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Maine Comprehensive Energy Plan, 1978 Edition

Maine Office of Energy Resources

MAINE COMPREHENSIVE ENERGY PLAN

1978 EDITION

D R A F T

Prepared By

THE MAINE OFFICE OF ENERGY RESOURCES

July 31, 1978

MAINE COMPREHENSIVE ENERGY PLAN-1978 EDITION

Chapter I

Introduction

In December of 1976 the Maine Office of Energy Resources (OER) presented the first Maine Comprehensive Energy Plan to the people of Maine.

The primary effort of this document is to update the 1976 plan with particular emphasis on the data base. This revision will reflect the latest consumption and demand data rather than the 1974 data utilized in the original plan. This revision will also present Maine's present energy posture in terms of both supply and demand, and the implications of our present energy position on Maine's social and economic future will be discussed.

Consideration will be given to issues regarding our future energy mix and the various options which exist to deter Maine's growing and continued dependence of finite and costly petroleum resources. Discussion of Maine's energy options will be limited at this time to an outline of those energy forms and systems which could contribute to a reduced dependence on petroleum. These will be examined in much greater detail later this year when OER presents an energy strategy for Maine.

Although this document presents some conclusions and recommendations, the attempt is primarily to provide Maine people, the Legislature and the Governor with a foundation from which energy policy issues can be raised, discussed, and solutions can be sought. An energy educated public is prerequisite to finding solutions to our energy dilema. Additionally, concerned decision makers have to be well-informed to make wise choices on the crucial energy issues that they will have to address in the years ahead.

This update of Maine's energy consumption and demand data reveals that our energy problem has worsened since 1974. The State of Maine presently relies on

petroleum for 81% of its energy requirements as opposed to 75% in 1973. Fully 64% of our total energy needs is contingent upon petroleum supplied by foreign countries.* Energy consumption in Maine is once again on the rise after initial drops in 1974 and 1975. In 1976 petroleum consumption increased by 7.4% over 1975. Overall energy demand increased 9.6% over the same period.**

Certainly, the time has come to reduce our overreliance on petroleum energy, especially imported petroleum. It is with the above points and concerns in mind that the OER presents this revision to the 1976 plan.

The Data

The latest year for which data is available that is comparable to the original data is 1975. However, other sources have been generated which carry the trends through 1976, with only slight variations from prior year data used in the original 1976 plan. These variations are minor enough to allow some comparison such that the trends in fuel and total energy consumption can be updated through 1976, allowing some more meaningful analysis of the post-embargo period than was possible in the earlier edition of this Comprehensive Energy Plan. Where significant differences do occur, attempts will be made to explain the variations and bring the data into a range of comparability.

The data base on which we are relying for this update is one generated by Clark Associates of Menlo Park, California for the "Forum Data Handbook for New England Energy Alternatives" prepared by the Mitre Corporation for the U.S. Department of Energy. That data base, in turn, relies heavily upon data generated by the U.S.Bureau of Mines and methodologies used in the Arthur D. Little study, "Historical Data on New England's Energy Requirements, 1962-1972", prepared for the New England Regional Commission in September 1974.

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* includes indirect imports
** includes electrical exports

Chapter II - Trends in Energy Demand in Maine

Introduction

The Maine Comprehensive Energy Plan, 1976 Edition, described in detail the trends in energy demand in Maine, by end use sector* from 1950 through 1974. Figures 1 and 2 are reproduced from that document and show these historical trends, Figure 1 in BTU's of energy consumption and Figure 2 in terms of percentage of total energy consumed in Maine, so that sectoral distribution, and any shifts in that sectoral distribution, could be identified.

Figure 2 indicates that the Transportation and Commercial end use sectors are growing relatively faster in their annual rate of energy consumption than are the other end use sectors. This conclusion seems to be reasonable on the premise that we are becoming a motorized, commuting, service-oriented society. This update to 1975 and 1976 data does not contradict this conclusion and indicates that the trend is continuing with the commercial and transportation sectors consuming even larger shares of our total state energy use, and the residential and industrial sectors consuming smaller shares. Table 1 details the total energy use in Maine by end use sector, in BTU's and by proportion of total energy use, for the period 1974-1976.

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* Note: The end use sectors are: "Residential", "Commercial", "Industrial", "Transportation", "Miscellaneous", and "Transmission Losses and Unaccounted For". Energy exports are treated as a special case.

Note: The data presented in this section must be considered preliminary and is subject to revision in succeeding drafts of this document. It should be particularly noted that some of the extreme variations in fuel use in specific sectors between 1974 and 1975 are due to use of a different data base than that used in the 1976 Edition of this plan. Unless otherwise noted, the sources for all data in this chapter are: "Maine Comprehensive Energy Plan, 1976 Edition", by the Maine Office of Energy Resources; "Forum Data Handbook for New England Energy Alternatives, Volume II, Today's Energy System Description", by the Mitre Corporation for the U.S.Dept.of Energy, and computations by the Maine Office of Energy Resources.

FIGURE 1

ULTIMATE USES OF ENERGY IN MAINE, 1950 - 1974

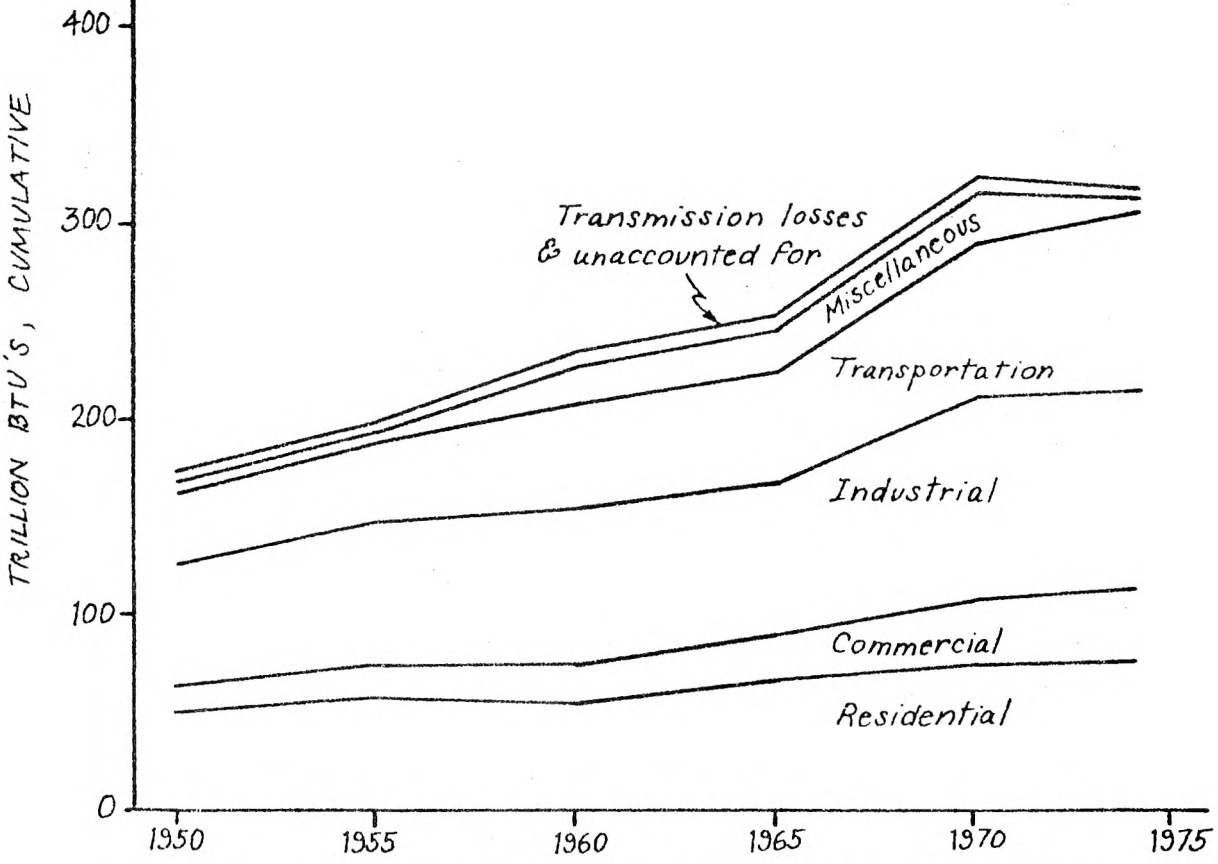


FIGURE 2 - ULTIMATE USES OF ENERGY, AS % OF TOTAL DEMAND

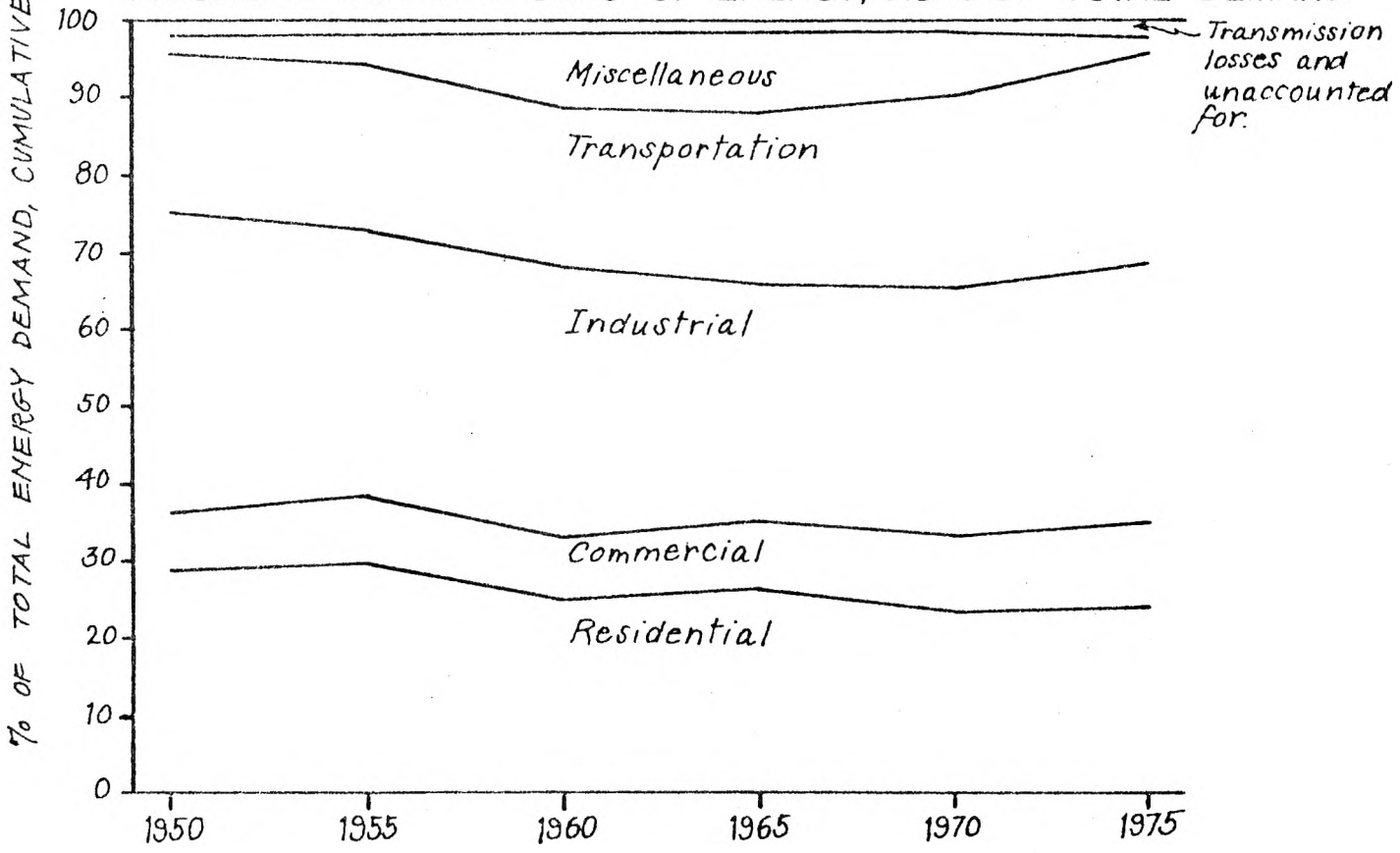


Table 1

Energy Consumption in Maine, 1974-1976

(Trillion BTU's)

	1974	% Δ	1975	%Δ	1976
All Ultimate Uses	317.8(100%)	-4.2%	304.5(100%)	+9.6%	333.7(100%)
Residential	78.2(24.6%)	-8.6%	71.5(23.5%)	+9.4%	78.2(23.4%)
Commercial	33.5(10.5%)	+19.4%	40.0(13.1%)	+15.3%	46.1(13.8%)
Industrial	105.8(33.3%)	-18.3%	86.4(28.4%)	+11.6%	96.4(28.9%)
Transportation	87.0(27.4%)	-3.9%	83.6(27.5%)	+10.5%	92.4(27.8%)
Miscellaneous	5.7(1.8%)	+175.4%	21.4(7.0%)	-12.1%	18.8(5.6%)
Electricity Transmission Losses	7.5(2.4%)	-78.7%	1.6(0.5%)	+12.5%	1.8(0.5%)
Electricity Exports	7.1(-)	-29.6%	5.0(-)	+14%	5.7(-)
Gross Energy Inputs	324.9	-4.7%	309.5	+9.7%	339.4

(Note: Numbers in parentheses (-%) represent percentage each sector represents of total energy consumption for that year.

Residential Energy Demand Trends

Residential demand for energy declined somewhat in 1975 from 1974 levels, then rebounded sharply, up by about 9.4% in 1976.

Most of the decline can be attributed to a reduction in the use of distillate oil and kerosine, although LPG use declined somewhat also. The sharp drop in fuelwood use is thought to be a data problem, and is being checked.

Electrical consumption in the residential sector continued to grow unabated, while natural gas increased slightly and coal continued to provide immeasurably small quantities of energy to this sector.

The drop in petroleum consumption in 1975 can probably be attributed to a combination of conservation efforts via reduced thermostats and increased levels of home insulation, assisted by a particularly mild winter in this part of the country.

Table 2

Residential Energy Use in Maine, 1974-1976

(Trillion BTU's)

	1974	1975	1976
All Sources	78.2	71.5	78.2
Coal	0.1	-	-
Fuelwood	4.6	0.5	0.5
Natural Gas	0.6	0.8	1.0
Petroleum	46.3	41.9	45.3
Distillate	36.5	39.8	43.1
Kerosine	6.3	-	-
LPG	3.5	2.1	2.2
Electricity	26.6	28.3	31.4

Table 2A

Per Capita and Per Household Residential Energy Use in Maine 1974-1976

(Million BTU's)

	1974	% Δ	1975	% Δ	1976
Per Capita	74.6	-9.3%	67.6	+8.1%	73.1
Per Household	232.2	-11.2%	206.1	+6.3%	219.0

Commercial Energy Demand Trends

Unlike the residential sector, demand for energy in the commercial sector continued to increase rapidly throughout 1975 and 1976. The increase in energy demand in this sector was led by strong gains in the use of electricity and distillate fuels.

It is felt that these large increases in energy use in the commercial sector are due primarily to continued construction and operation of heavily lighted, "climate-controlled" shopping centers and malls, the opening of new and expanded hospital facilities, schools, supermarkets, etc., and the general increases in lighting levels and air conditioning use throughout our commercial buildings and institutions.

Table 3

Commercial Energy Use in Maine, 1974-1976

(Trillion BTU's)

	1974	1975	1976
All Sources	33.5	40.0	46.1
Coal	-	-	-
Natural Gas	0.6	0.6	0.6
Petroleum	18.6	21.6	26.0
Distillate	18.2	19.6	21.3
Residual	*	1.3	4.0
LPG	0.4	0.7	0.7
Electricity	14.3	17.8	19.5

*Note: Residual fuel use in the commercial sector was not reported in the data base used for 1974 data.

Industrial Energy Demand Trends

Industrial energy use dropped sharply between 1974 and 1975, recovering somewhat in 1976, but did not rebound back to the 1974 level of energy consumption.

Among the fuel types within the industrial sector, there were declines in the use of virtually all fuels, the exceptions being the gases, both natural gas and LPG. The largest reductions occurred in the use of residual oil and electricity (both that purchased from utilities and self-generated).

This reduction in energy use in the industrial sector in 1975 can most likely be attributed to strong conservation efforts, as well as lingering recessionary effects. The increased use of energy in 1976 would seem to follow the increased manufacturing activity that took place in that year as economic recovery occurred.

Table 4

Industrial Energy Use in Maine, 1974-1976

(Trillion BTU's)

	1974	1975	1976
All Sources	105.8	86.4	96.4
Coal	1.2	0.7	0.5
Fuelwood	2.2	1.3	1.3
Natural Gas	0.5	0.7	0.5
Petroleum	62.9	46.2	54.7
Residual	60.4	43.4	51.8
Distillate	2.1	1.9	2.0
LPG	0.4	0.9	0.9
Electricity	39.0	37.5	39.4
Utilities (Purchased)	25.7	25.1	26.4
Industries (Hydro)	13.3	12.4	13.0 (est.)

Table 4A

Industrial Energy Use in Maine, 1974-1976

Per Dollar of Manufacturing Value Added and Per Dollar of Manufacturing Gross State Product (BTU's/$)

	1974	1975	1976
Per Dollar Value Added	78,806 BTU/$	71,820 BTU/$	N/A
Per Dollar Mfg.GSP	100,149 "	91,043 "	N/A

(All in 1967 $'s)

Transportation Energy Demand Trends

Energy consumption in the transportation sector also declined somewhat in 1975 and increased again in 1976.

Among the fuel types within the transportation sector, the 1975 declines occurred solely in the fuel types used in commerce - the residual fuels used by shipping; distillates used by shipping, trains, trucks and busses; and jet fuel used in commercial aviation - and these declines were more than enough to offset the increased consumption of gasoline, which is assumed to be attributed primarily to increased use of private passenger cars. In 1976, all types of fuels used in the transportation sector registered gains. These gains are seen to be caused by several factors, including increased vehicle miles driven, increased volume of goods hauled as economic recovery occurred, and a general disregard for the national 55 mph speed limit, thereby decreasing the average fuel economy of all vehicles on the road.

Table 5

Transportation Energy Use in Maine, 1974-1976

(Trillion BTU's)

	1974	1975	1976
All Sources	87.0	83.6	92.4
Petroleum	87.0	83.4	92.2
Residuals	10.0	5.8	10.0
Distillates	8.2	7.4	8.1
Jet Fuel	3.8	2.7	2.9
Gasoline	65.0	67.5	71.2
Natural Gas	-	0.2	0.2

Miscellaneous Energy Demand Trends

Trends in energy demand for "miscellaneous" use are more difficult to track than the above described sectors, due to the "catch-all" nature of the category, and the lack of a precise definition of what is included under the "miscellaneous"

heading. Among the uses which are included are those by municipal and state government facilities, street lighting, and military use. The military energy demand is especially difficult to pin down with any degree of accuracy.

For these reasons, the trends in "miscellaneous" energy use are not regarded as particularly meaningful, other than as a means of "rounding out" the total energy demand. For this reason, and because miscellaneous energy use accounts for 7% or less of the total energy demand in Maine, no attempt is made here to analyze this trend.

Table 6

Miscellaneous Energy Use in Maine, 1974-1976

(Trillion BTU's)

	1974	1975	1976
All Sources	5.7	21.4	18.8
Petroleum	3.3	21.4	18.8
Residual	0.6	0.4	0.4
Distillate	1.2	2.9	2.9
LPG	0.1	-	-
Jet Fuel	1.4	18.1	15.5
Electricity	2.5	-	-

Economic Factors

There can be little doubt that energy demand is dependent upon a great deal of factors, including the level of economic activity, conversion efficiency from fuel input to useful work output, operating conditions, weather factors, intensity of use of energy-consuming devices, and the price of energy, to name but a few of these factors. Many attempts have been made to analyze energy demand as it re-

lates to all or most of these influencing factors. As yet, no satisfactory relationships have been established for Maine and work is continuing on this problem. In the meantime, some of the relevant data is presented in the following tables on which upcoming energy/economic analyses may be based. These tables are presented without comment at this time.

Tables - 1) Economic Indicators for Maine, 1965-1976

2) Energy Prices in Maine - Cents per Million BTU, 1975-1976

3) Energy Prices in Maine - Original Units, 1965-1976

4) Motor Vehicle Registrations, 1973-76

Air Carrier Operations, 1973-76

Highway Vehicle Miles Traveled, 1973-76

Class I Railroad Millage, 1974-75

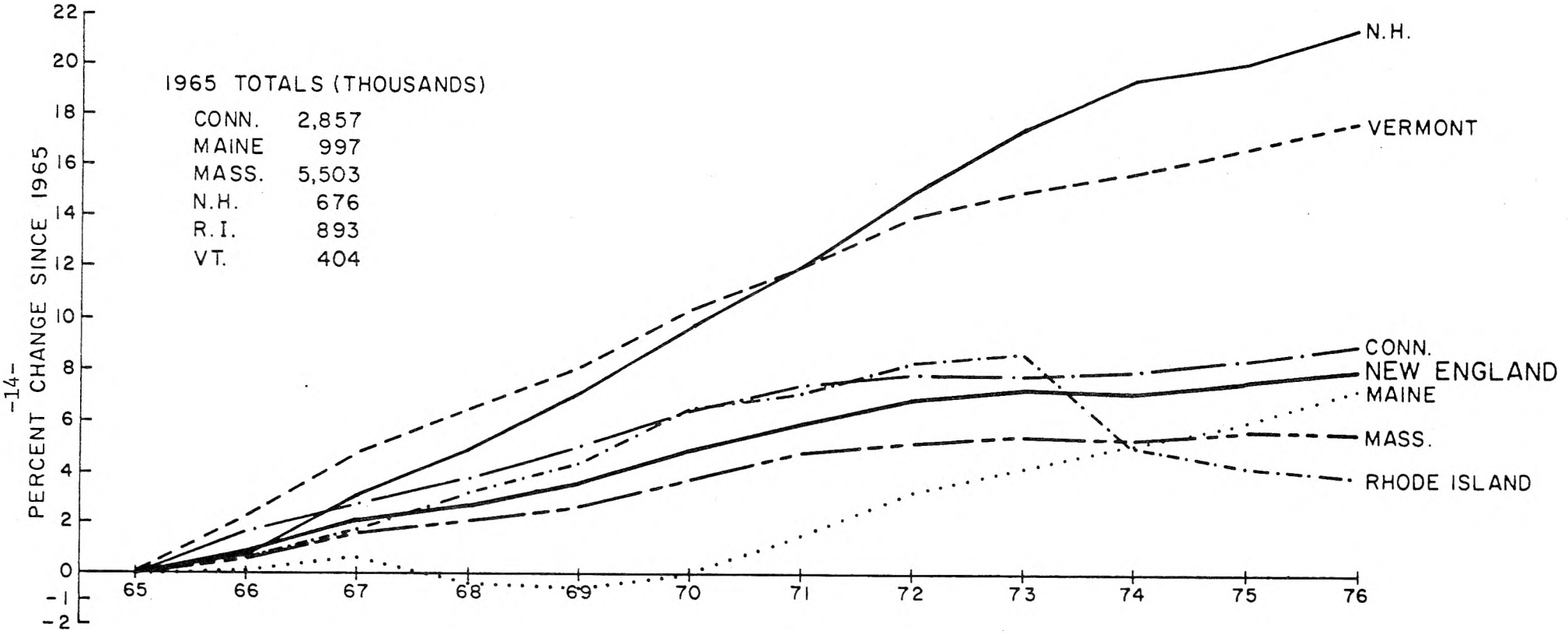
Households, 1973-76

Economic Indicators for Maine, 1965-1976

ts Note

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Resident Population(Thousands)	997	999	1,004	994	992	997	1,012	1,030	1,039	1,049	1,058	1,070
Civilian Labor Force(Thousands)	-	-	-	-	-	401.7	409.5	418.7	423.8	439.0	439.7	472.0
Unemployment (Thousands)	-	-	-	-	-	22.8	31.3	29.1	25.2	29.3	44.9	42.0
Unemployment Rate (Percent)	-	-	-	-	-	5.7%	7.6%	7.0%	5.9%	6.7%	10.2%	8.9%
Personal Income (Millions of $)	$2,300	$2,466	$2,592	$2,813	$3,039	$3,292	$3,431	$3,744	$4,243	$4,716	$5,040	$5,741
Per Capita PI (actual $)	$2,307	$2,469	$2,582	$2,830	$3,064	$3,302	$3,391	$3,634	$4,085	$4,494	$4,764	$5,366
Personal Income (millions of 1967 $'s)	$2,426	$2,529	$2,592	$2,702	$2,791	$2,893	$2,888	$3,044	$3,269	$3,280	$3,239	$3,505
Per Capita PI (1967 $'s)	$2,436	$2,532	$2,582	$2,719	$2,814	$2,902	$2,854	$2,954	$3,147	$3,125	$3,062	$3,276
Value added by Manufacture (millions of $'s)	$ 895	$ 980	$1,070	$1,132	$1,226	$1,227	$1,208	$1,383	$1,567	$1,768	$1,758	-
Value added by Manufacture (millions of 1967 $'s)	$ 933	$1,003	$1,070	$1,094	$1,158	$1,111	$1,062	$1,204	$1,327	$1,342	$1,203	-
U.S.Personal Consumption Expenditures Implicit Price Deflator (1967=100)	94.8	97.5	100.0	104.1	108.9	113.8	118.8	123.0	129.8	143.8	155.6	163.8
Manufacturing Implicit Price Deflator (1967=100)	95.9	97.7	100.0	103.5	105.9	110.4	113.7	114.9	118.1	131.7	146.1	-
Manufacturing GSP* (current million $'s)	$ 899	$1,002	$1,042	$1,121	$1,125	$1,128	$1,125	$1,151	$1,295	$1,391	$1,386	$1,655
Manufacturing GSP* (1967 million $'s)	$ 937	$1,026	$1,042	$1,083	$1,062	$1,022	$ 989	$1,002	$1,097	$1,056	$ 949	?

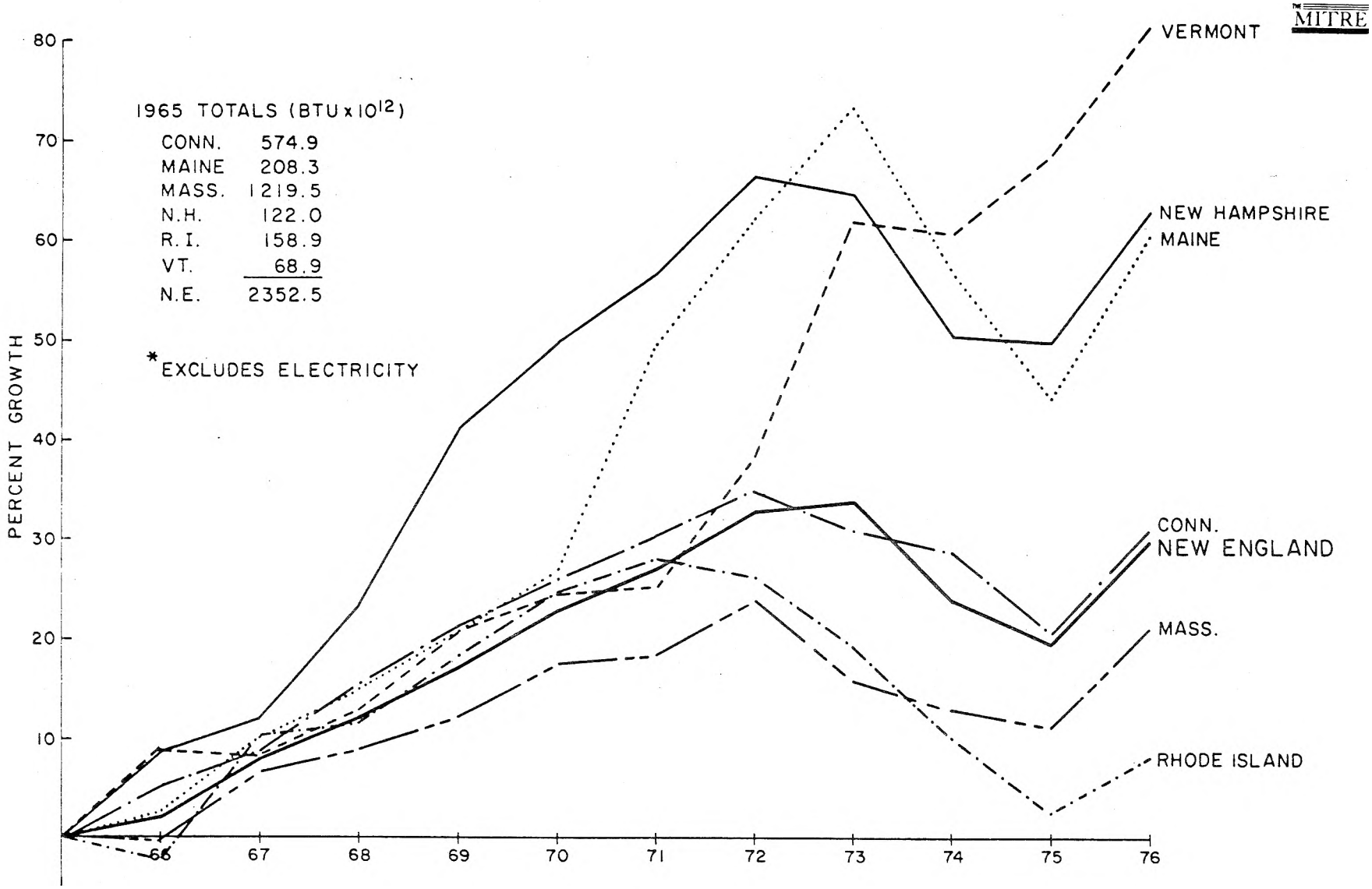
*Source: Federal Reserve Bank of Boston



NEW ENGLAND STATES' POPULATION
GROWTH SINCE 1965

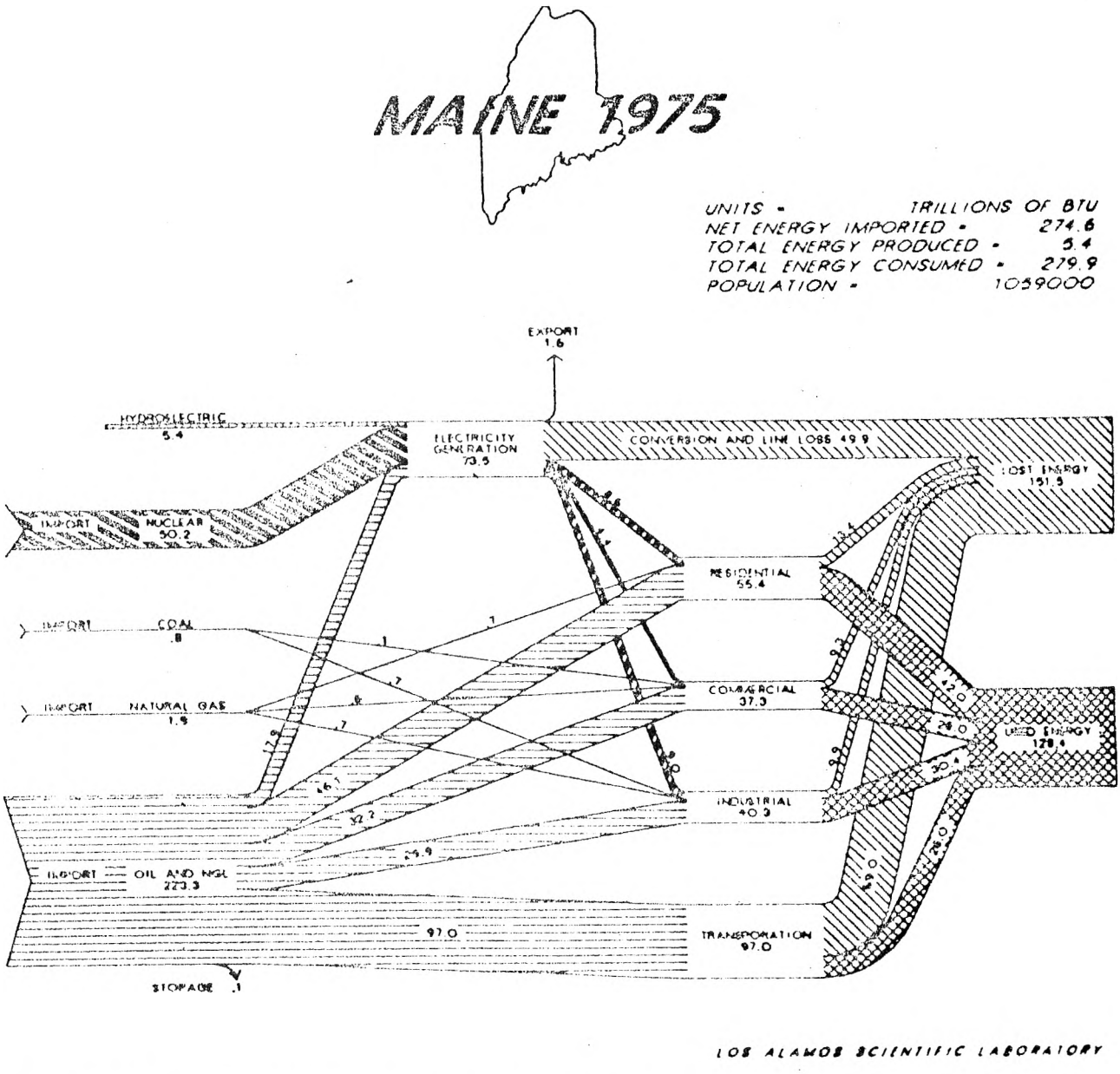
DATA SOURCE: CLARK ASSOCIATES

Figure 1-A



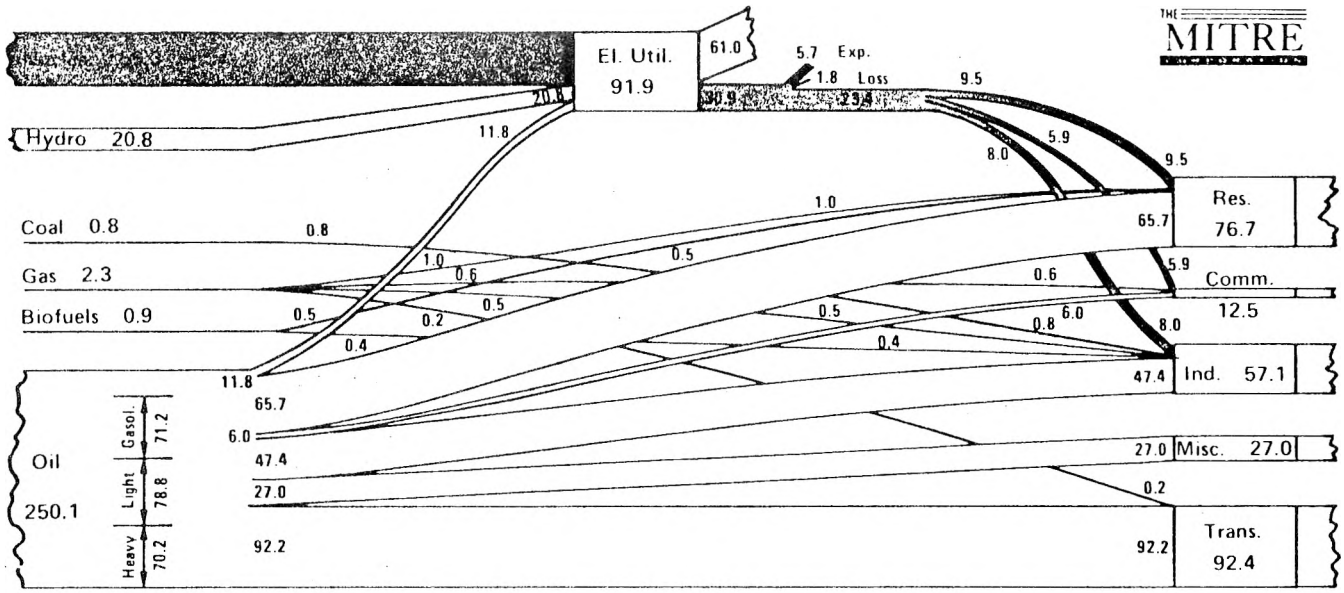
STATES'
PRIMARY ENERGY USE *
GROWTH SINCE 1965
Figure P-A

DATA SOURCE: CLARK ASSOCIATES



Source: "New England Energy Situation and Alternatives for 1985", updated August 1977 by the New England Federal Regional Council, Energy Resources Department Task Force, Energy Statistics and Projections Work Group.

FIGURE 3-A



TOTAL PRIMARY CONSUMPTION: 334.2 x 10^{12} BTU

1976 ENERGY FLOW PATTERN

MAINE

(BTU x 10^{12})

FIGURE 4-A

DATA SOURCE: CLARK ASSOCIATES

Appendix A

DISCUSSION OF THE DATA

The data on energy use, prices and demographics was gathered by S. H. Clark Associates, 1100 Alma Street, Menlo Park, California, 94025.

At the present time, the most widely used data source on New England's historic energy use is from the Arthur D. Little study, "Historical Data on New England's Energy Requirements", 1962-1972, prepared for the New England Regional Commission in September 1974.

There are some significant differences between these two data sets:

The Clark data includes energy attributable to nuclear fuel and hydro power, which ADL does not. When this difference is accounted for, the "total use" figures in the two data sets agree within two tenths of one percent.

The major difference between the data sets is in the attribution of oil products to the end use sectors. Each relies on Bureau of Mines data; that data does not allocate "heating oil" to the sector which uses it. ADL does this allocation to the residential sector according to a study they had made previously, using degree days, BTU requirements per dwelling type per degree day, the estimated number of houses of each type which heats with oil, etc.

The Clark data attributed the oil product use from the Bureau of Mines data as follows:

Bureau of Mines Category	Clark's Sector Attribution
Kerosene	
Heating	Residential
All Other Uses	Miscellaneous
Heating Oils - Distillates	
Number 1 Distillate	
Automatic Burner Fuel	Residential
Other Heating	Residential
Number 2 Distillate	
Number 4 Distillate	Commercial
Heating Oils - Residuals	
Number 5 Residual	Industrial
Number 6 Residual	Industrial

Bureau of Mines Category	Clark's Sector Attribution
Industrial	
Distillate	Industrial
Residual	
Oil Company Use	
Distillate	Industrial
Residual	
Railroad Use	
Distillate	Transportation
Residual	
Vessel Bunkering	
Distillate	Transportation
Residual	
Military Use	
Distillate	Military
Residual	
Electric Company Use	
Distillate	Power Plants
Residual	
Miscellaneous Uses	
Diesel Fuel	
On-highway	Transportation
Off-highway	Miscellaneous
Other Distillate	
Residual	Miscellaneous

In the Clark data tables, all diesel, Number 1 distillate, Number 2 distillate, Number 4 distillate, and kerosene are called "Light Oil".

Number 5 Residual and Number 6 Residual are called "Heavy Oil".

Table 1

ECONOMIC INDICATORS FOR NEW ENGLAND, BY STATE
1965-1976

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Civilian labor force* (thousands)												
Connecticut						1,369.6	1,354.1	1,370.5	1,364.7	1,419.5	1,345.0	1,475.0
Maine						401.7	409.5	418.7	423.8	439.0	439.7	472.0
Massachusetts						2,463.0	2,472.0	2,489.0	2,565.0	2,637.0	2,755.2	2,762.0
New Hampshire						306.5	313.7	321.1	328.6	367.3	372.8	387.0
Rhode Island						393.3	397.8	411.7	418.0	427.4	448.4	430.0
Vermont						186.5	189.2	194.5	199.7	203.7	206.1	216.0
New England						5,120.6	5,136.3	5,205.5	5,299.8	5,493.9	5,567.2	5,742.0
Unemployment* (thousands)												
Connecticut						76.4	120.4	112.0	77.3	87.3	136.4	139.0
Maine						22.8	31.3	29.1	25.2	29.3	44.9	42.0
Massachusetts						113.0	164.0	160.0	171.0	190.0	343.7	263.0
New Hampshire						10.2	14.9	14.4	12.7	13.2	25.7	25.0
Rhode Island						20.6	27.2	27.0	26.1	31.3	65.5	35.0
Vermont						9.1	12.9	12.7	11.1	14.1	20.7	19.0
New England						252.1	370.7	355.2	323.4	365.2	636.9	523.0
Unemployment rate* (percent)												
Connecticut						5.6%	8.9%	8.2%	5.7%	6.2%	10.1%	9.5%
Maine						5.7	7.6	7.0	5.9	6.7	10.2	8.9
Massachusetts						4.6	6.6	6.4	6.7	7.2	12.5	9.5
New Hampshire						3.3	4.7	4.5	3.9	3.6	6.9	6.4
Rhode Island						5.2	6.8	6.5	6.2	7.3	14.6	8.1
Vermont						4.9	6.8	6.5	5.6	6.9	10.0	8.7
New England						4.9%	7.2%	6.8%	6.1%	6.7%	11.4%	9.1%
Personal income (millions of dollars)												
Connecticut	$ 9,865	$10,789	$11,838	$12,868	$14,059	$14,952	$15,355	$16,508	$18,062	$19,712	$21,086	$22,929
Maine	2,300	2,466	2,592	2,813	3,039	3,292	3,431	3,744	4,243	4,716	5,040	5,741
Massachusetts	16,469	17,765	19,271	21,055	22,919	24,767	25,753	27,852	30,138	32,805	35,156	38,272
New Hampshire	1,752	1,929	2,112	2,330	2,536	2,773	2,961	3,277	3,675	4,069	4,400	4,942
Rhode Island	2,516	2,746	2,998	3,291	3,486	3,766	3,922	4,276	4,629	4,956	5,342	5,866
Vermont	951	1,082	1,173	1,303	1,425	1,547	1,645	1,802	1,966	2,142	2,313	2,577
New England	$33,853	$36,778	$39,983	$43,660	$47,464	$51,096	$53,067	$57,459	$62,713	$68,400	$73,337	$80,327
Per capita personal income (actual dollars)												
Connecticut	$ 3,453	$ 3,717	$ 4,033	$ 4,341	$ 4,686	$ 4,917	$ 5,002	$ 5,357	$ 5,865	$ 6,388	$ 6,802	$ 7,356
Maine	2,307	2,469	2,582	2,830	3,064	3,302	3,391	3,634	4,085	4,494	4,764	5,366
Massachusetts	2,993	3,210	3,445	3,748	4,057	4,340	4,465	4,810	5,192	5,657	6,046	6,588
New Hampshire	2,592	2,833	3,030	3,286	3,502	3,737	3,894	4,213	4,622	5,034	5,420	6,010
Rhode Island	2,817	3,054	3,298	3,570	3,740	3,960	4,097	4,417	4,769	5,283	5,737	6,331
Vermont	2,353	2,621	2,772	3,031	3,261	3,468	3,630	3,907	4,226	4,581	4,900	5,411
New England	$ 2,988	$ 3,218	$ 3,458	$ 3,752	$ 4,045	$ 4,300	$ 4,415	$ 4,745	$ 5,160	$ 5,630	$ 6,017	$ 6,573

Table 1 (continued)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Resident population (thousands)												
Connecticut	2,857	2,903	2,935	2,964	3,000	3,041	3,070	3,082	3,080	3,086	3,100	3,117
Maine	997	999	1,004	994	992	997	1,012	1,030	1,039	1,049	1,058	1,070
Massachusetts	5,503	5,534	5,594	5,618	5,649	5,707	5,768	5,790	5,805	5,799	5,814	5,809
New Hampshire	676	681	697	709	724	742	760	778	795	808	812	822
Rhode Island	893	899	909	922	932	951	957	968	971	938	931	927
Vermont	404	413	423	430	437	446	453	461	465	468	472	476
New England	11,330	11,429	11,562	11,637	11,734	11,884	12,020	12,109	12,155	12,148	12,187	12,221
Personal income (millions of 1967 dollars)												
Connecticut	$10,406	$11,066	$11,838	$12,361	$12,910	$13,139	$12,925	$13,421	$13,915	$13,708	$13,551	$13,998
Maine	2,426	2,529	2,592	2,702	2,791	2,893	2,888	3,044	3,269	3,280	3,239	3,505
Massachusetts	17,372	18,221	19,271	20,226	21,046	21,764	21,678	22,644	23,219	22,813	22,594	23,365
New Hampshire	1,848	1,978	2,112	2,238	2,329	2,437	2,492	2,664	2,831	2,830	2,828	3,017
Rhode Island	2,654	2,816	2,998	3,161	3,201	3,309	3,301	3,476	3,566	3,446	3,433	3,581
Vermont	1,003	1,110	1,173	1,252	1,309	1,359	1,385	1,465	1,515	1,490	1,487	1,573
New England	$35,709	$37,720	$39,983	$41,940	$43,586	$44,901	$44,669	$46,714	$48,315	$47,567	$47,132	$49,039
Per capita personal income (1967 dollars)												
Connecticut	$ 3,642	$ 3,812	$ 4,033	$ 4,170	$ 4,303	$ 4,321	$ 4,210	$ 4,355	$ 4,518	$ 4,442	$ 4,371	$ 4,491
Maine	2,436	2,532	2,582	2,719	2,814	2,902	2,854	2,954	3,147	3,125	3,062	3,276
Massachusetts	3,157	3,292	3,445	3,600	3,725	3,814	3,758	3,911	4,000	3,934	3,886	4,022
New Hampshire	2,734	2,906	3,030	3,157	3,216	3,284	3,278	3,425	3,561	3,501	3,483	3,669
Rhode Island	2,972	3,132	3,298	3,429	3,434	3,480	3,449	3,591	3,674	3,674	3,687	3,865
Vermont	2,482	2,688	2,772	2,912	2,994	3,047	3,056	3,176	3,256	3,186	3,149	3,303
New England	$ 3,152	$ 3,301	$ 3,458	$ 3,604	$ 3,714	$ 3,779	$ 3,716	$ 3,858	$ 3,975	$ 3,915	$ 3,867	$ 4,013
U.S. personal consumption expenditures implicit price deflator--1967 = 100	94.8	97.5	100.0	104.1	108.9	113.8	118.8	123.0	129.8	143.8	155.6	163.8
Value added by manufacture (millions of dollars)												
Connecticut	$ 5,295	$ 6,185	$ 6,390	$ 6,620	$ 7,172	$ 6,580	$ 6,049	$ 6,828	$ 7,893	$ 8,934	$ 8,762	
Maine	895	980	1,070	1,132	1,226	1,227	1,208	1,383	1,567	1,768	1,758	
Massachusetts	7,449	8,378	8,715	9,056	9,572	9,582	9,495	10,678	11,718	12,836	12,554	
New Hampshire	790	866	932	1,040	1,007	1,048	1,089	1,279	1,462	1,578	1,606	
Rhode Island	1,213	1,355	1,351	1,465	1,473	1,404	1,469	1,764	1,924	2,183	2,020	
Vermont	444	514	515	534	556	556	562	576	688	792	782	
New England	$16,086	$18,278	$18,973	$19,847	$21,006	$20,397	$19,872	$22,508	$25,252	$28,091	$27,482	

Table 1 (concluded)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Value added by manufacture (millions of 1967 dollars)												
Connecticut	$ 5,521	$ 6,331	$ 6,390	$ 6,396	$ 6,772	$ 5,960	$ 5,320	$ 5,943	$ 6,683	$ 6,784	$ 5,997	
Maine	933	1,003	1,070	1,094	1,158	1,111	1,062	1,204	1,327	1,342	1,203	
Massachusetts	7,767	8,575	8,715	8,750	9,039	8,679	8,351	9,293	9,922	9,746	8,593	
New Hampshire	824	886	932	1,005	951	949	958	1,113	1,238	1,198	1,099	
Rhode Island	1,265	1,387	1,351	1,415	1,391	1,272	1,292	1,535	1,629	1,658	1,383	
Vermont	463	526	515	516	525	504	494	501	583	601	535	
New England	$16,773	$18,708	$18,973	$19,176	$19,836	$18,475	$17,447	$19,589	$21,382	$21,329	$18,810	
Manufacturing implicit price deflator--1967 = 100	95.9	97.7	100.0	103.5	105.9	110.4	113.7	114.9	118.1	131.7	146.1	

* Civilian labor force, unemployment, and unemployment rate are not available prior to 1970 because the federal-state cooperative program was not initiated until the early 1970s. According to the Editor of the Employment and Training Report, no retroactive data are under calculation or planned.

Sources: Price deflators: 1965-72, U.S. Department of Commerce, National Income and Product Accounts. 1973-76, U.S. Department of Commerce, Survey of Current Business.
Value added by manufacture: 1965-75, U.S. Department of Commerce, Annual Survey of Manufacture and Census of Manufacture, various years.
Civilian labor force, unemployment, and unemployment rate: 1970-75, U.S. Department of Labor and U.S. Department of Health, Education, and Welfare, Employment and Training Report of the President, 1977. 1976, U.S. Department of Labor, State and County Employment and Unemployment, January-December 1976.
Personal income and per capita personal income: 1965-70, U.S. Department of Commerce, Bureau of Economic Analysis, unpublished data, 1971-76. U.S. Department of Commerce, Survey of Current Business, August 1977.
Population: 1965-75, U.S. Department of Commerce, Statistical Abstract of the United States, various years. 1976, U.S. Department of Commerce, Survey of Current Business, August 1977 issue.

Table 3

CONSUMPTION OF ENERGY IN MAINE,
BY END USE AND TYPE OF ENERGY--TRILLIONS OF BTU
1965-1976

	Historical											Prel.
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Residential												
Light oil	53.6	49.3	58.5	60.7	64.5	64.8	64.8	67.4	62.5	60.0	58.4	63.5
LPG	1.4	1.4	1.4	1.5	1.5	1.4	1.4	1.6	1.6	1.8	2.1	2.2
Coal	1.0	0.7	0.5	0.4	0.3	0.1	0.1	0.1	0.1	0.1	--	--
Natural gas	0.8	1.1	1.0	1.1	1.2	1.2	1.2	1.1	0.7	0.8	0.8	1.0
Biofuels	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Electricity	4.1	4.2	4.6	5.0	5.4	5.9	6.4	7.2	7.7	8.2	8.6	9.5
Solar	--	--	--	--	--	--	--	--	--	--	--	--
Total	61.7	57.4	66.7	69.3	73.5	73.9	74.4	77.9	73.1	71.4	70.4	76.7
Commercial												
Light oil	1.2	1.3	1.3	1.7	1.2	1.2	1.3	1.8	1.5	1.2	1.0	1.3
Heavy oil	0.3	0.8	0.4	0.9	2.3	4.1	5.5	5.3	4.8	2.6	1.3	4.0
LPG	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.6	0.7	0.7
Coal	1.0	0.7	0.4	0.3	0.2	0.1	--	--	--	--	--	--
Natural gas	--	--	--	--	--	--	--	--	0.3	0.5	0.6	0.6
Electricity	2.7	2.9	3.1	3.3	3.7	4.1	4.5	4.9	5.2	5.2	5.4	5.9
Solar	--	--	--	--	--	--	--	--	--	--	--	--
Total	5.6	6.2	5.7	6.7	7.9	9.9	11.7	12.5	12.3	10.1	9.0	12.5
Industrial												
Light oil	1.7	1.4	1.9	2.3	2.5	2.3	2.4	2.1	2.3	2.1	1.9	2.0
Heavy oil	7.8	12.8	13.2	15.3	22.6	29.7	69.4	72.0	66.7	58.0	37.4	45.0
Still gas	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum coke	--	--	--	--	--	--	--	--	--	--	--	--
LPG	0.2	0.3	0.3	0.2	0.4	0.3	0.4	0.5	0.4	0.3	0.4	0.4
Coal	5.2	4.8	3.8	3.1	2.9	1.0	1.0	0.6	0.7	1.4	0.7	0.5
Natural gas	--	--	--	--	--	--	--	--	0.5	0.7	0.7	0.5
Biofuels	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Electricity	5.1	5.2	5.3	6.1	6.6	6.7	6.8	7.3	7.5	7.9	7.6	8.0
Total	20.3	24.8	24.8	27.3	35.3	40.3	80.3	82.8	78.5	70.8	49.1	57.1
Power plants												
Light oil	1.0	0.7	0.7	0.7	0.6	0.7	1.4	1.6	0.8	0.6	0.9	1.0
Heavy oil	28.5	27.1	29.2	31.3	29.7	30.5	29.8	34.9	30.7	25.2	17.1	10.8
Coal	--	--	--	--	--	--	--	--	--	--	--	--
Natural gas	--	--	--	--	--	--	--	--	--	--	--	--
Hydroelectric	13.8	16.7	17.0	17.1	19.2	19.1	16.5	17.7	18.5	17.6	18.3	20.8
Nuclear	--	--	--	--	--	--	--	0.5	33.5	35.7	45.0	59.3
Geothermal and other	--	--	--	--	--	--	--	--	--	--	--	--
Total	43.3	44.5	46.9	49.1	49.5	50.3	47.7	54.7	83.5	79.1	81.3	91.9
Transportation												
LPG	--	--	--	--	--	--	--	--	0.1	0.1	--	--
Gasoline	48.4	50.1	51.3	54.1	56.2	58.9	62.1	65.8	67.7	65.7	67.5	71.2
Jet fuel	--	--	--	0.4	2.2	3.2	3.5	3.5	4.6	3.1	2.7	2.9
Light oil	3.5	3.3	4.0	5.3	5.6	6.3	5.9	5.9	7.2	7.9	7.4	8.1
Heavy oil	2.9	5.5	4.6	5.6	4.4	8.6	9.7	21.1	22.0	10.0	5.8	10.0
Natural gas*	--	--	--	--	--	--	--	--	--	0.3	0.2	0.2
Electricity	--	--	--	--	--	--	--	--	--	--	--	--
Total	54.8	58.9	59.9	65.4	68.4	77.0	81.2	96.3	101.6	87.1	83.6	92.4
Military†												
Jet fuel	20.6	17.8	21.3	23.9	20.2	18.1	20.7	19.1	19.0	17.5	18.1	15.5
Light oil	3.7	4.4	1.8	2.1	2.8	1.8	2.9	3.5	1.7	1.0	1.3	1.3
Heavy oil	0.8	2.1	1.4	0.5	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Total	25.1	24.3	24.5	26.5	23.3	20.1	23.8	22.9	21.0	18.8	19.7	17.1

Table 3 (concluded)

	Historical											Prel.
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Raw materials												
LPG	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.5	0.5
Petrochemical feedstocks and special naphthas	--	--	--	--	--	--	--	--	--	--	--	--
Lubes and greases	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.4	1.4	1.3	1.2	1.3
Petroleum coke	--	--	--	--	--	--	--	--	--	--	--	--
Asphalt and road oil	5.4	6.0	5.5	5.3	5.3	5.0	5.6	5.4	7.0	6.3	4.8	5.5
Miscellaneous	0.7	0.6	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.7	0.9	0.9
Natural gas	--	--	--	--	--	--	--	--	--	--	--	--
Coking coal	--	--	--	--	--	--	--	--	--	--	--	--
Total	7.3	7.9	7.4	7.1	7.2	6.9	7.7	7.6	9.2	8.6	7.4	8.2
Miscellaneous uses												
LPG	--	--	--	--	--	--	--	--	--	--	--	--
Light oil	2.1	2.2	4.3	2.4	2.2	2.2	2.3	1.9	1.9	1.6	1.6	1.6
Heavy oil	--	--	2.2	0.2	--	--	0.3	0.3	0.3	0.1	0.1	0.1
Natural gas‡	--	--	--	--	--	--	--	--	--	--	--	--
Electricity§	--	--	--	--	--	--	--	--	--	--	--	--
Total	2.1	2.2	6.5	2.6	2.2	2.2	2.6	2.2	2.2	1.7	1.7	1.7
Total energy												
Still gas	--	--	--	--	--	--	--	--	--	--	--	--
LPG	2.1	2.3	2.4	2.4	2.6	2.4	2.5	2.9	2.9	3.1	3.7	3.6
Gasoline	48.4	50.1	51.3	54.1	56.2	58.9	62.1	65.8	67.7	65.7	67.5	71.2
Jet fuel	20.6	17.8	21.3	24.3	22.4	21.3	24.2	22.6	23.6	20.6	20.8	18.4
Light oil	66.8	62.6	72.5	75.2	79.4	79.3	81.0	84.2	77.9	74.4	72.5	78.8
Heavy oil	40.3	48.3	51.0	53.8	59.3	73.1	114.9	133.9	124.8	96.2	62.0	70.2
Petrochemical feedstocks and special naphthas	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum coke	--	--	--	--	--	--	--	--	--	--	--	--
Lubes and greases	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.4	1.4	1.3	1.2	1.3
Asphalt and road oil	5.4	6.0	5.5	5.3	5.3	5.0	5.6	5.4	7.0	6.3	4.8	5.5
Miscellaneous	0.7	0.6	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.7	0.9	0.9
Subtotal, oil	185.4	188.9	205.7	216.7	226.9	241.6	292.1	316.7	305.8	268.3	233.4	250.1
Coal	7.2	6.2	4.7	3.8	3.4	1.2	1.1	0.7	0.8	1.5	0.7	0.8
Natural gas	0.8	1.1	1.0	1.1	1.2	1.2	1.2	1.1	1.5	2.3	2.3	2.3
Biofuels	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.9	0.9	0.9	0.9
Hydroelectric	13.8	16.7	17.0	17.1	19.2	19.1	16.5	17.7	18.5	17.6	18.3	20.8
Nuclear	--	--	--	--	--	--	--	0.5	33.5	35.7	45.0	59.3
Geothermal and other	--	--	--	--	--	--	--	--	--	--	--	--
Solar	--	--	--	--	--	--	--	--	--	--	--	--
Total primary energy	208.3	213.9	229.4	239.6	251.6	263.9	311.7	337.5	361.0	326.3	300.6	334.2
Electricity	11.9	12.3	13.0	14.4	15.7	16.7	17.7	19.4	20.4	21.3	21.6	23.4

* Includes pipeline fuel and transmission losses.
† Includes only these fuels.
‡ Field use and net additions to storage.
§ Interdepartmental uses.

Sources: Table 10, converted to common Btu units, and Table 16.

Table 10

CONSUMPTION OF ENERGY IN MAINE, BY END USE AND TYPE OF ENERGY--ORIGINAL UNITS*
1965-1976

	Historical											Prel.
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Residential												
Light oil	9,240.0	8,512.0	11,076.0	10,479.0	11,132.0	11,159.0	11,189.0	11,626.0	10,728.0	10,291.0	10,011.0	10,885.0
LPG	14,114.0	14,850.0	14,637.0	15,545.0	15,502.0	14,186.0	13,903.0	16,352.0	16,867.0	18,550.0	22,371.0	23,436.0
Coal	39.0	27.0	19.0	15.0	9.0	4.0	2.0	2.0	2.0	2.0	1.0	--
Natural gas	875.0	1,091.0	992.0	1,093.0	1,203.0	1,186.0	1,196.0	1,068.0	693.0	797.0	798.0	997.5
Biofuels	44.0	39.0	39.0	33.0	33.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Electricity	1,195.0	1,236.0	1,350.0	1,452.0	1,571.0	1,722.0	1,883.0	2,117.0	2,265.0	2,405.0	2,519.0	2,794.0
Solar	--	--	--	--	--	--	--	--	--	--	--	--
Commercial												
Light oil	212.0	227.0	223.0	296.0	208.0	213.0	217.0	315.0	250.0	204.0	168.0	218.0
Heavy oil	42.0	131.0	71.0	141.0	385.0	675.0	894.0	867.0	794.0	423.0	208.0	640.0
LPG	4,705.0	4,950.0	4,879.0	5,182.0	5,168.0	4,729.0	4,634.0	5,451.0	5,622.0	6,183.0	7,457.0	7,457.0
Coal	39.0	27.0	18.0	14.0	9.0	4.0	2.0	2.0	1.0	1.0	1.0	--
Natural gas	--	--	--	--	--	--	--	--	302.0	492.0	600.0	600.0
Electricity	794.0	863.0	927.0	976.0	1,074.0	1,193.0	1,294.0	1,427.0	1,525.0	1,510.0	1,579.0	1,731.0
Solar	--	--	--	--	--	--	--	--	--	--	--	--
Industrial												
Light oil	290.0	228.0	322.0	380.0	420.0	377.0	405.0	356.0	387.0	366.0	322.0	339.0
Heavy oil	1,247.0	2,031.0	2,081.0	2,455.0	3,595.0	4,732.0	11,037.0	11,452.0	10,581.0	9,205.0	5,938.0	7,145.0
Still gas	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum coke	--	--	--	--	--	--	--	--	--	--	--	--
LPG	2,227.0	3,402.0	2,838.0	1,846.0	3,768.0	3,224.0	3,787.0	5,118.0	4,451.0	3,307.0	3,890.0	3,890.0
Coal	91.0	76.0	63.0	50.0	42.0	18.0	53.0	26.0	28.0	54.0	27.0	21.0
Natural gas	--	--	--	--	--	--	--	--	498.0	671.0	686.0	490.0
Biofuels	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	40.0	40.0	40.0	40.0
Electricity	1,487.0	1,526.0	1,540.0	1,803.0	1,937.0	1,968.0	1,994.0	2,127.0	2,205.0	2,317.0	2,230.0	2,346.0
Power plants												
Light oil	147.0	113.0	102.0	115.0	96.0	118.0	239.3	273.5	136.8	102.6	153.8	171.0
Heavy oil	4,547.0	4,309.0	4,652.0	4,986.0	4,727.0	4,872.0	4,730.2	5,539.7	4,873.0	4,000.0	2,714.3	1,714.0
Coal	--	--	--	--	--	--	--	--	--	--	--	--
Natural gas	--	--	--	--	--	--	--	--	--	--	--	--
Hydroelectric	1,372.0	1,677.0	1,713.0	1,707.0	1,918.0	1,913.0	1,651.0	1,769.0	1,853.0	1,757.0	1,832.0	2,081.0
Nuclear	--	--	--	--	--	--	--	54.0	3,351.0	3,574.0	4,502.0	5,929.0
Geothermal and other	--	--	--	--	--	--	--	--	--	--	--	--
Transportation												
LPG	232.0	295.0	175.0	245.0	292.0	319.0	308.0	377.0	535.0	538.0	299.0	290.0
Gasoline	387.7	400.7	410.3	433.3	450.0	471.2	497.0	526.4	541.2	525.7	540.0	569.8
Jet fuel	61.0	158.0	391.0	2,968.0	16,398.0	23,832.0	26,255.0	25,794.0	33,892.0	23,192.0	20,125.0	21,517.0
Light oil	594.0	568.0	690.0	952.0	953.0	1,080.0	1,002.0	1,018.0	1,219.0	1,356.0	1,268.0	1,388.0
Heavy oil	475.0	882.0	737.0	899.0	713.0	1,383.0	1,562.0	3,399.0	3,485.0	1,586.0	911.0	1,570.5
Natural gas†	--	--	--	--	--	--	--	--	--	314.0	194.0	194.0
Electricity	--	--	--	--	--	--	--	--	--	--	--	--

Table 10 (concluded)

	Historical											Prel.
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Military‡												
Jet fuel	3,854.0	3,329.0	3,985.0	4,468.0	3,778.0	3,403.0	3,871.0	3,566.0	3,553.0	3,261.0	3,372.0	2,867.0
Light oil	624.0	753.0	302.0	353.0	482.0	304.0	495.0	606.0	293.0	179.0	219.0	219.0
Heavy oil	127.0	344.0	233.0	80.0	43.0	29.0	30.0	50.0	50.0	55.0	50.0	50.0
Raw materials												
LPG	1,150.0	1,028.0	2,212.0	1,935.0	2,420.0	3,021.0	2,773.0	3,618.0	3,805.0	3,461.0	5,205.0	5,205.0
Petrochemical feedstocks and special naphthas	--	--	--	--	--	--	--	--	--	--	--	--
Lubes	7,135.0	7,320.0	7,324.0	7,396.0	7,467.0	7,733.0	7,999.0	8,375.0	8,752.0	8,357.0	7,963.0	8,350.0
Greases	2,894.0	3,000.0	2,984.0	3,000.0	2,972.0	2,966.0	2,960.0	2,933.0	2,906.0	2,690.0	2,473.0	2,680.0
Petroleum coke	--	--	--	--	--	--	--	--	--	--	--	--
Asphalt and road oil	146.1	163.0	148.6	144.3	145.4	135.8	150.3	146.5	188.2	170.3	129.8	156.6
Miscellaneous	134.0	106.0	87.0	77.0	89.0	80.0	94.0	93.0	92.0	128.0	158.0	155.0
Natural gas	--	--	--	--	--	--	--	--	--	--	--	--
Coking coal	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous uses												
LPG	--	--	9.0	6.0	186.0	192.0	180.0	164.0	301.0	--	114.0	100.0
Light oil	370.0	381.0	760.0	357.0	377.0	369.0	397.0	343.0	338.0	280.0	265.0	265.0
Heavy oil	4.0	380.0	347.0	29.0	4.0	2.0	44.0	55.0	50.0	21.0	12.0	15.0
Natural gas§	--	--	--	--	--	--	--	--	--	--	--	--
Electricity■	1.0	1.0	1.0	1.0	1.0	--	--	1.0	--	--	--	--
Total energy												
Still gas	--	--	--	--	--	--	--	--	--	--	--	--
LPG	22,428.0	24,525.0	24,750.0	24,759.0	27,336.0	25,671.0	25,585.0	31,080.0	31,581.0	32,039.0	39,336.0	40,378.0
Gasoline	387.7	400.7	410.3	433.3	450.0	471.2	497.0	526.4	541.2	525.7	540.0	569.8
Jet fuel--transportation	61.0	158.0	391.0	2,968.0	16,398.0	23,832.0	26,255.0	25,794.0	33,892.0	23,192.0	20,125.0	21,517.0
Light oil	11,477.0	10,782.0	13,475.0	12,932.0	13,668.0	13,620.0	13,944.3	14,537.5	13,351.8	12,778.6	12,406.8	13,485.0
Heavy oil	6,442.0	8,077.0	8,121.0	8,590.0	9,467.0	11,693.0	18,297.2	21,362.7	19,833.0	15,290.0	9,833.3	11,134.5
Petrochemical feedstocks and special naphthas	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum coke	--	--	--	--	--	--	--	--	--	--	--	--
Lubes	7,135.0	7,320.0	7,324.0	7,396.0	7,467.0	7,733.0	7,999.0	8,375.0	8,752.0	8,357.0	7,963.0	8,350.0
Greases	2,894.0	3,000.0	2,984.0	3,000.0	2,972.0	2,966.0	2,960.0	2,933.0	2,906.0	2,690.0	2,473.0	2,680.0
Asphalt and road oil	146.1	163.0	148.6	144.3	145.4	135.8	150.3	146.5	188.2	170.3	129.8	156.6
Miscellaneous	134.0	106.0	87.0	77.0	89.0	80.0	94.0	93.0	92.0	128.0	158.0	155.0
Jet fuel--military	3,854.0	3,329.0	3,985.0	4,468.0	3,778.0	3,403.0	3,871.0	3,566.0	3,553.0	3,261.0	3,372.0	2,867.0
Coal	169.0	130.0	100.0	79.0	60.0	26.0	57.0	30.0	31.0	57.0	29.0	21.0
Natural gas	875.0	1,091.0	992.0	1,093.0	1,203.0	1,186.0	1,196.0	1,068.0	1,493.0	2,274.0	2,278.2	2,281.5
Biofuels	74.0	69.0	69.0	63.0	63.0	58.0	58.0	58.0	68.0	68.0	68.0	68.0
Hydroelectric	1,372.0	1,677.0	1,713.0	1,707.0	1,918.0	1,913.0	1,651.0	1,769.0	1,853.0	1,757.0	1,832.0	2,081.0
Nuclear	--	--	--	--	--	--	--	54.0	3,351.0	3,574.0	4,502.0	5,929.0
Geothermal and other	--	--	--	--	--	--	--	--	--	--	--	--
Solar	--	--	--	--	--	--	--	--	--	--	--	--
Electricity	3,477.0	3,626.0	3,818.0	4,232.0	4,583.0	4,883.0	5,171.0	5,672.0	5,995.0	6,232.0	6,328.0	6,871.0

* Light oil, heavy oil, jet fuel (military), and miscellaneous--thousands of barrels; coal, coking coal, petroleum coke, and asphalt and road oil--thousands of short tons; electricity, hydroelectric, and nuclear--millions of kilowatt hours; LPG, lubes, and jet fuel (transportation)--thousands of gallons; natural gas--millions of cubic feet; biofuels--thousands of cords; and greases--thousands of pounds. † Includes pipeline fuel and transmission losses. ‡ Includes only these fuels. § Field use and net additions to storage. ■ Interdepartmental uses.

Sources: See Table 16.

Table 16

SOURCE NOTES AND CONVERSION FACTORS

Type of Energy	Original Units	Btu Conversion Factors	Source for Original Units
Petroleum			
LPG	Thousands of gallons	95,500 Btu per gallon	1965-75, Bureau of Mines, Mineral Industry Surveys, Sales of Liquefied Petroleum Gases and Ethane, annual. 1976, estimated by SHCA.
Gasoline	Millions of gallons	125,000 Btu per gallon	1965-70, API, Total Gasoline Consumption in the United States, annual. 1971-76, U.S. Department of Transportation, Federal Highway Administration, Highway Statistics, annual.
Jet fuel			
Commercial	Thousands of gallons	135,000 Btu per gallon	1965-76, compiled by SHCA from privileged company data.
Military	Thousands of barrels	5.36 million Btu per barrel	1965-66, Bureau of Mines, Mineral Industry Surveys, Sales of Fuel Oil and Kerosene, annual. 1967-76, Bureau of Mines, Mineral Industry Surveys, Crude Petroleum, Petroleum Products, and Natural Gas Liquids, monthly.
Light oil	Thousands of barrels	Kerosene--5.67 million Btu per barrel Diesel and distillate--5.825 million Btu per barrel	1965-75, Bureau of Mines, Mineral Industry Surveys, Sales of Fuel Oil and Kerosene, annual. 1976, estimated by SHCA.
Heavy oil	Thousands of barrels	6.1 million to 6.3 million Btu per barrel	Same as light oil.
Lubes	Thousands of gallons	144,495 Btu per gallon	1965-75, U.S. Department of Commerce, Current Industrial Reports, Sales of Lubricating and Industrial Oils and Greases, biennial (intervening years were interpolated). 1976, estimated by SHCA.
Greases	Thousands of pounds	19,254 Btu per pound	Same as lubes.
Asphalt and road oil	Thousands of short tons	Asphalt--36.76 million Btu per short ton Road oil--39.15 million Btu per short ton	1965-76, Bureau of Mines, Mineral Industry Surveys, Sales of Asphalt, annual.
Petroleum coke	Thousands of short tons	30.12 million Btu per short ton	1965-76, Bureau of Mines, Mineral Industry Surveys, Crude Petroleum, Petroleum Products, and Natural Gas Liquids, monthly.
Miscellaneous	Thousands of barrels	5.4 million Btu per barrel	Same as petroleum coke.
Coal and coke			
Anthracite	Thousands of short tons	25.4 million Btu per short ton	1965-75, Bureau of Mines, Mineral Industry Surveys, Distribution of Pennsylvania Anthracite, annual.
Bituminous and lignite	Thousands of short tons	25 million to 26 million Btu per short ton	1965-75, Bureau of Mines, Mineral Industry Surveys, Bituminous Coal and Lignite Distribution, quarterly.
Coke and coke breeze	Thousands of short tons	21 million to 26 million Btu per short ton	1965-75, Bureau of Mines, Mineral Industry Surveys, Coke and Coal Chemicals, annual. 1976, estimated by SHCA.
Natural gas	Millions of cubic feet	1,005 to 1,010 Btu per cubic foot	1965-75, Bureau of Mines, Mineral Industry Surveys, Natural Gas Production and Consumption, annual. 1976, estimated by SHCA (except power plant gas--Federal Power Commission, FPC News, March 25, 1977).
Biofuels	Thousands of cords	10 million to 18 million Btu per cord	1965-76, SHCA, estimated from wood consumption as reported in Department of Agriculture, Timber Resources for America's Future, Forest Resource Report #14, January 1958.

Table 16 (concluded)

Type of Energy	Original Units	Btu Conversion Factors	Source for Original Units
Hydroelectric	Millions of kilowatt hours	10,000 Btu per kilowatt hour	1965-75, Edison Electric Institute, Statistical Year Book, annual issues. 1976, Federal Power Commission, FPC News, March 25, 1977.
Nuclear	Millions of kilowatt hours	10,000 Btu per kilowatt hour	Same as hydroelectric.
Electricity	Millions of kilowatt hours	3,413 Btu per kilowatt hour	1965-76, Edison Electric Institute, Statistical Year Book, annual issues.

Table 18

ENERGY PRICES IN MAINE--CENTS PER MILLION BTU
1965-1976

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Residential												
Light oil	118¢	118¢	118¢	118¢	129¢	140¢	157¢	154¢	180¢	268¢	296¢	313¢
Natural gas	178	198	194	203	195	197	203	212	215	236	262	485
Electricity	885	876	838	806	794	774	765	800	812	920	1067	1022
Commercial												
Light oil	108	108	115	122	115	115	122	129	158	251	258	266
Natural gas	156	157	146	161	155	153	159	163	171	189	213	322
Electricity	896	861	812	791	776	756	744	788	797	923	1064	1028
Industrial												
Light oil	79	79	86	93	86	86	93	100	129	222	230	237
Heavy oil	44	42	39	38	38	38	40	40	42	153	183	182
Natural gas	92	112	107	89	84	84	92	100	110	119	144	244
Coal	53	54	53	48	51	54	62	66	70	101	139	143
Electricity	396	360	357	337	337	328	340	369	384	548	601	568
Power plants												
Light oil	--	79	86	93	86	86	93	100	--	--	--	272
Heavy oil	36	34	32	30	30	30	33	32	34	147	178	176
Natural gas	--	--	--	--	--	--	45	44	50	60	68	--
Coal	--	--	--	--	--	--	--	--	--	--	--	--
Nuclear	--	--	--	--	--	--	--	--	29	33	36	22
Transportation												
Gasoline	233	244	259	266	277	286	293	288	313	419	448	466
Jet fuel	n.a.	n.a.	79	78	85	84	88	90	95	163	215	235
Diesel	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	360	384	393

Sources: Table 24 and Table 29.

Table 24

ENERGY PRICES IN MAINE--ORIGINAL UNITS*
1965-1976

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Residential												
Light oil	16.5	16.5	16.5	16.5	18.0	19.5	21.9	21.5	25.1	37.4	41.2	43.6
Natural gas	180	200	196	205	197	199	205	214	217	238	265	490
Electricity	3.02	2.99	2.86	2.75	2.71	2.64	2.61	2.73	2.77	3.14	3.64	3.49
Commercial												
Light oil	15	15	16	17	16	16	17	18	22	35	36	37
Natural gas	158	159	148	163	157	155	161	165	173	191	215	325
Electricity	3.06	2.94	2.77	2.70	2.65	2.58	2.54	2.69	2.72	3.15	3.63	3.51
Industrial												
Light oil	11	11	12	13	12	12	13	14	18	31	32	33
Heavy oil	2.79	2.63	2.48	2.41	2.40	2.40	2.53	2.49	2.64	9.65	11.56	11.46
Natural gas	93	113	108	90	85	85	93	101	111	120	146	246
Coal	14.70	14.59	14.56	13.34	13.97	14.89	16.82	18.03	18.78	26.98	37.24	38.74
Electricity	1.26	1.23	1.22	1.15	1.15	1.12	1.16	1.26	1.31	1.87	2.05	1.94
Power plants												
Light oil	--	11	12	13	12	12	13	14	--	--	--	38
Heavy oil	2.29	2.13	1.98	1.91	1.90	1.90	2.03	1.99	2.14	9.15	11.06	10.96
Natural gas	--	--	--	--	--	--	46	45	51	61	69	--
Coal	--	--	--	--	--	--	--	--	--	--	--	--
Nuclear	--	--	--	--	--	--	--	--	0.290	0.331	0.357	0.221
Transportation												
Gasoline	29.15	30.48	32.32	33.32	34.65	35.73	36.57	35.98	39.07	52.40	55.98	58.23
Jet fuel	n.a.	n.a.	10.4	10.2	11.2	11.0	11.5	11.8	12.5	21.4	28.2	30.8
Diesel	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	49.9	53.2	54.5

* Natural gas--cents per thousand cubic feet; electricity--cents per Kwh; light oil--cents per gallon; heavy oil--dollars per barrel; coal--dollars per ton; nuclear--cents per Kwh; gasoline--cents per gallon; jet fuel--cents per gallon; and diesel--cents per gallon.

Sources: See Table 29.

Table 29

PRICE DATA SOURCES AND CONVERSION FACTORS

Electricity	Edison Electric Institute, Statistical Yearbook, 1965-76 Residential--residential Commercial--small light and power Industrial--large light and power Converted at 3,413 Btu per Kwh.
Natural gas	1970-75, Bureau of Mines, Mineral Industry Surveys, Natural Gas Annual. 1965-69, Bureau of Mines, Mineral Yearbook, Natural Gas. 1965-67: Industrial price--multiplied NCA Power Plant Price by BOM Electric Utilities Natural Gas volume to get value of electric utilities natural gas; then subtracted electric utilities value from total industrial natural gas value to get industrial value excluding electric utilities. Power plant price--National Coal Association (NCA), Steam-Electric Plant Factors. 1976: Power plant price--Federal Power Commission, Cost and Quality of Steam-Electric Plant Fuels. Residential and commercial price--American Gas Association, 1976 Gas Facts. Industrial price--multiplied FPC Power Plant Price by AGA Gas Facts sales to get electric utilities gas revenue; then subtracted electric utilities gas revenue from the total sum of "industrial" and "other" category revenues to get industrial revenue excluding electric utilities. Converted at 1,010 Btu per cubic foot
Coal	Power plant price--1965-75, National Coal Association, Steam-Electric Plant Factors. 1976, Federal Power Commission, Cost and Quality of Steam-Electric Plant Fuels. Industrial price: Connecticut, Massachusetts, New Hampshire, and Vermont--power plant price plus $4.00 per ton. Rhode Island--Massachusetts industrial price plus $1.00 per ton. Maine--New Hampshire industrial price plus $1.00 per ton. Conversion--as reported in the National Coal Association, Steam-Electric Plant Factors.
Heavy oil	Power plant price--1965-75, National Coal Association, Steam-Electric Plant Factors. 1976, Federal Power Commission, Cost and Quality of Steam-Electric Plant Fuels. Industrial price--power plant prices plus $0.50 per barrel (except Vermont). Vermont equals Massachusetts prices. Converted at 6.3 million Btu per barrel.
Light oil	Power plant price--1965-75, National Coal Association, Steam-Electric Plant Factors. 1976, Federal Power Commission, Cost and Quality of Steam-Electric Plant Fuels. Industrial price: Massachusetts--power plant price. All other--Massachusetts industrial price plus 1 cent per gallon. Commercial--industrial price plus 4 cents per gallon. Residential Massachusetts--1965-71 price for Lowell, Massachusetts reported by Independent National Gas Association of America, Comparison of Seasonal Househeating Costs for Gas, Fuel Oil, Coal, and Electricity. 1972-76, price for Boston, Massachusetts reported by U.S. Department of Labor, Retail Prices and Indexes of Fuels and Utilities, various years.

Table 29 (concluded)

	New Hampshire and Rhode Island--1965-71 price of Manchester, New Hampshire reported by Independent National Gas Association of America, Comparison of Seasonal Househeating Costs for Gas, Fuel Oil, Coal, and Electricity. 1972-76, Massachusetts residential price plus 1 cent per gallon. All other states--1965-76, Massachusetts residential price plus 1 cent per gallon. Converted at 139,300 Btu per gallon.
Nuclear	1965-74, Federal Power Commission, Steam-Electric Plant Construction Cost and Annual Production Expenses. 1975-76, individual company data. Converted at 10,000 Btu per Kwh.
Gasoline (regular grade)	1965-76, Massachusetts (Boston), Vermont (Burlington), New Hampshire (Manchester), Rhode Island (Providence)--Platt's Oil Price Handbook and Oilmanac, various years, and American Petroleum Institute, Petroleum Facts and Figures. Maine and Connecticut--same as Massachusetts. Converted at 125,000 Btu per gallon.
Jet fuel	1973-76, Department of Labor, Wholesale Prices and Price Indexes (commercial jet fuel--New England and U.S. average). 1967-1972, direct communication with Air Transport Association. Converted at 131,000 Btu per gallon.
Diesel fuel	Federal Energy Administration, Monthly Energy Review. Diesel Fuel Service Station Selling Prices--U.S. average plus: 1977 - 1.7 cents per gallon 1976 - 1.0 cents per gallon 1975 - 0.8 cents per gallon 1974 - 0.7 cents per gallon (estimated) as per Department of Labor, Wholesale Prices and Price Indexes (prices of diesel to commercial consumers in New England versus U.S. average). Converted at 138,700 Btu per gallon.

Table 30

Motor Vehicle Registration by States, 1973 - 1976

States	Automobile				Trucks				Buses			
	1973	1974	1975	1976	1973	1974	1975	1976	1973	1974	1975	1976
Conn.	1,782,037	1,828,790	1,858,503		160,492	154,918	148,599		7,303	7,689	7,482	
Maine	474,321	498,118	526,569		119,976	137,073	146,555		2,048	1,964	2,102	
Mass.	2,652,950	2,726,002	2,856,939		290,559	307,482	321,815		8,286	8,468	9,566	
N. H.	385,778	403,870	431,695		75,221	85,214	79,465		1,141	1,219	1,267	
R.I.	497,519	510,000	518,929		64,380	68,422	62,944		931	928	920	
Vt.	224,661	229,984	247,249		48,906	53,913	52,938		996	1,045	1,081	
Total	6,017,266	6,196,764	6,439,884		759,534	807,022	812,016		20,705	21,313	22,418	

Source: Federal Highway Administration

TABLE 31

*Air Carrier Operations 1973 - 1976

(in ,000)

	Total	Conn.	Mne.	Mass.	N.H.	R.I.	Vt.
1973	359	65	18	228	5	33	10
1974	335	66	18	210	5	28	8
1975	383	65	19	347	14	23	15
1976	379	61	22	249	13	21	13

*Air carrier operations are defined as arrivals or departures from an airport by an air carrier.

Source: Terminal Area Forecast 1978 - 1988; U.S. DOT/FAA January 1977

TABLE 32

Highway Vehicle Miles Traveled by State 1973 - 1976

(in millions of miles)

State	1973	1974	1975	1976
Conn.	18,421	18,005	18,234	
Mne.	6,930	6,713	6,916	
Mass.	29,291	28,237	29,100	
N.H.	5,235	5,078	5,290	
R.I.	5,473	5,544	5,660	
Vt.	3,291	3,101	5,314	
Total	68,641	66,678	68,514	

Source: Federal Highway Administration

TABLE 33

*Class I Railroad Mileage by State

State	1973	1974	**1975	1976
Conn.		656	634	
Maine		1,665	1,600	
Mass.		1,405	1,404	
N. Id.		752	751	
R.I.		139	139	
Vt.		716	767	
Total		5,333	5,295	

**Effective January 1, 1976, Class I railroads were redefined to be those with annual gross revenues of $10 million or more.

Railroad mileage-represents the aggregate length of roadway of all line haul railroads. Does not include the mileage of yard tracks or sidings, nor does it reflect the fact that a mile of railroad may include multiple tracks. Jointly used track is counted only once.

* Source: "Background Material for States". Association of American Railroads. May 1976

**Source: Yearbook of Railroad Facts of 1977 Ed. Association of American Railroads.

Table 34

Household by States, 1973-1976

	1973	1974	1975*	1976*
Connecticut	995,000	1,010,000	1,029,000	1,031,000
Maine	332,000	337,000	347,000	357,000
Massachusetts	1,879,000	1,906,000	1,936,000	1,964,000
New Hampshire	254,000	261,000	267,000	277,000
Rhode Island	312,000	307,000	312,000	316,000
Vermont	146,000	150,000	153,000	159,000
Total	3,918,000	3,971,000	4,044,000	4,104,000

Source: Statistical Abstracts of the U.S./U.S. Bureau of Census, current population reports, series P-25, Nos. 440 and 544, and U.S. Census of Population, 1970, Vol.I, Part B.

*Estimates from Bureau of Census Boston Office.

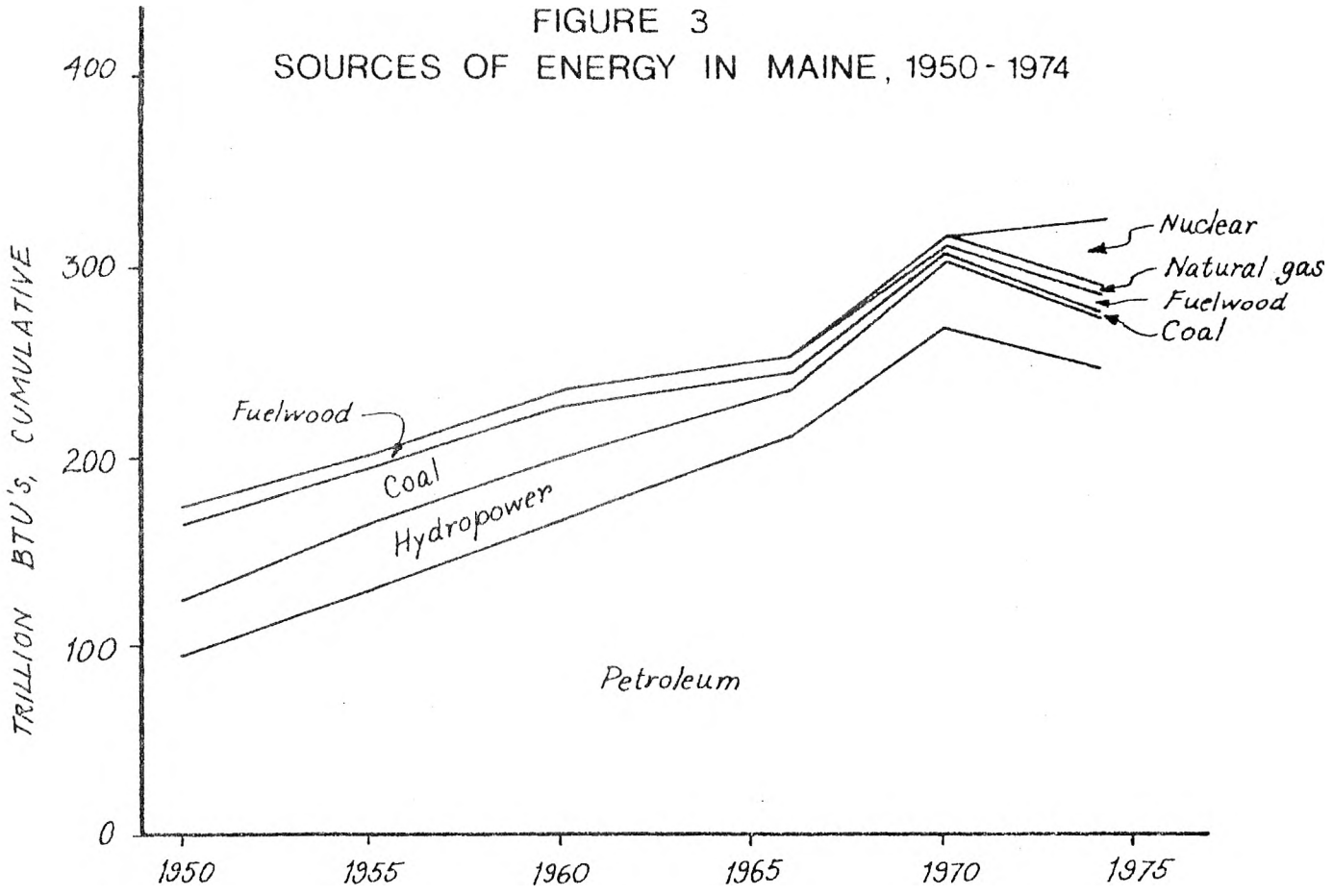
Chapter III- Trends in Energy Supply in Maine

1. Maine Supply Overview

This section will deal with the specifics regarding Maine's total energy supply posture, especially as it compares to the rest of the nation. It is useful to first re-examine Maine's historical supply back to 1950 and then to analyze trends to 1976.

At the present time Maine's quantifiable energy sources include petroleum, nuclear, hydropower, fuelwood, natural gas and coal. Figures 3 and 4, from the "Maine Comprehensive Energy Plan, 1976 Edition", review historical trends in energy supply in Maine from 1950 through 1974, Figure 3 in BTU's of energy and Figure 4 as a percentage of total energy supplies to the State.

FIGURE 3
SOURCES OF ENERGY IN MAINE, 1950 - 1974



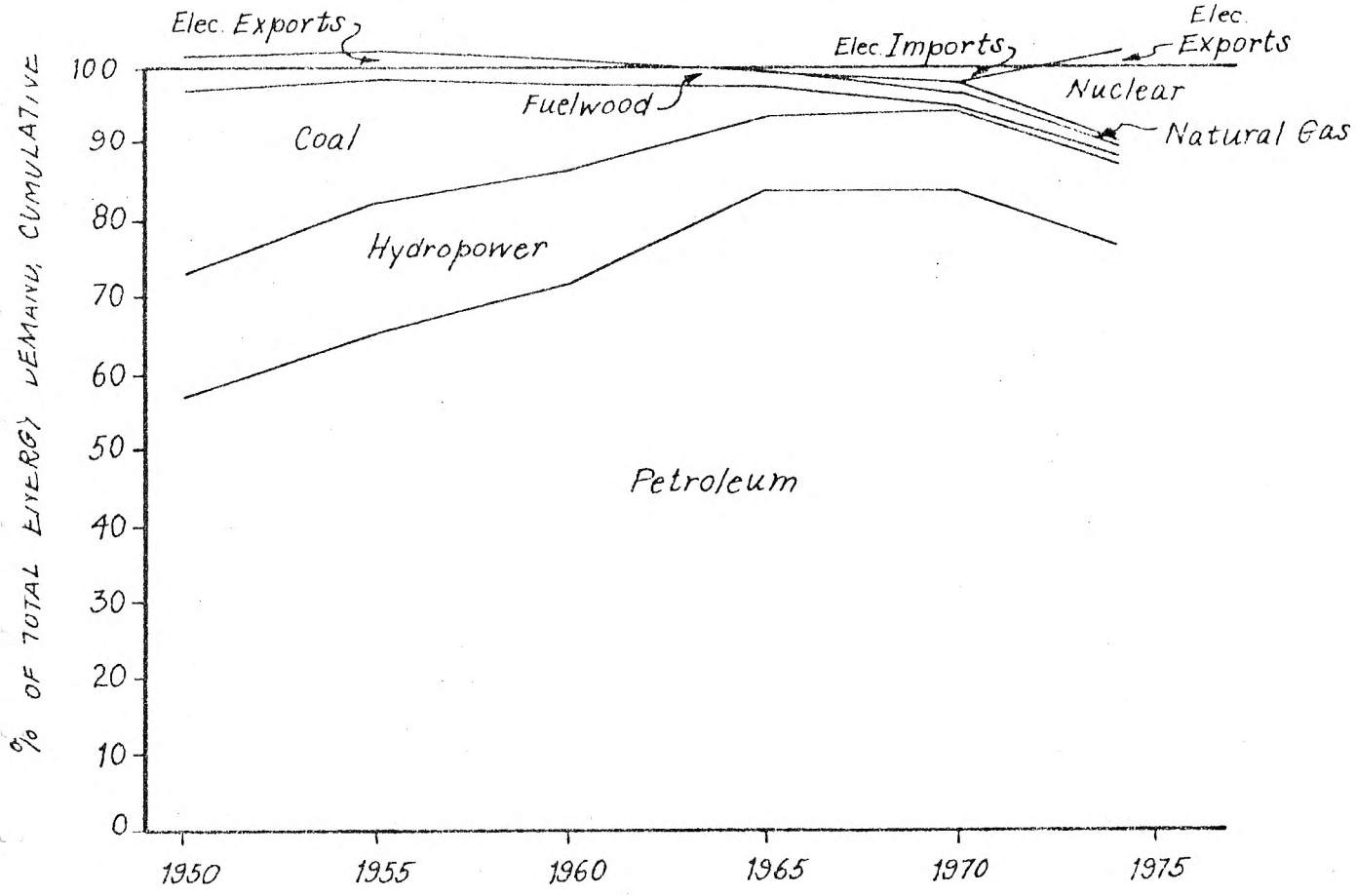
Source: Maine Comprehensive Energy Plan, 1976 Edition

These figures illustrate the dramatic increases in petroleum consumption in Maine, and the increasing reliance upon that fuel as an energy input into Maine's economy. Hydropower and fuelwood have remained relatively stable as input's throughout this period, while coal has decreased dramatically. Natural gas was introduced into the State in the late 1960's and contributes a small fraction to the overall energy picture, although it makes a substantial contribution in those areas of Southwestern Maine where it is available. Nuclear energy was introduced into Maine in the winter of 1972-73, with the initial operation of the Maine Yankee Atomic Power Company plant in Wiscasset, although nuclear-generated electricity had been imported into Maine from units located in other New England states (Massachusetts and Connecticut) since about 1960. In 1976, Maine Yankee supplied 37.7% of Maine's total electricity needs, while nuclear generated electricity from out-of-state plants furnished another 6.6%, for a total nuclear contribution of 44.3% of our electricity consumption.

FIGURE 4

SOURCES OF ENERGY IN MAINE, 1950 - 1974

(As Percent of Total Energy Demand)



Tables 7 and 8 compare Maine sources of energy in 1975 and 1976 to 1974. As these tables emphasize, Maine's social and economic system has increased its reliance upon liquid petroleum products to over 80% of its total energy supplies.

Table 7

Sources of Energy in Maine
(Trillion BTU's)

Energy Form	1974	1975	1976
Petroleum	243.7	233.4	250.1
Hydropower	33.3	18.3*	20.8*
Coal	1.3	.7	.8
Fuelwood	6.8	.9*	.9*
Natural Gas	1.7	2.3	2.3
Nuclear	38.1	45.0	59.3
Total	324.9	300.6	334.2

Source: "Forum Data Handbook for New England Energy Alternatives", the Forum Working Group, sponsored by the Department of Energy, December 1977.

Table 8

Sources of Energy in Maine
(As percent of total Energy)

Energy Form	1974	1975	1976
Petroleum	75.1	82.2	81.8
Hydro	10.2	6.9	7.2
Coal	.4	.3	.2
Fuelwood	2.1	.3	.3
Natural gas	.5	.9	.9
Nuclear*	11.7	9.4	9.5

*Excludes exports of nuclear power

Data Source: Forum Data Handbook for New England Energy Alternatives

Although nuclear energy and hydropower continue to contribute to Maine's electrical generating potential, their combined percentage of total energy input dropped from 21.9% in 1974 to 16.7% in 1976. The only other significant non-petroleum fuel is fuelwood. The contribution of fuelwood as an energy source is almost certainly higher than is reflected in the given 1975/76 data. Efforts are underway to improve the data on this fuel.

Basically, 1976 finds Maine primarily dependent upon petroleum - a non renewable and non-indigenous resource - for energy.

2. Maine/U.S. Comparisons

The difference between Maine's energy supply posture and that of the country as a whole is evident by comparing Figures 5 and 6. The data presented in these figures graphically illustrate that Maine is much more dependent on petroleum than is the rest of the nation. Whereas the rest of the country enjoys a diversified energy base consisting of natural gas or coal to operate its economic machinery, Maine relies almost exclusively on residual oil. Most homes in the country heat with natural gas, while in Maine distillate home heating oil is used by a wide margin over other energy forms. Gasoline is another petroleum product upon which Maine is very dependent, as many Maine people live in rural areas, distant from work, school, shopping centers, medical services and other social services. Maine's citizens rely upon the family automobile in their day-to-day living. They do not have the option of using or constructing mass transit systems to the degree that more populous states do. 5% of petroleum consumption in Maine is used in the generation of electricity.

Not only is Maine more dependent upon petroleum than the rest of the nation, but, as a state, we are also more dependent on imported petroleum.

In 1976, foreign petroleum accounted for 79% of Maine's petroleum needs. * Approximately 23% of this oil was directly imported and the remaining 56% refined domestically from foreign crudes. 1/

Maine's dependence on foreign oil by various refined products follows:

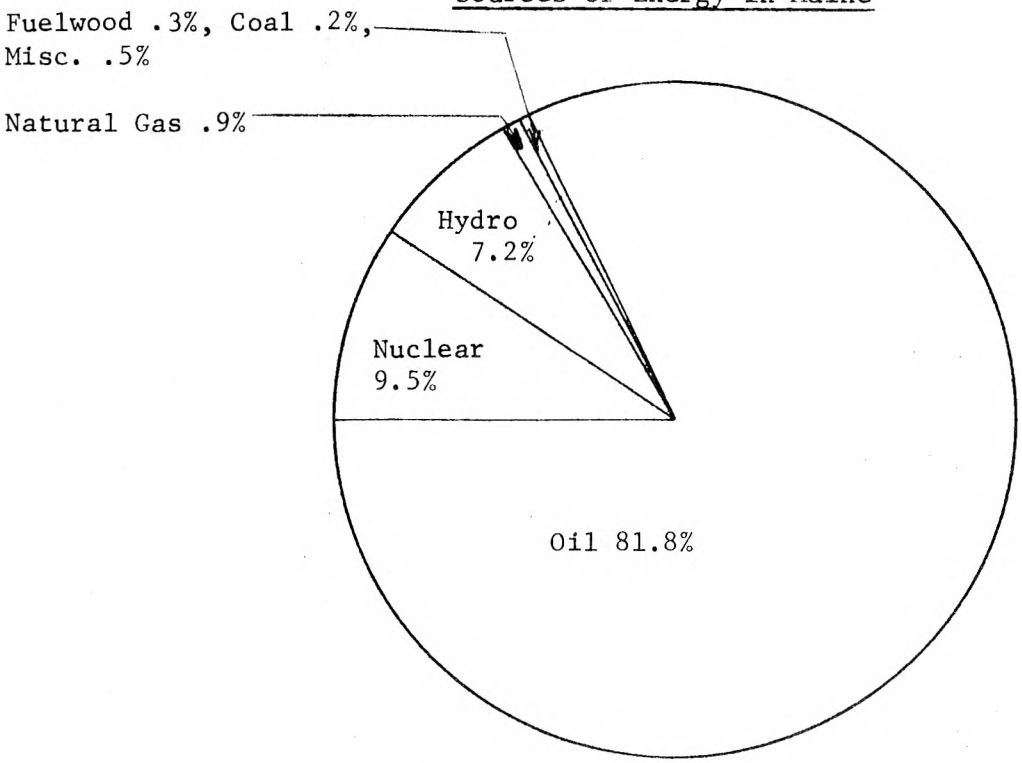
Direct and Indirect Imports as Percent of Consumption - 1976

Residual	93%
Distillate	69%
Gasoline	75%
Other Oils	77%
Total	79%

* New England data, percentages applicable to the State of Maine

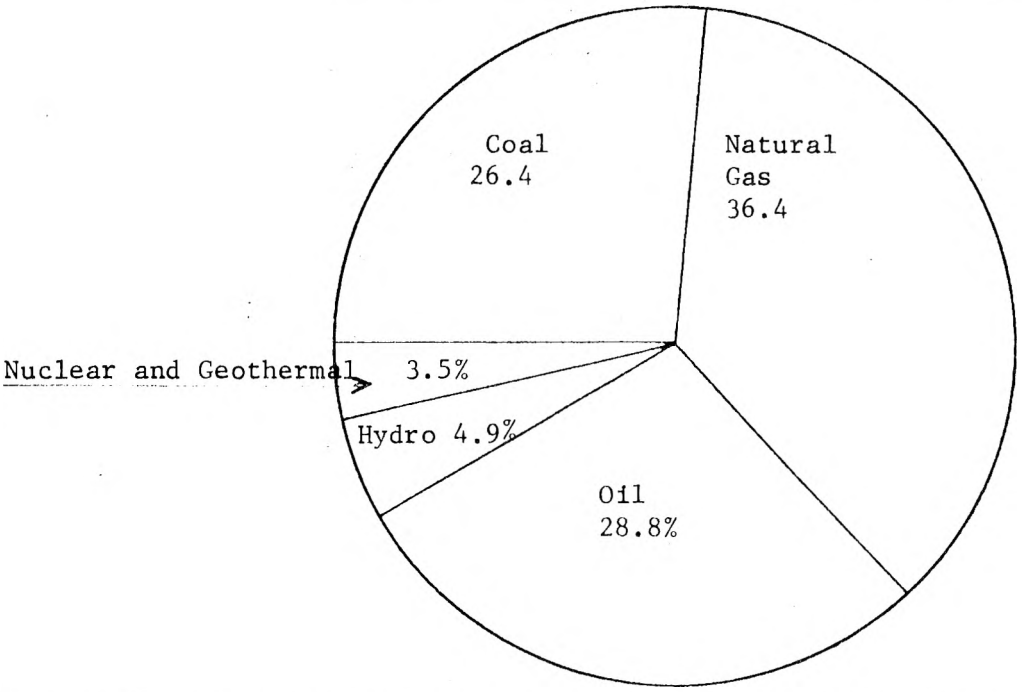
1/"New England Petroleum Product Imports", Department of Energy

Figure 5
Sources of Energy in Maine



Source Data: "Forum Data Handbook for New England Alternatives"

Figure 6
Sources of Energy in the United States, 1976



Source Data: Energy Information Administration/Department of Energy

Based on New England data, Maine receives 68% of its imported residual supply, 86% of distillates, and 50% of its imported gasoline as direct imports from foreign supplies. Table 9 describes our direct import requirements from 1973 to 1976. The important fact brought out by the data presented thus far is that only 21% of Maine's petroleum supply is produced from domestic crude.

Table 9

Direct Petroleum Product Imports

Percentage by Product by Country of Origin

	1973	1974	1975	1976
Residual				
Venezuela	28%	30%	23%	33%
Netherlands Antilles	26%	28%	15%	13%
Trinidad	15%	20%	17%	22%
Distillate				
Netherlands Antilles	28%	19%	11%	17%
Venezuela	16%	18%	23%	13%
Bahamas	11%	15%	4%	11%
Trinidad	1%	12%	23%	41%
Motor Gasoline				
Italy	10%	21%	15%	29%
Netherlands	19%	20%	2%	0
Trinidad	1%	18%	15%	15%
Venezuela	3%	1%	16%	16%

Source: "New England Petroleum Product Imports", U.S.Department of Energy, Region I Office

New England data, percentages applicable to Maine

Based on historical data, Maine's petroleum position is worsening. Figure 7 compares the New England region's consumption to that of the entire nation. In 1973 our total imports were 75% of demand. In 1976 total imported product had increased to 79% of consumption.

For the U.S. in 1973, only 36% of our petroleum was imported. The increased national demand caused a 5% increase in imported petroleum supplies by 1976.

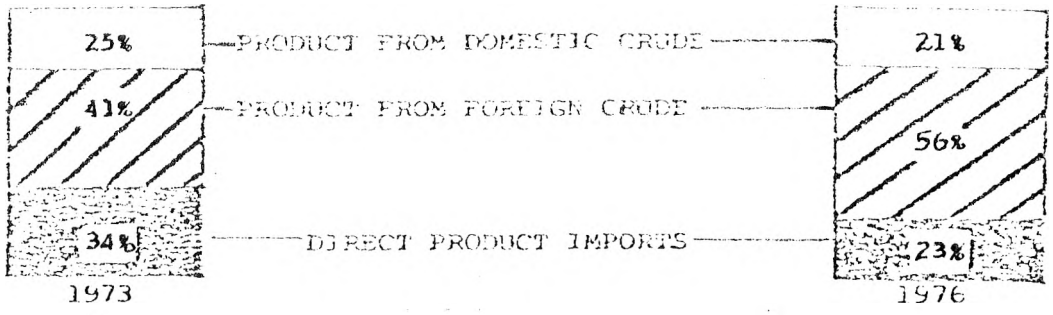
Thus for both our region and the nation in general, the trend has been one of increasing reliance on imports to satisfy our growing energy demand.

Figure 7

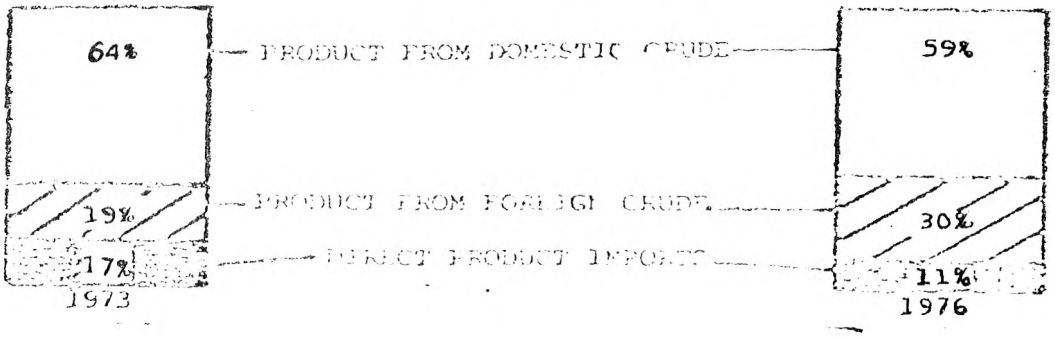
MAJOR SOURCES OF OIL IMPORTS

1973-1976

NEW ENGLAND



UNITED STATES



Source: New England Federal Regional Council

3. Petroleum Reserves and Resources

In 1976, 6.4 billion barrels of petroleum were consumed in the United States. 1/ Consumption for all the free world was 12.1 billion barrels. 2/ Petroleum energy is, however, a finite resource. As outlined in Table 10, the world's reserves as of January 1, 1977 equalled 497.9 billion barrels. 3/ At current consumption levels, the world has approximately 40 years of petroleum remaining.

Until the 1960's, the United States relied on its own indigenous petroleum resources. Recently, however, the nation has had to rely increasingly on imports to satisfy the growing demand for petroleum. This dependence on imports is caused by the fact that national production cannot keep pace with demand and the fact that new discoveries are not replacing oil fields which are becoming less productive.

The degree to which the nation has been able to add new reserves is evidenced in Table 11. Since 1971, U. S. proved additions to reserves has dropped by an average of 1.3 billion barrels per year.. Imports rose consistently during the same period from 1.5 billion barrels a year to 2.7 billion barrels (See Table 12).

Presently, the U.S. has a demonstrated petroleum reserve of 32.7 billion barrels. 4/ At present consumption levels, our nation's known petroleum reserves only equal approximately 5 years of U.S. demand.

1/ Bureau of Mines, Energy Information Administration
2/ Department ov Energy "Quarterly Report: Third Quarter 1977 DOE E1A-000813(77) January 1978.
3/ Oil and Gas Journal - December 27, 1976
4/ Enhanced Oil Recovery Potential: Congress of the United States, Office of Technology Assessment.

Table 10

WORLDWIDE OIL AND GAS
By Regions And Key Countries

COUNTRY	PROVED RESERVES 1-1-77 OIL BILL. BBL.	PROVED RESERVES 1-1-77 GAS-TCF	OIL PRODUCTION PRODUCING WELLS 7-1-76	OIL PRODUCTION EST. 1976 Bbl./D 000	OIL PRODUCTION AVG. PROD' BBL./Wel /I
ASIA-PACIFIC	19.4	120.0	6,645	2,672	4
Australia	1.4	32.3	378	430	1,138
India	3.0	3.5	1,548	180	116
Indonesia	10.5	24.0	3,162	1,500	4
Malaysia	2.4	15.0	87	155	1,782
EUROPE	24.5	141.9	6,109	900	1
Netherlands	.9	61.9	392	28	
Norway	5.7	18.5	29	300	10,344
United Kingdom	16.8	30.0	90	230	2,55
MIDDLE EAST	326.3	513.5	3,907	21,881	5,600
Abu Dhabi	29.0	20.0	209	1,590	7,60
Iran	63.0	330.0	428	5,875	13,7
Iraq	34.0	27.0	170	2,070	12,17
Kuwait	67.4	31.7	596	1,820	3,054
Saudi Arabia	110.0	63.0	701	8,570	12,2
AFRICA	60.6	209.1	3,884	5,598	1,441
Algeria	6.8	125.8	826	950	1,15
Libya	25.5	25.8	877	1,900	2,16
Nigeria	19.5	44.0	1,259	2,020	1,604
WESTERN HEMISPHERE	67.1	366.3	563,049	13,801	2
Mexico	7.0	12.0	3,382	850	25
Venezuela	15.3	40.7	10,720	2,290	214
United States	31.3	220.0	507,935	8,105	1
Canada	6.2	56.0	25,055	1,300	5
TOTAL NON-COMMUNIST	497.9	1,350.8	583,594	44,851	7
COMMUNIST WORLD	101.1	953.0	----	12,360	----
TOTAL WORLD	599.0	2,303.8	----	57,210	----

SOURCE: OIL AND GAS JOURNAL - Dec. 27, 1976

Table 11
Proved Reserves of Crude Oil in the United States, 1959-76
(Billions of Barrels of 42 U.S. Gallons)

Year	Proved reserves at beginning of year	Proved reserves at end of year	Net change from previous year
1959	30.5	31.7	+1.2
1960	31.7	31.6	–0.1
1961	31.6	31.8	+0.2
1962	31.8	31.4	–0.4
1963	31.4	31.0	–0.4
1964	31.0	31.0	+0.0
1965	31.0	31.4	+0.4
1966	31.4	31.5	+0.1
1967	31.5	31.4	–0.1
1968	31.4	30.7	–0.7
1969	30.7	29.6	–1.1
1970	29.6	39.0	+9.4
1971	39.0	38.1	–0.9
1972	38.1	36.3	–1.7
1973	36.3	35.3	–1.0
1974	35.3	34.3	–1.1
1975	34.3	32.7	–1.6
1976	32.7	30.9	–1.7

Note: 1970 figures reflect the addition of Prudhoe Bay, Alaska reserves.

Source: *Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada as of December 31, 1975.* Joint publication by the American Gas Association, American Petroleum Institute, and Canadian Petroleum Association, Vol. 30, May 1976.

Table 12
U.S. Domestic Production and Imports of Oil, 1959-76
(Barrels of 42 U.S. Gallons)

Year	Production		Imports	
	Annual (billions of barrels)	Daily (millions of barrels)	Annual (billions of barrels)	Daily (millions of barrels)
1959	2.6	7.1	0.7	1.8
1960	2.6	7.5	0.7	1.8
1961	2.6	7.2	0.7	1.9
1962	2.7	7.3	0.8	2.1
1963	2.8	7.5	0.8	2.1
1964	2.8	7.6	0.8	2.3
1965	2.8	7.8	0.9	2.5
1966	3.0	8.3	0.9	2.6
1967	3.2	8.8	0.9	2.5
1968	3.3	9.1	1.0	2.8
1969	3.4	9.2	1.2	3.2
1970	3.5	9.6	1.2	3.4
1971	3.5	9.5	1.4	3.9
1972	3.5	9.5	1.7	4.7
1973	3.4	9.2	2.3	6.2
1974	3.2	8.8	2.2	6.1
1975	3.1	8.4	2.2	6.0
1976	3.0	8.1	2.7	7.3

Source: U.S. Bureau of Mines.

Along with a diminishing capacity to provide for our own petroleum needs, came a corresponding scramble for petroleum sources abroad. Our energy dilemma was aggrevated by the fact that our historical suppliers such as Canada invoked their own "Project Independence" which resulted in severe curtailment of exports to the U.S. Also during this period a formerly very weak economic cartel matured - OPEC (Organization of Petroleum ExportingCountries). It became evident that of the free world's total remaining reserves of 497 billion barrels, the 13 OPEC members controlled 381 billion barrels or 76%. 5/

Table 13 depicts the increasing role of OPEC in providing for the energy needs of our nation. As the table points out, the cartel now supplies the U.S. with 69% of all its imported petroleum energy. Forty-seven percent of the domestic petroleum requirements of the U.S. are imported.

Political and economic disruptions in the supply from some of these nations has occured in the past, and there is little reason to believe that they will not occur again.

Even if the supply remains stable, U.S. consumers can expect to pay more for imported petroleum. The increasing demand for imported oil and the subsequent export of dollars to foreign energy suppliers has and will continue to broaden the gap in our nation's balance of payments and transfer our wealth abroad, endangering the stability of our economic system.

The conclusion to be drawn from the information presented up to this point is that our Nation's energy supply is controlled increasingly by other nations. A clea recognition of this fact must be seen as a starting point and the basis for an energy policy for Maine, as well as for the country as a whole.

5/ Quarterly Report: Fourth Quarter 1977
Energy Information, Report to Congress, Department of Energy/EIA-0008/4(77)

Table 13 Imports* of Petroleum from OPEC and Arab OPEC Countries (Thousands of Barrels per Day)

	Total	Arab OPEC	Percent Arab OPEC	OPEC	Percent OPEC
1977					
Fourth Quarter	8,062	2,978	37	5,578	69
Third Quarter	8,744	3,145	36	6,151	70
Second Quarter	8,703	3,397	39	6,398	74
First Quarter	9,332	3,051	33	6,349	68
1977	8,708	3,168	36	6,156	71
1976	7,295	2,442	33	5,061	59
1975	6,056	1,404	23	3,601	59
1974	6,112	770	13	3,276	54
1973	6,256	1,163	19	2,993	48
1972	4,741	553	12	2,063	44
1971	3,926	471	12	1,673	43

*Imports into the United States (50 States and D.C.). Data for Organization of Petroleum Exporting Countries (OPEC) and Arab members of OPEC exclude indirect imports.

Note: Third and Fourth Quarter 1977 data and 1977 year average data are preliminary.

Sources: Bureau of Mines--1971 through First Quarter 1977. U.S. Department of Energy--P113 and P133 Systems, Second Quarter 1977 forward.

Chapter IV - Implications for the Future

Introduction

Previous sections of this report have updated the information contained in the 1976 Edition of the Maine Comprehensive Energy Plan to 1975 and 1976 data. What this data reveals is that, in spite of warnings and admonitions that we are entirely too dependent on non-renewable energy resources - namely, fossil fuels and, more particularly, extremely vulnerable and expensive imported foreign petroleum - the situation has not improved since then and has, in fact, deteriorated. The discussion in Chapter III, on the supply situation in Maine, describes how we are more dependent on imported foreign petroleum to provide our energy needs now than we were in 1973 and 1974, during and immediately following the Arab oil embargo.

In any discussion of the energy situation in Maine, it is impossible to divorce ourselves from the international, national, and regional situations. This section is thus organized to, first present the energy outlook in the national context, in which the international context is also introduced. Next, the regional outlook is discussed before finally concentrating on the outlook for Maine.

National Outlook

The information on the national energy outlook is drawn primarily from the Annual Report to Congress of the U.S.Department of Energy, Energy Information Administration, Volume II, 1977, "Projections of Energy Supply and Demand and Their Impacts."

The national energy outlook is developed on the basis of three scenarios for energy growth, reflecting high, medium, and low assumptions for each forecast variable. Economic growth was forecast at three levels of projection by Data Resources Incorporated (DRI). These three macroeconomic forecasts were then incorporated along with three assumed levels of energy supply into the Project Independence

Evaluation System (PIES) to obtain basic national-level projections. These energy and economic relationships are then analyzed, along with certain energy price assumptions, to obtain the interactive effects and to arrive at the final energy projections so as to relate these projections to levels of Gross National Product (GNP).

In the short term (1976 through 1979), U.S. energy consumption is projected to grow at about 2.6 percent annually. Within this projected annual growth figure, petroleum consumption is expected to rise at a rate between 4% and 6% annually, natural gas use is expected to decline, coal demand is projected to increase between 5 and 6 percent annually, and electricity use is expected to increase by 5% to 6% annually. Within this short term, domestic natural gas production is expected to decline while domestic oil production is expected to increase sufficiently to offset the decline in natural gas production and coal production is expected to increase faster than domestic oil production.

In the mid term (1980 through 1990) changes in trends that became evident in the short term are expected to continue. The following developments will have important impacts on the pattern of growth and fuel use in the 1980's:

- Further development of Alaskan and Outer Continental Shelf (OCS) oil resources is expected to allow domestic oil production to continue to rise at a modest rate at least to 1985.

- Coal production is projected to increase from current levels of 685 million tons (1976) to over 1 billion tons by 1985 and to over 1-1/4 billion tons by 1990.

- Electric power generation, which grew at less than 5 percent from 1970 - 1976, is projected to grow at 4 percent in the mid-term period.

. The decline in natural gas production that began in 1973 will continue until Alaskan gas is available in quantity - probably after 1985.*

The following table describes the historical and projected growth rates for energy and factors influencing energy growth in the U.S., stated as the average annual percentage change.

	Actual 1960-1972	Actual 1972-1975	1975-1985	1985-1990
Real GNP	3.9	0.9	4.1	3.2
Prices (constant dollars)				
Energy	-0.8	10.1	2.5	1.5
Electricity	-2.2	4.7	2.0	0.6
Consumption				
Energy	4.0	-0.6	3.0	2.8
Electricity	7.3	3.1	4.7	3.9

For the long term, projecting out beyond 1990, no reliable data exists. As the 1977 Annual Report to Congress of the Energy Information Administration states, "... it would be improper to assume that the existing projections techniques can be used to map a distant future. They are by nature heavily biased in favor of existing systems, and these may become untenable in the face of future resource and environmental limitations. Studies involving technology forecasting, structural changes in the producing sectors of the economy, and changes in the lifestyle and motivation of consumers employ other legitimate techniques. They concentrate on potential discontinuties in past trends rather than trend projections, and many such forecasts lie outside of the range indicated (by the trend projection forecasts.)'

* Annual Report to Congress, Volume II, 1977, "Projections of Energy Supply Demand and their Impacts" U.S.Department of Energy, Energy Information Administration p. xxii

** ibid, p. xxviii

The national outlook also recognizes that "Alternative energy futures will have differential effects on State and regional economies because neither energy resources nor those industries which are affected by energy related macroeconomic changes are uniformly distributed across the country".

Regional Outlook

The two primary sources of information for this section are "A Perspective on the Energy Future of the Northeast United States", by Brookhaven National Laboratory's Policy Analysis Division at the National Center for Analysis of Energy Systems, and "New England Energy Situation and Alternatives for 1985", by the New England Federal Regional Council's Energy Resource Development Task Force. The former study was published in June 1976 and includes New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, and the District of Columbia. The latter study was updated in August 1977.

The principal findings of the Brookhaven Study are:

1. Conservation measures can reduce fuel and resource requirements in the Northeast by over 30%.
2. Oil imports are likely to continue to be a major energy resource for the Northeast since only if strong conservation measures are combined with large increases in U.S. energy supplies is there apt to be a substantial decline in oil imports to the region.
3. A shift to coal and other alternate energy supplies, coupled with increased conservation, could compensate for a curtailment in the use of nuclear power in the region.
4. New Resource technologies are capable of supplying up to 20% of the region's energy requirements in 2000.
5. No single supply technology or single conservation strategy taken alone can reduce the region's increasing dependence on foreign oil. Rather,

the creation of an acceptable energy system for the region will require efforts in many directions in terms of both reducing demand and developing reliable, diversified supplies.

A continuation of current trends in population, economic growth, and energy use patterns and of current policies related to energy resource development and usage would lead to an 80% increase in the demand for fuels in the Northeast and a 100% increase in energy resource requirements between 1972 and 2000. The need for imported oil would increase by 85%. Coal and nuclear power would each supply roughly 20 to 25% of the total resources used by the Northeast in 2000.

Conservation can play a major role in reducing the fuel and resource requirements of the Northeast: The moderate-conservation actions considered in the Brookhaven studies can reduce fuel demands by 11% in 1985 and 18% in 2000 from the level in the reference scenario, and the strong-conservation actions can reduce them by 19% in 1985 and 32% in 2000.

Conservation is seen as providing several benefits to the Northeast. In addition to the obvious and primary one of reducing the region's dependence on and vulnerability to imported foreign oil constraints, conservation measures could result in net long-run monetary savings (and, thereby, lead to an increase in the level of disposable income available for investments, savings, and consumption of durable and non-durable goods). Conservation strategies also have a potential for creating more jobs within the region than corresponding supply strategies, and environmental and health benefits would be derived from the lower levels of resource extraction and energy use both within the region and outside it.

Although imported oil is likely to continue to play a major role an an energy resource for the Northeast, this role can be reduced by the implementation of programs that concentrate on energy conservation in petroleum consuming processes,

and switching to alternative fuels wherever possible and feasible.

There are no panaceas for the solution of our energy dilemma. Concerted action is needed at both the Federal and State levels, and needed soon, to avoid a precarious energy future.

On November 7, 1975, the New England Governors, through the New England Regional Commission, adopted "A New England Energy Policy". This policy recognized the national goal of energy independence as "aimed at ensuring stable, long-term supplies of fuel at reasonable prices to meet a level of energy growth consistent with long-term economic, social, and environmental goals. New England has a strong interest in that goal because it has the greatest vulnerability to international oil price and supply manipulation. Continued heavy reliance upon imported oil with its consequent, disproportionate regional energy cost will further undermine the economic base of this region and, therefore, cannot be borne.

Therefore, the region of New England is prepared to commit itself to the development of a more nearly balanced mix of energy production capabilities, including nuclear power facilities, hydroelectric and other indigenous resources, domestic oil and gas resources, and the use of coal and other alternative fuels. To that end it has established fuel-use goals to be achieved during the next decade to reflect that balance and to reduce the region's dependence upon oil by one-fifth."

The full draft of this New England Energy Policy Statement was published in the Appendix of the Maine Comprehensive Energy Plan, 1976 Edition and is reproduced again here as a reminder of the goals and policy positions that were agreed to at that time.

The New England FRC "New England Energy Situation and Alternatives for 1985" goes on to recap the regions energy posture as of August 1977, when the report was published. The inescapable conclusion is that New England, as a region, is

extremely reliant upon expensive and unreliable imported foreign oil, primarily from the OPEC nations, and that, primarily due to that extreme dependence, the region pays prices well above the national average for its energy in all forms. The dependence on foreign oil for New England as a region was discussed in the previous chapter.

The Federal Energy Administration (now Department of Energy) pledged technical assistance to the region as an aid in meeting the goals set in the regional energy policy statement. Their analysis of the goal of reducing the regions dependence upon oil by one-fifth indicates that oil dependence will be reduced from 81% current level to 65% by 1985.

Up to 97 million barrels of oil can be conserved in 1985 by the development and implementation of conservation programs aimed at the major oil-consuming sectors. The following table summarizes the target programmatic savings attainable:

Target Programmatic Savings - 1985
In Percent

Sector/Fuel	Gasoline	Distillate	Residual	Kerosene	Electricity	Natural Gas
Residential		20.1		19.3	13.7	14.0
Commercial		14.7	12.9		18.0	11.8
Industrial		18.5	14.3		14.7	15.1
Transportation	18.5					

Construction of the six new nuclear generating units that were scheduled for completion in the early to mid-1980's would have saved 65.7 million barrels of oil in 1985. These plants were:

Millstone III (Conn.)	1150 MW	10.9 mmBbls/yr.
Sears Island (Maine)	1150 MW	10.9 "
Pilgrim II (Mass.)	1180 MW	11.2 "
Seabrook I (N.H.)	1150 MW	10.9 "
Seabrook II (N.H.)	1150 MW	10.9 "
NEPCO I (R.I.)	1150 MW	10.9 "
Totals, N.E.	6930 MW	65.7 mmBbls/yr.

Development of the oil and gas resources of the outer continental shelf (OCS) could lead to as much as 60 million barrels of oil and 300 billion cubic feet of natural gas by 1985. Construction of two refineries in New England could provide 180 million barrels of refined products (although the crude stocks input to the refineries may still be from foreign sources).

Increased use of coal by utilities and industry could displace 25.2 million barrels of oil in 1985. Coal production from the Narragansett Basin might be 4 million tons in 1985 (about 15 million barrels oil equivalent).

Development of alternative energy sources could provide the following maximum inputs by 1985:

Solar - up to 1.4 million bbl/yr. oil equivalent

Solid Waste Utilization - up to 7.3 million bbl./yr.

Reclaim Hydroelectric - up to 9.0 million bbl/yr.

Wood Utilization - up to 21.3 million bbl/yr.

The following table outlines the maximum developable potential by state:

(Thousands of BBL of Oil Equivalence per year)

State	Solar	Solid Waste	Reclaim Hydro	Wood
Connecticut	385	2,000	-	-
Maine	120	120	2,700	7,100
Massachusetts	670	4,400	900	-
New Hampshire	90	160	2,700	7,100
Rhode Island	110	640	-	-
Vermont	55	40	2,700	7,100
NE Total	1,430	7,360	9,000	21,300

The current and forecast situations in Maine, as viewed by the FEA and the NEFRC, are as depicted on the following two pages.

MAINE

Current Oil Consumption: 45.0 million barrels (1975)

Projected 1985 oil consumption: 66.6 million barrels
(assuming 4% annual growth 1975-1985)

Potential Savings

	Millions of Barrels in 1985	
Conservation	11.6	
State Energy Conservation Plan (SECP)		3.6 (1980)
Nuclear - Sears Island I	10.9	
Coal-New industrial use & conversion	1.1	
Solid Waste	.1	
Solar	.1	
Reclaim Hydro	2.7	
Wood Utilization	7.1	

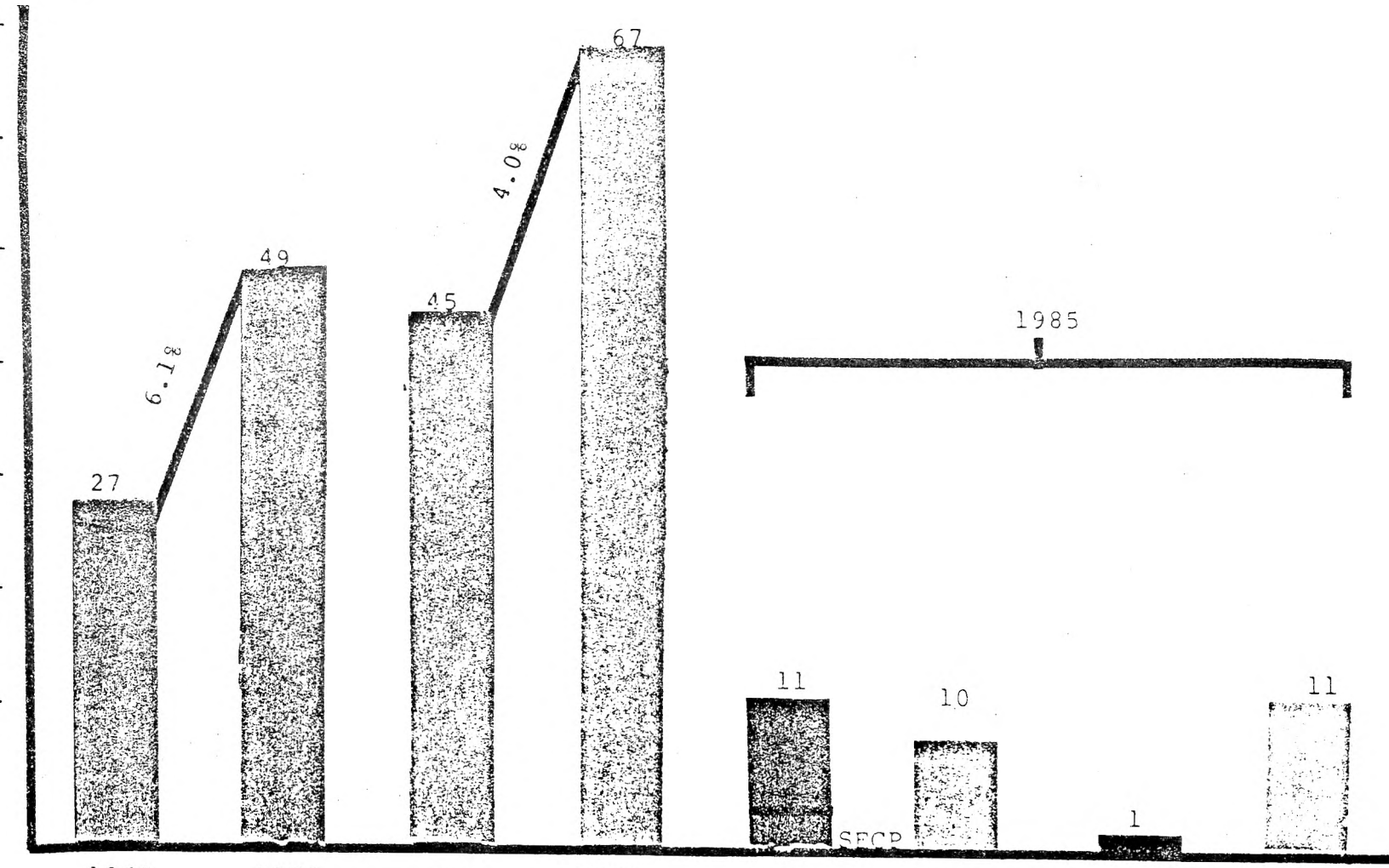
OCS - Development decreases reliance on foreign sources

Refining Siting

Source: "New England Energy Situation and Alternatives for 1985"
by the New England Federal Regional Council, August 1977 Update

OIL USE AND POTENTIAL SAVINGS
MAINE

S OF BARRELS
IVALENT



Source: "New England Energy Situation and Alternat
for 1985" by the New England Federal Regio
Council, August 1977 update

The Outlook for Maine

The preceeding discussion in this chapter has described the energy outlook on the regional and national levels (and, to a lesser extent, or by implication, on the international level) because the energy outlook for Maine is necessarily dependent upon these larger contexts. Even if Maine were, at this point, to develop resources available locally to attain complete energy independence, such a step would be taken because of the external influences of regional, national, and global energy politics. It is, therefore, important to establish the framework within which Maine's energy future will develop, or be developed.

It is not foreseeable that the State of Maine can or will ever achieve total energy independence. To some degree, we will continue to rely upon external sources for some portion of our energy needs. We can, however, mitigate many of the adverse consequences associated with importation of energy from external sources with a three-tiered energy policy approach:

1. Conservation
2. Diversification
3. Native Resource Development

Conservation of energy, especially within the heavily petroleum - consuming users, would lead to reduced consumption of petroleum, and that reduced consumption could be taken right off the level of oil imports.

"Diversification" means increased use of energy resources that are either little used or not used at all today, to balance out the energy "mix" and to distribute energy use among several fuels rather than relying too heavily on any one fuel. It is especially important to reduce dependence on fuels whose supply may be unreliable, which are particularly expensive, which have potential for political blackmail or may adversely effect the international balance of payments, or which have real or potential severe environmental impacts. Oil, and especially imported

foreign oil, fits into most of these categories, such that the diversification effort should be aimed primarily at drastically reducing the fractional share of Maine's energy that comes from oil.

Related to the diversification issue, and a component of it, is the development of the available native resources that are indigenous to Maine. These native resources include: Solar, wood, hydro, wind, solid wastes, and tidal power. To the extent that these renewable resources can be developed, either on individual, commercial, industrial, community, or larger scales, they will help to reduce the State's dependence on petroleum. More specific details on the development of these resources, including the quantities available for development, and a timetable and strategy for the development of each are being prepared by the Office of Energy Resources with plans to publish in the fall of 1978.

On the demand side, energy consumption in Maine is expected to continue to grow, and the pace of that growth is dependent to a great extent on policy decisions that are made today. It is possible to slow the rate of growth of energy demand in the State and to control the expansion of energy systems within manageable bounds, reducing pressure on the capital supply, environment, and the collective will of our population.

Some policies are already in place whose effect will be to slow the rate of energy growth, and nearly all of these policies are at the national level. These include appliance efficiency standards, which will reduce the rate of growth of electrical demand in the residential sector: automobile gasoline mileage standards, which should tend to slow the rate of growth of gasoline demand in the transportation sector; and incentives for solar heating systems and weatherization for homes, which should slow the rate of growth of demand for home heating fuels, which means primarily No.2 oil and electricity in Maine. The potential impacts of these policies, and others that have been or may be implemented, are being analyzed as part of the strategy studies now underway at OER.

Lacking the results of these studies and quantification of the impacts on Maine and observing the trends in energy demand and supply since publication of the 1976 Edition of the Comprehensive Energy Plan, we must, for the moment, continue to hold the conclusions reached in that study, and to maintain the scenarios for growth that were developed at that time.

The basic data is presented in the accompanying charts and tables. As can be seen, the commercial and transportation sectors are anticipated to continue to grow relatively faster than the residential and industrial sectors, and petroleum is expected to continue to provide the vast majority of our energy inputs for the foreseeable future. The inescapable conclusion to be reached from this is that we will continue to be precariously dependent upon expensive and uncertain imports of foreign oil, with no relief seen in the predictable future, unless strong and definitive action is taken now to halt this trend.

FIGURE 23

MAINE ENERGY GROWTH SCENARIOS -
Total Energy Consumption

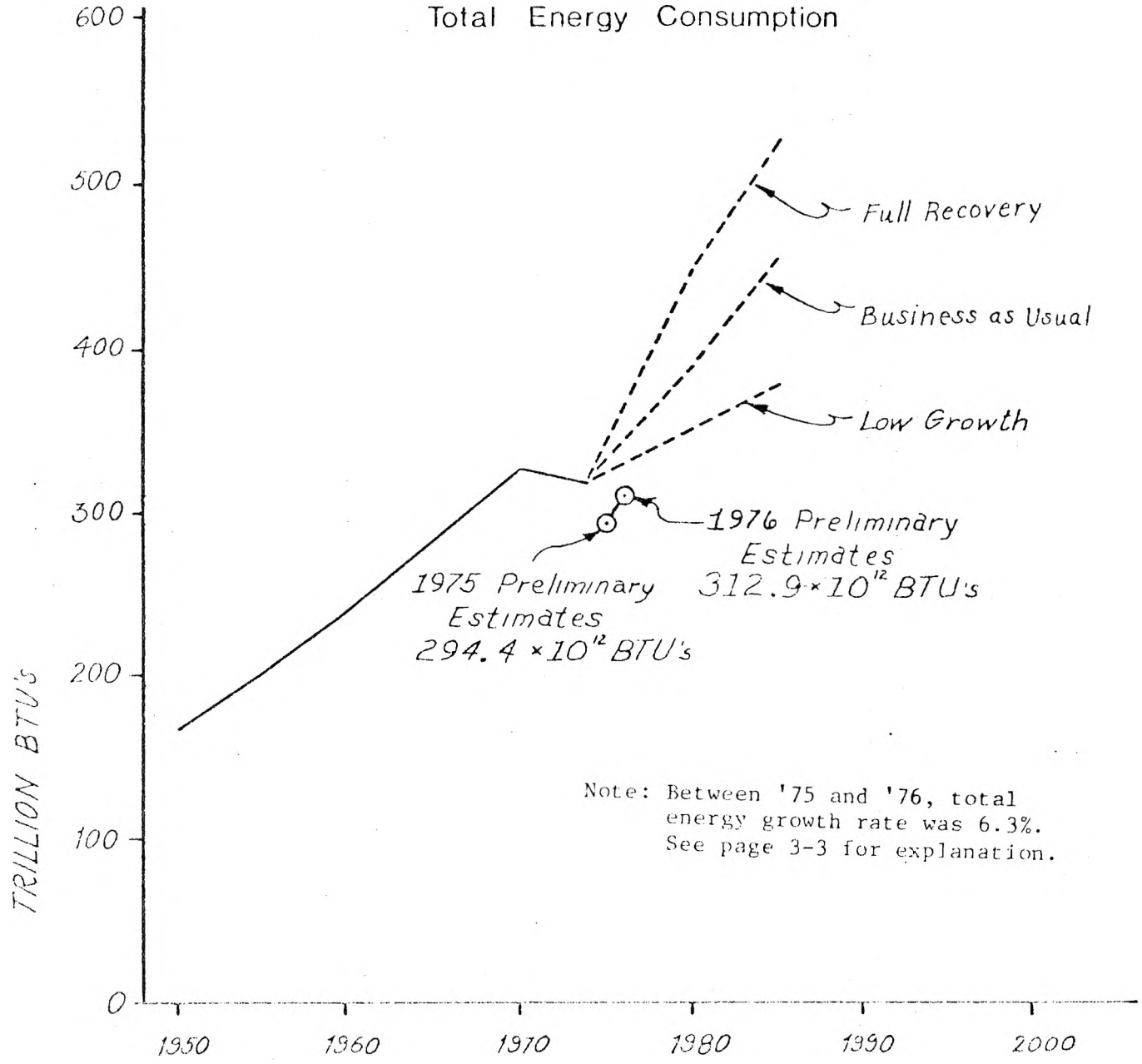


TABLE - 7

MAINE TOTAL ENERGY CONSUMPTION - 1974-1985

Scenario	1974	% Annual Growth	1980	% Annual Growth	1985
"Business as Usual"(BAU) Base Case	317,780	3.3%	385,975	3.3%	453,551
"Full Recovery" Case	-------	6.0%	450,892	3.3%	531,378
"Low Growth"Case	-------	1.58%	349,077	1.58%	377,254

Table gives the total energy demanded by each sector under each of the three possible scenarios, for two future years (1980 and 1985), with 1974 consumption levels included for comparison.

TABLE -

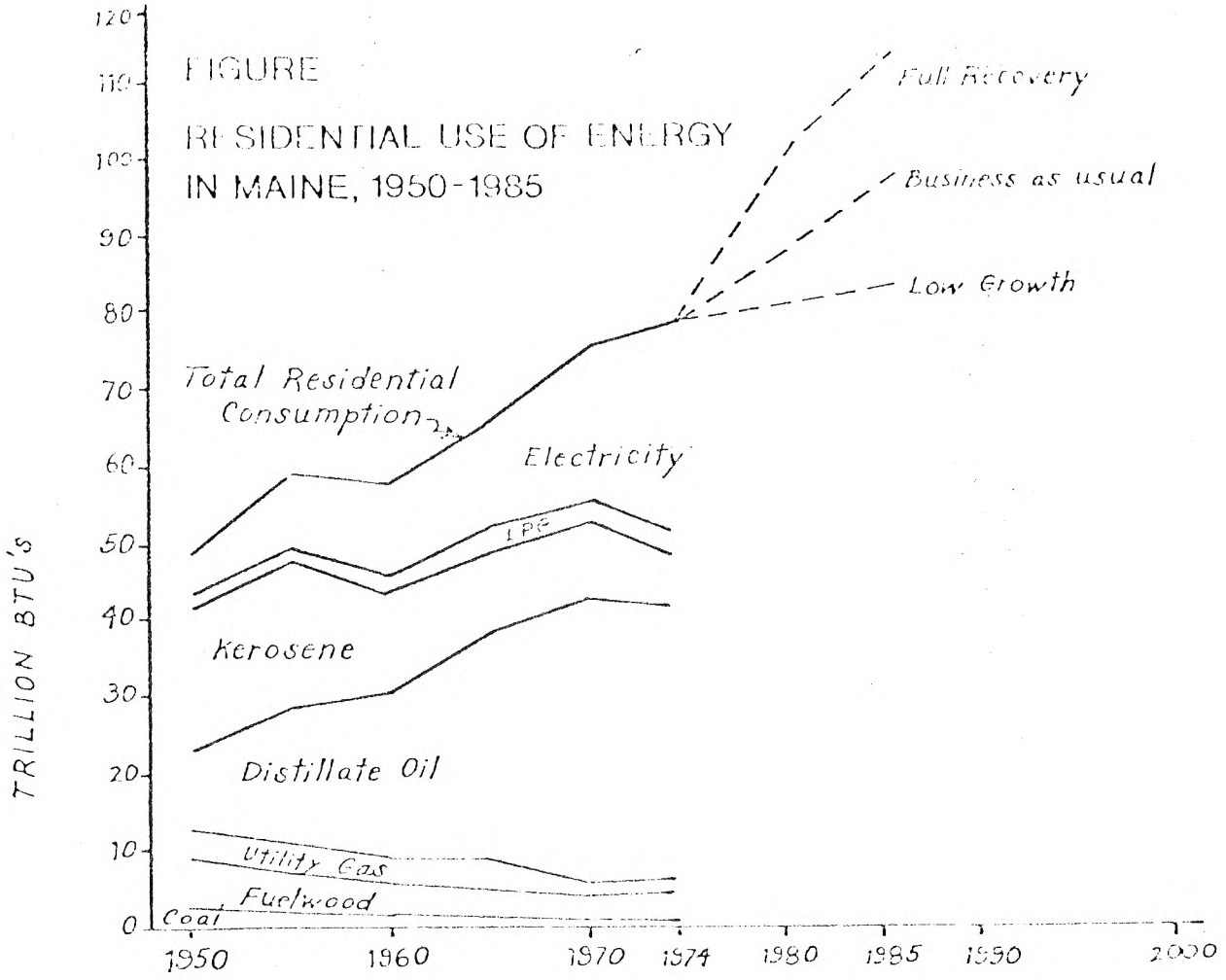
MAINE ENERGY GROWTH SCENARIOS:SECTORAL ENERGY DEMANDS

(Billion BTU's)

SECTOR	SCENARIOS	1974	1980	1985
Residential	BAU Case	78,242	88,777	98,947
	Low Growth	------	80,647	82,314
	High Growth	------	101,133	112,637
Commercial	BAU Case	33,502	44,003	54,920
	Low Growth	------	39,780	45,688
	High Growth	------	53,017	67,058
Industrial	BAU Case	105,757	124,288	142,520
	Low Growth	------	112,437	118,562
	High Growth	------	143,458	161,882
Transportation	BAU Case	87,021	111,550	136,619
	Low Growth	------	100,547	113,654
	High Growth	------	134,102	166,597
Miscellaneous	BAU Case	5,726	6,948	7,716
	Low Growth	------	6,284	6,419
	High Growth	------	7,128	8,382
Electric Transmission Losses and Unaccounted For	BAU Case	7,532	10,409	12,829
	Low Growth	------	9,382	10,617
	High Growth	------	12,054	14,822
Total Demand	BAU Case	317,780	385,975	453,551
	Low Growth	------	349,077	377,254
	High Growth	------	450,892	531,378

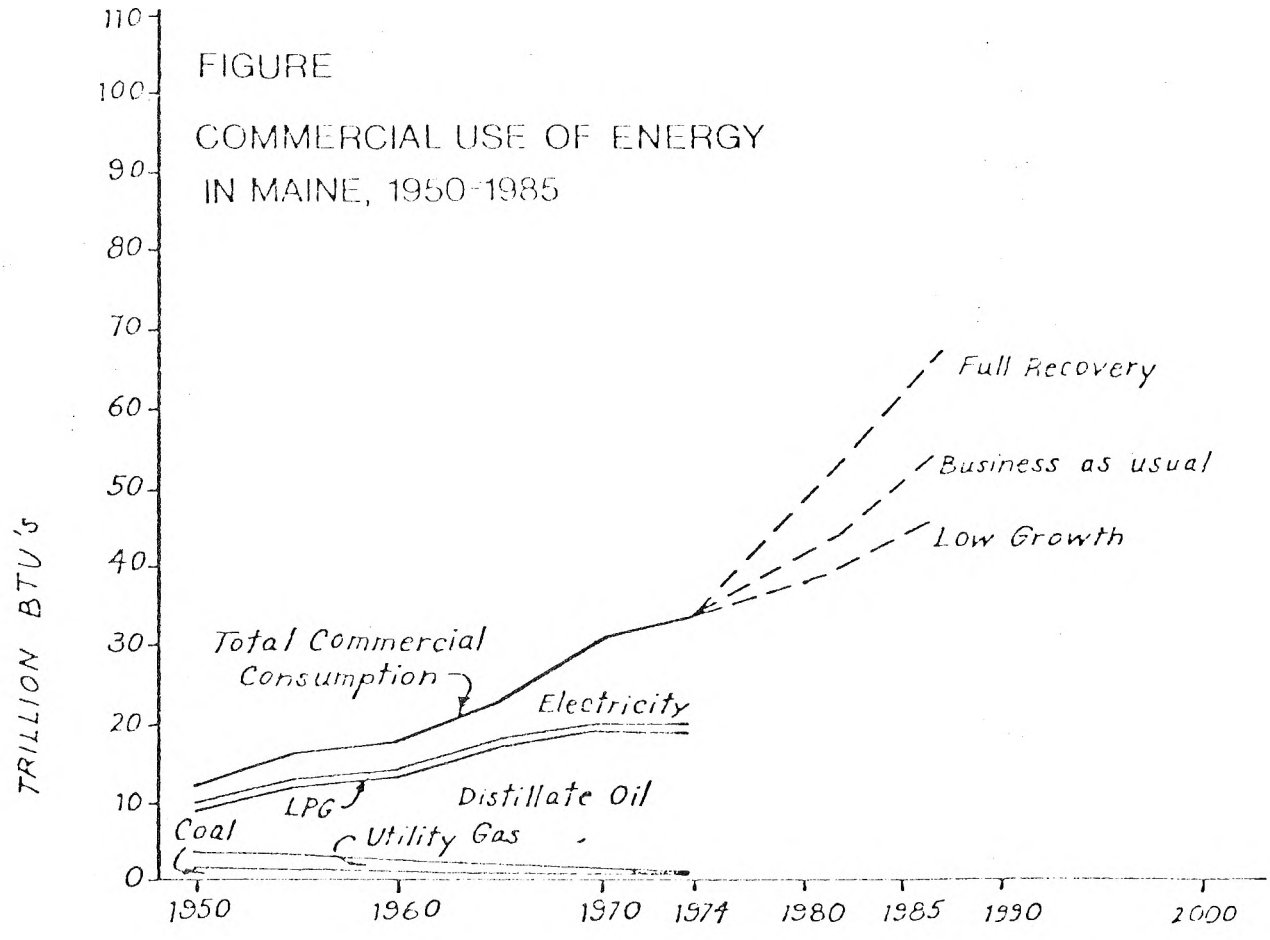
FIGURE

RESIDENTIAL USE OF ENERGY IN MAINE, 1950-1985



FIGURE

COMMERCIAL USE OF ENERGY IN MAINE, 1950-1985



FIGURE

Transportation Use of Energy in Maine, 1950-1985

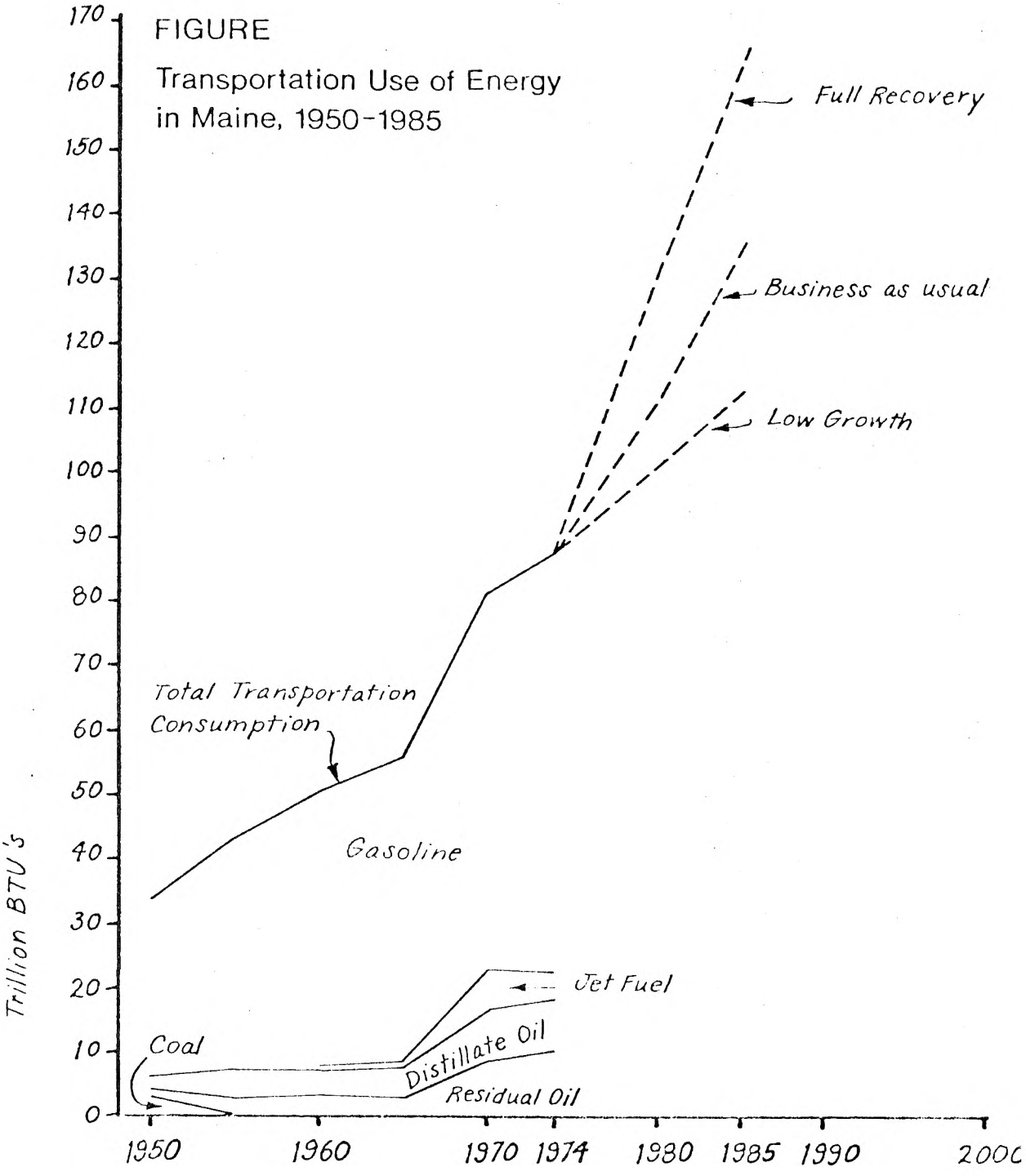
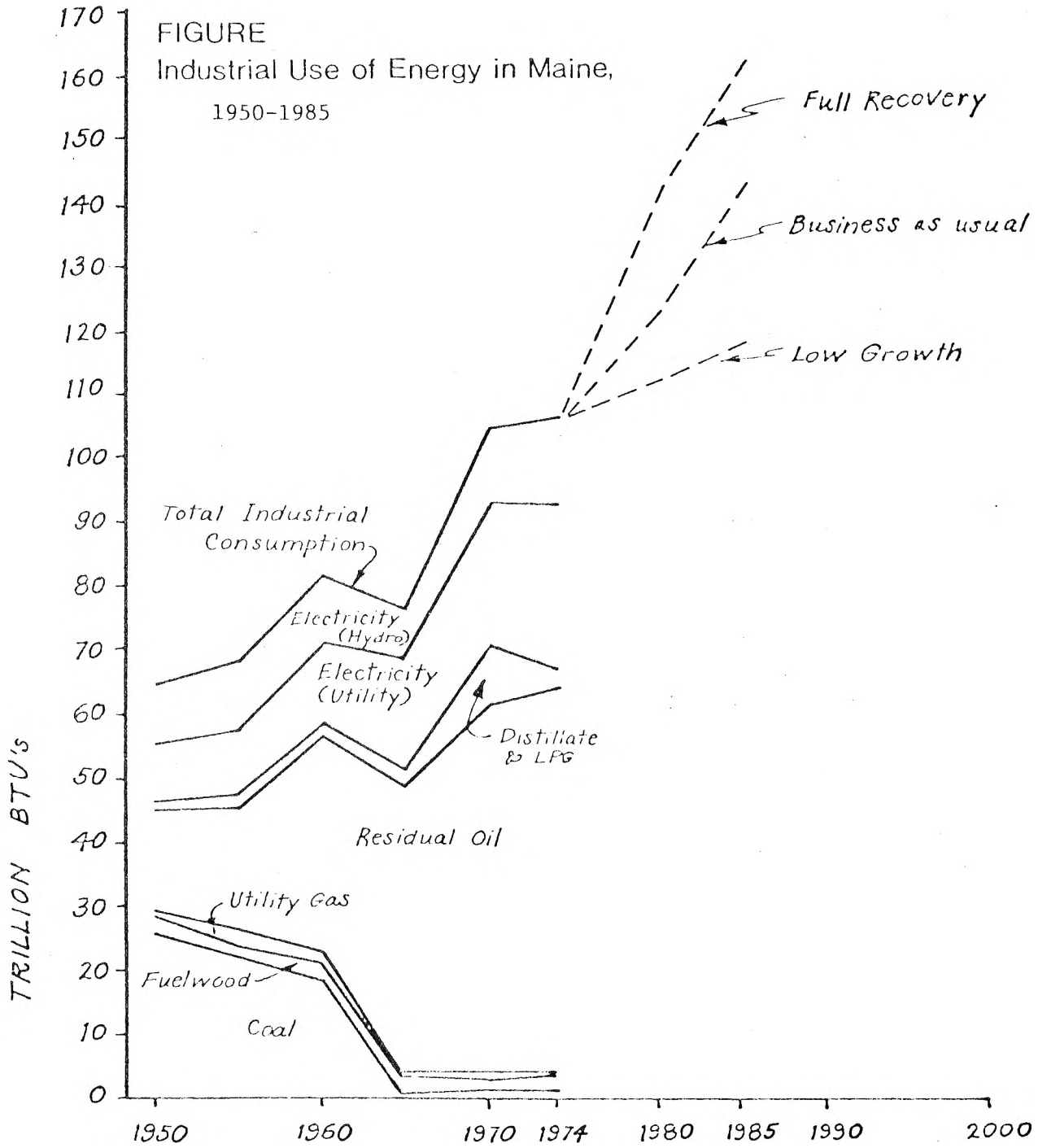
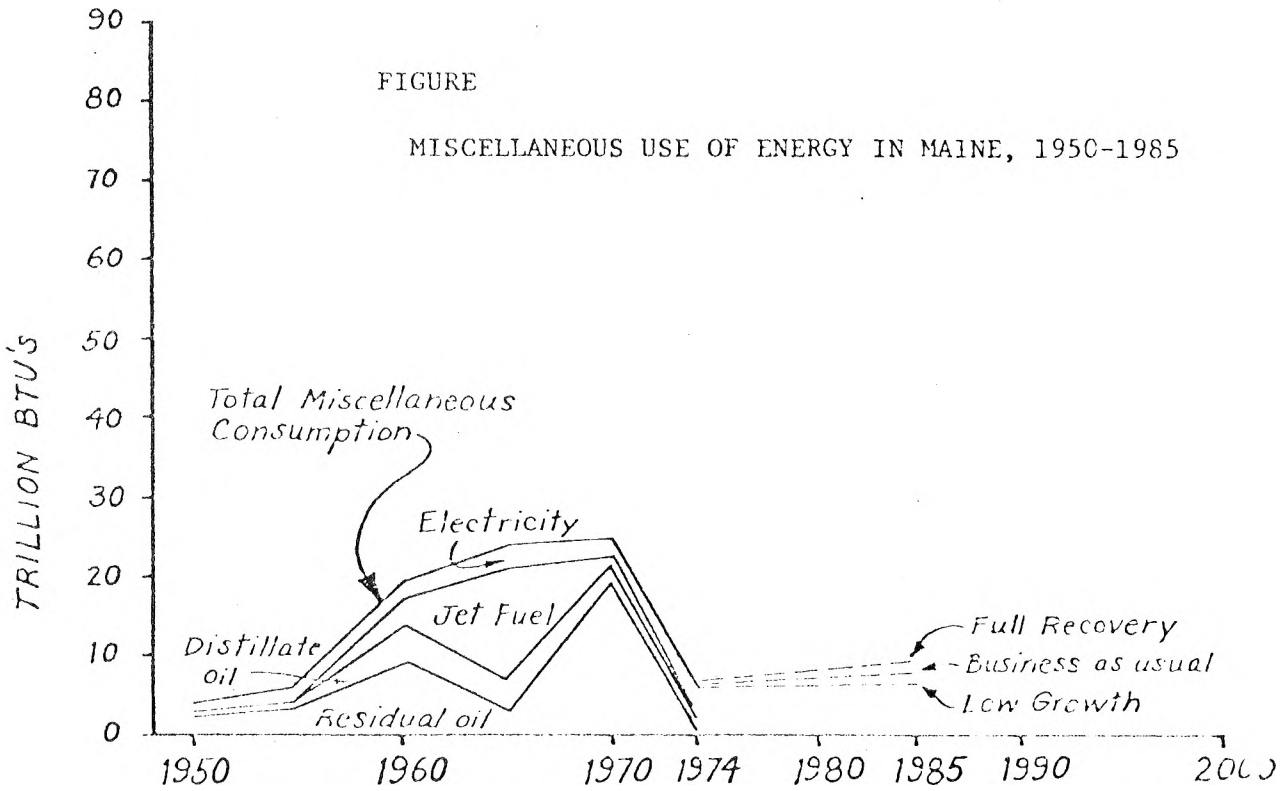


FIGURE
Industrial Use of Energy in Maine,
1950-1985



FIGURE

MISCELLANEOUS USE OF ENERGY IN MAINE, 1950-1985



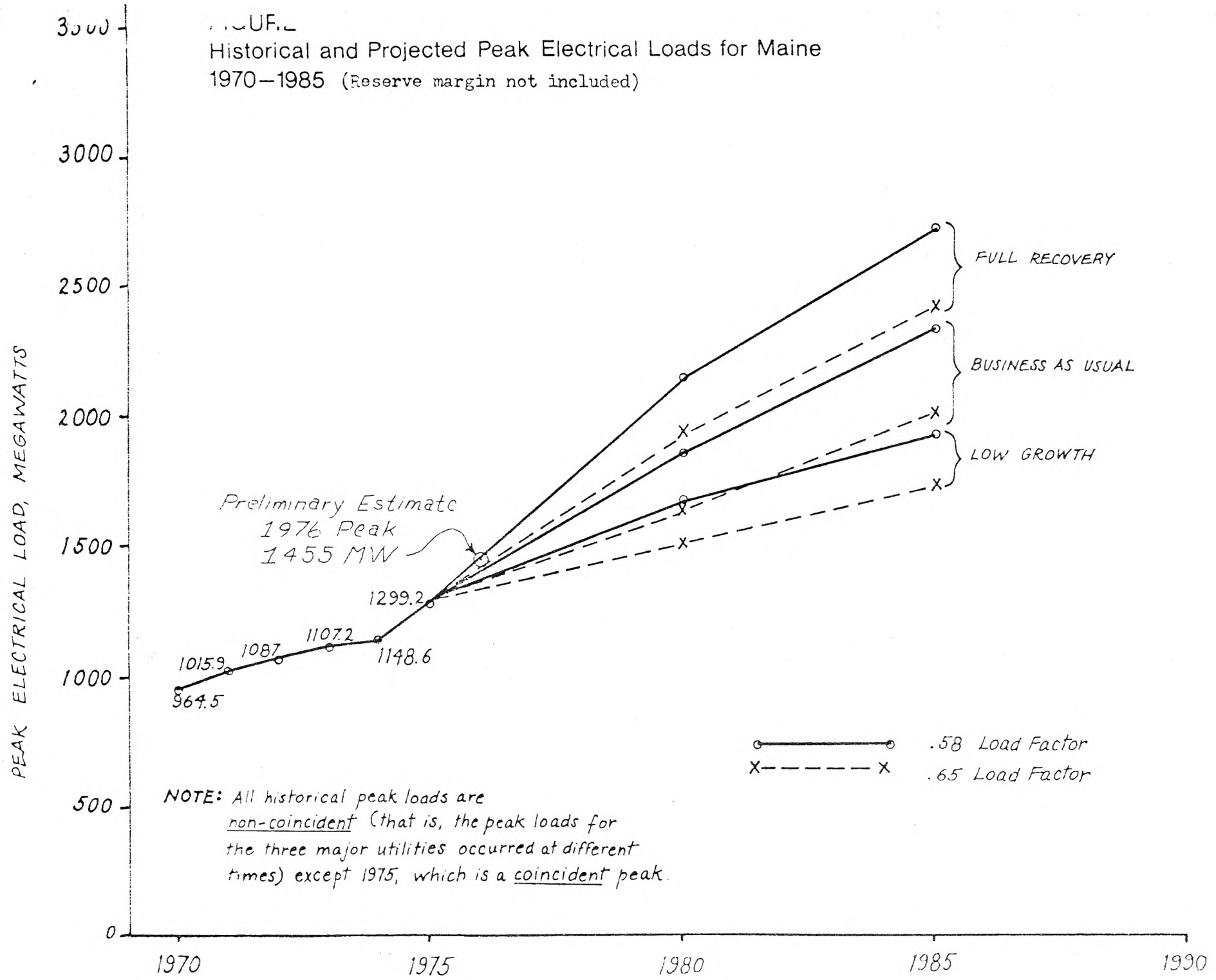
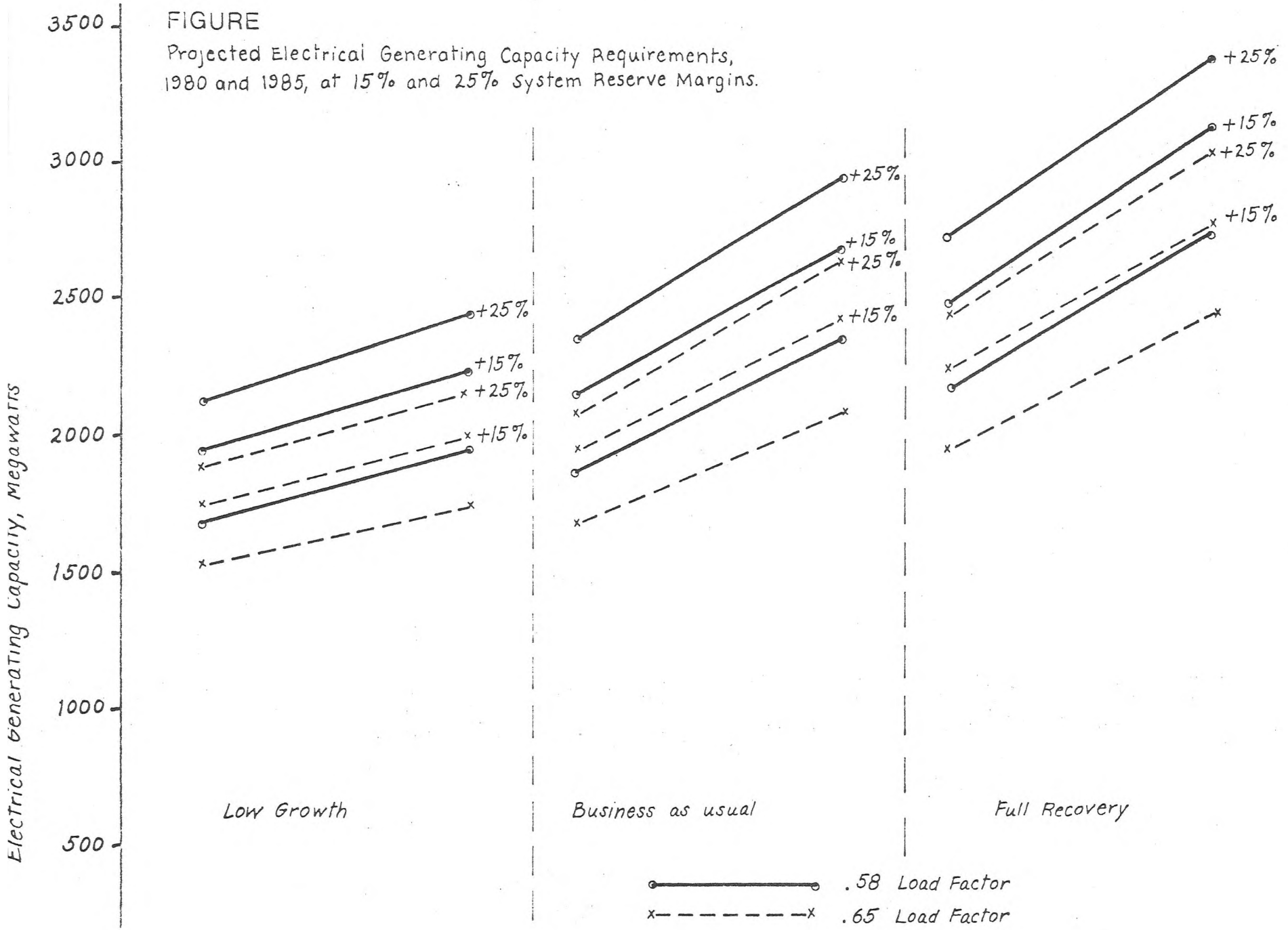


FIGURE
Historical and Projected Peak Electrical Loads for Maine
1970—1985 (Reserve margin not included)
PEAK ELECTRICAL LOAD, MEGAWATTS
3500
3000
2500
2000
1500
1000
500
0
1970
1975
1980
1985
1990
FULL RECOVERY
BUSINESS AS USUAL
LOW GROWTH
Preliminary Estimate
1976 Peak
1455 MW
964.5
1015.9
1087
1107.2
1148.6
1299.2
.58 Load Factor
.65 Load Factor
NOTE: All historical peak loads are non-coincident (that is, the peak loads for the three major utilities occurred at different times) except 1975, which is a coincident peak.

FIGURE

Projected Electrical Generating Capacity Requirements, 1980 and 1985, at 15% and 25% System Reserve Margins.



Total Projected Fuel Requirements to 1980 and 1985, By Fuel Type

Tables 15 and 16 summarize and aggregate the fuel requirements for all demand sectors and fuel types for the years 1980 and 1985, respectively. These tables indicate that the above assumptions and scenario developments will result in the patterns of fuel consumption shown in Table 17 for 1980 and 1985 relative to 1974 consumption levels, and for the BAU Case, Low Growth, and Full Recovery Scenarios.

The latter table shows that total coal consumption is expected to decline slightly (about 5%) by 1980 and stabilize through 1985, natural gas consumption may decline by 30% by 1980 and disappear altogether by 1985, and kerosene consumption may decline significantly due to high prices relative to the other available fuels.

Fuelwood and LPG consumption are projected to increase somewhat while residual, distillate, gasoline and electrical consumption are projected to increase more strongly, and jet fuel consumption is projected to increase dramatically over the 1974 level.

Table 18 shows estimated fuel requirements for 1980 and 1985 in units of measure.

TABLE -

CONSUMPTION OF ENERGY BY SECTOR AND BY FUEL TYPE, 1980, 10^9 BTU

Fuel Type	Scenario	Residential	Commercial	Industrial	Transportation	Misc.	Total
Coal	Low	100	50	1,100	---	---	,2
	BAU	100	50	1,100	---	---	,2
	High	100	50	1,100	---	---	1,2
Fuelwood	Low	4,678	---	2,249	---	---	,9
	BAU	5,149	---	2,486	---	---	7,6
	High	5,866	---	2,869	---	---	8,7
Natural Gas	Low	500	500	500	---	---	,5
	BAU	500	500	500	---	---	1,5
	High	500	500	500	---	---	,5
Petroleum	Low	44,356	20,686	67,462	100,547	2,100	235,1
	BAU	48,827	22,882	74,573	111,550	2,100	25 ,9
	High	55,623	27,569	86,075	134,102	2,100	30 ,4
Residual	Low	---	---	64,651	12,066	450	77,1
	BAU	---	---	71,466	13,385	450	8 ,3
	High	---	---	82,488	16,092	450	9 ,0
Distillate	Low	37,098	20,288	2,249	10,055	1,000	7 ,6
	BAU	40,837	22,442	2,486	11,155	1,000	7 ,9
	High	46,521	27,039	2,870	13,410	1,000	90,8
Kerosene	Low	4,839	---	---	---	---	,8
	BAU	5,327	---	---	---	---	5,3
	High	6,068	---	---	---	---	6,0
LPG	Low	2,419	398	562	---	50	,4
	BAU	2,663	440	621	---	50	3,7
	High	3,034	530	717	---	50	,3
Jet Fuel	Low	---	---	---	9,049	600	9,6
	BAU	---	---	---	10,040	600	1 ,6
	High	---	---	---	12,070	600	1 ,6
Gasoline	Low	---	---	---	69,377	---	69,3
	BAU	---	---	---	76,970	---	7 ,9
	High	---	---	---	92,530	---	9 ,5
Electricity *	Low	31,013	18,544	41,126	---	4,184	9 ,8
	BAU	34,201	20,571	45,629	---	4,848	10 ,2
	High	39,044	24,898	52,914	---	5,028	121,8
Transmission	Low	---	---	---	---	---	,3
Losses and	BAU	---	---	---	---	---	10,4
Unaccounted For	High	---	---	---	---	---	12,0
	1974	---	---	---	---	---	,5
Totals-1980	Low	80,647	39,780	112,437	100,547	6,284	34 ,0
	BAU	88,777	44,003	124,288	111,550	6,948	385,9
	High	101,133	53,017	143,458	134,102	7,128	45 ,8
Totals-1974		78,242	33,502	105,757	87,021	5,726	31 ,7

* Electricity - BTU's needed to generate energy; all other direct use only.

TABLE -

CONSUMPTION OF ENERGY BY SECTOR AND BY FUEL TYPE, 1985, 10^9 BTU

l ;pe	Scenario	Residential	Commercial	Industrial	Transportation	Misc.	Total
l	Low	100	50	1,100	---	---	1,250
	BAU	100	50	1,100	---	---	1,250
	High	100	50	1,100	---	---	1,250
lwood	Low	4,774	---	2,371	---	---	7,145
	BAU	5,739	---	2,850	---	---	8,589
	High	6,533	---	3,237	---	---	9,770
ur l Gas	Low	---	---	---	---	---	---
	BAU	---	---	---	---	---	---
	High	---	---	---	---	---	---
ro eum	Low	14,157	22,844	71,137	113,654	2,100	250,892
	BAU	49,474	27,460	85,512	136,619	2,100	301,165
	High	56,319	33,529	97,129	166,597	2,100	355,674
es dual	Low	---	---	68,173	13,638	450	82,261
	BAU	---	---	81,949	16,394	450	98,793
	High	---	---	93,082	19,992	450	113,524
istillate	Low	37,042	22,387	2,371	11,365	1,000	74,165
	BAU	44,527	26,911	2,850	13,662	1,000	88,950
	High	50,687	32,858	3,237	16,660	1,000	104,442
erosene	Low	2,469	---	---	---	---	2,469
	BAU	2,968	---	---	---	---	2,968
	High	3,379	---	---	---	---	3,379
PC	Low	1,646	457	593	---	50	2,746
	BAU	1,979	549	713	---	50	3,291
	High	2,253	671	810	---	50	3,784
et Fuel	Low	---	---	---	10,230	600	10,830
	BAU	---	---	---	12,296	600	12,896
	High	---	---	---	14,994	600	15,594
as line	Low	---	---	---	78,421	---	78,421
	BAU	---	---	---	94,267	---	94,267
	High	---	---	---	114,951	---	114,951
tricity *	Low	36,283	22,794	43,954	---	4,319	107,350
	BAU	43,634	27,410	53,058	---	5,616	129,718
	High	49,685	33,479	60,416	---	6,282	149,862
smission	Low	---	---	---	---	---	10,617
s nd	BAU	---	---	---	---	---	12,829
nt_d For	High	---	---	---	---	---	14,822
	1974	---	---	---	---	---	7,532
l: 1985	Low	82,314	45,688	118,562	113,654	6,419	377,254
	BAU	98,947	54,920	142,520	136,619	7,716	453,551
	High	112,637	67,058	161,882	166,597	8,382	531,378
1, 1974		78,242	33,502	105,757	87,021	5,726	317,780

TABLE -

PROJECTED FUEL CONSUMPTION INCREASES, 1974 to 1980 and 1985

		1974 Billion BTU's	1980 Billion BTU's	% Increase (Decrease) 1974-1980	1985, Billion BTU's	% Increase (Decrease) 1974-1985
Coal	Low	---	1,250	(4.9)	1,250	(4.9)
	BAU	1,315	1,250	(4.9)	1,250	(4.9)
	High	---	1,250	(4.9)	1,250	(4.9)
Fuelwood	Low	---	6,927	2.3	7,145	5.5
	BAU	6,773	7,635	12.7	8,589	23.7
	High	---	8,735	29.0	9,770	33.1
Natural Gas	Low	---	1,500	(13.0)	---	(100.0)
	BAU	1,724	1,500	(13.0)	---	(100.0)
	High	---	1,500	(13.0)	---	(100.0)
Petroleum	Low	---	235,151	7.8	250,892	15.0
	BAU	218,114	259,932	19.2	301,165	38.1
	High	---	305,469	40.1	355,674	63.1
Residual	Low	---	77,167	8.6	82,261	15.9
	BAU	70,980	85,301	20.2	98,793	39.2
	High	---	99,030	39.5	113,524	59.9
Distillate	Low	---	70,690	6.6	74,165	11.8
	BAU	66,317	77,920	17.5	88,950	34.1
	High	---	90,840	37.0	104,442	57.5
Kerosene	Low	---	4,839	(23.5)	2,469	(61.0)
	BAU	6,328	5,327	(15.8)	2,968	(53.1)
	High	---	6,068	(4.1)	3,379	(46.6)
LPG	Low	---	3,429	(20.8)	2,746	(36.5)
	BAU	4,327	3,774	(12.8)	3,291	(23.9)
	High	---	4,331	0.1	3,784	(12.5)
Jet Fuel	Low	---	9,649	86.2	10,830	109.0
	BAU	5,181	10,640	105.4	12,896	148.9
	High	---	12,670	144.5	15,594	201.0
Gasoline	Low	---	69,377	6.8	78,421	20.7
	BAU	64,981	76,970	18.5	94,267	45.1
	High	---	92,530	42.4	114,951	76.9
Electricity *	Low	---	94,867	15.2	107,350	30.4
	BAU	82,322	105,249	27.9	129,718	57.6
	High	---	121,884	48.1	149,862	82.0
Transmission Losses & Unaccounted For	Low	---	9,382	24.6	10,617	41.0
	BAU	7,532	10,409	38.2	12,829	70.3
	High	---	12,054	60.0	14,822	96.8
Total Electricity	Low	---	104,249	16.0	117,967	31.3
	BAU	89,854	115,658	28.7	142,547	58.6
	High	---	133,938	49.1	164,684	83.3

* BTU's needed to generate, all others direct use only.

TABLE -

ESTIMATED FUEL DEMANDS, 1980 and 1985, IN UNITS OF MEASURE

Fuel	Unit of Measure	BTU Conversion Factor	Demand Scenario	Estimated 1980	Demand 1985
oal	10^3 Tons	23 x 10^6/Ton	Low	54.3	54.3
			BAU	54.3	54.3
			High	54.3	54.3
ue wood	10^3 Cords	19 x 10^6/Cord	Low	365	376
			BAU	402	452
			High	460	514
at ral Gas	10^3 Therms	100,000/Therm	Low	15,000	0
			BAU	15,000	0
			High	15,000	0
etroleum	10^3 Barrels	As noted for Specific Type	Low	41,238	44,014
			BAU	45,590	52,834
			High	53,627	62,507
Residual	10^3 Barrels	6.3 x 10^6/BBL	Low	12,248	13,057
			BAU	13,540	15,681
			High	15,719	18,020
Distillate	10^3 Barrels	5.8 x 10^6/BBL	Low	12,188	12,787
			BAU	13,434	15,336
			High	15,662	18,007
Kerosene	10^3 Barrels	5.7 x 10^6/BBL	Low	849	433
			BAU	935	521
			High	1,065	593
LPG	10^3 Barrels	4.0 x 10^6/BBL	Low	857	687
			BAU	944	823
			High	1,083	946
Jet Fuel	10^3 Barrels	5.5 x 10^6/BBL	Low	1,754	1,969
			BAU	1,935	2,345
			High	2,304	2,835
Gasoline	10^3 Barrels	5.2 x 10^6/BBL	Low	13,342	15,081
			BAU	14,802	18,128
			High	17,794	22,106
ectricity *	10^6 KWH	10,500 BTU/KWH	Low	9,900	11,203
			BAU	10,984	13,537
			High	12,720	15,640

ncludes transmission losses and unaccounted for. Does not include industrial thermal generation for own use.

TABLE -

FUTURE ENERGY PRICES

	SRI (1)		FEA (2) (1975 $'s)	FEA (3) (1975 $'s)	CEP (4) (1974 $'s)		GE (5) (1974 $'s
	1980	1985	1985	1985	1980	1985	1975- 00
Gasoline, Regular Grade, ¢/Gal.	----	----	59.8-67.3	23.4-40.4	----	----	26.4- 0.
No. 2 Fuel, ¢/Gal.	----	----	39.9-46.9	----	----	----	----
No. 6 Fuel, $/bbl.	----	----	15.75-18.46	----	----	----	---
Fuel Oil to Utilities ¢/10^6 BTU	149-248	154-249	----	----	----	----	165-200
Coal to Utilities ¢/10^6 BTU	147-184	155-186	----	114.7-121.8	117.0	117.9	35-1 0
Nuclear*	$40-50 Per lb.	$40-50 Per lb.	----	----	¢/kwh 2.33	¢/kwh 2.33	40¢/m 11 TU
Electricity ¢/kwh	----	----	2.97-3.79	2.82-3.02	4.23	4.37	----
Natural Gas $/1000 $Ft.^3$	----	----	3.57-3.58	1.79-2.07	2.93	3.10	0.461-0.
Crude Oil, $/bbl.	----	----	----	$8-16	16.41	18.52	-- -

Sources:

(1) SRI - Stanford Research Institute, "Cost of Fuels, Labor, and Interest for Alternative Methods of Electricity Generation", by H. Attinger, G.T. Coene, C. Erickson, and B. Lou es June 1976.

(2) FEA - "Interim Report to the New England Energy Policy Task Force, Preliminary Assesment and Results of the Application of the PIES Computer Model to Forecast Energy Flows for New England", by Paul F. Levy, Marc Hoffman, Linda Mansfield, Harvey Michaels, Fred Nemergut, and Stephen Stern, June 1976.

(3) FEA - "1976 National Energy Outlook", Federal Energy Administration

(4) CEP - "New England Energy Use Patterns in 1980 and 1985: Pilot Projections and Sensivity Analysis", by the Center for Energy Policy, Inc., Boston, Massachusetts, January 1976.

(5) GE - "Impact of Uncertainty on Long Range Generation Planning", by Dr. L.L. Garver H.G. Stoll, and R.S. Szczepanski, Electric Utility Systems Engineering Dept., General Electric Company, April 1976.

*ERDA data indicates that Uranium under contract in 1976 for delivery in 1980 is averag ng about $15.95 per pound, and for delivery in 1985 about $19.90 per pound. This compares with $12.05 per pound in 1976 and $10.50 for 1975. (See "Information from ERDA, "Vol. , #44, W/E 11/12/76) "Nuclear Fuel" (Vol. 1, #1 11/1/76) reported that utilities had paid up to $59 per pound in 1976 for uranium to be delivered in 1980. Other prices paid were $46 for 1977 delivery, $53 for 1985, and $54 for 1978. It is difficult to project trends from this kind of data.

NEW ENGLAND REGIONAL COMMISSION
53 State Street
Boston, Massachusetts 02109

"A NEW ENGLAND ENERGY POLICY"

November 7, 1975

A NEW ENGLAND ENERGY POLICY

New England recognizes that the national goal of energy independence is aimed at ensuring stable, long-term supplies of fuel at reasonable prices to meet a level of energy growth consistent with long-term economic, social, and environmental goals. New England has a strong interest in that goal because it has the greatest vulnerability to international oil price and supply manipulation. Continued heavy reliance upon imported oil with its consequent, disproportionate regional energy cost will further undermine the economic base of this region and, therefore, cannot be borne.

Therefore, the region of New England is prepared to commit itself to the development of a more nearly balanced mix of energy production capabilities, including nuclear power facilities, hydroelectric and other indigenous resources, domestic oil and gas resources, and the use of coal and other alternative fuels. To that end it has established fuel-use goals to be achieved during the next decade to reflect that balance and to reduce the region's dependence upon oil by one fifth.

In this effort the states of New England are well aware of the necessity to coordinate various technological and institutional aspects of energy resource development within their region and to join that development to the national framework.

1. This coordination has already gained momentum through state participation in energy-related activities at the New England Regional Commission.

2. This coordination has been communicated to the national level by means of joint meetings between representatives of the Federal Energy Administration and of the states and the New England Regional Commission.

3. We emphasize that successful communications of this sort are essential to the creation of a regional energy implementation plan which enhances the capabilities of the states to contribute to a regional and national energy framework, while increasing the responsiveness of the nation to those particular needs of the region for sound economic development.

4. Continuation of this effort, to which the region is committed, should result in a deliberate, realistic regional energy policy.

Recognizing the need for immediate and intermediate steps, the New England Region is prepared to deal with the following areas:

1. conservation;

2. nuclear energy;

3. outer continental shelf development;

4. coal conversion;

5. hydroelectric and other indigenous resource development; and

6. alternative energy sources--research and development.

Conservation

The New England Region, of all the regions within the United States, has attained an unequaled record of energy conservation. It has recorded a 20% conservation effort in stark contrast to a 5% conservation effort recorded in the remainder of the nation.

1. The region is committed to a continued effort of conservation in a systematic and concerted manner and on a regional basis.

2. The establishment of strong quantitative goals and a comprehensive implementation plan commensurate with respective state capabilities will have the highest immediate priority within our region.

Nuclear Energy

The existing base of nuclear generating capacity in New England is far in excess of any other region within the United States. However, the region recognizes the role of additional nuclear capacity in meeting future requirements, mindful of the continuing need for the pursuit of plans for disposition of nuclear wastes.

1. To this end, the region will participate in concert and in equal partnership with the Nuclear Regulatory Commission regarding the evaluation and siting of nuclear facilities.

2. The region will work for the establishment and creation of a regional institution which will plan the implementation of power generation jointly with private and/or public utilities dependent on the system in the individual states.

3. The region will work as an equal partner with the Nuclear Regulatory Commission in regulatory and licensing procedures to ensure expeditious and safe handling of radioactive materials and wastes and mutually satisfactory construction and operation practices.

OCS Development

Inasmuch as the Federal Government has recognized the need for a national policy with regard to Outer Continental Shelf as a potential site of energy resources, including both natural gas and oil, the New England region stands ready to participate fully with the Federal Government in that endeavor, and in the pursuit of regulations and guidelines to protect the coastal shore line.

The proximity of the New England region to Canada emphasizes the desirability of a close working relationship in the development of the Outer Continental Shelf.

The New England region has the capabilities to:

1. Provide sites for refineries and other facilities so that the potential resources of the Outer Continental Shelf can be processed economically to meet both the regional and national needs for energy resources; and

2. Review the development of facilities to accommodate OCS service and support industries.

Coal Conversion

Recognizing the overall dependence upon imported oil for the generation of electric energy by the utilities within the New England Region, the Region affirms its position:

1. To convert existing oil-fired facilities to coal within a time frame adequate to guarantee implementation that is economically feasible.

2. To review and agressively pursue the economic viability of new fossil-fuel energy production facilities with the private sector; and

3. To cooperate with the Federal Government in resolving coal transportation problems caused by the incapacity of the northeastern railroad network.

Hydroelectric, Solid Waste, and Other Indigenous Resource Development

Recognizing the imperative of pursuing all possible sources of energy, the New England Region affirms its position:

1. To support the expeditious implementation of feasible hydroelectric, including tidal projects;

2. To support the use of wood for power generation, where feasible; and

3. To continue the discussions and negotiations concerning the purchase of surplus energy from the Eastern Canadian Provinces as it is developed.

4. Recognizing the potential value of energy recovery from solid waste, New England will undertake to develop facilities for solid waste recovery and conversion to energy.

Alternative Energy Sources--Research and Development

Recognizing the immense resources available within the New England region in terms of technical competence in research and development, financial institutions, and creativity, the New England region affirms its intent to pursue the research capability and development technology for solar and other alternative energy resources. To this end New England will:

1. Establish, within our institutions of higher learning, a priority for the development and marketing of alternative replenishable energy sources, e.g., solar, wind, and wood for practical and widespread consumption;

2. Encourage and marshal venture capital in the private sector for the marketing of alternative energy resources; and

3. Provide tax and financial incentives for utilizing solar and other alternative forms of energy.

Economic Implications

The New England Region recognizes the regional and national imperatives which address the issues of its economic viability and its land use patterns,

as well as its quality of life. The Region further recognizes that its declaration of principles cannot be achieved without the full cooperation of the national government. As individual states, as the regional entity of New England, and as part of our nation's Federal system, we recognize the different roles we must play and the different stewardships we must discharge.

However, the changes in fuel consumption implied by the previously described targets will themselves generate large capital costs throughout the region. The funds necessary to finance these changes have historically and are currently diverted to high fuel costs. Therefore, only some short-term relief from high energy prices will make possible the capital formation necessary to achieve those energy-use targets.

The commonality of energy as a fundamental base of our society, be it the State, the Region, or the Nation, is inescapable. The responsibilities which we hold separately as well as collectively require action in concert as well as in variation within a central theme. To address the energy issue jointly, to act collectively in the pursuit of its solution--this is the affirmation of the New England Region.