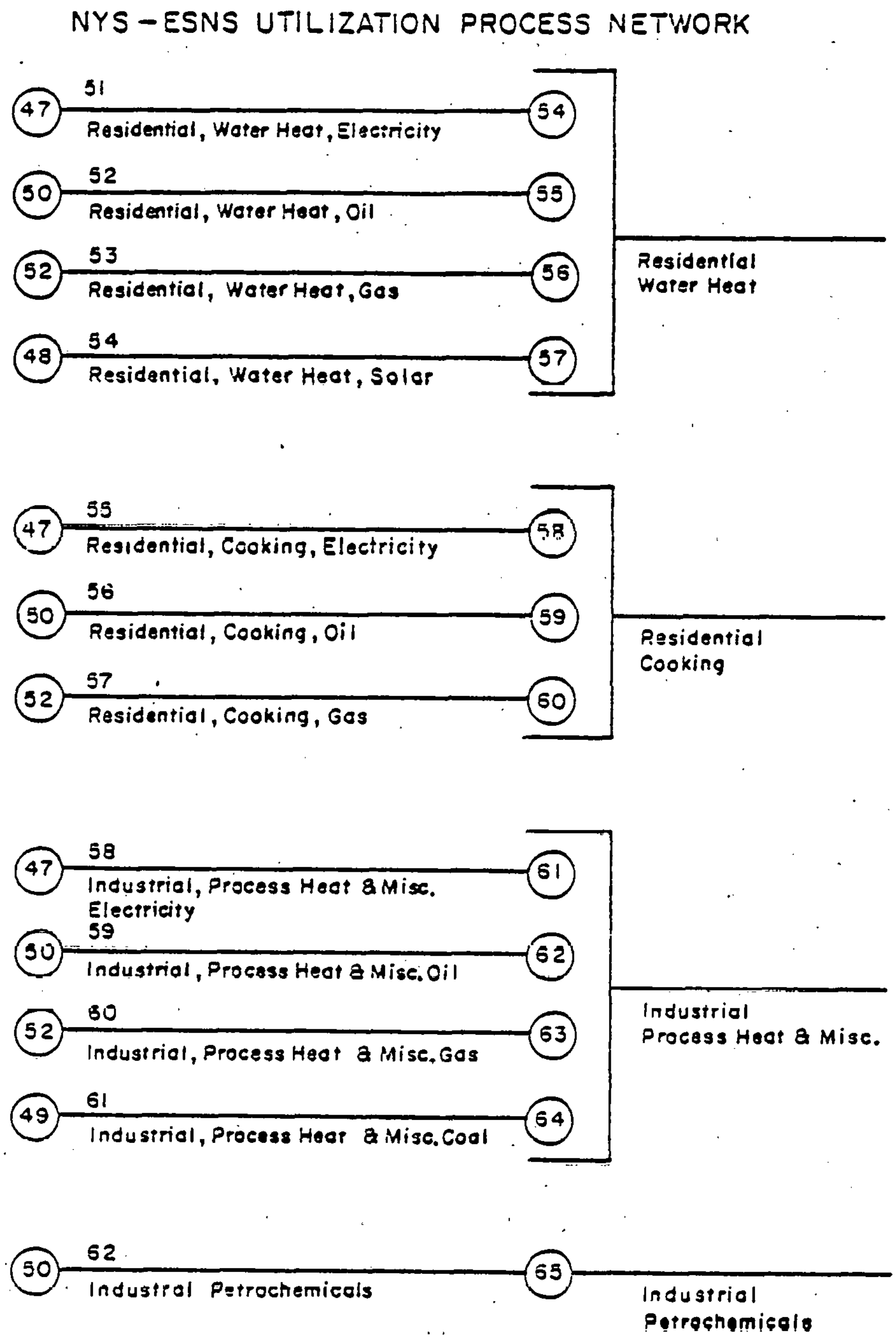

Figure 7.5 NYS-ESNS UTILIZATION PROCESS NETWORK
(Residential Water Heat & Cooking; Industrial Process Heat, Misc., Petrochemicals)

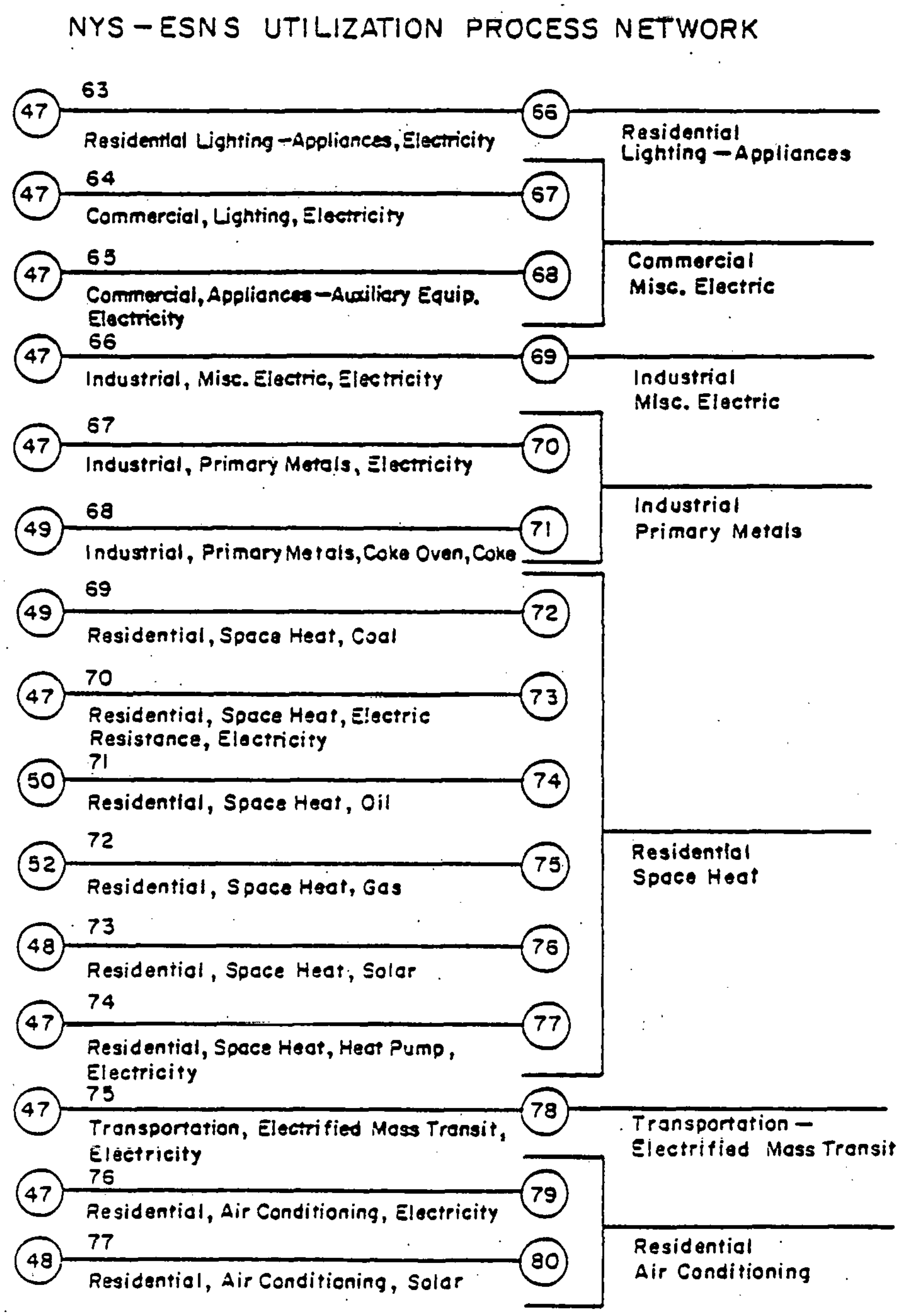

Figure 7.6 NYS-ESNS UTILIZATION PROCESS NETWORK
(Residential Lighting, Appliances, Space Heat, Air Conditioning; Commercial & Industrial Misc. Electric; Transportation, Electrified Mass Transit)

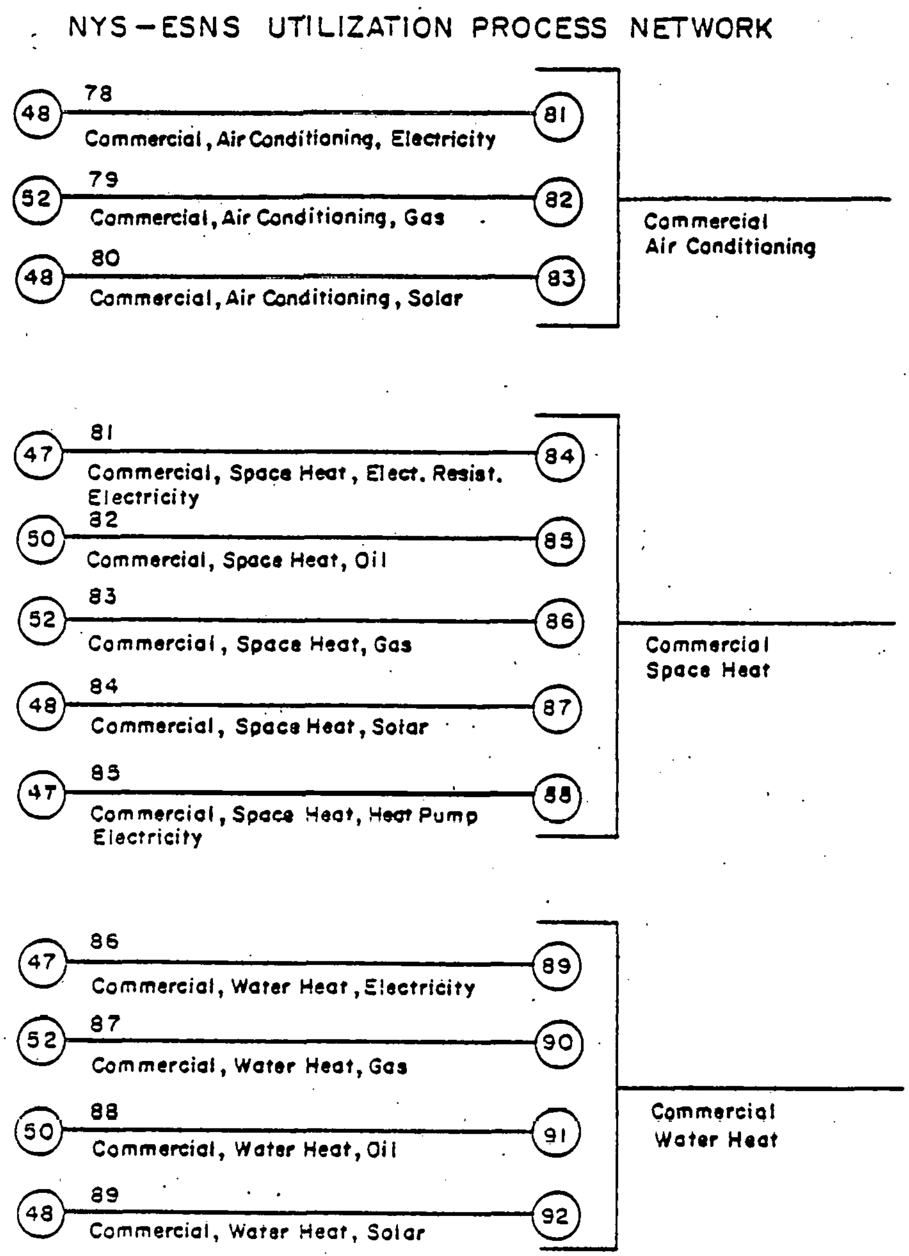

Figure 7.7 NYS-ESNS UTILIZATION PROCESS NETWORK
(Commercial Air Conditioning, Space Heat & Water Heat)

2.6 ESNS INPUTS

The input information required to operate NYS-ESNS includes the overall supply and demand structure of the energy system, the magnitude and type of energy demand, the efficiency of each technological process represented, the market allocation of each process and, if available, cost and environmental residuals data. The model as currently constructed does not contain a projection component, but depends upon exogenously specified demands.

The input components to NYS-ESNS are described briefly below:

1. New York State Reference Energy System

The structure of the New York State Reference Energy System described above is the primary input to the NYS-ESNS model. The details of the NYS-ESNS representation of the New York State RES are provided in Chapter IV.

2. Energy Demand

Demand for energy drives the NYS-ESNS model. The model calculates the level of energy resources and imports required to satisfy a specified mix of demand types.

Demand for energy can be quantified for input into ESNS in three ways:

a. Direct Fuel Consumption (DFC) - the amount of fuel (x) in BTUs delivered to a particular end use category,

b. Basic Energy Demand (BED) - the amount of energy in BTUs which represent the useful energy required by the particular demand category,

c. Measure of demand activity (measure) - the level of energy service required expressed in units of activity i.e., passenger-miles traveled for automobiles.

Demand expressed initially as basic energy demand or measure is converted within the model to direct fuel consumption by the use of numbers to represent the efficiency of end use (see Section 2.7 Calculations).

3. Efficiencies

Efficiency can be represented in NYS-ESNS in three different ways: primary efficiency, relative effectiveness and energy demand per measure.

Primary efficiency, used in all supply processes, is defined as the ratio of useful energy out of the process to primary energy delivered to the process. Fuel of a type other than the primary fuel which may also be required by the process, called ancillary fuel, is not included in the calculation of the primary efficiency (see Figure 8). Overall efficiency, taking into account ancillary energy requirements, is not computed in NYS-ESNS.

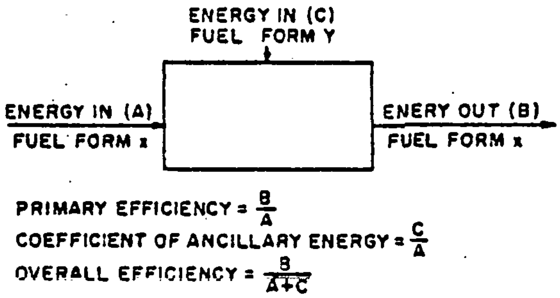

Figure 8. ENERGY BALANCE FOR PROCESS.

Relative Effectiveness is the concept used to describe the efficiency of end use devices. Relative effectiveness is distinguished from primary efficiency in that, in addition to reflecting the technical efficiency of the end use device (process), it incorporates other differences among fuels serving the same function.

For example, all-electric houses tend to be more heavily insulated than houses that are heated with oil. The relative effectiveness of electric and oil-heated houses reflects this difference.

The arithmetic product of fuel delivered to the end use device (or process) and the relative effectiveness is the basic energy demand (see Section 2.7 Calculations).

Energy Demand Per Measure is used to convert demand expressed in units of use to direct fuel consumption, or conversely to translate fuel consumed by an end use function into units of use.

The demand-efficiency type combination selected for input to ESNS depends on both the available data and the demand projection methodology (which operates external to the model). For example, if demand for energy in a future year is projected by determining the level of energy consuming activity in that year, then the demand efficiency type chosen would be energy per measure.

4. Market Allocations

An RES diagram displays the choices that are available to supply a particular fuel form to a specified use. When more than one option exists to supply a process with the energy it needs, the relative magnitude of each of the supply shares of that technology is expressed as the fraction of the total market for the product.

5. Other Parameters

Using only the RES structure, demands, efficiencies, and allocations, NYS-ESNS can calculate energy flows through the system. However, additional optional inputs can greatly enhance the usefulness of the model.

A list of optional parameters which can be included in NYS-ESNS follows. These include process efficiency components, residuals discharged to air and water, land use, occupational health, and fixed and operating costs. These data are inserted into the model in the form of units/10^{12} BTUs input to the process.

2.7 CALCULATIONS

Flows of energy represented by the RES diagram are calculated from demand to supply (right to left).

Very simply, on the supply side of the RES the energy available to any node is split according to the market share of each of the processes which deliver energy to that node, yielding the energy out of each process. The energy out of the process is divided by the primary efficiency of the process to yield the energy into the process. This sequence is repeated until all energy flows on the supply side of the RES have been calculated.

On the demand side, three different calculations are made, depending upon which demand input type is entered into NYS-ESNS. If Direct Fuel Consumption (DFC) is provided, no calculation needs to be made. Optionally, if either Basic Energy Demand (BED) or measure is desired, and the proper efficiency is supplied, these can be calculated from DFC.

When BED is entered, it is divided by the relative effectiveness to give DFC. Measure multiplied by energy demand per measure, yields DFC.

When all the energy flows in the network have been calculated, then the residuals and costs associated with each process for which a coefficient has been previously entered are calculated. Since the coefficients are expressed in units/10^{12} Btu of energy input to the process, the calculation is to multiply the coefficient by the total energy flow into the process.

As can be inferred from the calculations, NYS-ESNS is primarily an accounting model. Given certain data inputs and demand assumptions, a snapshot of the energy system at one point in time is produced, with energy flows and associated parameters summed and the required resources and imports tabulated.

2.8 OUTPUTS

The output of NYS-ESNS is available in two basic formats; an inverted listing and a production run listing.

Table 3

OPTIONAL PARAMETERS FOR NYS-ESNS

Parameter	Units
Primary Fuel, Processing Loss	BTU/10^{12} BTU (in)
Primary Fuel, Physical Loss	"
Primary Fuel, Steam Raising	"
Ancillary Fuel, Coal	"
Ancillary Fuel, Oil	"
Ancillary Fuel, Gas	"
Ancillary Fuel, Electricity	"
Acids	tons/10^{12} BTU (in)
Bases	"
Phosphates	"
Nitrates	"
Dissolved Solids, Misc.	"
Suspended Solids	"
Non-Degradable Organics	"
BOD	"
COD	"
Thermal Rejection	BTU/10^{12} BTU (in)
Particulates, Air	tons/10^{12} BTU (in)
Oxides of Nitrogen	"
Sulfur Dioxide	"
Hydrocarbons	"
Carbon Monoxide	"
Carbon Dioxide	"
Aldehydes	"
Solid Waste	"
Land Use	Acre-years/10^{12} BTU (in)
Occupational Deaths	Men/10^{12} BTU (in)
Occupational Injuries	"
Occupational Man-Days Lost	"
Potential Disaster	number/10^{12} BTU (in)
Annual Costs, Fixed	dollars/10^{12} BTU (in)

Table 3 (Continued)

OPTIONAL PARAMETERS FOR NYS-ESNS

Parameter	Units
Annual Costs, Operating	dollars/10^{12} BTU (in)
Total Costs	"
Population Exposure, Radiation	man-rem/10^{12} BTU (in)
High-Level Radioactive Waste	curies/10^{12} BTU (in)
Tritium Emission	"
Krypton Emission	"
Energy Demand per Measure	BTU/Measure (varies)
Direct Fuel Consumption	BTU
Basic Energy Demand	BTU
Aqueous Ammonia	tons/10^{12} BTU (in)
Trace Elements	"
Hydrochloric Acid	"
Hydrogen Cyanide	"
Anti-biofouling agent	"
Hydrogen Sulfide	"
Carbonyl Sulfide	"
Ammonia	"
Photochemical Oxidents	"
Boron	"
Make-Up Water	acre-ft/10^{12} BTU (in)
Plant Volume	cubic feet-year/10^{12} BTU (in)
Radon-222	Curie/10^{12} BTU (in)
Thorium-230 (Air)	"
Transuranics	"
Radium-226 (Air)	"
Uranium (Air)	"
Iodine-131	"
Misc. Fission Products (Air)	"
Noble Gases	"
Radium-226 (Liquid)	"
Uranium + Daughters (Liquid)	"
Ruthenium-106	"
Thorium-234	"
Misc. Fission Products (Liquid)	"

Table 3 (continued)

OPTIONAL PARAMETERS FOR NYS-ESNS

Parameter	Units
Solid Low Level Waste	cubic feet/10^{12} BTU (in)
Solid High Level Waste	curie/10^{12} BTU
Solid Low Level Waste	"

The inverted listing format displays, in an easily readable style, all data associated with each process and conversely, all processes which contain a certain data type. This capability allows data to be organized in a useable fashion as they are gathered, as well as permitting rapid checks of specific items of data with corresponding numbers from other sources.

The production run listing is the output which results from an actual run of the NYS-ESNS model. Options exist which allow some user control of the detail required to be printed from a specific run of the model. Unless specified by the user, output of a production run includes the following sections:

1. Total effects by process for the base year considered.
   For each process, NYS-ESNS displays the energy flow entering and leaving the process, indicates the efficiency and market allocation assumed for the process, and tabulates the total amounts of any environmental residual or other parameters for which a coefficient was previously entered.

2. Total effects by quantity of residual for the base year considered.
   All the residuals generated by the processes represented in the current run are totaled, resulting in the tabulation of system-wide impacts.

3. Total resources consumed for the given run.
   The energy resources required, by fuel type, to satisfy the demands of the current run, are given in units of total BTUs consumed.

4. Total end use energy demands by fuel type and by sectors.
   The quantity of fuels by type delivered to each utilization sector are given in BTUs, then summed across all sectors and finally across all fuels.

5. Basic Energy Demands.
   The useful energy requirements (after the end use device efficiencies are accounted for) are summed for categories of interest in demand projection and planning. The units are BTUs of useful energy required rather than of a specific fuel type.

Optional output information which can be specified by the user includes (1) the energy flow into or out of any set of processes specified by the user, as well as the impacts of residuals generated by the selected process set; (2) output of processes by sector.

2.9 PERTURBATIONS

Given the inputs discussed above, NYS-ESNS will reproduce a base-case RES for New York State for a previously designated base year. However, the greatest utility of the model lies in the ability to modify any or all of the inputs and observe the changes resulting from these new inputs.

Modifications to a base case model run can be made by

a) substitution of a new value of any input variable for the original base case number,

b) addition of a value for a parameter in a particular process for which no previous value was indicated,

c) addition of new processes anywhere on the supply or demand side which were not present in the original New York State RES diagram,

d) specification of a maximum energy flow for any supply process represented in the RES. Should this flow be exceeded the excess will be redistributed among all competing processes (i.e., processes which supply the same energy product) in proportion to their original market allocation. Alternatively, it is possible to specify a priority of redistribution for the excess energy flow.

When any or all of these changes are made to a base or reference case, a perturbation case is calculated in which the effect of the modifications on the resources and imports are summed and the new flows through each process, as well as the residuals generated by these flows, are calculated. In addition, a comparison of any two cases, perturbation or base, can be printed if desired. Three types of perturbation runs involving less than the full system runs described above are especially useful to make with the NYS-ESNS model.

A trajectory is a single pathway which can be traced through the entire system. If all other demands and market allocations are set to zero, then only the residual effects and magnitude of flows of the trajectory of interest are calculated and displayed. This technique can be used for example, to examine alternate supply possibilities for a given demand.

Somewhere between a full system run and a single trajectory lies consideration of a subsystem of the full energy system. A subsystem can display the portion of an energy supply system which serves only one type of demand, e.g., electric demand or a subset of energy demand. This option allows a portion of the RES to be examined without allowing the effects of the rest of the supply system to obscure the impacts of interest.

Finally, the impact of introducing a new technology or set of technologies on the existing or future reference energy system can be evaluated and compared to other possible energy supply strategies.

REFERENCES TO CHAPTER II

1. Associated Universities, Inc., "Reference Energy Systems and Resources Data for Use in the Assessment of Energy Technologies," AET-8, April 1972 and M. Beller, Ed., "Sourcebook for Energy Assessment," BNL-50483, Brookhaven National Laboratory, December 1975.

2. J. Allentuck _et al._, "An Assessment of Energy Research, Development and Demonstration Priorities for New York State," BNL-50735, Brookhaven National Laboratory, Upton, New York, November 1977.

3. W. A. Sevian, "The Energy Systems Network Simulator (ESNS): General Description and Sample Analysis," BNL-50492 (September 1975), Brookhaven National Laboratory, Upton, New York.

CHAPTER III

THE NATIONAL ENERGY PLAN AND THE NEW YORK STATE REFERENCE CASE

In another report we described the way in which the consequences of the National Energy Plan (NEP) for the U.S. energy economy were derived.[1] For ease of reference we repeat this description in the paragraphs which follow.

The level of services in the projection year in terms of Basic Energy Demand represented on the right-hand-side of the RES, is computed using a series of economic models. Long-run trends of consumption and investment are obtained from the DRI macroeconomic growth model and supplied to the DRI inter-industry energy model. The economic output obtained from the inter-industry model is then applied to energy-related coefficients from the BNL input-output model, resulting in the Btu final demands shown on the right hand-side of the RES.

For 1985, the mix of fuels satisfying these final demands are set equal to the fuel mix specified in the NEP outlined by the Executive Office of the President-Energy Policy and Planning. New technology implementation levels are determined by the U.S. Department of Energy.

Efficiency improvements are determined from specific proposals in the NEP. Proposals in the building sector, for example, include a homeowner tax-credit of 25 percent of the first $800 and 15 percent of the next $1400 spent on approved conservation measures. These proposals are translated into end-use device efficiency improvements such as a reduction in average heat loss per housing unit from an estimate of the number of new and retrofit housing units having a given level of conservation due to fuel prices, tax incentives and other policy proposals as illustrated above.

The implications of the NEP are reflected in the NYS reference case on the demand side in several ways: changed efficiencies of conventional technologies, substitution of other fuels for oil and gas, and market penetration of innovative technologies. On the supply side it has consequences for our study by increasing the quantity of coal which otherwise would be available nationally.

These changed efficiencies of conventional technologies, market penetrations of new technologies and fuel substitutions derived from the national case were transferred with only few modifications to the NYS case. In the present study we have reconsidered the impact of these changes on New York's energy economy in the light of the failure of the national government to complete action on the NEP* and the modification or elimination of a number of the original proposals. In addition we have reconsidered our estimate of the effect of conservation in electricity demand in the residential sector. In the paragraphs which follow we examine in detail our revised assumptions.

3.1 RESIDENTIAL AND COMMERICAL SECTORS

The following paragraphs and tables describe the various reference case projection assumptions for the residential and commercial sectors. The national projections actually combined these two sectors, but we have attempted to separate them where possible. In each we review our previous assumptions as to consequences of the NEP for end use efficiencies and market penetration.

In Table 4 we summarize assumptions as to energy efficiencies in 1976 and 1985 in these sectors. It will be noted that our current assumptions are generally more pessimistic than in the past report. The projected market penetration of innovative technologies is displayed in Table 5. Table 6 describes the market share of electric energy in space and water heating in 1985. The use of electricity is expected to increase over its 1976 value though it will be seen to be somewhat less than in our 1977 study for NYS ERDA.[1]

Conservation is also expected to play a role in the 1985 electricity consumption. We anticipate a reduction in the amount of electricity used for lighting in both the residential and commercial sectors. It is expected that appliances will become more efficient. These decreases in unit demands for lighting and appliances were not taken into account in the NYS ERDA Study. Table 7 describes unit demand changes in commercial and residential end use which are attributed to conservation and improved efficiency.

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*The act was passed subsequent to the completion of the work reported here.

Table 4

EFFICIENCIES: COMMERCIAL/RESIDENTIAL SECTOR

	1976		1985		
			This Study		NYS ERDA Study
	Res	Com	Res	Com	Res/Com
Space heating					
Oil	.40	.52	.50	.50	.52
Gas	.48	.53	.55	.55	.58
Water heating					
Oil	.63	.63	.63	.63	.63
Gas	.57	.70	.57	.70	.61
Air conditioning					
Vapor Compression	2.1	3.0	3.0	3.0	3.3

Table 5

NYS MARKET PENETRATIONS OF NEW TECHNOLOGIES RESIDENTIAL/COMMERICAL SECTOR
(% of Total Subsector Energy Demand)

	This Study	NYS ERDA Study
Space heating		
Heat Pump	5	10
Solar	0	0
Water Heating		
Solar	1	2

Table 6

NYS CHANGES IN ELECTRIC ENERGY MARKET SHARE
(% of Total 1976 Subsector Energy Demand)

			1985		
			This Study		NYS ERDA Study
	Res	Com	Res	Com	Res/Com
Space heating	3	0	10	10*	8
Water heating	9	32	20	40*	40

*These values do not apply to the hospital or school subsectors. The electricity market shares remain at the 1976 level.

Table 7

NYS CHANGES IN UNIT DEMANDS
(% Decrease in Demand, 1976-1985)

	1976-1985 Decrease (%)
Commercial Lighting	7
Residential Light-Appliances	7

3.2 MANUFACTURING SECTOR

Recent trends in N.Y. State show a move away from natural gas as an energy source to oil and, to a lesser extent, electricity. This is probably a reaction to the gas shortage of 1976-77, and the fact that a number of industries have interruptible contracts. The use of coal as a primary fuel has not increased significantly. The NEP will encourage a shift away from gas and oil toward coal. However, the NEP has not been approved at this point, and it will take a number of years for plants to convert burners for coal use. Gas burners can also be converted to use oil more easily than they can be converted to use coal. Therefore, we anticipate a continued short term shift from natural gas to oil and electricity, though a long term shift to coal might occur. This represents a change from our view in the NYS ERDA study which assumed a substantial shift to coal for process heat by 1985.

Industrial energy demands were initially projected to 1985, and included some efficiency improvements in the industrial processes. To account for the anticipated shifts described above gas demand was then reduced by 20% and oil and electricity were increased in equal amounts to compensate for the gas reduction.

3.3 TRANSPORTATION

Present legislation mandates certain improvements in fuel economy of the auto fleet by 1985. The 1985 national average automobile fuel economy is expected to be 18.35 miles per gallon and this is reflected in the N.Y. reference case estimates.

Improved efficiencies are also anticipated for other modes of transportation. These occur from increased passenger or freight loads and are accounted for by improved unit demands. These improvements are described in Table 8 for each subsector in the Transportation Sector.

Table 8

TRANSPORTATION SECTOR UNIT DEMANDS

(Btu x 10^3)

Auto	1976	1985
Auto	1.29	.96
Air-Freight	13.06	10.93
Air-Pass	4.54	4.49
Bus	2.67	2.67
Rail-Freight	.23	.23
Rail-Pass	1.05	1.00
Truck	.95	.95
Water-Freight	.14	.14

3.4 ELECTRIC UTILITIES

For the nation as a whole the NEP is estimated to effect a shift from oil and gas to coal. However, in projecting the 1985 NYS electricity generation mix, one must take into account the present mix, plants under construction, planned plants, and the time lag necessary in constructing new plants or modifying old plants. The electric utilities in New York State already have plans for the 1985 generation mix, and it is unlikely that these plans will be changed significantly to dramatically effect the 1985 mix.

The projected 1985 national and NYS generation mixes are presented in Table 9. The national mix includes the effects of the NEP while the NYS mix reflects the New York Power Pool[2] (NYPP) plans.

Table 9

COMPOSITION OF ENERGY INPUT TO US AND NYS ELECTRIC GENERATION

	US[a]	NYS[b]
Oil	8	46
Gas	2	0
Coal	55	16
Nuclear	25	19
Hydro	10	19
Other	-	-

[a]Includes the effects of the NEP.
[b]NYPP mix for 1985.

REFERENCES TO CHAPTER III

1. J. Allentuck et al., "An Assessment of Energy Research, Development, and Demonstration Priorities for New York State," BNL-50735, Brookhaven National Laboratory, Upton, New York, November 1977.

2. "Report to Member Electric Systems of the New York Power Pool Persuant to Article VIII, Section 149-b of the Public Service Law - 1978."

CHAPTER IV

NYS REFERENCE YEAR ENERGY DEMANDS

In this chapter we start by reviewing state aggregate energy demands by consuming sector for 1976, and our projections of these demands to 1985. Included are reviews of demand highlights in the base year and in 1985 as well as our projection methodology. Detailed state aggregate demands are provided in Appendix A. A comparison of sectoral demands is provided in Figure 9.

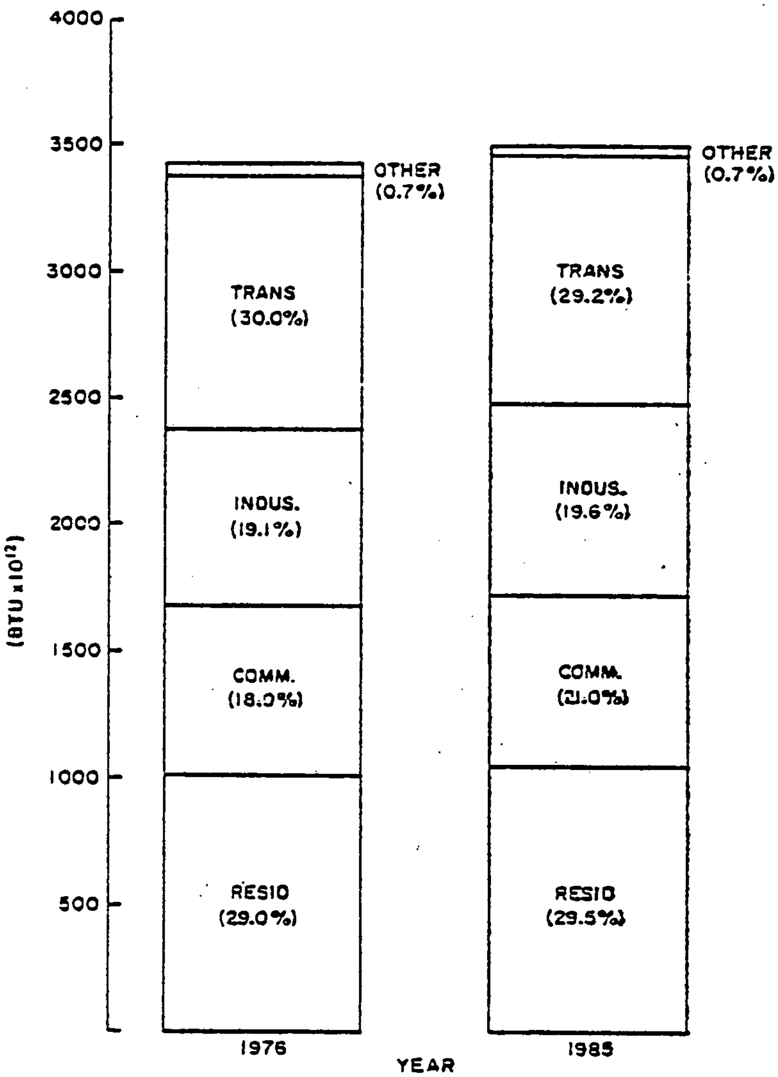

Figure 9. ENERGY DEMAND BY SECTOR.

In the next chapter we turn to county level energy demands and supplies as they existed in 1976. Here we review data and data sources as well.

4.1 THE RESIDENTIAL SECTOR

4.1.1 Highlights

Highlights of energy consumption for the residential sector in each reference year are as follows:

1976

- Total energy consumption: 976 x 10^{12} Btu
- Consumes 29% of total state energy demand*
- By energy form, demands in terms of the state fuel totals* are: oil 24%, gas 61%, electricity 32%
- By energy form, demands in terms of the residential energy total are: oil 51%, gas 33%, electricity 12%
- By end use, fuel demands as a percentage of the residential fuel totals are:

Space Heating	oil 87%, gas 73%,	electricity 8%
Water Heating	oil 12%, gas 19%,	electricity 6%
Air Conditioning		electricity 9%
Lights-Appliances		electricity 70%
Cooking	gas 8%,	electricity 7%

1985

- Total energy consumption: 1019 x 10^{12} Btu
- Consumes 29% of the total state energy demand
- By energy form, demands in terms of state fuel totals are: oil 23%, gas 62%, electricity 39%
- By energy form, demands in terms of the residential energy total are:
  oil 47%, gas 33%, electricity 19%

*All state total end-use demands exclude the electric utility sector.

- By end use, fuel demands as a percentage of the residential fuel totals are:

Space Heating	oil 80%, gas 64%, electricity 17%
Water Heating	oil 19%, gas 25%, electricity 16%
Air Conditioning	electricity 8%
Lights-Appliances	electricity 57%

- Changes in the energy mix for space heating and hot water arise from a shift from oil and gas technologies to electric technology
- Consumption of natural gas increases 3% and oil decreases 5% from 1976 quantities. Electricity use increases 66%
- Electricity demand for space heat increases 228%, for water heat 352%
- Lighting and appliances demand increases 35% (over 1976)
- Air conditioning demand increases 48% (over 1976)
- The impact of new technologies is small

Residential energy demands for each reference year are summarized in Appendix A. Fuel requirements for this sector are compared in Figure 10.

4.1.2 Residential Unit Demands, Saturation, and Efficiencies

Unit energy demands for all end uses in residential dwellings were obtained from the Brookhaven National Laboratory Report "Future Residential and Commercial Energy Demand in the Northeast"[1] and from the Oak Ridge report, "Residential Consumption of Electricity, 1950-1970."[2] These unit demands were initially reported by A.D. Little, "Residential and Commercial Energy Use Patterns,"[3] for different regions of the country. Northeast unit demands were modified to apply to New York State based on heating degree values and the average dwelling unit size. These unit demands were then changed, as appropriate, to take into account more recent data from A.D. Little.[4]

Changes in the unit demands for lights-appliances from 1976-1985, were included as discussed in Chapter III.

The saturation rate for space heating, water, heating, and cooking were taken as unity for all reference years. The lights-appliances saturation rate

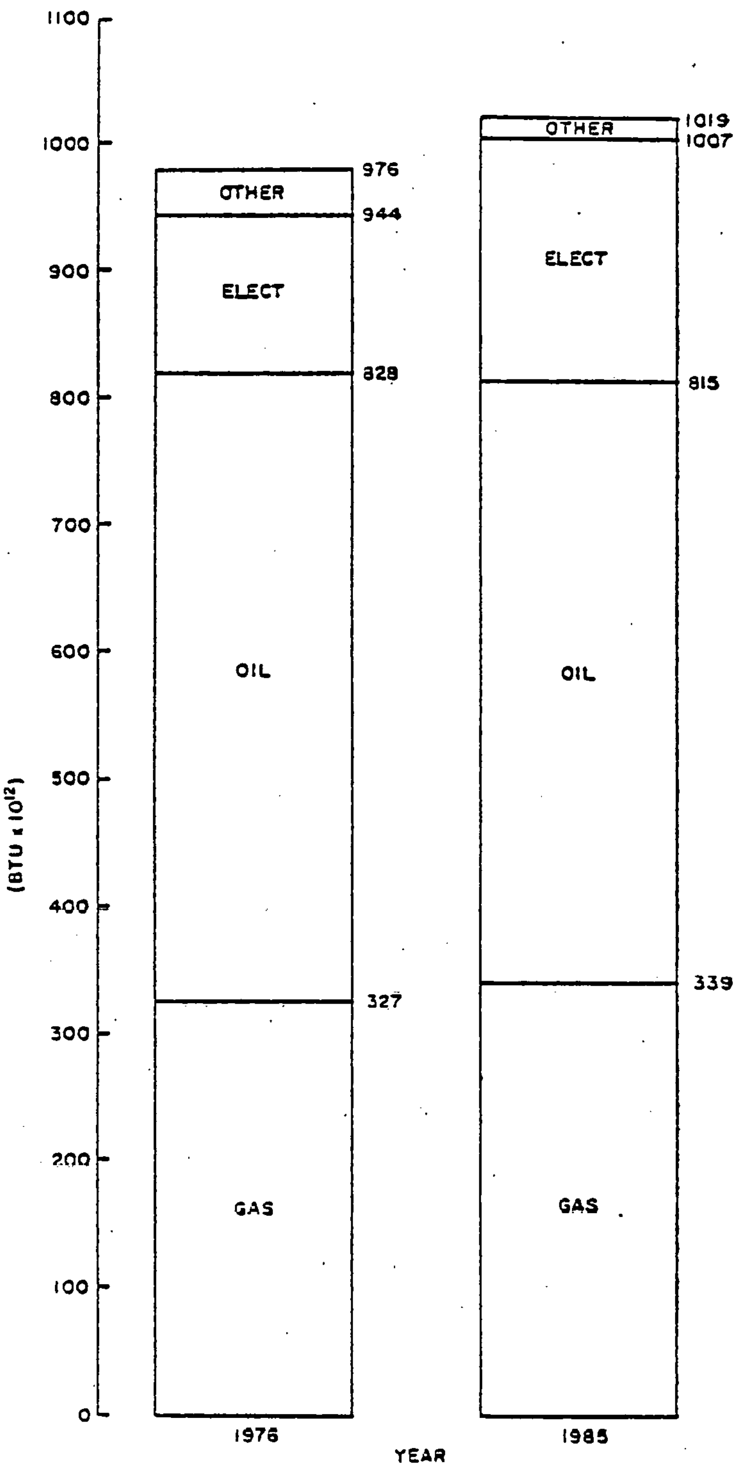

Figure 10. NYS RESIDENTIAL SECTOR ENERGY DEMAND.

for 1976 was interpolated from the 1972 and 1985 saturation rates in Ref. 3, and its 1985 saturation rate was also taken from this source. The air conditioning saturation rate was initially taken from Ref. 3 for 1972. This was then updated to 1976 by applying air conditioning saturation rates of new construction in the Northeast to NYS new construction data.[5]

Efficiency values for energy devices were taken from the BNL report "Sourcebook for Energy Assessment."[6] For future reference years, changes in efficiencies were included as shown in Chapter III.

4.1.3 Residential Sector Projection Basis and Data Sources

To project residential energy and fuel demands, the following data were required:

- o Estimates of the number of households for 1976 and 1985 (see Table 10)
- o Breakdown according to housing types for all reference years
- o Unit energy demands for major end use technologies in residential units (e.g., space heating) (see Appendix A)
- o Saturation values for major end uses (see Appendix A)
- o Breakdown of the fuel mix to meet end use demand (see Appendix A)

4.1.4 Residential Fuel Mix Projections

The procedure described below was employed to obtain projections of fuel demands in the residential sector.

- o The 1976 fuel utilization breakdown was initially obtained by assuming the same fuel mix as given in the 1970 Bureau of Census Report, "Detailed Housing Characteristics, 1970."[7] The values were then modified based on the fuel mix of new construction in the Northeast for the period 1970-1975.[8]
- o The 1985 allocation of fuels to space and water heating end uses was determined by incorporating the 1985 residential market allocation of electricity as shown in Table 6 in Chapter III. Oil and gas were allocated to the remaining energy demand in these end use areas in the same proportion as in 1976.
- o New technologies were included as described in Table 5, Chapter III.
- o For the remaining end use demands, allocation among fuels was based on the 1976 breakdown, with the additional restriction that the consumption of oil for cooking cannot exceed the 1976 level.

Table 10

NYS HOUSEHOLD AND POPULATION PROJECTION
(in Thousands)

	1976	1985
Households	6,150*	6,889
Population	18,084	18.343

*Estimated using the 1976 population and 2.94 persons/household, which was calculated from historical data.

Source: New York State Economic Development Board (EDB)[9]

Table 11

ANNUAL GROWTH RATES AND BASIS CHANGES FOR REFERENCE YEARS

(10^6 Households)

Subsect on	1976 Basis	1976-1985 AGR[a]	1985 Basis
High Rise	1.50	.0015	1.52
Low Density	1.46	b	1.44
Low Rise	.79	.0207	.95
Single Family	2.31	.0158	2.66
Mobile Homes	.09	.1514	.32
Total	6.15	.0127	6.89

[a]Annual Growth Rate
[b]Overall, 1.3% fewer low density structures existed in 1985 than 1976.

4.1.5 Housing Projections

Housing was characterized by five basic types:

- o Single family — one unit detached structures
- o Low Density — one unit attched structure and 2 to 4 unit structures
- o Low Rise — structures with 5 to 19 housing units
- o High Rise — structures with 20 or more units
- o Mobile Homes

The projected housing mix shown in Table 11 was obtained as follows:

1. The 1970 housing mix was obtained from the 1970 Census of Housing. The housing mix was then projected to 1976 after consideration of a number of factors, including the total number of households in 1976, the mix of new housing from 1970 to 1976,[8] and the 1970 housing mix.
2. The 1985 housing breakdown was distributed according to the Northeast housing breakdown in the "Project Independence Task Force Report."

4.2 THE COMMERCIAL SECTOR

4.2.1 Highlights

Highlights of energy consumption for the commercial sector in each reference year are as follows:

1976

- Total energy consumption: 641×10^{12} Btu
- Consumes 19% of the total state energy demand
- By energy form, demands in terms of the state fuel totals are: oil 18%, gas 20%, electricity 33%
- By energy form, demands in terms of the commercial energy total are: oil 57%, gas 18%, electricity 20%, steam 5%
- By end use, fuel demands as a percentage of the commercial fuel totals are:

Space Heating	steam 100%, oil 100%,	gas 62%,	electricity 3%
Water Heating		gas 37%,	electricity 12%
Air Conditioning		gas 1%,	electricity 15%
Lighting			electricity 43%
App-Aux Equip.			electricity 30%

1985

- Total energy consumption: 728×10^{12} Btu
- Consumes 21% of the total state energy demand
- By energy form, demands in terms of state fuel totals are: oil 20%, gas 24%, electricity 32%
- By energy form, demands in terms of the commercial energy total are: oil 56%, gas 18%, electricity 122%

- By end use, fuel demands as a percentage of the commercial fuel totals are:

Space Heating	oil 100%, gas 64%,	electricity 11%
Water Heating	gas 35%,	electricity 12%
Air Conditioning		electricity 13%
Lighting		electricity 37%
App-Aux Equip.		electricity 27%

- Total energy demand increases 14% over the 1976 period
- Demand for electricity increases 24% while natural gas and oil demands increase by only 11% and 11% respectively, from 1976.
- The relative differences in growth rates between electricity and fossil fuel demands arises from a slight shift to electric technologies for space and water heating from oil and gas technologies.
- Approximately 1% of the space heating demand is met by the use of heat pumps
- Solar provides less than 1% of the water heating requirements

Energy demands for each reference year are summarized in Appendix A. Fuel requirements for this sector are compared in Figure 11.

4.2.2 Commercial Sector Unit Demands, Saturation and Efficiencies

The commercial sector includes structures that serve such diverse activities as wholesale and retail trade, services (finance, insurance, etc.), schools and hospitals.

The following input is required to project the energy demand in each of these categories.

- The square footage of each activity listed above for both reference years.
- The unit energy demands for major end uses (space and water heating etc.) for each activity in terms of Btu/sq. ft.
- Saturation values for the major end uses and efficiency values of each technology.
- The fuel breakdown for each end use.

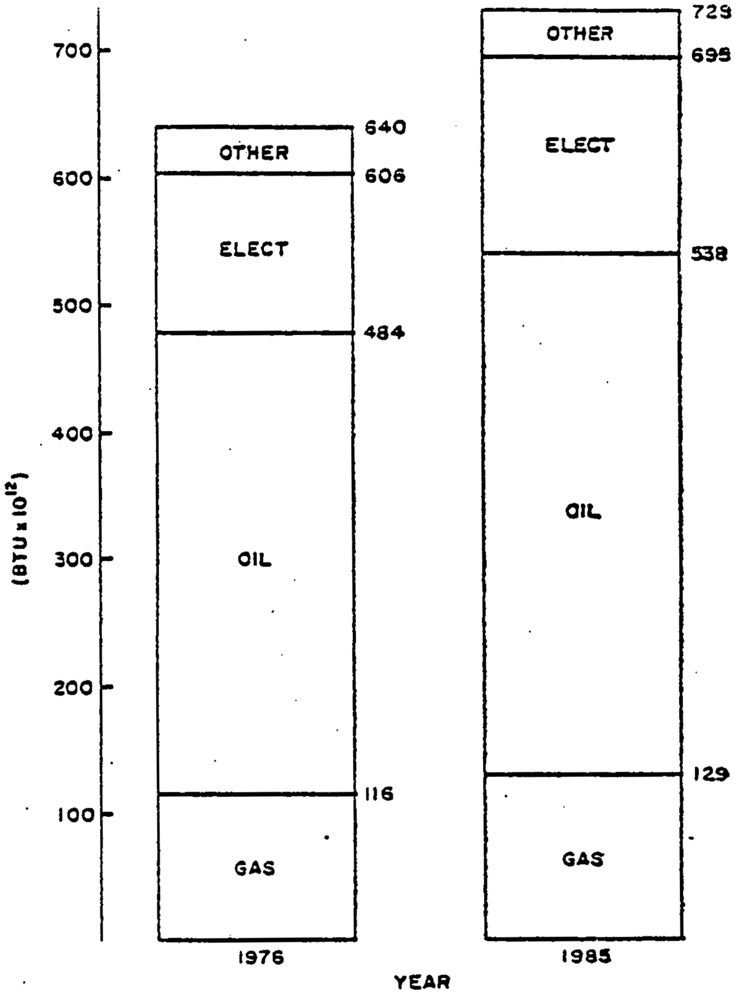

Figure 11. NYS COMMERCIAL SECTOR ENERGY DEMANDS.

4.2.3 Commercial Sector Projection Basis and Data Sources

Determination of floorspace in this sector for New York State was difficult as little data has been published at the level of disaggregation required. Floor space for 1974 provided in reference 10 was used as a starting point for further analysis. In that reference, Northeast data, obtained from Reference 1 was regionalized to New York State. Growth rates estimated in Reference 10 were used to obtain 1976 floorspace. These growth rates were then compared with other sources to test their reliability.* Hospital floorspace for 1976 was received from the N.Y.S. Department of Health and included floorspace of each hospital as reported by that hospital. However, the data were incomplete and the reporting procedure used by the hospitals were found to be inconsistent. Therefore, the floorspace for hospitals was taken from Reference 10.

*The combined floorspace of offices, retail establishments, and services were projected to increase at a rate of 2.4% during the 1974 to 1976 period. The number of business establishments included in these categories increased by 1.3% during the same period.[14] Employment in these categories actually dropped 1% during this period.

School floorspace for 1976 was obtained as follows:

1. College floorspace for 1976 was obtained from the N.Y.S. Dept. of Education, Post Secondary Education[11]
2. Enrollment in 1976 for grades K-12 was obtained from the N.Y.S. Department of Education.[12] The enrollment figures were multiplied by a factor of 120 sq. ft. per student.[10]
3. College floorspace and estimated pre-college floorspace were summed to determine the total 1976 school floorspace.

Two parameters must be considered in calculating the 1985 commercial floorspace, the new commercial floorspace during the projection period as well as the removals of old structures. The 1985 floorspace for each subsector was obtained using the following procedures:

1. Offices, Retail and Services: Earning projections for each of these subsectors were used to determine their new floorspace. These projections for New York State were obtained from the U.S. Department of Commerce and were the latest revisions of the "1972 OBER's Projections: Economic Activity in the U.S."[13] Forecasting removals from the commercial inventory is very difficult because of the lack of data on current and historical removal rates and on the age distribution of the structures. This report uses the removal rates described in Reference 1 for the Northeast, which were assumed to be the same as their projected residential removal rates.
2. Schools and Hospitals: The overall change in floorspace for each of these subsectors was assumed to be the same as those given in Reference 10 after a review of the described procedures and data sources. Implicit assumptions were made in that report that total removals will equal total constructions in each of these subsectors.

The 1976 and 1985 commercial inventory is presented in Table 12.

Table 12

COMMERCIAL FLOORSPACE INVENTORY

(10^6 sq. ft.)

Subsector	1976 Basis	1976-1985 Constructions	1976-1985 Removals	1985 Basis	1976-1985 AGR[b]
School	653.10	a	a	653.10	.0
Hospital	208.70	a	a	208.70	.0
Office	464.20	144.30	49.30	559.20	.0209
Retail	523.50	99.60	42.40	580.70	.0116
Services	800.60	341.10	64.90	1076.80	.0335
Total	2650.10	585.00	156.60	3078.50	.0168

[a]Removals and constructions for schools and hospitals are assumed to be equal.
[b]Annual growth rate.

4.3 THE MANUFACTURING SECTOR

4.3.1 Highlights

Highlights of the energy consumption for the manufacturing sector in each reference year are as follows:

1976

- Total energy consumption: 646 x 10^{12} Btu
- Consumes 19% of the total state energy demand
- The five largest energy consumers in the manufacturing sector are (in decreasing order):

Chemical and allied products,	SIC 28
Primary metal industries,	SIC 33
Paper and allied products,	SIC 26
Stone, clay and glass products,	SIC 32
Food and kindred products,	SIC 20

- By energy form, the industrial fuel demands as a percentage of the state fuel totals are: oil 6%, gas 16%, coal (including coking coal) 100%, P.C.F. (Petrochemical feedstocks) 100%, electricity 30%
- By energy form, demands as a percentage of the industrial energy total are: oil 19%, P.C.F. 20%, gas 14%, coal 30%, electricity 17%
- Coking coal to the primary metal industries (SIC 33) constituted 66% of the industrial coal demand

1985

- Total energy consumption: 702 x 10^{12} Btu
- Consumes 20% of the total state energy demand
- By energy form, demands as a percentage of the states fuel totals are: oil 7%, gas 14%, coal 100%, P.C.F. 19%, electricity 17%
- By energy form, demands as a percentage of the industrial energy total are: oil 18%, gas 10%, coal 33%, P.C.F. 19%, electricity 17%
- Coking coal to SIC 33 constituted 66% of the industrial coal demand
- Total industrial energy demand increases by 9% from 1976
- Coal demand increases by 19% primarily because of an increase in the demand for coking coal
- Gas demand decreases by 17% from 1976, while electricity demand increases 7%

- o Oil and petrochemical demands increase by 18% and 5%, respectively from 1976
- o The changes in fuel demand from 1976 for the industrial sectors major users of energy are:

SIC 28	(Chemical and allied products)	+ 5%
SIC 33	(Primary metal industries)	+ 11%
SIC 26	(Paper and Allied products)	+ 11%
SIC 32	(Stone, clay and glass products)	+ 6%
SIC 20	(Food and kindred products)	+ 20%

Energy demands in each reference year are summarized in Appendix A. A comparison of energy demands in this sector is provided in Figure 12.

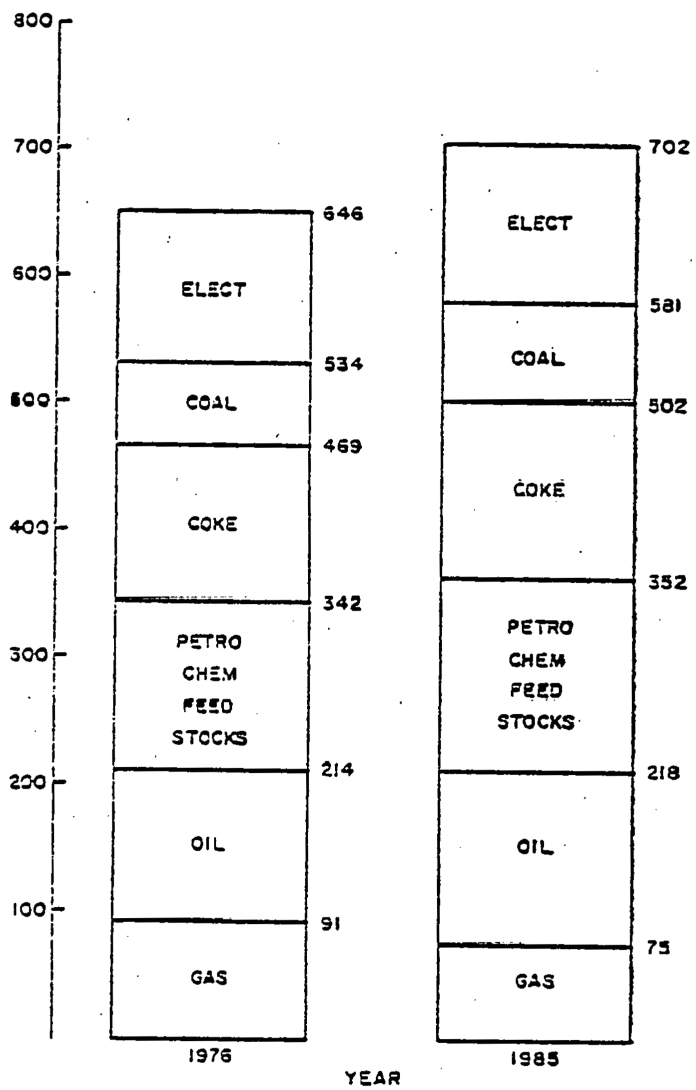

Figure 12. NYS MANUFACTURING SECTOR ENERGY DEMAND.

4.3.2 Industrial Sector Projection Basis and Data Sources

The energy intensiveness of each industrial subsector is represented by the ratio, Btu/dollar-value-added. Value added by two digit Standard Industrial Category was obtained from Reference 15. Fuel consumption by two digit SIC for 1976 was obtained from the 1976 Annual Survey of Manufacturers: Fuels and Electric Energy Consumed.[16]

Coking coal consumption in N.Y. was taken from a Mineral Industry Survey, "Bituminous Coal and Lignite Distribution, Calendar Year 1976."[28] Data on petrochemical consumption in N.Y. for 1976 was diffcult to obtain. The 1972 consumption of petrochemical feedstocks was taken from BNL-50555 "Alternative Patterns of Industrial Energy Consumption in the Northeast,"[18] and projected to 1976 on the basis of real dollar added growth in SIC 28 for the period 1972-1976. Total fuel consumption by SIC is shown in Table 13.

4.3.3 Industrial Fuel Mix Projections

Three factors were considered in projecting the industrial fuel mix, including estimates of value added in 1985, changes in the efficiency of industrial processes and fuel substitution. The following paragraphs describe the methodology employed in calculating the 1985 value added by SIC category and the combined role of all three factors noted above.

The procedure used in calculating the 1985 value added was taken from Reference 18. A constant national ratio of Gross Product Originating (GPO) to earnings was obtained from the 1972 OBERS for each two digit SIC for 1976* and 1985. The 1976 New York State GPO was calculated for each SIC by multiplying the New York State 1976 earnings for each SIC (from Reference 18) by the national GPO/earnings ratio. The 1985 GPO was calculated by multiplying the 1985 GPO/earnings ratio by the projected 1985 earnings for each SIC, also taken from Reference 18. Growth rates for each SIC were determined by calculating the percentage differences from the 1977 and 1985 GPO values. These growth rates were then applied to the 1976 value added by SIC.

The 1985 fuel demands were then calculated for each SIC by using the 1976 energy intensiveness coefficient, the 1985 valve added, and including the efficiency and fuel demand changes described in Chapter III. Projected fuel demands for the major industrial users are shown in Table 14. The fuel breakdown in the industrial sector for each reference year is shown in Table 15.

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*The 1976 GPO/earnings was extrapolated from 1972 and 1980 values.

Table 13

INDUSTRIAL SUBSECTORS ORDERED BY 1976 ENERGY CONSUMPTION

Order	SIC	Description	(10^{12} Btu) Energy Demand
1	28	Chemical and allied products	192.3
2	33	Primary metal industries	190.2
3	26	Paper and allied products	45.9
4	32	Stone, clay and glass products	38.5
5	20	Food and kindred products	34.3
6	36	Electrical equipment supplies	23.9
7	35	Machinery, except electrical	22.8
8	37	Transportation equipment	15.9
9	38	Instruments and related products	15.3
10	34	Fabricated metal products	15.1
11	27	Printing and publishing	12.9
12	30	Rubber and plastic products	9.1
13	22	Textile mill products	7.7
14	23	Apparel and other fabric products	6.5
15	39	Misc. manufacturing industries	6.0
16	31	Leather and leather products	3.0
17	25	Furniture and fixtures	2.7
18	24	Lumber and wood products	2.2
			644.3

Table 14

MAJOR INDUSTRIAL ENERGY USERS: TOTAL FUEL DEMAND

(Btu x 10^{12} and % of Total Industrial Demand)

SIC	Description	1976	1985
28	Chemical and allied products	193 (29.9%)	202 (28.8%)
33	Primary metal industries	190 (29.3%)	211 (30.1%)
26	Paper and allied products	46 (7.1%)	51 (7.3%)
32	Stone, clay and glass products	39 (6.0%)	41 (5.8%)
20	Food and kindred products	32 (5.0%)	41 (5.8%)

Table 15

INDUSTRIAL ENERGY DEMAND BY FUEL TYPE

(% and Btu x 10^{12})

Fuel Type	1976 %	1976 Btu x 10^{12}	1985 %	1985 Btu x 10^{12}
Coal*	29.7	191.7	32.5	228.5
Natural Gas	14.2	91.5	10.8	75.5
Oil	19.0	122.9	20.4	143.0
Electricity	17.4	112.7	17.2	120.9
Petrochemical Feedstocks	19.7	127.6	19.1	134.1

*Includes coking coal.

4.4 THE TRANSPORTATION SECTOR

4.4.1 Highlights

Highlights of energy consumption for the transportation sector in each reference year are as follows:

1976

- Total energy consumption: 1016×10^{12} Btu
- Consumes 32% of the total state energy demand
- By energy form, demands in terms of the state fuel totals are: oil 52%, electricity 2%
- By energy form, demands as a percentage of the transportation energy total are: oil 98%, electricity 2%
- By mode, energy demands as a percentage of the total transportation energy consumption are:

Automobile	54%
Truck	16%
Air Pass	13%
Air Freight	5%
Water Freight	5%
Rail	2%

1985

- Total energy consumption: 1011×10^{12} Btu
- Consumes 29% of the total state energy demand
- By energy form, demands in terms of state fuels totals are: oil 49%, electricity 2%
- By energy form, demands as a percentage of the transportation energy total are: oil 99%, electricity 1%
- By mode, energy demands as a percentage of the total transportation energy consumption are:

Automobile	46%
Air Pass	19%
Truck	16%
Air Freight	8%
Water Freight	7%
Rail	3%

- Total transportation energy demand decreases by less than 1% from 1976
- Automobile energy demand decreases by 21% from 1976, a consequence of increased fuel efficiency and a slow growth in vehicle miles travelled during the period

- The air subsectors energy demand increases by 37% (despite decreased unit demands) due to a large increase in service

Details of reference year fuel demand by end use are presented in Appendix A.

4.2.2 Transportation Sector Projection Basis and Data Sources

Total motor vehicle oil consumption in New York State for 1976 was obtained from the U.S. Federal Highway Administration (F.H.A.).[19] This aggregate consumption figure was apportioned among three motor vehicle subsectors (buses, trucks, and automobiles) reflecting their vehicle miles traveled (VMT) and mileage per gallon (MPG). The VMT and MPG estimates were obtained from Highway Statistics, 1975[20] and the New York State Department of Transportation.

Bunker fuel consumption by water freight carriers was obtained from Reference 22 as was the consumption by the rail subsectors. Electricity consumed by railroads in the state was taken from a New York Power Pool Report.[23] Consumption by the air subsector was obtained from the Air Transport Association.[24]

Unit demands were obtained from a previous study by System Designs, Inc.[25] Modification were made based on more recent information. For example, the automobile unit demand reflects a different miles per gallon value than that used by Systems Design, Inc.

Ton miles for freight carriers and passenger miles for passenger carriers were calculated for each subsector using the unit demand and fuel consumption values.

4.4.3 Transportation Fuel Projections

The 1976 to 1985 growth rate in VMT for automobiles was based on a study by the New York State Department of Transportation.[21] The average passenger load per vehicle was kept at the 1976 level to calculate the 1985 automobile passenger miles travelled. Ton-mile and passenger-mile values for the remaining subsectors were calculated by using the procedure described in Reference 10, but included the latest data available. Data for the air subsectors were modified according to Reference 24. The new OBER's projections were used in the basis projections for the rail, water, truck and bus subsectors. The 1976 and 1985 basis values are presented in Table 16. Efficiency and unit demands were modified to conform with the projection assumptions described in Chapter III.

Table 16

ANNUAL GROWTH RATES AND BASIS CHANGES FOR REFERENCE YEARS

(10^6 Passenger miles for passenger transport and 10^6 ton miles for freight transport)

Subsector	1976 Basis	1976-1985 AGR*	1985 Basis
Air-Pass	9,046	.0400	12,876
Air-Freight	1,348	.0500	2,091
Auto	89,680	.0080	96,425
Bus	838	.0140	950
Rail-Pass	8,472	.0124	9,467
Rail-Freight	21,525	.0190	25,499
Truck	40,692	.0122	45,389
Water Freight	81,694	.0258	102,740

*Annual Growth Rate

Table 17

TRANSPORTATION FUEL DEMAND

(Btu x 10^{12})

	Auto	Truck	Air Pass	Air Freight	Water	Rail	Bus	Total
1976	578.4	148.3	136.9	58.7	55.6	26.7	11.2	1015.8
1985	463.3	165.4	192.7	76.2	69.9	30.4	12.7	1010.6

Table 18

SUMMARY OF TRANSPORTATION ENERGY DEMANDS

(Btu x 10^{12})

1976	Oil	Electricity	Total
Freight	278.4	.2	278.6
Passenger	729.1	8.1	737.2
Total	1007.5	8.3	1015.8
1985			
Freight	330.4	.2	330.6
Passenger	671.4	8.6	680.0
Total	1001.8	8.8	1010.6

Table 17 summarizes transportation demand by subsector and reference year. The 1976 and 1985 fuel mix is presented in Table 18.

4.5 GOVERNMENT

4.5.1 Highlights

Highlights of energy consumption for the government sector in each reference year are as follows:

1976

- Total energy consumption: 11×10^{12} Btu
- Consumes less than 1/2% of the total state energy demand
- By energy form, demands as a percentage of the government energy total are: oil 81%, gas 9¢, electricity 7%
- By end use, fuel demands as a percentage of the government fuel totals are:

Auto	oil 62%	
Space Heating	oil 38%, gas 70%,	electricity 0%
Water Heating		electricity 12%
Lighting		electricity 40%
App-Aux. Equip.		electricity 25%
Air conditioning		electricity 23%

1985

- Total energy consumption: 10×10^{12} Btu
- Consumes less than 1/2% of the total state energy demand
- By energy form, demands as a percentage of the government energy total are: oil 78%, gas 9%, electricity 10%
- By end use, the fuel demands as a percentage of the government fuel totals are:

Auto	oil 56%	
Space Heating	oil 44%, gas 70%,	electricity 20%
Water Heating	gas 29%,	electricity 11%
Lighting		electricity 30%
App-Aux. Equip.		electricity 20%
Air Conditioning		electricity 19%

- Total energy demand decreases 13% from 1976 to 1985
- Electrical demand increases 19% over 1976 because of a shift in space heating technologies from gas and oil to electricity
- Automobile demand decreases by 24%, brought about mainly by a decrease in auto unit demand
- Oil and gas demands decrease by 16% and 11% respectively from 1976

Government fuel demands for each reference year are summarized in Appendix A.

4.5.2 Government Projection Basis and Data Sources

Government offices and auto fleets are the primary energy consuming units in the government sector. Floorspace was selected as the projection variable for government offices and vehicle miles travelled (VMT) for the government auto fleet. State office space data was obtained from the N.Y.S. Bureau of Space Planning.[26] The number of government automobiles in the state was taken from Reference 20 and the averge yearly mileage from the N.Y.S. Office of General Services.[27] Note that the government auto fleet includes automobiles from all levels of government, not just the state government. The average annual mileage was applied to all government automobiles.

Unit demands, efficiencies and the technology breakdown for office energy use were assumed to be the same as for the commercial sector office energy use. The efficiencies of government automobiles were assumed to be the same as for automobiles in the transportation sector. Government auto fuel consumption was calculated by dividing the total government VMT by the state average miles per gallon figure provided by Reference 27. The government auto unit demand was then calculated from these data.

4.5.3 Government Fuel Mix Projections

Office space and vehicle miles travelled were projected to 1985 on the basis of the 1976-1985 state population growth. Population projections were available from the NYS EDB. Growth rates and the projected floorspace and vehicle miles for 1985 are shown in Table 19.

Changes in efficiencies and unit demands, as described in Chapter III are incorporated into the 1985 fuel projections.

Table 19

ANNUAL GROWTH RATES AND BASIS CHANGES FOR REFERENCE YEARS

Subsector	1976 Basis	1976-1985 AGR	1985 Basis
Offices (10^6 sq. ft.)	16.65	.0014	16.86
Pass. Trans. (10^6 Vehicle Miles)	573.44	.0014	580.83

4.6 THE AGRICULTURAL SECTOR

4.6.1 Highlights

Agricultural sector highlights for the two reference years are:

1976

- o Total energy consumption: 14.0 x 10^{12} Btu
- o Accounts for less than 1% of the state's energy consumption
- o Obtains 87% of its energy from oil and 13% from electricity

1985

- o Total energy consumption: 12.4 x 10^{12} Btu
- o Accounts for less than 1% of the state's energy consumption
- o Obtains 87% of its energy from oil and 13% from electricity
- o Electricity demand decreases by 11%, oil demand decreases by 11% (from 1976)

Table 20 summarizes agricultural fuel demands for the two reference years.

Table 20

SUMMARY OF ENERGY USE IN THE AGRICULTURAL SECTOR

(Btu x 10^9)

1976	Oil	Electricity	Total Direct Use
All Crops	9,435.0		9,435.0
All Stock	1,780.7		1,780.7
Electricity		1,781.2	1,781.2
Propane	973.5		973.5
Total	12,189.2	1,781.2	13,970.4

1985	Oil	Electricity	Total Direct Use
All Crops	8,351.1		8,351.1
All Stock	1,576.2		1,576.2
Electricity		1,576.7	1,576.7
Propane	861.7		861.7
Total	10.789.0	1,576.7	12,365.7

4.6.2 Agricultural Projection Basis, Data Sources and Fuel Mix

For the agricultural sector, the most convenient parameters of energy demand are number of farms, acres harvested by kind of crop and heads of livestock. Information on these for 1976 has been provided by Reference 28 and 29.

A complete breakdown of the agricultural subsectors by end uses would require data that are at the present time unavailable. Thus it was decided to define an aggregate end use for each subsector which would encompass all the uses for that subsector. For crops, for example, the end use would include tilling, planting, cultivating, harvesting, drying, etc., for the livestock subsector it would include, among other uses, heating barns and cleaning milk machines. Fuel consumption patterns will reflect composition of the basis and the choice of technologies employed. For this study, technologies have been specified by the type of fuel using average efficiencies of typical devices which use that fuel.

Projections of energy demands for this sector were derived from 1975 OBERS projections for New York State, using projected total earnings from 1976 and 1985. The earnings yield a 8.3 decrease in income from 1976 to 1985.

Projected energy demands for the agricultural sector in 1976 and 1985 are presented in Appendix A.

REFERENCES TO CHAPTER IV

1. J. Lee, "Future Residential and Commercial Energy Demand in the Northeast," BNL 50552 (March 1976). Brookhaven National Laboratory, Upton, New York.
2. T. Tansil, "Residential Consumption of Electricity, 1950-70," (July 1973), Oak Ridge National Laboratory, Oak Ridge, Tennessee.
3. Arthur D. Little, Inc., "Project Independence Task Force Report: Residential and Commercial Energy Use Patterns, 1970-1990," prepared for the Federal Energy Administration, Washington, D.C. (1974).
4. Arthur D. Little, Inc. Latest revisions of unit demands in Reference 3 (unpublished).
5. NYS Division of the Budget, NYS Statistical Yearbook 1977, Albany, New York.
6. M. Beller, "Sourcebook for Energy Assessment," BNL-50483 (December 1975), Brookhaven National Laboratory, Upton, New York.
7. U.S. Department of Commerce, Bureau of the Census, "Detailed Housing Characteristics, 1970: New York State," Washington, DC (1972).
8. U.S. Department of Commerce, Bureau of the Census, "Characteristics of New Housing, Construction Reports," Washington DC (1976).
9. NYS Economic Development Board, "Official Household Projections for New York State Counties, 1978" and "Official Population Projections for New York State Counties, 1978," Albany, N.Y.
10. J. Allentuck et. al., "An Assessment of Energy Research, Development and Demonstration Priorities for New York State," BNL-50733 (November 1977), Brookhaven National Laboratory, Upton, New York.
11. Phone conversation with Mr. Luce, NYS Department of Education, Post Secondary Schools, April, 1978.
12. Phone conversation with staff members, NYS Department of Education, Facilities Planning, April, 1978.
13. U.S. Departments of Commerce and Agriculture, "1972 OBERS Projections: Economic Activity in the U.S.," Vols. 1 and 4, Washington, D.C. (1974) and latest modifications (unpublished).
14. NYS Department of Commerce, Business Fact Book: 1974 and 1976 editions, Albany, New York.
15. U.S. Department of Commerce, Bureau of the Census, Annual Survey of Manufacturers, Washington, D.C., (1976).
16. U.S. Department of Commerce, Bureau of the Census, Annual Survey of Manufacturers, Fuels and Electrical Energy Conserved. Washington, D.C. (1976).
17. U.S. Bureau of Mines, Division of Fossil Fuels, "Bituminous Coal and Lignite Distribution, calendar year 1974," Washington, D.C. (April 1975).
18. R. Goettle, Alternative Patterns of Industrial Energy Consumption in the Northeast," BNL-50555 (March 1976) Brookhaven National Laboratory, Upton, New York.

19. Communication with Federal Highway Administration, May 1978.

20. U.S. Department of Transportation, "Highway Statistics, 1975" Federal Highway Administration, Washington, D.C.

21. D. Gooding, "Automotive Energy Use: A Baseline Projection for New York State," August 1977, New York State DOT, Albany, N.Y.

22. U.S. Department of Energy, "Energy Data Reports, Sales of Fuel Oil and Kerosene, 1976," Washington, D.C.

23. New York Power Pool, "Report to Member Electric Systems of the NYPP Pursuant to Article VIII, Section 149-6 of the Public Service Law - 1978, Vol. 1."

24. Air Transport Association, "Domestic Industry Passenger Demand Forecast, 1974-2000," June 1975, and "International Air Travel Industry Passenger Demand Forecast, U.S. - Related Traffic, 1976-2000," May 1976, Washington, D.C.

25. Systems Designs Concepts, Inc., "Transportation Energy Consumption and Conservation Policy Options in the Northeast," BNL 50544, Brookhaven National Laboratory, Upton, N.Y., April 1976.

26. Telephone interview with Mr. Ray Tesiero of the NYS Bureau of Space Planning (June 1978).

27. Telephone interview with Mr. Whalan of the NYS Office of General Services (June 1978).

28. Telephone interview with staff of the Farm Bureau, NYS Department of Agriculture and Markets (June 1978).

29. Cornell University, Agricultural Engineering Bulletin 405 (July 1976).

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CHAPTER V

COUNTY LEVEL ENERGY SUPPLY AND DEMAND

5.1 INTRODUCTION

We discuss in this section the structure of the county data base, its data and data sources. While significant differences in structure do occur between fuel types because of differences in the characteristics of the fuel, variations in consumption patterns and differences in the data available, there are basic structural elements common to all energy forms. These we discuss below.

The basic structural elements common to all energy forms in the county base are show in Figure 13. For each energy form the state is divided into utility regions consisting of a number of counties. Energy is transported into the utility region, by trucks, barges, pipelines or transmission lines or produced within the region. This activity is shown in Figure 13 on the supply side of the diagram.

Within each county in a region, activities take place which require the use of energy. There is a demand for energy in the various consuming sectors - residential, commercial, industrial, transportation, electric utilities, etc. This demand by consuming sector is represented on the demand side of Figure 13.

A typical tree structure for the New York State County Data Base is shown in Figure 14. The structures have the capability of including more information than is necessary or possible to obtain for any particular energy form. For example, information for coal would not be found under power plants, capacity, or typical bills. These categories would be used only for electricity.

For electric and gas utilities regions correspond to the actual service areas of utilities providing these energy forms. For other fuels utility regions are fictitious but useful entities.

5.2 SPECIFIC STRUCTURES

In the paragraphs which follow we briefly describe the structure used for each of the fuel forms. A more detailed description of the data sources and the type of data available appears in Chapter IV.

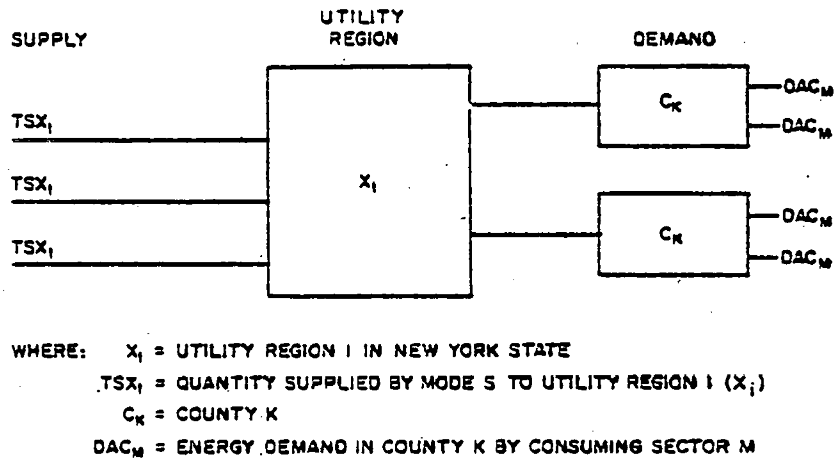

Figure 13. COUNTY DATA BASE STRUCTURAL ELEMENTS.

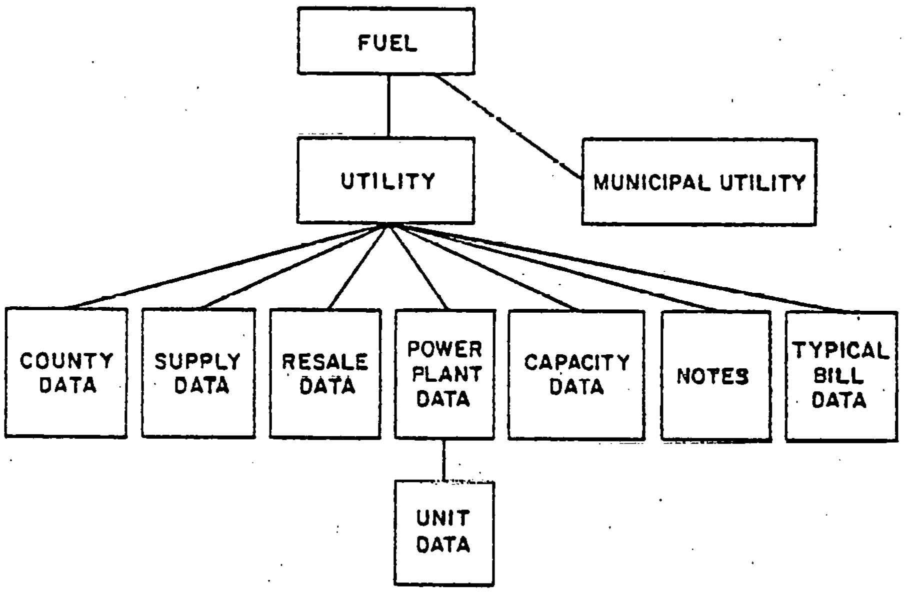

Figure 14. TREE STRUCTURE FOR NEW YORK STATE COUNTY DATA BASE.

5.2.1 Natural Gas

The structure for natural gas is presented in Figure 15. Gas can be supplied to a utility region through one of the following supply modes:

- Pipeline- Gas purchased from the national pipeline companies, and is transported to a utility region via the companies pipeline network.
- Production- Synthetic gas purchased or produced by a utility
- Utility- Gas purchased from another gas utility
- Other- Gas supplied from miscellaneous sources, such as a private well owned by a utility.

There are 15 gas utilities in the state each supplying a utility region. A county which is supplied by more than one gas utility is included as part of each utility region. Utility regions can overlap. Thus, Queens County which is supplied by both Lilco and Con Ed, is included in both the Lilco and Con Ed utility regions.

Information that is not available at the county levels but is deemed important enough to be included in the data base, is available for a utility region. These data include:

- Internal Use- Gas used by a utility for its own requirements
- Quantity Stored- Storage space available to a utility
- Quantity Lost- Gas lost or unaccounted for due to faults in the distribution network
- CI Firm- Commercial/Industrial Firm. Contracts to commercial/industrial customers that cannot be interrupted because of a gas shortage.
- CI Interruptible-Commercial/Industrial Interruptible Contracts to commercial/industrial customers that allow a utility to interrupt supply to these customers because of a gas shortage.
- Sales for Resale-Sales to other utilities
- Cost Data- Average cost to residential, commercial/industrial, and public authority customers

The demand sectors include sales to:

Residential customers
Commercial/Industrial customers
Public Authorities

The unit of measure for natural gas supply/demand data is Mcf-thousand cubic feet. The unit of measure for cost data is $/Mcf.

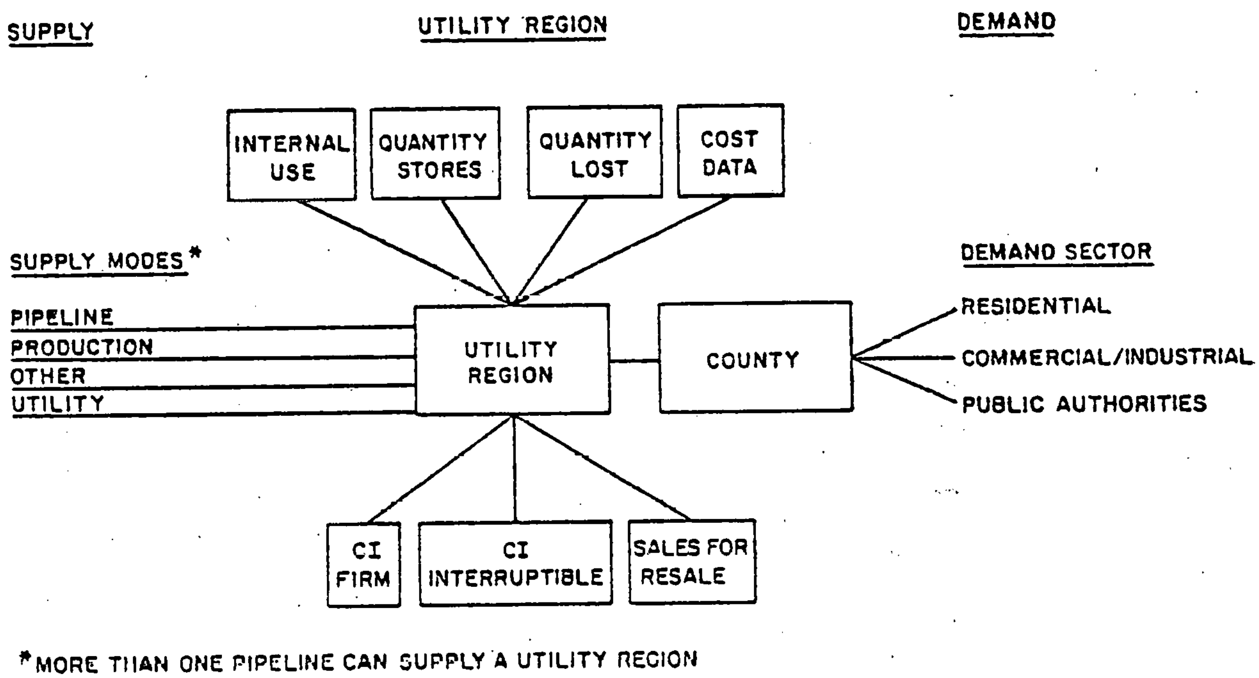

Figure 15. STRUCTURE FOR NATURAL GAS.

5.2.2 Electricity

The structure for electricity is presented in Figure 16. Electricity is supplied to a region by an electric utility. Each utility generates electricity by using a combination of any of the following types of power plants:

Nuclear
Coal
Gas
Oil
Hydro

Eight major electric utilities operate in New York State. Each utility supplies electricity to an electric utility region. These regions may overlap so that a county can be in more than one electric utility region.

Detailed information on fossil fuel fired generating plants is available. These data include:

Fuel Consumption by Power Plant
Pollution by Power Plant
Individual Unit Data
The County in Which the Plant is Located

The demand sectors include:

Residential
Commercial/Industrial
Public Authorities

Demand and supply data are measured in MWhr (Megawatt hours). Cost information is measured in $/KWhr ($/Kilowatt hour).

5.2.3 Coal

The structure for coal is presented in Figure 17. Coal is transported into a region via one of the modes, including:

Rail
Truck
Water

There are seven coal utility regions in the state, named after one of the seven major electric utilities in the state. Unlike the utility regions for natural gas and electricity, however, coal utility regions do not overlap.

Demand data are provided for each of the following sector.

Electric Utilities -	Bituminous and lignite coal supplied to electric utilities for the generation of electricity
Industrial Customers -	Bituminous and lignite coal supplied to industrial customers
Coking Coal -	Bituminous and lignite coal used in the coking process
Anthracite -	Anthracite demand
Other -	Miscellaneous demand

Coal demand and supply data are in units of 1000 tons.

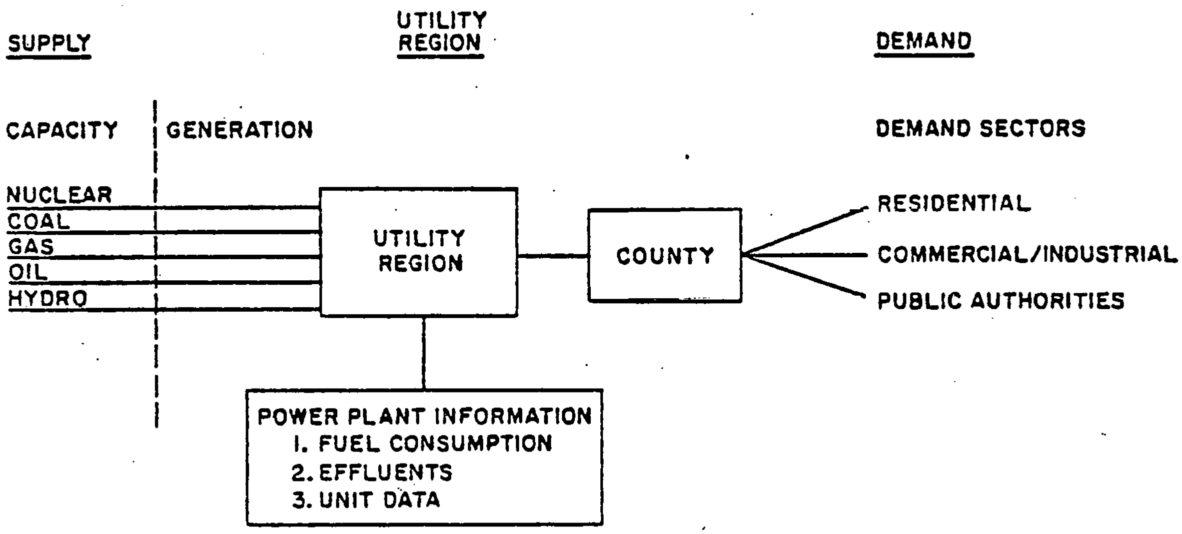

Figure 16. STRUCTURE FOR ELECTRICITY.

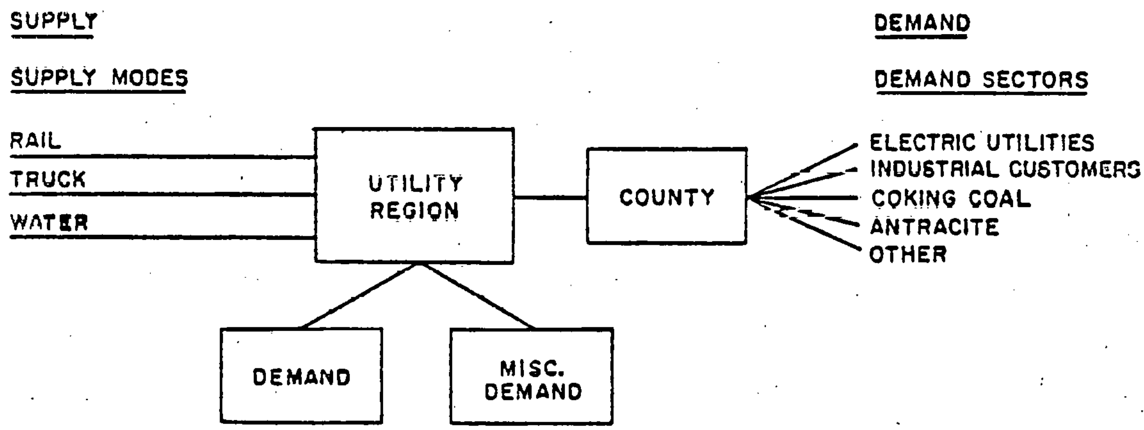

Figure 17. STRUCTURE FOR COAL.

5.2.4 Petroleum

The structure for petroleum is presented in Figure 18. Petroleum is transported into the state by the following modes:

Truck
Water Transportation
Pipeline

The petroleum utility regions coincide with the coal utility regions. Each region receives both a domestic and a foreign supply of oil, and might contain a refinery that receives crude oil.

The demand sectors include the following:

Residential Sector
Commercial Sector
Transportation Sector

Demand and supply data are measured in 1000 barrels (mbbl).

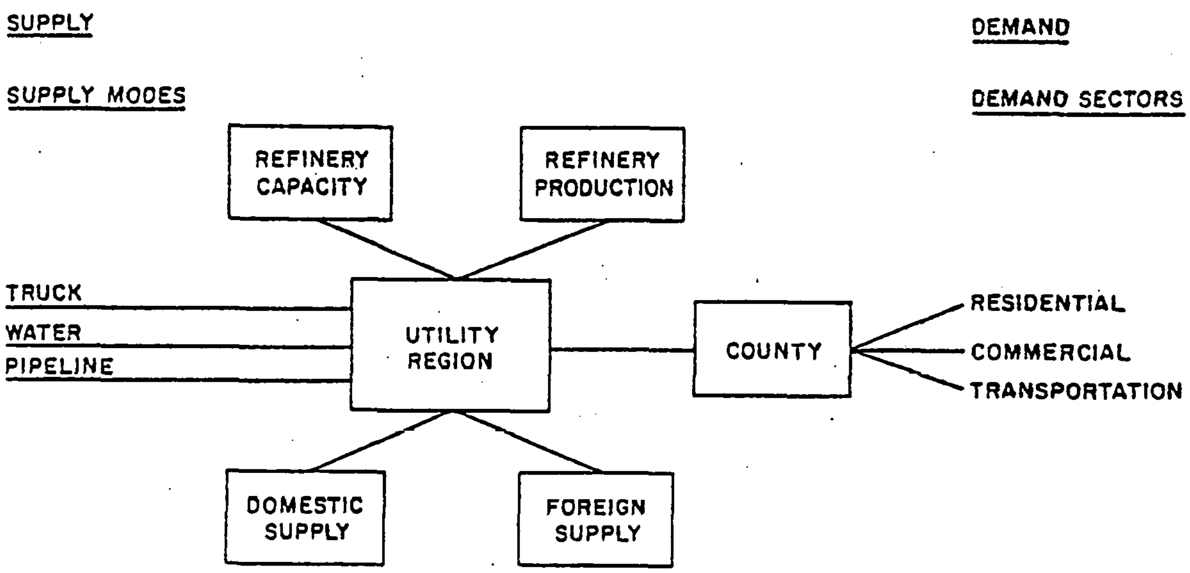

Figure 18. STRUCTURE FOR PETROLEUM.

5.2.5 Solid Waste

Solid waste is not examined in the same structural terms as the other fuels previously discussed. Solid waste is not a fuel source that was consumed in substantial amounts in 1976, but is considered likely to be a significant energy resource in future years. For this reason data of solid waste by regions of the state have been included.

The potential for the generation of solid waste is estimated only for those counties included in Standard Metropolitan Statistical Areas (SMSA's) since it is unlikely that sufficient useful material would be produced in counties with low population densities.

The potential for energy generation from solid waste is measured in Btu x 10^9.

5.3 COUNTY LEVEL SUPPLY AND DEMAND

In the previous section we examined the structural elements of each of the fuels included in the county level data base.* In this section, we describe the data and data sources for each of the fuels.

5.3.1 Natural Gas

The primary sources of information for natural gas were the State of New York Public Service Commission Reports (PSC)[40] filed by each gas utility in the state. These reports included the following information:

1. Total sales to residential, industrial and commercial (combined) and public authority customers.
2. The cost per thousand cubic feet of gas to each of these customer classifications.
3. Consumption by communities with a population of 10,000 or more (by customer classifications).
4. Supplies to a utility and their cost per Mcf.
5. Gas production by a utility.
6. Utility internal use of gas, storage, sales for resale, and losses in the system.
7. Industrial interruptible and firm requirements.

County data was derived from the above sources for many of the utilities. However, if a utilities PSC report did not contain county data, further information was requested. If the data required remained unavailable, estimates were made of consumption by customer classification for those communities with a population of less than 10,000. (As noted above the PSC reports did contain consumption data for those communities of 10,000 or more). These estimates were based on the population of the communities.

*County level data appear in Appendix B.

There are 15 major in addition to several small municipal gas utilities in the state. The abbreviation used for the utilities, as well as the supply types and units of measurement, are described in Table 21. The gas pipelines supplying the state are named in Table 22, and the counties serviced by each utility are presented in Table 23.

A detailed description on how to gain access to the gas data and the type of data that is available is presented in Appendix C.

5.3.2 Electricity

Information on county consumption of electricity was requested from each electric utility in the state. County consumption for Con Ed customers was obtained from their annual yearbook.[2] Niagara-Mohawk did not provide exact County data, but they were able to provide enough information so that we were able to estimate accurately county consumptions for their region.

Environmental emissions were calculated for each power plant in the state from environmental coefficients found in References 3 and 5 and fuel consumption data from the Federal Power Commission (FPC).[4]

Installed capacity and generation in 1976, as well as additional information on fuel consumed, were obtained from the New York Power Pool Report. Unit data was also obtained from References 1 and 5.

Data of total cost and cost/kilowatt hour (kwh) were provided by the utility or calculated from information in Moody's Public Utility Manual, 1977.[6] Cost data were not available for any of the PASNY customers.

The environmental coefficients were originally taken from a report by the Committee on Nuclear Alternative Energy Systems, Risk-Impact Panel Study on Routine Emissions from Energy Sources.

Typical bill information for each utility by customer classification was taken from Typical Electric Bills, 1977, prepared by the FPC.[7]

Table 24 lists the counties served by each electric utility in the state. Note that the abbreviations used are the same as those for the gas utilities.

A more detailed description on access to the electricity data and the type of data available, is presented in Appendix C.

5.3.3 Coal

The determination of county consumption of coal in N.Y. is difficult. There are numerous supplies of coal to numerous recipients. In the paragraphs which follow we describe available data sources and the way they were utilized in making estimates for this project.

Table 21

MAJOR GAS UTILITIES IN N.Y. AND SUPPLY TYPES

Utilities	Abbreviation
Brooklyn Union Gas Company	Brooklyn Union
Central Hudson Gas & Electric Corp.	Central Hudson
Columbia Gas of New York, Inc.	Columbia
Consolidated Edison Co. of N.Y., Inc.	Con Ed
Corning Natural Gas Corp.	Corning
Long Island Lighting Co.	Lilco
National Fuel Gas Dist. Corp.	National Fuel
New York State Electric & Gas Corp.	NYSE&G
Niagara Mohawk Power Corp.	Niagara Mohawk
Orange and Rockland Utilities	Orange & Rockland
Pavillion Natural Gas Co.	Pavillion
Pennsylvania & Southern Gas Co.	Penn & South
Rochester Gas & Electric Corp.	RG&E
St. Lawrence Gas Co., Inc.	St. Lawrence
Syracuse Surburban Gas Co., Inc.	Syracuse Suburban

Supply Types
- Pipeline
- Production
- Utility
- Other

Type of Gas	Abb
Synthetic	Syn
Natural	Nat

Units of Measurements
- $/Mcf
- Units in Mcf

Table 22

GAS PIPELINES SERVICES, N.Y.

Name	Abbreviation
Columbia Gas Transmission Corp.	Columbia Nat.
Algonquin Gas Transmission Corp.	Algonquin Nat.
Tennessee Gas Pipeline Company	Tennessee
Texas Eastern Transmission Company	Texas-Eastern
Columbia LNG Corp.	Columbia Syn
Algonquin Gas Transmission Corp.	Algonquin Syn
Consolidated Gas Supply Corp.	Consolidated
North Penn Gas Co.	North Penn
Transcontinental Gas Pipe Line Corporation	Transcontinental
Trans Canada Pipeline	Trans Canada
National Fuel Gas Supply Corp.	National
Distri Gas Corp.	Distri Gas
Ashland Oil Co.	Ashland Syn

Table 23

COUNTIES SERVICED BY MAJOR GAS UTILITIES, NEW YORK STATE

Utility	County
Brooklyn Union	Kings
	Queens
	Richmond
Central Hudson	Albany
	Dutchess
	Greene
	Orange
	Ulster
Columbia	Alleghany
	Broome
	Cattaraugus
	Chemung
	Delaware
	Orange
	Schuyler
	Steuben
	Sullivan
	Tioga
	Yates
Con Ed	Bronx
	New York
	Queens
	Westchester
Corning	Chemung
	Stueben
Lilco	Nassau
	Queens
	Suffolk
National Fuel	Alleghany
	Cattaraugus
	Chautauqua
	Erie
	Genesee
	Monroe
	Niag
	Steuben
	Wyoming
Niagara Mohawk	Albany
	Columbia
	Fulton
	Herkimer
	Jefferson
	Madison
Niagara Mohawk	Montgomery
	Oneida
	Onondaga
	Oswego
	Rensselaer
	Saratoga
	Schenectady
	Warren
	Washington
NYSE&G	Cayuga
	Chemung
	Cortland
	Livingston
	Madison
	Niagara
	Oneida
	Onondaga
	Ontario
	Orange
	Orleans
	Otsego
	Saratoga
	Seneca
	Tioga
	Tompkins
	Wayne
	Wyoming
	Yates
Orange & Rockland	Orange
	Rockland
Pavillion	Genesee
	Livingston
	Wyoming
Penn & South	Tioga
RG&E	Genesee
	Livingston
	Monroe
	Ontario
	Orleans
	Wayne
St. Lawrence	St. Lawrenc
Syracuse Suburban	Onondaga

The U.S. Bureau of Mines[8] provides data of bituminous coal and lignite distribution for the entire state. These data include the transportation method by which the coal is delivered. This reference was key to our estimate of county demand.

In addition Federal Railroad Administration Waybill Statistics for 1972-76 of coal deliveries to N.Y.S. based on a 1% sample and the N.Y. State Department of Transportation 100% sample of deliveries in 1973, 70% of the railroads in the state, were also useful.

Approximately 45% of the bituminous coal consumed in the state is used by electric utilities. The consumption of coal by power plants was obtained from the FPC.[4] From this source we were able to determine the counties in which the plants are located. Information on the transportation method by which this coal was delivered to specific plants was obtained either through the New York Power Pool report or through conversations with employees of the electric utilities in the state.

Approximately 38% of the bituminous coal delivered to N.Y. in 1976 was used in coking plants. Almost all of this coal was delivered by rail, with the remainder delivered by water across the Great Lakes. It appeared from the data available in the Waybill Statistics and from the location of coking plants in N.Y., that the Niagara-Erie area was the principal recipient of coking coal. Since the breakdown between Niagara and Erie could not be determined, all of the coking coal was assumed to be delivered to Erie County.

The remaining amounts of bituminous coal delivered to N.Y. were primarily consumed by industrial customers, through some residential and commercial customers, though some residential and commercial customers do require coal. The New York State Energy Office provided us with information on coal consumption by primary industrial consumers of coal. Though the consumption data reported by the industries might not be considered highly accurate, the total coal consumption reported by the industries in 1976 agreed within 3% with the amount reported in Reference 8 under its "all others" category. The majority (92%) of coal used by industrial customers entered the state by rail, though many of these consumers might have received final delivery by truck.

Data of anthracite deliveries to N.Y. were obtained from the Department of Energy.[9] These data were on a statewide or regional level. There were no data available to enable disaggregation at a county level.

The coal utility regions and the counties which they include are listed in Table 25.

Table 24

COUNTIES SERVED BY ELECTRIC UTILITIES

Utility	County
Central Hudson	Albany
	Columbia
	Dutchess
	Greene
	Orange
	Putnam
	Sullivan
	Ulster
Con Ed	Bronx
	Kings
	New York
	Queens
	Richmond
	Westchester
Lilco	Nassau
	Queens
	Suffolk
NYSE&G	Alleghany
	Broome
	Cattaraugus
	Cayuga
	Chautauqua
	Chemung
	Chenango
	Clinton
	Columbia
	Cortland
	Delaware
	Dutchess
	Erie
	Essex
	Franklin
	Greene
	Hamilton
	Herkimer
	Livingston
	Madison
	Niagara
	Oneida
	Onondaga
	Ontario
	Orange
	Putnam
	Rensselaer
	Saratoga
	Schoharie
NYSE&G	Schuyler
	Senaca
	Steuben
	Sullivan
	Tioga
	Tompkins
	Ulster
	Washington
	Wayne
	Westchester
	Wyoming
	Yates
Orange & Rockland	Orange
	Rockland
	Sullivan
Niagara Mohawk	Albany
	Alleghany
	Cattaraugus
	Cayuga
	Chautaugua
	Chenango
	Clinton
	Columbia
	Cortland
	Erie
	Essex
	Franklin
	Fulton
	Genesee
	Hamilton
	Herkimer
	Jefferson
	Lewis
	Livingston
	Madison
	Monroe
	Montgomery
	Niagara
	Oneida
	Onondaga
	Ontario
	Orleans
	Oswego
	Otsego
	Rensselaer
	St. Lawrence
	Saratoga

Table 24 (continued)

COUNTIES SERVED BY ELECTRIC UTILITIES

Utility	County
Niagara Mohawk	Schenectady
	Schoharie
	Warren
	Washington
	Wyoming
PASNY	Albany
	Alleghany
	Broome
	Cattaraugus
	Chautauqua
	Chenango
	Clinton
	Cortland
	Delaware
	Erie
	Essex
	Franklin
	Genesee
	Herkimer
	Jefferson
	Madison
	Monroe
	Nassau
	Niagara
	Oneida
	Onondaga
	Orleans
	Otsego
	Schoharie
	Schuyler
	Steuben
	St. Lawrence
	Suffolk
	Tompkins
	Wyoming
	Yates
RG&E	Alleghany
	Cayuga
	Livingston
	Ontario
	Monroe
	Wayne
	Wyoming
City of Jamestown	
Village of Freeport	
City of Plattsburgh	

5.3.4 Petroleum

County petroleum demands have been calculated separately for the residential, commercial and transportation sectors.

For each of the three sectors, since county level supply information was lacking, county shares of aggregate state demand were determined on the basis of appropriate allocating measures described below.

Residential Sector: The county information for the resiential sector was provided by the 1970 Detailed Housing Report, which gave the number of housing units in each county broken down according to building types, end-uses and fuels used for the end-uses. These numbers were then projected to 1976, taking into consideration the changing characteristics of new housing. The county changes for the residential sector were determined by first multiplying for each housing type and end-use the numbers of housing units that used oil by the unit demand for a house in that housing type and end-use category, and then adding across all housing types and end-uses.

Commercial Sector: Estimation of commercial oil demand involved two separate steps. First, the total commercial fuel demand was computed for each county, and then a portion of that demand was alloted to oil.

The commercial sector consists of five subsectors: retail, services, offices, hospitals and schools. Each county's share of New York State commercial energy demand depends, thus, on a sum of its shares in the five subsectors weighted by the subsectors' fractions of total commercial energy demand.

For the services, retail and office subsectors the county shares were alloted according to employment figures in these subsectors as given by the New York State Business Fact Book.[10] (The category: "Finance, Insurance, and Real Estate" was taken to represent the office subsector.) The school shares were determined by enrollment as documented in the 1975 Survey of Enrollment, Staff and Schooling.[11] Finally, as there were no complete source of data on hospitals, the state hospital energy fraction was divided in proportion to the county populations. In this manner five shares were determined for each county with their sum providing commercial energy demand for that county.

An added consideration arose from the fact that in the commercial sector, there is no direct information as to how county energy demand breaks down between oil and the other fuels. The reasonable assumption was made that the commercial fuel is likely to resemble the residential mix in the sense that

Table 25

COAL UTILITY REGIONS IN N.Y.

Utility	County	Utility	County
Central Hudson	Dutchess	NYSE&G	Allegheny
	Greene		Broome
	Putnam		Cayuga
	Ulster		Chenango
			Chemung
Con Ed	Bronx		Delaware
	Kings		Livingston
	New York		Madison
	Queens		Otsego
	Richmond		Schuyler
	Westchester		Seneca
	Other		Steuben
			Sullivan
Lilco	Nassau		Tioga
	Suffolk		Tompkins
	Other		Wyoming
			Yates
Niagara Mohawk	Albany		Other
	Cattaraugus		
	Chautauqua	Orange & Rockland	Orange
	Clinton		Rockland
	Cortland		Other
	Columbia		
	Essex	RG&E	Monroe
	Erie		Ontario
	Franklin		Wayne
	Genesee		
	Hamilton	Other (Statewide)	Other
	Herkimer		
	Jefferson		
	Lewis		
	Montgomery		
	Niagara		
	Oneida		
	Onondaga		
	Orleans		
	Oswego		
	St. Lawrence		
	Saratoga		
	Schoharie		
	Schenectady		
	Rensselaer		
	Warren		
	Washington		

counties with high residential oil use, for example, are also high in commercial oil use.

Transportation Sector: Data for the disaggregation of transportation oil demand came from two sources:

a) The N.Y.S. Department of Motor Vehicles provided information on the number of motor vehicle registrations.[12]

b) A N.Y.S. Department of Transportation report provided estimates of the average annual miles per vehicle for nine SMSA regions in New York State and also for the counties that are not included in any SMSA region.[13]

The county shares of the aggregate state transportation oil demand were determined, then, by the product of the number of motor vehicle registrations in a county and the average number of miles per vehicle the SMSA that includes that county. All counties not in an actual SMSA were grouped in a fictitious SMSA for this purpose.

5.3.5 Solid Waste

Solid waste data came from Reference 14 which provided, by SMSA region, the potential yield from refuse combustion in Btu/yr for 1970, and the per capita refuse generation estimates for 1975 and 1980. By allowing for changes in population and the changing per capita yield we estimated the potential yield (again in Btu/yr) for 1976. For each SMSA region, this yield, then, was allocated among the counties in that SMSA according to the relative share of its population they contained. The 31 counties that do not fall within any SMSA region were given a yield of 0.0 since refuse combustion for energy generation does not seem to be practical for nonurban areas.

REFERENCES TO CHAPTER V

1. Public Service Commission Reports Nos. 182 and 207, Filed by New York State Utilities for 1976.

2. Consolidated Edison Co., "Operating Statistic Yearbook,1976," New York, N.Y.

3. USEPA, "Compilation of Air Pollution Emission Factors, "AP42, Feb., 1976.

4. Federal Power Commission, Bureau of Power, "Annual Summary of Cost and Quantity of Electric Utility Plant Fuels, 1976," Washington, DC, May, 1977.

5. New York Power Pool, "Report to Member Electric System of the New York Power Pool Pursuant to Article VIII, Section 149-b of the Public Service Law, Vol. I."

6. Moody's Investors Service, Inc., Moody's Public Utility Manual, 1977, New York, NY.

7. Federal Power Commission, Typical Bills 1977, Washington DC.

8. U.S. Dept. of Interior, Bureau of Mines, "Bituminous Coal and Lignite Distribution, 1976," Washington, DC.

9. USDOE, Energy Data Reports, 1976 Wash., DC.

10. NYS Dept. of Commerce, "NYS Business Fact Book, 1976 Supplement," Albany, N.Y.

11. NYS Education Dept., "Survey of Enrollment, Staff and School Housing, Fall 1976," Albany, N.Y.

12. NYS Dept. of Motor Vehicles, "Motor Vehicle Registrations, Licenses, Fees Collected, Deductions and Monies Available for Distribution, 1975," MV215, April, 1976, Albany, NY.

13. D. Gooding, "Automotive Energy Use: A Baseline Projection for NYS," NYS Dept. of Transportation, PPR 124, Albany, NY, August, 1977.

14. P Meier and T. McCoy, "Solid Waste as an Energy Source for the Northeast," BNL 50559, Brookhaven National Laboratory, Upton, NY, June, 1976.

CHAPTER VI

SHORT RUN PRICE AND WEATHER MODELS

6.1 INTRODUCTION

In this chapter we examine two short-run models included in the NYS EIAS for the purpose of addressing the need of decision makers to respond to two specific changes in the determinants of energy demand: price and weather. In the case of the former our interest here is further directed to consumer's short-term response to prices.

In the next section (6.2) we focus on the short-term response model. We examine the elasticities of demand chosen for incorporation in the model and their derivation. There is considerable uncertainty as to precisely how consumers will respond in the short run to energy price changes and so our model permits the inclusion, at the users option, of alternative elasticities.

In section 6.3 we present the Weather Sensitive Energy Demand Model. Demand of the residential and commerical sectors only are addressed.

Use of the computerized version of these models is described in Appendix C.

6.2 SHORT-TERM PRICE RESPONSE MODEL

The Price Elasticity Model is a Fortran program that converts general assumptions about consumer sensitivity to price variation (price elasticities) and specific assumptions about future price behavior into predictions of future energy demand.

Price elasticity is a concept that describes how sensitive the demand for one commodity is to change in price of that or some other commodity. More precisely, the elasticity of demand of commodity A with respect to the price of commodity B is defined as the ratio of two quantities: the relative change is the demand for A which is induced by the relative change in the price of B. Of particular significance are price elasticities for the special case when A and B are the same commodity. They are most often negative, thus reflecting the fact that an increase in price usually decreases demand. For example, an elasticities of "-1" would imply that a 10% increase in the price of a certain commodity would cause a 10% decrease in the demand for that commodity. When A and B are substitutes the elasticities are positive as a consequence of the fact that an increase in the price of one will increase the demand for the other.

The Price Elasticity Model is an application of these concepts to the demand for energy. It contains elasticities for four fuels: coal, gas, electricity, and oil. Included in addition to price elasticities of demand are price elasticities of substitution. These are separate elasticities for the commerical/residential and the industrial sectors. In addition the user is enabled to supply alternative elasticities which he may consider to be more realistic representations of consumer behavior. When provided with current demand levels and current and future prices, the program returns the predicted future demand.

6.2.1 Industrial Sector

Price elasticities of demand for the industrial sector[1] have been computed utilizing a model that incorporates equations for three simultaneous decisions. The first is an equation for total energy demand (excluding feedstocks) of the industrial sector. The second is a set of equations used to derive the cross-sectional energy consumption patterns. The final equation is used to derive demands for each of the four specific energy forms.

The short run elasticities are a function for the presently existing market shares of each fuel and the relative existing market shares of each fuel and the relative fuel prices. They have been derived via simulation by altering individually the prices of each energy form (by 5%), and then using the simulated results one year after the change to compute the relevant fuel price elasticities. This was done around a trajectory of prices corresponding to those used by FEA in the Project Independence Report. Short run price elasticities of demand for the industrial sector are given in Table 26.

6.2.2 Residential and Commercial Sectors

Price elasticities of demand for the residential and commerical sector have been derived from a model[2] consisting of two parts. The first determines aggregate demand for energy in all forms, the second estimates market shares for three major fuels (electricity, natural gas and petroleum products). Aggregate energy demand is assumed to be a function of the weighted average energy price, personal income, and the numbers of heating and cooling degree days. The market share for (each individual) fuel is assumed to be a function of its price, prices of substitute fuels, personal income, and degree days.

The short run elasticities were derived via simulation by altering the prices of each energy form and using the simulated results one year after the change to compute the relevant elasticities. These elasticities are given in Table 27.

Table 26

SHORT RUN ELASTICITIES OF DEMAND: INDUSTRIAL (1)

	Pg	Po	Pe	Pc
GAS	- .07	.01	.03	.01
OIL	.06	- .11	.03	.01
ELECT.	.06	.01	- .11	.01
COAL	.06	.01	.03	- .10

Table 27

SHORT RUN ELASTICITIES OF DEMAND: RESIDENTIAL & COMMERCIAL (2)

	Pg	Po	Pe
GAS	- .06	.01	.04
OIL	.02	- .08	.04
ELECT.	.02	.01	- .13

Table 28

NERA LONG RUN ELASTICITIES OF DEMAND FOR N.Y.S. (3)

Industry:	Pg	Po	Pe
GAS	- .6	.1	.04
ELECT.	.1[(a)]		- .4[(a)]
	.2[(b)]		- .5[(b)]
Commercial;	**Pg**	**Po**	**Pe**
GAS	- .4	.4	.1
ELECT.	- .8[(a)]	.8[(a)]	- .8[(a)]
	0[(b)]	.4[(b)]	- .4[(b)]
Residential:	**Pg**	**Po**	**Pe**
GAS	- .2	.2	0
ELECT.	0	.5	- .5

[(a)]Central and Western New York
[(b)]Downstate region

While the elasticities of Tables 26-28 are included in the computerized version of the price response model, the user at his option may supply alternative elasticities.

It must be noted that the above short term (1 year) elasticities were computed on the national level. NERA[3] has derived a set of long run (10-12 years) elasticities for New York State. (See Table 28.) It is assumed that elasticities are generally greater in the long run than in the short run due to changes in capital stock. Using the NERA elasticities as a ceiling, the short term national figures are consistent with this assumption.

6.3 WEATHER SENSITIVE ENERGY DEMAND MODEL

The New York State Energy Information System Weather Model calculates the change in fuel demand which can be expected in the state due to a variation in temperature. The model is based on projections of the number of households in six regions of the state and the amount of commercial floorspace. It uses a specified number of heating and cooling degree days and energy-intensity factors to arrive at the actual change in end-use fuel demand. The data for the model was collected from the same sources used for the main New York State Energy Information System Data Bases, and is consistent with that information. The computer program has several options which allow sensitivity analyses to be performed on the calculation of change in fuel demand. Saturation levels, fuel efficiencies, housing mix, and floorspace mix may be individually altered to study their effect on expected change in fuel demand as a consequence of temperature variation.

6.3.1 Residential Sector - Space Heat

The number of households in each of the six regions (i) which heat with fuel (j) in subsector (p) and are in county (k) was derived from the formula:

$$N^t_{ijp} = \sum_k H_{kt} f^{70}_{kip} \times g^{70}_{kij}$$

where H = number of houses in county k in year t

f = fraction of the total number of homes in year 1970 in county k and region i which are in subsector i

g = fraction of the total number of homes in 1970 in county k and region i which heat with fuel j

i = region (1-6)

j = fuel (oil, gas, electricity, or other)

k = county in region i

p = subsector (single family, low density, low rise, or high rise)

t = target year

The number of households in each county for each time period (H_k^t) was abstracted from the New York State Economic Development Board (NYSEDB) Household Projections for 1978.[4] The fraction of the total number of homes in each subsector (f_{kip}^{70}) and the fraction of the total number of homes heating with each fuel (g_{kij}^{70}) were computed from the 1970 Census of Housing, Detailed Structural Characteristics.[5] "Other" fuel includes wood and kerosene used for space heating.

Projections. The space heat housing mix is projected to 1985 using two county growth rates abstracted from the NYSEDB Household Projections--one for 1975 to 1980, and from 1980 to 1985. This growth rate is applied to each of the twelve N_{ijkp}^t in each of the counties, and the result aggregated up to the six regions. Five year growth rates for the twelve N_{ijp}^t in each of the regions were then computed and stored in the program's data base, to be used for interpolation to target years between 1975 and 1985.

Fuel demand. Calculation of the fuel demand change for the target year is done through multiplication by heating degree days, energy-intensity factors, (Table 29) and fuel efficiencies (Table 30). The user inputs the first variable; the last two are stored in the program data base.

Table 29

ENERGY INTENSITY FACTORS; RESIDENTIAL SECTOR - SPACE HEAT[6]

Subsector	After 1970 (Btu/°day)	Before 1970 (Btu/°day)
Single Family	10,300	14,000
Low Density	7,400	10,200
Low Rise	5,500	7,500
High Rise	4,000	4,300

Table 30

FUEL EFFICIENCIES RESIDENTIAL SECTOR, SPACE HEAT[7]

Fuel	Efficiency
Oil	.69
Gas	.75
Electricity	1.00
Other	.35

The energy-intensity factors are also based on age of the housing stock in the subsector. The housing mix N^t_{ijp} is broken into age groups built before 1970 and built after 1970) by subtracting the number of houses in region i and subsector p which heat with fuel j that existed in 1970. If the result (N^t_{ijp} - N^t_{ijp}) is less than zero, the 1 is removal of households taken from the 1970 stock. This occurred in region number 6 - metropolitan New York - high rise apartments. The resulting formula for computation of fuel demand change is

$$BTU^t_{ij} = \frac{HDDS}{EFF_j} i \left\{ \sum_p [EI^t_p \times (N^t_{ijp} - N^{70}_{ijp})] + \left(\sum_p EI^t_p \times N^{70}_{ijp}\right) \right\}$$

where HDDS = user input heating degree days in region i

EFF = energy efficiency of fuel j

EI = energy-intensity of a house in subsector p constructed by year t

N^t = housing stock in region i, subsector p which heats with fuel j and was constructed between year t and 1970

N^{70} = housing stock in region i, subsector p which heats with fuel j and was constructed before 1970

6.3.2 Residential Sector - Air Conditioning

The number of households in each of the six regions (i) which cool with air conditioner type (j) in subsector (p) and are in county (k) was derived from the formula:

$$M^t_{ijp} = \sum_k H^t_k \times f^{70}_{kip} \times s^t_{ijk}$$

where s = saturation of air conditioner type j in county k and region i in year t

j = air conditioner type (room or central) i,k,p,t,f,H are the same as in the space-heating end-use.

Saturations of air conditioner type for each county were derived from the New York Power Pool[8] (Volume I) report on utility studies and projections (Table 31). Each county was classified in a primary utility's service area, and the resulting saturations were aggregated up to the regional level. (Saturation is defined as the number of units in a subsector divided by the number of dwellings in the subsector. Therefore, a saturation can be greater than one.)

Table 31

AIR CONDITIONER SATURATIONS

Utility	A/C type	1975	1980	1985
Central Hudson	Room	.70	.85	1.05
	Central	.07	.10	.12
Con Ed	Room	.53	.43	.32
	Central	.02	.19	.46
LILCO	Room	1.02	1.21	1.41
	Central	.12	.14	.17
Niag-Moh	Room	.32	.30	.45
	Central	.02	.03	.09
NYSEG	Room	.27	.35	.44
	Central	.01	.02	.04
RG&G	Room	.35	.45	.57
	Central	.06	.08	.10
O & R	Room	.74	.76	1.05
	Central	.11	.14	.19

Projections. The regional saturations for 1975, 1980, and 1985 were used to find a growth rate for the number of air conditioners in each region. It is assumed that for any given year, houses of all ages will have the same saturation. The growth in saturation level is then applied to the number of houses in each regional subsector.

Fuel demand. Calculation of the change in fuel demand for air conditioning in the target year is done through multiplication by cooling degree days, energy intensity factors (Table 32), and fuel efficiencies (Table 33). The user inputs the first variable; the last two are stored in the program's data base. The energy-intensity factors are based on age of the housing stock in a

Table 32

ENERGY INTENSITY FACTORS: AIR CONDITIONING END-USE[6]

Subsector	After 1970 (Btu/°day)	Before 1970 (Btu/°day)
Single Family	15,500	22,000
Low Density	12,500	17,700
Low Rise	8,100	11,200
High Rise	5,500	5,700

Table 33

FUEL EFFICIENCIES - RESIDENTIAL SECTOR - AIR CONDITIONING

Air Conditioner Type	Efficiency
Room	2.0
Central	2.5

subsector. The housing mix M^t_{ijp} is broken into age groups (built before 1970 and built after 1970) by subtracting the number of air conditioners installed in houses built before 1970. The resulting formula for computation of fuel demand change is:

$$BTU^t_{ij} = \frac{CDDS}{EFF_j}\, i \left(\sum_p EI^t_p \times (M^t_{ijp} - M^{70}_{ijp}) + \sum_p EI^t_p \times M^{70}_{ijp} \right)$$

where CDDS = user input cooling degree days in region i

EFF = energy efficiency of air conditioner type j

EI = energy intensity factor for housing stock age t, subsector p

M = housing stock of age t in region i, subsector p which cools with air conditioner type j

6.3.3 Commercial Sector - Space Heat

The amount of floorspace for each of the six regions in the five subsectors was obtained by disaggregating 1976 state wide data to a regional level. The disaggregating formula used was:

$$F_{ip} = \frac{D_{ip}}{D_p} \times F_1$$ where D_{ip} = disaggregating variable in region i, subsector p

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D_p = disaggregating variable, subsector p state-wide total

F_{ip} = floorspace in subsector p, region i

F_p = floorspace in subsector p, state-wide

The disaggregating variable used for each of the subsector were:

Schools -- Enrollment (from NYS Department of Education)[9]

Retail -- Retail Employment (from NYS Business Facts Book)[10]

Office -- Office Employment (from NYS Business Facts Book)[10]

Hospitals -- Population (from NYSEDB Population Projections, 1978)[4]

Services -- Service Employment (from NYS Business Facts Book)[10]

The fraction of floorspace heated by each of the three fuels in the commercial sector (oil, gas, or steam) was extrapolated from the residential fuel mix on a county level. This information was then aggregated to the regional level and stored in the program's data base.

Projections. Space heat for commercial floorspace was projected on a subsector level for each of the five subsectors using population as the projection variable. The fuel mix was held constant. The projected regional values were then adjusted to be consistent with the state-wide totals.

Fuel demand. Calculation of the change in fuel demand for the target year is done through multiplication by heating degree days, energy-intensity factors (Table 34) and fuel efficiencies (Table 35). The user inputs the first variable; the last two are stored in the program's data base.

Table 34

ENERGY-INTENSITY FACTORS - COMMERCIAL SECTOR - SPACE HEAT[6]

Subsector	Factor (btu/°day/square foot)
Schools	16
Retail	20
Office	19
Hospital	16
Services	16

Table 35

FUEL EFFICIENCIES - COMMERCIAL SECTOR - SPACE HEAT[7]

Fuel	Efficiency
Oil	.52
Gas	.53
Steam	.65

The resulting formula for computation of fuel demand change is

$$BTU_{ij}^{t} = \frac{HDDS_i^t}{EFF_j} \sum_p (EI_p \times F_{ip})$$

where BTU = fuel demand change in region i for fuel j
HDDS = change in heating degree days for region i in year t
EFF = fuel efficiency of fuel j
EI = energy-intensity factor for subsector p
F = space heat floorspace for subsector p in region i

6.3.4 Commercial Sector - Air Conditioning

The amount of air conditioned floorspace for each of the six regions in the five subsectors was obtained by applying the saturation levels of Table 36 to the floorspace (F_{ip}) derived in the commercial space heat floorspace calculation.

Table 36

AIR CONDITIONING SATURATIONS - COMMERCIAL SECTOR

Subsector	Saturation
Schools	.20
Retail	1.0
Services	.20
Office	1.0
Hospital	1.0

The formula used for finding the air-conditioning commercial floorspace in each region is:

$G_{ip} = S_p \times F_{ip}$ where S = saturation of air conditioner in subsector p
F = space heat floorspace in subsector p, region i
G = air conditioned floorspace in subsector p, region i

The fuel mix for air conditioned floorspace was estimated to be natural gas - 3.6% and electricity - 96.4% in each region. These values are stored in the program's data base.

Projection. Air conditioning saturations were assumed to remain constant in each region through the study period. The growth in air conditioned floorspace is thus due only to growth in the space heat floorspace as described above.

Fuel demand. Calculation of the change in fuel demand for the target year involves multiplying cooling degree days, energy-intensity factors (Table 37) and fuel efficiencies (Table 38) with the amount of commercial floorspace that is air conditioned. The user inputs the first value; the last two are stored in the program's data base.

Table 37

ENERGY-INTENSITY FACTORS - COMMERCIAL SECTOR - AIR CONDITIONING[6]

Subsector	Factor (btu/°day/square foot)
Schools	15
Retail	21
Office	18
Hospital	15
Services	15

Table 38

FUEL EFFICIENCIES - COMMERCIAL SECTOR - AIR CONDITIONING[7]

Fuel	Efficiency
Electricity	3.0
Gas	1.8

The formula used for the calculation of the fuel demand change is

$$BTU^t_{ij} = \frac{CDDS_i}{EFF_j} \sum_p G_{ip} \times EI_p$$

where CDDS = cooling degree days in region i, in year t

G = air conditioned floorspace in region i, subsector p

6.3.5 Region Definition

The sixty two New York State counties were grouped into six regions, in Table 39, based on three factors--primary utility serving the county, twenty nine heating and cooling degree day normals, and geographical proximity. The first was of concern due to the use of utility based data, and usually coincided with the third. The least variance in the degree day normals was chosen within this constraint.

Table 39

COUNTIES IN NYS REGIONS

The Counties in Region 1	The Counties in Region 4
Clinton	Chautauqua
Essex	Erie
Franklin	Genesee
Hamilton	Jefferson
Herkimer	Monroe
Lewis	Niagara
Oneida	Orleans
St. Lawrence	Oswego
Warren	Wayne

The Counties in Region 2	The Counties in Region 5
Albany	Alleghany
Columbia	Cattaraugus
Dutchess	Cayuga
Fulton	Chemung
Greene	Livingston
Montgomery	Onondaga
Orange	Ontario
Putnam	Schuyler
Rensselaer	Seneca
Rockland	Steuben
Saratoga	Tompkins
Schenectady	Wyoming
Ulster	Yates
Washington	

The Counties in Region 3	The Counties in Region 6
Broome	Bronx
Chenango	Kings
Cortland	Nassau
Delaware	New York
Madison	Queens
Otsego	Richmond
Schohari	Suffolk
Sullivan	Westchester
Tioga	

REFERENCES TO CHAPTER VI

1. M. Baughman and P. Joskow, "Interfuel Substitution of Energy in the US, Part II: Industrial Sector," April 1975.
2. M. Baughman and P. Joskow, "Interfuel Substitution of Energy in the US, Part I: Residential and Commercial Sectors: May 25, 1974.
3. National Ecomonic Research Associates, "A Long Range Planning Study for New York State Gas Utilities," November 1976.
4. New York State Economic Development Board, "1978 Official Household Projections for New York Counties," January 1978, Albany.
5. U.S. Dept. of Commerce, Bureau of the Census, "Detailed Housing Characteristics, 1970: New York State," Washington, DC, 1972.
6. T. O. Carroll, "A Planner's Energy Workbook," BNL 50633, Brookhaven National Laboratory, Upton, NY, 1978.
7. See Chapter 4 for efficiency references.
8. New York Power Pool, "Report to Member Electric Systems of the NYPP Pursuant to Article VIII, Section 149-50 of the Public Service Law, Vol. 1.
9. NYS Dept. of Education, "Survey of Enrollment, Staff, and Schooling, 1975," Albany, NY.
10. NYS Dept. of Commerce, "Business Fact Book, 1976," Albany, NY.

CHAPTER VII

FURTHER DEVELOPMENTS

7.1 INTRODUCTION

In the foregoing chapters we described the NYS EIAS at its first stage of implementation. The criteria on which its design was based were examined in the first chapter. In the second chapter we reviewed the BNL Reference Energy System framework and its computerized version, ESNS. In this chapter we suggest future developments in the NYS EIAS. These developments may be conveniently considered in three groups: 1. data base expansion; 2. extension of the analytic capabilities of the model and, 3. improvement of data quality. Aside from the installation of a facility siting model discussed below we would not recommend the extensions of the model's analytic capabilities in the foreseeable future, preferring to rely on the NYS EIAS's ability to inform policy makers with the latter undertaking analysis as appropriate. This we feel would be more cost effective than "building in" additional analytic capability which might see only infrequent use.

7.2 DATA BASE EXPANSION

Cost Data. The utility of the NYS EIAS for informing economic analysis would be significantly enhanced by the inclusion of cost data specific to New York in the state aggregate data base. The BNL data base already includes such data on a national basis. However, use of national average cost figures in policy analysis for the State is likely to lead to misleading results. This work would constitute a necessary first step in developing a linked energy-economic analytical capability for the state.

Bibliographical Data. A data set entirely absent in the first stage implementation of NYS EIAS is bibliographical information. Depending on the relative cost and availability of alternative means of accessing such information, it would appear that a selected bibliographical listing of references such as topical and statistical reports, state and federal codes and periodical literature in the area of energy would be a useful addition to the data base.

Industrial Process and Employment Data. Expansion of the data base to include process data of NYS manufacturing activities would permit the elimination of much uncertainty which presently exists in the projection of the energy requirements of this important sector. As we stated in Chapter IV, projections of energy requirements for manufacturing assumed that the fuel mix per dollar value added at the level of the two digit SIC was the same in NYS as for the nation as a whole. This assumption seems excessively crude in the face of widely varying processes and equipment vintage in many energy intensive industries.

Further expansion of the data base to include employment in the manufacturing sector as related to output would enable the planner to estimate the employment effects of energy supply curtailment. Employment in the energy activities in ESNS should also be added so that the employment implications of alternative energy strategies can be analyzed.

Industrial Location Data. Another data set which would enhance the usefulness of the NYS EIAS at the county level would be locational data of manufacturing activities. Aside from providing planners with a basis for estimating local effects of energy polciy on employment it would also provide important information to a mapping of point sources of environmental pollution. Such a mapping might be important to the formulation of siting policy for energy conversion facilities. Environmental considerations aside, the location of energy consuming activities is necessary information for planning the siting of dispersed energy conversion facilities serving a small to medium number of large consumers viz., a coal gasification plant serving a cluster of manufacturing establishments.

7.3 EXTENSIONS OF NYS EIAS ANALYTIC CAPABILITIES: ENERGY FACILITY SITING

It is likely that the siting of electric generating facilities will remain a substantial policy issue for NYS over the remainder of this century. A substantial enhancement of the Energy Office's policy analysis capabilities in this regard would result from the availability to it of an electric power plant siting model. Presently available at BNL is a linear programming siting model that translates the electric sector generation mix specified by a regional or state energy system scenario to the facilities required at the county level.* The model can be characterized as a multi-commodity transhipment problem, encompassing fuel mining and transportation costs (for each of the many types of fuel, each of differing heat value and sulfur content), electric transmission and cost penalties for various environmental control technologies.

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*See e.g., "The Brookhaven Regional Energy Facility Siting Model (REFS): Model Development and Application," BNL 51006, Brookhaven National Laboratory, Upton, New York, June 1977.

The model is based on the fact that given a particular specification of the generation mix, the siting problem can be reduced to the determination of that set of facility locations that minimizes the sum of coal extraction, coal transportation, and electric transmission costs, subject to meeting certain energy and resource mass balance conditions. Since the generation mix for any particular run is given as part of the scenario, the baseline costs of the generating facilities themselves do not enter into the computation, and only those that are location specific are considered (e.g., due to cooling, or air quality constraints).

The application of the model to New York State would not replace the process of detailed site evaluation as carried out by PASNY or individual utilities, but would provide the state with means to examine broad siting issues.

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APPENDIX A

STATE AGGREGATE ENERGY DEMANDS

AND POLLUTANT EMISSIONS

TABLE 1
APPENDIX A

FUEL DEMAND TABLES-1976
1E09 BTU

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SECTOR-              AGRICULTURE

   SUBSECTOR-     CROPS
     BASIS REFERENCE-          CORNELL UNIV.,!AGR ENGIN BULL 405,!JULY,1976, AND FARM BUREAU ,NYS DEPT OF AG v6 MKTS
     UNIT DEMAND REFERENCE-SAME AS BASIS
     EFFICIENCY REFERENCE- ASSUMED
     SATURATION REFERENCE- ASSUMED
     TECH FRAC REFERENCE-  SAME AS BASIS REFERENCE

   SUBSECTOR-     GENERAL
     BASIS REFERENCE-          CORNELL UNIV.,!AGR ENGIN BULL 405!,JULY,1976, AND FARM BUREAU ,NYS DEPT OF AG v MKTS
     UNIT DEMAND REFERENCE-SAME AS BASIS
     EFFICIENCY REFERENCE- ASSUMED
     SATURATION REFERENCE- ASSUMED
     TECH FRAC REFERENCE-  SAME AS BASIS REFERENCE

   SUBSECTOR-     LIVESTOCK
     BASIS REFERENCE-          CORNELL UNIV.,!AGR ENGIN BULL 405!,JULY,1976, AND FARM BUREAU ,NYS DEPT OF AG v MKTS
     UNIT DEMAND REFERENCE-SAME AS BASIS
     EFFICIENCY REFERENCE- ASSUMED
     SATURATION REFERENCE- ASSUMED
     TECH FRAC REFERENCE-  SAME AS BASIS REFERENCE
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SECTOR- COMMERCIAL

SUBSECTOR- HOSPITALS
BASIS REFERENCE- BNL,'ASSESSMENT OF NYS ENERGY RD√D PRIORITIES'(BNL50735,V2)
UNIT DEMAND REFERENCE-BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
EFFICIENCY REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
SATURATION REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
TECH FRAC REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)

SUBSECTOR- OFFICE
BASIS REFERENCE- AD LITTLE,'PROJ INDEP TASK FORCE REPT'(1974) AND BNL,'ASSESSMENT OF NYS ENERGY RD√D PRIORITIES'(BNL•
UNIT DEMAND REFERENCE-BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
EFFICIENCY REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
SATURATION REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
TECH FRAC REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)

SUBSECTOR- RETAIL
BASIS REFERENCE- AD LITTLE,'PROJ INDEP TASK FORCE REPT'(1974) AND BNL,'ASSESSMENT OF NYS ENERGY RD√D PRIORITIES'(BNL•
UNIT DEMAND REFERENCE-BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
EFFICIENCY REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
SATURATION REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
TECH FRAC REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)

SUBSECTOR- SCHOOL
BASIS REFERENCE- PHONE CONVERSATION WITH MR. LUCE, NYS DEPT OF ED, JUNE,1978 + STAFF MEMBERS
UNIT DEMAND REFERENCE-BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
EFFICIENCY REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
SATURATION REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
TECH FRAC REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)

SUBSECTOR- SERVICES
BASIS REFERENCE- AD LITTLE,'PROJ INDEP TASK FORCE REPT'(1974) AND BNL,'ASSESSMENT OF NYS ENERGY RD√D PRIORITIES'(BNL•
UNIT DEMAND REFERENCE-BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
EFFICIENCY REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
SATURATION REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)
TECH FRAC REFERENCE- BNL,'FUTURE RESIDENTIAL AND COMMERCIAL ENERGY DEMAND IN THE NORTHEAST'(BNL50552)

SECTOR- GOVERNMENT

SUBSECTOR- OFFICES
BASIS REFERENCE- PHONE CONVERSATIONS WITH MR. RAY TESIERO, NYS BUREAU OF SPACE PLANNING, (JUNE,1978)
UNIT DEMAND REFERENCE-SAME AS OFFICE SUBSECTOR
EFFICIENCY REFERENCE- SAME AS OFFICE SUBSECTOR
SATURATION REFERENCE- SAME AS OFFICE SUBSECTOR
TECH FRAC REFERENCE- SAME AS OFFICE SUBSECTOR

SUBSECTOR- PASS TRANS
BASIS REFERENCE- PHONE CONVERSATION WITH MR WHELAN, NYS OFFICE OF GENERAL SERVICES
UNIT DEMAND REFERENCE-SAME AS AUTO SUBSECTOR
EFFICIENCY REFERENCE- SAME AS AUTO SUBSECTOR
SATURATION REFERENCE- SAME AS AUTO SUBSECTOR
TECH FRAC REFERENCE- SAME AS AUTO SUBSECTOR

SECTOR- MANUFACTURING

SUBSECTOR- SIC 20
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC, 'CURRENT SURVEY OF BUSINESS' (1976)
UNIT DEMAND REFERENCE-USDOC, '1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 22
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC, 'CURRENT SURVEY OF BUSINESS' (1976)
UNIT DEMAND REFERENCE-USDOC, '1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 23
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC, 'CURRENT SURVEY OF BUSINESS' (1976)
UNIT DEMAND REFERENCE-USDOC, '1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 24
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC, 'CURRENT SURVEY OF BUSINESS' (1976)
UNIT DEMAND REFERENCE-USDOC, '1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 25
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC, 'CURRENT SURVEY OF BUSINESS' (1976)
UNIT DEMAND REFERENCE-USDOC, '1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 26
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC, 'CURRENT SURVEY OF BUSINESS' (1976)
UNIT DEMAND REFERENCE-USDOC, '1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 27
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC, 'CURRENT SURVEY OF BUSINESS' (1976)
UNIT DEMAND REFERENCE-USDOC, '1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA

TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 28
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 30
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 31
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 32
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 33
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 34
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 35
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 36
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 37
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 38
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SUBSECTOR- SIC 39
BASIS REFERENCE- USDOC, 1976 ANNUAL SURVEY OF MANUFACTURERS AND USDOC,'CURRENT SURVEY OF BUSINESS'(1976)
UNIT DEMAND REFERENCE-USDOC,'1976 ANNUAL SURVEY OF MANUFACTURES-FUELS AND ELEC ENERGY CONSUMED'
EFFICIENCY REFERENCE- BNL INTERNAL DATA
SATURATION REFERENCE- BNL INTERNAL DATA
TECH FRAC REFERENCE- SAME AS UNIT DEMAND REFERENCE

SECTOR- RESIDENTIAL

SUBSECTOR- HIGH RISE
BASIS REFERENCE- NYSDOC,'HOUSEHOLD PROJECTIONS FOR NYS--1978' AND 'POPULATION PROJNS FOR NYS--1978'
UNIT DEMAND REFERENCE-MODIFIED FOR NYS USING AVG DEG DAYS AND DWELLING SIZE FROM BNL,'FUTURE RES/COM ENERGY DEM IN THE NE*
EFFICIENCY REFERENCE- BNL,'SOURCEBOOK FOR ENERGY ASSESSMENT'(BNL50483)
SATURATION REFERENCE- INTERPOLATED FROM 'FUTURE RES/COM ENERGY DEM'(BNL50552),NYS, 'NYS STATISTICAL YEARBOOK'(1977),AND U*
TECH FRAC REFERENCE- USDOC,'DETAILED HOUSING CHARS--NYS,1970' + USDOC,'CHARS OF NEW HOUSING(1971-6)' WITH NYS CONST DATA

SUBSECTOR- LOW DENSITY
BASIS REFERENCE- NYSDOC,'HOUSEHOLD PROJECTIONS FOR NYS--1978' AND 'POPULATION PROJNS FOR NYS--1978'
UNIT DEMAND REFERENCE-MODIFIED FOR NYS USING AVG DEG DAYS AND DWELLING SIZE FROM BNL,'FUTURE RES/COM ENERGY DEM IN THE NE*
EFFICIENCY REFERENCE- BNL,'SOURCEBOOK FOR ENERGY ASSESSMENT'(BNL50483)
SATURATION REFERENCE- INTERPOLATED FROM 'FUTURE RES/COM ENERGY DEM'(BNL50552),NYS, 'NYS STATISTICAL YEARBOOK'(1977),AND U*
TECH FRAC REFERENCE- USDOC,'DETAILED HOUSING CHARS--NYS,1970' + USDOC,'CHARS OF NEW HOUSING(1971-6)' WITH NYS CONST DATA

SUBSECTOR- LOW RISE
BASIS REFERENCE- NYSDOC 'HOUSEHOLD PROJECTIONS FOR NYS--1978' AND 'POPULATION PROJNS FOR NYS--1978'
UNIT DEMAND REFERENCE-MODIFIED FOR NYS USING AVG DEG DAYS AND DWELLING SIZE FROM BNL,'FUTURE RES/COM ENERGY DEM IN THE NE*
EFFICIENCY REFERENCE- BNL,'SOURCEBOOK FOR ENERGY ASSESSMENT'(BNL50483)
SATURATION REFERENCE- INTERPOLATED FROM 'FUTURE RES/COM ENERGY DEM'(BNL50552),NYS, 'NYS STATISTICAL YEARBOOK'(1977),AND U*
TECH FRAC REFERENCE- USDOC,'DETAILED HOUSING CHARS--NYS,1970' + USDOC,'CHARS OF NEW HOUSING(1971-6)' WITH NYS CONST DATA

SUBSECTOR- MOBILE HOMES
BASIS REFERENCE- NYSDOC,'HOUSEHOLD PROJECTIONS FOR NYS--1978' AND 'POPULATION PROJNS FOR NYS--1978'
UNIT DEMAND REFERENCE-MODIFIED FOR NYS USING AVG DEG DAYS AND DWELLING SIZE FROM BNL,'FUTURE RES/COM ENERGY DEM IN THE NE*
EFFICIENCY REFERENCE- BNL,'SOURCEBOOK FOR ENERGY ASSESSMENT'(BNL50483)
SATURATION REFERENCE- INTERPOLATED FROM 'FUTURE RES/COM ENERGY DEM'(BNL50552),NYS, 'NYS STATISTICAL YEARBOOK'(1977),AND U*
TECH FRAC REFERENCE- USDOC,'DETAILED HOUSING CHARS--NYS,1970' + USDOC,'CHARS OF NEW HOUSING(1971-6)' WITH NYS CONST DATA

SUBSECTOR- SINGLE FAMILY
BASIS REFERENCE- NYSDOC,'HOUSEHOLD PROJECTIONS FOR NYS--1978' AND 'POPULATION PROJNS FOR NYS--1978'
UNIT DEMAND REFERENCE-MODIFIED FOR NYS USING AVG DEG DAYS AND DWELLING SIZE FROM BNL,'FUTURE RES/COM ENERGY DEM IN THE NE*
EFFICIENCY REFERENCE- BNL,'SOURCEBOOK FOR ENERGY ASSESSMENT'(BNL50483)
SATURATION REFERENCE- INTERPOLATED FROM 'FUTURE RES/COM ENERGY DEM'(BNL50552),NYS, 'NYS STATISTICAL YEARBOOK'(1977),AND U*
TECH FRAC REFERENCE- USDOC,'DETAILED HOUSING CHARS--NYS,1970' + USDOC,'CHARS OF NEW HOUSING(1971-6)' WITH NYS CONST DATA

SECTOR- TRANSPORT

SUBSECTOR- AIR FREIGHT
BASIS REFERENCE- RESIDUAL FROM MOTOR FUEL CONSUMP IN NYS. ABTRACTED FROM 1976 FEDERAL HIGHWAY ADMIN DATA
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP v CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

SUBSECTOR- AIR PASS
BASIS REFERENCE- AIR TRANS ASSOC,'DOMESTIC INDUS PASS DEM FORECAST'v'INTL AIR TRAVEL PASS DEM FORECAST-US'
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP v CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

SUBSECTOR- AUTO
BASIS REFERENCE- USDOT,'HIGHWAY STATS 1975' AND NYSDOT,'AUTO ENERGY USE-- A BASELINE PROJN FOR NYS(PPR133)'
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP v CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

SUBSECTOR- BUS
BASIS REFERENCE- RESIDUAL FROM MOTOR FUEL CONSUMP IN NYS. ABTRACTED FROM 1976 FEDERAL HIGHWAY ADMIN DATA
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP v CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

SUBSECTOR- RAIL
BASIS REFERENCE- ELECTRICITY CONSUMPTION FOR TRANSPORT FROM NYPP 149-B REPORT (1977)
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP v CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

SUBSECTOR- RAIL FREIGHT
BASIS REFERENCE- ELECTRICITY CONSUMPTION FOR TRANSPORT FROM NYPP 149-B REPORT (1977)
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP v CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

SUBSECTOR- TRUCK
BASIS REFERENCE- RESIDUAL FROM MOTOR FUEL CONSUMP IN NYS. ABTRACTED FROM 1976 FEDERAL HIGHWAY ADMIN DATA
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP v CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED

YEAR- 1976 SCENARIO- BASE CASE 4/01/79
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

SUBSECTOR- WATER
BASIS REFERENCE- BUNKER FUEL CONSUMP FROM USDOE, 'ENERGY DATA REPORTS-- SALES OF FUEL OIL & KEROSENE'(1976)
UNIT DEMAND REFERENCE-MODIFIED FROM SYS DESIGN CONCEPTS,'TRANSP ENERGY CONSUMP & CONSERV OPTIONS IN THE NE'(BNL50544)
EFFICIENCY REFERENCE- ASSUMED
SATURATION REFERENCE- ASSUMED
TECH FRAC REFERENCE- SAME AS BASIS REFERENCE

AGRICULTURE

SCENARIO- BASE CASE 4/01/79 YEAR- 1976

SUBSECTOR GENERAL
END-USE ELECTRICITY
UNIT DEMAND 30.71 SATURATION 1.000
BASIS 58.00 1E3 FARMS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ELECTRICITY	ELECTRICITY	58.00	1.00	1781.2

SUBSECTOR GENERAL
END-USE PROPANE
UNIT DEMAND 10.91 SATURATION 1.000
BASIS 58.00 1E3 FARMS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
PROPANE	OIL	58.00	.65	973.5

SUBSECTOR CROPS
END-USE ALL CROPS
UNIT DEMAND .37 SATURATION 1.000
BASIS 5100.00 1E3 ACRES

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS TECH	OIL	5100.00	.20	9435.0

SUBSECTOR LIVESTOCK
END-USE ALL STOCK
UNIT DEMAND .17 SATURATION 1.000
BASIS 2095.00 1E3 HEAD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS TECH	OIL	2095.00	.20	1780.7

SUBSECTOR HOSPITALS
END-USE AIR COND
UNIT DEMAND 44.00 SATURATION 1.000
BASIS 208.70 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	7.51	1.80	183.6
VAP COMP EL*	ELECTRICITY	201.19	3.00	2950.8
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR HOSPITALS
END-USE APP-AUX EQUIP
UNIT DEMAND 40.00 SATURATION 1.000
BASIS 208.70 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	203.70	1.00	8348.0

SUBSECTOR HOSPITALS
END-USE LIGHTING
UNIT DEMAND 31.30 SATURATION 1.000
BASIS 208.70 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	208.70	1.00	6532.3

SUBSECTOR HOSPITALS
END-USE SPACE HEAT
UNIT DEMAND 152.00 SATURATION 1.000
BASIS 208.70 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	154.44	.52	45143.4
GAS BURNER	GAS	31.31	.53	8978.0
MISC-TECH	STEAM	18.78	.65	4392.3
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	4.17	1.00	634.4
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR HOSPITALS
END-USE WATER HEAT
UNIT DEMAND 14.10 SATURATION 1.000
BASIS 208.70 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	141.92	.70	2858.6
ELEC RESIST	ELECTRICITY	70.96	1.00	1000.5
SOLAR	SOLAR	.00	1.00	.0
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR OFFICE
END-USE AIR COND
UNIT DEMAND 35.00 SATURATION 1.000
BASIS 464.20 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	16.71	1.80	324.9
VAP COMP EL*	ELECTRICITY	447.49	3.00	5220.8
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR OFFICE
END-USE APP-AUX EQUIP
UNIT DEMAND 12.20 SATURATION 1.000
BASIS 464.20 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	464.14	1.00	5662.5

SUBSECTOR OFFICE
END-USE LIGHTING
UNIT DEMAND 19.40 SATURATION 1.000
BASIS 464.20 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	464.14	1.00	9004.3

SUBSECTOR OFFICE
END-USE SPACE HEAT
UNIT DEMAND 142.00 SATURATION 1.000
BASIS 464.20 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	343.51	.52	93804.1
GAS BURNER	GAS	69.63	.53	18655.6
MISC-TECH	STEAM	41.78	.65	9126.9
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	9.28	1.00	1318.3
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR OFFICE
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 464.20 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	315.62	.70	7665.0
ELEC RESIST	ELECTRICITY	157.83	1.00	2683.1
SOLAR	SOLAR	.00	1.00	.0
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR RETAIL
END-USE AIR COND
UNIT DEMAND 38.00 SATURATION 1.000
BASIS 523.50 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	18.85	1.80	397.9
VAP COMP EL*	ELECTRICITY	504.65	3.00	6392.3
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR RETAIL
END-USE APP-AUX EQUIP
UNIT DEMAND 13.40 SATURATION 1.000
BASIS 523.50 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	523.50	1.00	7014.9

SUBSECTOR RETAIL
END-USE LIGHTING
UNIT DEMAND 16.60 SATURATION 1.000
BASIS 523.50 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	523.50	1.00	8690.1

SUBSECTOR RETAIL
END-USE SPACE HEAT
UNIT DEMAND 79.00 SATURATION 1.000
BASIS 523.50 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	387.39	.52	58853.5
GAS BURNER	GAS	78.53	.53	11704.7
MISC-TECH	STEAM	47.12	.65	5726.3
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	10.47	1.00	827.1
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR RETAIL
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 523.50 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	355.98	.70	8645.2
ELEC RESIST	ELECTRICITY	177.99	1.00	3025.8
SOLAR	SOLAR	.00	1.00	.0
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR SCHOOL
END-USE AIR COND
UNIT DEMAND 32.00 SATURATION .200
BASIS 553.10 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	2.61	1.80	46.3
VAP COMP EL*	ELECTRICITY	128.01	3.00	1365.5
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SCHOOL
END-USE APP-AUX EQUIP
UNIT DEMAND 10.60 SATURATION .635
BASIS 653.10 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	414.72	1.00	439[illegible].0

SUBSECTOR SCHOOL
END-USE LIGHTING
UNIT DEMAND 16.60 SATURATION 1.000
BASIS 653.10 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	653.10	1.00	10841.4

SUBSECTOR SCHOOL
END-USE SPACE HEAT
UNIT DEMAND 80.00 SATURATION 1.000
BASIS 653.10 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	496.81	.52	76432.2
GAS BURNER	GAS	97.31	.53	14688.6
MISC-TECH	STEAM	58.78	.65	7234.3
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SCHOOL
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 653.10 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	444.00	.70	10783.0
ELEC RESIST	ELECTRICITY	222.05	1.00	3774.9
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR SERVICES
END-USE AIR COND
UNIT DEMAND 38.00 SATURATION .200
BASIS 800.60 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	3.20	1.80	67.6
VAP COMP EL*	ELECTRICITY	156.93	3.00	1987.8
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SERVICES
END-USE APP-AUX EQUIP
UNIT DEMAND 14.00 SATURATION .965
BASIS 800.60 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	772.64	1.00	10816.9

SUBSECTOR SERVICES
END-USE LIGHTING
UNIT DEMAND 22.00 SATURATION 1.000
BASIS 800.60 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	800.66	1.00	17614.6

SUBSECTOR SERVICES
END-USE SPACE HEAT
UNIT DEMAND 79.00 SATURATION .965
BASIS 800.60 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	592.44	.52	90005.9
GAS BURNER	GAS	120.09	.53	17900.2
MISC-TECH	STEAM	72.05	.65	8757.3
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	16.01	1.00	1264.9
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR SERVICES
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 800.60 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	544.45	.70	13222.4
ELEC RESIST	ELECTRICITY	272.20	1.00	4627.5
SOLAR	SOLAR	.00	1.00	.0
OIL BURNER	OIL	.00	.63	.0

GOVERNMENT
SCENARIO- BASE CASE 4/01/79 YEAR- 1976

SUBSECTOR PASS TRANS
END-USE AUTOS
BASIS 573.44 IE6 VEH MI
UNIT DEMAND 1.95 SATURATION 1.000

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
INT COM	OIL	573.44	.20	5579.6

SUBSECTOR OFFICES
END-USE AIR COND
UNIT DEMAND 35.00 SATURATION 1.000
BASIS 16.65 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	.60	1.80	11.6
VAP COMP EL*	ELECTRICITY	16.05	3.00	187.2
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR OFFICES
END-USE APP-AUX EQUIP
BASIS 16.65 IE6 SQ FT
UNIT DEMAND 12.20 SATURATION 1.000

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	16.65	1.0	203.1

SUBSECTOR OFFICES
END-USE LIGHTING
UNIT DEMAND 19.40 SATURATION 1.000
BASIS 16.65 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	16.65	1.00	322.9

SUBSECTOR OFFICES
END-USE SPACE HEAT
UNIT DEMAND 142.00 SATURATION 1.000
BASIS 16.65 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
MISC-TECH	STEAM	1.50	.65	327.3
GAS BURNER	GAS	2.50	.53	669.0
OIL BURNER	OIL	12.32	.52	3363.8
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.00	2.00	.0
ELEC RESIST	ELECTRICITY	.33	1.00	47.3

SUBSECTOR OFFICES
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 16.65 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ELEC RESIST	ELECTRICITY	5.66	1.00	96.2
GAS BURNER	GAS	11.32	.70	274.8
SOLAR	SOLAR	.00	1.00	.0

MANUFACTURING
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SUBSECTOR SIC 20
END-USE ELEC DRIVE
UNIT DEMAND 5.60 SATURATION 1.000
BASIS 1552.08 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1552.08	1.00	8691.6

SUBSECTOR SIC 20
END-USE PROCESS HEAT
UNIT DEMAND 11.04 SATURATION 1.000
BASIS 1552.08 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	162.85	.70	2568.4
GAS BURNER	GAS	457.17	.64	7886.2
OIL BURNER	OIL	932.06	.68	15132.3

SUBSECTOR SIC 23
END-USE ELEC DRIVE
UNIT DEMAND 2.38 SATURATION 1.000
BASIS 2264.25 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	2264.25	1.00	5388.9

SUBSECTOR SIC 23
END-USE PROCESS HEAT
UNIT DEMAND .32 SATURATION 1.000
BASIS 2254.25 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	.00	.70	.0
GAS BURNER	GAS	831.43	.64	415.7
OIL BURNER	OIL	1432.82	68	674.3

SUBSECTOR SIC 22
END-USE ELEC DRIVE
UNIT DEMAND 6.32 SATURATION 1.000
BASIS 426.43 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	426.43	1.00	2695.0

SUBSECTOR SIC 22
END-USE PROCESS HEAT
UNIT DEMAND 7.89 SATURATION 1.000
BASIS 426.43 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	51.01	.70	575.0
GAS BURNER	GAS	107.95	.64	1330.8
OIL BURNER	OIL	267.48	.68	3103.6

SUBSECTOR SIC 24
END-USE ELEC DRIVE
UNIT DEMAND 9.33 SATURATION 1.000
BASIS 114.78 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	114.78	1.00	1070.9

SUBSECTOR SIC 24
END-USE PROCESS HEAT
UNIT DEMAND 6.83 SATURATION 1.000
BASIS 114.78 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	24.90	.70	243.0
GAS BURNER	GAS	28.76	.64	306.9
OIL BURNER	OIL	61.12	.68	613.9

SUBSECTOR SIC 25
END-USE ELEC DRIVE
UNIT DEMAND 3.00 SATURATION 1.000
BASIS 288.27 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	288.27	1.00	864.8

SUBSECTOR SIC 25
END-USE PROCESS HEAT
UNIT DEMAND 4.25 SATURATION 1.000
BASIS 288.27 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	71.07	.70	431.5
GAS BURNER	GAS	92.57	.64	614.7
OIL BURNER	OIL	124.63	.68	778.9

SUBSECTOR SIC 27
END-USE ELEC DRIVE
UNIT DEMAND 1.62 SATURATION 1.000
BASIS 3434.00 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	3434.00	1.00	5569.9

SUBSECTOR SIC 27
END-USE PROCESS HEAT
UNIT DEMAND 1.48 SATURATION 1.000
BASIS 3434.00 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	2230.75	.70	4716.4
GAS BURNER	GAS	620.15	.64	1434.1
OIL BURNER	OIL	583.10	.68	1269.1

SUBSECTOR SIC 26
END-USE ELEC DRIVE
UNIT DEMAND 15.06 SATURATION 1.000
BASIS 615.18 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	615.18	1.00	9264.6

SUBSECTOR SIC 26
END-USE PROCESS HEAT
UNIT DEMAND 40.49 SATURATION 1.000
BASIS 615.18 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	100.59	.70	5818.4
GAS BURNER	GAS	48.55	.64	3071.5
OIL BURNER	OIL	466.04	.68	27749.9

SUBSECTOR SIC 28
END-USE ELEC DRIVE
UNIT DEMAND 7.00 SATURATION 1.000
BASIS 1608.24 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1608.24	1.00	11257.7

SUBSECTOR SIC 28
END-USE FEEDSTOCK
UNIT DEMAND 79.33 SATURATION 1.000
BASIS 1608.24 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
PETROCHEM	FEEDSTOCK	1608.24	1.00	127581.7

SUBSECTOR SIC 28
END-USE PROCESS HEAT
UNIT DEMAND 22.54 SATURATION 1.000
BASIS 1608.24 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	598.01	.70	19255.9
GAS BURNER	GAS	357.56	.64	12592.8
OIL BURNER	OIL	652.66	.68	21633.8

SUBSECTOR SIC 30
END-USE ELEC DRIVE
UNIT DEMAND 10.36 SATURATION 1.000
BASIS -16.93 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	416.93	1.00	4319.4

SUBSECTOR SIC 30
END-USE PROCESS HEAT
UNIT DEMAND 7.59 SATURATION 1.000
BASIS 416 93 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	57.89	.70	627.7
GAS BURNER	GAS	276.20	.64	1275.6
OIL BURNER	OIL	82.84	.68	924.6

SUBSECTOR SIC 31
END-USE ELEC DRIVE
UNIT DEMAND 5.91 SATURATION 1.000
BASIS 233.14 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	233.14	1.00	1377.9

SUBSECTOR SIC 31
END-USE PROCESS HEAT
UNIT DEMAND 4.80 SATURATION 1.000
BASIS 233.14 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	50.19	.70	344.2
GAS BURNER	GAS	27.34	.64	205.0
OIL BURNER	OIL	155.61	.68	1098.4

SUBSECTOR SIC 32
END-USE ELEC DRIVE
UNIT DEMAND 11.25 SATURATION 1.000
BASIS 513.04 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	513.04	1.00	5771.7

SUBSECTOR SIC 32
END-USE PROCESS HEAT
UNIT DEMAND 43.07 SATURATION 1.000
BASIS 513.04 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	250.87	.70	15435.7
GAS BURNER	GAS	170.43	.64	11469.4
OIL BURNER	OIL	91.74	.68	5810.6

SUBSECTOR SIC 33
END-USE FEEDSTOCK
UNIT DEMAND 43.96 SATURATION 1.000
BASIS 748.71 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COKE	FEEDSTOCK	748.71	.26	126589.6

SUBSECTOR SIC 33
END-USE PRIMARY METALS
UNIT DEMAND 58.60 SATURATION 1.000
BASIS 748.71 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	2.85	.21	795.3
GAS BURNER	GAS	235.99	.64	21607.8
OIL BURNER	OIL	172.80	.68	14891.3
AGG-TECH EL*	ELECTRICITY	337.07	.75	26336.4

SUBSECTOR SIC 34
END-USE ELEC DRIVE
UNIT DEMAND 5.00 SATURATION 1.000
BASIS 1019.76 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1019.76	1.00	5098.8

SUBSECTOR SIC 34
END-USE PROCESS HEAT
UNIT DEMAND 6.49 SATURATION 1.000
BASIS 1019.76 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	193.97	.70	1798.4
GAS BURNER	GAS	464.56	.64	4710.9
OIL BURNER	OIL	361.24	.68	3447.7

SUBSECTOR SIC 35
END-USE ELEC DRIVE
UNIT DEMAND 2.78 SATURATION 1.000
BASIS 2500.33 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	2500.33	1.00	6960.9

SUBSECTOR SIC 35
END-USE PROCESS HEAT
UNIT DEMAND 4.21 SATURATION 1.000
BASIS 2500.33 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	166.35	.70	1000.5
GAS BURNER	GAS	1074.67	.64	7069.3
OIL BURNER	OIL	1259.32	.68	7796.7

SUBSECTOR SIC 36
END-USE ELEC DRIVE
UNIT DEMAND 3.02 SATURATION 1.000
BASIS 2716.69 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	2716.69	1.00	8207.1

SUBSECTOR SIC 36
END-USE PROCESS HEAT
UNIT DEMAND 3.86 SATURATION 1.000
BASIS 2716.69 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	652.44	.70	3597.7
GAS BURNER	GAS	1136.53	.64	6854.7
OIL BURNER	OIL	927.72	.68	5266.2

SUBSECTOR SIC 37
END-USE ELEC DRIVE
UNIT DEMAND 4.15 SATURATION 1.000
BASIS 1180.54 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1180.54	1.00	4904.0

SUBSECTOR SIC 37
END-USE PROCESS HEAT
UNIT DEMAND 6.19 SATURATION 1.000
BASIS 1180.54 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	187.41	.70	1657.2
GAS BURNER	GAS	508.26	.64	4915.8
OIL BURNER	OIL	484.87	.68	4413.7

SUBSECTOR SIC 38
END-USE ELEC DRIVE
UNIT DEMAND 1.04 SATURATION 1.000
BASIS 2820.84 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	2820.84	1.00	2926.0

SUBSECTOR SIC 38
END-USE PROCESS HEAT
UNIT DEMAND 2.97 SATURATION 1.000
BASIS 2820.84 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	1095.77	.70	4649.2
GAS BURNER	GAS	583.71	.64	3172.8
OIL BURNER	OIL	1041.36	.68	4548.3

SUBSECTOR SIC 39
END-USE ELEC DRIVE
UNIT DEMAND 2.78 SATURATION 1.000
BASIS 868.70 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	868.70	1.00	2414.1

SUBSECTOR SIC 39
END-USE PROCESS HEAT
UNIT DEMAND 2.72 SATURATION 1.000
BASIS 868.70 $ MIL VAL ADD (67$)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	318.11	.70	1236.1
GAS BURNER	GAS	216.61	.64	920.6
OIL BURNER	OIL	333.98	.68	1335.9

RESIDENTIAL
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SUBSECTOR HIGH RISE
END-USE AIR COND
UNIT DEMAND 5900.00 SATURATION .638
BASIS 1.47 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.68	2.00	2003.1
CENTRAL	ELECTRICITY	.26	2.50	606.5
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR HIGH RISE
END-USE COOKING
UNIT DEMAND 3310.00 SATURATION 1.000
BASIS 1.47 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.12	.38	1045.3
GAS BURNER	GAS	.75	.38	6498.1
ELEC RESIST	ELECTRICITY	.60	1.00	1992.6

SUBSECTOR HIGH RISE
END-USE LIGHT-APPLI
UNIT DEMAND 17000.00 SATURATION .064
BASIS 1.47 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	.93	1.00	15725.0

SUBSECTOR HIGH RISE
END-USE SPACE HEAT
UNIT DEMAND 31000.00 SATURATION 1.000
BASIS 1.47 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.81	.40	62930.0
GAS BURNER	GAS	.55	.48	35262.5
ELEC RESIST	ELECTRICITY	.06	1.00	1736.0
AGG-TECH	OTHER	.05	.35	4782.9
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR HIGH RISE
END-USE WATER HEAT
UNIT DEMAND 12283.00 SATURATION 1.000
BASIS 1.47 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.71	.63	13745.3
GAS BURNER	GAS	.73	.57	15817.1
ELEC RESIST	ELECTRICITY	.03	1.00	356.2
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR LOW DENSITY
END-USE AIR COND
UNIT DEMAND 5900.00 SATURATION .638
BASIS 1.41 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.65	2.00	1923.4
CENTRAL	ELECTRICITY	.25	2.50	582.9
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR LOW DENSITY
END-USE COOKING
UNIT DEMAND 3310.00 SATURATION 1.000
BASIS 1.41 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.12	.38	1010.4
GAS BURNER	GAS	.72	.38	6236.7
ELEC RESIST	ELECTRICITY	.58	1.00	1913.2

SUBSECTOR LOW DENSITY
END-USE LIGHT-APPLI
UNIT DEMAND 17000.00 SATURATION .639
BASIS 1.41 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	.89	1.00	15096.0

SUBSECTOR LOW DENSITY
END-USE SPACE HEAT
UNIT DEMAND 50000.00 SATURATION 1.000
BASIS 1.41 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.81	.40	100625.0
GAS BURNER	GAS	.54	.48	55729.2
ELEC RESIST	ELECTRICITY	.02	1.00	1000.0
AGG-TECH	OTHER	.05	.35	7142.9
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR LOW DENSITY
END-USE WATER HEAT
UNIT DEMAND 12283.00 SATURATION 1.000
BASIS 1.41 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.68	.63	13199.4
GAS BURNER	GAS	.71	.57	15192.1
ELEC RESIST	ELECTRICITY	.03	1.00	343.9
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR LOW RISE
END-USE AIR COND
UNIT DEMAND 5900.00 SATURATION .638
BASIS .83 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.38	2.00	1126.9
CENTRAL	ELECTRICITY	.14	2.50	339.8
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR LOW RISE
END-USE COOKING
UNIT DEMAND 3310.00 SATURATION 1.000
BASIS .83 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.07	.38	592.3
GAS BURNER	GAS	.42	.38	3649.7
ELEC RESIST	ELECTRICITY	.34	1.00	1118.8

SUBSECTOR LOW RISE
END-USE LIGHT-APPLI
UNIT DEMAND 17000.00 SATURATION .630
BASIS .83 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	.52	1.00	8840.0

SUBSECTOR LOW RISE
END-USE SPACE HEAT
UNIT DEMAND 33000.00 SATURATION 1.000
BASIS .83 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.45	.40	37372.5
GAS BURNER	GAS	.31	.48	21037.5
ELEC RESIST	ELECTRICITY	.04	1.00	1155.0
AGG-TECH	OTHER	.03	.35	2922.9
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR LOW RISE
END-USE WATER HEAT
UNIT DEMAND 12283.00 SATURATION 1.000
BASIS .83 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.40	.63	7720.7
GAS BURNER	GAS	.41	.57	8878.2
ELEC RESIST	ELECTRICITY	.02	1.00	208.8
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR MOBILE HOMES
END-USE AIR COND
UNIT DEMAND 7500.00 SATURATION .122
BASIS .09 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.01	2.00	41.3

SUBSECTOR MOBILE HOMES
END-USE COOKING
UNIT DEMAND 3310.00 SATURATION 1.000
BASIS .09 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.08	.38	688.1
ELEC RESIST	ELECTRICITY	.01	1.00	36.4

SUBSECTOR MOBILE HOMES
END-USE LIGHT-APPLI
UNIT DEMAND 22000.00 SATURATION .760
BASIS .09 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	.07	1.00	1496.0

SUBSECTOR MOBILE HOMES
END-USE SPACE HEAT
UNIT DEMAND 40000.00 SATURATION 1.000
BASIS .09 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.08	.40	8100.0
ELEC RESIST	ELECTRICITY	.01	1.00	360.0

SUBSECTOR MOBILE HOMES
END-USE WATER HEAT
UNIT DEMAND 15200.00 SATURATION 1.000
BASIS .09 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.02	.63	434.3
ELEC RESIST	ELECTRICITY	.07	1.00	1094.4

SUBSECTOR SINGLE FAMILY
END-USE AIR COND
UNIT DEMAND 7500.00 SATURATION .515
BASIS 2.36 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.74	2.00	2786.2
CENTRAL	ELECTRICITY	.47	2.50	1413.0
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SINGLE FAMILY
END-USE COOKING
UNIT DEMAND 3200.00 SATURATION 1.000
BASIS 2.36 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.19	.38	1625.3
GAS BURNER	GAS	1.20	.38	10080.0
ELEC RESIST	ELECTRICITY	.97	1.00	3091.2

SUBSECTOR SINGLE FAMILY
END-USE LIGHT-APPLI
UNIT DEMAND 22000.00 SATURATION .760
BASIS 2.36 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	1.79	1.00	39402.0

SUBSECTOR SINGLE FAMILY
END-USE SPACE HEAT
UNIT DEMAND 69000.00 SATURATION 1.000
BASIS 2.36 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	1.32	.40	227010.0
GAS BURNER	GAS	.88	.48	126643.8
ELEC RESIST	ELECTRICITY	.08	1.00	5244.0
AGG-TECH	OTHER	.08	.35	16560.0
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.00	2.00	.0

SUBSECTOR SINGLE FAMILY
END-USE WATER HEAT
UNIT DEMAND 14330.00 SATURATION 1.000
BASIS 2.36 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	1.13	.63	25725.8
GAS BURNER	GAS	.90	.57	22525.8
ELEC RESIST	ELECTRICITY	.33	1.00	4728.9
SOLAR	SOLAR	.00	1.00	.0

TRANSPORT
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SUBSECTOR AIR PASS
END-USE PASS
UNIT DEMAND 4.54 SATURATION 1.000
BASIS 9046.25 1E6 PASS MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	OIL	9046.25	.30	136899.9

SUBSECTOR BUS
END-USE PASS
UNIT DEMAND 2.67 SATURATION 1.000
BASIS 838.4 1E6 PASS MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	595.26	.20	7946.7
INT COM	OIL	243.14	.20	3245.9

SUBSECTOR RAIL FREIGHT
END-USE FREIGHT
UNIT DEMAND .23 SATURATION 1.000
BASIS 21525.67 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	20339.34	.30	15390.1
AGG-TECH EL*	ELECTRICITY	715.85	1.00	162.5
AGG-TECH OIL	OIL	470.48	.20	534.0

SUBSECTOR WATER
END-USE FREIGHT
UNIT DEMAND .14 SATURATION 1.000
BASIS 81694.00 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	9579.00	.20	6513.7
AGG TECH	OIL	72115.00	.20	49038.2

SUBSECTOR AIR FREIGHT
END-USE FREIGHT
UNIT DEMAND 13.06 SATURATION 1.000
BASIS 1347.73 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	OIL	1347.73	.30	58671.2

SUBSECTOR AUTO
END-USE PASS
UNIT DEMAND 1.29 SATURATION 1.000
BASIS 89680.00 1E6 PASS MI (OR=1.4)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	.00	.20	.0
INT COM	OIL	89680.00	.20	578436.0

SUBSECTOR RAIL
END-USE PASS
UNIT DEMAND 1.05 SATURATION 1.000
BASIS 8472.96 1E6 PASS MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	717.91	.30	2512.7
AGG TECH	ELECTRICITY	7755.05	1.00	8142.8

SUBSECTOR TRUCK
END-USE FREIGHT
UNIT DEMAND .95 SATURATION 1.000
BASIS 40692.12 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	24053.96	.33	69246.2
INT COM	OIL	16638.16	.20	79031.3

TABLE 2
APPENDIX A

ENERGY DEMAND AND FUEL MIX
1E09 BTU
SCENARIO- BASE CASE 4/79 YEAR- 1976
RUN DATE-APR 06,1979

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER √ FDSTCK	HYDRO √ SOLAR (7)	TOTAL (9) DIRECT USE
AGRICULTURE		12189.3		1781.2				12189.3
COMMERCIAL	116121.5	364239.1		125994.7		(3) 35237.2	.0	515597.7
GOVERNMENT	955.5	8943.3		856.7		(3) 327.3	.0	10226.1
MANUFACTURING	91854.9	120489.3	64750.5	113121.9		(4) (5) 254171.3		531265.9
RESIDENTIAL	327550.6	501824.3		115761.6		(6) 31408.6	.0	860783.5
TRANSPORT		1092080.9		8305.3				1092080.9
UTILITIES	5325.8	(2) 546860.0	184200.0		172515.0		(8) 94857.5	1003758.3

(9) DOES NOT INCLUDE ELECTRICITY

TABLE 3
APPENDIX A

ENERGY DEMAND AND FUEL MIX
1E09 BTU
SCENARIO- BASE CASE 4/79 YEAR-1976
RUN DATE-APR 06,1979

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER √ FDSTCK	HYDRO √ SOLAR (7)	TOTAL (9) DIRECT USE
AGRICULTURE								
ALL CROPS		9435.0						9435.0
ALL STOCK		1780.7						1780.7
ELECTRICITY				1781.2				.0
PROPANE		973.5						973.5
SECTOR TOTAL		12189.3		1781.2				12189.3
COMMERCIAL								
AIR COND	1020.2			17917.1			.0	1020.2
APP-AUX EQUIP				36238.3				.0
LIGHTING				52682.7				.0
SPACE HEAT	71327.1	364239.1		4044.9		35237.2 (3)	.0	471403.4
WATER HEAT	43174.1	.0		15111.8			.0	43174.1
SECTOR TOTAL	116121.5	364239.1		125994.7		35237.2	.0	515597.7
GOVERNMENT								
AIR COND	11.6			187.2			.0	11.6
APP-AUX EQUIP				203.1				.0
AUTOS		5579.6						5579.6
LIGHTING				322.9				.0
SPACE HEAT	669.0	3363.8		47.3		327.3 (3)	.0	4360.0
WATER HEAT	274.8			96.2			.0	274.8
SECTOR TOTAL	955.5	8943.3		856.7		327.3	.0	10226.1
MANUFACTURING								
ELEC DRIVE				86785.5				.0
FEEDSTOCK						254171.3 (4) (5)		254171.3
PRIMARY METALS	21607.8	14891.3	795.3	26336.4				37294.4
PROCESS HEAT	70247.0	105598.0	63955.2					239800.2

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER & FDSTCK	HYDRO & SOLAR (7)	TOTAL(9) DIRECT USE
SECTOR TOTAL	91854.9	120489.3	64750.5	113121.9		254171.3		531265.9
RESIDENTIAL								
AIR COND				10823.1			.0	.0
COOKING	26464.5	4961.4		8152.2				31425.9
LIGHT-APPLI				80559.0				.0
SPACE HEAT	230672.9	436037.5		9495.0		31408.6 (6)	.0	706119.0
WATER HEAT	62413.2	60825.4		6732.2			.0	123238.6
SECTOR TOTAL	327550.6	501824.3		115761.6		31408.6	.0	860783.5
TRANSPORT								
FREIGHT		302984.9		162.5				302984.9
PASS		789096.0		8142.8				789096.0
SECTOR TOTAL		1092080.9		8305.3				1092080.9
UTILITIES								
ELEC GENERATION	5325.8	546860.0 (2)	184200.0		172515.0		94857.5 (8)	1003758.3
SECTOR TOTAL	5325.8	546860.0	184200.0		172515.0		94857.5	1003758.3

GRAND TOTALS FOR SCENARIO BASE CASE 4/79 YEAR- 1976 RUN DATE- APR 06,1979

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER + FDSTCK	HYDRO + SOLAR	TOTAL (9) DIRECT USE
TOTAL FUEL CONSUMPTION	541808.2	2646626.1	248950.5	365821.4	172515.0	SEE(3,4,5,6)	SEE (7,8)	4025901.3

NOTES-
(1) DISTILLATE AND RESIDUAL COMBINED, UNLESS NOTED
(2) RESIDUAL OIL TOTAL USE= 519493.0
(3) STEAM TOTAL USE= 35564.4
(4) PETROCHEM TOTAL USE= 127581.7
(5) COKING COAL TOTAL USE= 126589.6
(6) OTHER TOTAL USE= 31408.6
(7) SOLAR,UNLESS NOTED TOTAL USE= .0
(8) HYDRO TOTAL USE= 94357.5
(9) DOES NOT INCLUDE ELECTRICITY

TABLE 4
APPENDIX A

FUEL DEMAND TABLES- 1985
1E09 BTU

AGRICULTURE
SCENARIO- BASE CASE 04/01/79 YEAR- 1985

SUBSECTOR GENERAL
END-USE ELECTRICITY
UNIT DEMAND 30.71 SATURATION 1.000
BASIS 51.34 IE3 FARMS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	51.34	1.00	1576.7

SUBSECTOR GENERAL
END-USE PROPANE
UNIT DEMAND 10.91 SATURATION 1.000
BASIS 51.34 IE3 FARMS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
PROPANE	OIL	51.34	.65	861.7

SUBSECTOR CROPS
END-USE ALL CROPS
UNIT DEMAND .37 SATURATION 1.000
BASIS 4514.11 IE3 ACRES

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS TECH	OIL	4514.11	.20	8351.1

SUBSECTOR LIVESTOCK
END-USE ALL STOCK
UNIT DEMAND .17 SATURATION 1.000
BASIS 1854.33 IE3 HEAD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS TECH	OIL	1854.33	.20	1576.2

COMMERCIAL
SCENARIO- BASE CASE 04/01/79 YEAR- 1985

SUBSECTOR HOSPITALS
END-USE AIR COND
UNIT DEMAND 44.00 SATURATION 1.000
BASIS 208.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	7.51	1.80	183.6
VAP COMP EL*	ELECTRICITY	201.19	3.00	2950.8
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR HOSPITALS
END-USE APP-AUX EQUIP
UNIT DEMAND 40.00 SATURATION 1.000
BASIS 208.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	208.70	1.00	8348.0

SUBSECTOR HOSPITALS
END-USE LIGHTING
UNIT DEMAND 29.11 SATURATION 1.000
BASIS 208.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	208.70	1.00	6075.3

SUBSECTOR HOSPITALS
END-USE SPACE HEAT
UNIT DEMAND 152.00 SATURATION 1.000
BASIS 208.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	158.61	.50	48218.0
GAS BURNER	GAS	31.31	.55	8651.6
MISC-TECH	STEAM	18.78	.65	4392.3
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.00	1.50	.0

SUBSECTOR HOSPITALS
END-USE WATER HEAT
UNIT DEMAND 14.10 SATURATION 1.000
BASIS 208.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	141.92	.70	2858.6
ELEC RESIST	ELECTRICITY	66.78	1.00	941.7
SOLAR	SOLAR	.00	1.00	.0
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR OFFICE
END-USE AIR COND
UNIT DEMAND 35.00 SATURATION 1.000
BASIS 559.23 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	20.03	1.80	389.5
VAP COMP EL•	ELECTRICITY	536.68	3.00	6261.2
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR OFFICE
END-USE APP-AUX EQUIP
UNIT DEMAND 12.20 SATURATION 1.000
BASIS 559.23 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	559.23	1.00	6822.6

SUBSECTOR OFFICE
END-USE LIGHTING
UNIT DEMAND 18.04 SATURATION 1.000
BASIS 559.23 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	559.23	1.00	10088.5

SUBSECTOR OFFICE
END-USE SPACE HEAT
UNIT DEMAND 142.00 SATURATION 1.000
BASIS 559.23 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	389.61	.50	110649.2
GAS BURNER	GAS	77.94	.55	20122.7
MISC-TECH	STEAM	38.39	.65	8386.1
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	27.97	1.00	3971.0
HEAT PUMP	ELECTRICITY	27.97	1.50	2647.4

SUBSECTOR OFFICE
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 559.23 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	329.94	.70	8012.8
ELEC RESIST	ELECTRICITY	223.69	1.00	3802.8
SOLAR	SOLAR	5.60	1.00	95.1
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR RETAIL
END-USE AIR COND
UNIT DEMAND 38.00 SATURATION 1.000
BASIS 580.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	20.90	1.80	441.3
VAP COMP EL•	ELECTRICITY	559.80	3.00	7090.8
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR RETAIL
END-USE APP-AUX EQUIP
UNIT DEMAND 13.40 SATURATION 1.000
BASIS 580.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	580.70	1.00	7781.4

SUBSECTOR RETAIL
END-USE LIGHTING
UNIT DEMAND 15.44 SATURATION 1.000
BASIS 580.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	580.70	1.00	8966.0

SUBSECTOR RETAIL
END-USE SPACE HEAT
UNIT DEMAND 79.00 SATURATION 1.000
BASIS 580.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	398.50	.50	62963.0
GAS BURNER	GAS	79.83	.55	11466.3
MISC-TECH	STEAM	43.91	.65	5337.0
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	29.01	1.00	2291.9
HEAT PUMP	ELECTRICITY	29.01	1.50	1527.9

SUBSECTOR RETAIL
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 580.70 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	342.61	.70	8320.6
ELEC RESIST	ELECTRICITY	232.28	1.00	3948.8
SOLAR	SOLAR	5.81	1.00	98.7
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR SCHOOL
END-USE AIR COND
UNIT DEMAND 32.00 SATURATION .200
BASIS 653.10 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	2.61	1.80	46.3
VAP COMP EL*	ELECTRICITY	128.01	3.00	1365.5
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SCHOOL
END-USE APP-AUX EQUIP
UNIT DEMAND 10.60 SATURATION .635
BASIS 653.10 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	414.72	1.00	4396.0

SUBSECTOR SCHOOL
END-USE LIGHTING
UNIT DEMAND 15.44 SATURATION 1.000
BASIS 653.10 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	653 10	1.00	10083.8

SUBSECTOR SCHOOL
END-USE SPACE HEAT
UNIT DEMAND 80.00 SATURATION 1.000
BASIS 653.10 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	496.81	.50	79489.4
GAS BURNER	GAS	98.56	.55	14335.4
MISC-TECH	STEAM	57.73	.65	7105.5
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SCHOOL
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 653.10 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	444.00	.70	10783.0
ELEC RESIST	ELECTRICITY	209.09	1.00	3554.6
OIL BURNER	OIL	.00	.63	.0

SUBSECTOR SERVICES
END-USE AIR COND
UNIT DEMAND 38.00 SATURATION .200
BASIS 1076.84 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	4.31	1.80	91.0
VAP COMP EL*	ELECTRICITY	211.08	3.00	2673.6
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SERVICES
END-USE APP-AUX EQUIP
UNIT DEMAND 14.00 SATURATION .965
BASIS 1076.84 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	1038.61	1.00	14540.6

SUBSECTOR SERVICES
END-USE LIGHTING
UNIT DEMAND 20.46 SATURATION 1.000
BASIS 1076.84 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	1076.80	1.00	22031.4

SUBSECTOR SERVICES
END-USE SPACE HEAT
UNIT DEMAND 79.00 SATURATION .965
BASIS 1076.84 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	684.94	.50	108219.9
GAS BURNER	GAS	191.85	.55	27555.9
MISC-TECH	STEAM	65.56	.65	7968.2
SOLAR	SOLAR	.00	1.00	.0
ELEC RESIST	ELECTRICITY	53.84	1.00	4253.1
HEAT PUMP	ELECTRICITY	53.84	1.50	2835.4

SUBSECTOR SERVICES
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 1076.84 IE6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
GAS BURNER	GAS	635.37	.70	15430.5
ELEC RESIST	ELECTRICITY	430.72	1.00	7322.2
SOLAR	SOLAR	10.77	1.00	183.1
OIL BURNER	OIL	.00	.63	.0

GOVERNMENT
SCENARIO- BASE CASE 04/01/79 YEAR- 1985

SUBSECTOR PASS TRANS
END-USE AUTOS
UNIT DEMAND 1.45 SATURATION 1.000
BASIS 580.83 1E6 VEH MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
INT COM	OIL	580.83	.20	4219.7

SUBSECTOR OFFICES
END-USE AIR COND
UNIT DEMAND 35.00 SATURATION 1.000
BASIS 16.86 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
VAP COMP GAS	GAS	.60	1.80	11.6
VAP COMP EL*	ELECTRICITY	16.25	3.00	189.6
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR OFFICES
END-USE APP-AUX EQUIP
UNIT DEMAND 12.20 SATURATION 1.000
BASIS 16.86 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	16.86	1.00	205.7

SUBSECTOR OFFICES
END-USE LIGHTING
UNIT DEMAND 18.04 SATURATION 1.000
BASIS 16.86 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
FLUOR-INCAN	ELECTRICITY	16.86	1.00	304.2

SUBSECTOR OFFICES
END-USE SPACE HEAT
UNIT DEMAND 142.00 SATURATION 1.000
BASIS 16.86 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
MISC-TECH	STEAM	1.29	.65	282.0
GAS BURNER	GAS	2.32	.55	599.0
OIL BURNER	OIL	11.57	.50	3285.9
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.84	1.50	79.5
ELEC RESIST	ELECTRICITY	.84	1.00	119.3

SUBSECTOR OFFICES
END-USE WATER HEAT
UNIT DEMAND 17.00 SATURATION 1.000
BASIS 16.86 1E6 SQ FT

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ELEC RESIST	ELECTRICITY	6.74	1.00	114.6
GAS BURNER	GAS	9.94	.70	241.4
SOLAR	SOLAR	.17	1.00	2.8

MANUFACTURING

SCENARIO- BASE CASE 04/01/73 YEAR- 1985

SUBSECTOR SIC 20
END-USE ELEC DRIVE
UNIT DEMAND 5.60 SATURATION 1.000
BASIS 1883.50 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1833.40	1.00	10267.0

SUBSECTOR SIC 20
END-USE PROCESS HEAT
UNIT DEMAND 11.05 SATURATION 1.000
BASIS 1883.50 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	222.35	.70	3510.0
GAS BURNER	GAS	387.82	.64	6696.0
OIL BURNER	OIL	1273.33	.68	20691.6

SUBSECTOR SIC 22
END-USE ELEC DRIVE
UNIT DEMAND 6.32 SATURATION 1.000
BASIS 504.10 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	490.69	1.00	3101.2

SUBSECTOR SIC 22
END-USE PROCESS HEAT
UNIT DEMAND 7.90 SATURATION 1.000
BASIS 504.10 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	67.81	.70	765.3
GAS BURNER	GAS	87.43	.64	1079.2
OIL BURNER	OIL	348.87	.68	4053.0

SUBSECTOR SIC 23
END-USE ELEC DRIVE
UNIT DEMAND 2.38 SATURATION 1.000
BASIS 2497.90 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	2431.46	1.00	5786.9

SUBSECTOR SIC 23
END-USE PROCESS HEAT
UNIT DEMAND .32 SATURATION 1.000
BASIS 2497.90 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	.00	.70	.0
GAS BURNER	GAS	661.65	.64	330.8
OIL BURNER	OIL	1836.25	.68	864.1

SUBSECTOR SIC 24
END-USE ELEC DRIVE
UNIT DEMAND 9.33 SATURATION 1.000
BASIS 131.10 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	127.61	1.00	1190.6

SUBSECTOR SIC 24
END-USE PROCESS HEAT
UNIT DEMAND 6.86 SATURATION 1.000
BASIS 131.10 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	31.91	.70	312.7
GAS BURNER	GAS	22.43	.64	240.4
OIL BURNER	OIL	76.76	.68	774.4

SUBSECTOR SIC 25
END-USE ELEC DRIVE
UNIT DEMAND 3.00 SATURATION 1.000
BASIS 306.30 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	298.15	1.00	894.5

SUBSECTOR SIC 25
END-USE PROCESS HEAT
UNIT DEMAND 4.26 SATURATION 1.000
BASIS 306.30 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	84.82	.70	516.2
GAS BURNER	GAS	69.91	.64	465.3
OIL BURNER	OIL	151.57	.68	949.5

SUBSECTOR SIC 27
END-USE ELEC DRIVE
UNIT DEMAND 1.78 SATURATION 1.000
BASIS 3551.90 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	3457.42	1.00	6154.2

SUBSECTOR SIC 27
END-USE PROCESS HEAT
UNIT DEMAND 1.53 SATURATION 1.000
BASIS 3551.90 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	2515.18	.70	5497.5
GAS BURNER	GAS	412.34	.64	985.8
OIL BURNER	OIL	624.37	.68	1404.8

SUBSECTOR SIC 26
END-USE ELEC DRIVE
UNIT DEMAND 15.06 SATURATION 1.000
BASIS 686.50 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	668.24	1.00	10063.7

SUBSECTOR SIC 26
END-USE PROCESS HEAT
UNIT DEMAND 40.67 SATURATION 1.000
BASIS 686.50 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	125.85	.70	7311.9
GAS BURNER	GAS	34.06	.64	2164.4
OIL BURNER	OIL	526.59	.68	31494.7

SUBSECTOR SIC 28
END-USE ELEC DRIVE
UNIT DEMAND 7.00 SATURATION 1.000
BASIS 1690.80 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1645.82	1.00	11520.7

SUBSECTOR SIC 28
END-USE FEEDSTOCK
UNIT DEMAND 79.33 SATURATION 1.000
BASIS 1690.80 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
PETROCHEM	FEEDSTOCK	1690.80	1.00	134131.2

SUBSECTOR SIC 28
END-USE PROCESS HEAT
UNIT DEMAND 22.79 SATURATION 1.000
BASIS 1690.80 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	700.14	.70	22794.6
GAS BURNER	GAS	251.47	.64	8954.7
OIL BURNER	OIL	739.19	.68	24773.7

SUBSECTOR SIC 30
END-USE ELEC DRIVE
UNIT DEMAND 10.36 SATURATION 1.000
BASIS 541.20 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	526.80	1.00	5457.6

SUBSECTOR SIC 30
END-USE PROCESS HEAT
UNIT DEMAND 7.57 SATURATION 1.000
BASIS 541.20 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	84.89	.70	918.0
GAS BURNER	GAS	307.70	.64	3639.5
OIL BURNER	OIL	143.61	.68	1654.4

SUBSECTOR SIC 31
END-USE ELEC DRIVE
UNIT DEMAND 5.91 SATURATION 1.000
BASIS 212.10 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	206.46	1.00	1220.2

SUBSECTOR SIC 31
END-USE PROCESS HEAT
UNIT DEMAND 4.83 SATURATION 1.000
BASIS 212.10 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	51.08	.70	352.5
GAS BURNER	GAS	15.84	.64	119.5
OIL BURNER	OIL	145.18	.68	1031.2

SUBSECTOR SIC 32
END-USE ELEC DRIVE
UNIT DEMAND 11.25 SATURATION 1.000
BASIS 551.70 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	537.02	1.00	6041.5

SUBSECTOR SIC 32
END-USE PROCESS HEAT
UNIT DEMAND 43.22 SATURATION 1.000
BASIS 551.70 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	302.73	.70	18691.4
GAS BURNER	GAS	133.37	.64	9006.6
OIL BURNER	OIL	115.61	.68	7348.0

SUBSECTOR SIC 33
END-USE FEEDSTOCK
UNIT DEMAND 43.96 SATURATION 1.000
BASIS 885.90 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COKE	FEEDSTOCK	885.90	.26	149785.2

SUBSECTOR SIC 33
END-USE PRIMARY METALS
UNIT DEMAND 48.01 SATURATION 1.000
BASIS 885.90 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	3.50	.21	800.1
GAS BURNER	GAS	269.24	.64	20195.1
OIL BURNER	OIL	203.10	.68	14338.0
AGG TECH	ELECTRICITY	410.06	.75	26246.6

SUBSECTOR SIC 34
END-USE ELEC DRIVE
UNIT DEMAND 5.00 SATURATION 1.000
BASIS 1079.50 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1050.79	1.00	5254.0

SUBSECTOR SIC 34
END-USE PROCESS HEAT
UNIT DEMAND 6.48 SATURATION 1.000
BASIS 1079.50 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	231.46	.70	2142.7
GAS BURNER	GAS	376.53	.64	3812.4
OIL BURNER	OIL	471.51	.68	4493.2

SUBSECTOR SIC 35
END-USE ELEC DRIVE
UNIT DEMAND 2.94 SATURATION 1.000
BASIS 2334.00 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	2271.92	1.00	6679.4

SUBSECTOR SIC 35
END-USE PROCESS HEAT
UNIT DEMAND 4.21 SATURATION 1.000
BASIS 2334.00 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	174.85	.70	1051.6
GAS BURNER	GAS	747.85	.64	4919.5
OIL BURNER	OIL	1411.30	.68	8737.6

SUBSECTOR SIC 36
END-USE ELEC DRIVE
UNIT DEMAND 3.18 SATURATION 1.000
BASIS 2802.30 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	2727.76	1.00	8674.3

SUBSECTOR SIC 36
END-USE PROCESS HEAT
UNIT DEMAND 3.86 SATURATION 1.000
BASIS 2802.30 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	758.35	.70	4181.8
GAS BURNER	GAS	883.08	.64	5326.1
OIL BURNER	OIL	1160.86	.68	6589.6

SUBSECTOR SIC 37
END-USE ELEC DRIVE
UNIT DEMAND 4.31 SATURATION 1.000
BASIS 1396.70 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	1353.55	1.00	5859.7

SUBSECTOR SIC 37
END-USE PROCESS HEAT
UNIT DEMAND 6.19 SATURATION 1.000
BASIS 1396.70 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	249.74	.70	2208.4
GAS BURNER	GAS	452.21	.64	4373.7
OIL BURNER	OIL	654.75	.68	6324.3

SUBSECTOR SIC 38
END-USE ELEC DRIVE
UNIT DEMAND 1.20 SATURATION 1.000
BASIS 3374.60 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	3284.84	1.00	3941.8

SUBSECTOR SIC 38
END-USE PROCESS HEAT
UNIT DEMAND 3.00 SATURATION 1.000
BASIS 3374.60 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	1463.77	.70	6260.4
GAS BURNER	GAS	554.28	.64	2598.2
OIL BURNER	OIL	1353.56	.68	5998.1

SUBSECTOR SIC 39
END-USE ELEC DRIVE
UNIT DEMAND 2.96 SATURATION 1.000
BASIS 881.20 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AC MOTOR	ELECTRICITY	857.76	1.00	2539.0

SUBSECTOR SIC 39
END-USE PROCESS HEAT
UNIT DEMAND 2.75 SATURATION 1.000
BASIS 881.20 $MIL VAL ADD

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
COAL BURNER	COAL	360.07	.70	1414.6
GAS BURNER	GAS	149.62	.64	642.9
OIL BURNER	OIL	371.51	.68	1502.4

SUBSECTOR HIGH RISE
END-USE AIR COND
UNIT DEMAND 11000.00 SATURATION .660
BASIS 1.52 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.86	3.00	3157.0
CENTRAL	ELECTRICITY	.14	3.00	528.0
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR HIGH RISE
END-USE COOKING
UNIT DEMAND 3200.00 SATURATION 1.000
BASIS 1.52 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.12	.38	1010.5
GAS BURNER	GAS	1.04	.38	8757.9
ELEC RESIST	ELECTRICITY	.36	1.00	1152.0

SUBSECTOR HIGH RISE
END-USE LIGHT-APPLI
UNIT DEMAND 21300.00 SATURATION .730
BASIS 1.52 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	1.11	1.00	23685.6

SUBSECTOR HIGH RISE
END-USE SPACE HEAT
UNIT DEMAND 31000.00 SATURATION 1.000
BASIS 1.52 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.82	.50	50840.0
GAS BURNER	GAS	.53	.55	29872.7
ELEC RESIST	ELECTRICITY	.15	1.00	4712.0
AGG-TECH	OTHER	.02	.35	1594.3
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.08	1.50	1570.7

SUBSECTOR HIGH RISE
END-USE WATER HEAT
UNIT DEMAND 16000.00 SATURATION 1.000
BASIS 1.52 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.64	.63	16177.8
GAS BURNER	GAS	.57	.57	15887.7
ELEC RESIST	ELECTRICITY	.30	1.00	4864.0
SOLAR	SOLAR	.02	1.00	240.0

SUBSECTOR LOW DENSITY
END-USE AIR COND
UNIT DEMAND 11000.00 SATURATION .660
BASIS 1.44 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.79	3.00	2911.3
CENTRAL	ELECTRICITY	.14	3.00	506.0
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR LOW DENSITY
END-USE COOKING
UNIT DEMAND 3200.00 SATURATION 1.000
BASIS 1.44 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.10	.38	842.1
GAS BURNER	GAS	1.00	.38	8421.1
ELEC RESIST	ELECTRICITY	.31	1.00	992.0

SUBSECTOR LOW DENSITY
END-USE LIGHT-APPLI
UNIT DEMAND 21300.00 SATURATION .730
BASIS 1.44 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	1.03	1.00	21960.3

SUBSECTOR LOW DENSITY
END-USE SPACE HEAT
UNIT DEMAND 50000.00 SATURATION 1.000
BASIS 1.44 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.76	.50	76000.0
GAS BURNER	GAS	.50	.55	45454.5
ELEC RESIST	ELECTRICITY	.07	1.00	3500.0
AGG-TECH	OTHER	.02	.35	2428.6
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.07	1.50	2333.3

SUBSECTOR LOW DENSITY
END-USE WATER HEAT
UNIT DEMAND 18000.00 SATURATION 1.000
BASIS 1.44 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.59	.63	16914.3
GAS BURNER	GAS	.52	.57	16547.4
ELEC RESIST	ELECTRICITY	.28	1.00	5076.0
SOLAR	SOLAR	.01	1.00	252.0

SUBSECTOR LOW RISE
END-USE AIR COND
UNIT DEMAND 11000.00 SATURATION .660
BASIS .95 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	.53	3.00	1954.3
CENTRAL	ELECTRICITY	.10	3.00	348.3
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR LOW RISE
END-USE COOKING
UNIT DEMAND 3200.00 SATURATION 1.000
BASIS .95 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.06	.38	505.3
GAS BURNER	GAS	.55	.38	4631.6
ELEC RESIST	ELECTRICITY	.23	1.00	736.0

SUBSECTOR LOW RISE
END-USE LIGHT-APPLI
UNIT DEMAND 21300.00 SATURATION .730
BASIS .95 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	.69	1.00	14782.2

SUBSECTOR LOW RISE
END-USE SPACE HEAT
UNIT DEMAND 33000.00 SATURATION 1.000
BASIS .95 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.51	.50	33660.0
GAS BURNER	GAS	.35	.55	21000.0
ELEC RESIST	ELECTRICITY	.05	1.00	1650.0
AGG-TECH	OTHER	.01	.35	1037.1
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.05	1.50	1100.0

SUBSECTOR LOW RISE
END-USE WATER HEAT
UNIT DEMAND 16000.00 SATURATION 1.000
BASIS .95 IE6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.40	.63	10082.5
GAS BURNER	GAS	.36	.57	9964.9
ELEC RESIST	ELECTRICITY	.19	1.00	3040.0
SOLAR	SOLAR	.01	1.00	144.0

SUBSECTOR MOBILE HOMES
END-USE COOKING
UNIT DEMAND 3200.00 SATURATION 1.000
BASIS .32 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.30	.38	2543.2
ELEC RESIST	ELECTRICITY	.04	1.00	134.4

SUBSECTOR MOBILE HOMES
END-USE LIGHT-APPLI
UNIT DEMAND 21300.00 SATURATION 1.000
BASIS .32 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	.34	1.00	7327.2

SUBSECTOR MOBILE HOMES
END-USE SPACE HEAT
UNIT DEMAND 40000.00 SATURATION 1.000
BASIS .32 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.31	.50	24800.0
ELEC RESIST	ELECTRICITY	.03	1.00	1360.0

SUBSECTOR MOBILE HOMES
END-USE WATER HEAT
UNIT DEMAND 11000.00 SATURATION .200
BASIS .32 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ELEC RESIST	ELECTRICITY	.07	3.00	253.0
OIL BURNER	OIL	.07	.63	1664.8
ELEC RESIST	ELECTRICITY	.28	1.00	4180.0

SUBSECTOR SINGLE FAMILY
END-USE AIR COND
UNIT DEMAND 11000.00 SATURATION .660
BASIS 2.66 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
ROOM	ELECTRICITY	1.50	3.00	5507.3
CENTRAL	ELECTRICITY	.25	3.00	927.7
SOLAR	SOLAR	.00	1.00	.0

SUBSECTOR SINGLE FAMILY
END-USE COOKING
UNIT DEMAND 3200.00 SATURATION 1.000
BASIS 2.66 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	.18	.38	1515.8
GAS BURNER	GAS	1.86	.38	15663.2
ELEC RESIST	ELECTRICITY	.62	1.00	1984.0

SUBSECTOR SINGLE FAMILY
END-USE LIGHT-APPLI
UNIT DEMAND 21300.00 SATURATION .730
BASIS 2.66 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	ELECTRICITY	1.94	1.00	41343.3

SUBSECTOR SINGLE FAMILY
END-USE SPACE HEAT
UNIT DEMAND 69000.00 SATURATION 1.000
BASIS 2.66 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	1.42	.50	195960.0
GAS BURNER	GAS	.95	.55	119181.8
ELEC RESIST	ELECTRICITY	.13	1.00	8970.0
AGG-TECH	OTHER	.03	.35	5914.3
SOLAR	SOLAR	.00	1.00	.0
HEAT PUMP	ELECTRICITY	.13	1.50	5980.0

SUBSECTOR SINGLE FAMILY
END-USE WATER HEAT
UNIT DEMAND 25000.00 SATURATION 1.000
BASIS 2.66 1E6 HOUSEHOLDS

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
OIL BURNER	OIL	1.11	.63	44047.6
GAS BURNER	GAS	.99	.57	43421.1
ELEC RESIST	ELECTRICITY	.53	1.00	13300.0
SOLAR	SOLAR	.03	1.00	675.0

TRANSPORT
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SUBSECTOR AIR PASS
END-USE PASS
UNIT DEMAND 4.49 SATURATION 1.000
BASIS 12875.53 1E6 PASS MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	OIL	12875.53	.30	192703.8

SUBSECTOR BUS
END-USE PASS
UNIT DEMAND 2.67 SATURATION 1.000
BASIS 949.82 1E6 PASS MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	674.37	.20	9002.8
INT COM	OIL	275.45	.20	3677.3

SUBSECTOR RAIL FREIGHT
END-USE FREIGHT
UNIT DEMAND .23 SATURATION 1.000
BASIS 25499.31 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	24223.15	.30	18328.9
AGG TECH	ELECTRICITY	715.85	1.00	162.5
AGG TECH	OIL	560.31	.20	636.0

SUBSECTOR WATER
END-USE FREIGHT
UNIT DEMAND .14 SATURATION 1.000
BASIS 102740.00 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	12051.00	.20	8194.7
AGG TECH	OIL	90689.00	.20	61668.5

SUBSECTOR AIR FREIGHT
END-USE FREIGHT
UNIT DEMAND 10.93 SATURATION 1.000
BASIS 2090.77 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
AGG TECH	OIL	2090.77	.30	76173.7

SUBSECTOR AUTO
END-USE PASS
UNIT DEMAND .96 SATURATION 1.000
BASIS 96425.48 1E6 PASS MI (OR=1.4)

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	.00	.20	.0
INT COM	OIL	96425.48	.20	463324.4

SUBSECTOR RAIL
END-USE PASS
UNIT DEMAND 1.00 SATURATION 1.000
BASIS 9466.83 1E6 PASS MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	802.32	.30	2669.1
AGG TECH	ELECTRICITY	8664.58	1.00	8647.3

SUBSECTOR TRUCK
END-USE FREIGHT
UNIT DEMAND .95 SATURATION 1.000
BASIS 45389.82 1E6 TON MI

TECHNOLOGY	FUEL	TECH FRAC	EFF	FUEL DEM
DIESEL	OIL	26830.99	.33	77240.7
INT COM	OIL	18559.04	.20	88155.4

TABLE 5

ENERGY DEMAND AND FUEL MIX
1E09 BTU
SCENARIO- BASE CASE 4/79 YEAR- 1985
RUN DATE-APR 06,1979

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER & FDSTCK	HYDRO & SOLAR (7)	TOTAL (9) DIRECT USE
AGRICULTURE		10789.0		1576.7				10789.0
COMMERCIAL	128689.0	409539.6		156572.2		33189.1 (3)	377.0	571794.7
GOVERNMENT	852.0	7505.6		1012.9		282.0 (3)	2.8	8642.5
MANUFACTURING	75550.1	143022.7	78729.5	120892.8		283916.4 (4) (5)		581218.7
RESIDENTIAL	338803.8	476563.8		191826.0		10974.3 (6)	1311.0	827652.9
TRANSPORT		1001775.2		8809.7				1001775.2
UTILITIES	.0	640451.3 (2)	233100.0		273000.0		86215.0 (8)	1232766.3

TABLE 6
APPENDIX A

ENERGY DEMAND AND FUEL MIX
1E09 BTU
SCENARIO- BASE CASE 4/79 YEAR- 1985
RUN DATE-APR 06,1979

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER ✓ FDSTCK	HYDRO ✓ SOLAR (7)	TOTAL (9) DIRECT USE
AGRICULTURE								
ALL CROPS		8351.1						8351.1
ALL STOCK		1576.2						1576.2
ELECTRICITY				1576.7				.0
PROPANE		861.7						861.7
SECTOR TOTAL		10789.0		1576.7				10789.0
COMMERCIAL								
AIR COND	1151.7			20341.9			.0	1151.7
APP-AUX EQUIP				41888.6				.0
LIGHTING				57245.0				.0
SPACE HEAT	82131.9	409539.6		17526.7		33189.1 (3)	.0	524860.6
WATER HEAT	45405.4	.0		19570.1			377.0	45782.4
SECTOR TOTAL	128689.0	409539.6		156572.2		33189.1	377.0	571794.7
GOVERNMENT								
AIR COND	11.6			189.6			.0	11.6
APP-AUX EQUIP				205.7				.0
AUTOS		4219.7						4219.7
LIGHTING				304.2				.0
SPACE HEAT	599.0	3285.9		198.8		282.0 (3)	.0	4166.9
WATER HEAT	241.4			114.6			2.8	244.2
SECTOR TOTAL	852.0	7505.6		1012.9		282.0	2.8	8642.5
MANUFACTURING								
ELEC DRIVE				94646.2				.0
FEEDSTOCK						283916.4 (4) (5)		283916.4
PRIMARY METALS	20195.1	14338.0	800.1	26246.6				35333.2
PROCESS HEAT	55355.0	128684.8	77929.4					261969.2

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER ✓ FDSTCK	HYDRO ✓ SOLAR (7)	TOTAL(9) DIRECT USE
SECTOR TOTAL	75550.1	143022.7	78729.5	120892.8		283915.4		581218.7
RESIDENTIAL								
AIR COND				15840.0			.0	.0
COOKING	37473.7	6416.8		4998.4				43890.5
LIGHT-APPLI				109098.6				.0
SPACE HEAT	215509.1	381260.0		31176.0		10974.3 (6)	.0	607743.4
WATER HEAT	85821.1	88887.0		30713.0			1311.0	176019.0
SECTOR TOTAL	338803.6	476563.8		191826.0		10974.3	1311.0	827652.9
TRANSPORT								
FREIGHT		330397.9		162.5				330397.9
PASS		671377.3		8647.3				671377.3
SECTOR TOTAL		1001775.2		8809.7				1001775.2
UTILITIES								
GENERATION	.0	640451.3 (2)	233100.0		273000.0		86215.0 (8)	1232766.3
SECTOR TOTAL	.0	640451.3	233100.0		273000.0		86215.0	1232766.3

GRAND TOTALS FOR SCENARIO BASE CASE 04/79 YEAR- 1985 RUN DATE- APR 06,1979

	NATURAL GAS	OIL (1)	COAL	ELECTRICITY	NUCLEAR	STEAM OTHER & FDSTCK	HYDRO & SOLAR	TOTAL (9) DIRECT USE
TOTAL FUEL CONSUMPTION	543895.0	2689647.3	311829.5	480690.3	273000.0	SEE(3,4,5,6)	SEE (7,8)	4234639.4

NOTES- (1) DISTILLATE AND RESIDUAL COMBINED, UNLESS NOTED

(2) RESIDUAL OIL	TOTAL USE=	627871.5
(3) STEAM	TOTAL USE=	33471.1
(4) PETROCHEM	TOTAL USE=	134131.2
(5) COKING COAL	TOTAL USE=	149785.2
(6) OTHER	TOTAL USE=	10974.3
(7) SOLAR,UNLESS NOTED	TOTAL USE=	1690.8
(8) HYDRO	TOTAL USE=	86215.0

(9) DOES NOT INCLUDE ELECTRICITY

APPENDIX B

COUNTY LEVEL DATA BASE

*ALLCOUNTIES(COAL)%

COAL DEMAND FOR NEW YORK STATE BY COUNTY

COUNTY	RES DEM	RES COST $/	CI DEM	CI COST $/	PA DEM	PA COST $/	TOTAL	AVE COST $/
ALBANY			275					
ALLEGANY			0					
BRONX			0					
BROOME			0					
CATTARAUGUS			8					
CAYUGA			0					
CHAUTAUQUA			0					
CHEMUNG			0					
CHENANGO			0					
CLINTON			0					
COLUMBIA			0					
CORTLAND			0					
DELAWARE			0					
DUTCHESS			0					
ERIE			79					
ESSEX			4					
FRANKLIN			0					
GENESEE			25					
GREENE			185					
HAMILTON			0					
HERKIMER			0					
JEFFERSON			81					
KINGS			0					
LEWIS			9					
LIVINGSTON			0					
MADISON			0					
MONROE			383					
MONTGOMERY			0					
NASSAU			0					
NEW YORK			0					
NIAGARA			227					
ONEIDA			0					
ONONDAGA			540					
ONTARIO			0					
ORANGE			0					
ORLEANS			0					
OSWEGO			0					
OTHER			0					
OTSEGO			32					
PUTNAM			0					
QUEENS			0					
RENSSELAER			0					
RICHMOND			0					
ROCKLAND			0					
SARATOGA			0					
SCHENECTADY			0					
SCHOHARIE			0					
SCHUYLER			520					

SENECA	0
STEUBEN	1
ST. LAWRENCE	15
SUFFOLK	0
SULLIVAN	0
TIOGA	0
TOMPKINS	0
ULSTER	0
WARREN	0
WASHINGTON	0
WAYNE	0
WESTCHESTER	0
WYOMING	29
YATES	0
TOTALS/AVERAGES	2,413

*ALLCOUNTIES(ELEC)%

ELEC DEMAND FOR NEW YORK STATE BY COUNTY

COUNTY	RES DEM MWHR	RES COST $/KWHR	CI DEM MWHR	CI COST $/KWHR	PA DEM MWHR	PA COST $/KWHR	TOTAL MWHR	AVE COST $/KWHR
ALBANY	574,948	$.03478	1,722,421	$.02344	28,292	$.06519	2,325,661	$.02675
ALLEGANY	142,186	$.03146	146,045	$.02064	22,086	$.03270	310,317	$.02646
BRONX	854,893	$.08780	1,613,779	$.07292	611,493	$.05583	3,080,165	$.07366
BROOME	442,556	$.03608	699,177	$.02885	212,229	$.03085	1,353,962	$.03153
CATTARAUGUS	256,949	$.03158	482,753	$.02292	11,386	$.03571	751,088	$.02608
CAYUGA	195,233	$.03719	205,736	$.02936	44,610	$.03233	445,579	$.03309
CHAUTAUQUA	385,727	$.02602	802,334	$.01716	43,516	$.01289	1,231,577	$.01978
CHEMUNG	204,376	$.03708	471,961	$.02941	61,975	$.03184	738,312	$.03174
CHENANGO	139,720	$.03401	110,613	$.02610	16,182	$.03014	266,515	$.03049
CLINTON	274,455	$.02246	315,730	$.00778	59,475	$.01756	649,660	$.01488
COLUMBIA	189,887	$.03579	223,252	$.02553	8,405	$.03944	421,544	$.03043
CORTLAND	112,464	$.03299	184,917	$.02362	6,806	$.04255	304,187	$.02751
DELAWARE	155,039	$.03200	124,900	$.02927	32,806	$.02934	312,745	$.03063
DUTCHESS	465,747	$.04748	892,091	$.03770	37,598	$.03165	1,395,436	$.04080
ERIE	1,776,612	$.03468	5,028,682	$.02382	206,751	$.04351	7,012,045	$.02715
ESSEX	123,010	$.03074	165,730	$.02300	12,263	$.02213	301,003	$.02612
FRANKLIN	148,268	$.02969	195,802	$.02241	6,164	$.02430	350,234	$.02552
FULTON	126,527	$.03408	196,688	$.02400	3,225	$.06585	326,440	$.02832
GENESEE	152,275	$.03343	303,464	$.02366	4,043	$.06282	459,782	$.02724
GREENE	121,319	$.04604	243,801	$.03785	3,725	$.03147	368,845	$.04048
HAMILTON	14,148	$.03473	19,739	$.02459	782	$.03192	34,669	$.02889
HERKIMER	210,237	$.02799	292,694	$.02216	8,558	$.02808	511,489	$.02465
JEFFERSON	226,773	$.03326	409,628	$.02386	4,127	$.04766	640,528	$.02734
KINGS	2,065,045	$.08780	2,569,449	$.07292	937,087	$.05583	5,571,581	$.07556
LEWIS	67,782	$.03408	107,293	$.02400	1,158	$.06585	176,233	$.02815
LIVINGSTON	164,500	$.03548	197,499	$.02557	28,586	$.04246	390,585	$.03098
MADISON	128,154	$.03053	136,238	$.02156	14,686	$.03072	279,078	$.02616
MONROE	1,486,686	$.03492	2,794,886	$.03107	376,545	$.04284	4,658,117	$.03325
MONTGOMERY	126,784	$.03408	218,852	$.02400	4,122	$.06585	349,758	$.02815
NASSAU	2,845,284	$.04969	3,186,684	$.04379	258,004	$.03791	6,289,972	$.04622
NEW YORK	1,224,360	$.08780	9,278,729	$.07292	1,355,753	$.05583	11,858,842	$.07250
NIAGARA	490,548	$.03461	3,857,101	$.02309	43,333	$.04091	4,390,982	$.02455
ONEIDA	624,210	$.03280	1,185,813	$.02383	27,485	$.05730	1,837,508	$.02738
ONONDAGA	895,616	$.03304	2,329,281	$.02187	48,102	$.05711	3,272,999	$.02544
ONTARIO	220,864	$.03759	224,169	$.03150	50,210	$.03715	495,243	$.03479
ORANGE	495,814	$.05860	666,466	$.04730	16,958	$.03684	1,179,238	$.05190
ORLEANS	112,889	$.03237	176,074	$.02314	2,637	$.04575	291,600	$.02691
OSWEGO	297,388	$.03408	618,185	$.02400	9,690	$.06585	925,263	$.02768
OTSEGO	170,963	$.03180	81,859	$.02919	38,102	$.03204	290,924	$.03110
PUTNAM	206,017	$.03824	80,085	$.03061	19,598	$.03183	305,700	$.03583
QUEENS	2,065,665	$.08634	2,724,154	$.07112	943,598	$.05544	5,733,417	$.07402
RENSSELAER	339,949	$.03450	461,854	$.02414	11,997	$.05642	813,800	$.02894
RICHMOND	471,370	$.08780	327,386	$.07292	149,200	$.05583	947,956	$.07763
ROCKLAND	432,406	$.06760	697,319	$.05340	12,846	$.04789	1,142,571	$.05871
SARATOGA	388,205	$.03445	558,991	$.02448	7,126	$.06585	954,322	$.02884
SCHENECTADY	324,621	$.03408	684,343	$.02400	12,761	$.06585	1,021,725	$.02773
SCHOHARIE	78,303	$.03236	2,106	$.01769	2,387	$.04295	82,796	$.03229

SCHUYLER	49,976	$.03317	28,573	$.02029	3,909	$.02198	82,458	$.02818
SENECA	898	$.03708	120,888	$.02941	27,665	$.03184	149,451	$.02991
STEUBEN	254,919	$.02930	486,821	$.02826	47,716	$.02971	789,456	$.02868
ST. LAWRENCE	277,325	$.03408	527,524	$.02173	6,663	$.06585	811,512	$.02631
SUFFOLK	2,683,422	$.05180	2,684,768	$.04570	313,155	$.04091	5,681,345	$.04832
SULLIVAN	197,476	$.04109	200,556	$.03087	34,206	$.03195	432,238	$.03562
TIOGA	120,826	$.03708	101,039	$.02941	12,304	$.03184	234,169	$.03350
TOMPKINS	195,643	$.03589	212,457	$.02873	196,093	$.03166	604,193	$.03200
ULSTER	391,866	$.04690	464,853	$.03795	11,311	$.03144	868,050	$.04191
WARREN	138,064	$.03408	295,759	$.02400	2,546	$.06585	436,369	$.02743
WASHINGTON	154,873	$.03465	215,660	$.02442	5,493	$.04513	376,026	$.02894
WAYNE	132,272	$.03799	260,332	$.03039	37,016	$.03644	429,620	$.03325
WESTCHESTER	1,490,199	$.08209	1,905,936	$.07136	356,747	$.05380	3,752,882	$.07395
WYOMING	126,872	$.02877	129,754	$.01826	10,798	$.02731	267,424	$.02361
YATES	69,750	$.03018	54,480	$.01794	95,435	$.03138	219,665	$.02766
TOTALS/AVERAGES	29,301,173	$.053	55,706,154	$.043	6,979,525	$.049	91,986,851	$.047

*ALLCOUNTIES(GAS)%

GAS DEMAND FOR NEW YORK STATE BY COUNTY

COUNTY	RES DEM MCF	RES COST $/MFC	CI DEM MCF	CI COST $/MFC	PA DEM MCF	PA COST $/MFC	TOTAL MCF	AVE COST $/MFC
ALBANY	7,668,539	$2.33670	4,615,071	$1.90252	13,165	$1.99000	12,296,775	$2.17338
ALLEGANY	1,459,166	$2.20813	1,282,546	$1.85681	0	XXXXXXXX	2,741,712	$2.04378
BRONX	9,088,000	$4.26000	5,928,000	$2.90000	1,367,000	$2.17000	16,383,000	$3.59351
BROOME	7,492,856	$2.22500	3,679,228	$1.63500	0	XXXXXXXX	11,172,084	$2.03070
CATTARAUGUS	3,485,723	$2.21319	6,923,220	$1.68353	0	XXXXXXXX	10,408,943	$1.86090
CAYUGA	2,127,648	$2.07900	1,432,911	$1.67400	286,826	$1.65300	3,847,385	$1.89640
CHAUTAUQUA	8,183,598	$2.20800	69,486	$1.85700	0	XXXXXXXX	8,253,084	$2.20504
CHEMUNG	4,614,254	$2.06426	5,289,278	$1.67314	620,294	$1.65139	10,523,826	$1.84335
CHENANGO	379,897	$2.07900	359,369	$1.67400	33,842	$1.65300	773,108	$1.87209
COLUMBIA	660,515	$2.33000	654,355	$1.90000	0	XXXXXXXX	1,314,870	$2.11601
CORTLAND	1,426,110	$2.07900	1,384,059	$1.67400	370,549	$1.65300	3,180,718	$1.85314
DELAWARE	378,308	$2.22500	309,052	$1.63500	0	XXXXXXXX	687,360	$1.95972
DUTCHESS	1,706,595	$3.25000	2,124,313	$2.03000	294,208	$1.99000	4,125,116	$2.53187
ERIE	59,634,424	$2.20800	40,344,439	$1.85700	0	XXXXXXXX	99,978,863	$2.06636
FULTON	1,484,232	$2.33000	1,068,421	$1.90000	0	XXXXXXXX	2,552,653	$2.15002
GENESEE	2,781,831	$2.18642	2,473,256	$1.79276	30,181	$1.93000	5,285,268	$2.00075
GREENE	100,129	$3.25000	146,396	$2.03000	39,634	$1.99000	286,159	$2.45135
HERKIMER	1,281,398	$2.33000	126,449	$1.90000	0	XXXXXXXX	1,407,847	$2.29138
JEFFERSON	2,132,801	$2.33000	1,620,987	$1.90000	0	XXXXXXXX	3,753,788	$2.14431
KINGS	44,927,376	$3.72000	10,520,457	$3.19000	2,168,892	$2.73000	57,616,725	$3.58596
LIVINGSTON	1,428,638	$1.99783	721,405	$1.65310	56,509	$1.70864	2,206,552	$1.87772
MADISON	1,243,871	$2.31210	1,109,991	$1.89642	183,620	$1.65300	2,537,482	$2.08257
MONROE	27,672,724	$2.44581	15,619,982	$1.88922	1,670,568	$1.93000	44,963,274	$2.23329
MONTGOMERY	1,629,922	$2.33000	1,070,320	$1.90000	0	XXXXXXXX	2,700,242	$2.15956
NASSAU	14,310,373	$3.36000	8,725,439	$2.73000	0	XXXXXXXX	23,035,812	$3.12137
NEW YORK	7,151,000	$4.26000	12,183,000	$2.90000	1,023,000	$2.17000	20,357,000	$3.34106
NIAGARA	5,870,059	$2.17133	10,086,928	$1.81511	230,916	$1.65300	16,187,903	$1.94197
ONEIDA	8,102,743	$2.32843	6,021,978	$1.89782	295	$1.65300	14,125,016	$2.14484
ONONDAGA	17,736,724	$2.31550	15,006,873	$1.84936	29,862	$1.65300	32,773,459	$2.10145
ONTARIO	2,178,210	$2.11131	1,640,267	$1.68301	372,649	$1.67198	4,191,126	$1.90462
ORANGE	4,571,366	$2.60772	2,120,009	$1.87653	171,759	$1.94953	6,863,134	$2.36538
ORLEANS	807,391	$2.10101	462,301	$1.68207	89,641	$1.67293	1,359,333	$1.93030
OSWEGO	2,917,868	$2.33000	2,030,503	$1.90000	0	XXXXXXXX	4,948,371	$2.15355
OTSEGO	483,233	$2.07900	278,279	$1.67400	25,362	$1.65300	786,874	$1.92204
QUEENS	31,856,930	$3.85015	10,571,302	$3.02272	1,627,099	$2.54208	44,055,331	$3.60330
RENSSELAER	3,300,064	$2.33000	1,878,367	$1.90000	0	XXXXXXXX	5,178,431	$2.17403
RICHMOND	5,647,846	$3.72000	939,938	$3.19000	272,653	$2.73000	6,860,437	$3.60804
ROCKLAND	10,668,647	$2.39000	7,282,014	$1.88000	0	XXXXXXXX	17,950,661	$2.18311
SARATOGA	3,676,678	$2.31927	2,268,788	$1.89572	7,997	$1.65300	5,953,463	$2.15697
SCHENECTADY	4,986,104	$2.33000	2,222,605	$1.90000	0	XXXXXXXX	7,208,709	$2.19742
SCHUYLER	297,983	$2.22500	257,388	$1.63500	0	XXXXXXXX	555,371	$1.95156
SENECA	886,926	$2.07900	865,484	$1.67400	77,308	$1.65300	1,829,718	$1.86943
STEUBEN	3,274,086	$1.80673	5,028,408	$1.44225	229,845	$1.44700	8,532,339	$1.58224
ST. LAWRENCE	1,544,198	$2.84000	3,971,183	$2.18000	0	XXXXXXXX	5,515,381	$2.36479
SUFFOLK	12,365,625	$3.36000	6,001,971	$2.73000	0	XXXXXXXX	18,367,596	$3.15414
SULLIVAN	0	XXXXXXXX	4,747	$1.63500	0	XXXXXXXX	4,747	$1.63500
TIOGA	621,396	$2.14971	388,465	$1.75592	59,382	$1.65300	1,069,243	$1.97906
TOMPKINS	1,989,016	$2.07900	2,080,724	$1.67400	1,053,929	$1.65300	5,123,669	$1.82690

ULSTER	541,506	$3.25000	312,885	$2.03000	57,340	$1.99000	911,731	$2.75208
WARREN	853,833	$2.33000	941,811	$1.90000	0	XXXXXXXX	1,795,694	$2.10447
WASHINGTON	660,515	$2.33000	654,355	$1.90000	0	XXXXXXXX	1,314,870	$2.11601
WAYNE	2,134,640	$2.22718	1,333,179	$1.72382	325,628	$1.75065	3,793,447	$2.00937
WESTCHESTER	15,583,000	$4.26000	7,233,000	$2.90000	1,480,000	$2.17000	24,296,000	$3.72781
WYOMING	1,514,536	$2.[illegible]2242	1,205,652	$1.77558	1,091	$1.65300	2,721,339	$1.96857
YATES	454,929	$2.[illegible]0806	289,077	$1.66436	36,840	$1.65300	780,846	$1.92233
TOTALS/AVERAGES	359,976,080	$2.879	223,159,911	$2.137	14,307,884	$2.[illegible]23	597,443,885	$2.584

*ALLUTILITIES(GAS)%

GAS DEMAND FOR NEW YORK STATE BY UTILITY 1976

UTILITY	RES DEM MCF	RES COST $/MFC	CI DEM MCF	CI COST $/MFC	PA DEM MCF	PA COST $/MFC	TOTAL MCF	AVE $/MFC
BROOKLYN UNION	72,969,589	$ 3.720	16,320,377	$3.190	3,522,644	$2.730	92,812,610	$3.589
CENTRAL HUDSON	3,636,637	$ 3.250	2,822,842	$2.030	555,480	$1.990	7,014,959	$2.659
COLUMBIA	9,589,927	$ 2.225	10,746,643	$1.635	0	XXXXXXXX	20,336,570	$1.913
CON ED	40,214,000	$ 4.260	30,396,000	$2.900	4,416,000	$2.170	75,026,000	$3.586
CORNING	2,096,266	$ 1.538	3,386,939	$1.304	234,694	$1.447	5,717,899	$1.396
LILCO	27,746,561	$ 3.360	15,386,730	$2.730	0	XXXXXXXX	43,133,291	$3.135
NATIONAL FUEL	80,887,216	$ 2.208	54,596,213	$1.857	0	XXXXXXXX	*5,483,429	$2.067
NIAGARA MOHAWK	57,166,236	$ 2.330	38,095,216	$1.900	0	XXXXXXXX	95,261,452	$2.158
NYSE+G	19,422,150	$ 2.079	18,228,271	$1.674	3,720,189	$1.653	41,370,610	$1.862
ORANGE+ROCKLAND	13,799,219	$ 2.390	9,108,922	$1.880	0	XXXXXXXX	22,908,141	$2.187
PAVILLION	1,681,860	$ 1.910	1,323,436	$1.603	0	XXXXXXXX	3,005,296	$1.775
PENN+SOUTH	115,056	$ 2.226	102,395	$1.991	0	XXXXXXXX	217,451	$2.115
RG+E	28,591,703	$ 2.450	15,754,948	$1.890	1,858,877	$1.930	46,205,528	$2.238
ST. LAWRENCE	1,544,198	$ 2.840	3,971,183	$2.180	0	XXXXXXXX	5,515,381	$2.365
SYRACUSE SUBURBAN	515,472	$ 1.978	2,919,796	$1.645	0	XXXXXXXX	3,435,268	$1.695
TOTALS/AVERAGES	359,976,090	$2.879	223,159,911	$2.137	14,307,884	$2.123	597,443,885	$2.584

*ALLUTILITIES(ELEC)%

ELEC DEMAND FOR NEW YORK STATE BY UTILITY 1976

UTILITY	RES DEM MWHR	RES COST $/KWHR	CI DEM MWHR	CI COST $/KWHR	PA DEM MWHR	PA COST $/KWHR	TOTAL MWHR	AVE $/KWHR
CENTRAL HUDSON	1,196,677	$ .047	1,833,904	$.038	35,355	$.031	3,065,936	$.042
CITY OF JAMESTOWN								
CITY OF PLATTSBURGH								
CON ED	7,919,660	$ .088	18,169,949	$.073	4,298,620	$.056	30,388,229	$.074
LILCO	5,485,545	$ .052	5,905,594	$.046	576,014	$.041	11,967,153	$.048
NIAGARA MOHAWK	7,655,974	$ .034	19,535,996	$.024	269,247	$.066	27,461,216	$.027
NYSE+G	3,848,341	$ .037	4,690,255	$.029	1,209,973	$.032	9,748,569	$.033
ORANGE+ROCKLAND	741,017	$ .068	1,118,581	$.053	18,612	$.048	1,878,210	$.059
PASNY	835,647		1,701,546		133,101		2,670,294	
RG+E	1,618,312	$ .038	2,750,329	$.033	438,603	$.043	4,807,244	$.035
VILLAGE OF FREEPORT								
TOTALS/AVERAGES	29,301,173	$.053	55,706,154	$.043	6,979,525	$.049	91,655,728	$.047

*ALLUTILITIES(COAL)%

	MCF	$/MFC	MCF	$/MFC	MCF	$/MFC	MCF	$/MFC
BROOKLYN UNION	72,969,589	$ 3.720	16,320,377	$3.190	3,522,644	$2.730	92,812,610	$3.589

COAL DEMAND FOR NEW YORK STATE BY UTILITY 1976

UTILITY	RES DEM	RES COST $/	CI DEM	CI COST $/	PA DEM	PA COST $/	TOTAL	AVE $/
CENTRAL HUDSON			185					
CON ED			0					
LILCO			0					
NIAGARA MOHAWK			1,263					
NYSE+G			582					
ORANGE+ROCKLAND			0					
OTHER			0					
RG+E			383					
TOTALS/AVERAGES			2,413					

COAL SUPPLY%

COAL SUPPLY IN 1000 TONS TO NEW YORK STATE 1976

REGION	RAIL	TRUCK	WATER	TOTAL
CENTRAL HUDSON	206			206
CON ED	134	9		143
LILCO	15			15
NIAGARA MOHAWK	8,555	565	340	9,460
NYSE+G	1,709	1,059		2,768
ORANGE+ROCKLAND	6			6
OTHER	29	160		189
RG+E	1,224			1,224
TOTAL	11,873	1,793	340	14,011

*COAL UTILITY.CENTRAL HUDSON)%

COAL IN 1000 TONS TO REGION CENTRAL HUDSON 1976

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
DUTCHESS	0	0	0	0	0	0
GREENE	185	0	0	0	0	185
OTHER	0	0	0	0	21	21
PUTNAM	0	0	0	0	0	0
ULSTER	0	0	0	0	0	0
TOTAL	185	0	0	0	21	206

*COAL UTILITY(CON ED)%

COAL IN 1000 TONS TO REGION CON ED 1976

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
BRONX	0	0	0	0	2	2
KINGS	0	0	0	0	0	0
NEW YORK	0	0	0	0	0	0
OTHER	0	0	0	141	0	141
QUEENS	0	0	0	0	0	0
RICHMOND	0	0	0	0	0	0
WESTCHESTER	0	0	0	0	0	0
TOTAL	0	0	0	141	2	143

*COAL UTILITY(LILCO)%

COAL IN 1000 TONS TO REGION LILCO 1976

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
NASSAU	0	0	0	0	0	0
OTHER	0	0	0	15	0	15
SUFFOLK	0	0	0	0	0	0
TOTAL	0	0	0	15	0	15

*COAL UTILITY(NIAGARA MOHAWK)%

COAL IN 1000 TONS TO REGION NIAGARA MOHAWK 1976

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
ALBANY	275	0	0	0	0	275
CATTARAUGUS	8	0	0	0	0	8
CHAUTAUQUA	0	1,325	0	0	0	1,325
CLINTON	0	0	0	0	0	0
COLUMBIA	0	0	0	0	0	0
CORTLAND	0	0	0	0	0	0
ERIE	79	1,585	5,157	0	0	6,821
ESSEX	4	0	0	0	0	4
FRANKLIN	0	0	0	0	0	0
GENESEE	25	0	0	0	0	25
HAMILTON	0	0	0	0	0	0
HERKIMER	0	0	0	0	0	0
JEFFERSON	81	0	0	0	0	81
LEWIS	9	0	0	0	0	9
MONTGOMERY	0	0	0	0	0	0
NIAGARA	227	0	0	0	0	227
ONEIDA	0	0	0	0	0	0
ONONDAGA	540	0	0	117	0	657
ORLEANS	0	0	0	0	0	0
OSWEGO	0	0	0	0	0	0
RENSSELAER	0	0	0	0	0	0
SARATOGA	0	0	0	0	0	0
SCHENECTADY	0	0	0	0	0	0
SCHOHARIE	0	0	0	0	0	0
ST. LAWRENCE	15	0	0	12	0	27
WARREN	0	0	0	0	0	0
WASHINGTON	0	0	0	0	0	0
TOTAL	1,263	2,910	5,157	129	0	9,459

*COAL UTILITY(NYSE+G)%

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
COAL IN 1000 TONS TO REGION NYSE+G 1976						
ALLEGANY	0	0	0	0	0	0
BROOME	0	350	0	70	0	420
CAYUGA	0	0	0	0	0	0
CHEMUNG	0	0	0	0	0	0
CHENANGO	0	194	0	0	0	194
DELAWARE	0	0	0	0	0	0
LIVINGSTON	0	0	0	0	0	0
MADISON	0	0	0	0	0	0
OTHER	0	0	0	0	0	0
OTSEGO	32	0	0	0	0	32
SCHUYLER	520	0	0	0	0	520
SENECA	0	0	0	0	0	0
STEUBEN	1	409	0	0	0	410
SULLIVAN	0	0	0	0	0	0
TIOGA	0	0	0	0	0	0
TOMPKINS	0	752	0	0	25	777
WYOMING	29	0	0	0	0	29
YATES	0	386	0	0	0	386
TOTAL	582	2,091	0	70	25	2,768

*COAL UTILITY(ORANGE+ROCKLAND)%

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
COAL IN 1000 TONS TO REGION ORANGE+ROCKLAND 1976						
ORANGE	0	0	0	0	0	0
OTHER	0	0	0	0	6	6
ROCKLAND	0	0	0	0	0	0
TOTAL	0	0	0	0	6	6

*COAL UTILITY(OTHER)%

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
COAL IN 1000 TONS TO REGION OTHER 1976						
OTHER	0	0	0	189	0	189
TOTAL	0	0	0	189	0	189

*COAL UTILITY(RG+E)%

COAL IN 1000 TONS TO REGION RG+E 1976

COUNTY	INDUSTRIAL	ELEC DEMAND	COKING	ANTHRACITE	OTHER	TOTAL
MONROE	383	780	0	1	60	1,224
ONTARIO	0	0	0	0	0	0
WAYNE	0	0	0	0	0	0
TOTAL	383	780	0	1	60	1,224

*COUNTIES IN REGION(GAS,LILCO)%
COUNTY NAME
***
* NASSAU
* QUEENS
* SUFFOLK

*COUNTIES IN REGION(ELEC,LILCO)%
COUNTY NAME
***
* NASSAU
* QUEENS
* SUFFOLK

*COUNTIES IN REGION(COAL,LILCO)%
COUNTY NAME
***
* NASSAU
* SUFFOLK
* OTHER

COUNTIES WITHOUT COAL DELIVERY%

COUNTIES WITHOUT COAL DELIVERY BY RAIL

ALLEGANY
CATTARAUGUS
CORTLAND
DELAWARE
FULTON
HAMILTON
PUTNAM
QUEENS
ROCKLAND
SENECA
SULLIVAN

*COUNTY UTIL POLL (SUFFOLK)%

POLLUTION IN TONS FOR SUFFOLK 1976

POWER PLANT	UTILITY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
E. HAMPTON	LILCO						
HOLBROOK	LILCO	12.5	37.5	25.0	1312.0	100.0	397.3
MONTAUK	LILCO						
NORTHPORT	LILCO	213.8	641.5	427:7	22453.5	1710.7	82622.5
PORT JEFFERSON	LILCO	94.6	283.7	189.1	9929.1	756.5	34431.3
SHOREHAM	LILCO	.0	.1	.0	2.2	.2	.7
SOUTHOLD	LILCO						
S. HAMPTON	LILCO						
W. BABYLON	LILCO	.1	.3	.2	8.8	.7	2.4
TOTAL		321.0	963.1	642.0	33705.6	2568.1	117454.2

*COUNTY(GAS,SUFFOLK)%

GAS DEMAND FOR COUNTY SUFFOLK

UTILITY	RES DEM MCF	RES COST $/MFC	CI DEM MCF	CI COST $/MFC	PA DEM MCF	PA COST $/MFC	TOTAL MCF	AVL $/MFC
LILCO	12,365,625	$3.36000	6,001,971	$2.73000	0		18,367,596	$3.15414
TOTALS/AVERAGES	12,365,625	$3.36000	6,001,971	$2.73000	0		18,367,596	$3.15414

*COUNTY(ELEC,SUFFOLK:%

PUTNAM

ELEC DEMAND FOR COUNTY SUFFOLK

UTILITY	RES DEM MWHR	RES COST $/KWHR	CI DEM MWHR	CI COST $/KWHR	PA DEM MWHR	PA COST $/KWHR	TOTAL MWHR	AVE $/KWHR
LILCO	2,677,839	$.05191	2,678,067	$.04581	312,420	$.04101	5,668,326	$.04843
PASNY	5,533		6,701		735		13,019	
TOTALS/AVERAGES	2,683,422	$.05180	2,684,768	$.04570	313,155	$.04091	5,681,345	$.04832

*COUNTY(COAL,SUFFOLK:%

COAL DEMAND FOR COUNTY SUFFOLK

UTILITY	RES DEM	RES COST $/	CI DEM	CI COST $/	PA DEM	PA COST $/	TOTAL	AVE $/
LILCO			0					

*ELEC UTILITY INFO(CENTRAL HUDSON)%

UTILITY CENTRAL HUDSON 1976

RES COST $.04749
CI COST $.03805
PA COST $.03134

FUEL	QTY		CAP IN MW	GEN IN GWHR
COAL	0	1000 TONS	0	0
DIST OIL	13	1000 BARRELS	53	3
HYDRO	0		46	157
NAT GAS	33	MMCF	0	2
NUCLEAR	0	1E9 BTU	0	0
RESID OIL	5,224	1000 BARRELS	692	3,415

*ELEC UTILITY INFO(CITY OF JAMESTOWN)%

UTILITY CITY OF JAMESTOWN 1976

RES COST
CI COST
PA COST

FUEL	QTY		CAP IN MW	GEN IN GWHR

*ELEC UTILITY INFO(CITY OF PLATTSBURGH)%

UTILITY CITY OF PLATTSBURGH 1976

RES COST
CI COST
PA COST

FUEL	QTY		CAP IN MW	GEN IN GWHR

*ELEC UTILITY INFO(CON ED)%

UTILITY CON ED 1976

RES COST $.08780
CI COST $.07292
PA COST $.05583

FUEL	QTY		CAP IN MW	GEN IN GWHR
COAL	0	1000 TONS	0	0
DIST OIL	3,481	1000 BARRELS	2,121	1,250
HYDRO	0		0	0
NAT GAS	2,095	MMCF	84	150
NUCLEAR	25,948	1E9 BTU	864	2,253
RESID OIL	52,692	1000 BARRELS	7,001	24,112

*ELEC UTILITY INFO.LILCO)%

UTILITY LILCO 1976

RES COST $.05191
CI COST $.04581
PA COST $.04101

FUEL	QTY		CAP IN MW	GEN IN GWHR
COAL	0	1000 TONS	0	0
DIST OIL	915	1000 BARRELS	1,204	363
HYDRO	0		0	0
NAT GAS	1,144	MMCF	0	111
NUCLEAR	0	1E9 BTU	0	0
RESID OIL	19,375	1000 BARRELS	2,523	11,976

*ELEC UTILITY INFO(NIAGARA MOHAWK)%

UTILITY NIAGARA MOHAWK 1976

RES COST $.03408
CI COST $.02400
PA COST $.06585

FUEL	QTY		CAP IN MW	GEN IN GWHR
	0		0	0
	92		270	30
	10,117		2,105	6,068
COAL	2,890	1000 TONS	1,470	7,267
HYDRO	0		649	3,591
NUCLEAR	44,729	1E9 BTU	610	4,121

*ELEC UTILITY INFO(NYSE+G)%

UTILITY NYSE+G 1976

RES COST $.03708
CI COST $.02941
PA COST $.03184

FUEL	QTY		CAP IN MW	GEN IN GWHR
COAL	3,354	1000 TONS	1,375	7,239
DIST OIL	200	1000 BARRELS	13	0
HYDRO	0		40	250
NAT GAS	0	MMCF	0	0
RESID OIL	0		0	0

*ELEC UTILITY INFO(ORANGE+ROCKLAND)%

UTILITY ORANGE+ROCKLAND 1976

RES COST $.06760
CI COST $.05340
PA COST $.04789

FUEL	QTY		CAP IN MW	GEN IN GWHR
COAL	0	1000 TONS	0	0
DIST OIL	4	1000 BARRELS	74	1
HYDRO	0		44	223
NAT GAS	1,904	MMCF	0	182
NUCLEAR	0	1E9 BTU	0	0
RESID OIL	4,979	1000 BARRELS	902	2,973

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*ELEC UTILITY INFO(PASNY)%

UTILITY PASNY 1976

RES COST
CI COST
PA COST

FUEL	QTY		CAP IN MW	GEN IN GWHR
COAL	0	1000 TONS	0	0
DIST OIL	0	1000 BARRELS	0	0
HYDRO	0		3,200	24,529
NAT GAS	0	MMCF	0	0
NUCLEAR	78,000	1E9 BTU	1,643	7,524
RESID OIL	0	1000 BARRELS	0	0

*ELEC UTILITY INFO(RG+E)%

UTILITY RG+E 1976

RES COST $.03800
CI COST $.03279
PA COST $.04316

FUEL	QTY		CAP IN MW	GEN IN GWHR
COAL	780	1000 TONS	340	1,800
DIST OIL	2	1000 BARRELS	14	1
HYDRO	0		47	260
NAT GAS	21	MMCF	15	1
NUCLEAR	23,000	1E9 BTU	470	2,000
RESID OIL	250	1000 BARRELS	112	110

*ELEC UTILITY INFO(VILLAGE OF FREEPORT)%

UTILITY VILLAGE OF FREEPORT 1976

RES COST
CI COST
PA COST

FUEL	QTY		CAP IN MW	GEN IN GWHR

GAS MUNICIPALS%

MUNICIPAL GAS UTILITIES 1976

MUNICIPAL	COUNTY	TOTAL SALES MCF
BATH E+G	STEUBEN	774,000
FILMORE GAS	ALLEGANY	185,000
GRANYBY+HEMENWAY GAS	ONTARIO	10,000
RESERVE GAS		220,000
VALLEY GAS	LIVINGSTON	32,000
WOODHULL	STEUBEN	46,000
TOTALS		1,267,000

*GAS RESALE(BROOKLYN UNION)%

GAS RESALE FROM UTILITY BROOKLYN UNION

UTILITY DOES NOT RESELL GAS

*GAS RESALE(CENTRAL HUDSON)%

GAS RESALE FROM UTILITY CENTRAL HUDSON

UTILITY DOES NOT RESELL GAS

*GAS RESALE(COLUMBIA)%

GAS RESALE FROM UTILITY COLUMBIA

UTILITY DOES NOT RESELL GAS

*GAS RESALE(CON ED)%

GAS RESALE FROM UTILITY CON ED

UTILITY DOES NOT RESELL GAS

*GAS RESALE(CORNING)%

GAS RESALE FROM UTILITY CORNING

NAME	QUANTITY MCF
NYSE-G	9,975,675
TOTAL	9,975,675

*GAS RESALE(LILCO)%

GAS RESALE FROM UTILITY LILCO

UTILITY DOES NOT RESELL GAS

*GAS RESALE(NATIONAL FUEL)%

GAS RESALE FROM UTILITY NATIONAL FUEL

NAME	QUANTITY MCF
OTHER	4,775,301
TOTAL	4,775,301

*GAS RESA_E(NIAGARA MOHAWK)%

GAS RESALE FROM UTILITY NIAGARA MOHAWK

NAME	QUANTITY MCF
NYSE+G	214,614
SYRACUSE	3,496,920
TOTAL	3,711,534

*GAS RESALE(NYSE+G)%

GAS RESALE FROM UTILITY NYSE+G

NAME	QUANTITY MCF
OTHER	1,925
TOTAL	1,925

*GAS RESALE(ORANGE+ROCKLAND)%

GAS RESALE FROM UTILITY ORANGE+ROCKLAND

NAME	QUANTITY MCF
NYSE+G	368,124
OTHER	628,216
TOTAL	996,340

*GAS RESALE(PAVILLION)%

GAS RESALE FROM UTILITY PAVILLION

NAME	QUANTITY MCF
OTHER	25,270
TOTAL	25,270

*GAS RESALE(PENN+SOUTH)%

GAS RESALE FROM UTILITY PENN+SOUTH

UTILITY DOES NOT RESELL GAS

*GAS RESALE(RG+E)%

GAS RESALE FROM UTILITY RG+E

UTILITY DOES NOT RESELL GAS

*GAS RESALE(ST. LAWRENCE)%

GAS RESALE FROM UTILITY ST. LAWRENCE

UTILITY DOES NOT RESELL GAS

*GAS RESALE(PAVILLION)%

GAS RESALE FROM UTILITY PAVILLION

NAME	QUANTITY MCF
OTHER	25,270
TOTAL	25,270

*GAS RESALE(PENN+SOUTH)%

GAS RESALE FROM UTILITY PENN+SOUTH

UTILITY DOES NOT RESELL GAS

*GAS RESALE(RG+E)%

GAS RESALE FROM UTILITY RG+E

UTILITY DOES NOT RESELL GAS

*GAS RESALE(ST. LAWRENCE)%

GAS RESALE FROM UTILITY ST. LAWRENCE

UTILITY DOES NOT RESELL GAS

*GAS RESALE(SYRACUSE SUBURBAN)%

GAS RESALE FROM UTILITY SYRACUSE SUBURBAN

NAME	QUANTITY MCF
OTHER	10,925
TOTAL	10,925

*GAS SUPPLY(BROOKLYN UNION)%

GAS SUPPLY TO UTILITY BROOKLYN UNION 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
	OTHER	14,542	$2.470
	PRODUCTION	5,906,993	
DISTRI GAS	PIPELINE	4,183,211	$2.167
TENNESSEE	PIPELINE	7,397,173	$1.089
TEXAS-EASTERN	PIPELINE	15,049,810	$1.432
TRANSCONTINENTAL	PIPELINE	67,665,547	$1.123
TOTALS		* 217,276	$1.144

*GAS SUPPLY(CENTRAL HUDSON)%

GAS SUPPLY TO UTILITY CENTRAL HUDSON 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
	PRODUCTION	1,662	
COLUMBIA NAT	PIPELINE	3,189,248	$1.200
TENNESSEE	PIPELINE	4,069,697	$1.130
TEXAS-EASTERN	PIPELINE	1,160,995	$1.170
TOTALS		8,421,602	$1.162

*GAS SUPPLY(COLUMBIA)%

GAS SUPPLY TO UTILITY COLUMBIA 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
	PRODUCTION	713	
	OTHER	169,037	$2.570
COLUMBIA NAT	PIPELINE	19,491,415	$1.198
TOTALS		19,661,165	$1.210

*GAS SUPPLY(CON ED)%

GAS SUPPLY TO UTILITY CON ED 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
ALGONQUIN NAT	PIPELINE	701,371	$2.165
TENNESSEE	PIPELINE	11,028,479	$1.095
TEXAS-EASTERN	PIPELINE	17,492,004	$1.263
TRANSCONTINENTAL	PIPELINE	60,998,698	$1.024
TOTALS		90,220,552	$1.088

*GAS SUPPLY(CORNING)%

GAS SUPPLY TO UTILITY CORNING 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
COLUMBIA NAT	PIPELINE	431,375	$1.270
CONSOLIDATED	PIPELINE	1,174,553	$1.140
NORTH PENN	OTHER	14,136,661	$1.110
TOTALS		15,742,589	$1.117

*GAS SUPPLY(LILCO)%

GAS SUPPLY TO UTILITY LILCO 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
	PRODUCTION	2,500	
TENNESSEE	PIPELINE	1,403,781	$1.210
TEXAS-EASTERN	PIPELINE	5,096,428	$1.360
TRANSCONTINENTAL	PIPELINE	37,957,637	$1.120
TOTALS		44,460,346	$1.150

*GAS SUPPLY(NATIONAL FUEL)%

GAS SUPPLY TO UTILITY NATIONAL FUEL 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
ASHLAND SYN	PIPELINE	11,600,000	$3.261
COLUMBIA SYN	PIPELINE	180,000	$4.406
NATIONAL	PIPELINE	*2,639,000	$1.204
TOTALS		*4,419,000	$1.362

*GAS SUPPLY(NIAGARA MOHAWK)%

GAS SUPPLY TO UTILITY NIAGARA MOHAWK 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
BORDERLINE	PIPELINE	10,878	$1.440
CONSOLIDATED	PIPELINE	*3,612,276	$1.200
TOTALS		*3,623,154	$1.200

*GAS SUPPLY(NYSE+G)%

GAS SUPPLY TO UTILITY NYSE+G 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
	OTHER	10,000	$1.870
	PRODUCTION	30,698	
COLUMBIA NAT	PIPELINE	644,053	$1.290
COLUMBIA SYN	PIPELINE	39,212	$4.350
CONSOLIDATED	PIPELINE	25,365,919	$1.140
CORNING	UTILITY	9,976,675	$1.190
NIAGARA MOHAWK	UTILITY	214,614	$1.730
ORANGE+ROCKLAND	UTILITY	368,124	$1.440
TENNESSEE	PIPELINE	5,598,660	$1.020
TOTALS		42,247,955	$1.146

*GAS SUPPLY(ORANGE+ROCKLAND)%

GAS SUPPLY TO UTILITY ORANGE+ROCKLAND 1976

NAME.	TYPE	QUANTITY MCF	COST $/MCF
	PRODUCTION	102,614	
ALGONQUIN NAT	PIPELINE	1,215,761	$1.700
ALGONQUIN SYN	PIPELINE	463,557	$5.250
COLUMBIA NAT	PIPELINE	8,493,559	$1.210
COLUMBIA SYN	PIPELINE	467,876	$4.300
TENNESSEE	PIPELINE	14,499,766	$1.060
TEXAS-EASTERN	PIPELINE	1,032,913	$1.170
TOTALS		26,276,046	$1.270

*GAS SUPPLY(PAVILLION)%

GAS SUPPLY TO UTILITY PAVILLION 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
CONSOLIDATED	PIPELINE	3,120,706	$1.137
TOTALS		3,120,706	$1.137

*GAS SUPPLY(SYRACUSE SUBURBAN)%

GAS SUPPLY TO UTILITY SYRACUSE SUBURBAN 1976

NAME	TYPE	QUANTITY MCF	COST $/MCF
NIAGARA MOHAWK	UTILITY	3,496,920	$1.369
TOTALS		3,496,920	$1.369

*GAS UTILITY INFO(BROOKLYN UNION)%

GAS UTILITY INFORMATION FOR UTILITY BROOKLYN UNION 1976

UTILITY NAME	BROOKLYN UNION
INTERNAL USE	696,672 MCF
QUANTITY STORED	2,716,555 MCF
QUNATITY LOST	6,588,145 MCF
CI FIRM	14,001,255 MCF
CI INTERRUPTABLE	2,317,121 MCF
RES COST	$3.720/MCF
CI COST	$3.190/MCF
PA COST	$2.730/MCF

*GAS UTILITY INFO(CENTRAL HUDSON)%

GAS UTILITY INFORMATION FOR UTILITY CENTRAL HUDSON 1976

UTILITY NAME	CENTRAL HUDSON
INTERNAL USE	88,723 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	317,224 MCF
CI FIRM	2,139,438 MCF
CI INTERRUPTABLE	1,683,374 MCF
RES COST	$3.250/MCF
CI COST	$2.030/MCF
PA COST	$1.990/MCF

*GAS UTILITY INFO(COLUMBIA)%

GAS UTILITY INFORMATION FOR UTILITY COLUMBIA 1976

UTILITY NAME	COLUMBIA
INTERNAL USE	14,527 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	270,521 MCF
CI FIRM	6,158,524 MCF
CI INTERRUPTABLE	4,588,099 MCF
RES COST	$2.225/MCF
CI COST	$1.635/MCF

*GAS UTILITY INFO(CON ED)%

GAS UTILITY INFORMATION FOR UTILITY CON ED 1976

UTILITY NAME	CON ED
INTERNAL USE	3,826,666 MCF
QUANTITY STORED	5,067,271 MCF
QUNATITY LOST	8,366,757 MCF
CI FIRM	21,069,824 MCF
CI INTERRUPTABLE	9,326,170 MCF
RES COST	$4.260/MCF
CI COST	$2.900/MCF
PA COST	$2.170/MCF

*GAS UTILITY INFO(CORNING)%

GAS UTILITY INFORMATION FOR UTILITY CORNING 1976

UTILITY NAME	CORNING
INTERNAL USE	3,506 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	44,705 MCF
CI FIRM	3,386,938 MCF
CI INTERRUPTABLE	0 MCF
RES COST	$1.538/MCF
CI COST	$1.304/MCF
PA COST	$1.447/MCF

*GAS UTILITY INFO(LILCO)%

GAS UTILITY INFORMATION FOR UTILITY LILCO 1976

UTILITY NAME	LILCO
INTERNAL USE	2,528,566 MCF
QUANTITY STORED	9,506,322 MCF
QUNATITY LOST	2,633,150 MCF
CI FIRM	13,278,346 MCF
CI INTERRUPTABLE	2,108,384 MCF
RES COST	$3.360/MCF
CI COST	$2.730/MCF

*GAS UTILITY INFO(NATIONAL FUEL)%

GAS UTILITY INFORMATION FOR UTILITY NATIONAL FUEL 1976

UTILITY NAME	NATIONAL FUEL
INTERNAL USE	280,894 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	2,760,434 MCF
CI FIRM	61,477,160 MCF
CI INTERRUPTABLE	0 MCF
RES COST	$2.208/MCF
CI COST	$1.857/MCF

*GAS UTILITY INFO(NIAGARA MOHAWK)%

GAS UTILITY INFORMATION FOR UTILITY NIAGARA MOHAWK 1976

UTILITY NAME	NIAGARA MOHAWK
INTERNAL USE	137,628 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	3,710,826 MCF
CI FIRM	23,565,076 MCF
CI INTERRUPTABLE	15,673,141 MCF
RES COST	$2.330/MCF
CI COST	$1.900/MCF

*GAS UTILITY INFO(NYSE+G)%

GAS UTILITY INFORMATION FOR UTILITY NYSE+G 1976

UTILITY NAME	NYSE+G
INTERNAL USE	93,078 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	875,425 MCF
CI FIRM	17,365,661 MCF
CI INTERRUPTABLE	861,218 MCF
RES COST	$2.079/MCF
CI COST	$1.674/MCF
PA COST	$1.653/MCF

*GAS UTILITY INFO(ORANGE+ROCKLAND)%

GAS UTILITY INFORMATION FOR UTILITY ORANGE+ROCKLAND 1976

UTILITY NAME	ORANGE+ROCKLAND
INTERNAL USE	495,556 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	56,700 MCF
CI FIRM	4,751,294 MCF
CI INTERRUPTABLE	4,357,628 MCF
RES COST	$2.390/MCF
CI COST	$1.880/MCF

*GAS UTILITY INFO(PAVILLION)%

GAS UTILITY INFORMATION FOR UTILITY PAVILLION 1976

UTILITY NAME	PAVILLION
INTERNAL USE	7,000 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	100,000 MCF
CI FIRM	132,436 MCF
CI INTERRUPTABLE	0 MCF
RES COST	$1.910/MCF
CI COST	$1.603/MCF

*GAS UTILITY INFO(PENN+SOUTH)%

GAS UTILITY INFORMATION FOR UTILITY PENN+SOUTH 1976

UTILITY NAME	PENN+SOUTH
INTERNAL USE	585 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	MCF
CI FIRM	102,081 MCF
CI INTERRUPTABLE	3 4 MCF
RES COST	$2.226/MCF
CI COST	$1.991/MCF

*GAS UTILITY INFO(RG+E)%

GAS UTILITY INFORMATION FOR UTILITY RG+E 1976

UTILITY NAME	RG+E
INTERNAL USE	1,231,035 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	1,833,027 MCF
CI FIRM	15,249,259 MCF
CI INTERRUPTABLE	0 MCF
RES COST	$2.450/MCF
CI COST	$1.880/MCF
PA COST	$1.930/MCF

*GAS UTILITY INFO(ST. LAWRENCE)%

GAS UTILITY INFORMATION FOR UTILITY ST. LAWRENCE 1976

UTILITY NAME	ST. LAWRENCE
INTERNAL USE	5,891 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	15.438 MCF
CI FIRM	3,157.140 MCF
CI INTERRUPTABLE	814.043 MCF
RES COST	$2 840/MCF
CI COST	$2 180/MCF

*GAS UTILITY INFO(SYRACUSE SUBURBAN)%

GAS UTILITY INFORMATION FOR UTILITY SYRACUSE SUBURBAN 1976

UTILITY NAME	SYRACUSE SUBURBAN
INTERNAL USE	1,195 MCF
QUANTITY STORED	0 MCF
QUNATITY LOST	49,533 MCF
CI FIRM	2,919,796 MCF
CI INTERRUPTABLE	0 MCF
RES COST	$1.978/MCF
CI COST	$1.645/MCF

*NYPP(CENTRAL HUDSON)%

FUEL - 1976

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM+	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
CENTRAL H*	DANSKAMMER	1	NEWBURGH	ST	S	#3	485 BBL		-	#3	-	39	39	A	7,592	11,728
CENTRAL H*	DANSKAMMER	2	NEWBURGH	ST	S	#3			-	#3	-	66	66	A	5,789	10,640
CENTRAL H*	DANSKAMMER	3	NEWBURGH	ST	S	#3			-	#3	-	118	118	A	5,000	10,247
CENTRAL H*	DANSKAMMER	4	NEWBURGH	ST	S	#3			-	#3	-	229	229	A	8,442	9,692
CENTRAL H*	ROSETON	1	NEWBURGH	ST	S	W	215 BBLS		-	W	-	120	120#1	A	5,683	9,798
CENTRAL H*	ROSETON	2	NEWBURGH	ST	S	W	#2		-	W	-	120	120#1	A	6,890	9,798
CENTRAL H*	DANSKAMMER	5	NEWBURGH	IC	K	T	.4 BBLS		-	T	-	2.5	2.5	C	8,764	15,466
CENTRAL H*	DANSKAMMER	6	NEWBURGH	IC	K	T			-	T	-	2.5	2.5	C	8,767	15,466
CENTRAL H*	DASHVILLE	1	RIFTON	HY	Q	-	-		-	-	-	1.5	1.9	-	-	-
CENTRAL H*	DASHVILLE	2	RIFTON	HY	Q	-	-		-	-	-	1.5	1.9	-	-	-
CENTRAL H*	NEVERSINK			HY	Q	-	-		-	-	-	27	27	-	-	-
CENTRAL H*	STURGEON	1	RIFTON	HY	Q	-	-		-	-	-	4.9	5.0	-	-	-
CENTRAL H*	STURGEON	2	RIFTON	HY	Q	-	-		-	-	-	4.9	5.0	-	-	-
CENTRAL H*	STURGEON	3	RIFTON	HY	Q	-	-		-	-	-	4.9	5.0	-	-	-
CENTRAL H*	COXSACKIE		COXSACKIE	CT	K	F	1.2 BBLS		-	F	NONE	19	24	C	8,774	14,162
CENTRAL H*	SO. CAIRO		CAIRO	CT	K	T	10.5 BBL		-	-	-	19	24	C	8,039	13,770
CENTRAL H*																

TOTAL CENTRAL HUDSON

		SUMMER	WINTER
CT	COMBUSTION TURBINE	38	48
HY	CONVENTIONAL HYDRO	45	46
IC	INTERNAL COMBUSTION	5	5
ST	STEAM TURBINE (OIL)	692	692
		780	791

NOTE #1 - ROSETON ACTUAL CAPACITY IS 1200 MW, CENTRAL HUDSON'S SHARE IS 240 MW.
NOTE #2 - ROSETON RESIDUAL STORAGE CAPACITY - 1079 MMBLS #2 OIL-33.4 MMBLS.
CENTRAL HUDSON'S SHARE OF EACH IS 20 PER CENT.
NOTE #3 - OIL DELIVERED TO THE PLANT VIA PIPELINE FROM SUPPLIERS TERMINAL.

*NYPP(CON ED)%

FUEL - 1976

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM*	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
CON ED	ARTHUR KI*	2	STATEN IS	ST	S	T	63 BBLS		NONE	W	207 TONS	335	350	A	7,109	10,177
CON ED	ARTHUR KI*	3	STATEN IS	ST	S	T		C	NONE	W		491	501	A	6,127	9,809
CON ED	ASTORIA	1	QUEENS	ST	S	F,B	#2		NONE	F,W	#4	161	164	A	8,139	11,607
CON ED	ASTORIA	2	QUEENS	ST	S	F,B	#2	G,C	NONE	F,W	#4	161	164	A	7,263	11,196
CON ED	ASTORIA	3	QUEENS	ST	S	F,B	#2	G,C	NONE	F,W	#4	378	386	A	7,475	10,256
CON ED	ASTORIA	4	QUEENS	ST	S	W	#2	C	NONE	F,W	#4	379	387	A	6,900	10,535
CON ED	ASTORIA	5	QUEENS	ST	S	W	#2	C	NONE	F,W	#4	359	367	A	3,439	11,379
CON ED	BOWLINE	1	HAVERSTRAW	ST	S	W #7	#17	-	-	W #7	- #16	401	401	A	4,953	9,730
CON ED	BOWLINE	2	HAVERSTRAW	ST	S	W	#17	-	-	W	- #16	400	400	A	6,474	9,654
CON ED	EAST RIVER	5	MANHATTAN	ST	S	F	#3		NONE	F,W	NONE	130	134	A	3,772	-
CON ED	EAST RIVER	6	MANHATTAN	ST	S	F	#3	G	NONE	F,W	NONE	130	134	A	4,058	-
CON ED	EAST RIVER	7	MANHATTAN	ST	S	F	#3	G	NONE	F,W	NONE	166	170	A	7,196	-
CON ED	HUDSON AV*	#A		ST	S	W	#3	NONE	-	W	-	493	515	A	-	#12
CON ED	RAVENSWOOD	1	QUEENS	ST	S	F	#2	G	NONE	F	NONE	405	410	A	6,389	10,039
CON ED	RAVENSWOOD	2	QUEENS	ST	S	F	#2	G	NONE	F	NONE	401	406	A	5,451	10,165
CON ED	RAVENSWOOD	3	QUEENS	ST	S	F	#2	C	NONE	F	NONE	972	972	A	7,266	5,850
CON ED	ROSETON	1	ROSETON	ST	S	W	#15	NONE	-	W	- #14	240	240	A	-	9,639 #11
CON ED	ROSETON	2	ROSETON	ST	S	W	#15	NONE	-	W	- #14	240	240	A	-	9,639
CON ED	WATERSIDE	7	MANHATTAN	ST	O	F	#3	NONE	-	F	-			A	-	16,745
CON ED	WATERSIDE	#B	MANHATTAN	ST	S	F	#3	NONE	-	F	-			A	-	16,745
CON ED	WATERSIDE	#C	MANHATTAN	ST	S	F	#3	G	-	F	-			A	-	16,745
CON ED	59 ST	#D	MANHATTAN	ST	S	W	35 BBLS	NONE	-	W	-	123	126	A	-	
CON ED	74 ST	#E	MANHATTAN	ST	S	F	-	-	-	F		147	147	A	-	13,734
CON ED	INDIAN PO*	1	BUCHANAN	SP	T	W	108 BBLS	NONE	-	W	-	0 #13	0 #13	A	-	
CON ED	INDIAN PO*	2	BUCHANAN	SP	N	-	-	NONE	-	T		864	864	A	3,056	11,442
CON ED	ARTHUR KI*		STATEN IS	CT	S	T	2 BBLS	NONE	-	-		15	18	C	148	17,055
CON ED	ASTORIA	01	QUEENS	CT	G	F	-	NONE	-	F	-	15	18	C	18	14,732
CON ED	ASTORIA	05	QUEENS	CT	S	W	48 BBLS	NONE	-	W	-	16	20	C	129	14,732
CON ED	ASTORIA	06		CT		-						16	20		165	14,732
CON ED	ASTORIA	07		CT		-						16	20		272	14,732
CON ED	ASTORIA	08		CT		-						11	15		184	14,732
CON ED	ASTORIA	09		CT		-						16	20		236	14,732
CON ED	ASTORIA	10		CT		-						19	25		257	14,732
CON ED	ASTORIA	11		CT		-						17	23		391	14,732
CON ED	ASTORIA	12		CT		-						20	26		233	14,732
CON ED	ASTORIA	#F	QUEENS	CT	K	W	48 BBLS	G	NONE	W	-	468	552	C	-	14,732
CON ED	GOWANUS	#G	BROOKLYN	CT	S	W	100 BBLS	NONE	-	W		536	728	C	-	17,090
CON ED	HUDSON AV*	1	BROOKLYN	CT	K	T	3 BBLS	NONE	-	T	-	17	20	C	61	20,308
CON ED	HUDSON AV*	2	BROOKLYN	CT	K	T				T	-	17	20	C	15	20,308
CON ED	HUDSON AV*	3	BROOKLYN	CT	K	T	3 BBLS	NONE	-	T	-	13	16	C	118	20,308
CON ED	HUDSON AV*	4	BROOKLYN	CT	K	T			-	T	-	14	17		103	20,308
CON ED	HUDSON AV*	5	BROOKLYN	CT	K	T			-	T	-	11	14		41	20,308
CON ED	INDIAN PO*	1	BUCHANAN	CT	K	W	6 BBLS	NONE	-	W		19	25	C	74	20,914
CON ED	INDIAN PO*	2	BUCHANAN	CT	K	-						21	27		195	23,120
CON ED	INDIAN PO*	3	BUCHANAN	CT	K	-						16	20		#8 144	23,120
CON ED	KENT AVE	2	BROOKLYN	CT	K	T	2 BBLS	NONE	-	T		9	12	C	88	17,120
CON ED	NARROWS B*	#H	BROOKLYN	CT	K	F	243 BBLS	G	NONE	W	107 BBLS	315	411	C	-	16,463

CON ED	RAVENSWOOD	01	QUEENS	CT	G	F	-	-	-	F	-	15	18	C	0	15,857
CON ED	RAVENSWOOD	02	QUEENS	CT	K	F	48 BBLS	G	NONE	W	NONE	124	159	C	..	15,857
CON ED	RAVENSWOOD	03	QUEENS	CT		-						126	161		-	15,857
CON ED	RAVENSWOOD	04	QUEENS	CT	K	F	2 BBLS	G		W	NONE	16	18	C	394	15,857
CON ED	RAVENSWOOD	05	QUEENS	CT		-						16	19		198	15,857
CON ED	RAVENSWOOD	06	QUEENS	CT		-						17	20		306	15,857
CON ED	RAVENSWOOD	07	QUEENS	CT		-						17	20		78	15,857
CON ED	RAVENSWOOD	08	QUEENS	CT	K	F	48 BBLS	G	NONE	W	NONE	19	23	C	149	15,857
CON ED	RAVENSWOOD	09	QUEENS	CT		-						19	23		127	15,857
CON ED	RAVENSWOOD	10	QUEENS	CT		-						19	23		94	15,857
CON ED	RAVENSWOOD	11	QUEENS	CT		-						19	23		135	15,857
CON ED	WATERSIDE	1	MANHATTAN	CT	K	T	1 BBL	NONE	-	T	-	11	14	C	104	16,777
CON ED	59 ST	1	MANHATTAN	CT	K	T	3 BBL	NONE	-	T	-	17	20	C	118	15,455
CON ED	59 ST	2		CT		-						17	20		130	15,455
CON ED	74 ST	1	MANHATTAN	CT	K	T	2 BBL	NONE	-	T	-	17	20	C	71	15,583
CON ED	74 ST	2		CT		-						17	20		128	15,583
CON ED																

TOTAL CON ED

CT - COMBUSTION TURBINE	2121	2691
SP - STEAM (PWR NUCLEAR)	864	864
ST - STEAM TURBINE(OIL)	6895	7009
	9880	10564

NOTE #A - UNITS 2-10
NOTE #B - UNITS 8 AND 9
NOTE #C - UNITS 4,5,6,11,13,14 AND 15
NOTE #D - UNITS 7,8 AND 13-15
NOTE #E - UNITS 3 AND 9-11
NOTE #F - UNITS 2-4
NOTE #G - UNITS 1-4
NOTE #H - UNITS 1-2

*NYPP(LILCO)%

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM*	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
						FUEL - 1976										
LILCO	BARRETT	1	ISLAND PA*	ST	S	F	480 BBLS	G	NONE	W	-	189	189	A	7,333	10,330
LILCO	BARRETT	2	ISLAND PA*	ST	S	F		G	NONE	W	-	191	191	A	8,227	10,214
LILCO	FAR ROCKA*	4	FAR ROCK	ST	S	F	49.6BBLS	G	NONE	W	-	114	115	A	5,833	10,972
LILCO	GLENWOOD	2	GLENWOOD	ST	S	F	147.1BBL	G	NONE	W	-	77	77	A	8,784	#1
LILCO	GLENWOOD	3	GLENWOOD	ST	S	F		G	NONE	W	-	77	77	A	8,784	#1
LILCO	GLENWOOD	4	GLENWOOD	ST	S	F		G	NONE	W	-	114	114	A	8,439	11,193
LILCO	GLENWOOD	5	GLENWOOD	ST	S	F		G	NONE	W	-	113	113	A	7,785	10,826
LILCO	NORTHPORT	1	NORTHPORT	ST	S	W	1988BBL	-	-	W	-	386	386	A	6,582	10,000
LILCO	NORTHPORT	2	NORTHPORT	ST	S	W		-	-	W	-	386	386	A	7,556	9,660
LILCO	NORTHPORT	3	NORTHPORT	ST	S	W		-	-	W	-	386	386	A	6,555	9,683
LILCO	PORT JEFF*	1	PORT JEFF	ST	S	W	645 BBLS	-	-	W	-	49	49	A	8,031	13,399
LILCO	PORT JEFF*	2	PORT JEFF	ST	S	W		-	-	W	-	49	49	A	7,092	13,399
LILCO	E. HAMPTON	#G	E. HAMPTON	IC	S	T	1.3 BBLS	-	-	T	-	6	6	C	8,136	31,336 #3
LILCO	MONTAUK	#G	MONTAUK	IC	S	T	1 BBLS	-	-	T	-	5	6	C	8,594	19,335 #3
LILCO	BARRETT	#B	ISLAND PA*	CT	S	T	2.4 BBLS	-	-	T	-	18	18	C	3,894	#1
LILCO	BARRETT	#C	ISLAND PA*	CT	S	F	71.4BBL	G	NONE	T	-	126	151	C	6,146	16,207
LILCO	BARRETT	#D	ISLAND PA*	CT	S	F		G	NONE	T	-	162	190	C	7,576	16,207
LILCO	E. HAMPTON	1	E. HAMPTON	CT	S	T	3.2 BBLS	-	-	T	-	20	24	C	8,550	16,030
LILCO	GLENWOOD	1	GLENWOOD	CT	S	T	12 BBLS	-	-	T	-	16	20	C	8,455	13,452
LILCO	GLENWOOD	#A	GLENWOOD	CT	S	W	35.7BBL	-	-	W	-	114	124	C	7,127	13,452
LILCO	HOLBROOK	#E	HOLBROOK	CT	S	W,F	119BBLS	-	-	W,F	-	528	664	C	7,810	13,729
LILCO	SHOREHAM	1	SHOREHAM	CT	S	T	23.8BBLS	-	-	T	-	51	64	C	3,171	#1
LILCO	SOUTHOLD	1	SOUTHOLD	CT	S	T	3 BBLS	-	-	T	-	14	17	C	8,602	30,334 #3
LILCO	S. HAMPTON	1	S. HAMPTON	CT	S	T	3 BBLS	-	-	T	-	11	14	C	8,358	
LILCO	W. BABYLON	4	W. BABYLON	CT	S	T	11.9BBLS	-	-	T	-	48	62	C	1,186	13,769
LILCO	W. BABYLON	#F	W. BABYLON	CT	S	T	11.9BBLS	-	-	T		52	63	C	8,022	13,769
LILCO																

TOTAL LILCO

	SUMMER	WINTER
CT - COMBUSTION TURBINE	1192	1455
IC - INTERNAL COMBUSTION	12	12
ST - STEAM TURBINE (OIL)	2523	2524
	3727	3991

NOTE #A - UNITS 2 AND 3.
NOTE #B - APG.
NOTE #C - UNITS 1-8.
NOTE #D - UNITS 9-12.
NOTE #E - UNITS 1-10.
NOTE #F - UNITS 1-3.
NOTE #G - UNITS 2-4.
NOTE #1 - INADEQUATE SERVICE HOURS TO DETERMINE HEAT RATE.
NOTE #2 - INCLUDES EXTENSIVE TESTING.
NOTE #3 THIS CALCULATED HEAT RATE IS NOT INDICATIVE OF UNIT PERFORMANCE BUT RATHER EXTREMELY LIMITED HOURS OF OPERATION BIASED BY AUXILIARY POWER REQUIREMENTS.

*NYPP(NIAGARA MOHAWK)%

FUEL - 1976.

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM*	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
NIAGARA M*	ALBANY	1	BETHLEHEM	ST	S	T,R	567 BBLS	C	-	W	150 TONS	100	100	A	8,081	10,365
NIAGARA M*	ALBANY	2	BETHLEHEM	ST	S	T,R		-	-	W	-	100	100	A	7,673	10,339
NIAGARA M*	ALBANY	3	BETHLEHEM	ST	S	T,R		-	-	W	-	100	100	A	8,290	10,328
NIAGARA M*	ALBANY	4	BETHLEHEM	ST	S	T,R		-	-	W	-	100	100	A	8,273	10,324
NIAGARA M*	DUNKIRK	1	DUNKIRK	ST	C	T,R	350 TONS	-	-	-	-	100	100	A	6,181	10,316
NIAGARA M*	DUNKIRK	2	DUNKIRK	ST	C	T,R		-	-	-	-	100	100	A	6,586	10,339
NIAGARA M*	DUNKIRK	3	DUNKIRK	ST	C	T,R		-	-	-	-	220	220	A	7,393	9,976
NIAGARA M*	DUNKIRK	4	DUNKIRK	ST	C	T,R		-	-	-	-	220	220	A	7,707	9,605
NIAGARA M*	HUNTLEY	63	TONAWANDA	ST	C	T,R,W	500 TONS	-	-	T,R,W	-	91	91	A	5,954	11,943
NIAGARA M*	HUNTLEY	64	TONAWANDA	ST	C	T,R,W		-	-	-	-	100	100	A	4,951	11,035
NIAGARA M*	HUNTLEY	65	TONAWANDA	ST	C	T,R,W		-	-	-	-	100	100	A	6,092	10,423
NIAGARA M*	HUNTLEY	66	TONAWANDA	ST	C	T,R,W		-	-	-	-	100	100	A	6,667	10,274
NIAGARA M*	HUNTLEY	67	TONAWANDA	ST	C	T,R,W		-	-	-	-	220	220	A	6,074	9,839
NIAGARA M*	HUNTLEY	68	TONAWANDA	ST	C	T,R,W		-	-	-	-	220	220	A	8,261	9,951
NIAGARA M*	OSWEGO	1	OSWEGO	ST	S	W	4500BBLS	-	-	W	-	90	90	A	7,120	12,345
NIAGARA M*	OSWEGO	2	OSWEGO	ST	S	W		-	-	W	-	90	90	A	7,848	12,420
NIAGARA M*	OSWEGO	3	OSWEGO	ST	S	W		-	-	W	-	95	95	A	7,763	12,255
NIAGARA M*	OSWEGO	4	OSWEGO	ST	S	W		-	-	W	-	100	100	A	7,064	11,091
NIAGARA M*	OSWEGO	5	OSWEGO	ST	S	T,R,W		-	-	T,R,W	-	850	850	A	3,088	10,195
NIAGARA M*	ROSETON	#3	NEWBURGH	ST	S	W	#2	-	-	W	- #1	480	486	C		
NIAGARA M*	DIESEL			IC	K	T	-	-	-	-	-	9.0	9.0	-	-	-
NIAGARA M*	COLTON			HY	Q	-	-	-	-	-	-	28.5	28.5	-	-	-
NIAGARA M*	LEASED		MISC.	HY	Q	-	-	-	-	-	-	26.3	26.6	-	-	-
NIAGARA M*	OWNED		STATIONS	HY	Q	-	-	-	-	-	-	430.4	419.7	-	-	-
NIAGARA M*	SCHOOL ST			HY	Q	-	-	-	-	-	-	35.5	35.5	-	-	-
NIAGARA M*	SHERMAN I*			HY	Q	-	-	-	-	-	-	29.6	29.0	-	-	-
NIAGARA M*	SPIER FAL*			HY	Q	-	-	-	-	-	-	47.8	47.8	-	-	-
NIAGARA M*	STEWARTS *			HY	Q	-	-	-	-	-	-	36.0	36.0	-	-	-
NIAGARA M*	TRENTON			HY	Q	-	-	-	-	-	-	27.7	27.7	-	-	-
NIAGARA M*	ALBANY	11	BETHLEHEM	CT	K	F	55 BBLS	-	-	T		35.25	44.5	C	8,478	15,056
NIAGARA M*	ALBANY	12	BETHLEHEM	CT	K	F		-	-	T		35.25	44.5	C	8,699	15,056
NIAGARA M*	ALBANY	13	BETHLEHEM	CT	K	F		-	-	T	35.25		44.5	C	8,738	15,056
NIAGARA M*	ALBANY	14	BETHLEHEM	CT	K	F		-	-	T		35.25	44.5	C	8,478	15,056
NIAGARA M*	ROTTERDAM	11	ROTTERDAM	CT	K	F		-	-	T	-	15	21	C	8,729	16,050
NIAGARA M*	ROTTERDAM	12	ROTTERDAM	CT	K	F		-	-	T	-	15	21	C	8,783	16,050
NIAGARA M*	ROTTERDAM	13	ROTTERDAM	CT	K	F		-	-	T	-	15	15	C	8,780	16,050
NIAGARA M*	ROTTERDAM	14	ROTTERDAM	CT	K	F		-	-	T	-	15	21	C	8,779	16,050
NIAGARA M*	ROTTERDAM	15	ROTTERDAM	CT	K	F		-	-	T	-	15	21	C	8,758	
NIAGARA M*	ROTTERDAM	16	ROTTERDAM	CT	K	F		-	-	T	-	15	21	C	8,689	
NIAGARA M*	ROTTERDAM	17	ROTTERDAM	CT	K	F		-	-	T	-	15	21	C	8,658	
NIAGARA M*	ROTTERDAM	18	ROTTERDAM	CT	K	F		-	-	T	-	15	21	C	8,779	
NIAGARA M*																

TOTAL NIAGARA MOHAWK

CT	- COMBUSTION TURBINE	261	346
HY	- CONVENTIONAL HYDRO	661	651

IC - INTERNAL COMBUSTION		9	9
SB - STEAM (BWR NUCLEAR)		610	610
ST - STEAM TURBINE (COAL)		1471	1471
ST - STEAM TURBINE (OIL)		2105	2105
		5117	5192

NOTE #1 - ROSETON ACTUAL CAPACITY IS 1200 MW, NIAGARA MOHAWK'S SHARE IS 480 MW.
NOTE #2 - ROSETON RESIDUAL STORAGE - 1079 MBBLS; #2 OIL- 33.4 MBBLS
NIAGARA MOHAWK'S SHARE OF EACH IS 40 PER CENT
NOTE #3 - UNITS 1 AND 2

*NYPP(NYSE+G)%

FUEL - 1976

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM+	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
NYSE+G	GOUDEY	7	UNION TOWN	ST	C	R,T	125 TONS	-	-	R,T	-	44	44	A	7,751	12,704
NYSE+G	GOUDEY	8	UNION TOWN	ST	C	R,T		-	-	R,T	-	82	82	A	8,090	10,128
NYSE+G	GREENIDGE	1	TORREY	ST	C	R,T	300 TONS	-	-	R,T	-	24	24	A	7,797	14,543
NYSE+G	GREENIDGE	2	TOWNSHIP	ST	C	R,T		-	-	R,T	-	23	23	A	6,454	15,274
NYSE+G	GREENIDGE	3		ST	C	R,T		-	-	R,T	-	55	55	A	8,054	12,633
NYSE+G	GREENIDGE	4		ST	C	R,T		-	-	R,T	-	103	103	A	5,108	10,771
NYSE+G	HICKLING	1	CORNING	ST	C	T	70 TONS	-	-	T	-	33	33	A	8,713	15,657
NYSE+G	HICKLING	2	TOWNSHIP	ST	C	T		-	-	T	-	50	50	A	8,780	14,860
NYSE+G	HOMER CITY	1	CENTER	ST	C	B,T	1250 TO*	-	-	B,T	-	300	300#1	B	4,364	9,516
NYSE+G	HOMER CITY	2	TOWNSHIP *	ST	C	B,T		-	-	B,T	-	300	300#1	B	6,651	10,351
NYSE+G	JENNISON	1	BRAINBRID*	ST	C	R,T	100 TONS	-	-	R,T	-	35	35	A	7,938	16,262
NYSE+G	JENNISON	2	TOWNSHIP	ST	C	R,T		-	-	R,T	-	38	38	A	8,769	15,817
NYSE+G	MILLIKEN	1	LANSING	ST	C	R,T	250 TONS	-	-	R,T	-	143	143	A	8,217	9,516
NYSE+G	MILLIKEN	2	TOWNSHIP	ST	C	R,T		-	-	R,T	-	147	147	A	7,586	9,499
NYSE+G	MISC. OIL*			IC		-	-		=	-	-	40	40	-		
NYSE+G	MISC. HYD*			HY	-	-	-	-	-	-	-	40	40	.		
NYSE+G																

TOTAL NYSE+G

IC - INTERNAL COMBUSTION	13	13
ST - STEAM TURBINE (COAL)	1377	1377
	1390	1390

NOTE #1 - NYSE+G SHARE (50 PERCENT OF JOINTLY OWNED UNIT)
NOTE #2 - UNIT AVAILABLE HOURS MAY NOT BE INDICATIVEOF LONG TERM OPERATING PERFORMANCE.

*NYPP(ORANGE+ROCKLAND)%

FUEL - 1976

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM+	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
ORANGE+RO*	BOWLINE	1	NEW YORK	ST	S	W #7	870 BBLS	-	-	W #7	-	201	201#1	A	4,952	9,731
ORANGE+RO*	BOWLINE	2	NEW YORK	ST	S	W	#7	-	-	W	-	200	200#1	A	6,473	9,654
ORANGE+RO*	LOVETT	1	NEW YORK	ST	S	#4	21[illegible] BBLS	G,C	NONE	#2 W	75 TONS	19	19	A	8,751	21,318#5
ORANGE+RO*	LOVETT	2	NEW YORK	ST	S	#4		G,C	NONE	W		20	20	A	8,727	19,917#5
ORANGE+RO*	LOVETT	3	NEW YORK	ST	S	#4		G,C	NONE	W		63	63	A	7,158	13,817
ORANGE+RO*	LOVETT	4	NEW YORK	ST	S	#4		G,C	NONE	W		197	197	A	7,598	10,472
ORANGE+RO*	LOVETT	5	NEWYORK	ST	S	#4		G,C	NONE	W		202	202	A	8,595	10,720
ORANGE+RO*	HYDRO	1	NEW YORK#3	HY	Q	-		-	-	-	-	44	44	-	-	-
ORANGE+RO*	HILLBURN	1	NEW YORK	CT	K	F	5.1 BBLS	G	NONE	T #6	-	37	43	C	8,784	26,258#5
ORANGE+RO*	SHOEMAKER	1	NEW YORK	CT	K	F	5.1 BBLS	G	NONE	T #6	-	37	43	C	7,615	46,379#5
ORANGE+RO*																

TOTAL ORANGE+ROCKLAND

	SUMMER	WINTER
CT - CONVENTIOAL TURBINE	74	86
HY - CONVENTIONAL HYDRO	44	44
ST - STEAM TURBINE (OIL)	902	902
	1020	1032

NOTE #1 - BOWLINE ACTUAL CAPACITY IS 1202 MW,O+RU'S SHARE IS 401 MW.
NOTE #1 - BOWLINE ACTUAL CAPACITY IS 1202 ME, O+RU'S SHARE IS-401 MW
NOTE #2 - ALL FOSSIL PLANTS ARE EQUIPPED TO BURN GAS BUT SUPPLY IS LIMITED BY SUPPLYING SYSTEMS
NOTE #3 - 9 UNITS AT 4 PLANTS.
NOTE #4 PIPELINE FOR GAS, UNIT TRAIN FOR COAL, PERMISSION REQUIRED FROM D.E.C. TO BURN COAL.
NOTE #5 - UNITS OPERATED ON A CYCLE BASIS APPROXIMATELY 1.2 PERCENT OF UNIT AVAILABLE HOURS - 1976.
NOTE #6 - ADDITIONAL 11,500 BBLS OF FUEL STORAGE CAPACITY AT GENUNG ST. IN MIDDLETOWN.
NOTE #7 - BOWLINE RESIDUAL STORAGE CAPACITY IS 870 MBBLS, O+RU SHARE OF THIS IS 1/3.

*NYPP(PASNY)%

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	FUEL - 1976 ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM+	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
PASNY	INDIAN PO*	3	BUCHANAN	SP	N	-	-	-	-	T	-	873	873	A	2,280	10,708#1
PASNY	FITZPATRI*		SCRIBA	SB	N	-	-	-	-	-	-	770	770	A	6,290	10,384
PASNY	AUX. PUMP*		N.Y.	PS	-					-	-			-	8,784	-
PASNY	BLENHIEM *	#A	GILBOA	PS	-	-	-	-	-	-	-	1000	1000	-	8,784	-
PASNY	MOSES NIA*		NIAG FALLS	HY	Q	-	-	-	-	-	-	2400	2400	-	8,784	-
PASNY	MOSES POW*		MESSENA	HY	Q	-	-	-	-	-	-	800	800	-	8,784	-

TOTAL PASNY

	SUMMER	WINTER
HY - CONVENTIONAL HYDRO	3200	3200
PS - PUMPED STORAGE HYDRO	1000	1000
SB - STEAM (BWR NUCLEAR)	770	770
SP - STEAM (PWR NUCLEAR)	873	873
	5843	5843

NOTE #A - UNITS 1-4.
NOTE #1 FROM START OF COMMERCIAL OPERATION 8/30/76.

*NYPP(RG+E)%

FUEL - 1976

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM+	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
RG+E	BEEBEE	12	ROCHESTER	ST	C	R	60 TONS	NONE	-	-	-	80	80	A	8,190	9,980
RG+E	BEEBEE	#1	ROCHESTER	ST	S	T	31 BBLS	#4	-	-	-	112	93	A	#3 -	-
RG+E	RUSSELL	1	GREECE	ST	C	R	200 TONS	NONE	-	-	-	50	50	A	7,146	11,500
RG+E	RUSSELL	2	GREECE	ST	C	R	-	NONE	-	-	-	65	65	A	7,317	10,240
RG+E	RUSSELL	3	GREECE	ST	C	R	-	NONE	-	-	-	65	65	A	7,354	10,235
RG+E	RUSSELL	4	GREECE	ST	C	R	-	NONE	-	-	-	80	80	A	8,002	10,090
RG+E	STA. 8	1	ROCHESTER	ST	C	F	-	NONE	-	-	-	0	3	A	#3 -	-
RG+E	STA. 9	1	ROCHESTER	ST	S	T	19 BBLS	#4	-	-	-	0	3	A	#3 -	-
RG+E	GINNA	1	ONTARIO	SP	N	-	-	-	-	-	-	470	470	A	5,115	11,570
RG+E	MISC. #2		ROCHESTER	HY	Q	-	-	-	-	-	-	0	1	-	-	-
RG+E	STA. 2	1	ROCHESTER	HY	Q	-	-	-	-	-	-	6	6	-	-	-
RG+E	STA. 26	1	ROCHESTER	HY	Q	-	-	-	-	-	-	2	2	-	-	-
RG+E	STA. 5	1	ROCHESTER	HY	Q	-	-	-	-	-	-	17	17	-	-	-
RG+E	STA. 5	2	ROCHESTER	HY	Q	-	-	-	-	-	-	11	12	-	-	-
RG+E	STA. 5	3	ROCHESTER	HY	Q	-	-	-	-	-	-	11	11	-	-	-
RG+E	BEEBEE	13	ROCHESTER	CT	S	T	4.8 BBLS	NONE	-	-	-	14	18	C	117	18,010
RG+E	STA. 9	2	ROCHESTER	CT	S	F	-	NONE	-	-	-	15	18	C	124	16,430
RG+E																

TOTAL RG+E

CT - COMBUSTION TURBINE	29	36
HY - CONVENTIONAL HYDRO	47	50
SP - STEAM (PWR NUCLEAR)	470	470
ST - STEAM TURBINE (COAL)	340	340
ST - STEAM TURBINE (OIL)	112	99
	998	995

NOTE #1 COMMON HEADER T-G'S NO'S. 1,2,3,6,8,9,10,11.
NOTE #2 - FOUR SMALL HYDRO UNITS LOCATED IN LIVINGSTON AND WYOMING COUNTIES, N.Y.
NOTE #3 - TOPPING TURBINE EXHAUST STEAM IS USED AS DISTRICT HEATING STEAM SENDOUT
NOTE #4 - APPROXIMATELY 95,000 BARRELS OF #2 FUEL OIL IS STORED OFFSITE TO PROVIDE AN ALTERNATE TO THE #6 FUEL OIL NO.

*NYPP(CITY OF JAMESTOWN)%

COMPANY	STATION	UNIT	LOCATION	TYPE	FUEL - 1976 PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM*	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
CITY OF J*	S.A. CARL*	2	JAMESTOWN	ST	C	-	-	-	-	-	-	5	5	-	-	-
CITY OF J*	S.A. CARL*	3	-	ST	C	-	-	-	-	-	-	15	15	-	-	-
CITY OF J*	S.A. CARL*	4	-	ST	C	-	-	-	-	-	-	13	13	-	-	-
CITY OF J*	S.A. CARL*	5	-	ST	C	-	-	-	-	-	-	20	20	-	-	-
CITY OF J*	S.A. CARL*	6	-	ST	C	-	-	-	-	-	-	25	25	-	-	-
							TOTAL		CITY OF JAMESTOWN							
							ST - STEAM TURBINE (COAL)					78	78			
												78	78			

*NYPP(VILLAGE OF FREEPORT)%

COMPANY	STATION	UNIT	LOCATION	TYPE	FUEL - 1976 PRI	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM*	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
VILLAGE O*	BUFFALO A*	1	FREEPORT	IC		T	38 BBLS	-	-	-	-	20	20	-	-	-
VILLAGE O*	BUFFALO A*	2	FREEPORT	IC		-	-	-	-	-	-			-	-	-
VILLAGE O*	SUNRISE H*	10	FREEPORT	IC		-	-	-	-	-	-			-	-	-
VILLAGE O*	SUNRISE H*	11	FREEPORT	IC		-	-	-	-	-	-			-	-	-
VILLAGE O*	SUNRISE H*	12	FREEPORT	IC		-	-	-	-	-	-			-	-	-
VILLAGE O*	SUNRISE H*	9	FREEPORT	IC		T	4.8 BBLS	-	-	-	-	12	12	-	-	-
VILLAGE O*	BUFFALO A*	3	FREEPORT	CT		-	-	-	-	-	-	18	21	-	-	-
							TOTAL		VILLAGE OF FREEPORT							
							IC - INTERNAL COMBUSTION					32	32			
												32	32			

*NYPP(CITY OF PLATTSBURGH)%

COMPANY	STATION	UNIT	LOCATION	TYPE	PRI	FUEL - 1976: METHOD OF HANDLING	MAX STOR CAPACITY (X 000)	ALT	TIME LIMIT ON USE	METHOD OF HANDLING	MAX STOR CAPACITY (X1000)	CAPABILITY-MW SUMMER	CAPABILITY-MW WINTER	TYPE OF COOLING SYSTEM+	UNIT AVAILABLE HOURS FOR 1976	AVERAGE HEAT RATE FOR 1976 (BTU/KWH)
CITY OF P*	DIESEL	1	PLATTSBUR-	IC	[illegible]	W	-	-	-	-	-	3	3	-	-	-
											TOTAL CITY OF PLATTSBURGH					
											IC - INTERNAL COMBUSTION	3	3			
												3	3			

*ALLPIPELINES(GAS)%

GAS SUPPLY FROM ALL PIPELINES TO THE STATE 1976

PIPELINE	QUANTITY MCF	COST $/MCF
ALGONQUIN NAT	1,917,132	$1.87
ALGONQUIN SYN	463,557	$5.25
ASHLAND SYN	11,600,000	$3.26
BORDERLINE	10,878	$1.44
COLUMBIA NAT	32,249,650	$1.20
COLUMBIA SYN	687,088	$4.33
CONSOLIDATED	181,715,198	$1.17
DISTRI GAS	4,183,211	$2.17
NATIONAL	142,639,003	$1.20
TENNESSEE	44,211,109	$1.08
TEXAS-EASTERN	39,832,153	$1.33
TRANS CANADA	5,536,703	$1.77
TRANSCONTINENTAL	166,621,882	$1.09
TOTALS	631,657,564	$1.221

OILALLCOUNTIES%

OIL DEMAND FOR NEW YORK STATE BY COUNTY FOR THE YEAR 1976

COUNTY	RESIDENTIAL BTUS(X1E09)	COMMERCIAL BTUS(X1E09)	AUTOS BTUS(X1E09)*	AIRCRAFT BTUS(X1E09)**	TOTALS BTUS(X1E09)
ALBANY	8,052	6,721	12,711	4,287	31,770
ALLEGANY	460	228	2,479	0	3,167
BRONX	40,056	28,003	16,710	0	84,769
BROOME	3,950	4,187	11,587	583	20,307
CATTARAUGUS	1,206	1,312	4,222	0	6,740
CAYUGA	1,685	1,601	4,084	0	7,371
CHAUTAUQUA	1,059	468	7,892	0	9,419
CHEMUNG	844	391	4,810	601	6,646
CHENANGO	2,395	1,392	2,690	0	6,477
CLINTON	4,484	2,740	3,785	0	11,009
COLUMBIA	2,647	1,421	3,348	0	7,416
CORTLAND	1,020	1,033	2,454	0	4,507
DELAWARE	2,439	1,371	2,721	0	6,531
DUTCHESS	10,841	6,205	3,415	0	20,460
ERIE	5,947	2,907	35,031	13,876	57,761
ESSEX	2,641	1,282	2,039	0	5,962
FRANKLIN	3,112	1,532	2,164	0	6,809
GENESEE	1,257	1,211	3,415	0	5,883
GREENE	2,174	1,005	1,323	0	4,502
HAMILTON	393	169	353	0	914
HERKIMER	2,678	1,947	2,996	0	7,621
JEFFERSON	3,214	2,315	3,835	0	9,364
KINGS	64,804	48,746	41,839	0	155,388
LEWIS	1,594	825	1,323	0	3,742
LIVINGSTON	1,434	1,284	2,698	0	5,416
MADISON	2,160	1,732	3,246	0	7,138
MONROE	12,812	13,596	31,121	7,094	64,623
MONTGOMERY	1,537	1,172	2,760	0	5,470
NASSAU	59,946	31,798	73,463	0	165,208
NEW YORK	48,313	44,005	13,827	100	106,246
NIAGARA	7,277	5,511	8,433	0	21,221
ONEIDA	8,063	7,289	11,652	264	27,268
ONONDAGA	4,559	2,311	23,885	6,153	36,908
ONTARIO	1,833	1,776	4,189	0	7,798
ORANGE	8,090	5,826	12,554	0	26,470
ORLEANS	1,379	947	1,941	0	4,268
OSWEGO	2,676	2,379	5,460	0	10,515
OTSEGO	2,984	1,743	3,081	0	7,809
PUTNAM	3,919	1,817	3,248	0	8,984
QUEENS	60,733	39,907	44,238	166,095	310,973
RENSSELAER	5,153	3,643	6,909	0	15,705
RICHMOND	7,743	5,933	9,654	0	23,329
ROCKLAND	1,208	630	10,203	0	12,041
SARATOGA	4,622	3,326	7,587	0	15,535
SCHENECTADY	4,525	3,553	8,197	0	16,275
SCHOHARIE	1,667	854	1,611	0	4,132
SCHUYLER	579	422	1,050	0	2,051

SENECA	770	719	1,947	0	3,436
STEUBEN	1,842	1.793	5,441	0	9,076
ST. LAWRENCE	5,499	3.765	5,578	0	14,841
SUFFOLK	46,744	26.580	53,793	820	127,937
SULLIVAN	4,078	1.969	3,970	0	10,017
TIOGA	2,127	1,345	2,782	0	6,253
TOMPKINS	1,405	1,655	3,963	483	7,507
ULSTER	7,897	4,038	8,522	0	20,457
WARREN	2,434	1,713	2,980	0	7,127
WASHINGTON	2,213	1,358	2,796	0	6,367
WAYNE	2,449	1,911	4,318	0	8,679
WESTCHESTER	29,141	19,011	34,517	260	82,929
WYOMING	678	716	2,212	0	3,606
YATES	665	504	1,346	0	2,515
TOTALS	530,104	367,546	602,400	200,616	1,700,665

* MOTOR GASOLINE DEMAND FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

B-46

OILALLUTILITIES%

OIL DEMAND FOR NEW YORK STATE BY UTILITY FOR THE YEAR 1976

UTILITY	RESIDENTIAL BTUS(X1E09)	COMMERCIAL BTUS(X1E09)	AUTOS BTUS(X1E09)*	AIRCRAFT BTUS(X1E09)**	TOTALS BTUS(X1E09)
CENTRAL HUDSON	24,830	13,066	16,508	0	54,404
CON ED	250,790	185,606	160,784	166,455	763,635
LILCO	106,691	58,379	127,255	820	293,145
NIAGARA MOHAWK	90,908	63,703	175,358	24,580	354,549
NYSE+G	30,494	23,053	60,108	1,667	115,321
ORANGE+ROCKLAND	9,297	6,456	22,758	0	38,511
RG+E	17,094	17,283	39,629	7,094	81,100
TOTALS	530,104	367,546	602,400	200,616	1,700,665

* MOTOR GASOLINE DEMAND FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

*OILCOUNTY(SUFFOLK)%

OIL DEMAND FOR COUNTY SUFFOLK

UTILITY	RESIDENTIAL BTUS(XIE09)	COMMERCIAL BTUS(XIE09)	AUTOS BTUS(XIE09)*	AIRCRAFT BTUS(XIE09)**	TOTALS BTUS(XIE09)
LILCO	46,744	26,580	53,793	820	127,937

*OILUTILITY(CENTRAL HUDSON)%

OIL DEMAND FOR UTILITY CENTRAL HUDSON 1976

COUNTY	RESIDENTIAL BTUS(XIE09)	COMMERCIAL BTUS(XIE09)	AUTOS BTUS(XIE09)*	AIRCRAFT BTUS(XIE09)**	TOTALS BTUS(XIE09)
DUTCHESS	10,841	6,205	3,415	0	20,460
GREENE	2,174	1,005	1,323	0	4,502
PUTNAM	3,919	1,817	3,248	0	8,984
ULSTER	7,897	4,038	8,522	0	20,457
TOTALS	24,830	13,066	16,508	0	54,404

* MOTOR GASOLINE FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

*OILUTILITY(CON ED)%

OIL DEMAND FOR UTILITY CON ED 1976

COUNTY	RESIDENTIAL BTUS(XIE09)	COMMERCIAL BTUS(XIE09)	AUTOS BTUS(XIE09)*	AIRCRAFT BTUS(XIE09)**	TOTALS BTUS(XIE09)
BRONX	40,056	28,003	16,710	0	84,769
KINGS	64,804	48,746	41,839	0	155,388
NEW YORK	48,313	44,005	13,827	100	106,246
QUEENS	60,733	39,907	44,238	166,095	310,973
RICHMOND	7,743	5,933	9,654	0	23,329
WESTCHESTER	29,141	19,011	34,517	260	82,929
TOTALS	250,790	185,606	160,784	166,455	763,635

* MOTOR GASOLINE FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

*OILUTILITY(LILCO)%

OIL DEMAND FOR UTILITY LILCO 1976

COUNTY	RESIDENTIAL BTUS(X1E09)	COMMERCIAL BTUS(X1E09)	AUTOS BTUS(X1E09)*	AIRCRAFT BTUS(X1E09)**	TOTALS BTUS(X1E09)
NASSAU	59,946	31,798	73,463	0	165,208
SUFFOLK	46,744	26,580	53,793	820	127,937
TOTALS	106,691	58 379	127,255	820	293,145

* MOTOR GASOLINE FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

*OILUTILITY(NIAGARA MOHAWK)%

CIL DEMAND FOR UTILITY NIAGARA MOHAWK 1976

COUNTY	RESIDENTIAL BTUS(X1E09)	COMMERCIAL BTUS(X1E09)	AUTOS BTUS(X1E09)*	AIRCRAFT BTUS(X1E09)**	TOTALS BTUS(X1E09)
ALBANY	8,052	6,721	12,711	4,287	31,770
CATTARAUGUS	1,206	1,312	4,222	0	6,740
CHAUTAUQUA	1,059	468	7,892	0	9,419
CLINTON	4,484	2,740	3,785	0	11,009
COLUMBIA	2,647	1,421	3,348	0	7,416
CORTLAND	1,020	1,033	2,454	0	4,507
ERIE	5,947	2,907	35,031	13,876	57,761
ESSEX	2,641	1,282	2,039	0	5,962
FRANKLIN	3,112	1,532	2,164	0	6,809
GENESEE	1,257	1,211	3,415	0	5,883
HAMILTON	393	169	353	0	914
HERKIMER	2,678	1,947	2,996	0	7,621
JEFFERSON	3,214	2,315	3,835	0	9,364
LEWIS	1,594	825	1,323	0	3,742
MONTGOMERY	1,537	1,172	2,760	0	5,470
NIAGARA	7,277	5,511	8,433	0	21,221
ONEIDA	8,063	7,289	11,652	264	27,268
ONONDAGA	4,559	2,311	23,885	6,153	36,908
ORLEANS	1,379	947	1,941	0	4,268
OSWEGO	2,676	2,379	5,460	0	10,515
RENSSELAER	5,153	3,643	6,909	0	15,705
SARATOGA	4,622	3,326	7,587	0	15,535
SCHENECTADY	4,525	3,553	8,197	0	16,275
SCHOHARIE	1,667	854	1,611	0	4,132
ST. LAWRENCE	5,439	3,765	5,578	0	14,841
WARREN	2,434	1,713	2,980	0	7,127
WASHINGTON	2,213	1,358	2,796	0	6,367
TOTALS	90,908	63,703	175,358	24,580	354,549

* MOTOR GASOLINE FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

*OILUTILITY(NYSE+G)%

OIL DEMAND FOR UTILITY NYSE+G 1976

COUNTY	RESIDENTIAL BTUS(XIE09)	COMMERCIAL BTUS(XIE09)	AUTOS BTUS(XIE09)*	AIRCRAFT BTUS(XIE09)**	TOTALS BTUS(XIE09)
ALLEGANY	460	228	2,479	0	3,167
BROOME	3,950	4,187	11,587	583	20,307
CAYUGA	1,685	1,601	4,084	0	7,371
CHEMUNG	844	391	4,810	601	6,646
CHENANGO	2,395	1,392	2,690	0	6,477
DELAWARE	2,439	1,371	2,721	0	6,531
LIVINGSTON	1,434	1,284	2,698	0	5,416
MADISON	2,160	1,732	3,246	0	7,138
OTSEGO	2,984	1,743	3,081	0	7,809
SCHUYLER	579	422	1,050	0	2,051
SENECA	770	719	1,947	0	3,436
STEUBEN	1,842	1,793	5,441	0	9,076
SULLIVAN	4,078	1,969	3,970	0	10,017
TIOGA	2,127	1,345	2,782	0	6,253
TOMPKINS	1,405	1,655	3,963	483	7,507
WYOMING	678	716	2,212	0	3,606
YATES	665	504	1,346	0	2,515
TOTALS	30,494	23,053	60,108	1,667	115,321

* MOTOR GASOLINE FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

*OILUTILITY(ORANGE+ROCKLAND)%

OIL DEMAND FOR UTILITY ORANGE+ROCKLAND 1976

COUNTY	RESIDENTIAL BTUS(XIE09)	COMMERCIAL BTUS(XIE09)	AUTOS BTUS(XIE09)*	AIRCRAFT BTUS(XIE09)**	TOTALS BTUS(XIE09)
ORANGE	8,090	5,826	12,554	0	26,470
ROCKLAND	1,208	630	10,203	0	12,041
TOTALS	9,297	6,456	22,758	0	38,511

* MOTOR GASOLINE FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

*OILUTILITY(RG+E)%

OIL DEMAND FOR UTILITY RG+E 1976

COUNTY	RESIDENTIAL BTUS(X1E09)	COMMERCIAL BTUS(X1E09)	AUTOS BTUS(X1E09)*	AIRCRAFT BTUS(X1E09)**	TOTALS BTUS(X1E09)
MONROE	12,812	13,596	31,121	7,094	64,623
ONTARIO	1,833	1,776	4,189	0	7,798
WAYNE	2,449	1,911	4,318	0	8,679
TOTALS	17,094	17,283	39,629	7,094	81,100

* MOTOR GASOLINE FOR AUTOS
** JET FUEL DEMAND FOR PASSENGER AND FREIGHT AIRCRAFT

NO GAS%

COUNTIES WITHOUT GAS

CLINTON
ESSEX
FRANKLIN
HAMILTON
LEWIS
PUTNAM
SCHOHARIE

*PIPELINE(GAS,DISTRI GAS)%

GAS SUPPLY FROM PIPELINE DISTRI GAS 1976

UTILITY	QUANTITY MCF	COST $/MCF
BROOKLYN UNION	4,183,211	$2.167
TOTALS	4,183,211	$2.167

*PIPELINE(GAS,TENNESSEE)%

GAS SUPPLY FROM PIPELINE TENNESSEE 1976

UTILITY	QUANTITY MCF	COST $/MCF
BROOKLYN UNION	7,397,173	$1.089
CENTRAL HUDSON	4,069,697	$1.130
CON ED	11,028,479	$1.095
LILCO	1,403,781	$1.210
NYSE+G	5,598,660	$1.020
ORANGE+ROCKLAND	14,499,766	$1.060
PENN+SOUTH	213,553	$0.936
TOTALS	44,211,109	$1.079

*PIPELINE(GAS,TEXAS-EASTERN)%

GAS SUPPLY FROM PIPELINE TEXAS-EASTERN 1976

UTILITY	QUANTITY MCF	COST $/MCF
BROOKLYN UNION	15,049,810	$1.432
CENTRAL HUDSON	1,160,995	$1.170
CON ED	17,492,004	$1.263
LILCO	5,096,428	$1.360
ORANGE+ROCKLAND	1,032,913	$1.170
TOTALS	39,832,150	$1.334

*PIPELINE(GAS,TRANSCONTINENTAL)%

GAS SUPPLY FROM PIPELINE TRANSCONTINENTAL 1976

UTILITY	QUANTITY MCF	COST $/MCF
BROOKLYN UNION	67,665,547	$1.123
CON ED	60,998,698	$1.024
LILCO	37,957,637	$1.120
TOTALS	166,621,882	$1.086

*PIPELINE(GAS,COLUMBIA NAT)%

UTI_ITY	QUANTITY MCF	COST $/MCF

GAS SUPPLY FROM PIPELINE COLUMBIA NAT 1976

UTILITY	QUANTITY MCF	COST $/MCF
CENTRAL HUDSON	3,189,248	$1.200
COLUMBIA	19,491,415	$1.198
CORNING	431,375	$1.270
NYSE+G	644,053	$1.290
ORANGE+ROCKLAND	8,493,559	$1.210
TOTALS	32,249,650	$1.204

*PIPELINE(GAS,ALGONQUIN NAT)%
GAS SUPPLY FROM PIPELINE ALGONQUIN NAT 1976

UTILITY	QUANTITY MCF	COST $/MCF
CON ED	701,371	$2.165
ORANGE+ROCKLAND	1,215,761	$1.700
TOTALS	1,917,132	$1.870

*PIPELINE(GAS,NORTH PENN)%
GAS SUPPLY FROM PIPELINE NORTH PENN 1976

UTILITY	QUANTITY MCF	COST $/MCF
CORNING	14,136,661	$1.110
TOTALS	14,136,661	$1.110

*PIPELINE(GAS,ASHLAND SYN)%

GAS SUPPLY FROM PIPELINE	ASHLAND SYN	1976
UTILITY	QUANTITY MCF	COST $/MCF
NATIONAL FUEL	11,600,000	$3.261
TOTALS	11,600,000	$3.261

*PIPELINE(GAS,COLUMBIA SYN)%

GAS SUPPLY FROM PIPELINE	COLUMBIA SYN	1976
UTILITY	QUANTITY MCF	COST $/MCF
NATIONAL FUEL	180,000	$4.406
NYSE+G	39,212	$4.350
ORANGE+ROCKLAND	467,876	$4.300
TOTALS	687,088	$4.331

*PIPELINE(GAS,BORDERLINE)%

GAS SUPPLY FROM PIPELINE	BORDERLINE	1976
UTILITY	QUANTITY MCF	COST $/MCF
NIAGARA MOHAWK	10,878	$1.440
TOTALS	10,878	$1.440

*PIPELINE(GAS,CONSOLIDATED)%

GAS SUPPLY FROM PIPELINE CONSOLIDATED 1976

UTILITY	QUANTITY MCF	COST $/MCF
CORNING	1,174,553	$1.140
NIAGARA MOHAWK	103,612,276	$1.200
NYSE+G	25,365,919	$1.140
PAVILLION	3,120,706	$1.137
RG+E	48,441,744	$1.130
TOTALS	181,715,198	$1.171

*PIPELINE(GAS,CORNING)%

GAS SUPPLY FROM PIPELINE CORNING 1976

UTILITY	QUANTITY MCF	COST $/MCF
NYSE+G	9,976,675	$1.190
TOTALS	9,976,675	$1.190

*PIPELINE(GAS,NIAGARA MOHAWK)%

GAS SUPPLY FROM PIPELINE NIAGARA MOHAWK 1976

UTILITY	QUANTITY MCF	COST $/MCF
NYSE+G	214,614	$1.730
SYRACUSE SUBURBAN	3,496,920	$1.369
TOTALS	3,711,534	$1.390

*PIPELINE(GAS,ORANGE+ROCKLAND)%

GAS SUPPLY FROM PIPELINE ORANGE+ROCKLAND 1976

UTILITY	QUANTITY MCF	COST $/MCF
NYSE+G	368,124	$1.440
TOTALS	368,124	$1.440

*RESCOM POLL COUNTY(SUFFOLK)%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

COUNTY		ALDEHYDES	CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
SUFFOLK	RES	46.7	3,973,257.0	93.5	46.7	187.0	187.0	514.2
	COM	186.1	2,259,317.8	1,913.8	292.4	5,767.9	1,435.3	3,030.1
	TOT	232.8	6,232,574.9	2,007.3	339.1	5,954.9	1,622.3	3,544.3

RESCOM POLL PER CTY%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

COUNTY		ALDEHYDES	CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ALBANY	RES	8.1	684,428.5	16.1	8.1	32.2	32.2	88.6
	COM	47.0	571,252.7	483.9	73.9	1,458.4	362.9	766.2
	TOT	55.1	1,255,681.2	500.0	82.0	1,490.6	395.1	854.7
ALLEGANY	RES	0.5	39,074.5	0.9	0.5	1.8	1.8	5.1
	COM	1.6	19,397.0	16.4	2.5	49.5	12.3	26.0
	TOT	2.1	58,471.5	17.3	3.0	51.4	14.2	31.1
BRONX	RES	40.1	3,404,777.0	80.1	40.1	160.2	160.2	440.6
	COM	196.0	2,380,281.3	2,016.2	308.0	6,076.7	1,512.2	3,192.4
	TOT	236.1	5,785,058.4	2,096.4	348.1	6,236.9	1,672.4	3,633.0
BROOME	RES	3.9	335,716.0	7.9	3.9	15.8	15.8	43.4
	COM	29.3	355,895.8	301.5	46.1	908.6	226.1	477.3
	TOT	33.3	691,611.9	309.4	50.0	924.4	241.9	520.8
CATTARAUGUS	RES	1.2	102,476.0	2.4	1.2	4.8	4.8	13.3
	COM	9.2	111,491.1	94.4	14.4	284.6	70.8	149.5
	TOT	10.4	213,967.1	96.9	15.6	289.5	75.7	162.8
CAYUGA	RES	1.7	143,259.0	3.4	1.7	6.7	6.7	18.5
	COM	11.2	136,125.0	115.3	17.6	347.5	86.5	182.6
	TOT	12.9	279,384.0	118.7	19.3	354.3	93.2	201.1
CHAUTAUQUA	RES	1.1	89,998.0	2.1	1.1	4.2	4.2	11.6
	COM	3.3	39,786.0	33.7	5.1	101.6	25.3	53.4
	TOT	4.3	129,783.9	35.8	6.2	105.8	29.5	65.0
CHEMUNG	RES	0.8	71,731.5	1.7	0.8	3.4	3.4	9.3
	COM	2.7	33,269.9	28.2	4.3	84.9	21.1	44.6
	TOT	3.6	105,001.4	29.9	5.1	88.3	24.5	53.9
CHENANGO	RES	2.4	203,541.0	4.8	2.4	9.6	9.6	26.3
	COM	9.7	118,316.6	100.2	15.3	302.1	75.2	158.7
	TOT	12.1	321,857.6	105.0	17.7	311.6	84.7	185.0
CLINTON	RES	4.5	381,131.5	9.0	4.5	17.9	17.9	49.3
	COM	19.2	232,869.4	197.3	30.1	594.5	147.9	312.3
	TOT	23.7	614,000.9	206.2	34.6	612.4	165.9	361.6
COLUMBIA	RES	2.6	225,003.5	5.3	2.6	10.6	10.6	29.1
	COM	9.9	120,812.2	102.3	15.6	308.4	76.8	162.0
	TOT	12.6	345,815.7	107.6	18.3	319.0	87.3	191.1
CORTLAND	RES	1.0	86,700.0	2.0	1.0	4.1	4.1	11.2
	COM	7.2	87,838.1	74.4	11.4	224.2	55.8	117.8

	TOT	8.3	174,538.2	76.4	12.4	228.3	59.9	129.0
DELAWARE	RES	2.4	207,349.0	4.9	2.4	9.3	9.8	26.8
	COM	9.6	116,539.3	98.7	15.1	297.5	74.0	156.3
	TOT	12.0	323,888.3	103.6	17.5	307.3	83.8	183.1
DUTCHESS	RES	10.8	921,442.5	21.7	10.8	43.4	43.4	119.2
	COM	43.4	527,409.7	446.7	68.3	1,346.4	335.1	707.3
	TOT	54.3	1,448,852.2	468.4	79.1	1,389.8	378.4	826.6
ERIE	RES	5.9	505,478.0	11.9	5.9	23.8	23.8	65.4
	COM	20.3	247,087.3	209.3	32.0	630.8	157.0	331.4
	TOT	26.3	752,565.4	221.2	37.9	654.6	180.8	396.8
ESSEX	RES	2.6	224,476.5	5.3	2.6	10.6	10.6	29.0
	COM	9.0	108,929.2	92.3	14.1	278.1	69.2	146.1
	TOT	11.6	333,405.7	97.6	16.7	288.7	79.8	175.1
FRANKLIN	RES	3.1	264,528.5	6.2	3.1	12.4	12.4	34.2
	COM	10.7	130,255.7	110.3	16.9	332.5	82.8	174.7
	TOT	13.8	394,784.2	116.6	20.0	345.0	95.2	208.9
GENESEE	RES	1.3	106,836.5	2.5	1.3	5.0	5.0	13.8
	COM	8.5	102,936.7	87.2	13.3	262.8	65.4	138.1
	TOT	9.7	209,773.2	89.7	14.6	267.8	70.4	151.9
GREENE	RES	2.2	184,781.5	4.3	2.2	8.7	8.7	23.9
	COM	7.0	85,450.5	72.4	11.1	218.2	54.3	114.6
	TOT	9.2	270,232.0	76.7	13.2	226.8	63.0	138.5
HAMILTON	RES	0.4	33,362.5	0.8	0.4	1.6	1.6	4.3
	COM	1.2	14,344.6	12.2	1.9	36.6	9.1	19.2
	TOT	1.6	47,707.1	12.9	2.2	38.2	10.7	23.6
HERKIMER	RES	2.7	227,630.0	5.4	2.7	10.7	10.7	29.5
	COM	13.6	165,511.1	140.2	21.4	422.5	105.1	222.0
	TOT	16.3	393,141.2	145.6	24.1	433.3	115.9	251.4
JEFFERSON	RES	3.2	273,181.5	6.4	3.2	12.9	12.9	35.4
	COM	16.2	196,742.7	166.7	25.5	502.3	125.0	263.9
	TOT	19.4	469,924.2	173.1	28.7	515.1	137.8	299.2
KINGS	RES	64.8	5,508,357.0	129.6	64.8	259.2	259.2	712.8
	COM	341.2	4,143,378.5	3,509.7	536.2	16,577.8	2,632.3	5,557.0
	TOT	406.0	9,651,735.5	3,639.3	601.0	16,837.0	2,891.5	6,269.8
LEWIS	RES	.6	135,507.0	3.2	1.6	6.4	6.4	17.5
	COM	5.8	70,127.5	59.4	9.1	179.0	44.6	94.1
	TOT	7.4	205,634.5	62.6	10.7	185.4	50.9	111.6
LIVINGSTON	RES	1.4	121,898.5	2.9	1.4	5.7	5.7	15.8
	COM	9.0	109,100.9	92.4	14.1	278.5	69.3	146.3
	TOT	10.4	230,995.4	95.3	15.6	284.3	75.0	162.1

MADISON	RES	2.2	183,557.5	4.3	2.2	8.6	8.6	23.8
	COM	12.1	147,253.1	124.7	19.1	375.9	93.5	197.5
	TOT	14.3	330,810.7	129.1	21.2	384.6	102.2	221.2
MONROE	RES	12.8	1,089,011.5	25.6	12.8	51.2	51.2	140.9
	COM	95.2	1,155,694.0	978.9	149.6	2,950.4	734.2	1,550.0
	TOT	108.0	2,244,705.5	1,004.6	162.4	3,001.7	785.5	1,690.9
MONTGOMERY	RES	1.5	130,653.5	3.1	1.5	6.1	6.1	16.9
	COM	8.2	99,631.9	84.4	12.9	254.4	63.3	133.6
	TOT	9.7	230,285.4	87.5	14.4	260.5	69.4	150.5
NASSAU	RES	59.9	5,095,444.0	119.9	59.9	239.8	239.8	659.4
	COM	222.6	2,702,870.8	2,289.5	349.8	6,900.3	1,717.1	3,625.0
	TOT	282.5	7,798,314.8	2,409.4	409.7	7,140.1	1,956.9	4,284.4
NEW YORK	RES	48.3	4,106,605.0	96.6	48.3	193.3	193.3	531.4
	COM	308.0	3,740,465.8	3,168.4	484.1	9,549.2	2,376.3	5,016.6
	TOT	356.4	7,847,070.8	3,265.0	532.4	9,742.4	2,569.5	5,548.1
NIAGARA	RES	7.3	618,570.5	14.6	7.3	29.1	29.1	80.1
	COM	38.6	468,448.6	396.8	60.6	1,195.9	297.6	628.3
	TOT	45.9	1,087,019.1	411.4	67.9	1,225.0	326.7	708.3
ONEIDA	RES	8.1	685,389.0	16.1	8.1	32.3	32.3	88.7
	COM	51.0	619,596.5	524.8	80.2	1,581.8	393.6	831.0
	TOT	59.1	1,304,985.5	541.0	88.2	1,614.0	425.9	919.7
ONONDAGA	RES	4.6	387,515.0	9.1	4.6	18.2	18.2	50.1
	COM	16.2	196,407.8	166.4	25.4	501.4	124.8	263.4
	TOT	20.7	583,922.8	175.5	30.0	519.7	143.0	313.6
ONTARIO	RES	1.8	155,771.0	3.7	1.8	7.3	7.3	20.2
	COM	12.4	150,919.2	127.8	19.5	385.3	95.9	202.4
	TOT	14.3	306,690.2	131.5	21.4	392.6	103.2	222.6
ORANGE	RES	8.1	687,641.5	16.2	8.1	32.4	32.4	89.0
	COM	40.8	495,220.2	419.5	64.1	1,264.3	314.6	664.2
	TOT	48.9	1,182,861.7	435.7	72.2	1,296.6	347.0	753.2
ORLEANS	RES	1.4	117,223.5	2.8	1.4	5.5	5.5	15.2
	COM	6.6	80,532.4	68.2	10.4	205.6	51.2	108.0
	TOT	8.0	197,755.9	71.0	11.8	211.1	56.7	123.2
OSWEGO	RES	2.7	227,485.5	5.4	2.7	10.7	10.7	29.4
	COM	16.7	202,188.6	171.3	26.2	516.2	128.4	271.2
	TOT	19.3	429,674.2	176.6	28.8	526.9	139.2	300.6
OTSEGO	RES	3.0	253,614.5	6.0	3.0	11.9	11.9	32.8
	COM	12.2	148,194.1	125.5	19.2	378.3	94.1	198.8
	TOT	15.2	401,808.6	131.5	22.2	390.3	106.1	231.6
PUTNAM	RES	3.9	333,132.0	7.8	3.9	15.7	15.7	43.1
	COM	12.7	154,486.6	130.9	20.0	394.4	98.1	207.2

	TOT	16.6	487,618.7	138.7	23.9	410.1	113.8	250.3
QUEENS	RES	60.7	5,162,305.0	121.5	60.7	242.9	242.9	668.1
	COM	279.4	3,392,118.0	2,873.3	439.0	8,659.9	2,155.0	4,549.4
	TOT	340.1	8,554,423.0	2,994.8	499.7	8,902.8	2,397.9	5,217.5
RENSSELAER	RES	5.2	438,005.0	10.3	5.2	20.6	20.6	56.7
	COM	25.5	309,693.3	262.3	40.1	790.6	196.7	415.4
	TOT	30.7	747,698.3	272.6	45.2	811.2	217.4	472.0
RICHMOND	RES	7.7	658,112.5	15.5	7.7	31.0	31.0	85.2
	COM	41.5	504,306.7	427.2	65.3	1,287.5	320.4	676.4
	TOT	49.3	1,162,419.2	442.7	73.0	1,318.4	351.4	761.5
ROCKLAND	RES	1.2	102,637.5	2.4	1.2	4.8	4.8	13.3
	COM	4.4	53,571.3	45.4	6.9	136.8	34.0	71.8
	TOT	5.6	156,208.8	47.8	8.1	141.6	38.9	85.1
SARATOGA	RES	4.6	392,904.0	9.2	4.6	18.5	18.5	50.8
	COM	23.3	282,704.9	239.5	36.6	721.7	179.6	379.2
	TOT	27.9	675,608.9	248.7	41.2	740.2	198.1	430.0
SCHENECTADY	RES	4.5	384,650.5	9.1	4.5	18.1	18.1	49.8
	COM	24.9	301,971.9	255.8	39.1	770.9	191.8	405.0
	TOT	29.4	686,622.4	264.8	43.6	789.0	209.9	454.8
SCHOHARIE	RES	1.7	141,669.5	3.3	1.7	6.7	6.7	18.3
	COM	6.0	72,586.6	61.5	9.4	185.3	46.1	97.4
	TOT	7.6	214,256.1	64.8	11.1	192.0	52.8	115.7
SCHUYLER	RES	0.6	49,172.5	1.2	0.6	2.3	2.3	6.4
	COM	3.0	35,858.9	30.4	4.6	91.5	22.8	48.1
	TOT	3.5	85,031.4	31.5	5.2	93.9	25.1	54.5
SENECA	RES	0.8	65,407.5	1.5	0.8	3.1	3.1	8.5
	COM	5.0	61,123.5	51.8	7.9	156.0	38.8	82.0
	TOT	5.8	126,531.0	53.3	8.7	159.1	41.9	90.4
STEUBEN	RES	1.8	156,587.0	3.7	1.8	7.4	7.4	20.3
	COM	12.5	152,363.3	129.1	19.7	389.0	96.8	204.3
	TOT	14.4	308,950.4	132.7	21.6	396.3	104.2	224.6
ST. LAWRENCE	RES	5.5	467,381.0	11.0	5.5	22.0	22.0	60.5
	COM	26.4	319,989.3	271.0	41.4	816.9	203.3	429.2
	TOT	31.9	787,370.3	282.0	46.9	838.9	225.3	489.6
SUFFOLK	RES	46.7	3,973,257.0	93.5	46.7	187.0	187.0	514.2
	COM	186.1	2,259,317.8	1,913.8	292.4	5,767.9	1,435.3	3,030.1
	TOT	232.8	6,232,574.9	2,007.3	339.1	5,954.9	1,622.3	3,544.3
SULLIVAN	RES	4.1	346,664.0	8.2	4.1	16.3	16.3	44.9
	COM	13.8	167,351.4	141.8	21.7	427.2	106.3	224.4
	TOT	17.9	514,015.4	149.9	25.7	443.6	122.6	269.3

TIOGA	RES	2.1	180,786.5	4.3	2.1	8.5	8.5	23.4
	COM	9.4	114,297.8	96.8	14.8	291.8	72.6	153.3
	TOT	11.5	295,084.3	101.1	16.9	300.3	81.1	176.7
TOMPKINS	RES	1.4	119,450.5	2.8	1.4	5.6	5.6	15.5
	COM	11.6	140,673.3	119.2	18.2	359.1	89.4	188.7
	TOT	13.0	260,123.8	122.0	19.6	364.8	95.0	204.1
ULSTER	RES	7.9	671,219.5	15.8	7.9	31.6	31.6	86.9
	COM	28.3	343,256.4	290.8	44.4	876.3	218.1	460.4
	TOT	36.2	1,014,475.9	306.6	52.3	907.9	249.7	547.2
WARREN	RES	2.4	206,856.0	4.9	2.4	9.7	9.7	26.8
	COM	12.0	145,599.9	123.3	18.8	371.7	92.5	195.3
	TOT	14.4	352,455.9	128.2	21.3	381.4	102.2	222.0
WASHINGTON	RES	2.2	188,130.5	4.4	2.2	8.9	8.9	24.3
	COM	9.5	115,428.3	97.8	14.9	294.7	73.3	154.8
	TOT	11.7	303,558.8	102.2	17.2	303.5	82.2	179.2
WAYNE	RES	2.4	208,165.0	4.9	2.4	9.8	9.8	26.9
	COM	13.4	162,452.0	137.6	21.0	414.7	103.2	217.9
	TOT	15.8	370,617.0	142.5	23.5	424.5	113.0	244.8
WESTCHESTER	RES	29.1	2,477,002.0	58.3	29.1	116.6	116.6	320.6
	COM	133.1	1,615,951.1	1,368.8	209.1	4,125.4	1,026.6	2,167.3
	TOT	162.2	4,092,953.1	1,427.1	238.3	4,242.0	1,143.2	2,487.8
WYOMING	RES	0.7	57,638.5	1.4	0.7	2.7	2.7	7.5
	COM	5.0	60,857.5	51.5	7.9	155.4	38.7	81.6
	TOT	5.7	118,495.9	52.9	8.6	158.1	41.4	89.1
YATES	RES	0.7	56,542.0	1.3	0.7	2.7	2.7	7.3
	COM	3.5	42,860.4	36.3	5.5	109.4	27.2	57.5
	TOT	4.2	99,402.4	37.6	6.2	112.1	29.9	64.8
TOTAL		3,102.9	76,300,215.2	27,523.5	4,573.1	81,877.9	21,967.9	47,731.4

RESCOM POLL PER UTIL%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

UTILITY		ALDEHYDES	CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
CENTRAL HUDSON	RES	10.8	921,442.5	21.7	10.8	43.4	43.4	119.2
	COM	43.4	527,409.7	446.7	68.3	1,346.4	335.1	707.3
	TOT	54.3	1,448,852.2	468.4	79.1	1,389.8	378.4	826.6
CON ED	RES	40.1	3,404,777.0	80.1	40.1	160.2	160.2	440.6
	COM	196.0	2,380,281.3	2,016.2	308.0	6,076.7	1,512.2	3,192.4
	TOT	236.1	5,785,058.4	2,096.4	348.1	6,236.9	1,672.4	3,633.0
LILCO	RES	59.9	5,095,444.0	119.9	59.9	239.8	239.8	659.4
	COM	222.6	2,702,870.8	2,289.5	349.8	6,900.3	1,717.1	3,625.0
	TOT	282.5	7,798,314.8	2,409.4	409.7	7,140.1	1,956.9	4,284.4
NIAGARA MOHAWK	RES	8.1	684,428.5	16.1	8.1	32.2	32.2	88.6
	COM	47.0	571,252.7	483.9	73.9	1,458.4	362.9	766.2
	TOT	55.1	1,255,681.2	500.0	82.0	1,490.6	395.1	854.7
NYSE+G	RES	0.5	39,074.5	0.9	0.5	1.8	1.8	5.1
	COM	1.6	19,397.0	16.4	2.5	49.5	12.3	26.0
	TOT	2.1	58,471.5	17.3	3.0	51.4	14.2	31.1
ORANGE+ROCKLAND	RES	8.1	687,641.5	16.2	8.1	32.4	32.4	89.0
	COM	40.8	495,220.2	419.5	64.1	1,264.3	314.6	664.2
	TOT	48.9	1,182,861.7	435.7	72.2	1,296.6	347.0	753.2
RG+E	RES	12.8	1,089,011.5	25.6	12.8	51.2	51.2	140.9
	COM	95.2	1,155,694.0	978.9	149.6	2,950.4	734.2	1,550.0
	TOT	108.0	2,244,705.5	1,004.6	162.4	3,001.7	785.5	1,690.9
TOTAL		785.9	19,773,345.3	6,931.7	1,156.4	20,607.0	5,549.4	12,073.9

*RESCOM POLL UTILITY(CENTRAL HUDSON)%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

CENTRAL HUDSON

COUNTY		ALDEHYDES	CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
DUTCHESS	RES	10.8	921,442.5	21.7	10.8	43.4	43.4	119.2
	COM	43.4	527,409.7	446.7	68.3	1,346.4	335.1	707.3
	TOT	54.3	1,448,852.2	468.4	79.1	1,389.8	378.4	826.6
GREENE	RES	2.2	184,781.5	4.3	2.2	8.7	8.7	23.9
	COM	7.0	85,450.5	72.4	11.1	218.2	54.3	114.6
	TOT	9.2	270,232.0	76.7	13.2	226.8	63.0	138.5
PUTNAM	RES	3.9	333,132.0	7.8	3.9	15.7	15.7	43.1
	COM	12.7	154,486.6	130.9	20.0	394.4	98.1	207.2
	TOT	16.6	487,618.7	138.7	23.9	410.1	113.8	250.3
ULSTER	RES	7.9	671,219.5	15.8	7.9	31.6	31.6	86.9
	COM	28.3	343,256.4	290.8	44.4	876.3	218.1	460.4
	TOT	36.2	1,014,475.9	306.6	52.3	907.9	249.7	547.2
TOTAL		116.3	3,221,178.7	990.4	168.6	2,934.6	804.9	1,762.6

RESCOM POLL UTILITY(CON ED)

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

COUNTY		ALDEHYDES	CON ED CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
BRONX	RES	40.1	3,404,777.0	80.1	40.1	160.2	160.2	440.6
	COM	196.0	2,380,281.3	2,016.2	308.0	6,076.7	1,512.2	3,192.4
	TOT	236.1	5,785,058.4	2,096.4	348.1	6,236.9	1,672.4	3,633.0
KINGS	RES	64.8	5,508,357.0	129.6	64.8	259.2	259.2	712.8
	COM	341.2	4,143,376.5	3,509.7	536.2	10,577.8	2,632.3	5,557.0
	TOT	406.0	9,651,735.5	3,639.3	601.0	10,837.0	2,891.5	6,269.8
NEW YORK	RES	48.3	4,106,605.0	96.6	48.3	193.3	193.3	531.4
	COM	303.0	3,740,465.8	3,168.4	484.1	9,549.2	2,376.3	5,016.6
	TOT	355.4	7,847,070.8	3,265.0	532.4	9,742.4	2,569.5	5,548.1
QUEENS	RES	60.7	5,162,305.0	121.5	60.7	242.9	242.9	668.1
	COM	273.4	3,392,118.0	2,873.3	439.0	8,659.9	2,155.0	4,549.4
	TOT	340.1	8,554,423.0	2,994.8	499.7	8,902.8	2,397.9	5,217.5
RICHMOND	RES	7.7	658,112.5	15.5	7.7	31.0	31.0	85.2
	COM	41.5	504,306.7	427.2	65.3	1,287.5	320.4	676.4
	TOT	49.3	1,162,419.2	442.7	73.0	1.318.4	351.4	761.5
WESTCHESTER	RES	29.1	2,477,002.0	58.3	29.1	116.6	116.6	320.6
	COM	133.1	1,615,95[illegible].1	1,368.8	209.1	4,125.4	1,026.6	2,167.3
	TOT	162.2	4,092,953.1	1,427.1	238.3	4,242.0	1,143.2	2,487.8
TOTAL		1,550.0	37,093,660.0	13,865.2	2,292.5	41,279.6	11,025.9	23,917.8

*RESCOM POLL UTILITY(LILCO)%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

COUNTY		ALDEHYDES	LILCO CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
NASSAU	RES	59.9	5,095,444.0	119.9	59.9	239.8	239.8	659.4
	COM	222.6	2,702,870.8	2,289.5	349.8	6,900.3	1,717.1	3,625.0
	TOT	282.5	7,798,314.8	2,409.4	409.7	7,140.1	1,956.9	4,284.4
SUFFOLK	RES	46.7	3,973,257.0	93.5	46.7	187.0	187.0	514.2
	COM	186.1	2,259,317.8	1,913.8	292.4	5,767.9	1,435.3	3,030.1
	TOT	232.8	6,232,574.9	2,007.3	339.1	5,954.9	1,622.3	3,544.3
TOTAL		515.3	14,030,889.7	4,416.6	748.9	13,094.9	3,579.2	7,828.8

*RESCOM POLL UTILITY(NIAGARA MOHAWK)%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

NIAGARA MOHAWK

COUNTY		ALDEHYDES	CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ALBANY	RES	8.1	684,428.5	16.1	8.1	32.2	32.2	88.6
	COM	47.0	571,252.7	483.9	73.9	1,458.4	362.9	766.2
	TOT	55.1	1,255,681.2	500.0	82.0	1,490.6	395.1	854.7
CATTARAUGUS	RES	1.2	102,476.0	2.4	1.2	4.8	4.8	13.3
	COM	9.2	111,491.1	94.4	14.4	284.6	70.8	149.5
	TOT	10.4	213,967.1	96.9	15.6	289.5	75.7	162.8
CHAUTAUQUA	RES	1.1	89,998.0	2.1	1.1	4.2	4.2	11.6
	COM	3.3	39,786.0	33.7	5.1	101.6	25.3	53.4
	TOT	4.3	129,783.9	35.8	6.2	105.3	29.5	65.0
CLINTON	RES	4.5	381,131.5	9.0	4.5	17.3	17.9	49.3
	COM	19.2	232,869.4	197.3	30.1	594.5	147.9	312.3
	TOT	23.7	614,000.9	206.2	34.6	612.4	165.9	361.6
COLUMBIA	RES	2.6	225,003.5	5.3	2.6	10.6	10.6	29.1
	COM	9.9	120,812.2	102.3	15.6	308.4	76.8	162.0
	TOT	12.6	345,815.7	107.6	18.3	319.0	87.3	191.1
CORTLAND	RES	1.0	86,700.0	2.0	1.0	4.1	4.1	11.2
	COM	7 2	87,838.1	74.4	11.4	224.2	55.8	117.8
	TOT	8 3	174,538.2	76.4	12.4	228.3	59.9	129.0
ERIE	RES	5.9	505,478.0	11.9	5.9	23.8	23.8	65.4
	COM	20.3	247,087.3	209.3	32.0	630.8	157.0	331.4
	TOT	26.3	752,565.4	221.2	37.9	654.6	180.8	396.8
ESSEX	RES	2.6	224,476.5	5.3	2.6	10.6	10.6	29.0
	COM	9.0	108,929.2	92.3	14.1	278.1	69.2	146.1
	TOT	11.6	333,405.7	97.6	16.7	288.7	79.8	175.1
FRANKLIN	RES	3.1	264,528.5	6.2	3.1	12.4	12.4	34.2
	COM	10.7	130,255.7	110.3	16.9	332.5	82.8	174.7
	TOT	13.8	394,784.2	116.6	20.0	345.0	95.2	208.9
GENESEE	RES	1.3	106,836.5	2.5	1.3	5.0	5.0	13.8
	COM	8.5	102,936.7	87.2	13.3	262.8	65.4	138.1
	TOT	9.7	209,773.2	89.7	14.6	267.8	70.4	151.9
HAMILTON	RES	0.4	33,362.5	0.8	0.4	1.6	1.6	4.3
	COM	1.2	14,344.6	12.2	1.9	36.6	9.1	19.2
	TOT	1.6	47,707.1	12.9	2.2	38.2	10.7	23.6
HERKIMER	RES	2.7	227,630.0	5.4	2.7	10.7	10.7	29.5

	COM	13.6	165,511.1	140.2	21.4	422.5	105.1	222.0
	TOT	16.3	393,141.2	145.6	24.1	433.3	115.9	251.4
JEFFERSON	RES	3.2	273,181.5	6.4	3.2	12.9	12.9	35.4
	COM	16.2	196,742.7	166.7	25.5	502.3	125.0	263.9
	TOT	19.4	469,924.2	173.1	28.7	515.1	137.8	299.2
LEWIS	RES	1.6	135,507.0	3.2	1.6	6.4	6.4	17.5
	COM	5.8	70,127.5	59.4	9.1	179.0	44.6	94.1
	TOT	7.4	205,634.5	62.6	10.7	185.4	50.9	111.6
MONTGOMERY	RES	1.5	130,653.5	3.1	1.5	6.1	6.1	16.9
	COM	8.2	99,631.9	84.4	12.9	254.4	63.3	133.6
	TOT	9.7	230,285.4	87.5	14.4	260.5	69.4	150.5
NIAGARA	RES	7.3	618,570.5	14.6	7.3	29.1	29.1	80.1
	COM	38.6	468,448.6	396.8	60.6	1,195.9	297.6	628.3
	TOT	45.9	1,087,019.1	411.4	67.9	1,225.0	326.7	708.3
ONEIDA	RES	8.1	685,389.0	16.1	8.1	32.3	32.3	88.7
	COM	51.0	619,596.5	524.8	80.2	1,581.8	393.6	831.0
	TOT	59.1	1,304,985.5	541.0	88.2	1,614.0	425.9	919.7
ONONDAGA	RES	4.6	387,515.0	9.1	4.6	18.2	18.2	50.1
	COM	16.2	196,407.8	166.4	25.4	501.4	124.8	263.4
	TOT	20.7	583,922.8	175.5	30.0	519.7	143.0	313.6
ORLEANS	RES	1.4	117,223.5	2.8	1.4	5.5	5.5	15.2
	COM	6.6	80,532.4	68.2	10.4	205.6	51.2	108.0
	TOT	8.0	197,755.9	71.0	11.8	211.1	56.7	123.2
OSWEGO	RES	2.7	227,485.5	5.4	2.7	10.7	10.7	29.4
	COM	16.7	202,188.6	171.3	26.2	516.2	128.4	271.2
	TOT	19.3	429,674.2	176.6	28.8	526.9	139.2	300.6
RENSSELAER	RES	5.2	438,005.0	10.3	5.2	20.6	20.6	56.7
	COM	25.5	309,693.3	262.3	40.1	790.6	196.7	415.4
	TOT	30.7	747,698.3	272.6	45.2	811.2	217.4	472.0
SARATOGA	RES	4.6	392,904.0	9.2	4.6	18.5	18.5	50.8
	COM	23.3	282,704.9	239.5	36.6	721.7	179.6	379.2
	TOT	27.9	675,608.9	248.7	41.2	740.2	198.1	430.0
SCHENECTADY	RES	4.5	384,650.5	9.1	4.5	18.1	18.1	49.8
	COM	24.9	301,971.9	255.8	39.1	770.9	191.8	405.0
	TOT	29.4	686,622.4	264.8	43.6	789.0	209.9	454.8
SCHOHARIE	RES	1.7	141,669.5	3.3	1.7	6.7	6.7	18.3
	COM	6.0	72,586.6	61.5	9.4	185.3	46.1	97.4
	TOT	7.6	214,256.1	64.8	11.1	192.0	52.8	115.7
ST. LAWRENCE	RES	5.5	467,381.0	11.0	5.5	22.0	22.0	60.5
	COM	26.4	319,989.3	271.0	41.4	816.9	203.3	429.2
	TOT	31.9	787,370.3	282.0	46.9	838.9	225.3	489.6

WARREN	RES	2.4	206,856.0	4.9	2.4	9.7	9.7	26.8
	COM	12.0	145,599.9	123.3	18.8	371.7	92.5	195.3
	TOT	14.4	352,455.9	128.2	21.3	381.4	102.2	222.0
WASHINGTON	RES	2.2	188,130.5	4.4	2.2	8.9	8.9	24.3
	COM	9.5	115,428.3	97.8	14.9	294.7	73.3	154.8
	TOT	11.7	303,558.8	102.2	17.2	303.5	82.2	179.2
TOTAL		536.8	13,141,935.9	4,768.4	791.6	14,187.2	3,803.6	8,262.1

*RESCOM POLL UTILITY(NYSE+G)%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

COUNTY		ALDEHYDES	NYSE+G CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ALLEGANY	RES	0.5	39,074.5	0.9	0.5	1.8	1.8	5.1
	COM	1.6	19,397.0	16.4	2.5	49.5	12.3	26.0
	TOT	2.1	58,471.5	17.3	3.0	51.4	14.2	31.1
BROOME	RES	3.9	335,716.0	7.9	3.9	15.8	15.8	43.4
	COM	29.3	355,895.8	301.5	46.1	908.6	226.1	477.3
	TOT	33.3	691,611.9	309.4	50.0	924.4	241.9	520.8
CAYUGA	RES	1.7	143,259.0	3.4	1.7	6.7	6.7	18.5
	COM	11.2	136,125.0	115.3	17.6	347.5	86.5	182.6
	TOT	12.9	279,384.0	118.7	19.3	354.3	93.2	201.1
CHEMUNG	RES	0.8	71,731.5	1.7	0.8	3.4	3.4	9.3
	COM	2.7	33,269.9	28.2	4.3	84.9	21.1	44.6
	TOT	3.6	105,001.4	29.9	5.1	88.3	24.5	53.9
CHENANGO	RES	2.4	203,541.0	4.8	2.4	9.6	9.6	26.3
	COM	9.7	118,316.6	100.2	15.3	302.1	75.2	158.7
	TOT	12.1	321,857.6	105.0	17.7	311.6	84.7	185.0
DELAWARE	RES	2.4	207,349.0	4.9	2.4	9.8	9.8	26.8
	COM	9.6	116,539.3	98.7	15.1	297.5	74.0	156.3
	TOT	12.0	323,888.3	103.6	17.5	307.3	83.8	183.1
LIVINGSTON	RES	1.4	121,898.5	2.9	1.4	5.7	5.7	15.8
	COM	9.0	109,100.9	92.4	14.1	278.5	69.3	146.3
	TOT	10.4	230,999.4	95.3	15.6	284.3	75.0	162.1
MADISON	RES	2.2	183,557.5	4.3	2.2	8.6	8.6	23.8
	COM	12.1	147,253.1	124.7	19.1	375.9	93.5	197.5
	TOT	14.3	330,810.7	129.1	21.2	384.6	102.2	221.2
OTSEGO	RES	3.0	253,614.5	6.0	3.0	11.9	11.9	32.8
	COM	12.2	148,194.1	125.5	19.2	378.3	94.1	198.8
	TOT	15.2	401,808.6	131.5	22.2	390.3	106.1	231.6
SCHUYLER	RES	0.6	49,172.5	1.2	0.6	2.3	2.3	6.4
	COM	3.0	35,858.9	30.4	4.6	91.5	22.8	48.1
	TOT	3.5	85,031.4	31.5	5.2	93.9	25.1	54.5
SENECA	RES	0.8	65,407.5	1.5	0.8	3.1	3.1	8.5
	COM	5.0	61,123.5	51.8	7.9	156.0	38.8	82.0
	TOT	5.8	126,531.0	53.3	8.7	159.1	41.9	90.4
STEUBEN	RES	1.8	156,587.0	3.7	1.8	7.4	7.4	20.3

	COM	12.5	152,363.3	129.1	19.7	389.0	96.8	204.3
	TOT	14.4	308,950.4	132.7	21.6	396.3	104.2	224.6
SULLIVAN	RES	4.1	346,664.0	8.2	4.1	16.3	16.3	44.9
	COM	13.8	167,351.4	141.8	21.7	427.2	106.3	224.4
	TOT	17.9	514,015.4	149.9	25.7	443.6	122.6	269.3
TIOGA	RES	2.1	180,786.5	4.3	2.1	8.5	8.5	23.4
	COM	9.4	114,297.8	96.8	14.8	291.8	72.6	153.3
	TOT	11.5	295,084.3	101.1	16.9	300.3	81.1	176.7
TOMPKINS	RES	1.4	119,450.5	2.8	1.4	5.6	5.6	15.5
	COM	11.5	140,673.3	119.2	18.2	359.2	89.4	188.7
	TOT	13.0	260,123.8	122.0	19.6	364.8	95.0	204.1
WYOMING	RES	0.7	57,638.5	1.4	0.7	2.7	2.7	7.5
	COM	5.0	60,857.5	51.5	7.9	155.4	38.7	81.6
	TOT	5.7	118,495.9	52.9	8.6	158.1	41.4	89.1
YATES	RES	0.7	56,542.0	1.3	0.7	2.7	2.7	7.3
	COM	3.5	42,860.4	36.3	5.5	109.4	27.2	57.5
	TOT	4.2	99,402.4	37.6	6.2	112.1	29.9	64.8
TOTAL		191.9	4,551,467.8	1,720.8	284.1	5,124.4	1,366.8	2,963.4

*RESCOM POLL UTILITY(ORANGE+ROCKLAND)%

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

ORANGE+ROCKLAND

COUNTY		ALDEHYDES	CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ORANGE	RES	8.1	687,641.5	16.2	8.1	32.4	32.4	89.0
	COM	40.8	495,220.2	419.5	64.1	1,264.3	314.6	664.2
	TOT	48.9	1,182,861.7	435.7	72.2	1,296.6	347.0	753.2
ROCKLAND	RES	1.2	102,637.5	2.4	1.2	4.8	4.8	13.3
	COM	4.4	53,571.3	45.4	6.9	136.8	34.0	71.8
	TOT	5.6	156,208.8	47.8	8.1	141.6	38.9	85.1
TOTAL		54.5	1,339,070.4	483.5	80.3	1,438.2	385.8	838.3

*RESCOM POLL UTILITY(RG+E)%

STEUBEN	RES	1.8	156,587.0	3.7	1.8	7.4	7.4	20.3
	COM	12.5	152,363.3	129.1	19.7	389.0	96.8	204.3

POLLUTION FROM RESIDENTIAL AND COMMERCIAL OIL CONSUMPTION
FOR NEW YORK STATE 1976 (1000 TONS)

COUNTY		ALDEHYDES	RG+E CARBON DIOX	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
MONROE	RES	12.8	1,089,011.5	25.6	12.8	51.2	51.2	140.9
	COM	95.2	1,155,694.0	978.9	149.6	2,950.4	734.2	1,550.0
	TOT	108.0	2,244,705.5	1,004.6	162.4	3,001.7	785.5	1,690.9
ONTARIO	RES	1.8	155,771.0	3.7	1.8	7.3	7.3	20.2
	COM	12.4	150,919.2	127.8	19.5	385.3	95.9	202.4
	TOT	14.3	306,690.2	131.5	21.4	392.6	103.2	222.6
WAYNE	RES	2.4	208,165.0	4.9	2.4	9.8	9.8	26.9
	COM	13.4	162,452.0	137.6	21.0	414.7	103.2	217.9
	TOT	15.8	370,617.0	142.5	23.5	424.5	113.0	244.8
TOTAL		138.1	2,922,012.7	1,278.6	207.2	3,818.8	1,001.7	2,158.3

*TYPICAL BILLS(INDUSTRIAL)%

TYFICAL-BILLS--INDUSTRIAL-AS OF JAN. 1 1977
04/10/79

UTILITY	COMMUNITY	SCHED	TYPE	75KW 15E3KWH	75KW 3E5KWH	150KW 3E5KWH	150KW 6E5KWH	300KW 6E5KWH	300KW 12E5KWH	500KW 1E6KWH	600KW 1E6 KWH	1E3KW 1E6 KWH	1E3KW 4E6 KWH
***													
* CON ED	N Y C	SC-9 SUMM	MUL	$1410.	$2087.	$2820.	$4173.	$5641.	$8347.	$9401.	$13911.	$18802.	$27822.
*	N Y C	SC-9 WINT	MUL	$1362.	$2039.	$2725.	$4078.	$5450.	$8156.	$9083.	$13593.	$18166.	$27186.
*	WHITE PLA INS	SC-9 SUMM	MUL	$1392.	$2060.	$2784.	$4120.	$5569.	$8241.	$9282.	$13734.	$18563.	$27468.
*	WHITE PLA INS	SC-9 WINT	MUL	$1345.	$2013.	$2690.	$4026.	$5380.	$8052.	$8967.	$13420.	$17935.	$26840.
* LILCO	LEVITTOWN	SC-2-L	MUL	$839.	$1386.	$1647.	$2586.	$3080.	$4957.	$5021.	$8149.	$9872.	$16128.
* NIAGARA MOHAWK	BUFFALO	3-PSC -207	MUL	$693.	$965.	$1197.	$1740.	$2197.	$3284.	$3487.	$5298.	$6710.	$10332.
*	SYRACUSE	3-PSC -207	MUL	$693.	$965.	$1197.	$1740.	$2197.	$3284.	$3487.	$5298.	$6710.	$10332.
*	UTICA	3-PSC -207	MUL	$693.	$965.	$1197.	$1740.	$2197.	$3284.	$3487.	$5298.	$6710.	$10332.
* NYSE+G	BINGHAMTO N	SC30S C115	MUL	$627.	$899.	$1149.	$1673.	$211.	$3205.	$3388.	$5211.	$6578.	$10225.
*	BINGHAMTO N	SC2PS C115	MUL	$630.	$935.	$1203.	$1760.	$2111.	$3205.	$3388.	$5211.	$6578.	$10225.
*	CHEEKTOWA GA	SC2PS C115	MUL	$630.	$935.	$1203.	$1760.	$2111.	$3205.	$3388.	$5211.	$6578.	$10225.
*	CHEEKTOWA GA	SC3PS C115	MUL	$627.	$965.	$1197.	$1704.	$2197.	$3284.	$3487.	$5298.	$6710.	$10332.
* RG+E	IRONDEQUO IT TWN	SC-3	MUL	$747.	$1021.	$1257.	$1805.	$2491.	$3575.	$4165.	$5973.	$7753.	$11368.
*	ROCHESTER	SC-3	MUL	$747.	$1021.	$1257.	$1805.	$2491.	$3575.	$4165.	$5973.	$7753.	$11368.

*TYPICAL BILLS(RESIDENTIAL)%

TYPICAL ELECTRICITY BILLS-RESIDENTIAL-AS OF JAN. 1 1977
04/10/79

UTILITY ***	COMMUNITY	POPULATION	BILL-MIN	KWH-INC	100 KWH	250 KWH	500 KWH	750 KWH	1000 KWH	SEASON
* CENTRAL HUDSON	KINGSTON	25544	$2.57	12	$9.06	$16.04	$26.12	$36.20	$46.28	
*	LINCOLN PARK	2851	$2.57	12	$9.06	$16.04	$26.12	$36.20	$46.28	
* CON ED	MOUNT VERNON	72778	$3.46	10	$10.91	$23.24	$41.21	$57.13	$77.12	SUMMER
*	MOUNT VERNON	72778	$3.43	10	$10.60	$22.47	$39.64	$54.77	$73.98	WINTER
*	MOUNT VERNON	72778	$3.43	10	$10.60	$22.47	$39.64		$73.98	WINTER
*	NYC BRONX	1471701	$3.47	10	$10.74	$22.76	$40.15	$55.48	$74.94	WINTER
*	NYC BRONX	1471701	$3.50	10	$11.05	$23.54	$41.74	$57.87	$78.12	SUMMER
*	NYC BROOKLYN	2602012	$3.50	10	$11.05	$23.54	$41.74	$57.87	$78.12	SUMMER
*	NYC BROOKLYN	2602012	$3.47	10	$10.74	$22.76	$40.15	$55.48	$74.94	WINTER
*	NYC MANHATTAN	1539233	$3.47	10	$10.74	$22.76	$40.15	$55.48	$74.94	WINTER
*	NYC MANHATTAN	1539233	$3.50	10	$11.05	$23.54	$41.74	$57.87	$78.12	SUMMER
* LILCO	LEVITTOWN	65440	$2.37	12	$7.62	$15.06	$26.02	$34.78	$45.11	WINTER
*	LEVITTOWN	65440	$2.37	12	$7.67	$15.88	$27.60	$36.37	$48.09	SUMMER
*	MINEOLA	21845	$2.39	12	$7.69	$15.21	$26.28	$35.13	$45.56	WINTER
*	MINEOLA	21845	$2.39	12	$7.74	$16.04	$27.88	$36.73	$48.57	SUMMER
*	RIVERHEAD	7585	$2.37	12	$7.62	$15.06	$26.02	$34.78	$45.11	WINTER
*	RIVERHEAD	7585	$2.37	12	$7.67	$15.88	$27.60	$36.37	$48.09	SUMMER
*	ROSLYN HTS	7242	$2.37	12	$7.62	$15.06	$26.02	$34.78	$45.11	WINTER
*	ROSLYN HTS	7242	$2.37	12	$7.67	$15.88	$27.60	$36.37	$48.09	SUMMER
* NIAGARA MOHAWK	BUFFALO	462768	$3.25	15	$7.10	$12.48	$19.16		$32.52	
*	SYRACUSE	197297	$3.25	15	$7.10	$12.48	$19.16	$25.84	$32.52	
*	VOORHEESVILLE	2826	$3.25	15	$7.10	$12.48	$19.16	$25.84	$32.52	
* NYSE+G	CORNING	15792	$2.35	12	$6.74	$12.01	$18.34	$25.25	$33.74	
*	ITHACA	26226	$2.35	12	$6.74	$12.01	$18.34	$25.25	$33.74	
*	WALDEN	5277	$2.35	12	$6.79	$12.12	$18.57	$25.59	$34.19	
* ORANGE+ ROCKLAND	MIDDLETOWN	22607	$3.48	13	$10.21	$19.92	$36.09	$48.49	$60.89	SUMMER
*	MIDDLETOWN	22607	$3.48	13	$10.21	$19.09	$33.54	$45.94	$58.34	WINTER
*	SPRING VALLEY	18112	$3.48	13	$10.21	$19.92	$36.09	$48.49	$60.89	SUMMER
*	SPRING VALLEY	18112	$3.48	13	$10.21	$19.09	$33.54	$45.94	$58.34	WINTER
* RG+E	PENFIELD	8500	$2.27	12	$5.95	$12.22	$20.01	$27.14	$34.26	

*	ROCHESTER	296233	$2.27	12	$5.95	$12.22	$20.01	$27.14	$34.26	

*TYPICAL BILLS(COMMERCIAL)X

*	LYN NYC BROOK LYN	2602012	$3.47	10	$10.74	$22.76	$40.15	$55.48	$74.94	WINTER

TYPICAL ELECTRICITY-BILLS-COMMERCIAL-AS OF JAN. 1 1977
04/10/79

UTILITY	COMMUNITY	SCH DESIGN	TYPE OF SERVICE	375 KWH-3 KW	750 KWH-6 KW	1500 KWH-12 KW	6000 KWH-30 KW	10000 KWH-40
***								
* CON ED	N Y C	SC-2,9 SUM	GEN	$40.02	$75.63	$189.24	$574.57	$856.
*	N Y C	SC-2,9 WIN T	GEN	$38.82	$73.24	$181.60	$555.48	$830.
*	WHITE PLA INS	SC-2,9 SUM	GEN	$39.51	$74.67	$186.83	$567.26	$845.
*	WHITE PLA INS	SC-2,9 WIN	GEN	$38.33	$72.31	$179.29	$548.41	$820.
* LILCO	LEVITTOWN	SC-2 SUMM	GEN	$23.55	$45.17	$88.42	$351.66	$533.
*	LEVITTOWN	SC-2 WINT	GEN	$21.84	$41.21	$79.96	$351.66	$533.
* NIAGARA MOHAWK	BUFFALO	2-PSC-207	GEN	$22.20	$39.82	$75.02	$273.42	$428.
*	SYRACUSE	2-PSC-207	GEN	$22.20	$39.82	$75.05	$273.42	$428.
*	UTICA	2-PSC-207	GEN	$22.20	$39.82	$75.05	$273.42	$428.
* NYSE+G	BINGHAMTO N	SC2PSC115	GEN	$19.20	$34.79	$77.37	$263.54	$409.
*	CHEEKTOWA GA	SC2PSC115	GEN	$19.20	$34.79	$77.37	$263.54	$409.
* RG+E	IRONDEQUO IT TWN	S.C. NO.7	GEN	$31.21	$47.84	$95.68	$315.78	$459.
*	ROCHESTER	S.C. NO.7	GEN	$31.21	$47.84	$95.68	$315.78	$459.

*POWER PLANT CONS(CENTRAL HUDSON)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* COXSACKIE	GREENE						
* DANSKAMMER	ORANGE					3679	23067
* DASHVILLE	ULSTER						
* NEVERSINK	SULLIVA N						
* ROSETON	ORANGE					1621	10164
* SO. CAIRO	GREENE						
* STURGEON	ULSTER						

*POWER PLANT CONS(CITY OF JAMESTOWN)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* S.A. CARLSO N							

*POWER PLANT CONS(CITY OF PLATTSBURGH)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* DIESEL							

*POWER PLANT CONS(CON ED)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* 59 ST	NEW YORK					1410	8841
* 74 ST	NEW YORK					630	3950
* ARTHUR KILL	RICHMOND					5479	34353
* ASTORIA	QUEENS			382	390	10087	63245
* BOWLINE	ROCKLAND			63	64	5044	31626
* EAST RIVER	NEW YORK			78	80	2275	14264
* GOWANUS	KINGS					947	5938
* HUDSON AVENUE	KINGS					974	6107
* INDIAN POINT	WESTCHESTER					118	740
* KENT AVE	KINGS					2	13
* NARROWS BAY	KINGS					784	4916
* RAVENSWOOD	QUEENS			218	222	12747	79924
* ROSETON	ORANGE					3241	20321
* WATERSIDE	NEW YORK			1385	1413	2126	13330

*POWER PLANT CONS(LILCO)%

POWER PLANT FUEL CONSUMPTION-1976
04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* BARRETT	NASSAU			701	715	2929	18365
* FAR ROCKAWAY	NASSAU			232	237	544	3411
* GLENWOOD	NASSAU			216	220	1944	12189
* HOLBROOK	SUFFOLK					595	3731
* MONTAUK	SUFFOLK						
* NORTHPORT	SUFFOLK					10183	63847
* PORT JEFFERSON	SUFFOLK					4503	28234
* SHOREHAM	SUFFOLK					1	6
* E. HAMPTON	SUFFOLK						
* S. HAMPTON	SUFFOLK						
* SOUTHOLD	SUFFOLK						
* W. BABYLON	SUFFOLK					4	25

*POWER PLANT CONS(NIAGARA MOHAWK)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* OSWEGO	OSWEGO					4607	28886
* ROSETON	ORANGE					3241	20321
* ROTTERDAM	SCHENEC TADY					61	382
* ALBANY	ALBANY					3507	21989
* HUNTLEY	ERIE	1610	38640				
* DUNKIRK	CHAUTAU QUA	1217	29208				
* COLTON							
* TRENTON							
* SCHOOL ST							
* SHERMAN IS.							
* SPIER FALLS							
* STEWARDS BR IDGE							
* OWNED							
* LEASED							
* DIESEL							

*POWER PLANT CONS(NYSE+G)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* GOUDEY	BROOME	350	8400				
* GREENIDGE	YATES	386	9264				
* HICKLING	STEUBEN	409	9816				
* JENNISON	CHENANG O	194	4656				
* MILLIKEN	TOMPKIN S	752	18048				
* HOMER CITY							
* MISC. HYDRO							
* MISC. DIESE L							

*POWER PLANT CONS(ORANGE+ROCKLAND)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* HILLBURN	ROCKLAN D					2	13
* LOVETT	ROCKLAN D			1878	1916	2417	15155
* SHOEMAKER	ORANGE					2	13
* BOWLINE	ROCKLAN D			32	32	2525	15832
* HYDRO							

*POWER PLANT CONS(PASNY)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* MOSES NIAG. LEWISTON							
* AUX. PUMPED STORAGE							
* BLENHIEM GI LBOA							
* FITZPATRICK							
* INDIAN POIN T							
* MOSES POWER DAM							

*POWER PLANT CONS(FG+E)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* ROCH 3	MONROE	197	4728			930	5831
* ROCH 7	MONROE	515	12360			1	6

*POWER PLANT CONS(VILLAGE OF FREEPORT)%

POWER PLANT FUEL CONSUMPTION-1976

04/10/79

POWER PLANT	COUNTY	COAL 1000 TONS	COAL 1E9 BTU	GAS MMCF	GAS 1E9 BTU	OIL 1000 BARRELS	OIL 1E9 BTU
***							
* SUNRISE HWY							
* BUFFALO AVE							

*SOLIDWASTE*X

SOLID WASTE SUPPLY FOR NEW YORK STATE BY COUNTY FOR THE YEAR 1976

COUNTY	SUPPLY (BTUX1E+9)
ALBANY	1,732
ALLEGANY	0
BRONX	9,159
BROOME	1,594
CATTARAUGUS	0
CAYUGA	0
CHAUTAUQUA	0
CHEMUNG	638
CHENANGO	0
CLINTON	0
COLUMBIA	0
CORTLAND	0
DELAWARE	0
DUTCHESS	0
ERIE	7,094
ESSEX	0
FRANKLIN	0
GENESEE	0
GREENE	0
HAMILTON	0
HERKIMER	410
JEFFERSON	0
KINGS	16,237
LEWIS	0
LIVINGSTON	371
MADISON	379
MONROE	4,617
MONTGOMERY	331
NASSAU	0
NEW YORK	9,521
NIAGARA	1,543
ONEIDA	1,609
ONONDAGA	2,763
ONTARIO	554
ORANGE	0
ORLEANS	247
OSWEGO	635
OTSEGO	0
PUTNAM	463
QUEENS	13,191
RENSSELAER	920
RICHMOND	2,167
ROCKLAND	1,684
SARATOGA	860
SCHENECTADY	950
SCHOHARIE	0
SCHUYLER	0

SENECA	0
STEUBEN	0
ST. LAWRENCE	0
SUFFOLK	8,380
SULLIVAN	0
TIOGA	348
TOMPKINS	0
ULSTER	0
WARREN	0
WASHINGTON	0
WAYNE	534
WESTCHESTER	5,305
WYOMING	0
YATES	0
TOTAL	94,836

*UTILITY(GAS,BROOKLYN UNION)%

GAS SUPPLY FROM UTILITY BROOKLYN UNION 1976

RES COST $3.720/MFC
CI COST $3.190/MFC
PA COST $2.730/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
KINGS	44,927,376	10,520,457	2,168,892	57,616,725
QUEENS	22,394,367	4,859,982	1,081,099	28,335,448
RICHMOND	5,647,846	939,938	272,653	6,860,437
TOTALS	72,969,589	16,320,377	3,522,644	92,812,610

*UTILITY(GAS,CENTRAL HUDSON)%

GAS SUPPLY FROM UTILITY CENTRAL HUDSON 1976

RES COST $3.250/MFC
CI COST $2.030/MFC
PA COST $1.990/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
ALBANY	55,824	89,453	13,165	158,442
DUTCHESS	1,706,595	2,124,313	294,208	4,125,116
GREENE	100,129	146,396	39,634	286,159
ORANGE	1,232,583	149,795	151,133	1,533,511
ULSTER	541,506	312,885	57,340	911,731
TOTALS	3,636,637	2,822,842	555,480	7,014,959

*UTILITY(GAS,COLUMBIA)%

GAS SUPPLY FROM UTILITY COLUMBIA 1976

RES COST $2.225/MFC
CI COST $1.635/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
ALLEGANY	10,983	1,115	0	12,098
BROOME	7,492,856	3,679,228	0	11,172,084
CATTARAUGUS	1,065,110	5,409,795	0	6,474,905
CHEMUNG	32,361	1,984	0	34,345
DELAWARE	378,308	309,052	0	687,360
ORANGE	0	7,955	0	7,955
SCHUYLER	297,983	257,388	0	555,371
STEUBEN	36,644	987,585	0	1,024,229
SULLIVAN	0	4,747	0	4,747
TIOGA	185,124	16,354	0	201,478
YATES	90,558	71,440	0	161,998
TOTALS	9,589,927	10,746,643	0	20,336,570

*UTILITY(GAS,CON ED)%

GAS SUPPLY FROM UTILITY CON ED 1976

RES COST $4.260/MFC
CI COST $2.900/MFC
PA COST $2.170/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
BRONX	9,088,000	5,928,000	1,367,000	16,383,000
NEW YORK	7,151,000	12,183,000	1,023,000	20,357,000
QUEENS	8,392,000	5,052,000	546,000	13,990,000
WESTCHESTER	15,583,000	7,233,000	1,480,000	24,296,000
TOTALS	40,214,000	30,396,000	4,416,000	75,026,000

*UTILITY(GAS,CORNING)%

GAS SUPPLY FROM UTILITY CORNING 1976

RES COST $1.538/MFC
CI COST $1.304/MFC
PA COST $1.447/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
CHEMUNG	134,438	12,094	4,849	151,381
STEUBEN	1,961,828	3,374,845	229,845	5,566,518
TOTALS	2.096,266	3,386,939	234,694	5,717,899

*UTILITY(GAS,LILCO)%

GAS SUPPLY FROM UTILITY LILCO 1976

RES COST $3.360/MFC
CI COST $2.730/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
NASSAU	14,310,373	8,725,439	0	23,035,812
QUEENS	1,070,563	659,320	0	1,729,883
SUFFOLK	12,365,625	6,001,971	0	18,367,596
TOTALS	27,746,561	15,386,730	0	43,133,291

*UTILITY(GAS,NATIONAL FUEL)%

GAS SUPPLY FROM UTILITY NATIONAL FUEL 1976

RES COST $2.208/MFC
CI COST $1.857/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
ALLEGANY	1,448,183	1,281,431	0	2,729,614
CATTARAUGUS	2,420,613	1,513,425	0	3,934,038
CHAUTAUQUA	8,183,598	69,486	0	8,253,084
ERIE	59,634,424	40,344,439	0	99,978,863
GENESEE	2,174,198	1,756,434	0	3,930,632
MONROE	479,684	369,451	0	849,135
NIAGARA	4,201,448	7,777,896	0	11,979,344
STEUBEN	1,275,614	665,978	0	1,941,592
WYOMING	1,069,454	817,673	0	1,887,127
TOTALS	80,887,216	54,596,213	0	*5,483,429

*UTILITY(GAS,NIAGARA MOHAWK)X

GAS SUPPLY FROM UTILITY NIAGARA MOHAWK 1976

RES COST $2.330/MFC
CI COST $1.900/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
ALBANY	7,612,715	4,525,618	0	12,138,333
COLUMBIA	660,515	654,355	0	1,314,870
FULTON	1,484,232	1,068,421	0	2,552,653
HERKIMER	1,281,398	126,449	0	1,407,847
JEFFERSON	2,132,801	1,620,987	0	3,753,788
MADISON	1,155,141	1,092,425	0	2,247,566
MONTGOMERY	1,629,922	1,070,320	0	2,700,242
ONEIDA	8,052,217	5,963,951	0	14,016,168
ONONDAGA	16,919,351	12,019,193	0	28,938,544
OSWEGO	2,917,868	2,030,503	0	4,948,371
RENSSELAER	3,300,064	1,878,367	0	5,178,431
SARATOGA	3,519,510	2,225,856	0	5,745,366
SCHENECTADY	4,986,104	2,222,605	0	7,208,709
WARREN	853,883	941,811	0	1,795,694
WASHINGTON	660,515	654,355	0	1,314,870
TOTALS	57,156,236	38,095,216	0	95,261,452

*UTILITY(GAS,NYSE+G)%

GAS SUPPLY FROM UTILITY NYSE+G 1976

RES COST $2.079/MFC
CI COST $1.674/MFC
PA COST $1.653/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
CAYUGA	2,127,648	1,432,911	286,826	3,847,385
CHEMUNG	4,447,455	5,275,200	615,445	10,338,100
CHENANGO	379,897	359,369	33,842	773,108
CORTLAND	1,426,110	1,384,059	370,549	3,180,718
LIVINGSTON	473,131	386,120	45,159	904,410
MADISON	88,730	17,566	183,620	289,916
NIAGARA	1,668,611	2,309,032	230,916	4,208,559
ONEIDA	50,526	58,027	295	108,848
ONONDAGA	301,901	67,884	29,862	399,647
ONTARIO	1,988,528	1,571,860	347,111	3,907,499
ORANGE	208,211	135,351	20,626	364,188
ORLEANS	759,492	445,026	83,192	1,287,710
OTSEGO	483,233	278,279	25,362	786,874
SARATOGA	157,168	42,932	7,997	208,097
SENECA	886,926	865,484	77,308	1,829,718
TIOGA	321,216	269,716	59,382	650,314
TOMPKINS	1,989,016	2,080,724	1,053,929	5,123,669
WAYNE	1,282,030	1,025,692	210,837	2,518,559
WYOMING	17,950	5,402	1,091	24,443
YATES	364,371	217,637	36,840	618,848
TOTALS	19,422,150	18,228,271	3,720,189	41,370,610

*UTILITY(GAS,ORANGE+ROCKLAND)%

GAS SUPPLY FROM UTILITY ORANGE+ROCKLAND 1976

RES COST $2.390/MFC
CI COST $1.880/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
ORANGE	3,130,572	1,826,908	0	4,957,480
ROCKLAND	10,668,647	7,282,014	0	17,950,661
TOTALS	13,799,219	9,108,922	0	22,908,141

*UTILITY(GAS,PAVILLION)%

GAS SUFPLY FROM UTILITY PAVILLION 1976

RES COST $1.910/MFC
CI COST $1.603/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
GENESEE	383,464	635,977	0	1,019,441
LIVINGSTON	871,204	304,882	0	1,176,086
WYOMING	427,192	382,577	0	809,769
TOTALS	1,681,860	1,323,436	0	3,005,296

*UTILITY(GAS,PENN+SOUTH)%

GAS SUPPLY FROM UTILITY PENN+SOUTH 1976

RES COST $2.226/MFC
CI COST $1.991/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
TIOGA	115,056	102,395	0	217,451
TOTALS	115,056	102,395	0	217,451

*UTILITY(GAS,RG+E)%

GAS SUPPLY FROM UTILITY RG+E 1976

RES COST $2.450/MFC
CI COST $1.890/MFC
PA COST $1.930/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
GENESEE	224,169	80,845	30,181	335,195
LIVINGSTON	84,303	30,403	11,350	126,056
MONROE	27,193,040	15,250,531	1,670,568	44,114,139
ONTARIO	189,682	68,407	25,538	283,627
ORLEANS	47,899	17,275	6,449	71,623
WAYNE	852,610	307,487	114,791	1,274,888
TOTALS	28,591,703	15,754,948	1,858,877	46,205,528

*UTILITY(GAS,ST. LAWRENCE)%

GAS SUPPLY FROM UTILITY ST. LAWRENCE 1976

RES COST $2.840/MFC
CI COST $2.180/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
ST. LAWRENCE	1,544,198	3,971,183	0	5,515,381
TOTALS	1,544,198	3,971,183	0	5,515,381

*UTILITY(GAS,SYRACUSE SUBURBAN)%

GAS SUPPLY FROM UTILITY SYRACUSE SUBURBAN 1976

RES COST $1.978/MFC
CI COST $1.645/MFC

COUNTY	RES DEM MCF	CI DEM MCF	PA DEM MCF	TOTAL MCF
ONONDAGA	515,472	2,919,796	0	3,435,268
TOTALS	515,472	2,919,796	0	3,435,268

*UTILITY POLL(CENTRAL HUDSON)%

POLLUTION IN TONS FOR CENTRAL HUDSON 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBCN	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
COXSACKIE	GREENE						
DANSKAMMER	ORANGE	77.8	3.2	155.5	8004.0	622.0	10867.6
DASHVILLE	ULSTER						
NEVERSINK	SULLIVAN						
ROSETON	ORANGE	34.2	1.4	68.5	3525.8	274.0	5999.5
SO. CAIRO	GREENE						
STURGEON	ULSTER						
TOTAL		112.0	4.6	224.0	11529.8	896.0	16867.1

*UTILITY POLL(CITY OF JAMESTOWN)%

POLLUTION IN TONS FOR CITY OF JAMESTOWN 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
S.A. CARLSON							
TOTAL							

*UTILITY POLL(CITY OF PLATTSBURGH)%

POLLUTION IN TONS FOR CITY OF PLATTSBURGH 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
DIESEL							
TOTAL							

*UTILITY POLL(CON ED)%

POLLUTION IN TONS FOR CON ED 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ARTHUR KILL	RICHMOND	115.1	345.5	230.1	12081.2	920.5	4756.5
ASTORIA	QUEENS	211.8	635.5	423.7	22241.8	1694.6	8420.1
BOWLINE	ROCKLAND	70.6	211.7	141.2	7409.6	564.6	3590.5
EAST RIVER	NEW YORK	47.8	143.3	95.6	5016.4	382.2	2051.0
GOWANUS	KINGS	19.9	59.7	39.8	2088.1	159.1	442.7
HUDSON AVENUE	KINGS	20.5	61.4	40.9	2147.7	163.6	878.1
INDIAN POINT	WESTCHEST*	2.5	7.4	5.0	260.2	19.8	102.4
KENT AVE	KINGS	.0	.1	.1	4.4	.3	.5
NARROWS BAY	KINGS	16.5	49.4	32.9	1728.7	131.7	288.0
RAVENSWOOD	QUEENS	267.7	803.1	535.4	28107.1	2141.5	11066.2
ROSETON	ORANGE	68.5	4.7	137.0	7051.3	548.0	11999.0
WATERSIDE	NEW YORK	44.6	133.9	89.3	4687.8	357.2	1916.7
59 ST	NEW YORK	115.8	4.7	231.6	11920.1	926.4	2732.5
74 ST	NEW YORK	13.3	.5	26.6	1370.6	106.5	326.3
TOTAL		1014.6	2460.9	2029.2	106115.0	8116.0	48570.5

*UTILITY POLL(LILCO)%

POLLUTION IN TONS FOR LILCO 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
BARRETT	NASSAU	61.5	184.5	123.0	6458.4	492.1	3325.2
E. HAMPTON	SUFFOLK						
FAR ROCKAWAY	NASSAU	11.4	34.3	22.8	1199.5	91.4	508.6
GLENWOOD	NASSAU	40.8	122.5	81.6	4286.5	326.6	2142.0
HOLBROOK	SUFFOLK	12.5	37.5	25.0	1312.0	100.0	397.3
MONTAUK	SUFFOLK						
NORTHPORT	SUFFOLK	213.8	641.5	427.7	22453.5	1710.7	82622.5
PORT JEFFERSON	SUFFOLK	94.6	283.7	189.1	9929.1	756.5	34431.3
SHOREHAM	SUFFOLK	.0	.1	.0	2.2	.2	.7
SOUTHOLD	SUFFOLK						
S. HAMPTON	SUFFOLK						
W. BABYLON	SUFFOLK	.1	.3	.2	8.8	.7	2.4
TOTAL		434.7	1304.4	869.4	45650.0	3478.2	123430.0

*UTILITY POLL(NIAGARA MOHAWK)%

POLLUTION IN TONS FOR NIAGARA MOHAWK 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ALBANY	ALBANY	73.6	220.9	147.3	7732.9	589.2	26698.5
COLTON							
DIESEL							
DUNKIRK	CHAUTAUQUA	3.0	608.5	182.6	10953.0	797.1	53182.9
HUNTLEY	ERIE	4.0	805.0	241.5	14490.0	1054.6	59344.6
LEASED							
OSWEGO	OSWEGO	96.7	290.2	193.5	10158.4	774.0	39995.2
OWNED							
ROSETON	ORANGE	68.5	2.8	137.0	7051.6	548.0	11999.0
ROTTERDAM	SCHENECTA*	1.3	3.8	2.6	134.6	10.2	61.1
SCHOOL ST							
SHERMAN IS.							
SPIER FALLS							
STEWARDS BRIDGE							
TRENTON							
TOTAL		247.1	1931.2	904.5	50520.5	3773.1	191281.3

*UTILITY POLL(NYSE+G)%

POLLUTION IN TONS FOR NYSE+G 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
GOUDEY	BROOME	.9	175.0	52.5	3150.0	229.3	9243.5
GREENIDGE	YATES	1.0	193.0	57.9	3474.0	252.8	9974.2
HICKLING	STEUBEN	1.0	204.5	61.4	3681.0	267.9	8470.4
HOMER CITY							
JENNISON	CHENANGO	.5	97.0	29.1	1746.0	127.1	4681.2
MILLIKEN	TOMPKINS	1.9	376.0	112.8	6768.0	492.6	29004.6
MISC. DIESEL							
MISC. HYDRO							
TOTAL		5.3	1045.5	313.7	18819.0	1369.7	61373.9

*UTILITY POLL(ORANGE+ROCKLAND)%

POLLUTION IN TONS FOR ORANGE+ROCKLAND 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
BOWLINE	ROCKLAND	17.7	53.0	35.4	1857.0	141.5	899.8
HILLBURN	ROCKLAND	.0	.1	.1	4.4	.3	.7
HYDRO							
LOVETT	ROCKLAND	50.8	152.3	101.5	5329.5	406.1	2582.5
SHOEMAKER	ORANGE	.0	.1	.1	4.4	.3	.4
TOTAL		68.5	205.5	137.1	7195.3	548.2	3483.4

*UTILITY POLL(PASNY)%

POLLUTION IN TONS FOR PASNY 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
AUX. PUMPED STORAGE							
BLENHIEM GILBOA							
FITZPATRICK							
INDIAN POINT							
MOSES NIAG. LEWISTON							
MOSES POWER DAM							
TOTAL							

*UTILITY POLL(RG+E)%

POWER PLANT COUNTY ALDEHYDES CARBON MONO HYDRO CARBON NITROGEN OXIDE PARTICULATES SULFUR DIOXIDE

POLLUTION IN TONS FOR RG+E 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ROCH 3	MONROE	20.0	157.1	68.6	3823.7	285.3	12813.5
ROCH 7	MONROE	1.3	257.6	77.3	4637.2	337.5	18787.3
TOTAL		21.3	414.7	145.9	8460.9	622.8	31600.8

*UTILITY POLL(VILLAGE OF FREEPORT)%

POLLUTION IN TONS FOR VILLAGE OF FREEPORT 1976

POWER PLANT	COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
BUFFALO AVE.							
SUNRISE HWY.							
TOTAL							

UTIL POLL PER CTY%

POLLUTION IN TONS FOR NEW YORK STATE BY COUNTY 1976

COUNTY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
ALBANY	73.6	220.9	147.3	7732.9	589.2	26698.5
BROOME	.9	175.0	52.5	3150.0	229.3	9243.5
CHAUTAUQUA	3.0	608.5	182.6	10953.0	797.1	53182.9
CHENANGO	.5	97.0	29.1	1746.0	127.1	4681.2
ERIE	4.0	805.0	241.5	14490.0	1054.6	59344.6
GREENE						
KINGS	56.9	170.6	113.7	5968.9	454.7	1609.3
MONROE	21.3	414.7	145.9	8460.9	622.8	31600.8
NASSAU	113.7	341.3	227.4	11944.4	910.1	5975.8
NEW YORK	221.5	282.4	443.1	22994.9	1772.3	7026.5
ORANGE	249.0	12.2	498.1	25637.1	1992.3	40865.5
OSWEGO	96.7	290.2	193.5	10158.4	774.0	39995.2
QUEENS	479.5	1438.6	959.1	50348.9	3836.1	19486.3
RICHMOND	115.1	345.5	230.1	12081.2	920.5	4756.5
ROCKLAND	139.1	417.1	278.2	14600.5	1112.5	7073.5
SCHENECTA*	1.3	3.8	2.6	134.6	10.2	61.1
STEUBEN	1.0	204.5	61.4	3681.0	267.9	8470.4
SUFFOLK	321.0	963.1	642.0	33705.6	2568.1	117454.2
SULLIVAN						
TOMPKINS	1.9	376.0	112.8	6768.0	492.6	29004.6
ULSTER						
WESTCHEST*	2.5	7.4	5.0	260.2	19.8	102.4
YATES	1.0	193.0	57.9	3474.0	252.8	9974.2
TOTAL	1903.5	7366.8	4623.8	248290.5	18804.0	476607.0

UTIL POLL PER UTIL%

POLLUTION IN TONS FOR NEW YORK STATE BY UTILITY 1976

UTILITY	ALDEHYDES	CARBON MONO	HYDRO CARBON	NITROGEN OXIDE	PARTICULATES	SULFUR DIOXIDE
CENTRAL HUDSON	112.0	4.6	224.0	11529.8	896.0	16867.1
CITY OF JAMESTOWN						
CITY OF PLATTSBURGH						
CON ED	1014.6	2460.9	2029.2	*6115.0	8116.0	48570.5
LILCO	434.7	1304.4	869.4	45650.0	3478.2	123430.0
NIAGARA MOHAWK	247.1	1931.2	904.5	50520.5	3773.1	191281.3
NYSE+G	5.3	1045.5	313.7	18819.0	1369.7	61373.9
ORANGE+ROCKLAND	68.5	205.5	137.1	7195.3	548.2	3483.4
PASNY						
RG+E	21.3	414.7	145.9	8460.9	622.8	31600.8
VILLAGE OF FREEPORT						
TOTAL	1903.5	7366.8	4623.8	248290.5	18804.0	476607.0

APPENDIX C

COMPUTER OPERATIONS

Appendix C

Introduction

In this appendix we address the actual use of the county level data base and the analytic models of the NYSEIAS. For each model and the data base we review its use in a numerical problem indicating user operations at the access terminal. It is necessary to state though, that the contents of this appendix are not intended as a set of operating instructions and that user training in the operation of the several systems is required.

ESNS

If the user has successfully connected to intercom the system should respond with the following:

```
BROOKHAVEN INTERCOM 4.5
DATE  09/11/78
TIME  13.34.48.

PLEASE LOGIN
LOGIN ③

ENTER USER NAME-KATZ ③

########## ENTER PASSWORD-

ENTER PROBLEM NO-1347 ③


09/11/78   LOGGED IN AT  13.35.28.
           WITH USER-ID VN
           EQUIP/PORT 72/034


LOGIN       UPDATED 09/11/78  TODAY IS 09/11/78
  SCOPE 3.4.4 RELEASE


MON. 11 SEPT.
        FR-80 FILM PROCESSING IS BACKLOGGED EIGHT HOURS.
THUR 24 AUG.
            ATTENTION 110 BAUD DIALUP USERS.
        EFFECTIVE 0830 FRI 1 SEPT. , THE EXTENSION FOR 110 BAUD
        SERVICE WILL BE X7894.
 P1  MMKATZ                    PN001347
```

The user is first requested to identify himself to the system. This is accomplished by typing LOGIN (R) where (R) is the symbol which denotes pressing the carriage return key which involves the system program LOGIN. When requested enter your user name type: KATZ (R). When requested type your password: enter NEIL (R). (Note: the password is overprinted by the system for security reasons.) When asked type your problem number: 1347 (R) indicating the computer account number to which all charges are made. The system then responds with the date, time and message(s) of interest to users about the BNL system. At this point the user has gained access to Intercom and is requested to type further instruction:

```
COMMAND-
```

In order to retrieve the PERTURB program from disk storage enter the following:

```
COMMAND- ATTACH,PERTURBNY,ID=MALONE (R)
```

which should respond:

```
LFN IS
PERTURB
PF CYCLE NO. = 001
```

At this point the user is ready to call for the loading and execution of PERTURB which is accomplished by typing the single word PERTURB followed by a carriage return:

```
COMMAND- PERTURB (R)
```

The user is now running the PERTURB program and continues to be prompted for further information:

```
TYPE THE NAME OF YOUR FILE:
NEWYORK (R)

'PERTURB' GENERATES REQUESTS FOR DATA AND USES RESULTING
USER RESPONSES TO CONSTRUCT INPUT FILES FOR THE 'E SNS' MODEL

**TO ALL YES/NO QUESTIONS REPLY 'Y' FOR YES AND 'N' FOR NO.**

GIVE A FILE IDENTIFIER (ID) OF NINE OR LESS ALPHABETICAL CHARACTERS:
NYSED (R)

GIVE THE BASE YEAR FOR WHICH THE PERTURBATION IS TO BE PERFORMED:
1985 (R)

TYPE A TWO-LINE TITLE FOR THE ANALYSIS
SAMPLE OF PERTURB USAGE (R)
FOR NEW YORK 1985 DATA FILE (R)
```

The first question asks for the name of the data file to be perturbed, which in this case is NEW YORK. The user is then told to answer each question with either "Y" or "N" for any YES/NO type questions. Should an entry be made which is not a "Y" or an "N" to a YES/NO type question, the question will be printed again and another opportunity given to respond correctly. Following this you must enter a file identifier. This ID is used to store a copy of the file which PERTURB generates on user inputs. The user is then questioned as to which of the base years he wishes to work with, (1985 is shown in the sample) After entering the base year, type in a two-line title (maximum of 70 characters per line) which you wish to assign.

After completing the above the user is queried as to whether or not he wishes to make additions (in the form of added processes) to the basic New York RES.* Should this option be desired enter Y:

```
ARE PROCESSES TO BE ADDED TO THE BASIC SYSTEM?
Y (R)
```

The user then must indicate the number of processes (links) to be added along with the number of new additional node necessary to accomodate the added processes:

*For processes included in the basic NYS RES see Figure 7.

```
GIVE THE TOTAL NUMBER OF PROCESSES TO BE ADDED:
1

GIVE THE TOTAL NUMBER OF NODES TO BE ADDED:
1
```

In the above sample entries have been made to request the addition of one new process and one new node. Perturb then requests the user to place the newly added link(s) within the existing network by asking for the node of origin and node of destination).

```
LINK NUMBERS WILL BE PROVIDED AUTOMATICALLY IN
CONSECUTIVE ORDER STARTING WITH LINK 14 FOR THE  1
ADDED PROCCESSES. KEEP TRACK OF THESE NUMBERS FOR LATER USE.

GIVE (1)THE NODE OF ORIGIN,(2)THE NODE OF DESTINATION,
(3)THE SUPPLY OR UTILIZATION SECTOR CODE, AND (4)THE FUEL TYPE
CODE FOR ALL PROCESSES TO BE ADDED.
USE THE FORMAT: XXX,XXX,XX,XXX

FOR PROCESS NUMBER  1 WITH A LINK NUMBER OF 14 TO BE ADDED.
53,101,3,15

DESCRIBE ALL PROCESSES TO BE ADDED, USING
LESS THAN SEVENTY CHARACTERS PER PROCESS.

FOR PROCESS NUMBER  1:
A TITLE FOR NEW PROCESS 101
```

The above example adds a new process with node of origin 53, node of destination 101, sector code 3, fuel code 15. This process was given the arbitrary title "A title for new process 101".

After changes to the network itself have been made PERTURB allows the user to change the data associated with each process. The first data items which the user can change (or add to) are the "data elements". ("parameters"; e.g. tons SO_x emitted, occupational person-days, etc.) Note: At this point all parameters may be changed (or added to) except end use demands (parameters 10, 42, 43), market allocations (parameter 1) and efficiencies (parameter 2). These will be asked for in subsequent questions.

The above dialogue adds the efficiency for process number 101 to the input data (The efficiency index is one of the following:

41 - for activity level demands

42 - for direct fuel consumption

43 - for basic energy demand)

After completing efficiency data inputs the program turns to end use demand data. The first question asks if anything at all is to be done with demand data. Note the following four questions carefully as they determine <u>how</u> the user wants the demands changed or added to:

```
ARE ANY CHANGES OR ADDITIONS TO BE MADE TO THE DEMAND
VALUES?
Y (N)

ARE END USE DEMANDS TO BE SELECTED BY FUEL TYPE?
Y (N)

ARE END USE DEMANDS TO BE SELECTED BY DEMAND SECTOR?
Y (N)

IS MULTIPLICATION OF DEMANDS TO BE PERFORMED?Y

IS DIRECT REPLACEMENT OR ADDITION OF DEMANDS
TO BE PERFORMED?
Y (N)
```

The question "selection by fuel type" means the following: The user has the option of selecting (by utilization fuel) only specific end use demands, with all other demands being set to zero. As an example, if the user wanted to include only oil demands in the analysis (s)he would answer this question "Y", and enter the code for oil later (see below). When the time came to do the actual calculations ESNSALL would collect all oil demands from the base year data file, apply any user changes, then reset all non-oil demands to <u>zero</u>, and finally perform the calculations. This option finds its greatest utility when it is desired to analyze the effects of only a (or several) specific demand fuel type(s) on the overall RES. The question about "selection by demand sector" is exactly analogous to the above. If the user wishes to maintain only a selected subset of end use demands based on their sector

The dialogue to accomplish this goes as follows:

```
ARE ANY CHANGES OR ADDITIONS TO BE MADE TO
DATA ELEMENTS (PARAMETERS) OTHER THAN DEMANDS,
ALLOCATIONS, AND EFFICIENCIES?
Y (N)

ARE EXISTING PARAMETERS TO BE MODIFIED?
Y (2)

ARE NEW PARAMETERS TO BE ADDED?
Y (2)

FOR PARAMETERS TO BE MODIFIED, GIVE (1)THE
PROCESS NUMBER, (2)THE PARAMETER INDEX, AND (3)THE
NEW PARAMETER VALUE.
USE THE FORMAT: XXX,XX,X.XXXEXX,  AND TERMINATE WITH: -3,0,0.
[illegible] (2)
-3,0,0 (2)

FOR PARAMETERS TO BE ADDED, GIVE (1)THE PROCESS
NUMBER, (2)THE PARAMETER INDEX, AND (3)THE PARAMETER
VALUE.
USE THE FORMAT: XXX,XX,X.XXXEXX, AND TERMINATE WITH: -3,0,0.
[illegible] (2)
-3,0,
0 (2)
```

The above example changes existing parameter number 21 for process 26 to a new value of 1.8E + 01 and adds parameter number 21 for process 28. After changing and/or adding to parameters PERTURB asks if it is desired to add (or modify) efficiency data: (Remember that if you added one or more new processes, an efficiency has to be entered for each of these new links.)

```
EFFICIENCY VALUES MUST BE ENTERED FOR EACH NEW PROCESS
ADDED. EXISTING EFFICIENCIES MAY ALSO BE MODIFIED.
 1 NEW PROCESSES HAVE BEEN ADDED.

FOR EACH PROCESS REQUIRING NEW OR MODIFIED EFFICIENCIES ,
GIVE (1)THE PROCESS NUMBER, (2)THE EFFICIENCY INDEX,
AND (3)THE EFFICIENCY VALUE

USE THE FORMAT: XXX,XX,X.XXXXEXX. TERMINATE THE INPUT OF DATA WITH: -1,0
,0

READY:
[illegible] (2)


READY:
-1,0,0 (2)
```

(resetting the demands for all non-chosen sectors to zero) then answer this question "Y" and enter the chosen sector code(s) later (see below).

The question relating to "multiplication of demands" allows the analyst the capability of multiplying an end use demand by an arbitrary constant.

The final question asks about directly modifying or adding to existing demand data. Answer this question "Y" if it is desired to modify a demand value (already in the base file) and/or add a new demand value.

Each question in the above section merely indicated to the program how demand data was to be changed or added to. The next part of PERTURB asks what demand data is to be manipulated and requests entry of specific values for these changes/additions.

If the "Selection by fuel types" question was answered Y this section is called and the user enters the sector codes desired (as explained above):

```
GIVE THE TWO-DIGIT CODES CORRESPONDING TO DEMAND
FUEL TYPES SELECTED FOR THIS PERTURBATION.
REPLY USING THE FORMAT: XX, AND TERMINATE WITH: 99

CODE=23 (R)

CODE=25 (R)

CODE=99 (R)
```

Similarly, the chosen sector codes are input:

```
GIVE THE ONE-DIGIT CODES CORRESPONDING TO DEMAND
SECTORS SELECTED FOR THIS PERTURBATION.
REPLY USING THE FORMAT: X, AND TERMINATE WITH: 9

CODE=2 (R)

CODE=3 (R)

CODE=4 (R)

CODE=9 (R)
```

If arbitrary multiplication of demands is desired, the values for said multiplication are entered next (note this data is based on node number):

```
GIVE THE DEMAND NODE NUMBERS AND THE CORRESPONDING
DEMAND MULTIPLIERS. USE THE FORMAT: XXX,X.XXXE+XX,
AND TERMINATE WITH: 0,0.
[illegible],2.07E+00 (R)
0,0
```

For modification or addition to demand values the next question is pertinent:

```
FOR MODIFICATION OF INDIVIDUAL DEMANDS, GIVE (1) THE
DEMAND PROCESS NUMBER, (2)THE DEMAND TYPE INDEX, AND
THE NEW DEMAND VALUE.
USE THE FORMAT: X,X,X.XXXXEXX AND TERMINATE WITH: 0,0,0.
51,43,1.506E+13 (R)
0,0,0 (R)
```

As seen above, the demand for process number 51 has been changed to 1.506 x 10^{13} BTU. The demand type index referred to is one of the following:

- 10 - Activity level demands
- 42 - Direct fuel consumption
- 43 - Basic energy demand

After demand data inputs are completed, PERTURB asks the user about allocations:

```
ARE MODIFICATIONS TO BE MADE TO ALLOCATION VALUES?
Y (R)

ALLOCATION VALUES MUST BE SUPPLIED FOR NEW PROCESSES ADDED
TO THE BASE CASE. ALL PROCESSES TERMINATING AT A COMMON
NODE MUST HAVE ASSIGNED ALLOCATION VALUES THAT ADD UP
TO ONE.

FOR EACH PROCESS FOR WHICH A NEW OR MODIFIED
MARKET ALLOCATION IS DESIRED, GIVE (1)THE PROCESS
NUMBER, (2)THE ALLOCATION VALUE, AND (3)THE NODE
OF DESTINATION.
USE THE FORMAT: XXX,X.XXXXEXX,XXX AND TERMINATE WITH: -1,0,0
[illegible] (R)

-1,0,0 (R)
```

In this example the analyst has changed the allocation for process number 30 to 1.4×10^{-2}. New allocation values may also be added at this point.

The next two questions query the user as to how output from ESNSALL is to be presented. The user has the obtion of requesting that output be

```
ARE ALL  FUEL TYPES IN THE BASE PROCESS SET REQUIRED?
Y

ARE NEW FUEL TYPES TO BE ADDED AS OUTPUT?
Y

GIVE THE NEW FUEL TYPE CODES FOR WHICH OUTPUT
IS TO BE PRINTED.
USE THE FORMAT: XX, AND TERMINATE WITH: -1
[illegible]
-1
```

generated only for processes which utilize specific fuels. If a fuel is not selected for output, data associated with processes utilizing that fuel are still maintained, with all calculations involving that fuel carried out as normal. When output is generated, however, sections of the report dealing with those selected fuels will be supressed. (Note: this option should not be confused with one discussed earlier which allows end use demands to be zeroed by fuel.)

Should the user in the course of adding new processes define a new fuel type(s) he must declare it (then) by entering their code numbers in response to the second question of this section.

The next set of questions deal with whether or not data which the user has perturbed in a given year is to be propagated through subsequent pertubations.

```
ARE ALLOCATIONS, DEMANDS, OR EFFICIENCIES TO BE RESET
TO BASE CASE VALUES STORED FOR (ANY) PREVIOUS PERTURBATION?
Y

ARE ALLOCATIONS TO BE RESET?
Y

ARE DEMANDS TO BE RESET?
Y

ARE EFFICIENCIES TO BE RESET?
Y
```

That is, should the changes the user makes in the first perturbation be carried over into subsequent ones or should the data be reset between perturbations to its base case values. As can be seen from the above example, any or all of allocations, demands, or efficiencies can be reset between perturbations.

At this point, all user entries for a single perturbation have been completed. PERTURB informs the user of this and invites him/her to continue on to a new perturbation or submit the current data set for execution.

```
THE INPUT REQUIREMENTS FOR THIS PERTURBATION ARE
COMPLETE. ARE ANY MORE PERTURBATIONS TO BE PERFORMED?
N (R)

ARE OUTPUTS REQUIRED FOR EACH PROCESS IN ALL
PERTURBATIONS AS WELL AS FOR THE OVERALL PERTURBATION TOTALS?
Y (R)

TRAJECTORY FILE SUCCESSFULLY CATALOGUED.
```

Unless the user answers "Y" to the question regarding "outputs for each process" (s)he will receive only a summary sheet of the analysis.

When the message "ANALYSIS IN IN PROGRESS" appears PERTURB has dispatched requests to MFZ for the actual execution of user data.

```
ANALYSIS IS IN PROGRESS. WAIT ABOUT 5 MINUTES TO CHECK
IF THE ANALYSIS IS COMPLETED.

 THIS TERMINATES EXECUTION OF PERTURB.

      END  PERTURB
       .370 CP SECONDS EXECUTION TIME
COMMAND- F,ALL,USA.
```

A job can be tracked through the BNL system by the following command: F, ALL, NY. (R)

The response will look like this:

	INPUT	OUTPUT	EXECUTE	PUNCH	JANUS
MFA	00013	00164	00021	00012	00002
	NONE				
MFB	00024	00002	00011	00007	00001
	NONE				
MFZ	00256	00019	00022	00000	00003
			NYESN6Z		

The NYESN6Z is the name the system has assigned this New York ESNS job. The last 2 characters of this name will change each time PERTURB is run. When the job returns to the user's terminal (s)he can verify this fact by typing:

FILES (R)

If the job has returned the response will be:

```
--LOCAL FILES --
  * PERTURB
--REMOTE OUTPUT FILES--
  NYESN6Z
```

At this point the user must decide how the output is to be produced (on paper or microfiche):

a) Type: BATCH, NYESN6Z, LOCAL. (R)
   REWIND, NYESN6Z. (R)

b) to get output on paper type:
   ROUTE, NYESN6Z, DC=PR, TID=C, FID=*NYSEO. (R)

   <u>or</u>

c) to get output on fiche type:
   IDCARD, FICHE, $NYSEO$, $ESNSALL RUN$, PRFI.
   COPY, NYESN6Z, FICHE.
   RETURN, FICHE.

When the user is satisfied with the disposition of the output (s)he should type:

LOGOUT (R)

which ends the terminal session.

The Disaggregated Data Base - System 2000

The data bases of the New York Energy Information System (NYEIS) are as follows:

1. NYS 1976 - statewide energy demand-supply information for 1976.
2. NYS 1985 - statewide energy demand-supply projected to 1985.
3. NYSDB - contains county and utility level information on the supply and consumption of energy within New York State for the year 1976

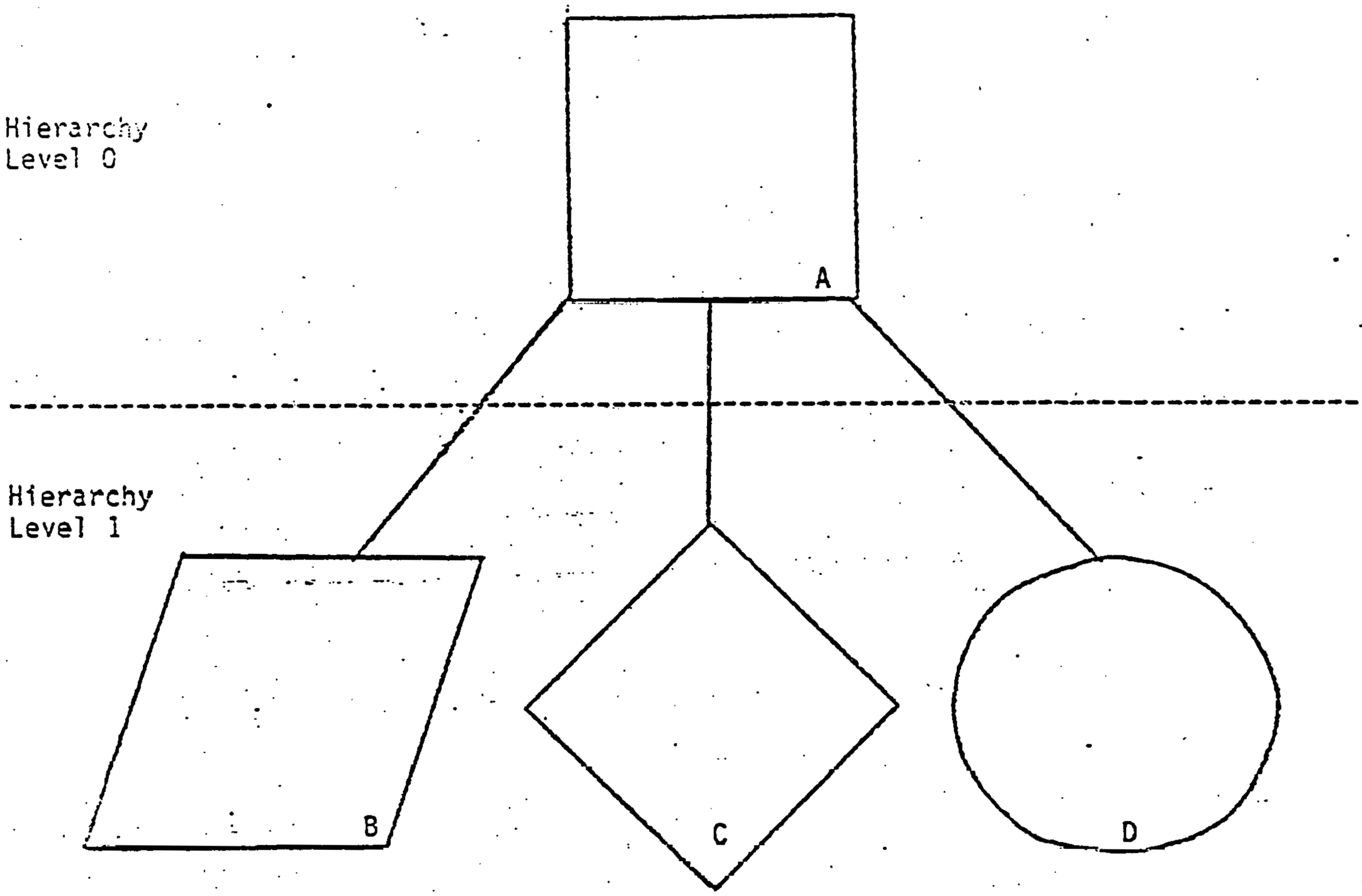
System 2000 Design Considerations

System 2000 portrays the data base in a hierarchical manner. As Figure 17 shows, the data is organized into groups which interrelate in a tree-structured (hierarchical) manner. The structure of the data base (i.e., its schema) is defined using System 2000's Define Module. The data definition language (ddl) categorizes the data into elements and repeating groups.

Elements are used for storing values, and can be of the types NAME, TEXT, INTEGER, DECIMAL, DATE or MONEY. Repeating groups specify which elements have multiple occurrences of data values and the relationships among elements in the hierarchy. The schema, in essence, is a data dictionary which describes the data elements and their relationships to each other.

The data definition language structures the data base in a hierarchy (Table 38). In Figure 18 the structure for the statewide data base discussed in greater detail in Section IV below, is illustrated. The selected structure takes advantage of the efficiency of a hierarchy. A region could have an end use demand that uses two technologies. A mechanism is needed to link the technology to its end-use, sub sector and region. One approach would be to keep subsector and region information with each set of end-use and technology. However, the hierarchical structure approach ensures that sector and region information appears only once in the data base, thereby eliminating redundancy. The hierarchical structure links the end use and technology to its proper region and subsector.

DEFINITION TREE



- The definition tree is the view of the data base that System 2000 sees.

- A is the ancestor of B, C and D; B, C, and D are the descendants of A.

- A, B, C, and D are repeating groups.

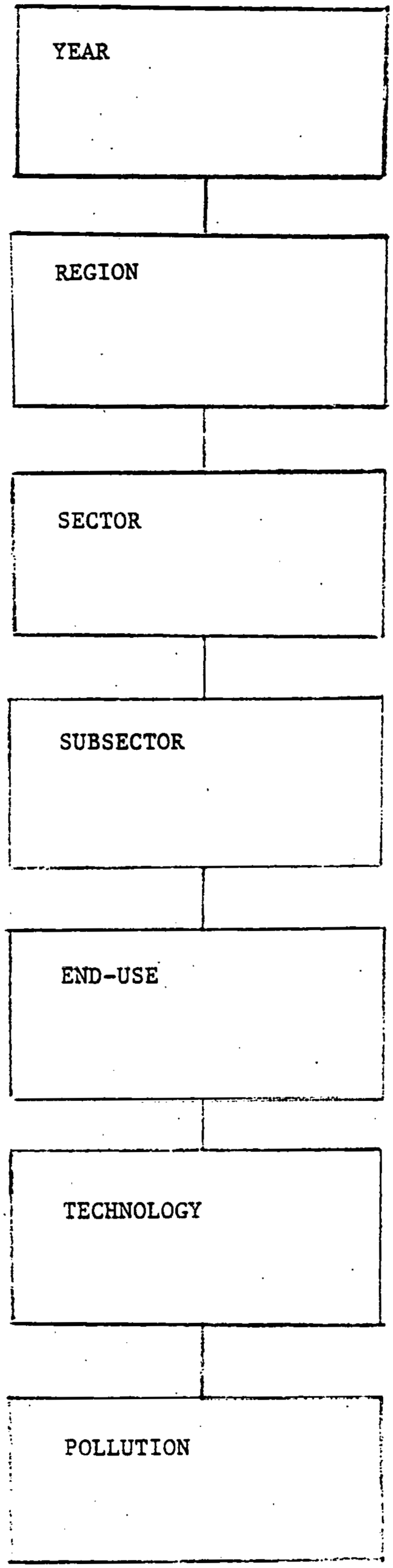
- A and B, A and C, A and D are families; B, C, and D are in different families and are called disjoint. B, C, and D relate to one another through A.

FIGURE 17: SYSTEM 2000 Data Definition Tree

Table 38. Data Elements

Region	SubSector	End-Use	Technology
Region Name	Region Name	Region Name	Region Name
Subsectors	Subsector Name	Subsector Name	Subsector Name
	End Uses	End Use Name	End Use Name
		Technologies	Technology
			Pollution Data

Figure 18. Statewide Data Base Structure



The detailed data base schema, including the specific data elements, is presented in Figure 19. The records are primarily organized by year and region; each logical entry in the data base is for one region for one year and the associated sector, subsector, end use, technology and pollution data. To expand on this concept, imagine Region X has two sectors (one and two) each with two subsectors (Gamma and Delta). Each of these subsectors has a cooking end use with Beta having a lighting end use as well. The logical entry for this Region for the year 1976 can be illustrated as in Figure 20, where the repeating groups sector, subsector and end use repeat for each set of data, while the common parent repeating group appears only once. This simple example, multiplied for each region forms the data base.

The NYSDB discussed more fully in Section IV below, has a more complicated structure. Most of the data elements are independent of each other (Table 39). Because of this independence the data base structure contains many siblings for each hierarchy level (Figure 21).

Statewide Data Bases

Two data bases were constructed to represent the 1976 and 1985 energy demands, NYS 1976 and NYS 1985. These data bases were constructed independently of ESNS. The fuel demands calculated within these data bases are the principal fuel demand inputs into ESNS, along with efficiencies and market allocations. (A detailed description of ESNS is included in Chapter II.)

Total demands for oil and oil products, natural gas, coal and electricity are aggregated from specific demand in the residential, commercial, industrial, transportation, governmental and agricultural sectors of New York State. The electrical sector supplies electric energy to the six sectors listed above and requires fuel inputs already mentioned in addition to uranium and hydropower. The energy requirements of a small utility steam sector are considered as well.

Future energy demand is projected by considering the underlying determinants of demand--the energy services required and the efficiencies with which various fuels are used to provide those services. More

Figure 19. Statewide Data Base Definition Tree Structure

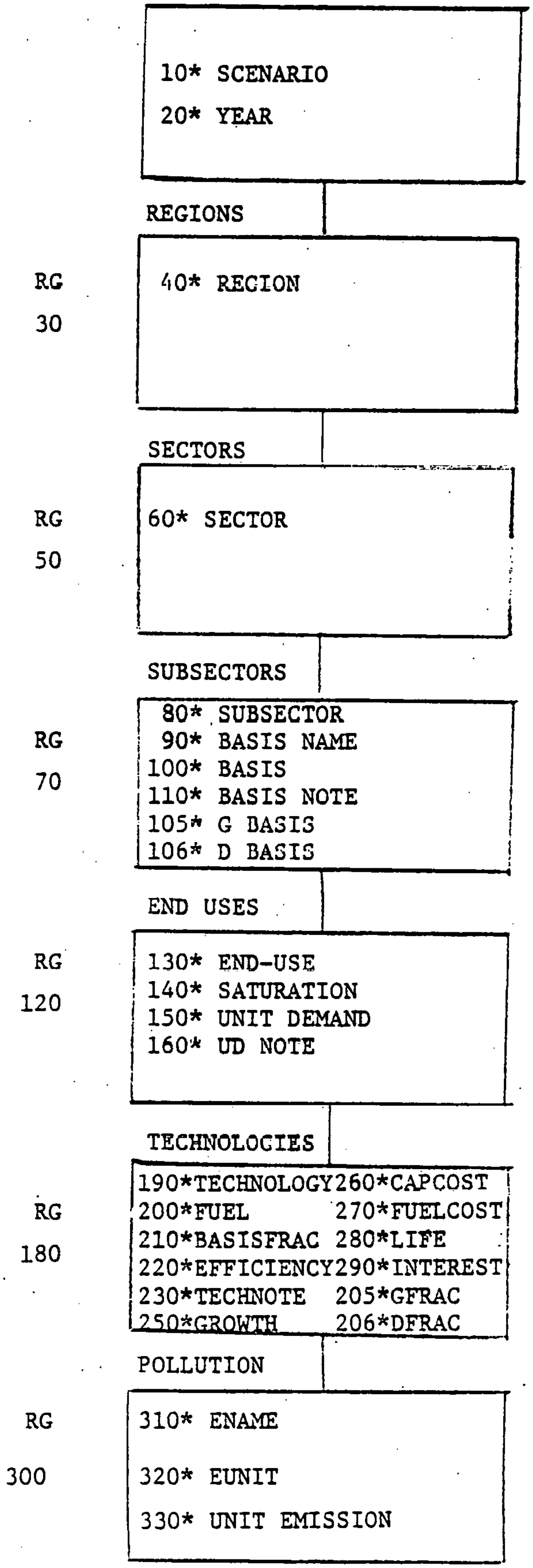


Figure 20. Statewide Data Base –
Example of a Logical Entry

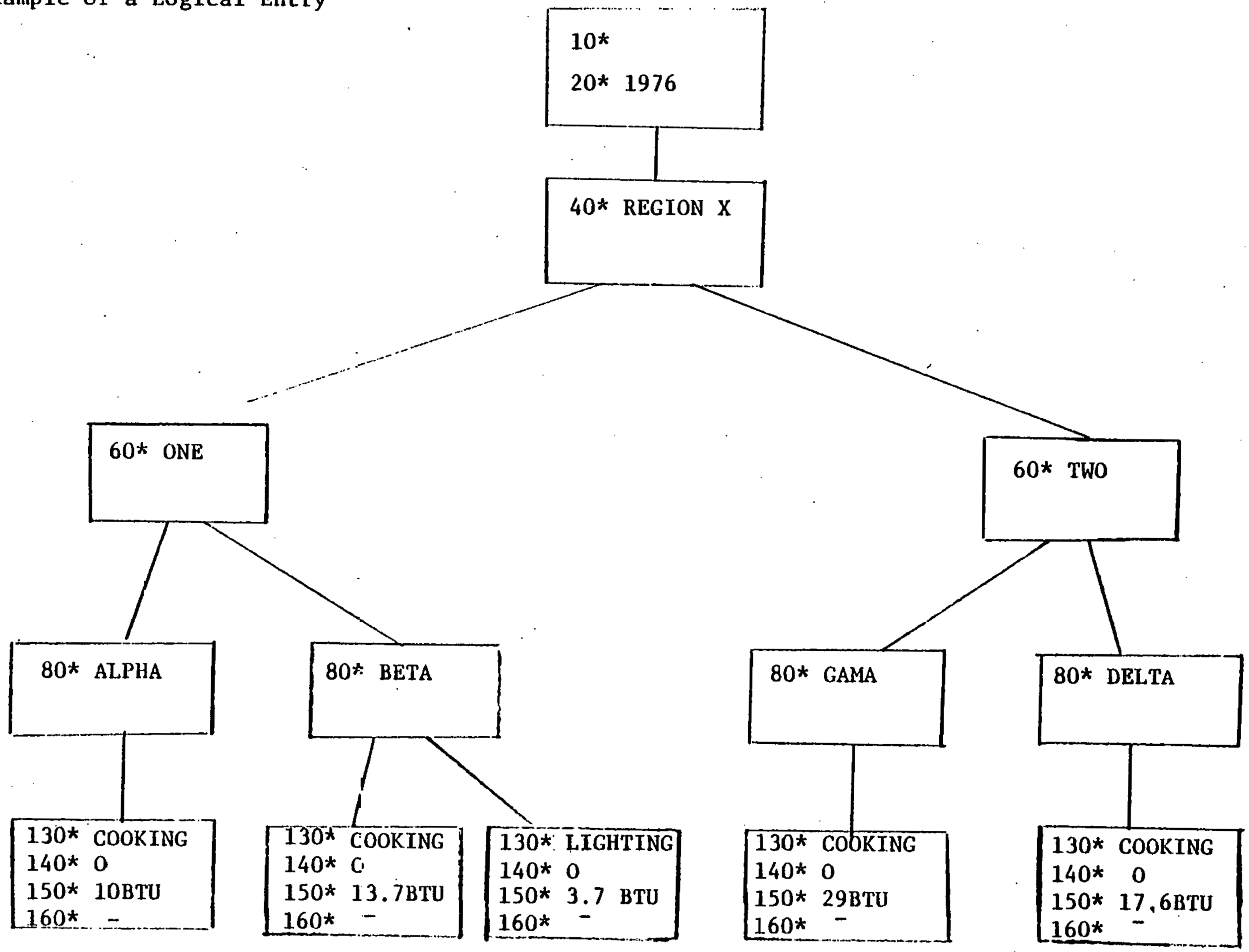
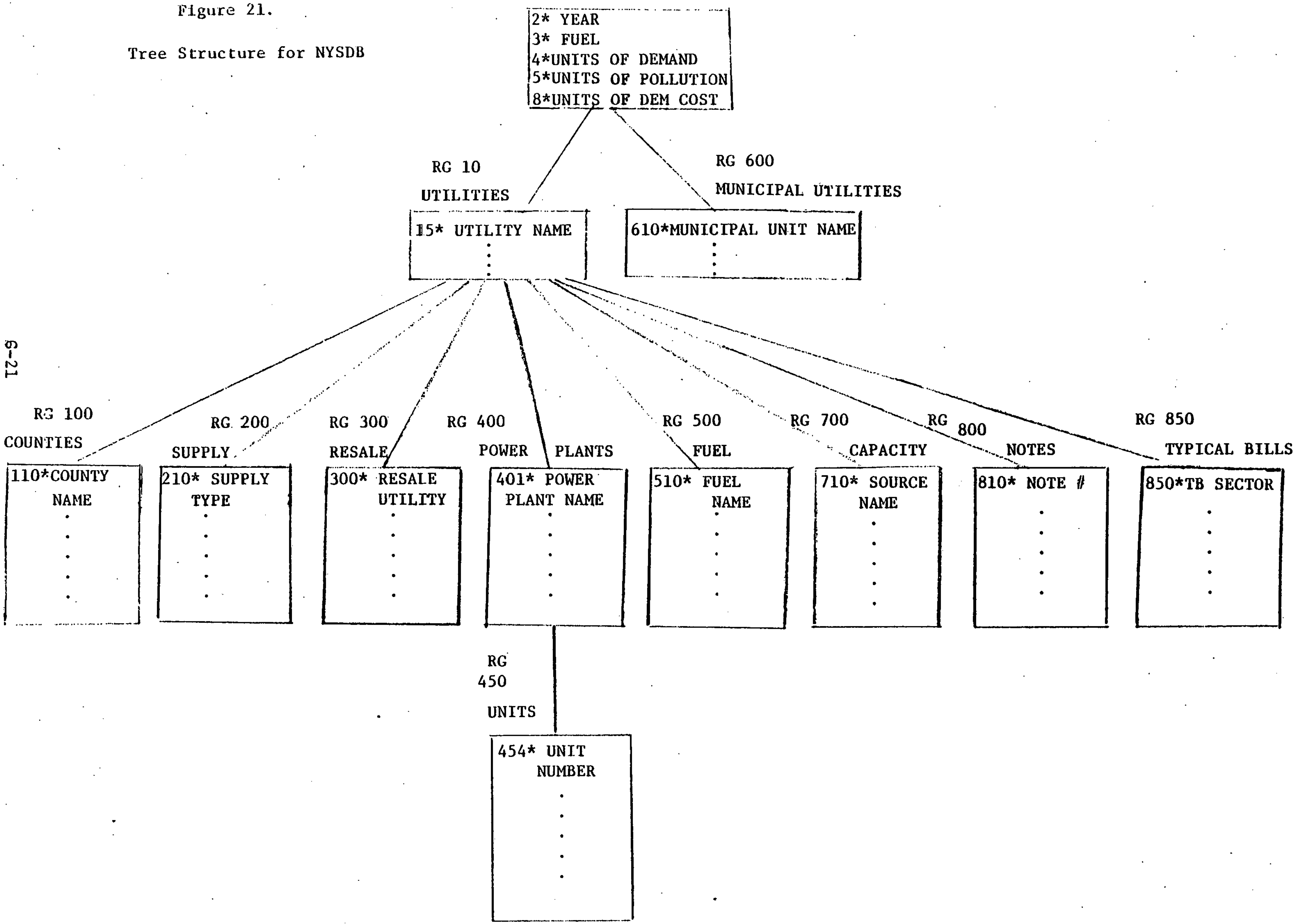


Table 39. Data Elements - NYSDB

Fuel	Utility	Power Plant Data
Year	Year	
Fuel Name	Fuel Name	
Utilities	Utility Name	
	Counties	
	Supply data	
	Resale data	
	Power plant data	
	Capacity data	Power plant name
	Notes	Unit data
	Typical Bills	
	Fuel data	

Figure 21.

Tree Structure for NYSDB



explicitly, the data listed below are included under the following headings.*

1.	Subsector	for example, in the transportation sector, passenger or freight, or in the residential sector, single family or high-rise dwellings.
2.	Basis	B, a projection variable which conveniently characterizes change in the subsector; for example, in the commercial sector the principal determinant of energy use is the amount of floorspace.
3.	Fuel Demand	D_i is the quantity of a fuel, i, actually consumed in a specific demand category, such as residential space heating or commercial air conditioning.
4.	Total Fuel Demand	D_s is the total fuel required to satisfy the requirements of a specific demand category. Electricity is considered as a fuel in this sense and $D_s = \sum_i D_i$.
5.	Relative System Efficiency	e_i, is the relative effectiveness with which fuel, i, is used in a demand category. This parameter depends on the utilization technology employed. For space heating, e_i for other structures are given in the fuel mix tables.
6.	Degree of Saturation	S, is the fraction of the potential demand for a particular energy use actually being fulfilled at a given time. For example, if 95% of all households have refrigerators and the potential demand for refrigerators is taken to be one per house, S = 0.95.

* This information was included in Chapter 2 in the discussion of the RES but is repeated here for convenience.

7. Unit Energy Demand — E_u, is the amount of energy per unit that would be required for a specific end use, assuming a relative system efficiency, e_i, of 100% for each fuel employed. Thus, for a given end use, the actual fuel demand per unit is E_u/e_i, where e_i is the actual relative system efficiency.

8. Technology Fraction — f_i is the number of energy consuming units satisfied by fuel i. $\Sigma f_i = S \cdot B$

By specifying the technology fraction, f_i, and relative system efficiency, e_i, the fuel demand D_i, can be derived by the equation:

$$D_i = E_u \times f_i \div e_i$$

<u>NYSDB</u>

The NYSDB which contains county and utility level information on the supply and consumption of energy within New York State for the year 1976 utilizes the System 2000 data management package. The five primary fuels analyzed were coal, electricity, natural. solid waste, gas, and petroleum. Details included for each fuel are listed below.

For coal:

1. Supply to a region by truck, rail or water
2. Consumption of bituminous coal by county for electric demand, industry, coking and others.
3. Consumption of anthracite coal by county.
4. A list of counties that have coal delivered by rail.

For electricity:

1. Average cost to the consumer of electricity by utility or county.
2. Consumption of electricity by residential, commercial-industrial or public authorities by county or utility.
3. Pollution generated by power plants or utilities.
4. Fuel consumed by power plants or utilities.

5. The New York Power Pool Report listing individual generating station capability.

6. Capacity and generation by utility.

7. Typical bills for each utility.

8. Transactions among utilities.

For natural gas:

1. Average cost to the consumer of natural gas by utility or county.

2. Consumption of natural gas by residential, commercial-industry or public authorities by county or utility.

3. Quantity supplied and cost of natural gas to utilities by type of transportation and company.

4. Quantity resold by one utility to another.

5. A list of counties that do not have access to natural gas.

6. Quantity of natural gas which is interruptible, firm, lost stored and internal use by utility.

For petroleum:

1. Consumption of petroleum by residential, commercial and transportation sectors by county and utility.

For solid waste:

1. BTU equivalent of solid waste generated by each county within an SMSA.

Using System 2000

There are two ways to retrieve data from the data base:

1. Natural Language
2. Report Writer

Natural Language is System 2000's English-like, interactive query language (see discussion below). Report Writer is a module which permits the user to compose and generate formatted reports.

Retrieval

Natural Language has two modes: Immediate Access and Queue Access. Immediate Access is oriented toward interactive use at a remote terminal, and provides data manipulation, analytic, update, and some formatting options. Queue Access is similar in syntax to Immediate Access, but is oriented toward processing a series of related transactions in a batch mode.

The basic form of Natural Language command consists of an action clause, and a where clause. Action commands include PRINT, LIST, TALLY, ADD, etc. The WHERE clause follows the operation or action section of a command, where the action may be retrieval or updating of data. For example, referring to Figure 4, imagine that Region X is one of a number of Regions with a cooking end use. To retrieve a list of all regions with a cooking end use from the data base one would structure a command such as:

LIST REGION WHERE END USE EQ COOKING %

Since System 2000 will recognize both the names and numbers of data elements the following command will be equivalent to the one above:

LIST C40 WH C130 EQ COOKING %

In addition to EQ, WHERE clause elements can be qualified with operators such as NE (not equal), GT (greater than), GE (greater than or equal to), LT (less than), LE (less than or equal to), SPANS (ranges of values), FAILS (value does not exist), and EXISTS (value does exist). Boolean Processing enables the user to relate the conditions with AND, OR and NOT, and with the HAS operators, to permit data in one hierarchical level to be qualified based on properties of data on another level. IF...THEN... ELSE... logic is possible in Queue Access.

The system functions of COUNT, SUM, AVERAGE, MAXIMUM, MINIMUM, and SIGMA (standard deviation) are built-in arithmetic commands. For example, to compute the average End Use demand for cooking by all Regions we issue the following command:

PRINT AVERAGE UNIT DEMAND WHERE END USE EQ COOKING %

Again the component number can be substituted giving the following equivalent command:

PRINT AVERAGE C150 WHERE C130 EQ COOKING %

Under-defined retrieval functions can be specified to supplement the system functions of COUNT, SUM, AVG, etc. These functions can be defined, stored in the data base, and then specified during a retrieval command.

The String capability allows the user to name and define a very complex or frequently used series of commands and store this string in the data base. Then, by simply typing the name of the string, System 2000 will automatically execute the commands.

Updates can be made in either the Queue or Immediate Access modes, depending on the size and nature of the updates. Updates can be qualified with a WHERE clause.

Examples of Applications

To familiarize the reader with the use and capabilities of the data base this section presents excerpts from terminal sessions which show examples of System 2000's Natural Language. After phoning in to the Brookhaven Intercom you will receive the following message requesting you to Login:

```
BROOKHAVEN INTERCOM 4.5
DATE  08/31/78
TIME  15.40.50.

PLEASE LOGIN
LOGIN,OWENS                             You type LOGIN, YOUR NAME

@@@@@@@@@@ ENTER PASSWORD-              Then type your PASSWORD and

ENTER PROBLEM NO- 1347                  your PROBLEM NUMBER


08/31/78   LOGGED IN AT  15.41.15.
           WITH USER-ID TJ
           EQUIP/PORT 73/010


LOGIN        UPDATED 08/30/78  TODAY IS 08/31/78
  SCOPE 3.4.4 RELEASE

MON. 28 AUG.
         THE CSCF WILL BE OPERATING WITH LIMITED STAFFING THROUGHOUT
         THE LABOR DAY HOLIDAY. SEE SYSBULL HOLIDAY FOR DETAILS.
```

The computer will then log you in and type the day's SYSBUL as shown above.

When the SYSBUL is finished printing you will be prompted by the printing of the word COMMAND -

```
COMMAND- ATTACH,S2K,ABSFIL6

 PF CYCLE NO. = 004
COMMAND- ETL,500

COMMAND- SCREEN,132

COMMAND- S2K

08/31/78  15.42.35. BEGIN SYSTEM 2000  VERSION 2.60D

\USER,NYSEO%

\DBN IS NYS1985%

-556-    ASSIGNED    NYS1985                    6     50 08/16/78   16.48.52.
```

ATTACH, S2K, ABSFIL 6	-	Brings the SAK software program to you.
ETL,500	-	Ups your CP time.
SCREEN, 132	-	Allows your terminal 132 characters per line.
S2K	-	Calls for your entry into S2K.
USER, NYSEO%	-	Puts you in control of your data bases.
DBN IS NYS1985%	-	Asks for access to the NYS1985 data base

We are now ready to retrieve information.

```
\PRINT SUBSECTOR WH SECTOR EQ COMMERCIAL%

      80* SERVICES
      80* HOSPITALS
      80* SCHOOL
      80* RETAIL
      80* OFFICE
```

This Command returns the five subsectors under Commercial.

```
---
PRINT END-USE WH SECTOR EQ COMMERCIAL%

        130* SPACE HEAT
        130* WATER HEAT
        130* APP-AUX EQUIP
        130* LIGHTING
        130* AIR COND
        130* SPACE HEAT
        130* WATER HEAT
        130* APP-AUX EQUIP
        130* LIGHTING
        130* AIR COND
        130* SPACE HEAT
        130* WATER HEAT
        130* APP-AUX EQUIP
        130* LIGHTING
        130* AIR COND
        130* SPACE HEAT
        130* WATER HEAT
        130* APP-AUX EQUIP
        130* LIGHTING
        130* AIR COND
        130* SPACE HEAT
        130* WATER HEAT
        130* APP-AUX EQUIP
        130* LIGHTING
        130* AIR COND
```

This command returns all END USES that have commercial as their sector.

These END USES are repeated five times, once for each of the subsectors under commercial.

If we wished to look at the END USES and UNIT DEMANDS of one subsector we would use the following command:

```
LIST END-USE+UNIT DEMAND WH C60 EQ COMMERCIAL AND SUBSECTOR EQ SCHOOL%

END-USE                UNIT DEMAND
***
* SPACE HEAT              80.000
* WATER HEAT              17.000
* APP-AUX EQUI            10.600
  P
* LIGHTING                15.440
* AIR COND                32.000
---
PRINT SUM UNIT DEMAND WH SAME%

SUM 150* 155.040
```

This command illustrates two concepts:

1. **The sum function returns the sum of the values of C150.**
2. **The SAME clause duplicates the previous WHERE clause.**

```
---
PRINT SIGMA UNIT DEMAND WH SAME%

SIG 150* 28.532
```

PRINT SIGMA returns the standard deviation at the values of C150.

UPDATING

To change the current value of a data element the CHANGE command is used

```
---
\CHANGE C150 EQ 32.001• WH SAME AND END-USE EQ AIR COND%
-        1  SELECTED DATA SETS -
---
\PRINT-C150 WH SAME%
          150•      32.001
```

- 1 SELECTED DATA SETS - This informs us that only one data set satisfied the WHERE clause.

The PRINT command verified the change.

If we wish to execute any of the reports listed in Appendix we simply give the command for that report.

```
---
\•POLLUTION•%
```

POLLUTANTS FROM THE COMBUSTION OF FOSSIL FUELS (TONS)
SCENARIO- BASE CASE 8/12/77 YEAR- 1985

SECTOR	PARTI- CULATES	NITRO- OXIDES	SULPHUR DIOXIDE	HYDRO- CARBONS	CARBON MONOXIDE	ALDEHYDES	CARBO N DIOXI DE
AGRICULTURE							
COMMERCIAL	23,092	94,298	46,796	4,939	30,573	3,410	41,433,327
GOVERNMENT	413	1,671	856	86	549	57	689,948
MANUFACTURING	76,028	48,273	78,442	3,272	4,702	1,429,012	22,568,393
RESIDENTIAL	21,052	27,761	52,249	6,162	12,187	80,551	58,709,286
TRANSPORT	84,556	401,630	31,241	422,750	2,812,990	29,502	71,248,568
ITAL	205,142	573,633	209,584	437,209	2,861,000	1,542,531	194,650,21

The above report writes more than 72 characters per line. If we wish we can write the above report to a local file which can be sent to a line printer when we return to INTERCOM .

```
\REPORT FILE IS ANYNAME%
---
\*POLLUTION*%
```

This command will write the next and ALL FUTURE commands output to local file ANYNAME.

A copy of the Report *POLLUTION* is now in local file ANYNAME and could be printed after leaving S2K.

We can change data bases by entering the CONTROL MODE and giving the command DATA BASE NAME IS.

```
---
\CONTROL%
---
\DBN IS NYSDB%
-506-   CLOSED     NYS1985          6    52 08/31/78  15.52.50.
-556-   ASSIGNED   NYSDB           91   710 08/30/78  15.48.01.

---
\PRINT RES DEMAND WH FUEL EQ GAS AND UTILITY NAME EQ LILCO%
       120*   14310373.00
       120*    1070563.00
       120*   12365625.00
---
\LIST RES DEMAND,COUNTY NAME WH SAME%
        RES DEMAND    COUNTY NAME
***
*      14310373.00    NASSAU
*       1070563.00    QUEENS
*      12365625.00    SUFFOLK
```

More examples of commands.

```
---
\PRINT AVG RES DEMAND,SUM RES DEMAND,SIGMA RES DEMAND WH SAME%

AVG 120* 9248853.667
SUM 120* 27746561.000
SIG 120*  -UNDEFINED VALUE-
```

Calling for execution of report.

```
---
\*COUNTIES IN REGION(ELEC,CON ED)%

 COUNTY NAME
***
* BRONX
* KINGS
* NEW YORK
* QUEENS
* RICHMOND
* WESTCHESTER
---
\EXIT%

-506-   CLOSED      NYSDB                  91    710 08/30/78   15.48.01
08/31/78  16.17.43. END   SYSTEM 2000  VERSION 2.60D
 STOP S2K
COMMAND- LOGOUT

CPA      32.504 SEC.       32.504 ADJ.
SYS TIME                  116.022
CONNECT TIME     0 HRS.    36 MIN.
 08/31/78  LOGGED OUT AT 16.17.58.
```

EXIT% - Lets you out of S2K and back into INTERCOM.

LOGOUT - Ends your terminal session.

NYS Temperature Sensitive Energy Demand Model

In Chapter 2 we described the temperature sensitive energy demand model in the paragraphs which follow we describe the actual operation of the computerized model. The section starts with a brief review of required inputs and outputs of the model and concludes with a typical computer run.

Region Definition

The sixty-two New York State counties were grouped into six regions based on three factors--primary utility serving the county, twenty-nine heating and cooling degree day normals, and geographical proximity. The first was of concern due to the use of utility-based data, and usually coincided with the third. The least variance in the degree day normals was chosen within this constraint.

Inputs to the Program

The program requires the following data:

1. Target year
2. Region (or entire state for which fuel demand change is to be computed)
3. Change in the number of cooling and heating degree days for the region(s) to be considered

Output of the Program

The user obtains the following information:

1. The housing mix and commercial floorspace for each of the end-uses, by subsector and fuel
2. Fuel efficiencies used
3. Change in fuel demand by sector and fuel

Options of the Program

1. County names. The names of the counties in each of the six regions are stored in the computer program's data base and can be recalled at the user's command when running the model. (They are listed in Table 16).

2. Changing the basic variables. The basic numbers (N^t_{ijl}, M^t_{ijl}, F_{il}, G_{il})* can be altered by the user. This option allows the user to study the effect on change in fuel demand of alternate fuel mixes in the residential or commercial subsectors, alternate saturations of air conditioning, and alternate projections of the basis variables. Any of the basis variables can be changed; instructions for the change command sequence are stored in the program.

3. Region. The user can study fuel demand change for one of the six regions in the state, or the entire state in one run of the program. If the latter option is chosen, the program will print out four tables containing the basis variables - space heat housing mix, air conditioning, housing mix, space heat commercial floorspace, and air conditioning commercial floorspace - for each of the six regions, for a total of 24 tables. This large output can be suppressed by the user, as shown in the attached sample run. Each of the end-use table types can be suppressed individually. The calculation of the change in fuel demand in all four end-uses will take place irregardless of the output suppression chosen. This is a useful option for studying the effect of a fuel demand change when altering the expected change in degree days while holding the basic variables constant.

4. Iterative runs. The program can be run repeatedly at the user's option. A command at the end of the program allows the calculation of fuel demand change to be re-computed, using the same values of the basic variables and fuel efficiencies as on the previous run. Thus, once changes are made on the basis variables stored in the program for the entire state (or one region), the user can study the effect on fuel demand change of further altering fuel efficiencies or basis variables, or entering different values for the heating and cooling degree day changes. Output suppression and change commands are allowed on iterative runs.

5. Fuel efficiency changes. Alternate scenarios providing for more efficient end-use demands can be tested in the program to study their effect on change in fuel demand. The fuel efficiencies stored in the program have been listed above; they can be changed by the user. (See Chapter 2).

*These variables are defined in Chapter II.

SAMPLE PROGRAM RUN: NYSEIS WEATER MODEL

A sample run on the NYSEIS Weather Model follows (page). It shows the commands necessary to run the program from the BNL Computer System, after logging in. All user entries are shown in either number or lower-case letters, typed after the prompting symbol "->"

The options the user has chosen are listed below.

1. A "1" has been entered, causing the program to display the main instructions.

2. The target year chosen is 1978.

3. The user has chosen to suppress commercial sector floorspace output by typing an "r"

4. Within the residential sector output to be shown, the user has chosen to see both end-uses by typing "bo"

5. The user has chosen to list the counties in region 6 by typing "6."

6. The user has chosen to change the fuel efficiencies in the residential sector by typing "r"

7. The user change the residential sector, air-conditioning end-use, central air conditioner type by entering "6,2.50"

8. The user has chosen to compute the change in fuel demand for region 6 of the state by typing "6"

9. The user has chosen to display the change command instructions by typing "2"

10. The user has changed the residential housing mix, air conditioning end-use, central air-conditioning type, single family subsector to 50000 units by typing "r,ac,2,1,50000."

11. The user has chosen to enter a second change command sequence by typing "1"

12. The user has changed the residential housing mix, space heat end-use, oil fuel type, high rise subsector, before 1970 construction, by typing the sequence "r,sh,2,8,900000."

13. The user has input a change of 100 heating degree days for the year 1978 in region 6 by typing "100"

14. The user has input a change of 100 cooling degree days for the year 1978 in region 6 by typing "100"

15. The user has chosen to make an iterative run by typing "r"

16. The user has chosen to suppress all output of the basis variables by typing "n"

17. The user has chosen to keep the fuel efficiencies as altered in the previous run by typing "x"

18. The user has chosen to make a further change on the residential housing mix by typing "1"

19. The user has chosen to change the residential sector, oil fuel type, single family subsector, built after 1970, to 90,000 by typing "r,sh,2,1,90000."

20. The user has entered a change in heating degree days of 1000 by typing "1000"

21. The user has entered a change in cooling degree days of 1000 by typing "1000"

22. The user has exited the program by typing "n"

USER ERRORS IN EXECUTING PROGRAM

The typical run (below) includes probable user errors and how to correct them. The first example shows entry of an invalid target year, and the program's response. The second example shows entry of an invalid output suppression command, and the program's response. The third example shows entry of the letter "x" for the region number to list the county names, and the program's response. Note that the error message was different than that which occurred after the first two sample mistakes. The user typed a "0" immediately following the word "field" in the error message. The fourth example shows entry of an invalid efficiency change command.

The fifth and sixth error examples show mistakes which can be made when entering change command sequences on the basis variables. The fifth example shows the input of an incorrect end-use which is more than two letters. The user retypes the line after the error message word "field", starting with the row of table data, not at the beginning of the line. The program responds with an error message, and the user re-enters the entire change command sequence. The sixth example shows the input of an incorrect two letter end-use--"ad". The program responds with an error message, and the user re-enters the entire line.

Monthly Heating and Cooling Degree Day Normals, 1941-1970, (Source (7))

Region Number	Region Name	Mean HDD (county)	Variance HDD	Mean CDD (county)	Variance CDD
1	Adirondacks	8,241	538	281	106
2	Hudson River Valley	6,458	504	599	146
3	Central	7,422	329	324	64
4	Great Lakes	6,802	361	493	79
5	Finger Lakes	6,910	379	451	142
6	Metro New York	5,307	315	792	182

The Mean HDD was calculated by averaging all the 29-year normals for each county in the region. The variance HDD reperesents the variance of those normals about the mean.

The mean CDD was calculated by averaging all the 29-year normals for each county in the region. The variance CDD represents the variance of those normals about the mean.

HDD = heating degree days

CDD = cooling degree days

Note: All User entries are in lower-case letters

```
COMMAND- attach,wftn,weatherftn,id=nyseo

 PF CYCLE NO. = 001
COMMAND- screen,132

COMMAND- wftn

 HELLO, THIS IS THE NYS ENERGY SYSTEM WEATHER MODEL

 TYPE 1 IF INSTRUCTIONS ARE NEEDED
 OR   0 TO CONTINUE PROGRAM
(1) -> 1
```

PURPOSE OF THE PROGRAM

THIS PROGRAM CALCULATES THE CHANGE IN FUEL DEMAND IN THE RESIDENTIAL AND COMMERCIAL SECTORS DUE TO A VARIATION IN WEATHER PATTERNS ACROSS THE STATE.

METHOD OF THE PROGRAM

HOUSING STOCK FOR 1970 IS PROJECTED TO THE TARGET YEAR IN WHICH FUEL DEMAND CHANGE IS TO BE CALCULATED, USING GROWTH RATES STORED IN THE PROGRAM. THE STOCK IS BROKEN INTO SIX REGIONS, FOUR HOUSING TYPES, AND TWO END USES.

COMMERCIAL FLOORSPACE FOR 1975 IS PROJECTED TO THE TARGET YEAR IN WHICH FUEL DEMAND CHANGE IS TO BE CALCULATED, USING GROWTH RATES STORED IN THE PROGRAM. THE FLOORSPACE IS BROKEN INTO SIX REGIONS, FIVE SUB-SECTORS, AND TWO END USES.

THE AMOUNT OF FLOORSPACE AND THE NUMBER OF HOUSEHOLD UNITS IN EACH CLASS IS THEN MULTIPLIED BY THE CHANGE IN THE NUMBER OF DEGREE DAYS FOR EACH REGION, DEGREE DAY-HOUSING TYPE FACTORS, AND ENERGY EFFICIENCIES TO DETERMINE THE CHANGE IN FUEL DEMAND FOR THE REGION.

INPUTS TO THE PROGRAM

THE CHANGE IN THE NUMBER OF COOLING AND HEATING DEGREE DAYS FOR EACH REGION OF THE STATE, AND THE YEAR WHEN THE CHANGE IN FUEL DEMAND WILL BE COMPUTED (1975-1985).

OPTIONS OF THE PROGRAM

(1) LIST THE COUNTIES IN EACH REGION
(2) CHANGE THE HOUSING MIX OR THE FLOORSPACE IN EACH REGION FOR THE TARGET YEAR
(3) CONSIDER FUEL DEMAND CHANGE IN ONE REGION
(4) CONSIDER FUEL DEMAND CHANGE IN THE ENTIRE STATE
(5) RUN THE PROGRAM ITERATIVELY, REUSING THE HOUSING MIX OR FLOORSPACE AS IT WAS CHANGED IN THE PREVIOUS RUN
(6) CHANGE THE EFFICIENCIES USED TO CALCULATE CHANGE IN FUEL DEMAND

Sample Weather Model Output — Page 1

Note: All user entries are in lower case letters, all comments are underlined

REGIONS OF THE STATE

<1> ADIRONDACKS
<2> HUDSON RIVER VALLEY
<3> CENTRAL
<4> GREAT LAKES
<5> FINGER LAKES
<6> METRO NEW YORK

TYPE THE TARGET YEAR AS XXXX
(2) -> 1978

```
OUTPUT OF THE RESIDENTIAL HOUSING MIX AND COMMERCIAL FLOORSPACE
CAN BE SUPPRESSED.  CALCULATION OF CHANGE IN FUEL DEMAND FOR BOTH
SECTORS WILL BE DONE, AND DISPLAYED.
TYPE R TO SEE ONLY RESIDENTIAL HOUSING STOCK
     C TO SEE ONLY COMMERCIAL FLOORSPACE
     B TO SEE BOTH FLOORSPACE AND HOUSING STOCK
     N TO SUPPRESS ALL OUTPUT
(3) -> r

RESIDENTIAL HOUSING STOCK WILL BE SHOWN

TYPE AC TO SEE ONLY AIR COND HOUSING MIX USED IN THE PROGRAM
     SH TO SEE ONLY SPC HEAT HOUSING MIX USED IN THE PROGRAM
     BO TO SEE BOTH HOUSING MIXES USED IN THE PROGRAM
     NO TO SUPPRESS OUTPUT OF BOTH HOUSING MIXES
(4) -> bo

BO HOUSING MIX(ES) WILL BE SHOWN

TYPE THE REGION NUMBER (1-6) TO LIST THE COUNTIES IN A REGION
OR    0 TO CONTINUE PROGRAM
(5) -> 6

THE COUNTIES IN REGION 6
  BRONX
  KINGS
  NASSAU
  NEW YORK
  QUEENS
  RICHMOND
  SUFFOLK
  WESTCHES

TYPE THE REGION NUMBER (1-6) TO LIST THE COUNTIES IN A REGION
OR    0 TO CONTINUE PROGRAM
-> 0

TYPE R TO CHANGE RESIDENTIAL FUEL EFFICIENCIES
     C TO CHANGE COMMERCIAL FUEL EFFICIENCIES
     D TO DISPLAY FUEL EFFICIENCIES USED IN PROGRAM
     X TO CONTINUE PROGRAM
(6) ->r
```

```
RESIDENTIAL FUEL EFFICIENCIES
SPACE HEAT                AIR CONDITIONING
CODE  FUEL    EFF         CODE  FUEL   EFF
  1   GAS     .75          5    ROOM   3.00
  2   OIL     .69          6    CNTRL  3.00
  3   ELEC   1.00
  4   OTHER   .35

ENTER CODE,NEW VALUE OF EFFICIENCY
-> 6,2.50


TYPE R TO CHANGE RESIDENTIAL FUEL EFFICIENCIES
     C TO CHANGE COMMERCIAL FUEL EFFICIENCIES
     D TO DISPLAY FUEL EFFICIENCIES USED IN PROGRAM
     X TO CONTINUE PROGRAM
->x


RESIDENTIAL FUEL EFFICIENCIES
SPACE HEAT                AIR CONDITIONING
CODE  FUEL    EFF         CODE  FUEL   EFF
  1   GAS     .75          5    ROOM   3.00
  2   OIL     .69          6    CNTRL  2.50
  3   ELEC   1.00
  4   OTHER   .35

COMMERCIAL FUEL EFFICIENCIES
SPACE HEAT                AIR CONDITIONING
CODE  FUEL    EFF         CODE  FUEL   EFF
  1   OIL     .52          4    ELEC   3.00
  2   GAS     .53          5    GAS    1.80
  3   STEAM   .65

TYPE THE NUMBER OF THE REGION (1-6) FOR WHICH CHANGE IN FUEL DEMAND IS TO BE COMPUTED
OR   0 TO COMPUTE FUEL DEMAND FOR ALL SIX REGIONS IN THE STATE
-> 6
```

NOTE: HOUSING MIX &/OR FLOORSPACE DATA IS USED TO COMPUTE FUEL DEMAND CHANGE

THE HOUSING MIX &/OR FLOORSPACE FOR THE REGION(S) CHOSEN IN THE YEAR 1978
78

SPACE HEAT HOUSING MIX, REGION 6 (NO. OF HOUSEHOLDS)

	BUILT AFTER 1970				BUILT BEFORE 1970			
FUEL	S.FAM	L.DENS	L.RISE	H.RISE	S.FAM	L.DENS	L.RISE	H.RISE
GAS	30328.	8760.	1813.	5477.	236516.	245204.	155372.	199578.
OIL	101512.	17181.	4481.	4786.	694909.	506461.	356879.	1165827.
ELEC	2261.	461.	125.	155.	14859.	8916.	7692.	21274.
OTHER	1986.	382.	0.	0.	14554.	21098.	25696.	75994.

AIR CONDITIONING HOUSING MIX, REGION 6 (NO. OF AIR COND UNITS)

	BUILT AFTER 1970				BUILT BEFORE 1970			
FUEL	S.FAM	L.DENS	L.RISE	H.RISE	S.FAM	L.DENS	L.RISE	H.RISE
ROOM	171324.	0.	0.	0.	797505.	424575.	276344.	711996.
CNTRL	55051.	48539.	0.	0.	78049.	21887.	0.	0.

TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
0 TO CONTINUE PROGRAM

(9) -> 2

ANY OF THE VALUES IN THE RESIDENTIAL AND COMMERCIAL SECTORS, EVEN
IF THEY ARE NOT PRINTED OUT ABOVE, CAN BE CHANGED IN THIS PART
OF THE PROGRAM. ALSO, EITHER END-USE IN THE SECTORS CAN BE CHANGED.

A STRING OF CODES IS NEEDED TO CHANGE THE VALUES.
THEY ARE LISTED BELOW:

WHEN DOING THE ENTIRE STATE—
<REG.NO.>,<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,
<REPLACEMENT VALUE><.>
WHEN DOING ONE REGION—
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,
<REPLACEMENT VALUE><.>

WHERE:
<REG. NO.> = REGION NUMBER, VALUE BETWEEN 1 AND 6
<SECTOR> = EITHER R OR C FOR RESIDENTIAL OR COMMERCIAL
<END-USE> = EITHER AC FOR AIR COND OR SH FOR SPACE HEAT
<ROW OF TABLE> = NUMBER OF ROW WHICH CONTAINS FUEL FOR VALUE TO BE CHANGED.
RESIDENTIAL SPACE HEAT- 1=GAS,2=OIL,3=ELEC,4=OTHER
RESIDENTIAL AIR COND- 1=ROOM,2=CNTRL
COMMERCIAL SPACE HEAT- 1=GAS,2=OIL,3=STEAM
COMMERCIAL AIR COND- 1=ELEC,2=GAS
<COLN OF TABLE> = NUMBER OF COLUMN WHICH CONTAINS SUB-SECTOR TO BE CHANGED
RESIDENTIAL—
AFTER 1970, 1=S.FAM,2=L.DENS,3=L.RISE,4=H.RISE
BEFORE 1970, 5=S.FAM,6=L.DENS,7=L.RISE,8=H.RISE
COMMERCIAL—
1=SCHOOLS,2=RETAIL,3=SERVICES,4=OFFICE,5=HOSPITAL
<REPLACEMENT VALUE> = NEW VALUE FOR HOUSING MIX OR FLOORSPACE IN THAT FUEL AND SUBSECTOR

ENTER CHANGE SEQUENCE:
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,<REPLACEMENT VALUE><.>
(10) -> r,ac,2,1,50000. — Period Must Be Typed at End of Change Sequence.

TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
0 TO CONTINUE PROGRAM
(11) -> 1

ENTER CHANGE SEQUENCE:
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,<REPLACEMENT VALUE><.>
(12) -> r,sh,2,8,900000.

TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
0 TO CONTINUE PROGRAM
-> 0

THE MODIFIED HOUSING MIX &/OR FLOORSPACE FOR THE REGION(S)
AND THE END USE(S) CHANGED ABOVE
ALL OTHER REGIONS AND END USES HAVE THE SAME HOUSING MIX &/OR FLOORSPACE LISTED ABOVE

SPACE HEAT HOUSING MIX, REGION 6 (NO. OF HOUSEHOLDS)

	BUILT AFTER 1970				BUILT BEFORE 1970			
FUEL	S.FAM	L.DENS	L.RISE	H.RISE	S.FAM	L.DENS	L.RISE	H.RISE
GAS	30328.	8760.	1813.	5477.	236516.	245204.	155372.	199578.
OIL	101512.	17181.	4481.	4786.	694909.	506461.	356879.	900000.
ELEC	2261.	461.	125.	155.	14859.	8916.	7692.	21274.
OTHER	1986.	382.	0.	0.	14554.	21098.	25696.	75994.

AIR CONDITIONING HOUSING MIX, REGION 6 (NO. OF AIR COND UNITS)

	BUILT AFTER 1970				BUILT BEFORE 1970			
FUEL	S.FAM	L.DENS	L.RISE	H.RISE	S.FAM	L.DENS	L.RISE	H.RISE
ROOM	171324.	0.	0.	0.	797505.	424575.	276344.	711996.
CNTRL	50000.	48539.	0.	0.	78049.	21887.	0.	0.

TYPE THE CHANGE IN THE NUMBER OF HEATING DEGREE DAYS FOR REGION 6
(13) IN YEAR 1978
-> 100

TYPE THE CHANGE IN THE NUMBER OF COOLING DEGREE DAYS FOR REGION 6
(14) IN YEAR 1978
->100

CHANGE IN SPACE HEAT FUEL DEMAND (1E09 BTU)

REG	RESIDENTIAL GAS	RESIDENTIAL OIL	RESIDENTIAL ELEC	RESIDENTIAL OTHR	COMMERCIAL OIL	COMMERCIAL GAS	COMMERCIAL STEAM	TOTALS OIL	TOTALS GAS	TOTALS RESID	TOTALS COMML
6	860.6	2625.9	38.4	223.7	4911.3	466.0	626.5	7537.2	1326.6	3748.7	6003.8
TOT	860.6	2625.9	38.4	223.7	4911.3	466.0	626.5	7537.2	1326.6	3748.7	6003.8

CHANGE IN AIR CONDITIONING FUEL DEMAND (1E09 BTU)

REG	RESIDENTIAL ROOM	RESIDENTIAL COMML	COMMERCIAL ELEC	COMMERCIAL GAS	TOTAL ELEC	TOTAL GAS	TOTAL RESID	TOTAL COMML
6	919.7	137.7	609.8	29.4	1667.2	29.4	1057.4	639.2
TOT	919.7	137.7	609.8	29.4	1667.2	29.4	1057.4	639.2

TO RERUN THE PROGRAM, STARTING WITH THE SAME HOUSING
MIX IN REGION 6 LISTED ABOVE, TYPE R.
TO END THE PROGRAM, TYPE N.

(15) -> r

OUTPUT OF THE RESIDENTIAL HOUSING MIX AND COMMERCIAL FLOORSPACE
CAN BE SUPPRESSED. CALCULATION OF CHANGE IN FUEL DEMAND FOR BOTH
SECTORS WILL BE DONE, AND DISPLAYED.
TYPE R TO SEE ONLY RESIDENTIAL HOUSING STOCK
C TO SEE ONLY COMMERCIAL FLOORSPACE
B TO SEE BOTH FLOORSPACE AND HOUSING STOCK
N TO SUPPRESS ALL OUTPUT

(16) -> n

NO FLOORSPACE OR HOUSING STOCK WILL BE SHOWN

TYPE THE REGION NUMBER (1-6) TO LIST THE COUNTIES IN A REGION
OR 0 TO CONTINUE PROGRAM
-> 0

```
TYPE R TO CHANGE RESIDENTIAL FUEL EFFICIENCIES
     C TO CHANGE COMMERCIAL FUEL EFFICIENCIES
     D TO DISPLAY FUEL EFFICIENCIES USED IN PROGRAM
     X TO CONTINUE PROGRAM
(17) ->x


RESIDENTIAL FUEL EFFICIENCIES
SPACE HEAT               AIR CONDITIONING
CODE  FUEL    EFF        CODE  FUEL   EFF
  1   GAS      .75         5   ROOM   3.00
  2   OIL      .69         6   CNTRL  2.50
  3   ELEC    1.00
  4   OTHER    .35

COMMERCIAL FUEL EFFICIENCIES
SPACE HEAT               AIR CONDITIONING
CODE  FUEL    EFF        CODE  FUEL   EFF
  1   OIL      .52         4   ELEC   3.00
  2   GAS      .53         5   GAS    1.80
  3   STEAM    .65

TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
     1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
     0 TO CONTINUE PROGRAM
(18) -> 1


ENTER CHANGE SEQUENCE:
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,<REPLACEMENT VALUE><.>
(19) -> r,sh,2,1,90000.


TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
     1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
     0 TO CONTINUE PROGRAM
-> 0
```

THE MODIFIED HOUSING MIX &/OR FLOORSPACE FOR THE REGION(S)
AND THE END USE(S) CHANGED ABOVE
ALL OTHER REGIONS AND END USES HAVE THE SAME HOUSING MIX &/OR FLOORSPACE LISTED ABOVE

SPACE HEAT HOUSING MIX, REGION 6 (NO. OF HOUSEHOLDS)

	BUILT AFTER 1970				BUILT BEFORE 1970			
FUEL	S.FAM	L.DENS	L.RISE	H.RISE	S.FAM	L.DENS	L.RISE	H.RISE
GAS	30328.	8760.	1813.	5477.	236516.	245204.	155372.	199578.
OIL	90000.	17161.	4481.	4786.	694909.	506461.	356879.	900000.
ELEC	2261.	461.	125.	155.	14859.	8916.	7692.	21274.
OTHER	1986.	382.	0.	0.	14554.	21098.	25696.	75994.

TYPE THE CHANGE IN THE NUMBER OF HEATING DEGREE DAYS FOR REGION 6
IN YEAR 1978
(20) -> 1000

TYPE THE CHANGE IN THE NUMBER OF COOLING DEGREE DAYS FOR REGION 6
IN YEAR 1978
(21) ->1000

CHANGE IN SPACE HEAT FUEL DEMAND (1E09 BTU)

	RESIDENTIAL				COMMERCIAL			TOTALS		TOTALS	
REG	GAS	OIL	ELEC	OTHR	OIL	GAS	STEAM	OIL	GAS	RESID	COMML
6	8606.1	26025.6	384.4	2237.2	49113.1	4659.9	6265.2	75138.7	13266.0	37253.3	60038.2
TOT	8606.1	26025.6	384.4	2237.2	49113.1	4659.9	6265.2	75138.7	13266.0	37253.3	60038.2

CHANGE IN AIR CONDITIONING FUEL DEMAND (1E09 BTU)

	RESIDENTIAL		COMMERCIAL		TOTAL		TOTAL	
REG	ROOM	COMML	ELEC	GAS	ELEC	GAS	RESID	COMML
6	9197.3	1377.0	6098.2	294.3	16672.5	294.3	10574.3	6392.5
TOT	9197.3	1377.0	6098.2	294.3	16672.5	294.3	10574.3	6392.5

TO RERUN THE PROGRAM, STARTING WITH THE SAME HOUSING
MIX IN REGION 6 LISTED ABOVE, TYPE R.
TO END THE PROGRAM, TYPE N.
(22) -> n

END WEATHER
.564 CP SECONDS EXECUTION TIME

COMMAND-

Sample Weather Model Output with User Errors — Page 1.

```
TYPE THE TARGET YEAR AS XXXX
-> 1986
```

User typed target year larger than 1985

(1)

```
YOU MADE A MISTAKE! TRY AGAIN—

TYPE THE TARGET YEAR AS XXXX
-> 1985

OUTPUT OF THE RESIDENTIAL HOUSING MIX AND COMMERCIAL FLOORSPACE
CAN BE SUPPRESSED.  CALCULATION OF CHANGE IN FUEL DEMAND FOR BOTH
SECTORS WILL BE DONE, AND DISPLAYED.
TYPE R TO SEE ONLY RESIDENTIAL HOUSING STOCK
     C TO SEE ONLY COMMERCIAL FLOORSPACE
     B TO SEE BOTH FLOORSPACE AND HOUSING STOCK
     N TO SUPPRESS ALL OUTPUT
```

(2) -> 0

User typed the output suppression command incorrectly.

```
YOU MADE A MISTAKE! TRY AGAIN—

OUTPUT OF THE RESIDENTIAL HOUSING MIX AND COMMERCIAL FLOORSPACE
CAN BE SUPPRESSED.  CALCULATION OF CHANGE IN FUEL DEMAND FOR BOTH
SECTORS WILL BE DONE, AND DISPLAYED.
TYPE R TO SEE ONLY RESIDENTIAL HOUSING STOCK
     C TO SEE ONLY COMMERCIAL FLOORSPACE
     B TO SEE BOTH FLOORSPACE AND HOUSING STOCK
     N TO SUPPRESS ALL OUTPUT
-> n

NO FLOORSPACE OR HOUSING STOCK WILL BE SHOWN

TYPE THE REGION NUMBER (1-6) TO LIST THE COUNTIES IN A REGION
OR   0 TO CONTINUE PROGRAM
```

(3) -> x ← User typed a letter for the region number.

```
      X < ERROR, RETYPE RECORD AT THIS FIELD 0
```

User correction

```
TYPE R TO CHANGE RESIDENTIAL FUEL EFFICIENCIES
     C TO CHANGE COMMERCIAL FUEL EFFICIENCIES
     D TO DISPLAY FUEL EFFICIENCIES USED IN PROGRAM
     X TO CONTINUE PROGRAM
```

(4) ->z

User typed an incorrect efficiency change command

```
YOU MADE A MISTAKE! TRY AGAIN—

TYPE R TO CHANGE RESIDENTIAL FUEL EFFICIENCIES
     C TO CHANGE COMMERCIAL FUEL EFFICIENCIES
     D TO DISPLAY FUEL EFFICIENCIES USED IN PROGRAM
     X TO CONTINUE PROGRAM
->x
```

Sample Weather Model Output with User Errors — Page 2.

```
TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
     1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
     0 TO CONTINUE PROGRAM
-> 1


ENTER CHANGE SEQUENCE:
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,<REPLACEMENT VALUE><.>
```

5 `-> r,ssh,2,8,900000.` ← (1) User typed an incorrect end-use - "ssh".

```
  R,SSH, < ERROR, RETYPE RECORD AT THIS FIELD2,8,900000.
```

(2) User retypes line, starting with the information following the incorrect data.

```
YOU MADE A MISTAKE! TRY AGAIN—
```

(3) Program displays error message

```
TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
     1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
     0 TO CONTINUE PROGRAM
-> 1
```

(4) User re-enters the entire original line.

```
ENTER CHANGE SEQUENCE:
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,<REPLACEMENT VALUE><.>
-> r,sh,2,8,900000.


TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
     1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
     0 TO CONTINUE PROGRAM
-> 1


ENTER CHANGE SEQUENCE:
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,<REPLACEMENT VALUE><.>
```

6 `-> r,ad,1,1,160000.` — (1) User typed an incorrect end-use - "ad"

```
YOU MADE A MISTAKE! TRY AGAIN—

TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
     1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
     0 TO CONTINUE PROGRAM
-> 1
```

(2) User retypes entire original line

```
ENTER CHANGE SEQUENCE:
<SECTOR>,<END-USE>,<ROW OF TABLE>,<COLN OF TABLE>,<REPLACEMENT VALUE><.>
-> r,ac,1,1,160000.


TYPE 2 TO DISPLAY INSTRUCTIONS ON HOW TO CHANGE THE VARIABLES ABOVE
     1 TO ENTER CHANGE SEQUENCE ON FLOORSPACE OR HOUSING MIX
     0 TO CONTINUE PROGRAM
-> 0
```

```
        screen,132

COMMAND- etl,500

COMMAND- attach,price,id=nyseo,mr=1.

 PFN IS
 PRICE
 PF CYCLE NO. = 001
COMMAND- price.

        WELCOME TO THE SHORT TERM PRICE ELASTICITY MODEL OF
             THE NEW YORK STATE ENERGY INFORMATION SYSTEM

         1=RESIDENTIAL-COMMERCIAL      2=INDUSTRIAL
    WHICH SECTOR DO YOU WANT (1 OR 2)>>2


    THESE ARE THE ELASTICITIES FOR INDUSTRIAL

                     1          2          3          4
                    GAS        OIL        ELEC       COAL

    GAS (1)        -.070       .010       .030       .010

    OIL (2)         .060      -.110       .030       .010

    ELEC(3)         .060       .010      -.110      -.010

    COAL(4)         .060       .010       .030      -.100

    DO YOU WANT TO CHANGE ANY ELASTICITY(Y OR N)>>n

   PLEASE INPUT CURRENT DEMAND,BLANK,CURRENT PRICE,BLANK,FUTURE PRICE
                 IN REAL NUMBERS FOR:
        GAS>>575  30.  60

        OIL>>2067 33 66

        ELEC>>375. 100. 130

        COAL>>65 35 45


                              PRESENT                              FUTURE
    FUEL                 DEMAND         PRICE              DEMAND            PRICE
    GAS                  575.00     30.0000000             547.32       60.0000000
    OIL                 2067.00     33.0000000            1988.16       66.0000000
    ELEC                 375.00    100.0000000             387.80      130.0000000
    COAL                  65.00     35.0000000              68.28       45.0000000

    WOULD YOU LIKE TO RUN THE MODEL AGAIN (Y OR N)>>n

    STOP
      .052 CP SECONDS EXECUTION TIME
 COMMAND-
```

Short Term Price Elasticity Model

The Short Term Price Elasticity Model described fully in Chapter 2, contains elasticities for two sectors and four fuels. The elasticity E_{ijk} denotes the electricity of demand of fuel "j" with respect to the price of fuel "k" in sector "i". The user selects one of the two sectors and then inserts, for each of the four fuels "j", the following information:

1) Current demand: d^c_{ij}

2) Current price: p^c_j

3) Future price: p^f_j

The program then returns the future demands: "d^i_{ij}" for the four fuels for which elasticities are designated. The equation used to compute future demand for fuel "j" in sector "i" is:

$$d^f_{ij} = \left[1 + \sum_{k=1}^{4} \frac{(Pk^f - Pk^c)}{Pk^c} = E_{ijk} \right] d^c_{ij}$$

A sample run of the program is shown below.