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Analysis Report

The Impact of 1980 Scheduled Capacity Additions on Electric Utility Oil Consumption

August 1980

U.S. Department of Energy
Energy Information Administration
Assistant Administrator for Applied Analysis
Washington, D.C. 20461

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Analysis Report

The Impact of 1980 Scheduled Capacity Additions on Electric-Utility Oil Consumption

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August 1980

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PREFACE

This Analysis Report was prepared in response to a request from John Sawhill, Deputy Secretary, U.S. Department of Energy, who requested updated schedules of 1980 coal-fired and nuclear generating capacity additions and analysis of their potential impact on 1980 oil consumption in the electric utility sector. The authors of the report are Mark Gielecki of the Coal and Electric Power Analysis Division and Gene Clark and Barry Roberts of the Nuclear Energy Analysis Division.

This report was prepared under the general direction of David T. Hulett, former Director of the Office of Energy Source Analysis; John D. Pearson, Acting Director of the Office of Energy Source Analysis; Gene Clark, Director of the Nuclear Energy Analysis Division; and Robert T. Eynon, Director of the Coal and Electric Power Analysis Division. The authors wish to acknowledge the contributions of Tom Murphy of the Office of Planning and Evaluation for providing data, support, and technical input; Ernestine B. Bosier and Joyce K. Jones who typed the report; and Paula Cleggett for making the report readable. Helpful technical reviews were prepared by Betsy O'Brien of the Coal and Electric Power Analysis Division and Phil Childress and Cecilia Chu of the Short-Term Analysis Division. Helpful reviews were also

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EXECUTIVE SUMMARY

This report contains current information on capacity additions which are expected to generate electricity in 1980. Generation from these additions is estimated, oil equivalence is calculated, and projections of potential changes in 1980 electric utility oil consumption are made.

Electric utility generating capacity is expected to increase by 23,066 megawatts in 1980. Of this total, coal capacity additions represent 16,304 megawatts; nuclear capacity 4,282 megawatts; hydroelectric and geothermal capacity 871 megawatts; natural gas capacity 70 megawatts; and oil capacity 1,539 megawatts. Table 1 provides a summary listing of this scheduled capacity by U.S. Department of Energy (DOE) Region. (See Appendix A for the geographical definitions of these Regions.)

Incremental 1980 generation with the potential for displacing oil was estimated by analyzing (1) capacity additions brought on-line during 1979 but which generate electricity for all of 1980, (2) plant additions scheduled to begin commercial operation in 1980, and (3) plants scheduled to begin commercial operation in 1981, but which generate electric power during their testing period in 1980.

The incremental 1980 generation, estimated to result from these capacity additions, is 85 billion kilowatt hours. The oil equivalence of this projected generation

Table 1. Scheduled Additions of Electric Utility Generating Capacity in 1980 (Megawatts)

DOE REGION	Coal	Oil		Natural Gas		Nuclear	Hydro ^a	Geothermal	Total
		Steam	Non- Steam	Steam	Non- Steam				
I	0	0	12	0	0	0	0	0	12
II	0	0	0	0	0	1,115	0	0	1,115
III	3,151	0	0	0	0	943	0	0	4,094
IV	1,705	775	200	0	0	1,140	338	0	4,158
V	1,871	0	0	0	0	0	0	0	1,871
VI	4,550	0	73	0	0	0	0	0	4,623
VII	1,545	0	111	0	0	0	93	0	1,749
VIII	2,360	0	22	0	0	0	100	0	2,482
IX	592	247	33	0	70	1,084	130	110	2,266
X	530	66	0	0	0	0	100	0	696
TOTAL	16,304	1,088	451	0	70	4,282	761	110	23,066

^aIncludes conventional hydro and pumped storage.

Source: Compiled from planned utility capacity additions as reported to the Federal Energy Regulatory Commission, the Nuclear Regulatory Commission, and contacts with individual utilities.

is 149.5 million barrels per year or 408,000 barrels per day.

Oil equivalence, however, assumes a one-to-one correspondence between additional non-oil-fired generation and oil displacement. It does not necessarily represent a reduction in oil consumption. Changes in electric utility oil consumption depend on, among other factors, regional electricity demand growth and generating plant mix. Five cases are presented using various electricity demand growth rate assumptions, fuel displacement strategies, and nuclear plant licensing assumptions.

In general, it is likely that there will be a reduction in electric utility oil consumption in 1980. Using the two reference cases of the report, this reduction is projected to amount to a 2-percent to 5-percent decrease from the 1979 oil consumption level. A 7-percent reduction from the 1979 electric utility oil consumption level is the largest reduction projected.¹

¹Historical oil consumption data was obtained from the Monthly Energy Review, July 1980, U.S. Department of Energy, Energy Information Administration.

1. INTRODUCTION

The electric utility sector currently consumes approximately 8 percent of the total oil used in the Nation. This oil represented about 15 percent of total fuel consumed by electric utilities in 1979.¹ Two important factors which affect the level of utility oil consumption in 1980 are the substantial increase in coal-fired generating capacity and the uncertainty surrounding nuclear plant licensing. With particular emphasis on these considerations, this report analyzes the potential for changes in electric utility oil consumption in 1980 relative to the 1979 level.

Plant conversions, oil to coal, for example, which may occur in 1980 are not considered in this analysis.² Only the potential reduction in oil consumption resulting from new generating capacity additions is analyzed.

¹Monthly Energy Review, July 1980, U.S. Department of Energy, Energy Information Administration.

²Possum Point Unit 4 in Dumfries, Virginia (Region III), a 239 megawatt oil unit, is expected to switch to coal use in September 1980. Our calculations indicate that 6,700 barrels of oil per day will be saved by this conversion. This represents an average of 1,638 barrels per day when annualized over all of 1980.

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2. 1980 SCHEDULED CAPACITY ADDITIONS

Table 2 shows the summary results of electric generating capacity additions planned for 1980, at the regional level shown in Appendix A. Since this report analyzes potential oil displacement, the coal, nuclear, hydro-electric (excluding pumped storage) and geothermal capacity additions are of primary concern. In this analysis, this capacity is assumed to be operated primarily in the base mode. Also, in order to project the total magnitude of 1980 generation over 1979, the 1980 incremental generation, resulting from 1979 capacity additions being operational over the course of a full year, is included in this analysis. In addition, the generation in 1980 from coal and nuclear plants in their startup testing phase, but which begin commercial operation in 1981, are also included.

Projected Coal-Fired, Hydroelectric, and Geothermal Capacity and Generation

Electric utility coal-fired capacity additions totalled 11,176 megawatts (MW) in 1979.¹ It is expected that 16,304 MW of coal-fired capacity will be added during

¹The 1979 coal-fired capacity data was obtained from the Generating Unit Reference File (GURF) maintained by the Division of Coal and Electric Power Statistics, Office of Energy Data and Interpretation, Office of the Assistant Administrator for Energy Data, Energy Information Administration.

Table 2. Scheduled Additions of Electric Utility Generating Capacity in 1980 (Megawatts)

DOE REGION	Coal	Oil		Natural Gas		Nuclear	Hydro ^a	Geothermal	Total
		Steam	Non- Steam	Steam	Non- Steam				
I	0	0	12	0	0	0	0	0	12
II	0	0	0	0	0	1,115	0	0	1,115
III	3,151	0	0	0	0	943	0	0	4,094
IV	1,705	775	200	0	0	1,140	232	0	4,052
V	1,871	0	0	0	0	0	0	0	1,871
VI	4,550	0	73	0	0	0	0	0	4,623
VII	1,545	0	111	0	0	0	0	0	1,656
VIII	2,360	0	22	0	0	0	0	0	2,382
IX	592	247	33	0	70	1,084	130	110	2,266
X	530	66	0	0	0	0	0	0	596
U.S. TOTAL	16,304	1,088	451	0	70	4,282	362	110	22,667

^a Refers only to conventional hydro. Excludes pumped storage.

Source: Compiled from planned utility capacity additions as reported to the Federal Energy Regulatory Commission, the Nuclear Regulatory Commission, and contacts with individual utilities.

1980 and an additional 3,215 MW during the first 2 months of 1981.²

Regional capacity and schedule information for the 1980 coal plant additions is shown in Table 3. The 1980 coal-fired plant capacity additions--71 percent of the total generating capacity additions scheduled for 1980--represent a 7-percent increase over the coal plant capacity available in 1979.

Coal-fired generation was projected by assuming that all of the new coal plants will preferentially operate to meet baseload demand.³ Further, it was assumed that coal plants begin producing electricity 2 months before they begin commercial operation. It is assumed that the plants operate at a 30-percent-capacity-factor⁴ level during this testing phase. Once commercial operation begins, a 65-percent capacity factor is assumed.⁵

²Utility capacity expansion plans, as reported to the Federal Energy Regulatory Commission (FERC), were used to identify plants planned for first commercial operation in 1980 and the first months of 1981. Thirty of the utilities were contacted. Current information concerning anticipated commercial operation dates was obtained.

³Base-load demand refers to continuous electricity demand which is unaffected by daily or seasonal variations.

⁴Capacity factor is defined for any generating unit or plant as the ratio of its actual output to its possible output in a specified time period.

⁵Interim Report of the Performance of 400 Megawatt and Larger Nuclear and Coal-Fired Generating Units, November 1979, U.S. Department of Energy, Economic Regulatory Administration.

Table 3. Scheduled Additions of Coal-Fired Generating Capacity in 1980

DOE REGION	STATE	PLANT	UNIT	CAPACITY (MWe)	MONTH OF COMMERCIAL OPERATION
III	Delaware	Indian River	4	400	September
	Pennsylvania	Mansfield	3	825	October
	West Virginia	Pleasants	2	626	September
		Mountaineer	1	1300	December
IV	Kentucky	Green	2	210	December
		Mill Creek	4	495	June
	North Carolina	Roxboro	4	720	June
	South Carolina	Winyah	3	280	May
V	Michigan	Campbell	3	791	September
	Minnesota	Boswell	4	500	May
	Wisconsin	Pleasant Prairie	1	580	July
VI	Arkansas	White Bluff	1	700	June
	Louisiana	Big Cajun 2	1	520	May
	Oklahoma	Sconer	2	515	May
		Northeastern	4	450	August
	Texas	Parish	7	570	June
		Fayette	2	550	June
		Welsh	2	528	April
		Harrington	3	317	June
		San Miguel	1	400	October

Table 3 (Continued). Scheduled Additions of Coal-Fired Generating Capacity in 1980.

DOE REGION	STATE	PLANT	UNIT	CAPACITY (MWe)	MONTH OF COMMERCIAL OPERATION
VII	Kansas	Nearman Creek	1	235	May
		Jeffrey	2	680	May
	Missouri	Iatan	1	630	March
VIII	Colorado	Pawnee	1	470	November
	North Dakota	Coal Creek	2	490	November
	Utah	Hunter	2	400	June
	Wyoming	Laramie River	1	500	April
		Laramie River	2	500	September
IX	Arizona	Cholla	3	242	June
		Coronado	2	350	October
X	Oregon	Boardman	1	530	September

Source: Compiled from planned utility capacity additions as reported to the Federal Energy Regulatory Commission and contacts with individual utilities.

1980 generation from 1979 additions of coal-fired capacity is obtained by assuming operation at a 65-percent-capacity-factor level for the full year. The difference between this level and the level in 1979 is the increased generation in 1980 resulting from 1979 coal plant additions.

The generation from 1980 coal-fired capacity additions is projected by assuming that commercial operation begins at the times shown in Table 3 with the same performance levels and testing periods described above.

Coal-fired capacity additions scheduled to begin commercial operation in 1981 are relevant to this analysis only in that some portion of their assumed 2-month testing period takes place during 1980 and that they operate at a 30-percent capacity factor during that period.

Generation resulting from hydroelectric pondage⁶ and geothermal capacity additions was calculated using a similar methodology to that described above for coal plants.

The primary differences between the two approaches are

⁶There are 724 MW of hydroelectric pumped storage capacity additions which were scheduled to become operational in 1979 and 399 MW scheduled to begin commercial operation in 1980. This capacity is not included in this analysis since it is generally not used in base mode operations.

that no testing period and that lower capacity factors were assumed for these plant additions.⁷

Regional 1980 projected incremental generation totals resulting from coal, hydroelectric, and geothermal capacity additions in 1979, 1980, and 1981 are shown in Table 4.

Projected Nuclear Capacity and Generation

This analysis assumes that 4,282 MW of nuclear capacity will be added in 1980 and that 1,990 MW of new 1981 nuclear capacity will generate some electricity during startup testing in 1980. The 1980 generation from this nuclear capacity was obtained through essentially the same methodology employed for determining 1980 coal generation, described in the previous section, although capacity factors and startup testing periods were different. Nuclear capacity additions for 1980 were obtained through a careful analysis of the current construction and licensing

⁷The following regional capacity factors were used:

<u>Year</u>	<u>DOE Region</u>				
	<u>IV</u>	<u>V</u>	<u>VIII</u>	<u>IX</u>	<u>X</u>
1979	--	.56	.50	.50	.57
1980	.38	.56	.50	.50	.55

These capacity factors reflect average hydroelectric conditions and were derived from Hydroelectric Power Resources of the U.S., Developed and Undeveloped, 1976, Federal Power Commission, Washington, D.C.

Table 4. Regional Generation Projections in 1980
Resulting From New Coal, Hydroelectric and
Geothermal Capacity Additions^a
(Thousands of Megawatt-hours)^a

DOE Region	Coal-Fired	Hydroelectric and Geothermal	Total
I	0	0	0
II	0	0	0
III	5,676	0	5,676
IV	7,888	450	8,338
V	8,766	180	8,946
VI	23,650	0	23,650
VII	10,182	0	10,182
VIII	12,007	60	12,067
IX	2,812	1,660	4,472
X	1,220	4,960	6,180
TOTAL	72,201	7,310	79,511

^aRefers to additions which achieved, or will achieve
commercial operation in 1979, 1980, and 1981.

status of those units nearly completed and awaiting operating licenses from the Nuclear Regulatory Commission (NRC).⁸ Shortly after the Three Mile Island (TMI) accident in March 1979, the NRC ceased granting licenses for either new construction or new operation. Their explanation was that staff time and effort were required to learn and absorb lessons from the accident. On November 4, 1979, the NRC staff stated that "if all goes well ... we could resume licensing by the springtime of 1980." (See the Washington Post article of November 4, 1979, by O'Tool and Omang.) In view of the NRC's earlier rebuff by the President's TMI (Kemeny) Commission on the question of licensing resumption, the current mood of key members of Congress and the Kemeny Commission's recommendation to restructure the NRC, it is anticipated that licensing actions will be cautiously considered on a case-by-case basis.⁹

⁸ The NRC publishes a series of periodic reports including Construction Status Report (NUREG 0030) and Regulatory Licensing and Status Summary Report (NUREG 0580), which provide detailed unit-specific construction and licensing data. EIA relied heavily upon these reports in forecasting nuclear additions for 1980.

⁹ On February 29, 1980, after this report was prepared, the NRC effectively resumed licensing with the issuance of a temporary low-level generating license (up to 5 percent of full power) to the Tennessee Valley Authority for its Sequoyah 1 reactor. In April the North Anna 2 and Salem 2 reactors were also issued low-level licenses.

Production of power does not commence immediately after receipt of an operating license. Since the beginning of 1976, the industry average duration from the receipt of an operating license to beginning of first power generation has been about 3 months.

During this period, the plant operators must load the initial "core" of nuclear fuel and carry out a series of mandatory startup test procedures. Furthermore, following first power production, it has taken an average of 4 months until the unit has satisfactorily completed its initial testing and can be operated at full power for sustained periods. When full, sustained operation is achieved, the unit is usually declared to be in full commercial operation and the owner formally accepts the unit from its builder. During the 4 months prior to commercial operation, the unit operates at an average 30 percent of design capacity. Following commercial operation, and until the unit shuts down for its first refueling (usually 2 years later), the unit operates at about a 48-percent-capacity-factor level. After that, a 60-percent-capacity factor can be expected.¹⁰

Only four new units would come into full commercial operation in 1980 under currently announced regulatory

¹⁰ The capacity factors used here were derived from an internal analysis of nuclear plants which were granted operating licenses during the period 1976 through 1979.

conditions (i.e. licensing resumption in spring 1980). These four units, totalling nearly 4,300 MW capacity, are essentially complete, and could probably have been licensed by January except for continuation of the licensing suspension initiated last May. This analysis assumed that the earliest these four units would be licensed is May 1, 1980. An additional five units totalling 5,000 MW could be licensed during the remainder of the year. (See Table 5.)

For those nuclear units which achieved commercial operation in 1979, anticipated 1980 generation in excess of 1979 generation was determined. Electricity generation is assumed to commence in August for the four units which are expected to receive licenses in May 1980, and the average operating factor from August through November is assumed to be 30 percent of capacity, followed by 48 percent of capacity in December. Only two of the five other units which are assumed to be licensed from August through December are expected to generate electricity in 1980, and only a nominal amount is anticipated. (See Table 6.)

Table 5. Potential New Nuclear Capacity For the Short Term

State	Unit Name	Size (MWe)	Construction Percentage ^a	NRC Staff Estimated Completion Date ^b	Utility Estimated Completion Date ^a	EIA Projected Completion Date ^c	Earliest Initial Fuel Load
NJ	Salem 2	1,115	99	5/79	2/79	10/79	5/80
VA	North Anna 2	943	100	8/79	5/79	9/79	5/80
TN	Sequoyah 1	1,140	98	1/80	10/79	2/80	5/80
CA	Diablo Canyon 1	1,084	100	1/80	2/79	9/79	5/80
SC	McGuire 1	1,180	95	8/80	5/80	6/80	8/80
OH	Zimmer 1	810	93	7/80	3/80	8/80	8/80
IL	LaSalle 1	1,078	91	6/80	6/80	10/80	10/80
CA	Diablo Canyon 2	1,106	98	7/80	3/80	2/80	^d 11/80
SC	Summer 1	900	90	12/80	7/80	12/80	12/80
TN	Watts Bar 1	1,177	86	12/80	9/80	3/81	3/81
MS	Grand Gulf 1	1,250	86	4/82	11/80	3/81	4/82
NY	Shoreham	854	83	11/80	6/80	6/81	6/81
TN	Sequoyah 2	1,140	83	8/80	8/80	6/81	6/81
MI	Ferni 2	1,123	84	6/81	5/81	5/81	6/81
PA	Susquehanna 1	1,052	94	6/81	5/80	9/80	6/81
CA	San Onofre 2	1,127	80	11/80	2/80	10/81	10/81
AL	Farley 2	829	76	7/80	5/80	1/82	1/82
WA	WPPSS 2	1,103	72	3/81	3/81	4/82	4/82
IL	LaSalle 2	1,078	67	6/81	6/81	9/82	9/82

^aSource: Construction Status Report, U.S. Nuclear Regulatory Commission, NUREG-0030 (October 1979).

^bSource: Regulatory Licensing Status Report, U.S. Nuclear Regulatory Commission, NUREG-0580 (November 2, 1979).

^cComputed from remaining percentage required to complete construction.

^dComputed using a 6-month lag after Diablo Canyon 1.

Table 6. Generation From New Nuclear Capacity--Comparison to Previous Study

Unit Name	Current Estimate		Previous Estimate ^a	
	Earliest Fuel Load	Generation ^b During 1980 ^b	Earliest Fuel Load	Generation ^b During 1980 ^b
Salem 2	^c 5/80	1,380	10/79	6,474
North Anna 2	^c 5/80	1,168	10/79	5,523
Sequoyah 1	^c 5/80	1,413	11/79	6,438
Diablo Canyon 1	5/80	1,343	12/79	5,910
McGuire 1	8/80	365	2/80	5,768
Zimmer 1	8/80	251	12/79	2,933
LaSalle 1	10/80	0	7/80	2,073
Diablo Canyon 2	11/80	0	9/80	2,453
Summer 1	12/80	0	10/80	1,705
Watts Bar 1	3/81	0	3/80	5,335
Grand Gulf 1	4/81	0	1/81	842
Shoreham	6/81	0	8/80	1,430
Sequoyah 2	6/81	0	8/80	2,942
Fermi 2	6/81	0	8/80	1,881
Susquehanna 1	6/81	0	11/81	25
San Onofre 2	10/81	0	1/81	1,183
Farley 2	1/82	0	1/82	0
WPPSS 2	4/82	0	12/80	917
LaSalle 2	9/82	0	7/81	152

^aBasis of Case II in DOE/EIA-0184/11 (An Evaluation of Potential Short-Term Nuclear Availability Levels and Associated Electric Utility Alternate Fuel Use Responses, July 1979) and the base case of Short-term Energy Outlook, October 1979.

^bMillion kilowatt-hours.

^cSequoyah 1 was licensed for low-level testing on February 29, 1980. North Anna 2 and Salem 2 received similar authorization during April 1980.

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3. POTENTIAL CHANGE IN 1980 ELECTRIC UTILITY OIL CONSUMPTION

Oil Equivalence

A central question in this analysis is, "How much oil could be displaced in the electric utility sector due to new capacity additions?" One method for determining oil displacement is to use the concept of oil equivalence. Oil equivalence simply measures the quantity of oil necessary to generate the same amount of power generated by other fuels. That is, a one-to-one correspondence between generation from new non-oil-fired capacity additions and oil displacement is assumed. This concept represents an upper bound to actual displacement. The only uncertainty in measuring oil equivalence, therefore, is that of projecting the amount of generation from scheduled capacity additions.

Oil equivalence is calculated by multiplying generation by the ratio of oil-fired plant efficiency (heat rate) to the thermal content of oil.

Specifically,

$$\text{Generation} \quad \times \quad \frac{\text{Heat rate}}{\text{Fuel Thermal Content}} \quad = \text{Oil Equivalence}$$

The units associated with this formulation are as follows:

$$\text{kWh} \quad \times \quad \frac{\frac{\text{Btu}}{\text{kWh}}}{\frac{\text{Btu}}{\text{barrel}}} \quad = \text{barrels of oil.}$$

A heat rate of 11,000 Btu (British thermal units) per kWh (kilowatt-hour) and the standard thermal content of 6.287 million Btu per barrel of residual oil were used to make this conversion.¹

The oil equivalence associated with each plant type's generation is shown in Table 7.

Potential Oil Displacement Methodology and Assumptions

In this analysis, 1980 regional, electricity-demand growth rates were derived using the demand projections assumed in the Energy Information Administration Annual Report to Congress, 1978, Volume Three, but adjusted to reflect more recent estimates of demand growth, 2.9 percent and 2.1 percent contained in the October 1979 and February 1980 Short-Term Energy Outlook reports, respectively. A high demand scenario which assumes the 1978 Annual Report projection of 3.7 percent was also analyzed. Regional demand growth (Appendix B) was prorated by load category using 1978 data (Appendix C).

The incremental generation in 1980 resulting from new capacity additions was compared to demand growth on a regional basis. In regions where projected generation

¹The heat rate, which is the average oil-fired plant efficiency for the affected DOE regions, was obtained from FERC Form 1, monthly data supplied by the electric utilities to the Federal Energy Regulatory Commission. The thermal content of residual oil was obtained from the DOE Monthly Energy Review.

**Table 7. Oil Equivalence From Projected Generation By
New Capacity, By Plant Type - U.S. Total**

Plant Type	1980 (Increase Over 1979 Levels)	
	Total Barrels	Barrels Per Day
Coal	126,326,000	345,000
Nuclear	10,358,000	28,000
Hydroelectric and Geothermal	12,790,000	35,000
Total	149,474,000	408,000

increase was more than sufficient to satisfy baseload demand increase, transfers of this "excess" generation to regions where baseload demand increase exceeded regional generation were allowed. It was assumed that the generation in excess of new baseload demand would reduce baseload oil or gas consumption. Such reduction would occur by the displacement of oil- and/or gas-fired generation, by the "excess" non-oil- or gas-fired generation in base mode operations, or by the shifting of new generating capacity to intermediate mode operations. The determination of which fuel would be displaced was based on 1979 regional shares of oil- and gas-fired generation in baseload operation.² In those regions where the projected generation increase was less than projected demand increase, it was assumed that oil or gas (in proportion to their 1979 regional shares) in excess of 1979 levels would be used. In all regions, sufficient oil- and gas-fired generating capacity was reserved to meet projected peak load demand.

General Findings

Table 8 summarizes the results of this analysis. Reference Cases I and II assume that oil and gas are displaced according to their contributions to total regional generation. The

²Regional fuel-specific power generation data was obtained from the Federal Power Commission Form 4, "Monthly Powerplant Report." This data is maintained by the Office of Energy Data, Energy Information Administration.

Table 8. Electricity Demand Growth and Potential Changes in Electricity Generation By Fuel Under Alternative Assumptions, 1979 - 1980^a
(Changes from 1979 level in billion kilowatt-hours of electricity)

	Reference Case I	Oil Retirement Preference	1980 Nuclear Licensing Moratorium	High Demand	Reference Case II
New Generation Demand Growth	65	65	65	83	47
New Coal-fired, Nuclear, and Hydroelectric Generation ^b	85	85	79	85	85
Change in Gas-fired Generation	-13	0	-12	-1	-22
Change in Oil-fired Generation	-7	-20	-1	-1	-16
Change in Electric Utility Oil Consumption (barrels/day)	-34,000	-97,000	-6,000	-6,000	-74,000

^aGeneration supply and demand data may not equal due to independent rounding.

^bConventional hydro.

Oil Retirement Preference case assumes that only oil is displaced by new generating capacity. The 1980 Nuclear Licensing Moratorium case assumes that nuclear generation does not exceed 1979 levels. The above cases (except Reference Case II which assumes a 2.1-percent growth rate) assume a 2.9 percent growth in electricity demand in 1980. The High Demand case assumes a 3.7-percent increase in electricity demand in 1980. In all cases, except the Oil Retirement Preference case, the potential secondary effect of displaced gas, in turn displacing oil, was not analyzed. Table 9 lists the assumptions associated with each case analyzed.

As Table 8 shows, there is a potential for oil reduction in the electric utility sector under all of the cases analyzed. This potential is primarily due to the large number of coal plant additions scheduled to become commercially operational in 1980. The scheduled 1980 coal capacity increase of over 16,000 MW compares with increases in the range of 10,000 to 12,000 MW which occurred in 1979 and is scheduled for 1981. It is this large increase, therefore, that is expected to offset the adverse effects on utility oil reduction caused by the nuclear licensing pause. In spite of the fact that coal-capacity increases level off in the next few years, the trend in utility oil reduction will continue. This belief is based on the assumptions that, at minimum, there will be only

Table 9. 1980 Oil Reduction Potential Case Assumptions

	Electricity Demand Growth Rate (Percent)	Fuel Displacement Strategy	Nuclear Plant Licensing ^a
Reference Case I	2.9	Based on 1978 regional oil- and gas-fired generation shares	Resumption on May 1, 1980
Oil Retirement Preference	2.9	All oil	Resumption on May 1, 1980
1980 Nuclear Licensing Moratorium	2.9	Based on 1978 regional oil- and gas-fired generation shares	No resumption in 1980
High Demand	3.7	Based on 1978 regional oil- and gas-fired generation shares	Resumption on May 1, 1980
Reference Case II	2.1	Based on 1978 regional oil- and gas-fired generation shares	Resumption on May 1, 1980

^aWhile this report was in final stages of preparation, nuclear plant licensing effectively resumed on February 29, 1980, when the Nuclear Regulatory Commission authorized low-level testing for the Sequoyah 1 reactor. In April, the North Anna 2 and Salem 2 reactors were also granted permission to begin low-level testing. These events are not expected to significantly change the nuclear generation assumptions for new units in 1980 which are used in this report. The "1980 Nuclear Licensing Moratorium" is retained for comparative purposes.

small increases in electricity demand, nuclear plant licensing will resume, and there will be a significant number of oil-to-coal plant conversions, particularly in regions heavily dependent on oil for electricity generation.

Caveats and Uncertainties

This analysis assumes increased generation based on new capacity additions only (and on their being commercially operational according to the information in Table 5).

It does not, for example, take into account potential changes in power imports from Canada or Mexico. Also, this analysis has been performed on a DOE Region level. A more comprehensive analysis might include examination of dispatching decisions at the utility or powerpool level.

Also, it is significant to note that during the first 5 months of 1980, total oil consumption by electric utilities was 25.5 percent less than that of the same period in 1979. This amounted to a reduction in consumption of 396,000 barrels per day for this period. Total electricity production for the first 5 months of 1980 was down by only 0.7 percent from that of the same period in 1979. Data was not available which readily indicated the portion of this savings which could be attributed to new generating capacity additions. Also, data was not available for electric utility oil consumption during the particularly warm summer months of 1980.

APPENDIX A

Department of Energy Federal Regions

	REGION	STATES
I	NEW ENGLAND	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
II	NEW YORK/ NEW JERSEY	New Jersey, New York
III	MIDDLE ATLANTIC	Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia
IV	SOUTH ATLANTIC	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
V	MIDWEST	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
VI	SOUTHWEST	Arkansas, Louisiana, New Mexico, Oklahoma, Texas
VII	CENTRAL	Iowa, Kansas, Missouri, Nebraska
VIII	NORTH CENTRAL	Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming
IX	WEST	Arizona, California, Hawaii, Nevada
X	NORTH WEST	Alaska, Idaho, Oregon, Washington

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APPENDIX B

1979 ACTUAL AND PROJECTED 1980 REGIONAL ELECTRICITY DEMAND (MILLIONS OF KILOWATT-HOURS)^a

DOE Region	1979	1980 Projected Increase over 1979 levels		
		3.7% Growth	2.9% Growth	2.1% Growth
I	78,291	1,525	1,195	865
II	131,871	3,128	2,451	1,775
III	272,582	4,042	3,168	2,294
IV	466,750	21,578	16,883	12,247
V	435,731	4,299	3,369	2,440
VI	313,116	30,212	23,680	17,147
VII	108,432	3,833	3,004	2,175
VIII	94,181	3,893	3,051	2,210
IX	208,028	7,905	6,196	4,487
X	138,394	2,768	2,169	1,571
Total	2,247,376	83,183	65,166	47,211

^aSource: 1979 generation was obtained from Federal Power Commission Form 4, "Monthly Powerplant Report", data as of April 24, 1980. While total assumed growth rates are as shown above, regional growth rates vary and were determined using Annual Report to Congress 1978 input data.

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APPENDIX C

1978 NET GENERATION OF ELECTRICITY BY LOAD CATEGORY (PERCENT OF TOTAL)^a

DOE Region	Base	Intermediate	Peak
I	77	15	8
II	63	28	9
III	72	24	4
IV	63	32	5
V	62	31	7
VI	64	27	9
VII	60	29	11
VIII	88	8	4
IX	59	35	6
X	79	17	4

^aSource: Trends in the Capacity Utilization and Fuel Consumption of Electric Utility Powerplants, 1970-1978, February 1980. DOE/EIA-0184/32.

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APPENDIX D

Primary Assumptions Used for This Report

General Assumptions

- New coal, nuclear, hydroelectric (excluding pumped storage) and geothermal capacity additions will operate primarily in the base mode.
- Oil equivalence, as used in this report, assumes that new non-oil generating capacity will directly displace oil.
- Regional electricity demand growth rates for 1980 were derived using demand projections in the Energy Information Administration Annual Report to Congress 1978, adjusted to reflect recent estimates in the October 1979 and February 1980 Short-Term Energy Outlook Reports.
- See Table 9, page 23, for the primary assumptions in the five cases analyzed.

Assumptions for New Coal Generating Capacity

- Coal plants begin producing electricity 2 months before they begin commercial operation, and they operate at 30 percent of full capacity during this testing phase.
- Once full commercial operation begins, coal plants operate at 65 percent of full capacity.
- 1980 coal-fired capacity additions are assumed to begin commercial operation at the times shown in Table 3 of this report.

Assumptions for New Nuclear Capacity

- New nuclear plants forecasted to achieve commercial operation in 1980 are shown in Table 5. Nuclear capacity of 4,282 MW will achieve commercial operation in 1980, and new 1981 commercial capacity of 1,990 MW will generate some electricity during startup testing in 1980.

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