Final Report On

THE ALLOCATION OF INCREASING GAS SUPPLIES IN OHIO

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EXECUTIVE SUMMARY

The study reported on in the enclosed three volumes was requested by the Public Utilities Commission of Ohio (PUCO) to assist it in the formation of policies concerning the allocation of increasing gas supplies in Ohio.

There is a great number of potential new service policies that could have been subjected to evaluation in this study. Generally potential new service policies can be defined in terms of (a) the type of customer to receive new service, (b) the location of the customer in relation to the existing distribution system, and (c) the contractual arrangement under which the new service is to be provided. The potential of introducing combined policies in terms of the above categories and the differentiation of policies in terms of time of implementation increases vastly the number of policies that need to be analyzed.

Due to time and budget limitations only representative new service policies were studied under alternative assumptions concerning future conditions, especially those related to the availability of various types of energy and associated prices. In particular, four policies were analyzed under seven energy scenarios. The four policies are:

1. No New Service Policy - the present ban is continued;

2. Company Initiative Policy - this policy permits the company to provide new service within the supply limits and in a particular order of customer classes. Residential, commercial, and industrial customers within the currently served areas are hooked-up in sequence, followed by residential customers outside the currently served areas;

3. Selected Residential Service - only residential customers within the currently served areas are hooked-up;

4. Industrial Service - only industrial customers within the currently served areas are connected.

The mere existence of a multitude of possible new service policies suggests that the choice of the preferred policy be based on the capacity of the policy to satisfy regulatory objectives. Among the traditional objectives of regulatory policies are concerns for financial stability of the regulated utility and adequacy of the quantity and quality of the supplied services. More recently, due to the newly revealed energy scarcity and the associated growth in utility bills, regulatory policies have been increasingly subjected to evaluations in terms of changes in production and end-use efficiency and in terms of fairness and the redistribution of income that they induce.

The analysis of these policies was carried out with the regulatory simulation model that was developed for this purpose. The results were obtained by applying the model to the East Ohio Gas Company (EOGC). It is important to note that the extent to which the results indicate differences in achievement of the various regulatory objectives is a function of differences in policies and scenarios only. No other exogenous forces were permitted to influence the results. Differences in the achievement of objectives by policies cannot be attributed to changes in the behavior of the EOGC or the PUCO.

Table 1 contains a summary of policies ranked in terms of the desirability of their impacts on utility finances, on customers, and on net aggregate economic efficiency as calculated for the EOGC's service area. These results are based on averages of annual impacts only. No reference is made to the time incidence of the impacts.

Table 1 Policy Rankings by Type of Impact Based on Simulations for the Period 1978-2000

Policy	Rankings in Terms of		
	Impact on Utility Finances	Impact on Customers	Impact on Net Aggregate Efficency
No New Service Policy	3	1	4
Company Initiative Policy	2	4	1
Selected Residential Policy	1	2	2
Industrial Only Policy	3	3	3

The choice of the preferred policy is made difficult by a number of factors. Above all, the extent to which some of the regulatory objectives are attained and the repercussions of several policies in terms of the various criteria cannot be measured accurately. In addition, the comparison of policies in terms of their achievement of all the objectives is not possible because of the non-existence of an aggregate measure. The lack of such a measure is due to the fact that the standards by which the attainment of the objectives is measured are not equivalent.

Yet, even the limited information contained in Table 1 is too rich to yield an objective and unambiguous choice of the preferred policy. All policies, except the industrial only policy, emerge as the preferred policy in terms of at least one of the impact criteria used in this study. Two of the policies considered emerge as second best policies. Thus, concern for the company finances alone would lead the decision-maker to choose the selected residential policy as a guide for new service offering by Ohio's gas distribution companies. Concern for customers alone would lead the same decision-maker to prefer the current ban as the preferred policy. Concern for economic efficiency, on the other hand, would lead the decision-maker to select the selected residential policy. The choice of the preferred policy depends on the relative importance, in the form of weights, that decision-makers attach to the decision criteria.

No full-scale attempt has been made to select the preferred policy under various assumptions concerning the relative importance of the decision criteria. An examination of the results reveals, however, that in some cases the selected residential policy is clearly preferred. In other cases, where the policy is not ranked as the preferred policy, it is almost indistinguishable from the preferred policy. Overall, it is ranked as the best policy in terms of impacts on utility finances and second best in terms of impacts on customers and on economic efficiency.

Finally, these results are valid for the EOGC only. Generalizations based on these results may be subject to errors due to circumstances that could be unique to the EOGC service area. The determination of precise new service policies for other companies could benefit from a similar analysis with the regulatory simulation model.

ACKNOWLEDGEMENTS

Many individuals contributed to the completion of this study. During various stages of research the project benefited from the able assistance of Mr. Robert Indian, Mr. Ali Rabbani, and Ms. Janet Ruggles. Mr. James Detwiler provided his drafting expertise. Professors Oscar Fisch, Steven Gordon, Wilpen Gorr, Kenneth Pearlman, and Burkhard von Rabenau were kind enough to provide us with monthly gas consumption data. We have gained many insights through discussions with Mr. James Balthaser and Ms. Hollie Mion of the Public Utilities Commission of Ohio (PUCO), Mr. Robert Koblenzer and Mr. Michael Bartels of the East Ohio Gas Company, and Dr. Kevin Kelly, Associate Director of the National Regulatory Research Institute (NRRI). Mr. Dennis Yun and Mr. Thomas Flockens helped to adapt the computerized model to facilities at the disposal of the PUCO. Finally, the project staff would like to thank the secretaries at NRRI who patiently endured with us the final execution of the report.

PREFACE

The study reported on in the enclosed three volumes was requested by the Public Utilities Commission of Ohio (PUCO) to assist it in the formation of policies concerning the allocation of increasing gas supplies in Ohio. In the early research stages the National Regulatory Research Institute (NRRI) team proposed an economic-engineering model for analyzing the repercussions of new service policies in the case of one gas distribution company. The results of such analysis were to serve as a basis for generic recommendations. At the same time it was recognized that the computerized model would be useful for the analysis of new service policies on a company by company basis.

In light of those research objectives the report is divided into two major parts. An overview of the analysis together with a complete statement of findings is presented in Volume I. Volume I is intended for those readers interested in general policy issues and in the basis for choosing preferred policies from the many alternatives. Volume II is intended for those readers who will use the computerized model. In this volume the means of constructing the model and the meaning of its results are explained in the context of an application. Since each volume is intended to be self-contained, there is some repetition of information. Volume III is composed of appendixes to the information contained in Volume II.

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APPENDIX A

DEMOGRAPHIC DATA AND FORECASTS

Various basic data used in partitioning the EOGC service area into five divisions and in preparing the divisions' forecasts of population and household size are presented in this Appendix. Table A-1 presents a listing, dated October 29, 1976, of the cities, villages and townships where natural gas is served by the EOGC. In Table A-2 population forecasts are presented, for the whole county, for the part legally covered by the EOGC service area, and for the areas currently served by the company. These forecasts are presented in graphical form in Figures A-1 through A-18. The population of a county located in more than one division is allocated among these divisions on the basis of the county's population currently located in each division. The results of this allocation process are presented in Table A-3. Finally, forecasts of household size on a county basis are presented in Table A-4.

Table A-1 Cities, Villages and Townships Served by the East Ohio Gas Company - October 1976

ASHLAND COUNTY

City or Village

Loudonville

ASHTABULA COUNTY

City or Village

Ashtabula
Conneaut
Geneva
Geneva-on-the-Lake
Jefferson
North Kingsville

Township

Ashtabula
Austinburg
Geneva
Harpersfield
Jefferson
Kingsville
Pierpont
Plymouth
Saybrook

CARROLL COUNTY

City or Village

Dellroy

Township

Monroe

COLUMBIANA COUNTY

City or Village

East Palestine

Township

Unity

COSHOCTON COUNTY

Township

Crawford

Table A-1 Cities, Villages and Townships Served by the East Ohio Gas Company - October 1976 (cont'd)

CUYAHOGA COUNTY

City or Village

Beachwood	Fairview Park	North Randall
Bedford	Garfield Heights	Oakwood
Bedford Heights	Gates Mills	Orange
Bentleyville	Glenwillow	Pepper Pike
Bratenahl	Highland Heights	Richmond Heights
Brecksville	Hunting Valley	Rocky River
Broadview Heights	Independence	Seven Hills
Brooklyn	Lakewood	Shaker Heights
Brooklyn Heights	Linndale	Solon
Brook Park	Lyndhurst	South Euclid
Chagrin Falls	Maple Heights	University Heights
Cleveland	Mayfield	Valley View
Cleveland Heights	Mayfield Heights	Walton Hills
Cuyahoga Heights	Moreland Hills	Warrensville Heights
East Cleveland	Newburgh Heights	Woodmere
Euclid	North Olmsted	

Township

Chagrin Falls
Riveredge
Warrensville

GEAUGA COUNTY

City or Village

Burton	Middlefield
Chardon	South Russell

Township

Bainbridge	Hambden
Chardon	Munson
Chester	Russell

Table A-1 Cities, Villages and Townships Served by the East Ohio Gas Company - October 1976 (cont'd)

HOLMES COUNTY

City or Village
Loudonville

Township
Clark
Washington

KNOX COUNTY

City or Village
Danville
Gann

LAKE COUNTY

City or Village		
Eastlake	Madison	Timberlake
Fairport Harbor	Mentor	Waite Hill
Grand River	Mentor-on-the-Lake	Wickliffe
Kirtland	North Perry	Willoughby
Kirtland Hills	Painesville	Willoughby Hills
Lakeline	Perry	Willowick

Township	
Concord	Painesville
Madison	Perry

Table A-1 Cities, Villages and Townships Served by the East Ohio Gas Company - October 1976 (cont'd)

MAHONING COUNTY

City or Village

Campbell	Lowellville	Poland
Craig Beach	New Middletown	Struthers
		Youngstown

Township

Austintown	Boardman	Jackson
Beaver	Canfield	Poland
Berlin	Coitsville	Springfield

MEDINA COUNTY

City or Village

Wadsworth

Township

Granger	Hinckley	Wadsworth
Guilford	Sharon	

PORTAGE COUNTY

City or Village

Aurora	Hiram	Ravenna
Brady Lake	Kent	Streetsboro
Garrettsville	Mantua	Windham
	Mogadore	

Township

Atwater	Freedom	Ravenna
Aurora	Hiram	Randolph
Brimfield	Mantua	Rootstown
Deerfield	Palmyra	Shalersville

STARK COUNTY

City or Village

Canal Fulton	Hartville	Louisville
Canton	Hills and Dales	Massillon
East Canton	Limaville	Meyers Lake
		North Canton

Table A-1 Cities, Villages and Townships Served by the East Ohio Gas Company - October 1976 (cont'd)

STARK COUNTY

Township		
Canton	Lexington	Perry
Jackson	Marlboro	Plain
Lake	Nimishillen	Tuscarawas
Lawrence	Osnaburg	Washington

SUMMIT COUNTY

City or Village		
Akron	Hudson	Reminderville
Barberton	Lakemore	Richfield
Boston Heights	Macedonia	Silver Lake
Clinton	Mogadore	Stow
Cuyahoga Falls	Munroe Falls	Tallmadge
Fairlawn	Northfield	Twinsburg
	Norton	
	Peninsula	

Township		
Bath	Coventry	Northampton
Boston	Franklin	Richfield
Copley	Green	Springfield

TRUMBULL COUNTY

City or Village		
Cortland	Hubbard	Newton Falls
Girard	McDonald	Niles
		Warren

Township		
Bazetta	Fowler	Lordstown
Brookfield	Howland	Vienna
Champion	Hubbard	Warren
	Liberty	Weathersfield

Table A-1 Cities, Villages and Townships Served by the East Ohio Gas Company - October 1976 (cont'd)

TUSCARAWAS COUNTY		
City or Village		
Baltic	Midvale	Stone Creek
Dennison	Mineral City	Sugarcreek
Dover	New Philadelphia	Tuscarawas
	Parral	Unrichsville
Township		
Bucks	Franklin	Mill
Dover	Goshen	Sandy
WAYNE COUNTY		
City or Village		
Apple Creek	Orrville	
Doylestown	Shreve	
Marshallville	Smithville	
	Wooster	
Township		
Baughman	East Union	Sugar Creek
Chippewa	Franklin	Wayne
	Green	Wooster

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Ashland				
1977	44,820	3,787	3,000	.792
1978	44,759	3,786	2,997	.792
1979	44,656	3,774	2,990	.792
1980	44,603	3,770	2,987	.792
1981	44,612	3,771	2,987	.792
1982	44,600	3,770	2,987	.792
1983	44,607	3,770	2,987	.792
1984	44,631	3,773	2,989	.792
1985	44,675	3,776	2,991	.792
1986	44,712	3,779	2,994	.792
1990	44,898	3,795	3,006	.792
1995	45,393	3,837	3,040	.792
2000	45,976	3,887	3,079	.792
Ashtabula				
1977	108,157	108,157	78,555	.726
1978	109,354	109,354	79,422	.726
1979	110,625	110,625	80,347	.726
1980	111,922	111,922	81,288	.733
1981	113,229	113,229	82,237	.726
1982	114,593	114,593	83,228	.726
1983	116,046	116,046	84,282	.726
1984	117,542	117,542	85,369	.726
1985	119,054	119,054	86,469	.726
1986	120,534	120,534	87,543	.726
1990	126,519	126,519	91,890	.726
1995	133,260	133,260	96,786	.726
2000	138,529	138,529	100,612	.726

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Carrol				
1977	22,168	1,500	1,500	1.00
1978	22,193	1,501	1,501	1.00
1979	22,226	1,504	1,504	1.00
1980	22,256	1,505	1,505	1.00
1981	22,280	1,507	1,507	1.00
1982	22,303	1,508	1,508	1.00
1983	22,346	1,511	1,511	1.00
1984	22,392	1,515	1,515	1.00
1985	22,429	1,517	1,517	1.00
1986	22,461	1,519	1,519	1.00
1990	22,598	1,529	1,529	1.00
1995	22,749	1,539	1,539	1.00
2000	22,857	1,546	1,546	1.00
Coshocton				
1977	33,615	892	892	1.00
1978	33,568	891	891	1.00
1979	33,542	890	890	1.00
1980	33,532	890	890	1.00
1981	33,528	890	890	1.00
1982	33,525	890	890	1.00
1983	33,533	890	890	1.00
1984	33,563	891	891	1.00
1985	33,611	892	892	1.00
1986	33,659	893	893	1.00
1990	33,924	901	901	1.00
1995	34,388	913	913	1.00
2000	35,206	935	935	1.00

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Columbiana				
1977	114,378	9,995	6,131	.613
1978	115,304	10,036	6,182	.616
1979	116,342	10,223	6,238	.616
1980	117,456	10,223	6,299	.616
1981	118,630	10,326	6,362	.616
1982	119,834	10,430	6,426	.616
1983	121,093	10,540	6,494	.616
1984	122,415	10,655	6,565	.616
1985	123,805	10,776	6,639	.616
1986	125,193	10,897	6,714	.616
1990	131,010	11,403	7,026	.675
1995	138,838	12,085	7,446	.738
2000	147,745	12,860	7,923	.729
Cuyahoga				
1977	1,608,109	1,407,680	1,378,877	.979
1978	1,589,313	1,391,091	1,362,577	.979
1979	1,575,160	1,376,010	1,347,790	.979
1980	1,556,439	1,362,218	1,334,273	.979
1981	1,542,094	1,349,647	1,321,911	.979
1982	1,528,713	1,337,928	1,310,476	.979
1983	1,516,710	1,327,418	1,300,180	.979
1984	1,506,163	1,318,187	1,291,139	.979
1985	1,497,139	1,310,289	1,283,403	.979
1986	1,488,861	1,303,042	1,276,304	.979
1990	1,467,365	1,284,277	1,257,875	.979
1995	1,451,697	1,270,516	1,244,446	.979
2000	1,439,803	1,260,107	1,234,250	.979

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Geauga				
1977	67,470	67,470	42,845	.635
1978	67,785	67,785	43,046	.635
1979	68,170	68,170	43,291	.635
1980	68,607	68,607	43,569	.635
1981	69,117	69,117	43,892	.635
1982	69,709	69,709	44,271	.635
1983	70,380	70,380	44,695	.635
1984	71,115	71,115	45,163	.635
1985	71,894	71,894	45,656	.635
1986	72,688	72,688	46,161	.635
1990	75,792	75,792	48,134	.635
1995	79,016	79,016	50,178	.635
2000	81,059	81,059	51,477	.635
Holmes				
1977	24,455	2,153	2,153	1.00
1978	24,629	2,169	2,169	1.00
1979	24,829	2,187	2,187	1.00
1980	25,044	2,206	2,206	1.00
1981	25,273	2,226	2,226	1.00
1982	25,512	2,247	2,247	1.00
1983	25,767	2,269	2,269	1.00
1984	25,035	2,293	2,293	1.00
1985	26,320	2,318	2,318	1.00
1986	26,606	2,343	2,343	1.00
1990	27,903	2,457	2,457	1.00
1995	29,948	2,638	2,638	1.00
2000	32,357	2,850	2,850	1.00

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Knox				
1977	42,683	1,998	1,140	.570
1978	42,644	1,996	1,139	.570
1979	42,589	1,993	1,137	.570
1980	42,519	1,987	1,134	.570
1981	42,454	1,986	1,133	.570
1982	42,395	1,982	1,131	.570
1983	42,342	1,981	1,130	.570
1984	42,302	1,979	1,129	.570
1985	42,284	1,977	1,128	.570
1986	42,271	1,977	1,128	.570
1990	42,279	1,977	1,128	.570
1995	42,550	1,989	1,135	.570
2000	43,019	2,012	1,148	.570
Lake				
1977	202,414	202,414	193,995	.958
1978	201,955	201,955	193,557	.958
1979	201,683	201,683	193,300	.958
1980	201,556	201,556	193,306	.958
1981	201,552	201,552	193,181	.958
1982	201,720	201,720	193,336	.958
1983	202,134	202,134	193,733	.958
1984	202,645	202,645	193,717	.958
1985	203,222	203,222	194,776	.958
1986	203,883	203,883	195,409	.958
1990	206,855	206,855	198,257	.958
1995	210,455	210,455	201,708	.958
2000	213,324	213,324	204,458	.958

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Mahoning				
1977	306,028	284,400	284,400	1.00
1978	305,835	285,179	285,179	1.00
1979	305,951	285,288	285,288	1.00
1980	306,186	285,508	285,508	1.00
1981	306,605	285,898	285,898	1.00
1982	307,156	286,413	285,413	1.00
1983	307,825	286,073	286,073	1.00
1984	308,602	286,795	286,795	1.00
1985	309,468	287,600	287,600	1.00
1986	310,258	288,335	288,335	1.00
1990	313,811	291,636	291,636	1.00
1995	318,525	296,017	296,017	1.00
2000	321,734	298,999	298,999	1.00
Medina				
1977	100,002	25,656	25,666	1.00
1978	102,210	26,210	26,210	1.00
1979	104,563	26,807	26,807	1.00
1980	107,004	27,431	27,431	1.00
1981	109,574	28,087	28,087	1.00
1982	112,311	28,788	28,788	1.00
1983	115,197	29,528	29,528	1.00
1984	118,177	30,292	30,292	1.00
1985	121,260	31,081	31,081	1.00
1986	124,361	31,876	31,876	1.00
1990	137,032	35,124	35,124	1.00
1995	151,548	38,845	38,845	1.00
2000	162,858	41,744	41,744	1.00

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Portage				
1977	132,703	132,703	60,049	.520
1978	133,176	133,176	69,247	.520
1979	133,672	133,672	69,522	.520
1980	134,184	134,184	69,795	.520
1981	134,937	134,937	70,188	.520
1982	135,694	135,694	70,586	.520
1983	136,371	136,371	70,940	.520
1984	137,157	137,157	71,348	.520
1985	137,925	137,925	72,211	.520
1986	138,657	138,657	72,128	.520
1990	141,279	141,279	73,493	.520
1995	143,515	143,515	74,657	.520
2000	144,570	144,570	75,256	.520
Stark				
1977	387,490	298,278	298,278	1.00
1978	388,375	209,943	298,943	1.00
1979	389,412	299,733	299,733	1.00
1980	390,604	300,646	300,646	1.00
1981	391,909	301,646	301,646	1.00
1982	393,266	302,691	302,691	1.00
1983	394,814	303,880	303,880	1.00
1984	396,583	305,244	305,244	1.00
1985	398,549	306,757	306,757	1.00
1986	400,530	308,282	308,282	1.00
1990	410,044	315,605	315,605	1.00
1995	424,983	327,105	327,105	1.00
2000	442,172	340,333	340,333	1.00

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Summit				
1977	524,831	524,831	503,637	.960
1978	519,074	519,074	498,103	.960
1979	513,611	513,611	492,855	.960
1980	508,454	508,454	487,904	.960
1981	503,613	503,612	483,256	.960
1982	498,966	498,966	478,797	.960
1983	494,686	494,686	474,690	.960
1984	490,903	490,903	471,060	.960
1985	487,560	487,560	467,852	.960
1986	484,435	484,435	464,853	.960
1990	475,803	475,803	456,570	.960
1995	472,621	472,621	453,517	.960
2000	475,279	475,279	456,068	.960
Trumbull				
1977	239,400	239,400	196,439	.820
1978	239,801	239,801	196,743	.820
1979	240,455	240,455	197,277	.820
1980	241,270	241,270	197,945	.820
1981	242,235	242,235	198,736	.820
1982	243,347	243,347	199,648	.820
1983	244,595	244,595	200,671	.820
1984	245,918	245,918	201,756	.820
1985	247,257	247,257	202,857	.820
1986	248,553	248,553	203,919	.820
1990	253,472	253,472	207,954	.820
1995	256,676	256,676	210,583	.820
2000	256,619	256,619	210,537	.820

Table A-2 Forecasted Population by County, Legal Service Area, and Served Areas, and Legal Service Area Coverage Ratios (Cont'd)

County and Year (1)	County Population (2)	Legal Service Area Population (3)	Served Areas Population (4)	Coverage Ratio (4/3) (5)
Tuscarawas				
1977	80,735	71,637	59,767	0.83
1978	81,233	72,081	60,127	0.83
1979	81,847	72,607	60,561	0.83
1980	82,464	73,171	61,035	0.83
1981	83,149	73,780	61,540	0.83
1982	83,846	74,398	62,053	0.83
1983	84,594	75,061	62,610	0.83
1984	85,390	75,768	63,197	0.83
1985	86,224	76,508	63,815	0.83
1986	87,058	77,330	63,351	0.83
1990	90,526	80,325	63,831	0.79
1995	95,176	84,452	67,111	0.79
2000	100,484	89,162	70,856	0.79
Wayne				
1977	89,743	62,036	62,036	1.00
1978	89,568	61,870	61,870	1.00
1979	89,449	61,785	61,785	1.00
1980	89,373	61,731	61,731	1.00
1981	89,396	61,749	61,749	1.00
1982	89,457	61,791	61,791	1.00
1983	89,566	61,866	61,866	1.00
1984	89,723	61,973	61,973	1.00
1985	89,898	62,095	62,095	1.00
1986	90,047	62,197	62,197	1.00
1990	90,598	62,578	62,578	1.00
1995	91,438	63,158	63,158	1.00
2000	92,659	64,003	64,003	1.00

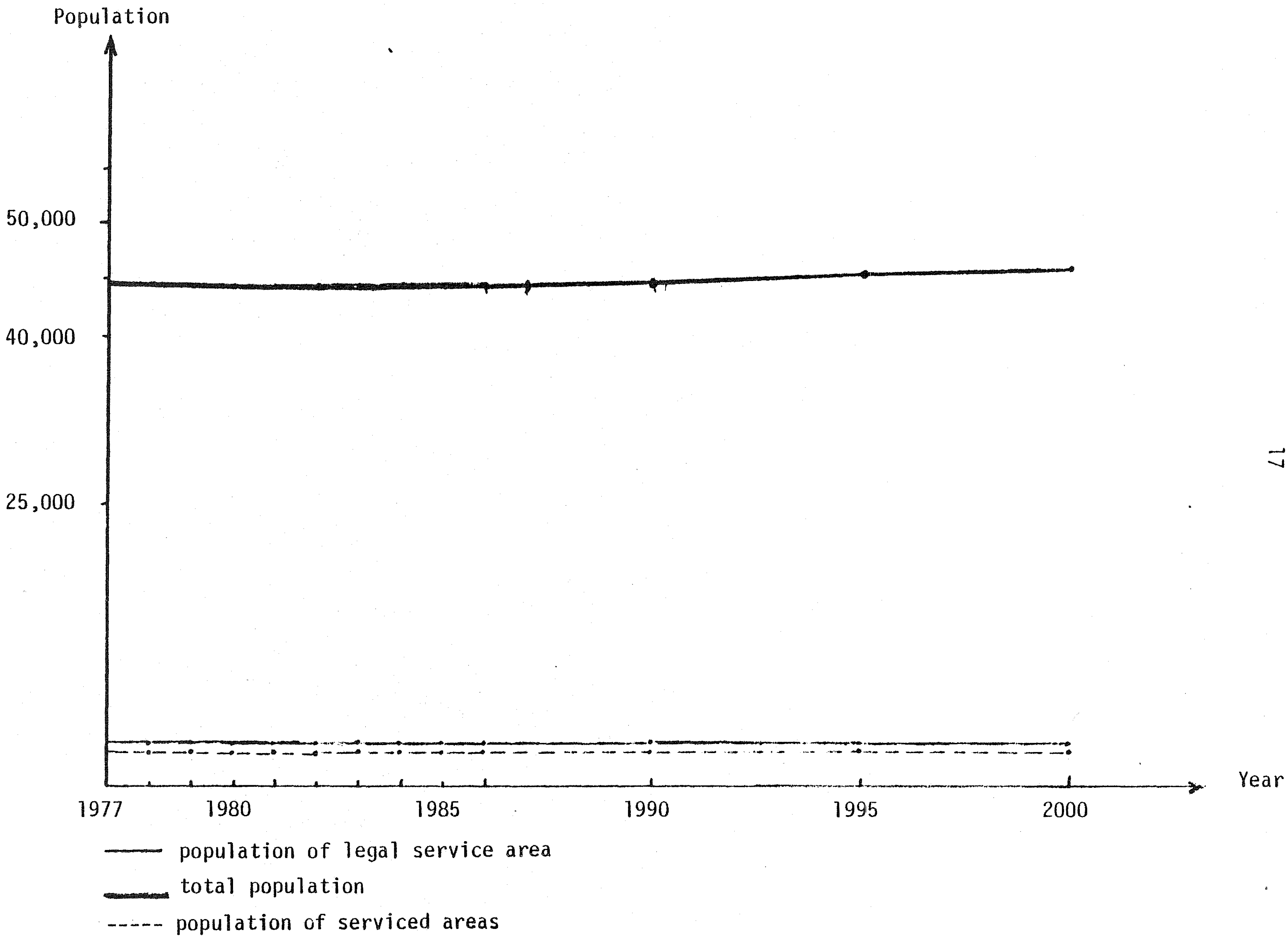


Figure A-1 Projections of Population - Ashland County

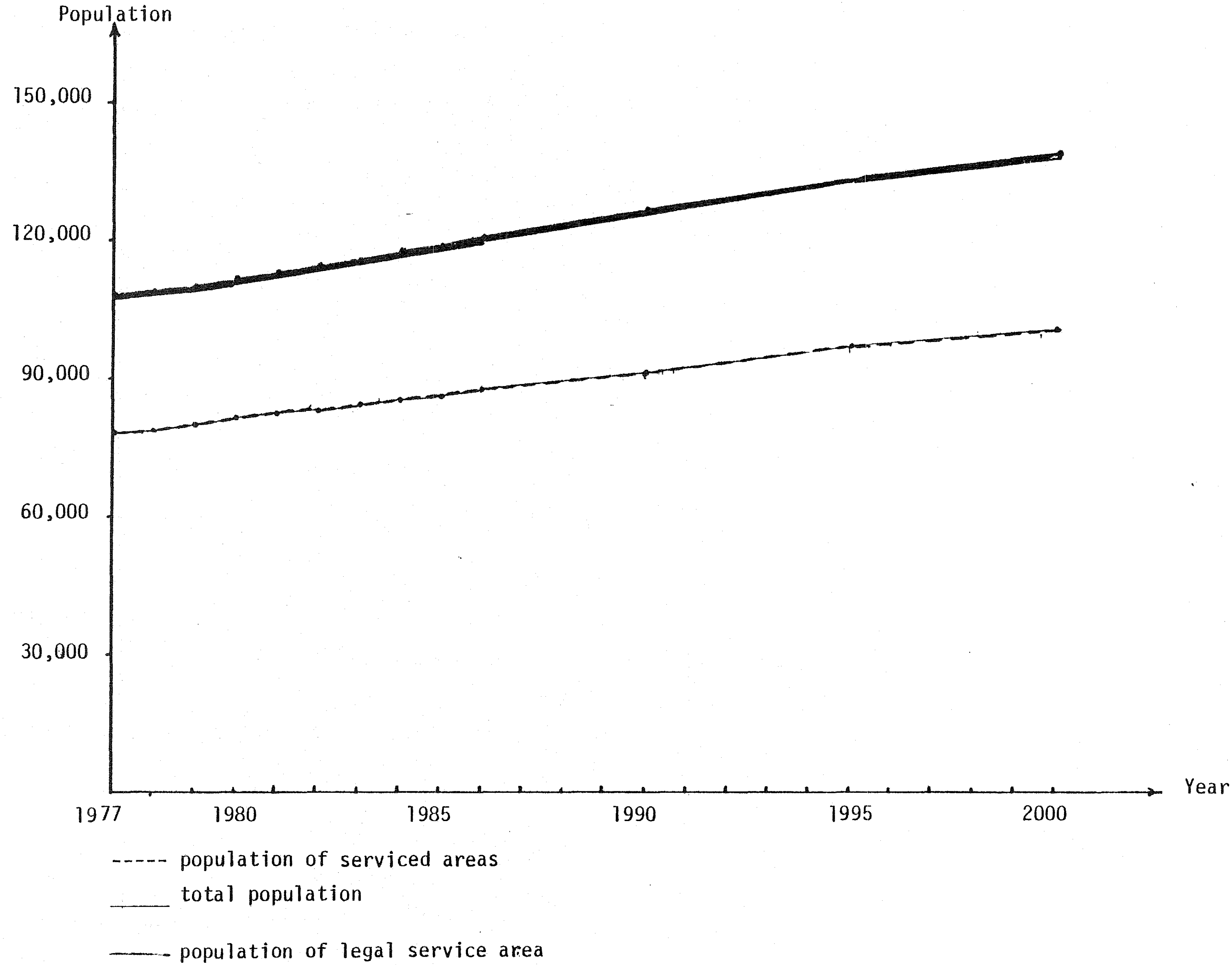


Figure A-2 Projections of Population - Ashtabula County

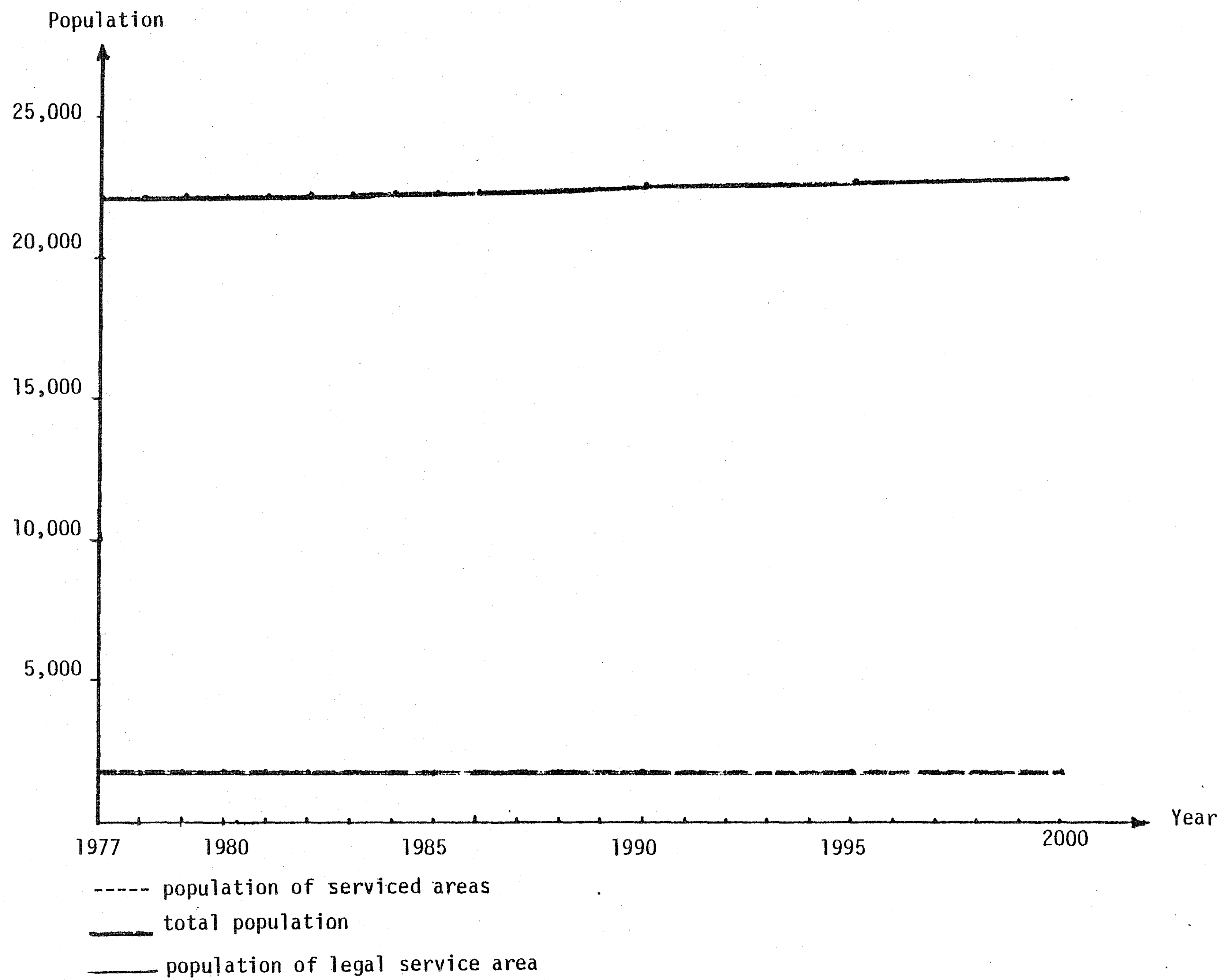
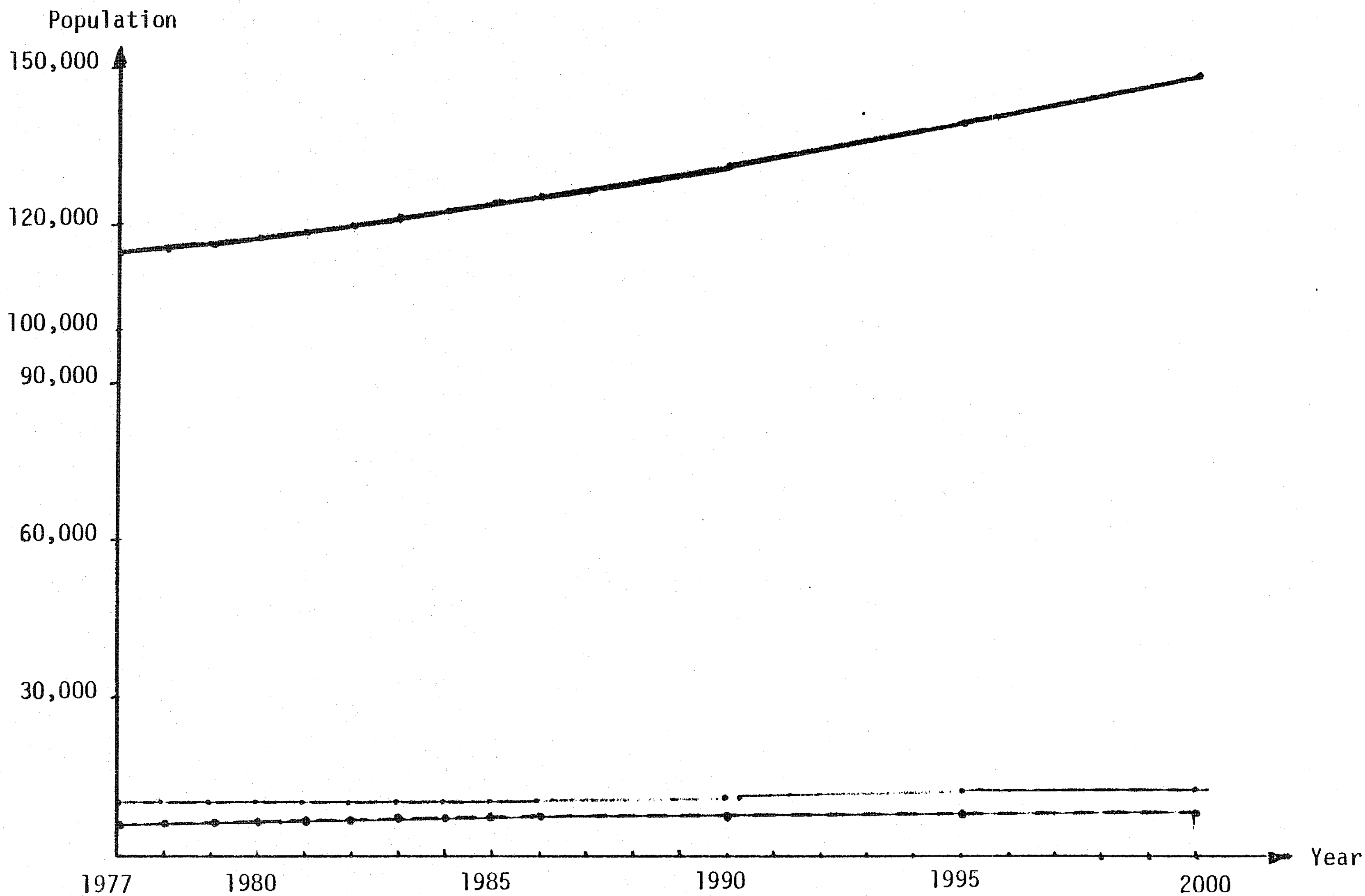


Figure A-3 Projections of Population - Carrol County

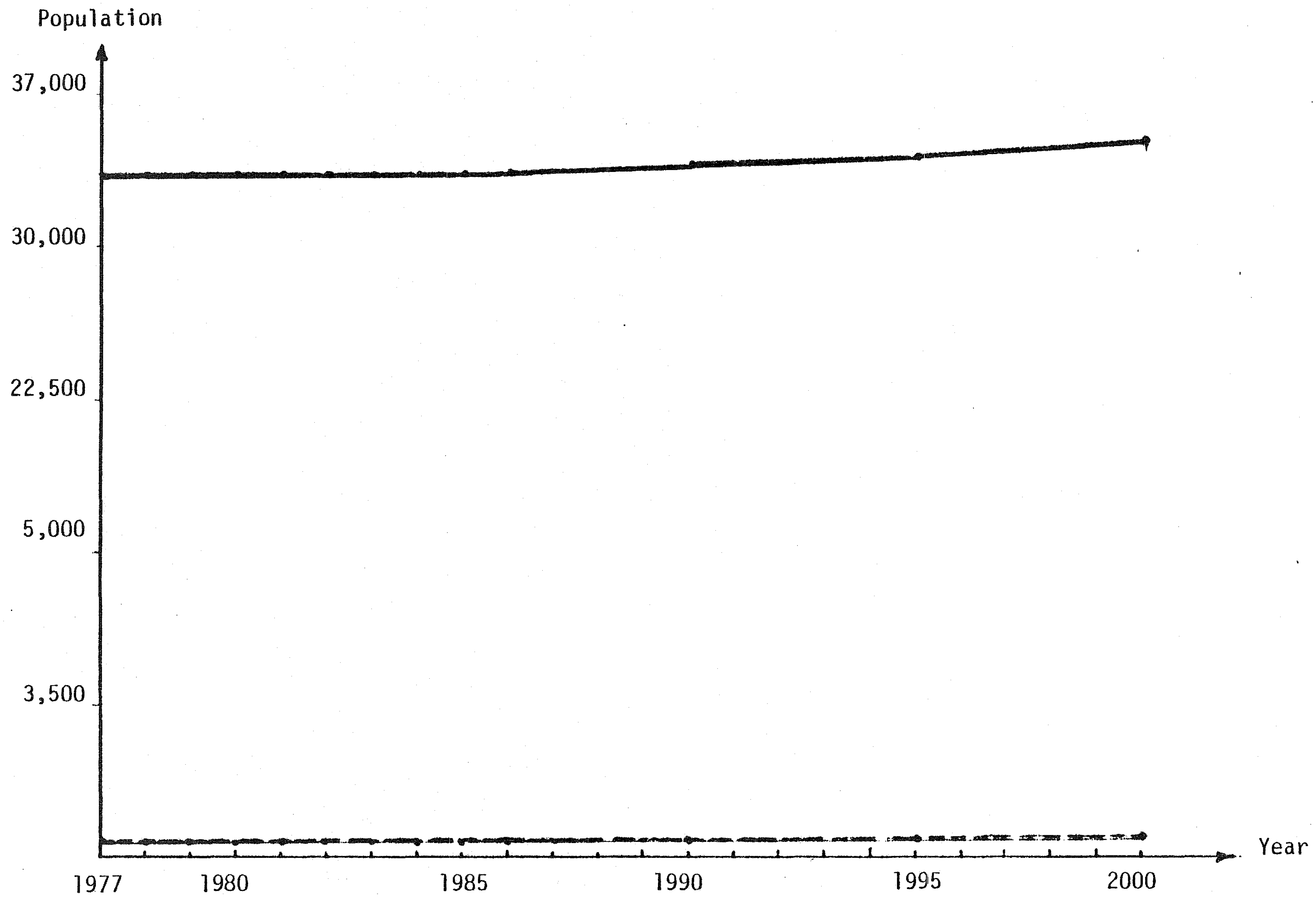


----- population of serviced areas

total population

population of legal service area

Figure A-4 Projections of Population - Columbiana County



----- population of serviced areas

total population

population of legal service area

Figure A-5 Projections of Population - Coshocton County

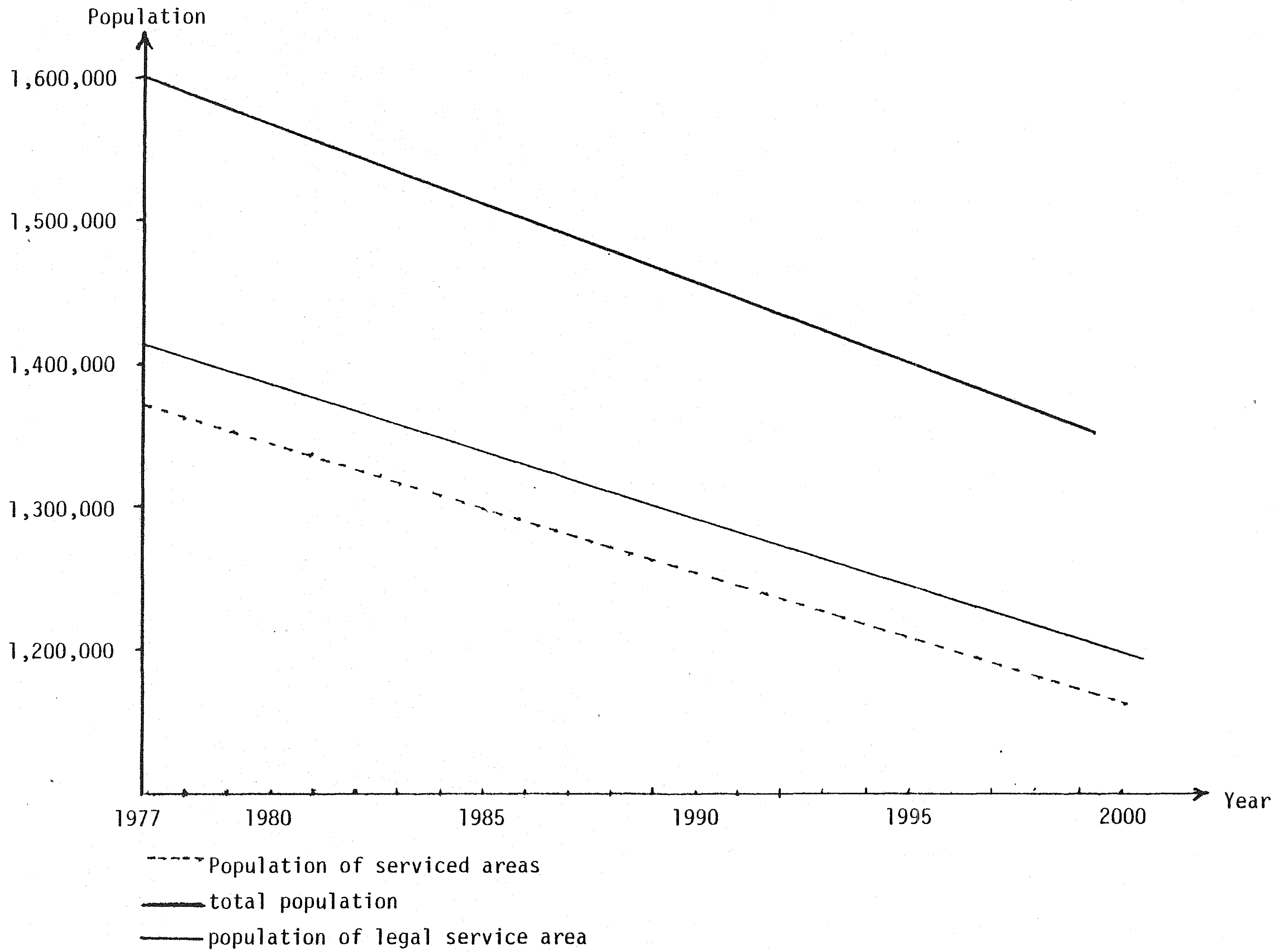
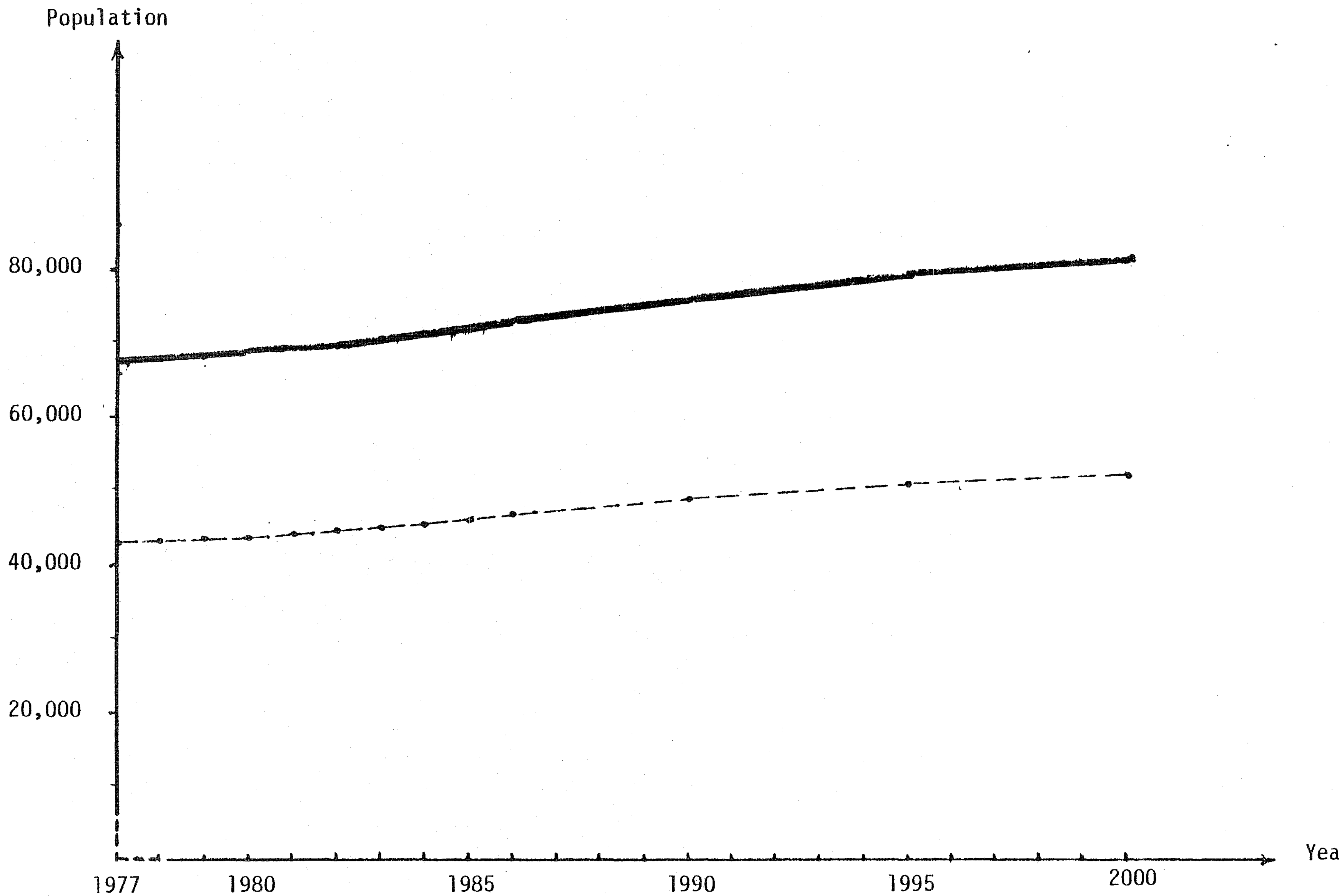


Figure A-6 Projection of Population - Cuyahoga County

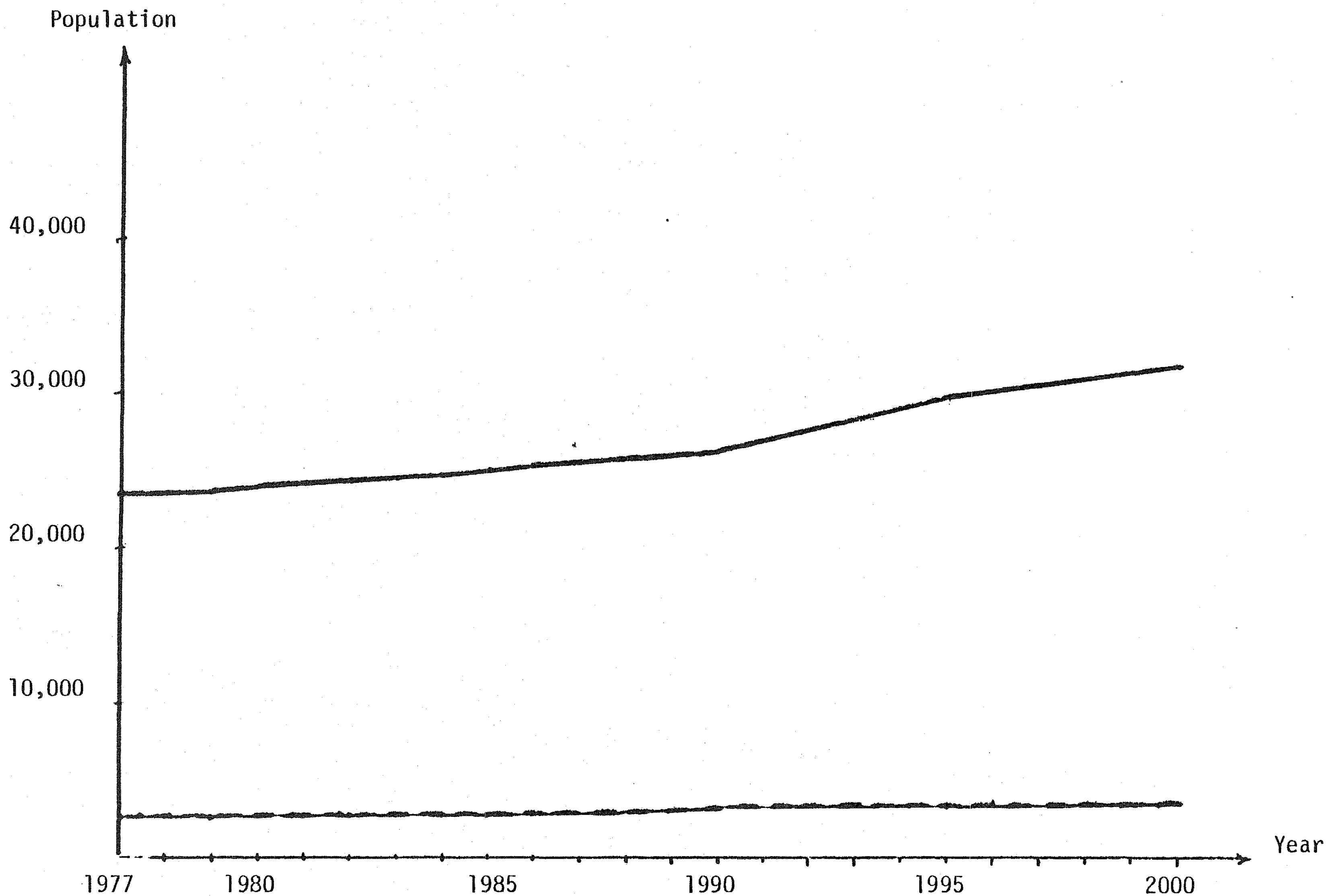


----- population of serviced areas

▬▬▬ total population

_____ population of legal service area

Figure A-7 Projections of Population - Geauga County



----- population of serviced areas

total population

population of legal service area

Figure A-8 Projections of Population - Holmes County

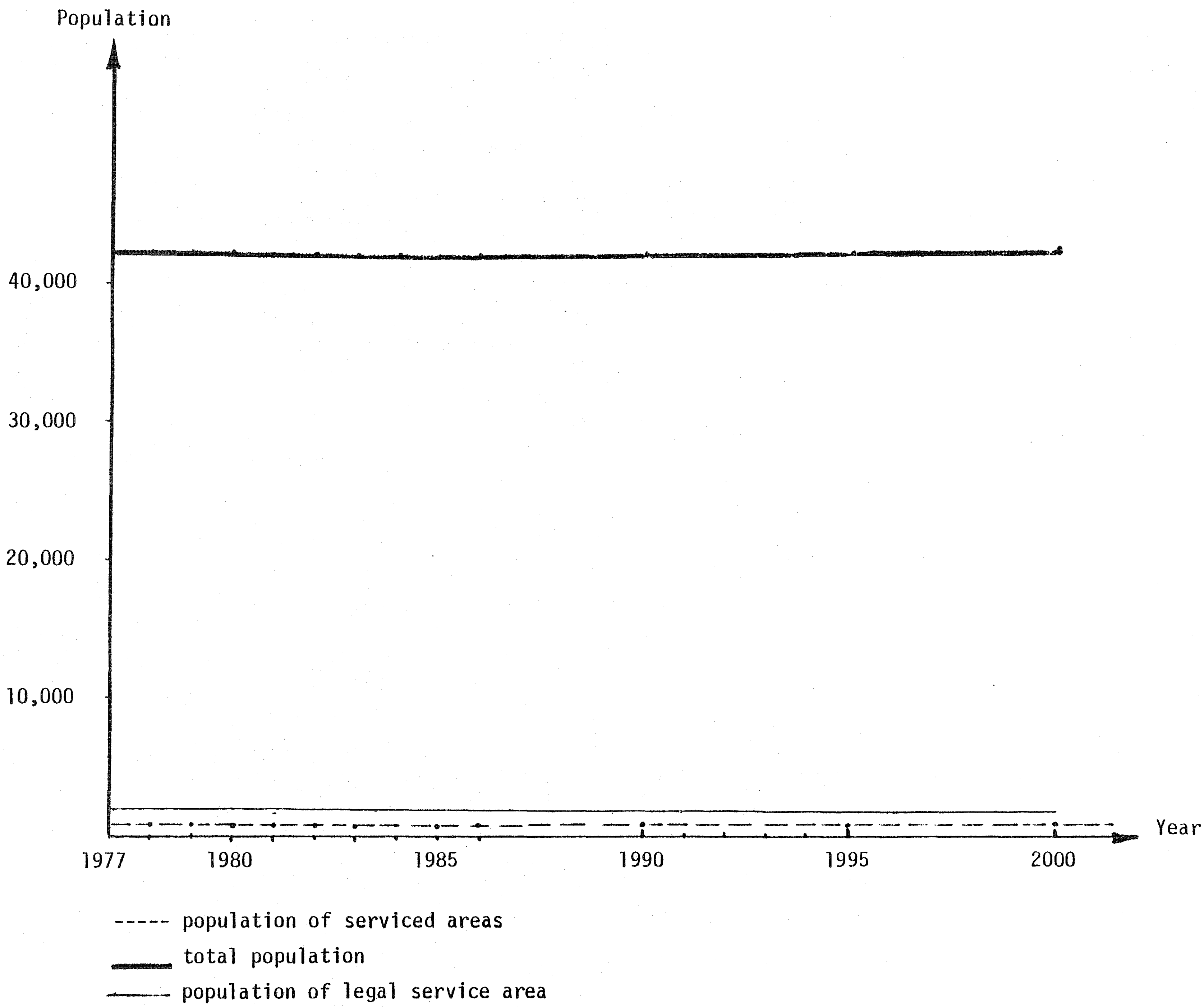


Figure A-9 Projections of Population - Knox County

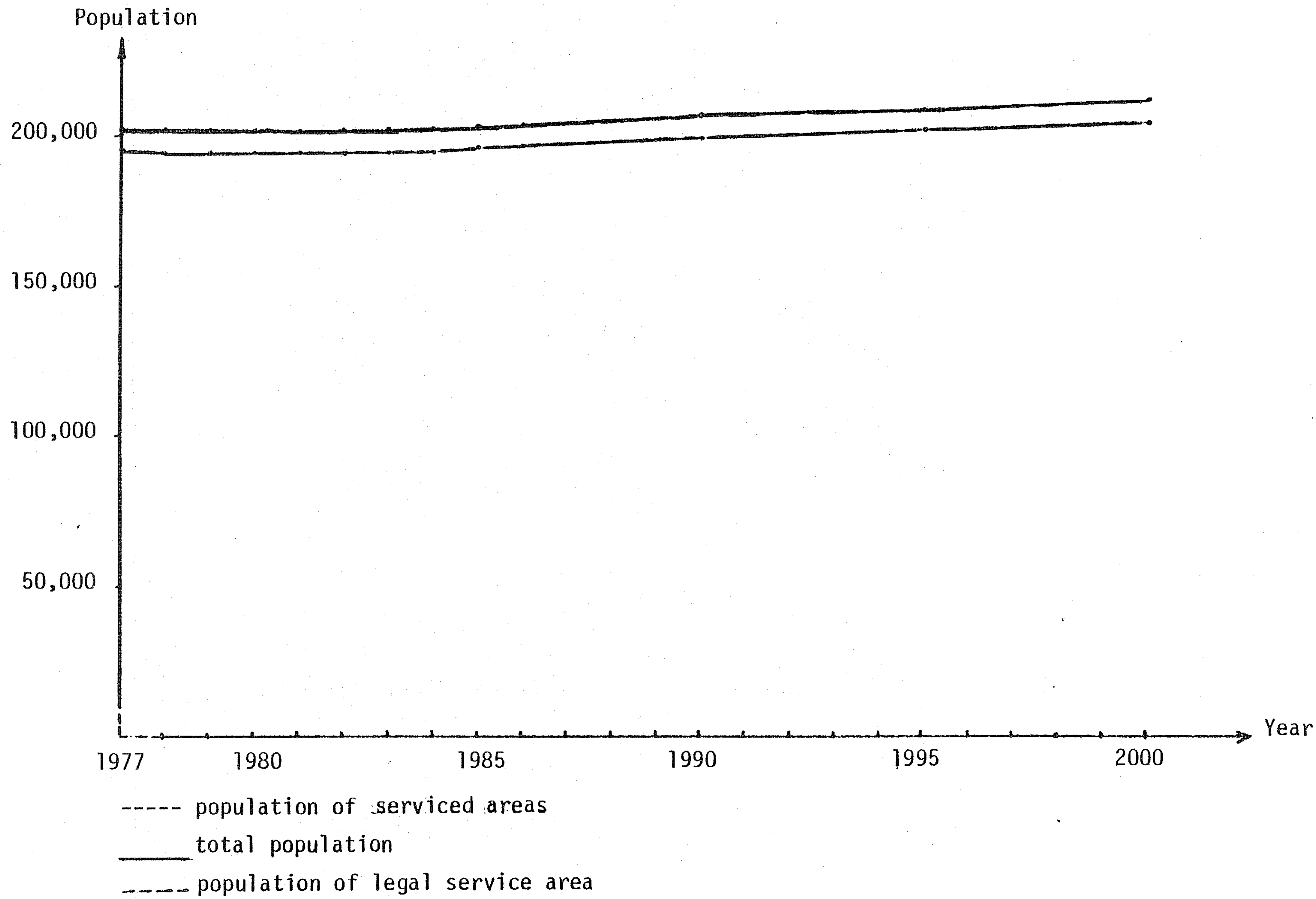


Figure A-10 Projections of Population - Lake County

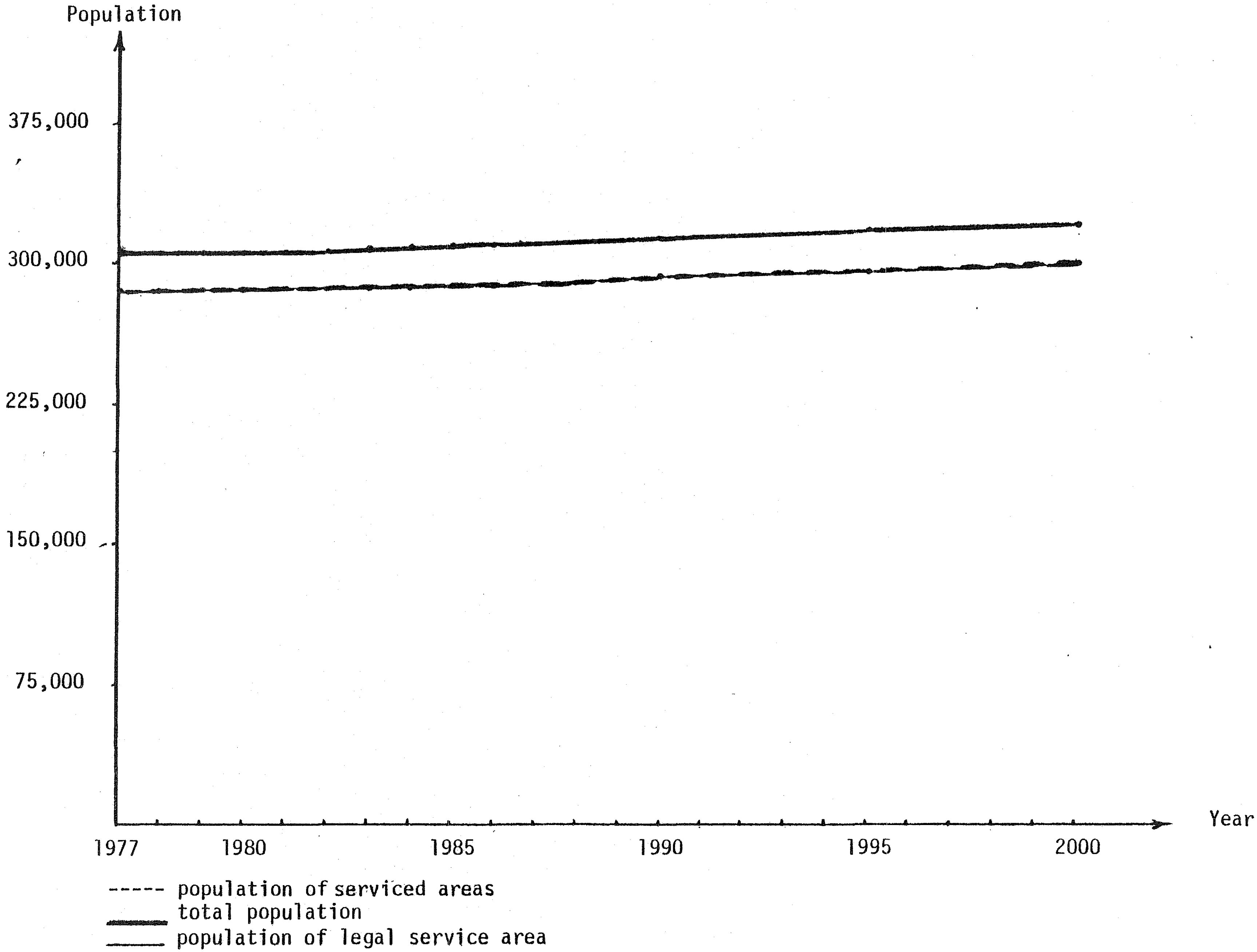
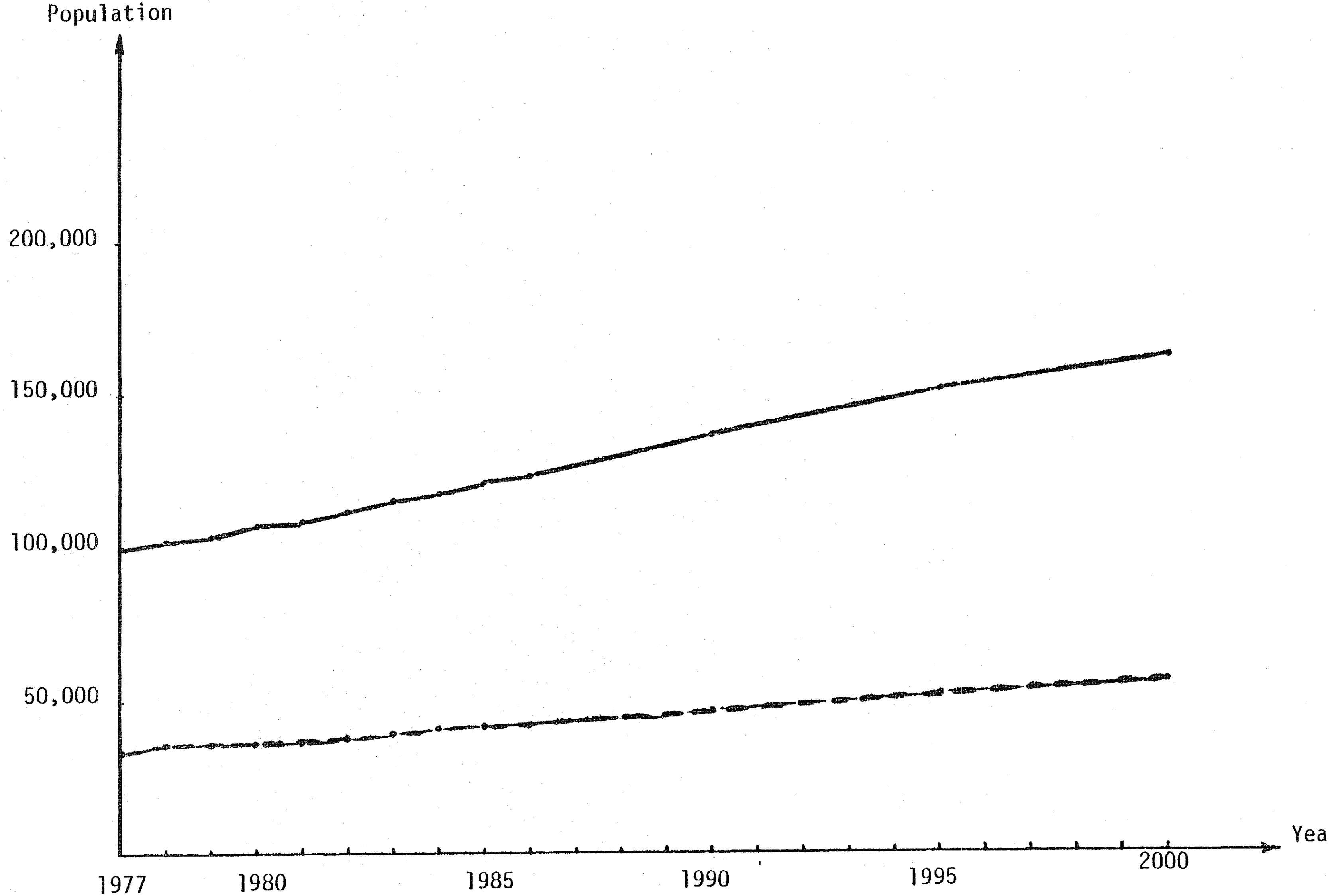


Figure A-11 Projections of Population - Mahoning County



----- population of serviced areas

total population

population of legal service area

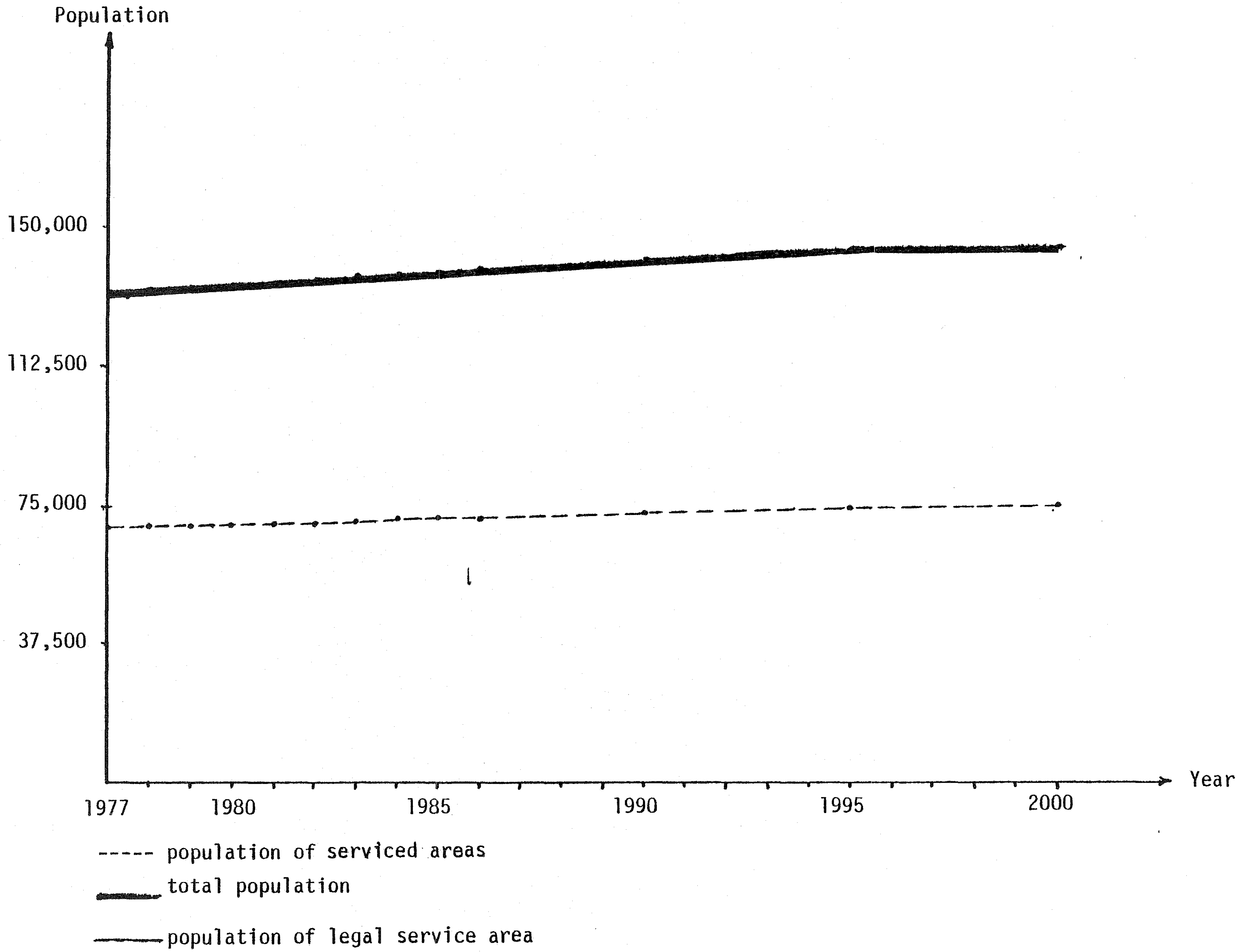
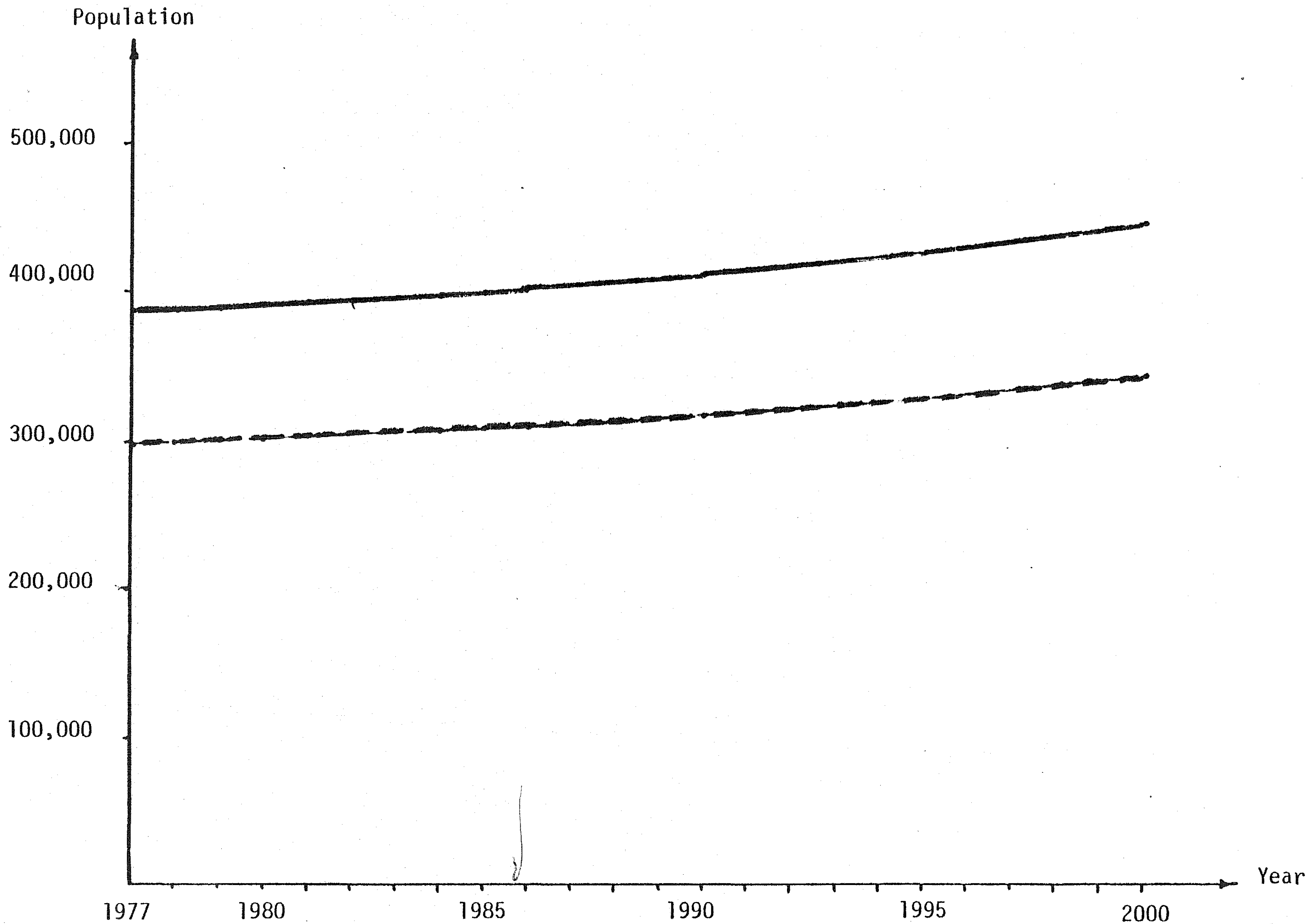


Figure A-13 Projections of Population - Portage County

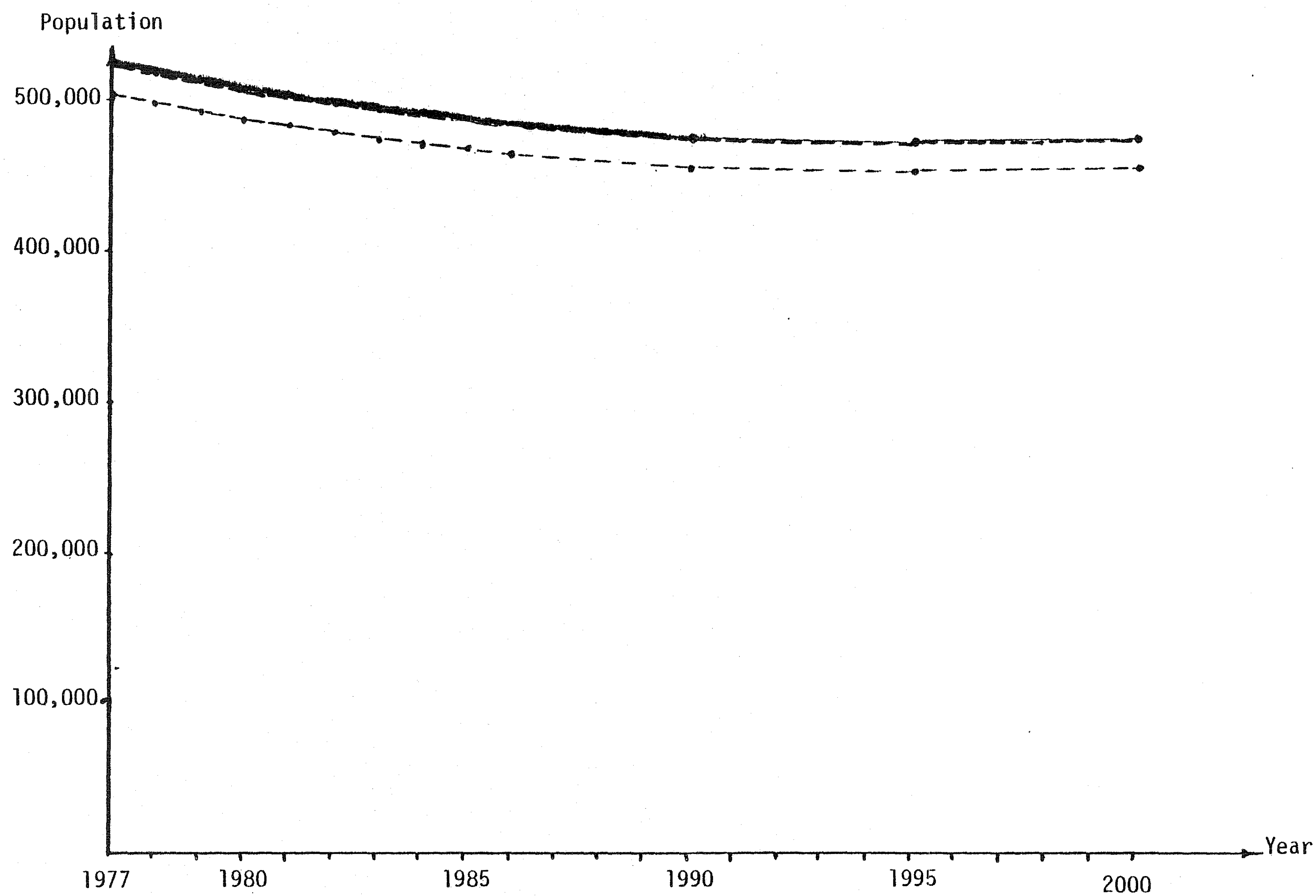


----- population of serviced areas

▬▬ total population

____ population of legal service area

Figure A-14   Projections of Population - Stark County

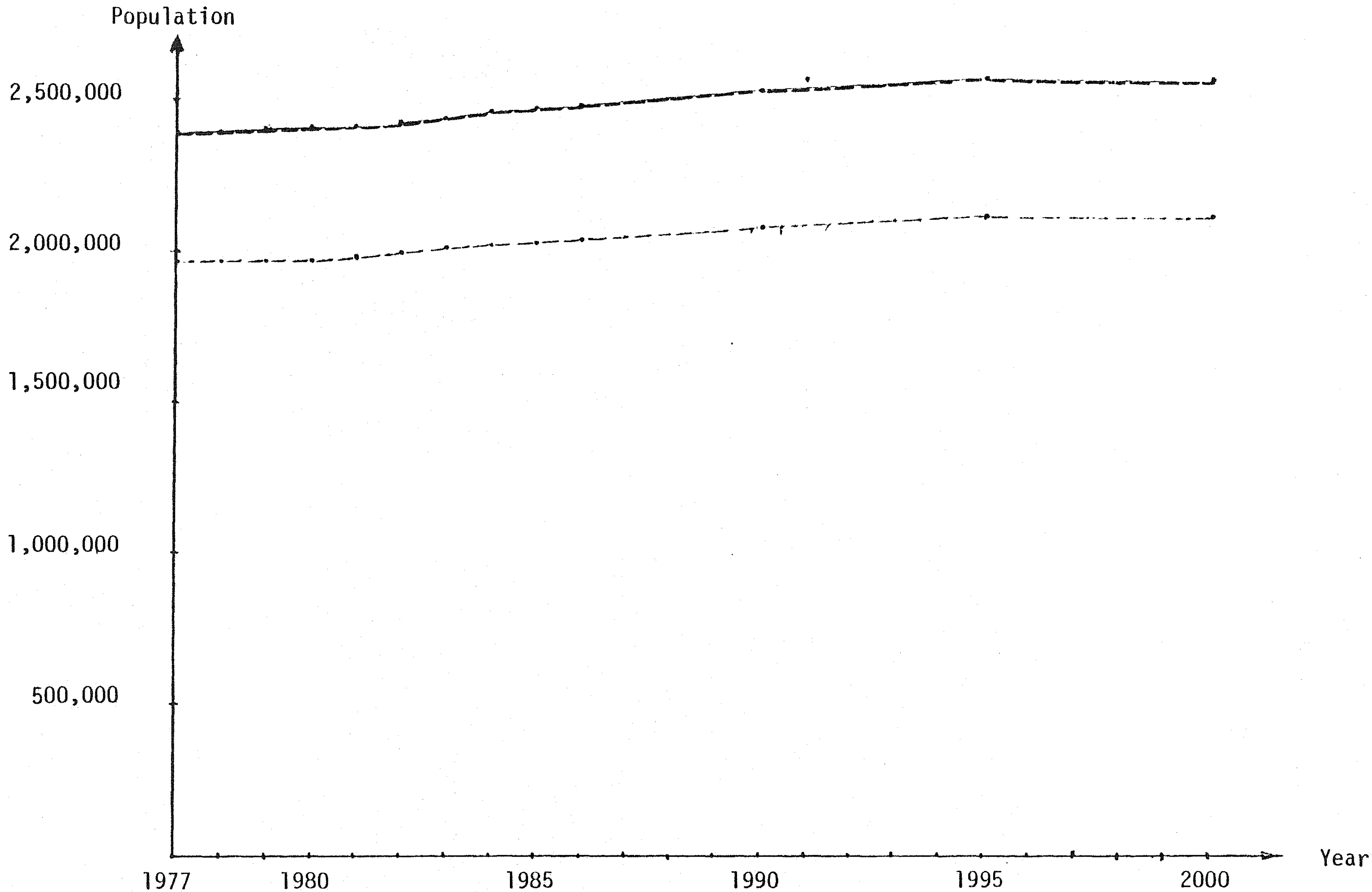


----- population of serviced areas

_____ total population

–––– population of legal service area

Figure A-15 Projections of Population - Summit County

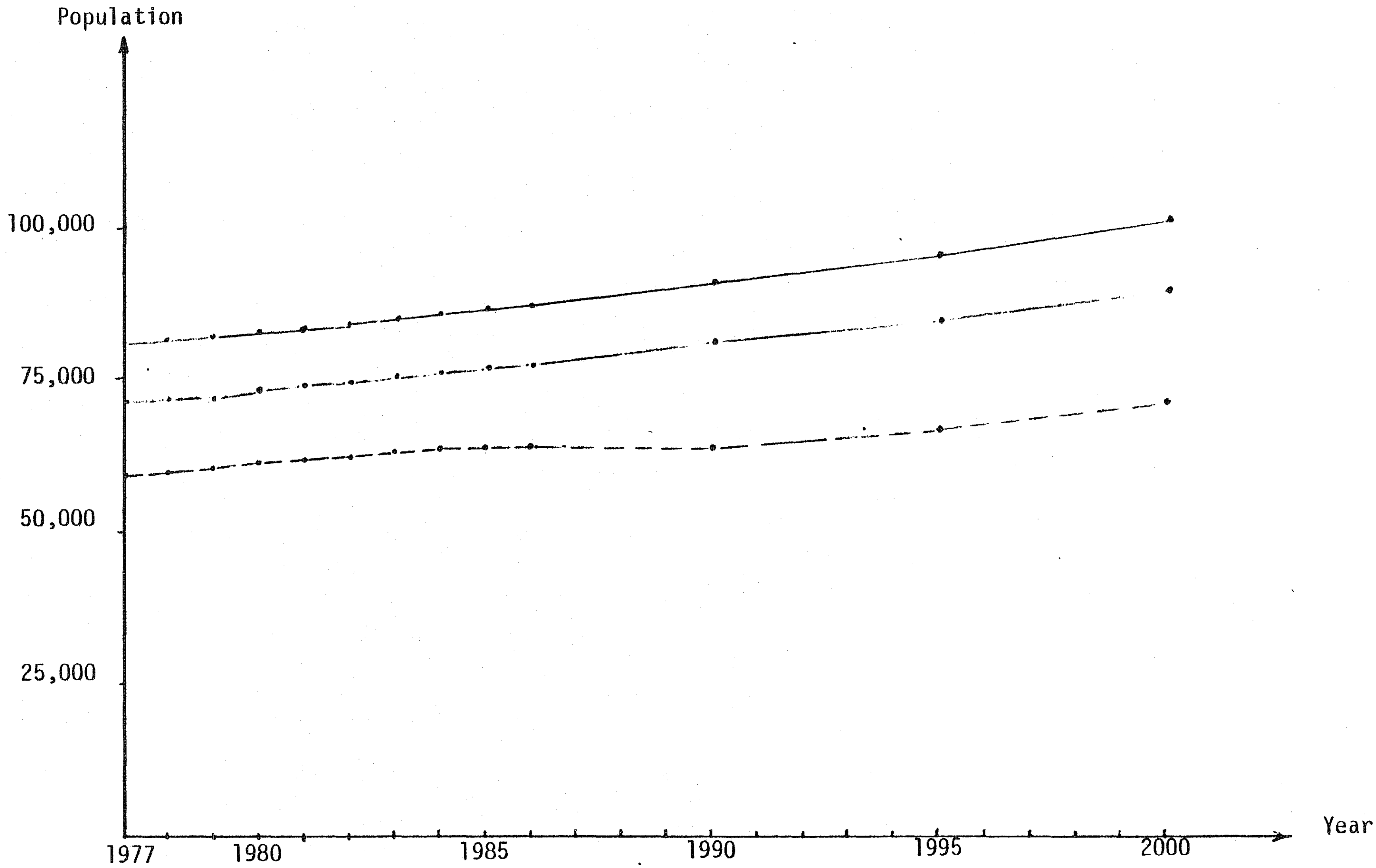


----- population of serviced areas

_____ total population

population of legal service area

Figure A-16 Projections of Population - Trumbull County



----- population of serviced areas

_____ total popoulation

_ _ _ _ population of legal service area

Figure A-17 Projections of Population - Tuscarawas County

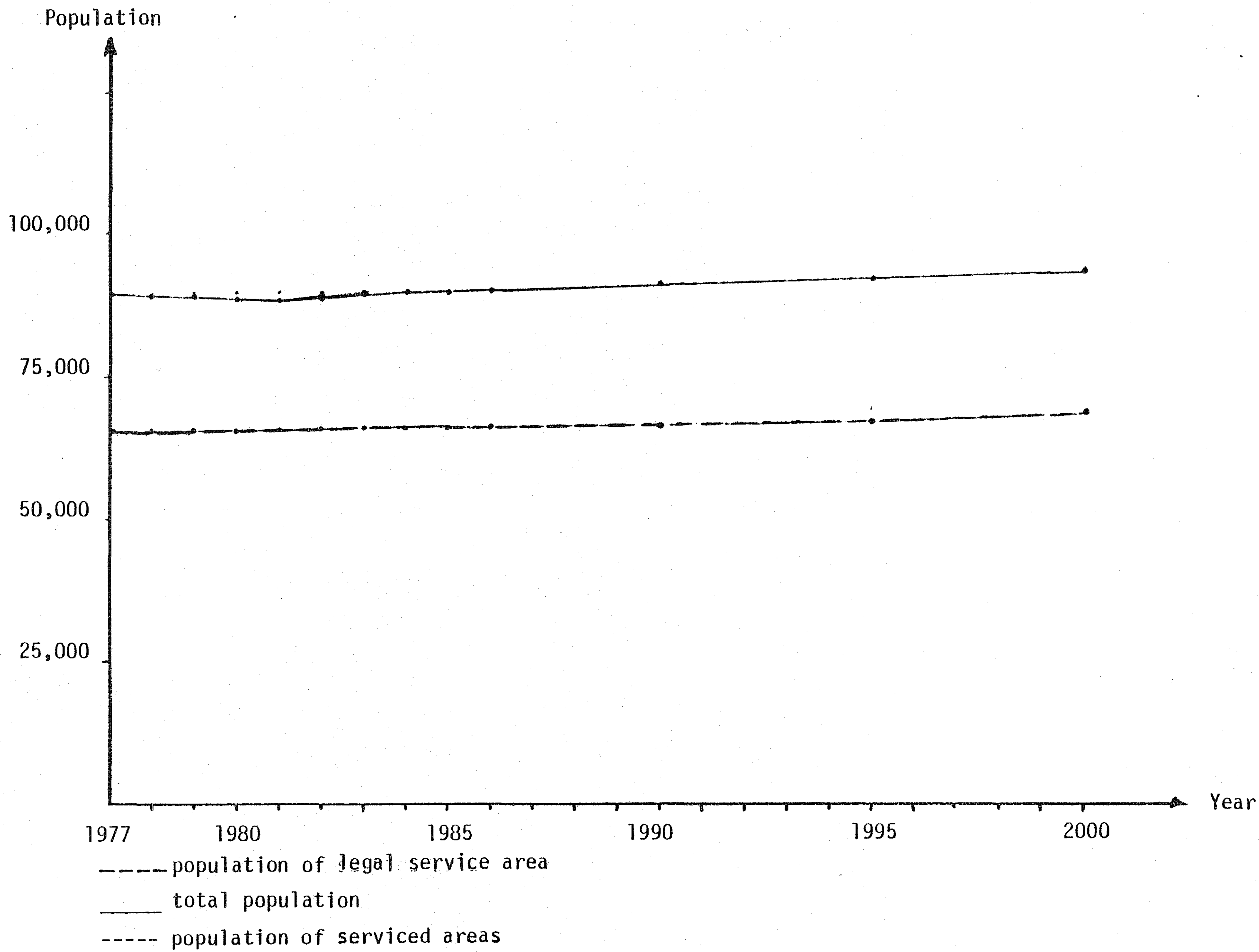


Figure A-18. Projections of Population - Wayne County

Table A-3 The Allocation of Forecasted Population Among Divisions of The East Ohio Gas Company - Mahoning County

Year	Forecasted Population in Area Served in 1977		Percentage of Forecasted Population in Area Served in 1977		Forecasted Population in Legal Service Area	
	Warren Division	Youngstown Division	Warren Division	Youngstown Division	Warren Division	Youngstown Division
1977	1,157	282,883	.53	99.47	1,517	282,883
1978	1,517	283,662	.53	99.47	1,517	283,662
1979	1,517	283,771	.53	99.47	1,517	283,771
1980	1,519	283,989	.53	99.47	1,519	283,989
1981	1,521	284,377	.53	99.47	1,521	284,377
1982	1,524	284,889	.53	99.47	1,524	284,889
1983	1,527	284,546	.53	99.47	1,527	284,546
1984	1,531	285,264	.53	99.47	1,531	285,264
1985	1,535	286,065	.53	99.47	1,535	286,065
1986	1,539	286,796	.53	99.47	1,539	286,796
1990	1,557	290,079	.53	99.47	1,557	290,079
1995	1,580	294,437	.53	99.47	1,580	294,437
2000	1,596	297,403	.53	99.47	1,596	297,403

Table A-3 The Allocation of Forecasted Population Among Divisions of The East Ohio Gas Company
Portage County (Cont'd)

Year	Forecasted Population in Area Served in 1977			Percentage of Forecasted Population in Area Served in 1977			Forecasted Population in Legal Service Area		
	Cleveland Division	Akron Division	Warren Division	Cleveland Division	Akron Division	Warren Division	Cleveland Division	Akron Division	Warren Division
1977	7,798	57,484	3,767	11.30	83.25	5.45	14,995	110,475	7,232
1978	7,833	57,630	3,784	11.31	83.23	5.46	15,062	110,842	7,271
1979	7,865	57,857	3,800	11.31	83.22	5.47	15,118	111,242	7,312
1980	7,897	58,082	3,816	11.31	83.22	5.47	15,176	111,668	7,340
1981	7,942	58,408	3,838	11.32	83.21	5.47	15,275	112,281	7,381
1982	7,988	58,739	3,859	11.32	83.21	5.47	15,361	112,911	7,422
1983	8,028	59,034	3,878	11.32	83.21	5.47	15,437	113,474	7,459
1984	8,074	59,374	3,900	11.32	83.21	5.47	15,526	114,128	7,503
1985	8,119	60,169	3,023	11.24	83.33	5.43	15,503	114,933	7,589
1986	8,162	60,023	3,043	11.32	83.21	5.47	15,696	115,376	7,728
1990	8,317	61,158	4,018	11.32	83.21	5.57	15,993	117,558	7,728
1995	8,448	62,127	4,082	11.32	83.21	5.47	16,246	119,419	7,850
2000	8,510	62,635	4,111	11.32	83.21	5.46	16,365	120,297	7,908

Table A-3 The Allocation of Forecasted Population Among Divisions of The East Ohio Gas Company - Stark County (Cont'd)

Year	Forecasted Population in Area Served in 1977		Percentage of Forecasted Population in Area Served in 1977		Forecasted Population in Legal Service Area	
	Akron Division	Canton Division	Akron Division	Canton Division	Akron Division	Canton Division
1977	2,505	295,773	.84	99.16	2,505	295,773
1978	2,511	296,432	.84	99.16	2,511	296,432
1979	2,518	297,215	.84	99.16	2,518	297,215
1980	2,525	298,121	.84	99.16	2,525	298,121
1981	2,534	299,112	.84	99.16	2,534	299,112
1982	2,543	300,148	.84	99.16	2,543	300,148
1983	2,553	301,327	.84	99.16	2,553	301,327
1984	2,564	302,680	.84	99.16	2,564	302,680
1985	2,577	304,180	.84	99.16	2,577	304,180
1986	2,590	305,692	.84	99.16	2,590	305,692
1990	2,651	312,954	.84	99.16	2,651	312,954
1995	2,748	324,357	.84	99.16	2,748	324,357
2000	2,859	337,474	.84	99.16	2,859	337,474

Table A-3 The Allocation of Forecasted Population Among Divisions of The East Ohio Gas Company - Summit County (Cont'd)

Year	Forecasted Population in Area Served in 1977		Percentage of Forecasted Population in Area Served in 1977		Forecasted Population in Legal Service Area	
	Cleveland Division	Akron Division	Cleveland Division	Akron Division	Cleveland Division	Akron Division
1977	16,977	486,660	3.37	96.63	17,687	507,144
1978	16,797	481,306	3.37	96.63	17,493	501,581
1979	16,623	476,232	3.37	96.63	17,309	496,302
1980	16,458	471,446	3.37	96.63	17,135	491,319
1981	16,301	466,955	3.37	96.63	16,972	486,640
1982	16,151	462,646	3.37	96.63	16,815	482,151
1983	16,013	458,677	3.37	96.63	16,671	478,015
1984	15,891	455,169	3.37	96.63	16,543	474,360
1985	15,782	452,070	3.37	96.63	16,431	471,129
1990	15,402	441,168	3.37	96.63	16,325	468,110
1995	15,298	438,219	3.37	96.63	15,927	456,694
2000	15,385	440,683	3.37	96.63	16,017	459,262

Table A-3 The Allocation of Forecasted Population Among Divisions of The East Ohio Gas Company - Trumbull County (Cont'd)

Year	Forecasted Population in Area Served in 1977		Percentage of Forecasted Population in Area Served in 1977		Forecasted Population in Legal Service Area	
	Warren Division	Youngstown Division	Warren Division	Youngstown Division	Warren Division	Youngstown Division
1977	187,634	8,805	95.52	4.48	228,675	10,725
1978	187,925	8,818	95.52	4.48	229,058	10,743
1979	188,435	8,842	95.52	4.48	229,683	10,772
1980	189,073	8,872	95.52	4.48	230,461	10,809
1981	189,828	8,908	95.52	4.48	231,383	10,852
1982	190,699	8,949	95.52	4.48	232,445	10,902
1983	191,677	8,994	95.52	4.48	233,637	10,958
1984	192,713	9,043	95.52	4.48	234,901	11,017
1985	193,765	9,092	95.52	4.48	236,180	11,077
1986	194,779	9,140	95.52	4.48	237,418	11,135
1990	198,633	9,321	95.52	4.48	242,116	11,356
1995	201,144	9,439	95.52	4.48	245,177	11,499
2000	201,100	9,437	95.52	4.48	245,122	11,497

Table A-3 The Allocation of Forecasted Population Among Divisions of The East Ohio Gas Company - Wayne County (Cont'd)

Year	Forecasted Population in Area Served in 1977		Percentage of Forecasted Population in Area Served in 1977		Forecasted Population in Legal Service Area	
	Akron Division	Canton Division	Akron Division	Canton Division	Akron Division	Canton Division
1977	2,472	59,564	3.98	96.02	2,472	59,564
1978	2,467	59,403	3.98	96.02	2,467	59,403
1979	2,464	59,321	3.98	96.02	2,464	59,321
1980	2,462	59,269	3.98	96.02	2,462	59,269
1981	2,463	59,286	3.98	96.02	2,463	59,286
1982	2,464	59,327	3.98	96.02	2,464	59,327
1983	2,468	59,398	3.98	96.02	2,468	59,398
1984	2,472	59,701	3.98	96.02	2,472	59,701
1985	2,477	59,618	3.98	96.02	2,477	59,618
1986	2,481	59,716	3.98	96.02	2,481	59,716
1990	2,496	60,082	3.98	96.02	2,496	60,082
1995	2,519	60,639	3.98	96.02	2,519	60,639
2000	2,553	61,450	3.98	96.02	2,553	61,450

Table A-4 Forecasts of Number of Households and Average Household Size by County

Year	1970	1975	1980	1985	1990	1995	2000
Ashland County							
Number of Households	13,321	14,616	15,780	16,514	16,876	17,209	17,688
Average Household Size	3.25	3.07	2.83	2.70	2.66	2.64	2.60
Ashtabula County							
Number of Households	29,953	33,319	37,254	41,074	43,954	46,153	48,248
Average Household Size	3.28	3.18	3.00	2.90	2.88	2.89	2.87
Carrol County							
Number of Households	6,562	7,073	7,577	8,026	8,214	8,284	8,373
Average Household Size	3.29	3.13	2.94	2.79	2.75	2.75	2.73

Table A-4 Forecasts of Number of Households and Average Household Size by County (Cont'd)

Year	1970	1975	1980	1985	1990	1995	2000
Columbiana County							
Number of Households	34,418	37,121	40,771	44,276	47,118	49,554	52,858
Average Household Size	3.15	3.04	2.88	2.80	2.78	2.80	2.79
Coshocton County							
Number of Households	10,959	11,537	12,142	12,725	13,099	13,312	13,647
Average Household Size	3.06	2.93	2.76	2.64	2.59	2.58	2.58
Cuyahoga County							
Number of Households	554,239	564,843	570,768	574,366	572,068	565,094	561,663
Average Household Size	3.11	2.92	2.73	2.61	2.57	2.57	2.56

Table A-4 Forecasts of Number of Households and Average Household Size by County (Cont'd)

Year	1970	1975	1980	1985	1990	1995	2000
Geauga County							
Number of Households	16,941	18,818	21,098	23,419	24,962	25,900	26,773
Average Household Size	3.72	3.55	3.25	3.07	3.04	3.05	3.03
Holmes County							
Number of Households	5,970	6,465	7,125	7,759	8,184	8,655	9,329
Average Household Size	3.86	3.74	3.51	3.39	3.41	3.46	3.47
Knox County							
Number of Households	12,998	14,015	15,074	15,728	16,080	16,327	16,728
Average Household Size	3.22	3.05	2.82	2.69	2.63	2.61	2.57

Table A-4 Forecasts of Number of Households and Average Household Size by County (Cont'd)

Year	1970	1975	1980	1985	1990	1995	2000
Lake County							
Number of Households	55,801	60,967	65,945	70,824	73,818	75,405	76,920
Average Household Size	3.53	3.33	3.06	2.87	2.80	2.79	2.77
Mahoning County							
Number of Households	93,047	99,616	106,360	112,191	115,093	116,681	118,476
Average Household Size	3.26	3.08	2.88	2.76	2.73	2.73	2.71
Medina County							
Number of Households	23,157	28,002	33,641	40,197	46,150	50,953	55,408
Average Household Size	3.57	3.43	3.18	3.02	2.97	2.97	2.94

Table A-4 Forecasts of Number of Households and Average Household Size by County (Cont'd)

Year	1970	1975	1980	1985	1990	1995	2000
Portage County							
Number of Households	33,555	39,882	44,941	49,042	52,091	54,408	56,178
Average Household Size	3.75	3.30	2.98	2.81	2.71	2.64	2.57
Stark County							
Number of Households	114,690	124,729	134,631	143,349	149,692	155,144	162,270
Average Household Size	3.25	3.09	2.90	2.78	2.74	2.74	2.72
Summit County							
Number of Households	172,789	178,528	181,881	182,962	182,051	180,891	182,566
Average Household Size	3.20	3.01	2.80	2.66	2.61	2.61	2.60

Table A-4 Forecasts of Number of Households and Average Household Size by County (Cont'd)

Year	1970	1975	1980	1985	1990	1995	2000
Trumbull County							
Number of Households	69,406	75,568	82,033	88,515	92,371	94,026	94,873
Average Household Size	3.35	3.17	2.94	2.79	2.74	2.73	2.70
Tuscarawas County							
Number of Households	24,612	26,381	28,698	31,035	32,797	34,288	36,288
Average Household Size	3.14	3.03	2.87	2.78	2.76	2.77	2.77
Wayne County							
Number of Households	25,053	27,563	29,770	31,560	32,559	33,104	34,060
Average Household Size	3.48	3.26	3.00	2.85	2.78	2.76	2.72

APPENDIX B

ECONOMIC DATA AND FORECASTS

Various basic data used in preparing the commercial floor space and industrial energy requirements forecasts are presented in this Appendix. In Table B-1, commercial employment forecasts drawn from the output of the DEMOS model (see Volume II, Chapter 2, first section) are presented for each county included in the EOGC service area. These employment projections are transformed into floor space projections by multiplying the average number of square feet per employee (Table B-2) by the projected number of employees in each commercial class. These floor space projections are summarized in Table B-3. County industrial employment forecasts drawn from the output of the DEMOS model are presented in Table B-4.

Table B-1 Actual and Projected Employment for Commercial Activities by County

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Ashland								
Transportation, Communication and Utilities	736	757	763	771	791	836	848	883
Wholesale Trade	307	309	311	313	323	336	350	367
Retail Trade	2,396	2,478	2,475	2,471	2,472	2,481	2,504	2,540
Services: Finance, Insurance and Real Estate	462	494	507	526	566	611	665	726
Services: Educational	1,871	1,870	1,870	1,870	1,878	1,896	1,923	1,950
Services: All Others	2,363	2,455	2,461	2,470	2,497	2,541	2,607	2,689
Ashtabula								
Transportation, Communication and Utilities	3,640	3,750	3,811	3,903	4,113	4,356	4,600	4,832
Wholesale Trade	730	747	759	778	825	878	931	983
Retail Trade	5,701	6,159	6,330	6,587	7,085	7,629	8,132	8,543
Services: Finance, Insurance and Real Estate	1,167	1,266	1,312	1,380	1,515	1,667	1,832	2,006
Services: Educational	2,449	2,620	2,688	2,789	2,992	3,216	3,425	3,601
Services: All Others	5,017	5,427	5,587	5,828	6,305	6,835	7,349	7,810

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Carroll								
Transportation, Communication and Utilities	451	454	455	457	463	471	480	489
Wholesale Trade	98	99	99	100	102	105	108	111
Retail Trade	1,001	1,032	1,034	1,038	1,043	1,059	1,068	1,076
Services: Finance, Insurance and Real Estate	205	210	212	215	221	228	235	242
Services: Educational	366	376	377	378	383	388	392	397
Services: All Others	1,009	1,021	1,025	1,032	1,047	1,064	1,076	1,091
Columbiana								
Transportation, Communication and Utilities	2,310	2,428	2,488	2,579	2,782	3,009	3,249	3,542
Wholesale Trade	914	944	966	999	1,087	1,184	1,286	1,410
Retail Trade	6,500	6,803	6,940	7,145	7,633	8,193	8,774	9,499
Services: Finance, Insurance and Real Estate	1,005	1,035	1,095	1,185	1,309	1,451	1,605	1,788
Services: Educational	1,998	2,085	2,129	2,194	2,353	2,532	2,719	2,953
Services: All Others	5,950	6,255	6,397	6,609	7,111	7,688	8,301	9,063

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Coshocton								
Transportation, Communication and Utilities	690	702	706	713	733	759	789	826
Wholesale Trade	182	181	182	183	189	196	205	215
Retail Trade	1,802	1,821	1,815	1,806	1,808	1,823	1,847	1,890
Services: Finance, Insurance and Real Estate	261	274	280	289	310	333	360	392
Services: Educational	609	613	612	610	614	624	636	655
Services: All Others	1,848	1,876	1,876	1,876	1,896	1,937	1,988	2,066
Cuyahoga								
Transportation, Communication and Utilities	47,917	46,498	45,697	44,495	43,350	43,058	42,736	42,797
Wholesale Trade	35,148	34,419	33,968	33,292	32,767	32,648	32,774	33,053
Retail Trade	104,589	100,460	97,672	93,490	88,774	86,296	84,947	83,937
Services: Finance, Insurance and Real Estate	35,000	35,411	35,528	35,704	36,544	37,762	39,236	40,893
Services: Educational	46,233	44,540	43,405	41,702	39,830	38,877	38,397	38,074
Services: All Others	157,076	152,372	148,902	143,698	138,141	135,795	135,138	135,106

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Geauga								
Transportation, Communication and Utilities	1,244	1,276	1,285	1,298	1,343	1,402	1,459	1,505
Wholesale Trade	617	629	634	641	663	694	724	750
Retail Trade	3,193	3,391	3,429	3,485	3,654	3,878	4,071	4,206
Services: Finance, Insurance and Real Estate	848	886	901	923	974	1,033	1,094	1,152
Services: Educational	1,688	1,780	1,799	1,828	1,911	2,025	2,125	2,195
Services: All Others	4,221	4,486	4,544	4,632	4,865	5,171	5,447	5,652
Holmes								
Transportation, Communication and Utilities	256	274	282	295	319	347	379	416
Wholesale Trade	111	117	120	124	135	148	161	179
Retail Trade	929	986	1,005	1,034	1,105	1,195	1,304	1,444
Services: Finance, Insurance and Real Estate	142	155	161	171	189	210	234	263
Services: Educational	297	315	321	331	355	385	419	465
Services: All Others	1,131	1,207	1,243	1,296	1,374	1,498	1,649	1,840

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Knox								
Transportation, Communication and Utilities	776	809	820	837	869	908	954	1,008
Wholesale Trade	259	265	269	274	287	303	322	345
Retail Trade	2,273	2,322	2,320	2,316	2,299	2,299	2,310	2,335
Services: Finance, Insurance and Real Estate	434	466	480	502	542	591	646	710
Services: Educational	1,467	1,499	1,500	1,501	1,501	1,510	1,529	1,558
Services: All Others	3,146	3,026	3,113	3,243	3,252	3,284	3,343	3,428
Lake								
Transportation, Communication and Utilities	3,865	3,883	3,867	3,842	3,874	3,956	4,052	4,149
Wholesale Trade	2,302	2,311	2,307	2,302	2,343	2,414	2,495	2,579
Retail Trade	11,291	11,747	11,701	11,631	11,706	11,967	12,245	12,485
Services: Finance, Insurance and Real Estate	2,577	2,666	2,694	2,735	2,847	2,986	3,136	3,294
Services: Educational	4,694	4,854	4,837	4,812	4,852	4,966	5,090	5,202
Services: All Others	11,461	11,952	11,946	11,938	12,102	12,454	12,833	13,191

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Mahoning								
Transportation, Communication and Utilities	6,352	6,311	6,284	6,244	6,261	6,318	6,395	6,478
Wholesale Trade	4,296	4,321	4,320	4,318	4,360	4,429	4,507	4,591
Retail Trade	19,388	19,694	19,652	19,590	19,802	20,146	20,522	20,838
Services: Finance, Insurance and Real Estate	3,909	4,031	4,078	4,148	4,314	4,505	4,710	4,928
Services: Educational	6,873	6,969	6,957	6,938	7,012	7,131	7,263	7,380
Services: All Others	20,940	21,356	21,354	21,351	21,642	22,118	22,621	23,082
Medina								
Transportation, Communication and Utilities	2,205	2,354	2,422	2,523	2,753	3,025	3,294	3,520
Wholesale Trade	1,194	1,249	1,279	1,324	1,428	1,554	1,681	1,792
Retail Trade	4,567	5,312	5,605	6,045	6,980	8,072	9,120	9,967
Services: Finance, Insurance and Real Estate	1,320	1,409	1,451	1,514	1,646	1,795	1,947	2,092
Services: Educational	1,869	2,131	2,237	2,395	2,734	3,132	3,516	3,828
Services: All Others	4,698	5,424	5,711	6,142	7,052	8,112	9,135	9,977

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Portage								
Transportation, Communication and Utilities	2,491	2,525	2,537	2,555	2,609	2,671	2,727	2,770
Wholesale Trade	1,044	1,054	1,059	1,067	1,092	1,121	1,148	1,172
Retail Trade	6,971	7,282	7,345	7,439	7,647	7,861	8,010	8,093
Services: Finance, Insurance and Real Estate	1,182	1,227	1,246	1,275	1,337	1,403	1,469	1,536
Services: Educational	7,001	7,263	7,319	7,404	7,605	7,818	7,973	8,071
Services: All Others	7,057	7,278	7,350	7,459	7,690	7,929	8,111	8,239
Stark								
Transportation, Communication and Utilities	8,182	8,448	8,544	8,688	9,008	9,421	9,900	10,484
Wholesale Trade	5,288	5,390	5,446	5,531	5,767	6,057	6,380	6,772
Retail Trade	22,048	22,979	23,138	23,376	23,931	24,773	25,836	27,185
Services: Finance, Insurance and Real Estate	5,209	5,610	5,780	6,036	6,546	7,144	7,827	8,618
Services: Educational	8,255	8,572	8,636	8,732	8,968	9,306	9,722	10,246
Services: All Others	24,590	25,756	26,028	26,437	27,363	28,660	30,269	32,291

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Summit								
Transportation, Communication and Utilities	13,665	13,409	13,244	12,997	12,761	12,676	12,719	12,880
Wholesale Trade	7,647	7,497	7,414	7,289	7,198	7,182	7,228	7,339
Retail Trade	34,897	34,033	33,197	31,943	30,263	29,282	30,922	29,057
Services: Finance, Insurance and Real Estate	7,578	7,698	7,736	7,794	7,990	8,259	8,597	9,001
Services: Educational	13,769	13,441	13,145	12,702	12,133	11,813	11,715	11,794
Services: All Others	39,775	39,093	38,309	37,133	35,615	34,854	34,776	34,251
Trumbull								
Transportation, Communication and Utilities	4,131	4,120	4,103	4,077	4,132	4,216	4,282	4,302
Wholesale Trade	1,958	1,943	1,935	1,922	1,949	1,994	2,030	2,046
Retail Trade	13,294	13,801	13,850	13,924	14,361	14,880	15,196	15,237
Services: Finance, Insurance and Real Estate	2,333	2,404	2,428	2,465	2,573	2,697	2,816	2,922
Services: Educational	4,968	5,117	5,127	5,141	5,287	5,466	5,578	5,599
Services: All Others	13,354	13,880	13,943	14,038	14,502	15,055	15,424	15,535

Table B-1 Actual and Projected Employment for Commercial Activities by County (cont'd)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Tuscarawas								
Transportation, Communication and Utilities	1,634	1,696	1,729	1,779	1,895	2,031	2,174	2,347
Wholesale Trade	696	717	732	754	812	880	949	1,033
Retail Trade	4,249	4,408	4,473	4,571	4,821	5,118	5,416	5,790
Services: Finance, Insurance and Real Estate	668	714	736	769	841	923	1,012	1,118
Services: Educational	1,558	1,614	1,640	1,678	1,778	1,894	2,012	2,160
Services: All Others	4,505	4,694	4,774	4,895	5,196	5,556	5,926	6,390
Wayne								
Transportation, Communication and Utilities	1,642	1,709	1,727	1,754	1,810	1,882	1,960	2,052
Wholesale Trade	888	901	907	915	943	980	1,020	1,067
Retail Trade	4,889	5,049	5,040	5,027	5,043	5,089	5,132	5,206
Services: Finance, Insurance and Real Estate	907	971	996	1,033	1,111	1,200	1,302	1,418
Services: Educational	3,252	3,352	3,349	3,344	3,367	3,410	3,453	3,518
Services: All Others	5,523	5,734	5,746	5,765	5,850	5,983	6,133	6,335

Table B-2 Average Number of Square Feet per Employee by Commercial Activity

Commercial Activity	Average Number of Square Feet per Employee
Transportation, Communication, and Utilities	945.95
Wholesale Trade	1,979.41
Retail Trade	1,523.62
Finance, Insurance, Real Estate	4,125.67
Educational	2,420.19
All Other Services	2,189.55

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Ashland								
Transportation, Communication, Utilities	0.59	0.60	0.60	0.62	0.63	0.67	0.68	0.70
Wholesale Trade	0.51	0.51	0.52	0.52	0.54	0.56	0.58	0.61
Retail Trade	3.08	3.19	3.18	3.18	3.18	3.19	3.20	3.27
Services: Finance, Insurance Real Estate	1.61	1.72	1.76	1.83	1.97	2.13	2.31	2.53
Services: Educational	3.82	3.82	3.82	3.82	3.84	3.88	3.92	3.98
Services: All Others	4.37	4.54	4.54	4.57	4.61	4.70	4.82	4.98
Total	13.99	14.46	14.45	14.54	14.78	15.13	15.56	16.08
Ashtabula								
Transportation, Communication Utilities	34.43	35.19	36.05	36.93	38.91	41.21	43.51	45.71
Wholesale Trade	14.45	14.79	15.02	15.40	16.33	17.38	18.43	19.46
Retail Trade	86.86	93.84	96.45	100.36	107.95	116.24	123.90	130.16
Services: Finance Insurance Real Estate	48.15	52.23	54.13	56.93	62.50	68.78	75.58	82.76
Services: Educational	59.27	63.41	65.06	67.50	72.41	77.83	82.89	87.15
Services: All Others	109.85	118.83	122.33	127.61	138.05	149.66	160.91	171.00
Total	353.01	378.29	389.04	404.70	436.15	471.10	505.22	536.24

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Carroll								
Transportation, Communication Utilities	.29	.29	.29	.29	.30	.30	.31	.31
Wholesale Trade	.13	.13	.13	.13	.14	.14	.14	.15
Retail Trade	1.03	1.06	1.07	1.07	1.07	1.09	1.10	1.11
Services: Finance, Insurance Real Estate	.57	.59	.59	.60	.62	.64	.66	.67
Services: Educational	.60	.62	.62	.62	.63	.64	.64	.65
Services: All Others	1.50	1.51	1.52	1.53	1.55	1.58	1.60	1.61
Total	4.12	4.20	4.22	4.24	4.31	4.39	4.45	4.50
Columbiana								
Transportation, Communication Utilities	1.91	2.01	2.06	2.12	2.29	2.48	2.67	2.92
Wholesale Trade	1.58	1.63	1.67	1.72	1.87	2.04	2.21	2.43
Retail Trade	8.66	9.06	9.24	9.47	10.12	10.86	11.63	12.59
Services: Finance, Insurance Real Estate	3.62	3.73	3.95	4.25	4.70	5.22	5.76	6.42
Services: Educational	4.23	4.41	4.50	4.62	4.95	5.33	5.73	6.22
Services: All Others	11.39	11.97	12.24	12.59	13.55	14.65	15.81	17.26
Total	31.39	32.81	33.66	34.77	37.48	40.58	43.81	47.84

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Coshocton								
Transportation, Communication Utilities	.17	.18	.18	.18	.18	.19	.20	.21
Wholesale Trade	.10	.10	.10	.10	.10	.10	.11	.11
Retail	.73	.74	.73	.73	.73	.74	.75	.77
Services: Finance, Insurance Real Estate	.29	.30	.31	.32	.34	.36	.40	.43
Services: Educational	.39	.39	.39	.39	.39	.40	.41	.42
Services: All Others	1.07	1.09	1.09	1.09	1.10	1.12	1.16	1.20
Total	2.75	2.78	2.79	2.81	2.84	2.91	3.03	3.14
Cuyahoga								
Transportation, Communication Utilities	396.79	385.04	378.41	368.37	358.89	356.48	353.81	354.31
Wholesale Trade	609.04	596.40	588.59	576.74	567.65	565.59	567.77	572.60
Retail Trade	1395.00	1339.90	1298.20	1246.70	1183.80	1150.70	1132.70	1119.30
Services: Finance, Insurance Real Estate	1264.10	1278.90	1283.10	1289.20	1319.50	1363.50	1416.70	1476.60
Services: Educational	979.51	943.64	919.59	883.31	843.66	823.29	813.31	806.47
Services: All Others	3010.70	2920.60	2854.10	2753.70	2647.20	2601.60	2589.60	2589.00
Total	7655.14	7464.48	7371.99	7118.02	6920.70	6861.16	6873.89	6918.28

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Geauga								
Transportation, Communication Utilities	11.77	12.07	12.16	12.28	12.70	13.26	13.80	14.24
Wholesale Trade	12.21	12.45	12.55	12.69	13.12	13.74	14.33	14.85
Retail Trade	48.65	51.67	52.24	53.10	55.67	59.09	62.03	64.08
Services: Finance, Insurance Real Estate	34.99	36.55	37.17	38.08	40.18	42.62	45.13	47.53
Services: Educational	40.85	43.08	43.54	44.24	46.25	49.01	51.43	53.12
Services: All Others	92.42	98.22	99.49	101.42	106.52	113.22	119.26	123.75
Total	240.89	254.04	257.15	261.81	274.44	290.94	305.98	317.57
Holmes								
Transportation, Communication Utilities	.21	.23	.23	.25	.27	.29	.32	.35
Wholesale Trade	.19	.20	.21	.22	.24	.26	.28	.31
Retail Trade	1.25	1.32	1.35	1.39	1.48	1.60	1.75	1.94
Services: Finance, Insurance Real Estate	.52	.56	.58	.62	.69	.76	.85	.96
Services: Educational	.63	.67	.68	.71	.76	.82	.89	.99
Services: All Others	2.18	2.33	2.39	2.50	2.65	2.89	3.18	3.55
Total	4.98	5.31	5.44	5.68	6.09	6.62	7.27	8.10

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Knox								
Transportation, Communication Utilities	.34	.36	.36	.37	.39	.40	.42	.44
Wholesale Trade	.24	.25	.25	.25	.27	.28	.30	.32
Retail Trade	1.62	1.66	1.65	1.65	1.64	1.64	1.65	1.67
Services: Finance, Insurance Real Estate	.84	.90	.93	.97	1.04	1.14	1.24	1.37
Services: Educational	1.77	1.69	1.70	1.70	1.70	1.71	1.73	1.77
Services: All Others	3.22	3.10	3.19	3.32	3.33	3.37	3.43	3.51
Total	7.92	7.96	8.09	8.26	8.37	8.54	8.77	9.08
Lake								
Transportation, Communication Utilities	36.56	36.73	36.58	36.34	36.65	37.43	38.33	39.25
Wholesale Trade	45.57	45.74	45.66	45.57	46.38	47.78	49.39	51.05
Retail Trade	172.03	178.98	178.28	177.21	178.35	182.33	186.57	190.22
Services: Finance, Insurance Real Estate	106.32	109.99	111.15	112.84	117.46	123.19	129.38	135.90
Services: Educational	113.60	117.48	117.06	116.46	117.43	120.19	123.19	125.90
Services: All Others	250.94	261.70	261.56	261.39	264.98	272.69	280.98	288.82
Total	725.02	750.62	750.29	749.81	761.25	783.61	807.84	831.14

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Mahoning								
Transportation, Communication Utilties	55.84	55.48	55.24	55.08	55.04	55.54	56.22	56.95
Wholesale Trade	79.02	79.48	79.47	79.70	80.20	81.47	82.91	84.45
Retail Trade	274.52	278.85	278.25	278.33	280.38	285.25	290.57	295.05
Services: Finance, Insurance Real Estate	149.87	154.55	156.35	159.58	165.40	172.72	180.58	188.94
Services: Educational	154.58	156.74	156.47	156.58	157.71	160.38	163.35	165.98
Services: All Others	426.08	434.55	434.50	435.94	440.36	450.05	460.28	469.66
Total	1,139.90	1,159.66	1,160.28	1,165.21	1,179.09	1,205.41	1,233.91	1,261.03
Medina								
Transportation, Communication Utilities	5.35	5.71	5.88	6.12	6.68	7.33	7.99	8.53
Wholesale Trade	6.06	6.34	6.50	6.72	7.24	7.88	8.53	9.09
Retail Trade	17.86	20.77	21.91	23.62	27.26	31.52	35.61	38.92
Services: Finance, Insurance Real Estate	13.97	14.92	15.36	16.02	17.41	18.98	20.59	22.12
Services: Educational	11.60	13.23	13.89	14.86	16.96	19.43	21.81	23.75
Services: All Others	26.40	30.47	32.09	34.48	39.57	45.52	51.26	55.98
Total	81.25	91.45	95.63	101.81	115.11	130.67	145.79	158.40

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Portage								
Transportation, Communication Utilities	23.56	23.89	23.99	24.17	24.68	25.27	25.80	26.20
Wholesale Trade	20.67	20.86	20.96	21.12	21.62	22.19	22.72	23.20
Retail Trade	106.21	110.95	111.91	113.34	116.51	119.77	122.04	123.31
Services: Finance, Insurance Real Estate	48.77	50.62	51.41	52.60	55.16	57.88	60.61	63.37
Services: Educational	169.44	175.78	177.13	179.19	184.06	189.21	192.96	195.33
Services: All Others	154.52	159.36	160.93	163.32	168.38	173.61	177.59	180.40
Total	523.17	541.46	546.33	553.74	570.41	587.93	601.72	611.81
Stark								
Transportation, Communication Utilities	59.58	61.52	62.22	63.27	65.59	68.59	72.08	76.33
Wholesale Trade	80.58	82.13	82.98	84.27	87.86	92.28	97.20	103.18
Retail Trade	258.60	269.52	271.38	274.17	280.65	290.52	302.99	318.81
Services: Finance, Insurance Real Estate	165.44	178.17	183.56	191.68	207.87	226.86	248.55	273.67
Services: Educational	153.80	159.70	160.89	162.66	167.06	173.35	181.10	190.86
Services: All Others	414.47	434.12	438.71	445.54	461.15	483.01	510.12	544.20
Total	1,132.47	1,185.16	1,199.74	1,221.59	1,270.18	1,334.61	1,412.04	1,507.05

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Summit								
Transportation, Communication, Utilities	129.26	126.84	125.28	122.95	120.71	119.91	120.32	121.84
Wholesale Trade	151.37	138.40	146.75	144.28	142.48	142.16	143.07	145.27
Retail Trade	531.70	518.53	505.80	486.69	461.09	446.15	471.13	442.72
Services: Finance, Insurance, Real Estate	312.64	317.59	319.16	321.55	329.64	340.74	354.68	371.35
Services: Educational	333.24	325.30	318.13	307.41	293.64	285.90	283.53	285.44
Services: All Others	870.89	855.96	838.79	813.05	779.81	763.15	761.44	771.84
Total	2,329.10	2,292.62	2,253.91	2,195.93	2,127.37	2,098.01	2,134.17	2,138.46
Trumbull								
Transportation, Communication Utilities	39.07	38.97	38.81	38.57	39.09	39.88	40.51	40.70
Wholesale Trade	38.76	38.46	38.30	38.04	38.58	39.46	40.18	40.50
Retail Trade	202.55	210.28	211.02	212.15	218.81	226.72	231.53	232.15
Services: Finance, Insurance, Real Estate	96.25	99.18	100.17	101.70	106.15	111.27	116.18	120.55
Services: Educational	120.24	123.84	124.08	124.42	127.96	132.29	135.00	135.51
Services: All Others	292.39	303.91	305.29	307.37	317.53	329.64	337.72	340.15
Total	789.26	814.64	817.67	822.25	848.12	879.26	901.12	909.56

Table B-3 Commercial Floor Space Projections in the EOGC Service Area by County and by Commercial Activity (cont'd) (10^5 Square Feet)

County and Activity	1970	1975	1977	1980	1985	1990	1995	2000
Tuscarawas								
Transportation, Communication, Utilities	13.72	14.24	14.51	14.93	15.91	17.05	18.25	19.70
Wholesale Trade	12.22	12.59	12.86	13.24	14.26	15.46	16.67	18.14
Retail Trade	57.44	59.59	60.47	61.80	65.18	69.19	73.22	78.28
Services: Finance, Insurance, Real Estate	24.45	26.14	26.94	28.15	30.79	33.79	37.05	40.93
Services: Educational	33.46	34.66	35.22	36.03	38.18	40.67	43.21	46.39
Services: All Others	87.52	91.20	92.75	95.09	100.95	107.94	115.13	124.14
Total	228.81	238.42	242.75	249.24	265.27	284.10	303.53	327.58
Wayne								
Transportation, Communication, Utilities	10.73	11.17	11.29	11.46	11.83	12.30	12.81	13.41
Wholesale Trade	12.14	12.32	12.41	12.52	12.89	13.40	13.95	14.59
Retail Trade	51.45	53.13	53.09	52.90	53.07	53.56	54.01	54.78
Services: Finance, Insurance, Real Estate	25.85	26.67	28.41	29.44	31.66	34.20	37.10	40.41
Services: Educational	54.36	56.03	56.03	55.90	56.28	57.00	57.72	58.81
Services: All Others	85.53	86.72	86.97	87.19	88.47	90.48	92.75	95.81
Total	238.06	247.04	248.20	249.41	254.20	260.92	268.34	277.81

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County

Ashland								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	68	79	82	87	91	96	101	106
Metals	777	801	815	835	877	922	969	1,019
Non-electrical machinery	1,254	1,245	1,264	1,293	1,393	1,501	1,617	1,742
Electrical machinery	432	404	406	409	441	475	512	552
Transportation equipment	772	777	786	799	835	873	914	965
Other durable goods	897	899	919	949	1,043	1,146	1,259	1,383
Food and kindred products	215	207	204	200	197	194	193	192
Textile and textile products	249	225	222	217	222	226	231	235
Printing and publishing	440	442	443	444	452	462	474	489
Chemicals	207	214	219	226	245	285	287	311
Other non-durable goods	2,005	1,790	1,771	1,742	1,818	1,905	2,003	2,113

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Ashtabula								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	278	322	335	354	372	392	412	433
Metals	3,069	3,164	3,217	3,297	3,465	3,642	3,828	4,023
Non-electrical machinery	758	752	764	782	842	907	977	1,053
Electrical machinery	2,019	1,889	1,899	1,914	2,062	2,221	2,393	2,578
Transportation equipment	1,157	1,164	1,177	1,197	1,252	1,309	1,369	1,432
Other durable goods	1,101	1,104	1,138	1,165	1,280	1,406	1,545	1,698
Food and kindred products	328	321	320	319	324	330	336	341
Textile and textile products	247	223	220	216	220	224	229	233
Printing and publishing	299	307	312	319	336	356	374	391
Chemicals	2,239	2,310	2,366	2,449	2,651	2,870	3,107	3,364
Other non-durable goods	2,890	2,626	2,630	2,636	2,830	3,044	3,260	3,471

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Carrol								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	81	78	81	85	82	80	77	74
Metals	851	851	850	848	844	840	836	832
Non-electrical machinery	617	630	720	856	693	731	773	816
Electrical machinery	46	44	44	44	46	48	51	54
Transportation equipment	458	392	374	348	318	290	265	242
Other durable goods	650	652	666	688	756	830	912	1,002
Food and kindred products	122	107	104	99	98	94	92	91
Textile and textile products	10	8	8	7	7	6	6	5
Printing and publishing	157	155	155	155	157	159	162	164
Chemicals	42	41	41	41	44	46	48	51
Other non-durable goods	497	481	471	455	474	494	515	536

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

	Columbiana							
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	607	703	731	772	813	855	899	946
Metals	5,858	6,039	6,141	6,294	6,615	6,952	7,307	7,679
Non-electrical machinery	3,652	3,624	3,681	3,766	4,057	4,371	4,709	5,073
Electrical machinery	359	336	338	340	367	395	425	458
Transportation equipment	509	512	518	527	551	576	602	630
Other durable goods	4,764	4,777	4,883	5,042	5,539	6,086	6,686	7,346
Food and kindred products	323	314	313	312	318	326	335	349
Textile and textile products	22	20	20	19	20	20	20	21
Printing and publishing	557	567	575	588	624	665	707	758
Chemicals	299	309	316	327	354	383	415	449
Other non-durable goods	823	743	744	745	804	870	939	1,021

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Coshocton								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	156	181	188	199	209	220	231	243
Metals	1,108	1,142	1,161	1,190	1,251	1,315	1,382	1,453
Non-electrical machinery	123	122	124	127	137	147	159	171
Electrical machinery	40	37	37	38	41	44	47	51
Transportation equipment	97	98	99	100	105	110	115	120
Other durable goods	291	292	298	308	338	372	408	449
Food and kindred products	143	136	134	132	129	128	127	127
Textile and textile products	626	565	557	546	557	569	580	592
Printing and publishing	405	402	402	402	410	420	432	446
Chemicals	187	193	198	205	221	240	260	281
Other non-durable goods	2,009	1,777	1,756	1,724	1,799	1,889	1,988	2,103

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

			Cuyahoga					
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	2,980	3,809	3,953	4,169	4,025	3,886	3,752	3,622
Metals	58,623	58,615	58,548	58,447	58,156	57,865	57,577	57,289
Non-electrical machinery	37,176	37,963	38,580	39,506	41,727	44,073	46,551	49,169
Electrical machinery	22,818	21,656	21,699	21,763	22,873	24,040	25,267	26,555
Transportation equipment	34,914	29,885	28,541	26,524	24,222	22,119	20,198	18,445
Other durable goods	22,334	22,395	22,891	23,636	25,969	28,531	31,347	34,440
Food and kindred products	6,907	5,859	5,607	5,230	4,910	4,670	4,481	4,324
Textile and textile products	9,165	7,538	7,168	6,612	6,100	5,627	5,191	4,789
Printing and publishing	14,156	13,497	13,737	12,896	12,651	12,563	12,561	12,595
Chemicals	11,982	11,654	11,728	11,838	12,441	13,076	13,743	14,444
Other non-durable goods	14,029	12,657	12,427	12,083	12,277	12,616	13,049	13,542

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Geauga								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	228	291	302	319	308	297	287	277
Metals	1,263	1,263	1,261	1,259	1,253	1,247	1,240	1,234
Non-electrical machinery	1,718	1,754	1,783	1,826	1,928	2,037	2,151	2,272
Electrical machinery	1,242	1,179	1,181	1,185	1,245	1,309	1,375	1,445
Transportation equipment	983	841	803	747	682	623	569	519
Other durable goods	789	791	809	835	917	1,008	1,107	1,217
Food and kindred products	275	243	237	228	226	226	227	226
Textile and textile products	76	63	60	55	51	47	43	40
Printing and publishing	464	465	466	468	483	503	522	536
Chemicals	416	405	407	411	432	454	477	501
Other non-durable goods	1,827	1,713	1,710	1,706	1,799	1,910	2,021	2,124

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Holmes								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	598	693	720	761	801	842	886	932
Metals	305	314	320	328	344	362	380	400
Non-electrical machinery	374	371	377	386	416	448	482	519
Electrical machinery	10	9	9	9	10	11	12	13
Transportation equipment	233	239	242	246	257	269	282	295
Other durable goods	369	370	378	391	429	471	518	569
Food and kindred products	162	159	159	158	161	166	172	182
Textile and textile products	23	21	21	20	20	21	21	22
Printing and publishing	28	29	29	30	32	34	36	40
Chemicals	19	20	20	21	22	24	26	29
Other non-durable goods	486	443	444	445	480	521	567	623

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Knox								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	98	114	118	125	131	138	145	153
Metals	828	854	868	890	935	983	1,033	1,085
Non-electrical machinery	1,792	1,778	1,806	1,848	1,991	2,145	2,311	2,489
Electrical machinery	232	217	218	220	237	255	275	296
Transportation equipment	636	640	647	658	688	720	753	787
Other durable goods	1,472	1,476	1,509	1,558	1,712	1,880	2,066	2,270
Food and kindred products	192	185	183	180	177	176	176	176
Textile and textile products	114	103	101	99	101	104	106	108
Printing and publishing	87	87	87	88	90	93	96	99
Chemicals	61	63	65	67	72	78	85	92
Other non-durable goods	157	140	139	137	144	151	160	167

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

	Lake							
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	224	286	297	313	303	202	282	272
Metals	6,558	6,557	6,549	6,538	6,506	6,473	6,441	6,409
Non-electrical machinery	7,620	7,781	7,908	8,098	8,553	9,034	9,542	10,078
Electrical machinery	4,039	3,833	3,841	3,852	4,049	4,255	4,472	4,701
Transportation equipment	4,546	3,891	3,716	3,454	3,154	2,880	2,630	2,402
Other durable goods	3,606	3,616	3,696	3,816	4,193	4,607	5,061	5,561
Food and kindred products	446	390	378	359	348	341	337	333
Textile and textile products	1,301	1,070	1,018	939	866	799	737	680
Printing and publishing	1,265	1,251	1,244	1,233	1,247	1,274	1,303	1,331
Chemicals	4,223	4,107	4,133	4,172	4,385	4,609	4,844	5,091
Other non-durable goods	2,656	2,467	2,446	2,415	2,508	2,626	2,754	2,887

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Mahoning								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	1,861	2,379	2,469	2,603	2,513	2,427	2,343	2,262
Metals	21,841	21,838	21,813	21,776	21,667	21,559	21,451	21,344
Non-electrical machinery	4,040	4,126	4,193	4,293	4,535	4,790	5,059	5,343
Electrical machinery	1,308	1,241	1,244	1,248	1,311	1,378	1,448	1,522
Transportation equipment	4,401	3,767	3,597	3,343	3,053	2,788	2,546	2,325
Other durable goods	3,591	3,601	3,681	3,800	4,175	4,587	5,040	5,537
Food and kindred products	994	864	837	796	770	751	735	722
Textile and textile products	530	436	414	382	353	325	300	277
Printing and publishing	1,115	1,094	1,089	1,081	1,092	1,108	1,126	1,142
Chemicals	278	270	272	275	289	303	319	335
Other non-durable goods	2,197	2,027	2,011	1,988	2,063	2,149	2,243	2,341

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Medina								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	212	271	281	297	286	276	267	258
Metals	2,843	2,843	2,839	2,834	2,820	2,806	2,792	2,778
Non-electrical machinery	1,594	1,628	1,654	1,694	1,789	1,890	1,996	2,108
Electrical machinery	317	301	301	302	318	334	351	369
Transportation equipment	2,000	1,712	1,635	1,519	1,387	1,267	1,157	1,057
Other durable goods	1,334	1,338	1,368	1,412	1,551	1,704	1,872	2,057
Food and kindred products	347	318	316	314	329	349	369	386
Textile and textile products	208	171	163	150	138	128	118	109
Printing and publishing	523	546	560	581	634	696	757	807
Chemicals	633	616	620	625	657	691	726	763
Other non-durable goods	2,110	2,046	2,079	2,129	2,344	2,591	2,838	3,060

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

	Portage							
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	277	354	367	387	374	361	349	337
Metals	4,029	4,028	4,024	4,017	3,997	3,977	3,957	3,937
Non-electrical machinery	2,531	2,585	2,627	2,690	2,841	3,001	3,169	3,347
Electrical machinery	1,193	1,132	1,134	1,138	1,196	1,257	1,321	1,388
Transportation equipment	1,708	1,462	1,396	1,298	1,185	1,082	988	902
Other durable goods	1,472	1,476	1,509	1,558	1,712	1,880	2,066	2,270
Food and kindred products	386	321	313	300	293	288	284	279
Textile and textile products	122	100	95	88	81	75	69	64
Printing and publishing	440	436	437	438	447	457	465	471
Chemicals	348	338	340	344	361	380	399	420
Other non-durable goods	5,284	4,918	4,902	4,878	5,102	5,343	5,581	5,814

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

Stark								
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	960	1,112	1,156	1,222	1,285	1,352	1,422	1,496
Metals	22,385	23,078	23,467	24,050	25,277	26,566	27,921	29,345
Non-electrical machinery	12,265	12,172	12,363	12,649	13,626	14,679	15,814	17,036
Electrical machinery	4,419	4,136	4,157	4,189	4,512	4,861	5,237	5,641
Transportation equipment	2,036	2,049	2,072	2,106	2,203	2,304	2,409	2,520
Other durable goods	5,177	5,191	5,306	5,479	6,019	6,613	7,266	7,983
Food and kindred products	2,614	2,530	2,506	2,471	2,452	2,453	2,467	2,502
Textile and textile products	353	319	315	308	314	321	327	334
Printing and publishing	2,126	2,150	2,163	2,183	2,250	2,324	2,429	2,544
Chemicals	677	699	715	740	802	868	939	1,017
Other non-durable goods	6,250	5,614	5,576	5,520	5,813	6,157	6,544	6,989

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

	Summit							
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	683	873	906	955	922	891	860	830
Metals	14,179	14,177	14,161	14,137	14,066	13,996	13,926	13,856
Non-electrical machinery	9,487	9,688	9,846	10,082	10,648	11,247	11,879	12,547
Electrical machinery	1,825	1,732	1,736	1,741	1,829	1,923	2,021	2,124
Transportation equipment	6,454	5,524	5,276	4,903	4,477	4,089	3,734	3,410
Other durable goods	4,649	4,662	4,765	4,920	5,406	5,939	6,525	7,169
Food and kindred products	2,184	1,861	1,784	1,669	1,578	1,490	1,433	1,394
Textile and textile products	422	347	330	304	281	259	239	220
Printing and publishing	2,416	2,317	2,279	2,223	2,181	2,164	2,168	2,190
Chemicals	3,239	3,150	3,170	3,200	3,363	3,535	3,715	3,905
Other non-durable goods	38,849	35,203	34,612	33,725	34,263	35,172	36,420	37,980

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

	Trumbull							
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	597	763	792	835	806	778	752	726
Metals	18,949	18,946	18,924	18,892	18,798	18,704	18,611	18,518
Non-electrical machinery	2,196	2,243	2,279	2,334	2,465	2,603	2,750	2,904
Electrical machinery	3,328	3,158	3,164	3,174	3,336	3,506	3,685	3,873
Transportation equipment	12,736	10,901	10,411	9,676	8,836	8,069	7,368	6,728
Other durable goods	2,308	2,314	2,366	2,443	2,684	2,948	3,239	3,559
Food and kindred products	398	347	336	320	312	307	302	294
Textile and textile products	63	52	49	45	42	39	36	33
Printing and publishing	737	726	723	718	732	750	762	767
Chemicals	170	165	166	168	177	186	195	205
Other non-durable goods	1,911	1,769	1,756	1,736	1,813	1,902	1,985	2,059

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

	Tuscarawas							
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	641	743	772	816	858	903	950	999
Metals	3,283	3,385	3,442	3,527	3,707	3,896	4,095	4,304
Non-electrical machinery	2,400	2,382	2,419	2,475	2,666	2,872	3,094	3,334
Electrical machinery	112	105	105	106	114	123	133	143
Transportation equipment	71	71	72	73	77	80	84	88
Other durable goods	3,100	3,108	3,177	3,281	3,604	3,960	4,351	4,780
Food and kindred products	304	295	293	291	295	300	307	316
Textile and textile products	68	61	60	59	61	62	63	64
Printing and publishing	237	240	243	247	261	276	291	310
Chemicals	541	240	572	592	641	693	751	813
Other non-durable goods	771	694	693	691	741	798	857	926

Table B-4 Industrial Employment Forecasts in the EOGC Service Area by County (Cont'd.)

	Wayne							
Industrial Sector	1970	1975	1977	1980	1985	1990	1995	2000
Furniture, lumber, wood	438	508	528	557	586	617	649	683
Metals	2,943	3,034	3,085	3,162	3,323	3,493	3,671	3,858
Non-electrical machinery	991	984	999	1,022	1,101	1,186	1,278	1,377
Electrical machinery	215	201	202	204	220	237	255	274
Transportation equipment	1,300	1,308	1,323	1,345	1,406	1,471	1,538	1,609
Other durable goods	1,816	1,821	1,861	1,922	2,112	2,320	2,549	2,800
Food and kindred products	1,105	1,066	1,052	1,031	1,014	1,002	993	989
Textile and textile products	126	114	112	110	112	114	117	119
Printing and publishing	204	205	205	206	210	215	221	227
Chemicals	545	562	576	596	645	699	756	819
Other non-durable goods	3,357	3,003	2,971	2,924	3,053	3,203	3,364	3,546

APPENDIX C

FORECASTS OF GAS SUPPLY AND ENERGY PRICES

Various data which either complement or have been used to prepare the forecasts presented in Chapter 3 of Volume II are described in this appendix. The first set of data is related to short-term (one year) monthly forecasts of gas flow management by the Consolidated Gas Supply Corporation. The second set of data is related to the PIES model forecasts produced under six different scenarios, as discussed in Chapter 3.

Consolidated Gas Supply Corporation Short-term Forecasts

Short-term monthly projections (1978) of gas management, together with recent (1977) historical data, are presented in Tables C-1 through C-11. Sources of ascertained supply, such as own production, pipeline suppliers, LNG, and storage, are described in Tables C-1 through C-3. Table C-3 presents a comparison of these data for the years 1977 and 1978. Gas supply and requirement summaries are presented in Tables C-4 through C-6, and Table C-6 presents a comparison of these data for the years 1977 and 1978. Breakdowns of the requirements of the customers of Consolidated, by state, are presented in Tables C-7 through C-9. Table C-9 presents a comparison of these requirements for the years 1977 and 1978. It is interesting to note that, effective June 1, 1977, Consolidated is no longer mandated to impose curtailments upon its customers. Actual and projected deliveries to and withdrawals from storage are described in Table C-10, and the basic sources for the estimation of anticipated new supplies are presented in Table C-11. Unfortunately, no documentation about the methodology used to establish these forecasts could be found.

Although these short-term forecasts will not be used in any way in the simulation model developed in this study, they were included in this appendix for documentary purposes and in order to show the kind of detailed, short-term projections transmission pipeline companies are federally mandated to perform under FERC regulations.

Project Independence Evaluation System (PIES) Forecasts

Table C-12 constitutes a summary of the major assumptions underlying DRI macroeconomic forecasts with respect to fiscal and monetary policies, consumer price index, nominal energy prices in the U.S., nominal price of imported oil, and foreign growth in industrial production index. This description completes that already presented in Chapter 3 and underlines the major differences between the scenarios' assumptions.

The Department of Energy Regions are presented in Figure C-1. Region V, the Midwest, comprises the states of Ohio, Indiana, Illinois, Michigan, Minnesota and Wisconsin. Base year (1975) data for the Midwest and the U.S. are presented in Table C-13. This base year is the start of the simulations of the PIES model.

The National Petroleum Council's supply regions are delineated in Figure C-2. The PIES gas production forecasts are indicated on the basis of this spatial subdivision of the U.S. The simulation outputs are presented in Tables C-14 through C-16. For each scenario and for both years 1985 and 1990, gas production and flows to the Midwest (C-14), intrastate unregulated wellhead prices (C-15), and levels of fuel consumption and prices in the Midwest and the U.S. (C-16) are presented.

Yearly forecasts of total gas supply for the U.S. and energy prices for the Midwest, from 1977 to 2000, are presented in Tables C-17 through C-29. These forecasts were derived by interpolating and extrapolating the 1985 and 1990 forecasts presented in Tables C-14 through C-16. Finally, the derived Midwest distillate and residual oil price forecasting indexes for the commercial and industrial sectors are presented in Tables C-30 through C-33, and the derived Midwest natural gas price forecasting indexes for the residential, commercial, and industrial sectors are presented in Tables C-34 through C-36.

Table C-1 Consolidated Gas Supply Corporation Actual Supply Adjusted for Losses by Source and Month for the Period April 1, 1977 to March 31, 1978 (MMCF/Day)

	April	May	June	July	August	September	October	November	December	January	February	March
Major Producing Areas												
West Virginia	211	176	213	178	178	232	182	197	212	181	177	194
Pennsylvania and New York	57	49	59	46	46	53	42	42	44	45	45	42
Louisiana	80	72	65	65	60	54	60	56	50	54	68	60
Pipeline Suppliers												
Tennessee Gas Pipeline Co.	586	610	648	648	645	629	650	594	589	589	588	588
Texas Eastern Transmission Corp.	722	745	743	736	730	730	731	662	636	637	635	639
Texas Gas Transmission Corp.	305	303	304	308	309	307	305	308	309	306	306	306
Transco. Gas Pipeline Corp.	50	50	50	50	77	50	-	-	-	-	-	-
Other Sources												
LNG	20	-	-	-	-	-	-	-	-	-	-	-
Storage Service												
Texas Eastern	77	163	167	175	176	135	52	8	-	-	-	-
Transcontinental	118	195	209	227	176	2	22	45	12	-	10	121
Tennessee	39	21	5	6	20	2	4	2	-	-	-	7
Columbia Gas Trans.	-	-	-	-	-	-	84	-	-	-	-	-
West Ohio Gas Co.	-	-	-	-	-	-	6	-	-	-	-	-
Sub-Total	2,265	2,384	2,463	2,439	2,417	2,194	2,138	1,914	1,852	1,812	1,829	1,957
Adjustments												
Pipeline Suppliers Curtailments	(201)	(176)	(151)	(113)	(121)	(168)	(155)	(189)	(198)	(264)	(267)	(271)
Unaccounted for Gas	(80)	21	(45)	(27)	(6)	(63)	(13)	(10)	(58)	(43)	(25)	(24)
Total	1,984	2,229	2,267	2,299	2,290	1,963	1,970	1,715	1,596	1,505	1,537	1,662

Source: FERC form 16 - Consolidated Gas Supply Corporation 4/30/78.

Table C-2 Consolidated Gas Suppply Corporation Projected Supply Adjusted for Losses by Source and Month for the Period April 1, 1978 to March 31, 1979 (MMCF/Day)

	April	May	June	July	August	September	October	November	December	January	February	March
Major Producing Areas												
West Virginia	189	189	189	189	189	189	189	189	189	187	187	187
Pennsylvania and New York	49	49	49	49	49	49	49	49	49	48	48	48
Louisiana	65	63	63	63	63	63	63	62	60	59	59	59
Pipeline Suppliers												
Tennessee Gas Pipeline Co.	589	615	649	648	648	649	649	589	589	589	588	589
Texas Eastern Transmission Corp.	672	718	718	718	718	718	718	672	625	625	625	625
Texas Gas Transmission Corp.	306	306	306	306	306	306	306	306	306	306	306	306
Transco. Gas Pipeline Corp.	50	50	50	50	50	50	27					
Other Sources												
LNG	1	46	57	91	112	110	130	191	131	286	418	355
Storage Service												
Texas Eastern	103	136	136	125	124	124	97					
Transcontinental	126	166	166	153	152	151	112					
Tennessee	8	12	12	11	11	11	8					
Columbia Gas Trans.	0	0	0	0	0	0						
West Ohio Gas Co.	0	0	0	0	0	0						
Sub-Total	2,158	2,350	2,395	2,403	2,422	2,420	2,343	2,058	1,949	2,100	2,231	2,169
Adjustments												
Pipeline Suppliers Curtailments	(198)	(235)	(222)	(201)	(201)	(213)	(228)	(199)	(184)	(214)	(192)	(184)
Unaccounted for Gas	(20)	(18)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)
Total	1,940	2,097	2,154	2,183	2,202	2,188	2,096	1,840	1,746	1,867	2,020	1,966

Source: FERC form 16 - Consolidated Gas Supply Corporation 4/30/78.

Table C-3 Comparison of Actual (1977) and Projected (1978) Supply for Consolidated Gas Supply Corporation by Source and Month (MMCF/Day)

	January		February		March		April		May		June	
	1977 Actual	1978 Actual	1977 Actual	1978 Actual	1977 Actual	1978 Actual	1977 Actual	1978 Projected	1977 Actual	1978 Projected	1977 Actual	1978 Projected
Major Producing Areas												
West Virginia	166	181	170	177	181	194	211	189	176	189	213	189
Pennsylvania and New York	45	45	43	45	44	42	57	49	49	49	59	49
Louisiana	74	54	63	68	78	60	80	65	72	63	65	63
Pipeline Suppliers												
Tennessee Gas Pipeline Co.	588	589	581	588	592	588	586	589	610	615	648	649
Texas Eastern Transmission	644	637	625	635	657	639	722	672	745	718	743	718
Texas Gas Transmission	318	306	286	306	301	306	305	306	303	306	304	306
Transco Gas Pipeline	-	-	-	-	-	-	50	50	50	50	50	50
Other Sources												
LNG	-	-	-	-	21	-	20	1	-	46	-	57
Storage Service												
Texas Eastern	-	-	-	-	-	-	77	103	163	136	167	136
Transcontinental	-	-	146	10	123	121	118	126	195	166	209	166
Tennessee	-	-	11	-	3	7	39	8	21	12	5	12
Columbia Gas Trans.	-	-	-	-	-	-	-	-	-	-	-	-
West Ohio Gas	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	1,835	1,812	1,925	1,829	2,000	1,957	2,265	2,158	2,384	2,350	2,463	2,395
Adjustments												
Pipeline Suppliers Curtailment	(302)	(264)	(260)	(267)	(148)	(271)	(201)	(198)	(176)	(235)	(151)	(222)
Unaccounted for Gas	(34)	(43)	(9)	(25)	(7)	(24)	(80)	(20)	21	(18)	(45)	(19)
Total	1,499	1,505	1,656	1,537	1,859	1,662	1,984	1,940	2,229	2,097	2,267	2,154

	July		August		September		October		November		December	
	1977 Actual	1978 Projected	1977 Actual	1978 Projected	1977 Actual	1978 Projected	1977 Actual	1978 Projected	1977 Actual	1978 Projected	1977 Actual	1978 Projected
Major Producing Areas												
West Virginia	178	189	178	189	232	189	182	189	197	189	212	189
Pennsylvania and New York	46	49	46	49	53	49	42	49	42	49	44	49
Louisiana	65	63	60	63	54	63	60	63	56	62	50	60
Pipeline Suppliers												
Tennessee Gas Pipeline Co.	648	648	645	648	629	649	650	649	594	589	589	589
Texas Eastern Transmission	736	718	730	718	730	718	731	718	662	672	636	625
Texas Gas Transmission	304	306	309	306	307	306	305	306	308	306	309	306
Transco Gas Pipeline	50	50	77	50	50	50	-	27	-	-	-	-
Other Sources												
LNG	-	91	-	112	-	110	-	130	-	191	-	131
Storage Service												
Texas Eastern	175	125	176	124	135	124	52	92	8	-	-	-
Transcontinental	227	153	176	152	2	151	22	112	45	-	12	-
Tennessee	6	11	20	11	2	11	4	8	2	-	-	-
Columbia Gas Trans.	-	-	-	-	-	-	84	-	-	-	-	-
West Ohio Gas	-	-	-	-	-	-	6	-	-	-	-	-
Sub-Total	2,439	2,403	2,417	2,422	2,194	2,420	2,138	2,343	1,914	2,058	1,852	1,949
Adjustments												
Pipeline Suppliers Curtailment	(113)	(201)	(121)	(201)	(168)	(213)	(155)	(228)	(189)	(199)	(198)	(184)
Unaccounted for Gas	(27)	(19)	(6)	(19)	(63)	(19)	(13)	(19)	(10)	(19)	(58)	(19)
Total	2,299	2,183	2,290	2,202	1,963	2,188	1,970	2,096	1,715	1,840	1,596	1,746

Source: FERC Form 16 - Consolidated Gas Supply Corporation 4-30-78 and 9-30-77.

Table C-4 Consolidated Gas Supply Corporation Actual Supply and Requirements by Month for the Period April 1, 1977 to March 31, 1978 (MMCF/Day).

	April	May	June	July	August	September	October	November	December	January	February	March	Annual Total (MMCF)	Peak Day
1. Present Supply	1,984	2,229	2,267	2,229	2,290	1,963	1,970	1,715	1,596	1,505	1,537	1,662	701,085	1,526
2. Anticipated New Supply	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Emergency Purchases	97	-	-	-	-	-	-	-	-	-	-	-	2,896	-
4. Exempted Purchases	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Subtotal (1+2+3+4)	2,081	2,229	2,267	2,299	2,290	1,963	1,970	1,715	1,596	1,505	1,537	1,662	703,981	1,526
6. Normally Anticipated Loss of Supply	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Company Use and Shrinkage	(44)	(30)	(53)	(54)	(49)	(44)	(50)	(39)	(54)	(44)	(53)	(47)	(17,032)	(45)
8. Exchange Gas Owed	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9. Storage (Injection) or Withdrawal	(329)	(916)	(1,015)	(1,262)	(1,173)	(816)	(210)	119	1,052	2,022	2,031	819	5,967	2,864
10. Net Available for Mainline (5-9)	1,708	1,283	1,199	983	1,068	1,103	1,710	1,795	2,594	3,483	3,515	2,434	692,916	4,345
11. Adjustments	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12. Available for Market	1,708	1,283	1,199	983	1,068	1,103	1,710	1,795	2,594	3,483	3,515	2,434	692,916	4,345
13. Firm Requirements	2,192	1,581	1,199	983	1,068	1,103	1,710	1,795	2,594	3,483	3,515	2,434	716,674	4,345

Note: All volumes 14.73 Psia at 60 F.
Source: FERC Form 16 - Consolidated Gas Supply Corporation 4/30/78

Table C-5 Consolidated Gas Supply Corporation Projected Supply and Requirements by Month for the Period April 1, 1978 to March 31, 1979 (MMCF/Day).

	April	May	June	July	August	September	October	November	December	January	February	March	Annual Total (MMCF)	Peak Day
1. Present Supply	1,940	2,097	2,154	2,183	2,202	2,188	2,096	1,840	1,746	1,867	2,020	1,966	739,137	1,878
2. Anticipated New Supply	-	12	12	108	107	108	106	107	121	114	114	114	31,063	-
3. Emergency Purchases	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Exempted Purchases	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Subtotal (1+2+3+4)	1,940	2,109	2,166	2,291	2,309	2,296	2,202	1,947	1,867	1,981	2,134	2,080	770,200	1,878
6. Normally Anticipated Loss of Supply	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Company Use and Shrinkage	(42)	(43)	(47)	(50)	(50)	(48)	(39)	(39)	(43)	(44)	(47)	(45)	(16,380)	(45)
8. Exchange Gas Owed	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9. Storage (Injection) or Withdrawal	53	(481)	(889)	(1,140)	(1,163)	(995)	(517)	(187)	849	1,085	1,045	449	(48,438)	2,777
10. Net Available for Mainline (5-9)	1,951	1,585	1,230	1,101	1,096	1,253	1,646	2,095	2,673	3,022	3,132	2,484	705,382	4,610
11. Adjustments	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12. Available for Market	1,951	1,585	1,230	1,101	1,096	1,253	1,646	2,095	2,673	3,022	3,132	2,484	705,382	4,610
13. Firm Requirements	1,951	1,585	1,230	1,101	1,096	1,253	1,646	2,095	2,673	3,022	3,132	2,484	705,382	4,610

Note: All volumes 14.73 Psia at 60 F.
Source: FERC Form 16 - Consolidated Gas Supply Corporation 4/30/78

Table C-6 Comparison of Actual (1977) and Projected (1978) Supply and Requirements for Consolidated Gas Supply Corporation by Month (MMCF/Day)

	January	February	March	April	May	June	July	August	September	October	November	December
1. Present Supply - 1977 - (Actual)	1,499	1,656	1,859	1,984	2,229	2,267	2,299	2,290	1,963	1,970	1,715	1,596
- 1978 - (Projected)*	1,505	1,537	1,662	1,940	2,097	2,154	2,183	2,202	2,188	2,096	1,840	1,746
2. Anticipated New Supply - 1977 (Actual)	-	-	-	-	-	-	-	-	-	-	-	-
- 1978 (Projected)*	-	-	-	-	12	12	108	107	108	106	107	121
3. Emergency Purchase - 1977 (Actual)	-	-	75	97	-	-	-	-	-	-	-	-
- 1978 (Projected)*	-	-	-	-	-	-	-	-	-	-	-	-
4. Exempted Purchase - 1977 (Actual)	-	-	-	-	-	-	-	-	-	-	-	-
- 1978 (Projected)*	-	-	-	-	-	-	-	-	-	-	-	-
5. Subtotal - 1977 (1+2+3+4) (Actual)	1,499	1,656	1,934	2,081	2,229	2,267	2,299	2,290	1,963	1,970	1,715	1,596
- 1978 (1+2+3+4) (Projected)*	1,505	1,537	1,662	1,940	2,109	2,166	2,291	2,309	2,296	2,202	1,947	1,867
6. Normally Anticipated Loss of Supply - 1977	-	-	-	-	-	-	-	-	-	-	-	-
- 1978*	-	-	-	-	-	-	-	-	-	-	-	-
7. Company Use and Shrinkage - 1977 (Actual)	(50)	(48)	(45)	(44)	(30)	(53)	(54)	(49)	(44)	(50)	(39)	(54)
- 1978 (Projected)*	(44)	(53)	(47)	(42)	(43)	(47)	(50)	(50)	(48)	(39)	(39)	(43)
8. Exchange Gas Owed - 1977 (Actual)	-	-	-	-	-	-	-	-	-	-	-	-
- 1978 (Projected)*	-	-	-	-	-	-	-	-	-	-	-	-
9. Storage (Injection) or Withdrawal - 1977 (Actual)	2,259	827	(189)	(329)	(916)	(1,015)	(1,262)	(1,173)	(816)	(210)	119	1,052
- 1978 (Projected)*	2,022	2,031	819	53	(481)	(889)	(1,140)	(1,163)	(995)	(517)	187	849
10. Net Available For Mainline (5-9)-1977 (Actual)	3,708	2,435	1,700	1,708	1,283	1,199	983	1,068	1,103	1,710	1,795	2,594
-1978 (Projected)*	3,483	3,515	2,434	1,951	1,585	1,230	1,101	1,096	1,253	1,646	2,095	2,673
11. Adjustments - 1977 Actual	-	-	-	-	-	-	-	-	-	-	-	-
1978 Projected	-	-	-	-	-	-	-	-	-	-	-	-
12. Available for Market - 1977 Actual	3,708	2,435	1,700	1,708	1,283	1,199	983	1,068	1,103	1,710	1,795	2,594
- 1978 Projected*	3,483	3,515	2,434	1,951	1,585	1,230	1,101	1,096	1,253	1,646	2,095	2,673
13. Firm Requirements - 1977 Actual	4,157	3,003	1,975	2,192	1,581	1,199	983	1,068	1,103	1,710	1,795	2,594
1978 Projected*	3,483	3,515	2,434	1,951	1,585	1,230	1,101	1,096	1,253	1,646	2,095	2,673

Source FERC Form 16 - Consolidated Gas Supply Corporation 4-30-78 and 9-30-77

* January, February and March are actual figures for 1978, April to December Projected

Table C-7 Actual Requirements of Customers of Consolidated Gas Supply Corporation by State and Month for the Period April 1, 1977 to March 31, 1978 (MMCF/Day)

	April	May	June	July	August	September	October	November	December	January	February	March	Annual Total MMCF	Peak Day MMCF
Total All States														
Firm:														
Deliveries	1,951	1,585	1,230	1,101	1,096	1,253	1,646	1,699	2,142	2,440	2,546	2,013	627,967	3,671
Curtailments														
Total Requirements	1,951	1,585	1,230	1,110	1,096	1,253	1,646	1,699	2,142	2,440	2,546	2,013	627,967	3,671
New York - Total														
Firm:														
Deliveries	549	356	221	189	190	257	434	651	883	978	958	791	195,682	1,484
Curtailments														
Total Requirements	549	356	221	189	190	257	434	651	883	978	958	791	195,682	1,484
Ohio - Total														
Firm:														
Deliveries	980	791	583	515	508	594	815	633	802	1,016	1,147	840	279,687	1,439
Curtailments														
Total Requirements	980	791	583	515	508	594	815	633	802	1,016	1,147	840	279,687	1,439
Ohio - East Ohio														
Firm:														
Deliveries	969	785	579	513	505	590	807	618	781	993	1,124	822	275,510	1,395
Curtailments														
Total Requirements	969	785	579	513	505	590	807	618	781	993	1,124	822	275,510	1,395
Ohio - River Gas														
Firm:														
Deliveries	11	6	4	2	3	4	8	15	21	23	23	18	4,177	44
Curtailments														
Total Requirements	11	6	4	2	3	4	8	15	21	23	23	18	4,177	44
Pennsylvania - Total														
Firm:														
Deliveries	292	337	337	312	311	311	283	263	271	241	235	215	103,651	433
Curtailments														
Total Requirements	292	337	337	312	311	311	283	263	271	241	235	215	103,651	433
West Virginia (Hope Natural Gas)														
Firm:														
Deliveries	130	101	89	85	87	91	114	152	186	205	206	167	48,947	315
Curtailments														
Total Requirements	130	101	89	85	87	91	114	152	186	205	206	167	48,947	315

Source: Ferc form 16, Consolidated Gas Supply Corporation 4/30/78.
Note: Effective June 1, 1977, Consolidated discontinued curtailments.

Table C-8 Projected Requirements of Customers of Consolidated Gas Supply Corporation by State and Month for the Period April 1, 1978 to March 31, 1979 (MMCF/Day)

	April	May	June	July	August	September	October	November	December	January	February	March	Annual Total MMCF	Peak Day MMCF
Total All States														
Firm:														
Deliveries	1,629	1,270	1,199	983	1,068	1,103	1,535	1,546	2,238	2,781	2,942	2,245	622,466	3,463
Curtailments	484	298											23,758	
Total Requirements	2,113	1,568	1,199	983	1,068	1,103	1,535	1,546	2,238	2,781	2,942	2,245	646,224	3,463
New York - Total														
Firm:														
Deliveries	462	289	225	179	197	231	441	585	887	1,011	1,011	810	191,599	1,260
Curtailments	93	40											4,029	
Total Requirements	555	329	225	179	197	231	441	585	887	1,011	1,011	810	195,628	1,260
Ohio - Total														
Firm:														
Deliveries	856	622	563	446	502	500	761	586	882	1,197	1,327	1,020	280,644	1,458
Curtailments	206	163											11,261	
Total Requirements	1,062	785	563	446	502	500	761	586	882	1,197	1,327	1,020	291,905	1,458
Ohio - East Ohio														
Firm:														
Deliveries	848	617	559	444	499	496	753	574	861	1,169	1,298	1,003	276,383	1,421
Curtailments	200	159											10,945	
Total Requirements	1,048	776	559	444	499	496	753	574	861	1,169	1,298	1,003	287,328	1,421
Ohio - River Gas														
Firm:														
Deliveries	8	5	4	2	3	4	8	12	21	28	29	17	4,261	37
Curtailments	6	4											316	
Total Requirements	14	9	4	2	3	4	8	12	21	28	29	17	4,577	37
Pennsylvania - Total														
Firm:														
Deliveries	213	284	334	291	299	294	244	220	287	349	375	244	104,371	441
Curtailments	140	62											6,110	
Total Requirements	353	346	334	291	299	294	244	220	287	349	375	244	110,481	441
West Virginia (Hope Natural Gas)														
Firm:														
Deliveries	98	75	77	67	70	78	89	155	182	224	229	171	45,852	304
Curtailments	45	33											2,358	
Total Requirements	143	108	77	67	70	78	89	155	182	224	229	171	48,210	304

Source: FERC form 16, Consolidated Gas Supply Corporation 4/30/78.
Note: Effective June 1, 1977, Consolidated discontinued curtailments.

Table C-9 Comparison of Actual (1977) and Projected (1978) Requirements of Consolidated Gas Supply Corporation by State and Month (MMCF/Day)

	January 1977 Actual	January 1978 Actual	February 1977 Actual	February 1978 Actual	March 1977 Actual	March 1978 Actual	April 1977 Actual	April 1978 Projected	May 1977 Actual	May 1978 Projected	June 1977 Actual	June 1978 Projected
Total All States												
Firm: Deliveries	2,969	2,781	2,175	2,942	1,581	2,245	1,629	1,951	1,270	1,585	1,199	1,230
Curtailments	449	--	568	--	275	--	484	--	298		--	
Total Requirements	3,418	2,781	2,743	2,942	1,856	2,245	2,113	1,951	1,568	1,585	1,199	1,239
New York - Total												
Firm: Deliveries	1,086	1,011	774	1,011	642	810	462	549	289	356	225	221
Curtailments	68	--	210	--	59	--	93	--	40	--	--	--
Total Requirements	1,154	1,011	984	1,011	701	810	555	549	329	356	225	221
Ohio - Total												
Firm: Deliveries	1,287	1,197	1,011	1,327	655	1,020	856	980	622	791	563	583
Curtailments	304	--	254	--	147	--	206	--	163	--	--	--
Total Requirements	1,591	1,197	1,265	1,327	802	1,020	1,062	980	785	791	563	583
Ohio - East Ohio												
Firm: Deliveries	1,257	1,169	990	1,298	642	1,003	848	969	617	785	559	579
Curtailments	299	--	246	--	140	--	200	--	159	--	--	--
Total Requirements	1,556	1,169	1,236	1,298	782	1,003	1,048	969	776	785	559	579
Ohio - River Gas												
Firm: Deliveries	30	28	21	29	13	17	8	11	5	6	4	4
Curtailments	5	--	8	--	7	--	6	--	4	--	-	-
Total Requirements	35	28	29	29	20	17	14	11	9	6	4	4
Pennsylvania - Total												
Firm: Deliveries	385	349	231	375	158	244	213	292	284	337	334	337
Curtailments	40	--	50	--	25	--	140	--	62	--	-	-
Total Requirements	425	349	281	375	183	244	353	292	346	337	334	337
West Virginia												
Firm: Deliveries	211	224	159	229	126	171	98	130	75	101	77	89
Curtailments	37	--	54	--	44	--	45	--	33	--	--	--
Total Requirements	248	224	213	229	170	171	143	130	108	101	77	89

	July 1977 Actual	July 1978 Projected	August 1977 Actual	August 1978 Projected	September 1977 Actual	September 1978 Projected	October 1977 Actual	October 1978 Projected	November 1977 Actual	November 1978 Projected	December 1977 Actual	December 1978 Projected
Total All States												
Firm: Deliveries	983	1,101	1,068	1,096	1,103	1,253	1,535	1,646	1,546	1,699	2,238	2,142
Curtailments	--		--		--		--		--		--	--
Total Requirements	983	1,101	1,068	1,096	1,103	1,253	1,535	1,646	1,546	1,699	2,238	2,142
New York - Total												
Firm: Deliveries	179	189	197	190	231	257	441	434	585	651	887	883
Curtailments	--	--	--	--	--	--	--	--	--	--	--	--
Total Requirements	179	189	197	190	231	257	441	434	585	651	887	883
Ohio - Total												
Firm: Deliveries	446	515	502	508	500	594	761	815	586	633	882	802
Curtailments	--	--	--	--	--	--	--	--	--	--	--	--
Total Requirements	446	515	502	508	500	594	761	815	586	633	882	802
Ohio - East Ohio												
Firm: Deliveries	444	513	499	505	496	590	753	807	574	618	861	781
Curtailments	--	--	--	--	--	--	--	--	--	--	--	--
Total Requirements	444	513	499	505	496	590	753	807	674	618	861	781
Ohio - River Gas												
Firm: Deliveries	2	2	3	3	4	4	8	8	12	15	21	21
Curtailments	-	-	-	-	-	-	-	-	-	-	-	--
Total Requirements	2	2	3	3	4	4	8	8	12	15	21	21
Pennsylvania - Total												
Firm: Deliveries	291	312	299	311	294	311	244	283	220	263	287	271
Curtailments	-	-	-	-	-	-	-	-	-	-	-	--
Total Requirements	291	312	299	311	294	311	244	283	220	263	287	271
West Virginia												
Firm: Deliveries	67	85	70	87	78	91	89	114	155	152	182	186
Curtailments	--	--	--	--	--	--	--	--	--	--	--	--
Total Requirements	67	85	70	87	78	91	89	114	155	152	182	186

Source: FERC Form 16 Consolidated Gas Supply Corporation 4/30/78 and 9/30/77
Note: Effective June 1, 1977 Consolidated discontinued curtailments.

Table C-10 Summary of Actual (4-1-77 to 3-31-78) and Projected (4-1-78 to 3-31-79) Storage Operations of the Consolidated Gas Supply Corporation by Month (MMCF/Day)

Actual 4-1-77 to 3-31-78	April	May	June	July	August	September	October	November	December	January	February	March
Company Net	174	550	634	854	801	677	217	75	(708)	(1,320)	(1,468)	(758)
Storage Service:												
Texas Eastern	39	162	167	175	176	135	52	(47)	(148)	(258)	(241)	(115)
Transcontinental	81	183	209	227	176	2	(151)	(80)	(153)	(422)	(298)	57
Tennessee	35	21	5	6	20	2	2	(1)	(19)	(22)	(24)	(3)
Columbia	-	-	-	-	-	-	84	(60)	(24)	-	-	-
West Ohio	-	-	-	-	-	-	6	(6)	-	-	-	-
Total	329	916	1,015	1,262	1,173	816	210	(119)	(1,052)	(2,022)	(2,031)	(819)
Field Names												
Bridgeport	21	30	15	8	3	10	4	(5)	(16)	(40)	(36)	(12)
Fink Kennedy	14	244	202	348	352	274	107	55	(231)	(540)	(554)	(221)
Newbern-Rachet	21	-	22	22	15	13	5	4	(10)	(46)	(37)	(11)
Teoga	3	48	57	58	63	47	1	(25)	(64)	(79)	(83)	(51)
Sharon	(3)	1	-	11	10	(2)	(3)	(3)	(6)	(6)	(6)	(1)
Sabursville	30	34	76	133	112	51	(21)	(75)	(93)	(88)	(146)	(102)
Harrison	(26)	25	56	56	55	54	43	(10)	(67)	(119)	(91)	(38)
Woodhull	(39)	41	102	115	104	76	(15)	4	(100)	(86)	(190)	(85)
Greenlick	91	134	153	149	134	133	18	(16)	(75)	(294)	(253)	(42)
Leidy/Tamarack	70	202	124	110	134	28	(41)	30	(101)	(370)	(289)	(57)
Ellesburg	67	124	103	105	117	90	39	(54)	(154)	(206)	(157)	(92)
Oaklord	80	33	105	126	35	12	47	(31)	(117)	(122)	(123)	(92)
South Bend	-	-	-	21	39	30	26	7	(20)	(26)	(66)	(15)
Total	329	916	1,015	1,262	1,173	816	210	(119)	(1,054)	(2,022)	(2,031)	(819)
Projected 4-1-78 to 3-31-79												
Company Net	(290)	167	575	851	876	709	305	209	(318)	(503)	(459)	22
Storage Service:												
Texas Eastern	103	136	136	125	124	124	92	(188)	(243)	(259)	(260)	(226)
Transcontinental	126	166	166	153	152	151	112	(182)	(262)	(297)	(300)	(219)
Tennessee	8	12	12	11	11	11	8	(26)	(26)	(26)	(26)	(26)
Columbia												
West Ohio												
Total	(53)	481	889	1,140	1,163	995	517	(187)	(849)	(1,085)	(1,045)	(449)

Source: FERC Form 16 - Consolidated Gas Supply Corporation 4/30/78

Table C-11 Consolidated Gas Supply Corporation Anticipated New Supply by Source and Month for the Period April 1, 1978 to March 31, 1979

Source	Docket Number	April	May	June	July	August	September	October	November	December	January	February	March	Annual Total MMCF
CNG Producing Co.	C178-234	-	6	6	8	8	8	8	8	8	6	6	6	2,378
Texas Gas Expl. Corp.	C178-576	-	6	6	8	8	8	8	8	8	6	6	6	2,378
CNG Producing Co.	C178-79	-	-	-	23	22	23	21	22	24	24	24	24	6,238
CNG Producing Co.	C178-533	-	-	-	25	25	25	25	25	25	25	25	25	6,850
CNG Producing Co.	C178-448	-	-	-	8	8	8	8	8	8	6	6	6	2,029
LA.Land & Expl. Co.	Not Filed	-	-	-	8	8	8	8	8	8	6	6	6	2,029
CNG Producing Co.	C177-768	-	-	-	14	14	14	14	14	14	11	11	11	3,569
Texas Gas Expl. Corp.	1.	-	-	-	14	14	14	14	14	14	11	11	11	3,569
CNG Producing Co.	C174-276	-	-	-	-	-	-	-	-	-	3	3	3	342
CNG Producing Co.	Not Filed	-	-	-	-	-	-	-	-	9	9	9	9	1,044
CNG Producing Co.	Not Filed	-	-	-	-	-	-	-	-	3	3	3	3	233
CNG Producing Co.	Not Filed	-	-	-	-	-	-	-	-	-	4	4	4	404
Total Anticipated New Supply		-	12	12	108	107	108	106	107	121	114	114	114	31,063

1. Docket number not available - filed 4/1/78

Source: FERC Form 16 - Consolidated Gas Supply Corporation 4/30/78

Table C-12 Major Assumptions Underlying DRI Macroeconomic Forecasts*

Assumptions	CEASPIRIT	TRENDLONG	CYCLELONG
1. Fiscal Policy	Federal expenditures increase at a compound annual rate of 7.8 percent between 1977 and 1990.	Federal expenditures increase at a compound annual rate of 8.6 percent on a national income basis between 1977 and 1990.	Federal expenditures increase at a compound annual rate of 12.1 percent between 1977 and 1990.
2. Monetary Policy	Money supply increases at a compound annual rate of 6.9 percent from 1977 to 1983 and 5.3 percent between 1983 and 1990.	Narrowly defined money supply (M1) increases at a compound annual rate of 5.7 percent between 1977 and 1983 and at a 4.6 percent rate between 1983 and 1990.	Money supply increases at a compound annual rate of 7.3 percent between 1977 and 1983 and 9.5 percent from 1983 to 1990.
	Prime lending rate declines almost continually from a high of 7 percent in 1978 to a low of 5.4 percent in 1990. Pattern and level of long-term yields similar to those in TRENDLONG but yields are slightly lower.	Prime lending rate ranges between 7.2 percent and 7.7 percent between 1978 and 1983. Subsequently declines gradually to 6.1 percent in 1990. A roughly similar pattern (but not level) of yields exists for long-term bonds (new AAA) after some time lag.	Prime lending rate increases continually to nearly 10 percent by 1982 with sharp variations thereafter between low of 6.7 percent and high of 11.3 percent. Long-term yields are substantially higher than in TRENDLONG throughout 1977–1990 reflecting higher inflation, credit crunches in 1982 and 1986, higher risks of financial instability and recurrent expansionary policies.
3. Consumer Price Index (CPI)	CPI increases at annual rate of 6.4 percent in 1977, between 4.9 percent and 5.6 percent during 1978–1983, and then declines continually to 4.0 percent.	CPI increases at annual rate of 5 percent-6 percent through 1983 (except in 1977), declines continually to 4.1 percent in 1990.	CPI increases at annual rate of 7 percent during 1977–1983 and at about 8 percent thereafter, with double digit inflation in 1986 and 1987.
4. Nominal Energy Prices in the United States	Compound annual rate of increase between 1978 and 1990 is about 5 percent, declining from 10 percent in 1978 to 3.3 percent in 1990.	Compound annual rate of increase between 1978 and 1990 is 7.6 percent, declining from 16 percent in 1978 to 5.3 percent in 1990.	Compound annual rate of increase between 1978 and 1990 is 12.2 percent peaking at 17 percent in 1990.
5. Nominal Price of Imported Oil	Rates of increase similar to those in TRENDLONG through 1982. Substantially smaller rates thereafter which decline gradually from 5.2 percent in 1983 to 3.6 percent in 1990.	Rates of increase range from 7.6 percent to 8.5 percent between 1977 and 1980. Rate of increase is at constant 7.5 percent after 1980.	Rates of increase similar to those in TRENDLONG through 1979. Thereafter, rates range from 8 percent to 18 percent and usually exceed 10 percent.
6. Foreign (OECD) Growth in Industrial Production Index	Growth Rates: 1977–1980 5.5 percent 1980–1985 4.2 percent 1985–1990 4.0 percent	Growth Rates: 1977–1980 4.2 percent 1980–1985 5.2 percent 1985–1990 4.4 percent	Growth Rates: 1977–1980 4.2 percent 1980–1985 4.9 percent 1985–1990 2.7 percent

*Source: EIA Administrators Annual Report to Congress - 1977.

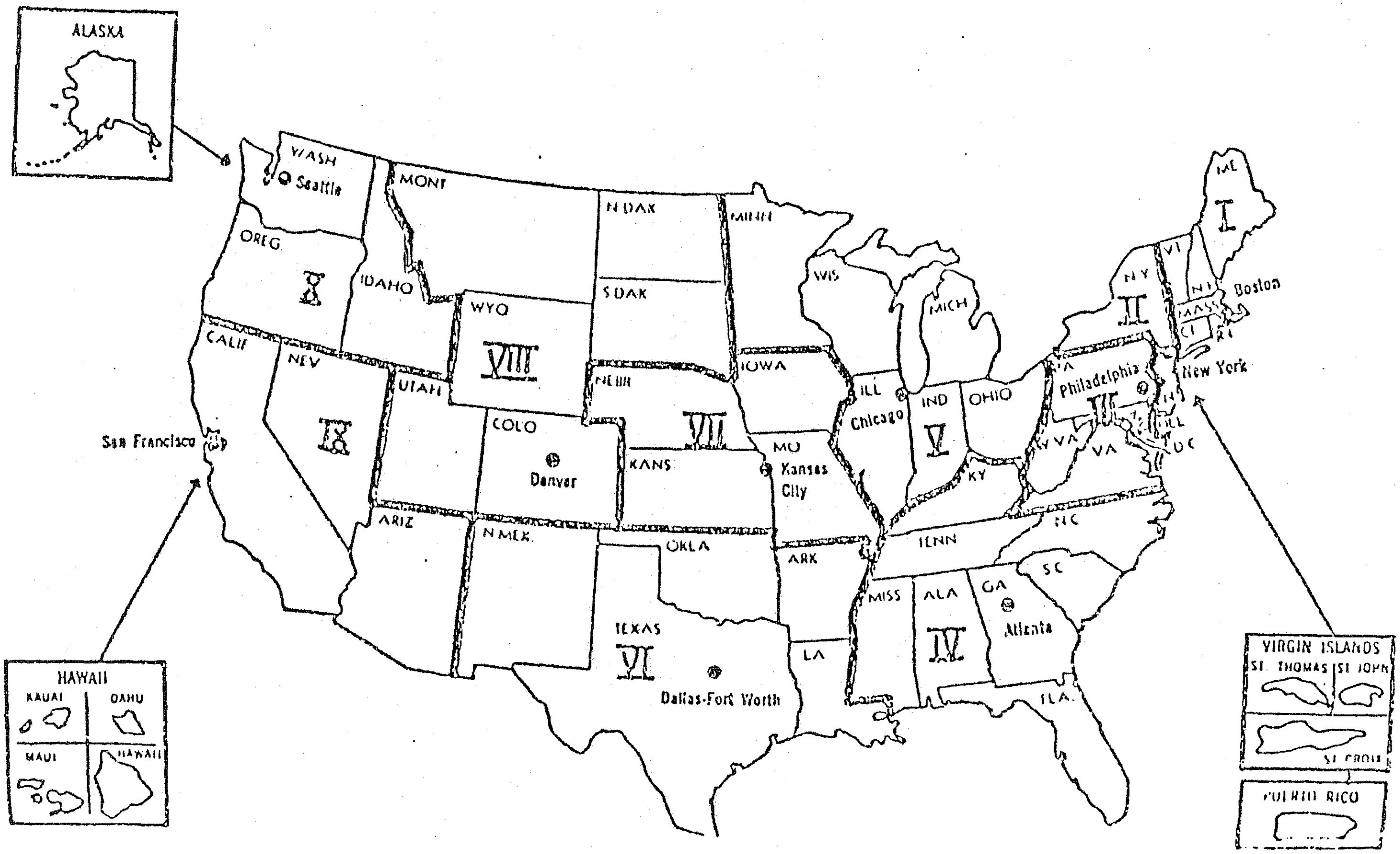


Figure C-1 U.S. Department of Energy Regions

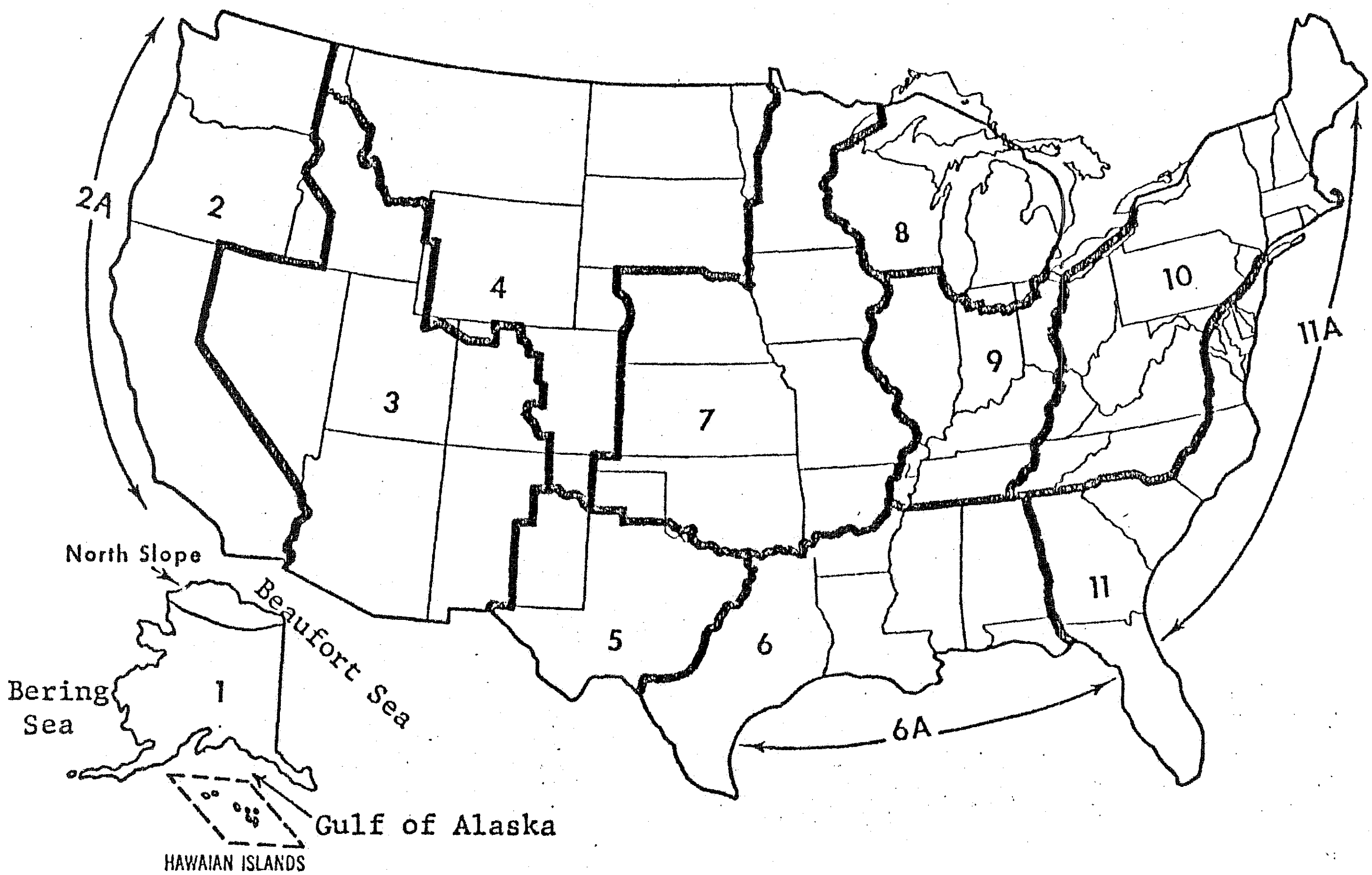
Source: Project Independence Evaluation System Documentation, Volume 14, Federal Energy Administration, Washington, D.C. 1977

Table C-13 Actual Energy Consumption and Prices by Sector and Fuel for the Midwest and U.S., 1975

Sector and Fuel Type	Midwest Consumption (Trillion of BTU's per year)	U.S. Consumption	Midwest Retail Price ($/MMBTU)	U.S. Retail Price ($/MMBTU)
Residential	2,795.9	9,991.3	3.44	4.12
Electricity	385.3	2,000.0	11.43	11.07
Distillate	515.1	2,193.7	3.03	3.18
Liquid Gas	158.6	603.4	2.87	2.92
Coal	45.9	112.5	-	-
Natural Gas	1,691.0	5,081.7	1.80	1.96
Commercial	1,768.6	7,348.5	3.75	4.37
Electricity	298.5	1,641.3	11.18	10.90
Distillate	208.0	972.6	2.76	2.86
Residual	150.4	975.1	2.44	2.37
Liquid Gas	17.6	67.0	-	-
Coal	24.7	60.6	-	-
Asphalt	249.3	1,043.2	-	-
Natural Gas	820.1	2,588.7	1.52	1.54
Raw Material[2]	230.3	2,391.1	-	-
Liquid Gas	82.2	1,297.1	-	-
Oil	104.6	487.9	-	-
Natural Gas	43.5	606.1	-	-
Industrial	3,950.4	15,665.2	2.36	2.34
Electricity	518.8	2,179.1	6.92	6.63
Distillate	94.6	476.4	2.76	2.85
Residual	100.6	793.4	2.44	2.26
Liquid Gas	63.8	314.6	2.62	2.76
Coal	578.8	1,390.5	1.04	1.05
Met Coal[3]	978.7	2,293.7	-	-
Naptha	67.6	280.8	-	-
Natural Gas	1,547.5	7,936.7	1.26	1.27
Transportation	3,475.5	18,553.7	5.16	4.94
Electricity	1.3	14.6	-	-
Distillate	448.0	2,350.5	3.90	-
Residual	15.7	731.3	2.44	-
Liquid Gas	1.7	17.8	-	-
Gasoline	2,728.8	13,028.9	5.49	-
Jet Fuel	226.4	1,809.0	3.22	-
Natural Gas[4]	53.6	601.6	-	-
Total Consumption	12,533.2	56,383.2	-	-

1. Does not include utility fuel consumption or synthetic fuel consumption.
2. Liquid gas in raw material sector includes liquid gas feedstock.
3. Met coal includes 70% premium coal & 30% bituminous low sulfur coal.
4. Natural gas consumption in transportation includes pipeline loss.

Source: National Energy Information Administration Project Independence Evaluation System Reports.



Source: NPC Future Petroleum Provinces of the United States (July 1970).

Figure C-2 National Petroleum Council's Supply Regions

Source: Project Independence Evaluation System Documentation, Volume 14, Federal Energy Administration, Washington, D.C. 1977

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year)
Scenario: MRTSF
Year: 1985

NPC Region	Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production			
1N. North Slope	263.2	803.8	8.7
1S. South Alaska		301.9	
2. Pacific Coast			
3. W. Rocky Mtns.		278.1	
4. E. Rocky Mtns.	9.8	128.5	0.3
5. W. Tex. & E.N. Mex.	47.8	317.9	1.6
6. W. Gulf Basin	381.1	1,253.3	12.7
7. Midcontinent	271.2	667.6	9.0
8-9. Mi Basin, Int.	4.5	4.5	0.1
10. Appalachians	36.0	119.6	1.2
11. Atlantic Coast			
Total Onshore	1,013.5	3,875.2	--
2A. Pacific Ocean		128.5	
6A. Gulf of Mexico	943.9	2,496.1	31.4
11A. Atlantic Ocean		221.3	
Total Offshore	943.0	2,845.9	--
New Interstate Onshore	129.1	464.7	4.3
Intrastate Refinery Consumption		1,001.2	
Intrastate Other	44.0	8,749.2	1.5
Synthetics	274.0	872.2	9.1
Total Domestic Production	2,404.5	17,808.4	--
Imports	605.7	1,842.9	20.1
Total Supply	3,010.3	19,651.3	100.0

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year) (Cont'd)
Scenario: MRTSF
Year: 1990

NPC Region	Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production			
1N. North Slope	289.4	884	9.3
1S. South Alaska		535.5	
2. Pacific Coast			
3. W. Rocky Mtns.		190.3	
4. E. Rocky Mtns.	6.5	85.7	0.2
5. W. Tex. & E.N. Mex.	28.4	188.3	0.9
6. W. Gulf Basin	216.4	711.4	6.9
7. Midcontinent	156.9	386.4	5.0
8-9. Mi Basin, Int.	3.7	3.7	0.1
10. Appalachians	22.5	74.9	0.7
11. Atlantic Coast			
Total Onshore	724.0	3,060.6	-
2A. Pacific Ocean		148.9	
6A. Gulf of Mexico	880.0	2,327.5	28.3
11A. Atlantic Ocean		298.7	
Total Offshore	880.0	2,775.1	-
New Interstate Onshore			
Intrastate Refinery Consumption		999.8	
Intrastate Other	34.1	10,063.1	1.1
Synthetics	274.0	997.9	8.8
Total Domestic Production	1,912.1	17,896.4	-
Imports	1,192.8	2,427.5	38.4
Total Supply	3,104.9	20,324.0	100.0

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year) (Cont'd)
Scenario: MRTSC
Year: 1985

NPC Region		Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production				
1N.	North Slope	263.2	803.8	8.7
1S.	South Alaska		301.9	
2.	Pacific Coast			
3.	W. Rocky Mtns.		278.1	
4.	E. Rocky Mtns.	9.8	128.5	0.3
5.	W. Tex. & E.N. Mex.	47.8	317.9	1.6
6.	W. Gulf Basin	381.1	1,253.3	12.7
7.	Midcontinent	271.2	667.6	9.0
8-9.	Mi Basin, Int.	4.5	4.5	0.1
10.	Appalachians	36.0	119.6	1.2
11.	Atlantic Coast			
	Total Onshore	1,013.5	3,875.2	--
2A.	Pacific Ocean		128.5	
6A.	Gulf of Mexico	943.9	2,496.1	31.4
11A.	Atlantic Ocean		221.3	
	Total Offshore	943.0	2,845.9	--
	New Interstate Onshore	129.1	464.7	4.3
	Intrastate Refinery Consumption		1,001.2	
	Intrastate Other	44.0	8,749.2	1.5
	Synthetics	274.0	872.2	9.1
	Total Domestic Production	2,404.5	17,808.4	--
	Imports	605.7	1,842.9	20.1
	Total Supply	3,010.3	19,651.3	100.0

Source: National Energy Information Administration
Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year) (Cont'd)
Scenario: MRTSC
Year: 1990

NPC Region	Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production			
1N. North Slope	289.4	884.5	9.7
1S. South Alaska		535.5	-
2. Pacific Coast			
3. W. Rocky Mtns.		190.3	
4. E. Rocky Mtns.	6.5	85.7	0.2
5. W. Tex. & E.N. Mex.	28.4	188.3	0.9
6. W. Gulf Basin	216.4	711.4	7.3
7. Midcontinent	156.9	386.4	5.3
8-9. Mi Basin, Int.	3.7	3.7	0.1
10. Appalachians	22.5	74.9	0.7
11. Atlantic Coast			
Total Onshore	724.0	3,060.6	-
2A. Pacific Ocean		148.9	
6A. Gulf of Mexico	880.0	2,327.5	29.6
11A. Atlantic Ocean		298.7	
Total Offshore	880.0	2,775.1	-
New Interstate Onshore			
Intrastate Refinery Consumption		856.0	
Intrastate Other	27.4	9,488.7	0.9
Synthetics	274.0	997.9	9.2
Total Domestic Production	1,905.5	17,178.3	-
Imports	1,063.2	2,507.6	35.8
Total Supply	2,968.6	19,685.8	100

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year) (Cont'd)
Scenario: HRCSA
Year: 1985

NPC Region		Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production				
1N.	North Slope	263.2	803.8	6.8
1S.	South Alaska		326.3	
2.	Pacific Coast			
3.	W. Rocky Mtns.		278.1	
4.	E. Rocky Mtns.	9.8	128.5	0.2
5.	W. Tex. & E.N. Mex.	47.8	317.9	1.2
6.	W. Gulf Basin	381.1	1,253.3	9.9
7.	Midcontinent	271.2	667.6	7.0
8-9.	Mi Basin, Int.	4.5	4.5	0.1
10.	Appalachians	36.0	119.6	0.9
11.	Atlantic Coast			
	Total Onshore	1,013.5	3,899.7	-
2A.	Pacific Ocean		127.4	
6A.	Gulf of Mexico	962.1	2,545.1	24.9
11A.	Atlantic Ocean		224.8	
	Total Offshore	962.1	2,897.3	-
	New Interstate Onshore	679.5	2,450.1	17.6
	Intrastate Refinery Consumption		916.8	
	Intrastate Other	47.3	8.710.8	1.2
	Synthetics	274.0	920.6	7.1
	Total Domestic Production	2,976.4	19,795.4	
	Imports	879.1	1,576.9	22.8
	Total Supply	3,855.6	21,372.3	100.0

Source: National Energy Information Administration
Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year) (Cont'd)
Scenario: HRCSA
Year: 1990

NPC Region		Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production				
1N.	North Slope	289.4	884.5	9.4
1S.	South Alaska		700.8	
2.	Pacific Coast			
3.	W. Rocky Mtns.		190.3	
4.	E. Rocky Mtns.	6.5	85.7	0.2
5.	W. Tex. & E.N. Mex.	28.4	188.3	0.9
6.	W. Gulf Basin	216.4	711.4	7.0
7.	Midcontinent	156.9	386.4	5.0
8-9.	Mi Basin, Int.	3.7	3.7	0.1
10.	Appalachians	22.5	74.9	0.7
11.	Atlantic Coast			
	Total Onshore	724.0	3,225.9	--
2A.	Pacific Ocean		148.9	
6A.	Gulf of Mexico	944.6	2,498.8	30.6
11A.	Atlantic Ocean		340.8	
	Total Offshore	944.6	2,988.5	--
	New Interstate Onshore	5.1	17.0	0.2
	Intrastate Refinery Consumption		916.2	
	Intrastate Other	38.6	10,555.1	1.2
	Synthetics	344.7	1,210.2	10.8
	Total Domestic Production	2,047.0	18,912.9	--
	Imports	1,044.1	2,180.1	33.8
	Total Supply	3,091.1	21,093.0	100.0

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year) (Cont'd)
Scenario: HRCSD
Year: 1985

NPC Region		Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production				
1N.	North Slope	263.2	803.8	6.9
1S.	South Alaska		181.1	
2.	Pacific Coast			
3.	W. Rocky Mtns.		278.1	
4.	E. Rocky Mtns.	9.8	128.5	0.2
5.	W. Tex. & E.N. Mex.	47.8	317.9	1.3
6.	W. Gulf Basin	381.1	1,253.3	10.0
7.	Midcontinent	271.2	667.6	7.2
8-9.	Mi Basin, Int.	4.5	4.5	0.1
10.	Appalachians	36.0	119.6	0.9
11.	Atlantic Coast			
	Total Onshore	1,013.5	3,754.4	--
2A.	Pacific Ocean		124.4	
6A.	Gulf of Mexico	962.1	2,545.1	25.5
11A.	Atlantic Ocean		224.8	
	Total Offshore	962.1	2,897.3	--
	New Interstate Onshore	819.2	2,905.8	21.7
	Intrastate Refinery Consumption		973.9	
	Intrastate-Other	47.3	8,165.5	1.3
	Synthetics	274.0	920.6	7.2
	Total Domestic Production	3,116.2	19,617.5	--
	Imports	664.1	1,229.0	17.6
	Total Supply	3,780.3	20,846.5	100.0

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year)(Cont'd)
Scenario: HRCSD
Year: 1990

NPC Region		Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production				
1N.	North Slope	289.4	884.5	8.7
1S.	South Alaska		700.8	
2.	Pacific Coast			
3.	W. Rocky Mtns.		190.3	
4.	E. Rocky Mtns.	6.5	85.7	0.2
5.	W. Tex. & E.N. Mex.	28.4	188.3	0.9
6.	W. Gulf Basin	216.4	711.4	6.5
7.	Midcontinent	156.9	386.4	4.7
8-9.	Mi Basin, Int.	3.7	3.7	0.1
10.	Appalachians	22.5	74.9	0.6
11.	Atlantic Coast			
	Total Onshore	724.0	3,225.9	
2A.	Pacific Ocean		148.9	
6A.	Gulf of Mexico	944.6	2,498.8	28.4
11A.	Atlantic Ocean		340.8	
	Total Offshore	944.6	2,988.5	
	New Interstate Onshore	96.2	347.3	2.9
	Intrastate Refinery Consumption		972.7	
	Intrastate Other	38.6	9,939.5	1.2
	Synthetics	408.7	1,210.2	12.3
	Total Domestic Production	2,212.1	18,684.2	-
	Imports	1,113.2	2,027.0	33.5
	Total Supply	3,325.3	20,711.2	100

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year) (Cont'd)
Scenario: LRCSE
Year: 1985

NPC Region		Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production				
1N.	North Slope	263.2	803.8	9.5
1S.	South Alaska		176.3	
2.	Pacific Coast			
3.	W. Rocky Mtns.		278.1	
4.	E. Rocky Mtns.	9.8	128.5	0.3
5.	W. Tex. & E.N. Mex.	47.8	317.8	1.7
6.	W. Gulf Basin	381.1	1,253.3	13.7
7.	Midcontinent	271.2	667.6	9.7
8-9.	Mi Basin, Int.	4.5	4.5	0.1
10.	Appalachians	36.0	119.6	1.3
11.	Atlantic Coast			
	Total Onshore	1,013.5	3,749.6	-
2A.	Pacific Ocean		128.8	
6A.	Gulf of Mexico	914.7	2,419.0	32.9
11A.	Atlantic Ocean		154.2	
	Total Offshore	914.7	2,702.0	-
	New Interstate Onshore	10.9	35.9	0.4
	Intrastate Refinery Consumption		856.0	
	Intrastate Other	40.0	7,809.7	1.4
	Synthetics	274.0	872.2	9.8
	Total Domestic Production	2,253.1	16,025.4	-
	Imports	529.3	1,935.0	19.0
	Total Supply	2,782.4	17,960.4	100

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year)(Cont'd)
Scenario: LRCSE
Year: 1990

NPC Region		Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production				
1N.	North Slope	289.4	884.5	10.0
1S.	South Alaska		209.1	
2.	Pacific Coast			
3.	W. Rocky Mtns.		190.3	
4.	E. Rocky Mtns.	6.5	85.7	0.2
5.	W. Tex. & E.N. Mex.	28.4	188.3	0.9
6.	W. Gulf Basin	216.4	711.4	7.5
7.	Midcontinent	156.9	386.4	5.4
8-9.	Mi Basin, Int.	3.7	3.7	0.1
10.	Appalachians	22.5	74.9	0.7
11.	Atlantic Coast			
	Total Onshore	724.0	2,734.2	--
2A.	Pacific Ocean		146.7	
6A.	Gulf of Mexico	792.0	2,094.8	27.5
11A.	Atlantic Ocean		195.1	
	Total Offshore	792.0	2,436.6	--
	New Interstate Onshore			
	Intrastate Refinery Consumption			
	Intrastate Other	22.1	7,660.3	0.7
	Synthetics	274.0	997.9	9.5
	Total Domestic Production	1,812.2	13,829.0	--
	Imports	1,070.7	2,557.0	37.1
	Total Supply	2,882.8	16,386.0	100.0

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year)(Cont'd)
Scenario: LRCSB
Year: 1985

NPC Region	Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production			
1N. North Slope	263.2	803.8	9.6
1S. South Alaska		176.3	
2. Pacific Coast			
3. W. Rocky Mtns.		278.1	
4. E. Rocky Mtns.	9.8	128.5	0.3
5. W. Tex. & E.N. Mex.	47.8	317.9	1.7
6. W. Gulf Basin	281.1	1,253.3	13.9
7. Midcontinent	271.2	667.6	9.9
8-9. Mi Basin, Int.	4.5	4.5	0.1
10. Appalachians	36.0	119.6	1.3
11. Atlantic Coast			
Total Onshore	1,013.5	3,749.6	--
2A. Pacific Ocean		128.8	
6A. Gulf of Mexico	914.7	2,419.0	33.3
11A. Atlantic Ocean		154.2	
Total Offshore	914.7	2,702.0	--
New Interstate Onshore	6.3	20.7	0.2
Intrastate Refinery Consumption		856.0	
Intrastate Other	40.0	8,185.5	1.5
Synthetics	274.0	872.2	9.9
Total Domestic Production	2,248.5	16,386.0	--
Imports	495.6	2,014.1	18.0
Total Supply	2,744.1	18,400.1	100.0

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-14 Gas Production and Distribution Summary by National Petroleum Council (NPC) Region and Scenario for the Midwest and United States (BCF per year)(Cont'd)
Scenario: LRCSB
Year: 1990

NPC Region	Midwest Consumption	U.S. Consumption	Production Region as % of Midwest
Interstate Production			
1N. North Slope	287.4	884.5	10.2
1S. South Alaska		209.1	
2. Pacific Coast			
3. W. Rocky Mtns.		190.3	
4. E. Rocky Mtns.	6.5	85.7	0.2
5. W. Tex. & E.N. Mex.	28.4	188.3	1.0
6. W. Gulf Basin	216.4	711.4	7.7
7. Midcontinent	156.9	386.4	5.6
8-9. Mi Basin, Int.	3.7	3.7	0.1
10. Appalachians	22.5	74.9	0.8
11. Atlantic Coast			
Total Onshore	724.0	2,734.2	-
2A. Pacific Ocean		146.7	
6A. Gulf of Mexico	792.0	2,094.8	28.3
11A. Atlantic Ocean		195.1	
Total Offshore	792.0	2,436.6	-
New Interstate Onshore			
Intrastate Refinery Consumption			
Intrastate Other	22.1	8,086.2	0.7
Synthetics	274.0	997.9	9.8
Total Domestic Production	1,812.2	14,254.9	-
Imports	986.5	2,557.0	35.2
Total Supply	2,798.6	16,811.9	100.0

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-15 Intrastate Regional Wellhead Gas Gas Price by Scenario and Region for 1985 and 1990 (1978 $/MCF)

Scenario	MRTSF		MRTSC		HRCSA		HRCSD		LRCSE		LRCSB	
Region	1985	1990	1985	1990	1985	1990	1985	1990	1985	1990	1985	1990
New England	3.75	5.01	3.75	3.69	2.77	3.65	3.04	3.54	2.97	3.76	2.91	3.83
New York/ New Jersey	3.54	4.50	3.54	3.15	2.97	3.10	2.99	3.06	3.02	3.14	3.03	3.20
Mid-Atlantic	1.66	1.78	1.66	1.87	1.61	1.87	1.60	1.79	1.72	1.85	1.76	1.89
South-Atlantic	2.98	3.32	2.98	2.80	2.39	2.72	2.47	2.49	2.68	2.79	2.69	2.84
Midwest	2.98	4.69	2.98	3.30	2.49	3.23	2.45	3.15	2.54	3.28	2.55	3.34
Southwest	1.74	2.30	1.74	2.42	1.71	1.82	1.69	1.74	2.23	2.64	2.23	2.73
Central	2.94	3.16	2.94	2.80	1.73	2.78	1.71	2.51	2.71	2.79	2.72	2.82
North Central	2.01	2.33	2.01	2.41	2.05	2.39	1.87	2.22	2.29	2.42	2.31	2.44
West	2.98	3.18	2.98	2.65	2.49	2.62	2.47	2.59	2.50	2.68	2.55	2.75
North West	-	-	-	-	-	-	-	-	-	-	-	-

Source: National Energy Information Administration Project Independence Evaluation System Reports.

Table C-16 Projected Consumption and Prices by Fuel, Sector, Scenario and Year for the Midwest and U.S.[1]
Scenario: MRTSF
Year: 1985

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Midwest Retail Price $/Unit	Average Midwest Retail Price $/MMBTU
Residential	3,292.4	11,843.7	1.6	1.7	-	5.03
Electricity	468.2	2,858.3	2.0	3.6	43.29	12.69
Distillate	883.9	2,995.8	5.5	3.2	25.34	4.35
Liquid Gas	152.6	590.5	- .4	-.2	20.22	5.04
Coal	10.5	22.7	-13.7	-14.8	39.78	1.77
Natural Gas	1,777.1	5,376.4	.5	.6	3.47	3.36
Commercial	1,721.7	7,579.6	- .3	.3	-	5.69
Electricity	411.8	2,354.7	3.3	3.7	43.16	12.65
Distillate	292.1	1,303.2	3.5	3.0	24.24	4.16
Residual	164.8	957.5	.9	- .2	23.03	3.66
Liquid Gas	15.4	54.5	-1.4	-2.0	18.22	4.54
Coal	5.6	12.2	-13.7	-14.8	39.78	1.77
Asphalt	240.2	1,049.3	- .4	.1	22.48	3.75
Natural Gas	591.8	1,848.2	-3.2	-3.3	3.13	3.03
Raw Material[2]	414.6	4,755.1	6.1	7.1	-	3.81
Liquid Gas	191.1	2,991.6	8.8	8.7	22.44	4.28
Oil	151.4	726.6	3.8	4.1	22.48	3.75
Natural Gas	72.1	1,036.9	5.2	5.5	2.79	2.70
Industrial[3]	4,779.0	22,012.4	1.9	3.5	-	4.09
Electricity	997.4	4,306.0	6.8	7.0	31.42	9.21
Distillate	428.8	1,416.1	16.3	11.5	24.22	4.16
Residual	208.8	1,583.9	7.6	7.2	22.88	3.64
Liquid Gas	348.1	968.6	18.5	11.9	19.54	4.87
Coal	1,148.4	2,391.7	7.1	5.6	19.78	1.77
Met Coal[4]	998.4	2,587.2	.2	1.2	54.91	2.03
Naptha	107.0	480.4	4.7	5.5	22.44	4.28
Natural Gas	542.1	8,278.6	-10.0	.4	2.79	2.70
Transportation	3,991.0	21,158.0	1.4	1.3	-	6.25
Electricity	1.2	13.8	- .8	- .6	36.85	10.80
Distillate	477.3	2,463.3	.6	.5	30.90	5.30
Residual	9.9	598.7	-4.5	-2.0	22.88	3.64
Liquid Gas	1.9	21.2	1.2	1.8	18.22	4.54
Gasoline	3,137.6	15,413.2	1.4	1.7	34.35	6.55
Set Fuel	265.7	2,233.9	1.6	2.1	25.71	4.61
Natural Gas	97.4	413.9	6.2	-3.7	-	-
Total Consumption (or avg. price)	14,198.8	67,348.8	1.3	1.8	-	5.10

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 2872.02; and refinery gas consumption of 1033.29; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel, Sector, Scenario and Year for the Midwest and U.S.[1] (Cont'd)
Scenario: MRTSF
Year: 1990

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Midwest Retail Price $/Unit	Average Midwest Retail Price $/MMBTU
Residential	3,141.8	11,863.8	.8	1.2	--	6.45
Electricity	541.6	3,618.4	2.3	4.0	40.37	11.83
Distillate	842.2	2,832.1	3.3	1.7	31.17	5.35
Liquid Gas	142.9	565.4	-.7	-.4	25.63	6.39
Coal	6.9	14.8	-11.9	-12.7	42.35	1.88
Natural Gas	1,608.3	4,833.1	-.3	-.3	5.41	5.24
Commercial	1,578.9	7,465.4	-.8	.1	--	7.19
Electricity	506.6	2,826.2	3.6	3.7	41.10	12.05
Distillate	288.9	1,308.9	2.2	2.0	30.07	5.16
Residual	138.3	818.3	-.6	-1.2	29.04	4.62
Liquid Gas	14.2	46.8	-1.4	-2.4	23.62	5.89
Coal	3.7	8.0	-11.9	-12.6	42.35	1.88
Asphalt	263.2	1,149.5	.4	.6	28.36	4.73
Natural Gas	364.1	1,307.7	-5.3	-4.5	5.07	4.91
Raw Material [2]	518.1	5,998.1	5.6	6.3	--	4.96
Liquid Gas	242.3	3,817.7	7.5	7.5	27.77	5.29
Oil	179.5	861.2	3.7	3.9	28.36	4.73
Natural Gas	96.4	1,319.1	5.4	5.3	4.72	4.58
Industrial [3]	5,355.0	25,737.0	2.0	3.4	--	5.19
Electricity	1,226.9	5,245.1	5.9	6.0	36.53	10.71
Distillate	381.6	1,563.0	9.7	8.2	30.05	5.16
Residual	170.3	1,827.9	3.6	5.7	28.89	4.59
Liquid Gas	300.6	1,020.6	10.9	8.2	24.94	6.22
Coal	1,040.9	2,600.6	4.0	4.3	42.35	1.88
Met Coal[4]	1,052.4	2,724.3	.5	1.2	59.09	2.19
Naptha	163.1	720.9	6.0	6.5	27.77	5.29
Natural Gas	1,019.2	10,034.6	-2.7	1.6	4.72	4.58
Transportation	4,175.4	22,662.9	1.2	1.3	--	7.33
Electricity	1.2	13.8	-.5	-.4	38.29	11.22
Distillate	468.7	2,486.1	.3	.4	36.73	6.31
Residual	10.0	608.3	-3.0	-1.2	28.89	4.59
Liquid Gas	1.7	18.6	-.1	.3	23.62	5.89
Gasoline	3,354.5	16,867.8	1.4	1.7	39.96	7.61
Set Fuel	257.9	2,257.9	.9	1.5	31.56	5.66
Natural Gas	81.5	410.4	2.8	-2.5	--	--
Total Consumption (or avg. price)	14,769.2	73,727.1	1.1	1.8	--	6.27

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 2915.82; and refinery gas consumption of 1031.79; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel,[1] Sector, Scenario and Year for the Midwest and U.S. (Cont'd)
Scenario: MRTSC
Year: 1985

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Midwest Retail Price $/Unit	Average Midwest Retail Price $/MMBTU
Residential	3,292.4	11,843.7	1.6	1.7	-	5.03
Electricity	468.2	2,858.3	2.0	3.6	43.29	12.69
Distillate	883.9	2,995.8	5.5	3.2	25.34	4.35
Liquid Gas	152.6	590.5	- .4	-.2	20.22	5.04
Coal	10.5	22.7	-13.7	-14.8	39.78	1.77
Natural Gas	1,777.1	5,376.4	.5	.6	3.47	3.36
Commercial	1,721.7	7,579.6	- .3	.3	-	5.69
Electricity	411.8	2,354.7	3.3	3.7	43.16	12.65
Distillate	292.1	1,303.2	3.5	3.0	24.24	4.16
Residual	164.8	957.5	.9	- .2	23.03	3.66
Liquid Gas	15.4	54.5	-1.4	-2.0	18.22	4.54
Coal	5.6	12.2	-13.7	-14.8	39.78	1.77
Asphalt	240.2	1,049.3	- .4	.1	22.48	3.75
Natural Gas	591.8	1,848.2	-3.2	-3.3	3.13	3.03
Raw Material [2]	414.6	4,755.1	6.1	7.1	-	3.81
Liquid Gas	191.1	2,991.6	8.8	8.7	22.44	4.28
Oil	151.4	726.6	3.8	4.1	22.48	3.75
Natural Gas	72.1	1,036.9	5.2	5.5	2.79	2.70
Industrial [3]	4,779.0	22,012.4	1.9	3.5	-	4.09
Electricity	997.4	4,306.0	6.8	7.0	31.42	9.21
Distillate	428.8	1,416.1	16.3	11.5	24.22	4.16
Residual	208.8	1,583.9	7.6	7.2	22.88	3.64
Liquid Gas	348.1	968.6	18.5	11.9	19.54	4.87
Coal	1,148.4	2,391.7	7.1	5.6	19.78	1.77
Met Coal [4]	998.4	2,587.2	.2	1.2	54.91	2.03
Naptha	107.0	480.4	4.7	5.5	22.44	4.28
Natural Gas	542.1	8,278.6	-10.0	.4	2.79	2.70
Transportation	3,991.0	21,158.0	1.4	1.3	-	6.25
Electricity	1.2	13.8	- .8	- .6	36.85	10.80
Distillate	477.3	2,463.3	.6	.5	30.90	5.30
Residual	9.9	598.7	-4.5	-2.0	22.88	53.64
Liquid Gas	1.9	21.2	1.2	1.8	18.22	4.54
Gasoline	3,137.6	15,413.2	1.4	1.7	34.35	6.55
Set Fuel	265.7	2,233.9	1.6	2.1	25.71	4.61
Natural Gas	97.4	413.9	6.2	-3.7	-	-
Total Consumption (or avg. price)	14,198.8	67,348.8	1.3	1.8	-	5.10

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 2840.78 ; and refinery gas consumption of 925.03 ; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel,[1] Sector, Scenario and Year for the Midwest and U.S. (Cont'd)
Scenario: MRTSC
Year: 1990

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	U.S. (%)	Average Midwest Retail Price $/Unit	$/MMBTU
Residential	3,483.2	12,783.2	1.5	1.7	--	5.20
Electricity	508.0	3,452.3	1.9	3.7	46.26	12.38
Distillate	996.9	3,411.7	4.5	3.0	23.11	3.97
Liquid Gas	179.1	715.2	.8	1.1	15.99	3.99
Coal	6.9	14.8	-11.9	-12.6	41.82	1.86
Natural Gas	1,792.2	5,189.1	.4	.1	4.10	3.98
Commercial	1,801.0	8,219.7	.1	.7	--	5.94
Electricity	484.9	2,782.0	3.3	3.6	42.17	12.36
Distillate	345.3	1,548.0	3.4	3.1	22.01	3.78
Residual	183.2	1,092.8	1.3	.8	20.75	3.30
Liquid Gas	15.7	56.6	-.8	-1.1	13.99	3.49
Coal	3.7	8.1	-11.9	-12.6	41.82	1.86
Asphalt	270.5	1,169.1	.5	.8	20.25	3.37
Natural Gas	497.7	1,563.0	-3.3	-3.3	3.76	3.64
Raw Material [2]	518.1	5,998.1	5.6	6.3	--	3.55
Liquid Gas	242.3	3,817.7	7.5	7.5	19.75	3.76
Oil	179.5	816.2	3.7	3.9	20.25	3.37
Natural Gas	96.4	1,319.1	5.4	5.3	3.42	3.31
Industrial [3]	5,516.2	26,281.2	2.3	3.5	--	4.31
Electricity	1,221.5	5,195.1	5.9	6.0	33.25	9.75
Distillate	546.1	2,004.5	12.4	10.1	21.99	3.77
Residual	237.9	2,143.4	5.9	6.8	20.60	3.28
Liquid Gas	454.8	1,452.5	14.0	10.7	15.31	3.82
Coal	1,308.1	3,006.4	5.6	5.3	41.82	1.86
Met Coal [4]	1,052.4	2,724.3	.5	1.2	57.87	2.14
Naptha	127.4	592.1	4.3	5.1	19.75	3.76
Natural Gas	567.9	9,162.9	-6.5	1.0	3.42	3.31
Transportation	4,300.3	23,278.1	1.4	1.5	--	5.87
Electricity	1.2	13.8	-.5	-.4	37.24	10.92
Distillate	506.0	2,682.6	.8	.9	28.67	4.92
Residual	10.0	603.8	-3.0	-1.3	20.60	3.28
Liquid Gas	1.7	18.6	-.1	.3	13.99	3.49
Gasoline	3,423.0	17,150.4	1.5	1.8	32.29	6.15
Set Fuel	277.1	2,404.4	1.4	1.9	23.53	4.22
Natural Gas	81.4	404.5	2.8	-2.6	--	--
Total Consumption (or avg. price)	15,618,8	76,560.2	1.5	2.1	--	5.10

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 3202.01; and refinery gas consumption of 883.40; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel,[1] Sector, Scenario and Year for the Midwest and U.S. (Cont'd)
Scenario: HRCSA
Year: 1985

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Midwest Retail $/Unit[6]	Average Midwest Price $/MMBTU[6]
Residential	3,416.1	12,329.6	2.0	2.1	-	4.54
Electricity	469.1	2,888.8	2.0	3.7	41.24	12.09
Distillate	937.9	3,200.6	6.2	3.8	21.95	3.77
Liquid Gas	170.6	658.2	.7	.9	15.79	3.94
Coal	10.5	22.7	-13.7	-14.8	39.32	1.75
Natural Gas	1,828.0	5,559.3	.8	.9	3.18	3.08
Commercial	1,814.3	8,093.7	.3	1.0	-	5.13
Electricity	416.6	2,382.4	3.4	3.8	41.15	12.06
Distillate	315.5	1,401.8	4.3	3.7	20.86	3.58
Residual	183.0	1,076.4	2.0	1.0	19.48	3.10
Liquid Gas	15.9	58.3	-1.0	-1.4	13.79	3.44
Coal	5.6	12.2	-13.7	-14.8	39.32	1.75
Asphalt	249.0	1,076.7	- .0	.3	19.06	3.18
Natural Gas	628.7	2,085.8	-2.6	-2.1	2.84	2.75
Raw Material[2]	427.1	4,987.6	6.4	7.6		3.22
Liquid Gas	197.7	3,148.7	9.2	9.3	18.69	3.56
Oil	151.4	706.6	3.8	4.1	19.06	3.18
Natural Gas	78.0	1,112.3	6.0	6.3	2.49	2.42
Industrial[3]	4,987.2	22,975.3	2.4	3.9		3.82
Electricity	988.7	4,283.5	6.4	7.0	32.23	9.45
Distillate	300.2	1,396.1	12.2	11.3	20.83	3.58
Residual	146.2	1,651.0	3.8	7.6	19.33	3.07
Liquid Gas	250.8	962.1	14.7	11.8	15.11	3.77
Coal	768.4	2,046.0	2.9	3.9	39.32	1.75
Met Coal[4]	1,030.2	2,670.1	.5	1.5	54.20	2.01
Naptha	109.3	487.7	4.9	5.7	18.69	3.56
Natural Gas	1,393.4	9,478.8	-1.0	1.8	2.49	2.42
Transportation	4,117.8	21,816.1	1.7	1.6	-	5.64
Electricity	1.2	13.8	- .8	- .6	36.42	16.67
Distillate	505.5	2,602.9	1.2	1.0	27.51	4.72
Residual	9.9	600.0	-4.5	-2.0	19.33	3.07
Liquid Gas	1.9	21.2	1.2	1.8	13.79	3.44
Gasoline	3,221.4	15,811.6	1.7	2.0	31.16	5.94
Set Fuel	279.6	2,345.8	2.1	2.6	22.40	4.02
Natural Gas	98.2	420.8	6.2	-3.5	-	-
Total Consumption (or avg. price)	14,762.5	70,202.1	1.6	2.2	-	4.64

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 2,868.33; and refinery gas consumption of 946.19 ; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel, Sector, Scenario and Year for the Midwest and U.S.[1] (Cont'd)
Scenario: HRCSA
Year: 1990

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Midwest Retail Price $/Unit	Average Midwest Retail Price $/MMBTU
Residential	3,473.9	12,796.9	1.5	1.7	-	5.18
Electricity	504.5	3,439.6	1.8	3.7	42.35	12.41
Distillate	1,000.3	3,421.1	4.5	3.0	22.74	3.90
Liquid Gas	178.3	741.5	.8	1.1	15.99	3.99
Coal	6.9	14.8	-11.9	-12.6	41.92	1.86
Natural Gas	1,783.9	5,209.9	.4	.2	4.11	3.98
Commercial	1,788.2	8,218.8	.1	.7	-	
Electricity	479.9	2,763.8	3.2	3.5	42.27	5.91
Distillate	345.2	1,545.7	3.4	3.1	21.65	12.39
Residual	183.2	1,091.5	1.3	.8	20.36	3.72
Liquid Gas	15.7	56.6	- .8	-1.1	13.99	3.24
Coal	3.7	8.1	11.9	-12.6	41.92	3.49
Asphalt	268.4	1,162.0	.5	.7	19.88	1.86
Natural Gas	492.1	1,591.1	-3.3	-3.2	3.77	3.31
Raw Material [2]	521.5	6,060.4	5.6	6.4	-	3.65
Liquid Gas	244.0	3,859.9	7.5	7.5	19.42	3.50
Oil	179.5	861.2	3.7	3.9	19.88	3.70
Natural Gas	98.0	1,339.3	5.6	5.4	3.43	3.31
Industrial [3]	5,561.8	27,126.8	2.3	3.7		3.32
Electricity	1,230.1	5,227.7	5.9	6.0	33.35	4.31
Distillate	525.2	1,910.9	12.1	9.7	21.63	9.77
Residual	228.7	2,109.3	5.6	6.7	20.20	3.71
Liquid Gas	435.5	1,360.2	13.7	10.3	15.31	3.21
Coal	1,249.6	2,812.1	5.3	4.8	41.92	3.82
Met Coal [4]	1,068.9	2,767.4	.6	1.3	57.96	1.86
Naptha	129.9	610.9	4.4	5.3	19.42	2.15
Natural Gas [5]	693.9	10,328.3	-5.2	1.8	3.43	3.70
Transportation	4,281.3	23,181.9	1.4	1.5	-	3.32
Electricity	1.2	13.8	- .5	- .4	37.31	5.80
Distillate	508.0	2,693.4	.8	.9	28.31	10.93
Residual	10.0	603.9	-3.0	-1.3	20.20	4.86
Liquid Gas	1.7	18.6	- .1	.3	13.99	3.21
Gasoline	3,403.7	17,049.8	1.5	1.8	31.89	3.49
Set Fuel	271.3	2,354.1	1.2	1.8	23.18	6.08
Natural Gas	85.4	448.3	3.2	-1.9	-	4.16
Total Consumption (or avg. price)	15,626.7	77,384.8	1.5	2.1	-	5.07

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 3,021.55; and refinery gas consumption of 863.40 ; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel,[1] Sector, Scenario and Year for the Midwest and U.S. (Cont'd)
Scenario: HRCSD
Year: 1985

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975: Midwest (%)	Growth in Consumption from 1975: U.S. (%)	Average Midwest Retail Price: $/Unit	Average Midwest Retail Price: $/MMBTU
Residential	3,368.6	12,102.0	1.9	1.9	-	4.47
Electricity	462.9	2,816.1	1.9	3.5	40.44	11.85
Distillate	920.0	3,115.0	6.0	3.6	21.77	3.74
Liquid Gas	166.8	642.9	.5	.6	15.79	3.94
Coal	10.5	22.8	-13.7	-14.8	38.73	1.72
Natural Gas	1,808.4	5,504.4	.7	.8	3.11	3.01
Commercial	1,746.9	7,793.4	- .1	.6	-	5.05
Electricity	404.7	2,312.9	3.1	3.5	40.36	11.83
Distillate	304.8	1,347.9	3.9	3.3	20.67	3.55
Residual	176.3	1,015.9	1.6	.4	19.24	3.06
Liquid Gas	15.9	48.3	- 1.0	- 1.4	13.79	3.44
Coal	5.7	12.3	-13.7	-14.8	38.73	1.72
Asphalt	227.7	1,007.4	- .9	- .3	18.89	3.15
Natural Gas	611.9	2,038.6	- 2.9	- 2.4	2.77	2.68
Raw Material [2]	409.8	4,666.7	5.9	6.9	-	3.18
Liquid Gas	188.6	2,931.7	8.7	8.5	18.48	3.52
Oil	151.4	726.6	3.8	4.1	18.89	3.15
Natural Gas	69.8	1,008.4	4.8	5.2	2.43	2.35
Industrial [3]	4,712.9	21,638.8	1.8	3.3	-	3.72
Electricity	929.6	4,031.5	6.0	6.3	31.44	9.21
Distillate	247.6	1,260.2	10.1	10.2	20.65	3.54
Residual	121.9	1,511.9	1.9	6.7	19.09	3.04
Liquid Gas	206.8	868.5	12.5	10.7	15.11	3.77
Coal	637.9	1,831.7	1.0	2.8	38.73	1.72
Met Coal [4]	999.3	2,589.6	.2	1.2	53.56	1.98
Naptha	99.8	443.5	4.0	4.7	18.48	3.52
Natural Gas	1,470.0	9,101.9	- .5	1.4	2.43	2.35
Transportation	3,859.9	20,428.9	1.1	1.0	-	5.61
Electricity	1.2	13.8	- .8	- .6	35.71	10.47
Distillate	475.1	2,437.5	.6	.4	27.33	4.69
Residual	9.9	599.0	- 4.5	- 2.0	19.09	3.04
Liquid Gas	1.9	21.2	1.1	1.7	13.79	3.44
Gasoline	3,016.7	14,806.4	1.0	1.3	30.96	5.90
Set Fuel	256.9	2,152.4	1.3	1.8	22.19	3.98
Natural Gas	98.2	398.7	6.2	- 4.0	-	-
Total Consumption (or avg. price)	14,098.1	66,629.7	1.2	1.7	-	4.56

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 2883.26; and refinery gas consumption of 1005.08; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal \$/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products \$/BBL.
Natural Gas - \$/MCF.
Electricity - \$/MKWH.

Table C-16 Projected Consumption and Prices by Fuel, Sector, Scenario and Year for the Midwest and U.S.[1] (Cont'd)
Scenario: HRCSD
Year: 1990

Sector/Year	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Retail $/Unit	Midwest Price $/MMBTU
Residential	3,400.3	12,486.3	1.3	1.5		5.12
Electricity	495.7	3,311.7	1.7	3.4	41.25	12.09
Distillate	983.2	3,339.8	4.4	2.8	22.27	3.82
Liquid Gas	173.0	688.7	.6	.9	15.99	3.99
Coal	6.9	15.0	-11.8	-12.6	41.48	1.84
Natural Gas	1,741.4	5,131.1	.2	.1	4.12	3.99
Commercial	1,686.8	7,818.8	- .3	.4		5.84
Electricity	463.0	2,658.0	3.0	3.3	41.17	12.07
Distillate	333.1	1,483.8	3.2	2.9	21.17	3.64
Residual	176.0	1,035.0	1.1	.4	19.78	3.15
Liquid Gas	15.7	56.6	- .8	-1.1	13.99	3.49
Coal	3.7	8.1	-11.8	-12.5	41.48	1.84
Asphalt	237.3	1,058.5	- .3	.1	19.40	3.23
Natural Gas	458.1	1,518.8	-3.8	-3.5	3.77	3.66
Raw Material [2]	504.8	5,753.5	5.4	6.0		3.42
Liquid Gas	235.5	3,652.1	7.3	7.1	18.93	3.61
Oil	179.5	861.2	3.7	3.9	19.40	3.23
Natural Gas	89.9	1,240.2	5.0	4.9	3.43	3.33
Industrial [3]	5,031.3	24,702.8	1.6	3.1		4.27
Electricity	1,125.1	4,760.8	5.3	5.3	32.25	9.45
Distillate	379.3	1,605.5	9.7	8.4	21.15	3.63
Residual	166.2	1,856.1	3.4	5.8	19.63	3.12
Liquid Gas	311.6	1,114.2	11.2	8.8	15.31	3.82
Coal	893.3	2,265.5	2.9	3.3	41.48	1.84
Met Coal[4]	1,007.7	2,607.8	.2	.9	57.20	2.12
Naptha	121.8	572.7	4.0	4.9	18.93	3.61
Natural Gas	1,026.3	9,920.2	-2.7	1.5	3.43	3.33
Transportation	3,921.3	21,217.6	.8	.9		5.71
Electricity	1.2	13.8	- .5	- .4	36.35	10.65
Distillate	466.5	2,464.8	.3	.3	27.83	4.78
Residual	10.0	603.4	-3.0	-1.3	19.63	3.12
Liquid Gas	1.7	18.5	- .1	.3	13.99	3.49
Gasoline	3,109.0	15,566.2	.9	1.2	31.41	5.99
Set Fuel	243.7	2,108.9	.5	1.0	26.67	4.07
Natural Gas[5]	89.3	442.0	3.5	-2.0	-	-
Total Consumption (or avg. price)	15,444.5	71,978.9	1.0	1.6	-	5.01

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 2941.36; and refinery gas consumption of 1003.86; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel,[1] Sector, Scenario and Year for the Midwest and U.S. (Cont'd)
Scenario: LRCSE
Year: 1985

Sector/Year	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Retail $/Unit	Midwest Price $/MMBTU
Residential	3,329.8	11,838.2	1.8	1.7		4.58
Electricity	463.1	2,814.0	1.9	3.5	40.55	11.88
Distillate	909.8	3,105.4	5.8	3.5	22.25	3.82
Liquid Gas	166.0	642.8	.4	.6	15.99	3.99
Coal	10.6	22.8	-13.7	-14.7	39.46	1.75
Natural Gas	1,780.4	5,253.3	.5	.3	3.24	3.14
Commercial	1,719	7,538.9	-.3	.3		5.18
Electricity	405.6	2,312.1	3.1	3.5	40.47	11.86
Distillate	301.0	1,340.4	3.8	3.3	21.15	3.63
Residual	173.5	1,020.7	1.4	.5	19.79	3.15
Liquid Gas	15.9	58.3	-1.0	-1.4	13.99	3.48
Coal	5.7	12.3	13.7	-14.7	39.46	1.75
Asphalt	227.0	1,005.8	-.9	-.4	19.37	3.23
Natural Gas	590.6	1,789.3	-3.2	-3.6	2.90	2.81
Raw Material [2]	409.8	4,666.7	5.8	6.9		3.28
Liquid Gas	188.6	2,931.7	8.7	8.5	18.95	3.61
Oil	151.4	726.6	3.8	4.1	19.37	3.23
Natural Gas	69.8	1,008.4	4.8	5.2	2.56	2.48
Industrial [3]	4,695.0	2,1056.1	1.7	3.0		3.86
Electricity	940.0	4,049.9	6.1	6.4	31.55	9.25
Distillate	483.4	1,556.4	17.7	12.6	21.13	3.63
Residual	232.4	1,665.1	8.7	7.7	19.64	3.12
Liquid Gas	401.3	1,126.8	20.2	13.6	15.31	3.82
Coal	1,241.4	2,533.4	7.8	6.2	39.46	1.75
Met Coal [4]	999.3	2,589.6	.2	1.2	54.18	2.01
Naptha	98.0	434.2	3.8	4.5	18.95	3.61
Natural Gas	299.2	7,100.7	-15.2	-1.1	2.56	2.48
Transportation	3,847.3	20,379.0	1.0	.9		5.70
Electricity	1.2	13.8	-.8	-.6	35.82	10.50
Distillate	471.7	2,429.4	.5	.3	27.81	4.77
Residual	9.9	599.8	-4.5	-2.0	19.64	3.12
Liquid Gas	1.9	21.2	1.1	1.7	13.99	3.49
Gasoline	3,010.6	14,782.1	1.0	1.3	31.42	5.99
Set Fuel	255.7	2,147.2	1.2	1.7	22.68	4.07
Natural Gas [5]	96.2	385.5	6.0	-4.4	-	-
Total Consumption (or avg. price)	14,001.0	65,478.9	1.1	1.5	-	4.68

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 2,840.52 and refinery gas consumption of 883.40 ; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel, Sector, Scenario and Year for the Midwest and U.S.[1] (Cont'd)
Sceario: LRCSE
Year: 1990

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Midwest Retail Price $/Unit	Average Midwest Retail Price $/MMBTU
Residential	3,379.7	12,294.5	1.3	1.4		5.17
Electricity	498.1	3,306.4	1.7	3.4	41.19	12.07
Distillate	963.1	3,289.1	4.3	2.7	22.99	3.95
Liquid Gas	173.1	690.4	.6	.9	15.99	3.98
Coal	6.9	14.8	-11.8	-12.7	41.35	1.84
Natural Gas	1,738.6	4,993.9	.2	- .1	4.13	4.00
Commercial	1,675.5	7,675.0	- .4	.3	-	5.92
Electricity	464.4	2,649.5	3.0	3.2	41.10	12.05
Distillate	326.1	1.460.8	3.0	2.7	21.89	3.76
Residual	171.2	1,015.6	.9	.3	20.58	3.28
Liquid Gas	15.7	56.6	- .8	-1.1	13.99	3.49
Coal	3.7	8.0	-11.9	-12.6	41.35	1.84
Asphalt	236.3	1,055.7	- .4	.1	20.17	3.36
Natural Gas	458.1	1.428.8	-3.8	-3.9	3.78	3.67
Raw Material [2]	504.8	5,753.5	5.4	6.0	-	3.53
Liquid Gas	235.5	3,652.1	7.3	7.1	19.61	3.74
Oil	179.5	861.2	3.7	3.9	20.17	3.36
Natural Gas	89.9	1,240.2	5.0	4.9	3.44	3.34
Industrial [3]	5,069.6	23,885.3	1.7	2.9	-	4.23
Electricity	1,125.9	4,778.3	5.3	5.4	32.18	9.43
Distillate	476.4	1,830.3	11.4	9.4	21.87	3.75
Residual	208.4	1,944.2	5.0	6.2	20.44	3.25
Liquid Gas	396.8	1,332.8	13.0	10.1	15.31	3.82
Coal	1,146.0	2,748.5	4.7	4.6	41.35	1.84
Met Coal [4]	1,007.7	2,607.8	.2	.9	57.28	2.12
Naptha	120.3	556.1	3.9	4.7	19.61	3.74
Natural Gas	588.2	8,087.2	-6.2	.1	3.44	3.34
Transportation	3,893.5	21,038.3	.8	.8	-	5.84
Electricity	1.2	13.8	- .5	- .4	36.28	10.63
Distillate	460.9	2,443.1	.2	.3	28.55	4.90
Residual	10.0	603.4	-3.0	-1.3	20.44	3.25
Liquid Gas	1.7	18.5	- .1	.3	13.99	3.49
Gasoline	3,100.1	15,524.3	.9	1.2	32.09	6.11
Set Fuel	242.0	2,098.1	.4	1.0	23.39	4.20
Natural Gas	77.7	337.1	2.5	-3.8	-	-
Total Consumption (or avg. price)	14,523.1	70,646.4	1.0	1.5	-	5.05

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 3,757.13; and refinery gas consumption of 863.40 ; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel,[1] Sector, Scenario and Year for the Midwest and U.S. (Cont'd)
Scenario: LRCSB
Year: 1985

Sector/Fuel	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975 Midwest (%)	Growth in Consumption from 1975 U.S. (%)	Average Midwest Retail Price $/Unit	Average Midwest Retail Price $/MMBTU
Residential	3,395.6	12,104.7	2.0	1.9		4.60
Electricity	469.0	2,883.3	2.0	3.7	41.39	12.13
Distillate	930.1	3,180.5	6.1	3.8	22.33	3.83
Liquid Gas	169.7	658.0	.7	.9	15.99	3.99
Coal	10.5	22.8	-13.7	-14.8	40.02	1.78
Natural Gas	1,816.2	5,360.2	.7	.5	3.23	3.13
Commercial	1,800.3	7,851.3	.2	.7	--	5.20
Electricity	416.6	2,378.5	3.4	3.8	41.30	12.11
Distillate	312.5	1,390.5	4.2	3.6	21.23	3.64
Residual	180.6	1,064.6	1.8	.9	19.91	3.17
Liquid Gas	15.9	58.3	-1.0	-1.4	13.99	3.49
Coal	5.7	12.3	-13.7	-14.8	40.02	1.78
Asphalt	248.4	1,075.3	-.0	.3	19.45	3.24
Natural Gas	620.7	1,871.8	-2.7	-3.2	2.89	2.80
Raw Material[2]	427.1	4,987.6	6.4	7.6	--	3.28
Liquid Gas	197.7	3,148.7	9.2	9.3	19.04	3.63
Oil	151.4	726.6	3.8	4.1	19.45	3.24
Natural Gas	78.0	1,112.3	6.0	6.3	2.55	2.47
Industrial[3]	4,981.3	22,400.1	2.3	3.6	--	3.94
Electricity	997.4	4,299.9	6.8	7.0	32.38	9.49
Distillate	547.2	1,746.9	19.2	13.8	21.21	3.64
Residual	262.1	1,848.2	10.0	8.8	19.75	3.14
Liquid Gas	453.9	1,267.7	21.7	15.0	15.31	3.82
Coal	1,399.5	2,852.4	9.2	7.4	40.02	1.78
Met Coal[4]	1,030.2	2,670.1	.5	1.5	55.21	2.04
Naptha	107.8	477.5	4.8	5.5	18.04	3.63
Natural Gas	183.2	7,237.8	-19.2	-.9	2.55	2.47
Transportation	4,106.9	21,742.5	1.7	1.6	--	3.63
Electricity	1.2	13.5	-.8	-.6	36.57	10.72
Distillate	502.6	2,586.1	1.2	1.0	27.89	4.79
Residual	9.9	599.9	-4.5	-2.0	19.75	3.14
Liquid Gas	1.9	21.2	1.2	1.8	13.99	3.49
Gasoline	3,216.4	15,793.3	1.7	1.9	31.52	6.01
Set Fuel	278.6	2,338.7	2.1	2.6	22.78	4.09
Natural Gas	96.2	389.4	6.0	-4.3	--	--
Total Consumption (or avg. price)	14,711.1	69,085.9	1.6	2.1	--	4.72

Notes 1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 3021.56; and refinery gas consumption of 883.40 ; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
Petroleum products $/BBL.
Natural Gas - $/MCF.
Electricity - $/MKWH.

Table C-16 Projected Consumption and Prices by Fuel, Sector, Scenario and Year for the Midwest and U.S. (Cont'd)
Scenario: LRCSB
Year: 1990

Sector/Year	Midwest Consumption 10^{12} BTU/Year	U.S. Consumption 10^{12} BTU/Year	Growth in Consumption from 1975: Midwest (%)	Growth in Consumption from 1975: U.S. (%)	Average Midwest Retail Price $/Unit	Average Midwest Retail Price $/MMBTU
Residential	3,462.7	12,657.9	1.4	1.6	-	5.21
Electricity	505.3	3,427.0	1.8	3.7	42.39	12.42
Distillate	986.0	3,377.1	4.4	2.8	23.37	4.01
Liquid Gas	178.4	712.8	.8	1.1	15.99	3.99
Coal	6.9	14.8	-11.9	-12.6	42.09	1.87
Natural Gas	1,786.1	5,126.2	.4	.1	4.09	3.96
Commercial	1,782.9	8,091.1	.1	.6	-	5.96
Electricity	479.9	2,749.3	3.2	3.5	42.31	12.40
Distillate	340.0	1,524.7	3.3	3.0	22.27	3.82
Residual	180.0	1,067.9	1.2	.6	21.00	3.34
Liquid Gas	15.7	56.6	- .8	-1.1	13.99	3.49
Coal	3.7	8.1	-11.9	-12.6	42.09	1.87
Asphalt	267.8	1,159.7	.5	.7	20.57	3.43
Natural Gas	495.7	1,524.9	-3.3	-3.5	3.75	3.63
Raw Material [2]	521.5	6,060.4	5.6	6.4	-	3.58
Liquid Gas	244.0	3,859.9	7.5	7.5	19.96	3.80
Oil	179.5	861.2	3.7	3.9	20.57	3.43
Natural Gas	98.0	1,339.3	5.6	5.4	3.41	3.30
Industrial [3]	5,581.7	26,237.3	2.3	3.5	-	4.31
Electricity	1,230.0	5,241.4	5.9	6.0	33.29	9.79
Distillate	587.7	2,124.4	12.9	10.5	22.25	3.82
Residual	256.0	2,212.9	6.4	7.1	20.85	3.32
Liquid Gas	490.9	1,565.4	14.6	11.3	15.31	3.82
Coal	1,411.5	3,240.8	6.1	5.8	42.09	1.87
Met Coal [4]	1,068.9	2,767.4	.6	1.3	58.21	2.16
Naptha	128.7	593.6	4.4	5.1	19.96	3.80
Natural Gas	408.0	8,491.4	-8.5	.5	3.41	3.30
Transportation	4,261.1	23,003.8	1.4	1.4	-	5.90
Electricity	1.2	13.8	- .5	- .4	37.35	10.95
Distillate	502.7	2,662.8	.8	.8	28.93	4.97
Residual	10.0	603.2	-3.0	-1.3	20.85	3.32
Liquid Gas	1.7	18.6	- .1	.3	13.99	3.49
Gasoline	3,397.7	17,621.7	1.5	1.8	32.43	6.18
Set Fuel	270.1	2,342.3	1.2	1.7	23.75	4.26
Natural Gas [5]	77.7	341.5	2.5	-3.7	-	--
Total Consumption (or avg. price)	15,609.9	76,050.5	1.5	2.0	-	5.11

Notes
1. Does not include utility fuel consumption or synthetics fuel consumption.
2. Liquid Gas in raw material sector includes Liquid Gas Feedstock.
3. Does not include refinery oil product consumption of 4128.14; and refinery gas consumption of 863.40 ; includes refinery coal consumption.
4. Met coal includes 70% premium coal and 30% Bituminous low sulfur coal.
5. Natural Gas Consumption in transportation includes pipeline loss.
6. Prices in 1978 dollars - Coal $/M.E. Ton (22.5 MMBTU/Ton).
   Petroleum products $/BBL.
   Natural Gas - $/MCF.
   Electricity - $/MKWH.

Table C-17 Total Gas Supply for the U.S. by Energy Scenario (BCF/year)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1976	20,850	20,850	20,850	20,850	20,850	20,850
1977	20,930	20,930	20,930	20,930	20,930	20,930
1978	20,000	20,000	20,000	20,000	20,000	20,000
1979	19,450	19,450	19,450	19,450	19,450	19,450
1980	19,483	19,441	19,770	19,682	19,201	19,275
1981	19,516	19,433	20,090	19,915	18,953	19,100
1982	19,550	19,425	20,411	20,148	18,705	18,925
1983	19,583	19,416	20,731	20,380	18,456	18,750
1984	19,616	19,408	21,051	20,613	18,208	18,575
1985	19,651	19,400	21,372	20,846	17,960	18,400
1986	19,785	19,457	21,316	20,819	17,645	18,082
1987	19,919	19,514	21,260	20,792	17,330	17,764
1988	20,054	19,571	21,204	20,765	17,015	17,447
1989	20,188	19,628	21,148	20,738	16,700	17,129
1990	20,324	19,685	21,093	20,711	16,386	16,812
1991	20,458	19,742	21,038	20,684	16,071	16,495
1992	20,592	19,799	20,983	20,657	15,756	16,178
1993	20,726	19,856	20,928	20,630	15,441	15,861
1994	20,860	19,913	20,873	20,603	15,126	15,544
1995	20,994	19,970	20,818	20,576	14,812	15,227
1996	21,128	20,027	20,763	20,549	14,497	14,910
1997	21,262	20,084	20,708	20,522	14,182	14,593
1998	20,396	20,141	20,653	20,495	13,867	14,276
1999	21,530	20,198	20,598	20,468	13,552	13,959
2000	21,664	20,255	20,543	20,441	13,238	13,642

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Note: Supply = U.S. Production + Imports

Table C-18 Midwest Residential Natural Gas Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	1.70	1.70	1.70	1.70	1.70	1.70
1976	1.85	1.82	1.82	1.81	1.83	1.83
1977	1.99	1.95	1.94	1.93	1.95	1.95
1978	2.14	2.07	2.06	2.04	2.08	2.08
1979	2.29	2.20	2.18	2.15	2.21	2.20
1980	2.44	2.32	2.30	2.27	2.34	2.33
1981	2.58	2.44	2.42	2.38	2.46	2.46
1982	2.73	2.57	2.54	2.49	2.59	2.58
1983	2.88	2.69	2.66	2.61	2.72	2.71
1984	3.02	2.82	2.78	2.72	2.84	2.83
1985	3.17	2.94	2.91	2.84	2.97	2.96
1986	3.53	3.10	3.08	3.03	3.13	3.12
1987	3.88	3.27	3.25	3.21	3.30	3.27
1988	4.24	3.43	3.42	3.40	3.46	3.43
1989	4.60	3.60	3.59	3.58	3.62	3.58
1990	4.95	3.76	3.76	3.77	3.78	3.74
1991	5.31	3.92	3.93	3.96	3.94	3.89
1992	5.66	4.09	4.10	4.14	4.10	4.05
1993	6.02	4.25	4.27	4.33	4.27	4.21
1994	6.37	4.42	4.44	4.51	4.43	4.36
1995	6.73	4.58	4.61	4.70	4.59	4.52
1996	7.09	4.74	4.78	4.89	4.75	4.68
1997	7.44	4.91	4.95	5.07	4.91	4.83
1998	7.79	5.07	5.12	5.26	5.08	4.99
1999	8.15	5.24	5.29	5.44	5.23	5.14
2000	8.51	5.40	5.46	5.63	5.40	5.30

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-19 Midwest Residential Electricity Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	10.80	10.80	10.80	10.80	10.80	10.80
1976	10.92	10.85	10.86	10.84	10.84	10.87
1977	11.04	10.91	10.92	10.88	10.88	10.93
1978	11.16	10.96	10.99	10.72	10.93	10.99
1979	11.28	11.02	11.05	10.96	10.96	11.06
1980	11.40	11.07	11.11	11.00	11.01	11.13
1981	11.51	11.12	11.17	11.04	11.05	11.20
1982	11.63	11.18	11.23	11.08	11.09	11.26
1983	11.75	11.23	11.30	11.12	11.14	11.33
1984	11.87	11.29	11.36	11.16	11.18	11.39
1985	11.99	11.34	11.42	11.20	11.22	11.46
1986	11.83	11.41	11.48	11.24	11.26	11.51
1987	11.67	11.48	11.54	11.29	11.29	11.57
1988	11.50	11.56	11.60	11.33	11.33	11.62
1989	11.34	11.63	11.66	11.38	11.36	11.68
1990	11.18	11.70	11.72	11.42	11.40	11.73
1991	11.02	11.77	11.78	11.46	11.44	11.78
1992	10.86	11.84	11.84	11.51	11.47	11.84
1993	10.69	11.92	11.90	11.55	11.47	11.84
1994	10.53	11.99	11.96	11.60	11.54	11.95
1995	10.37	12.06	12.02	11.64	11.58	12.00
1996	10.20	12.13	12.08	11.68	11.62	12.05
1997	10.05	12.20	12.14	11.73	11.65	12.11
1998	9.88	12.28	12,20	11.77	11.69	12.16
1999	9.72	12.35	12.26	11.82	11.72	12.22
2000	9.56	12.42	12.32	11.86	11.76	12.27

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-20 Midwest Residential Distillate Oil Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	2.86	2.86	2.86	2.86	2.86	2.86
1976	2.99	2.93	2.93	2.93	2.94	2.94
1977	3.11	3.00	3.00	2.99	3.01	3.01
1978	3.24	3.08	3.07	3.06	3.09	3.09
1979	3.36	3.15	3.14	3.13	3.16	3.16
1980	3.49	3.22	3.21	3.20	3.24	3.24
1981	3.61	3.29	3.28	3.26	3.31	3.31
1982	3.74	3.36	3.35	3.33	3.39	3.39
1983	3.86	3.44	3.42	3.40	3.46	3.46
1984	3.99	3.51	3.49	3.46	3.54	3.54
1985	4.11	3.58	3.56	3.53	3.61	3.61
1986	4.30	3.61	3.58	3.55	3.63	3.65
1987	4.49	3.65	3.60	3.56	3.66	3.68
1988	4.67	3.68	3.63	3.58	3.68	3.72
1989	4.86	3.72	3.66	3.59	3.71	3.75
1990	5.05	3.75	3.68	3.61	3.73	3.79
1991	5.24	3.78	3.70	3.63	3.75	3.83
1992	5.43	3.82	3.73	3.64	3.78	3.86
1993	5.61	3.85	3.75	3.66	3.80	3.90
1994	5.80	3.89	3.78	3.67	3.83	3.93
1995	5.99	3.92	3.80	3.69	3.85	3.97
1996	6.18	3.95	3.82	3.71	3.87	4.01
1997	6.37	3.99	3.85	3.72	3.90	4.04
1998	6.56	4.02	3.87	3.74	3.92	4.08
1999	6.74	4.06	3.90	3.75	3.95	4.11
2000	6.93	4.09	3.92	3.77	3.97	4.15

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-21 Midwest Commercial Natural Gas Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	1.43	1.43	1.43	1.43	1.43	1.43
1976	1.57	1.55	1.55	1.54	1.55	1.55
1977	1.72	1.67	1.66	1.65	1.67	1.67
1978	1.86	1.79	1.78	1.76	1.79	1.79
1979	2.00	1.91	1.90	1.87	1.92	1.92
1980	2.15	2.03	2.02	1.98	2.04	2.04
1981	2.29	2.15	2.13	2.09	2.16	2.16
1982	2.43	2.27	2.25	2.20	2.28	2.28
1983	2.57	2.39	2.37	2.31	2.40	2.40
1984	2.72	2.51	2.48	2.42	2.53	2.53
1985	2.86	2.63	2.60	2.53	2.65	2.65
1986	3.22	2.79	2.77	2.72	2.81	2.81
1987	3.57	2.95	2.94	2.90	2.98	2.96
1988	3.93	3.12	3.11	3.09	3.14	3.12
1989	4.28	3.28	3.28	3.27	3.30	3.27
1990	4.64	3.44	3.45	3.46	3.47	3.43
1991	4.98	3.60	3.62	3.65	3.63	3.59
1992	5.35	3.76	3.79	3.83	3.80	3.74
1993	5.71	3.93	3.96	4.02	3.96	3.90
1994	6.06	4.09	4.13	4.20	4.13	4.05
1995	6.42	4.25	4.30	4.39	4.29	4.21
1996	6.78	4.41	4.47	4.58	4.45	4.37
1997	7.13	4.57	4.64	4.76	4.62	4.52
1998	7.49	4.74	4.81	4.95	4.78	4.68
1999	7.84	4.90	4.98	5.13	4.95	4.83
2000	8.20	5.06	5.15	5.32	5.11	4.99

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-22 Midwest Commercial Electricity Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	10.56	10.56	10.56	10.56	10.56	10.56
1976	10.70	10.64	10.64	10.62	10.62	10.65
1977	10.84	10.71	10.73	10.68	10.69	10.74
1978	10.98	10.79	10.81	10.74	10.75	10.82
1979	11.12	10.86	10.89	10.81	10.82	10.91
1980	11.26	10.94	10.98	10.87	10.88	11.00
1981	11.39	11.02	11.06	10.93	10.94	11.09
1982	11.53	11.09	11.14	10.99	11.01	11.18
1983	11.67	11.17	11.22	11.05	11.07	11.26
1984	11.81	11.24	11.30	11.12	11.14	11.35
1985	11.95	11.32	11.39	11.18	11.20	11.44
1986	11.84	11.39	11.45	11.22	11.24	11.49
1987	11.72	11.46	11.52	11.27	11.27	11.55
1988	11.61	11.54	11.58	11.31	11.31	11.60
1989	11.49	11.61	11.64	11.36	11.34	11.66
1990	11.38	11.68	11.71	11.40	11.38	11.71
1991	11.27	11.75	11.77	11.44	11.42	11.76
1992	11.15	11.82	11.84	11.49	11.45	11.82
1993	11.04	11.90	11.90	11.53	11.49	11.87
1994	10.92	11.97	11.97	11.58	11.52	11.93
1995	10.81	12.04	12.03	11.62	11.56	11.98
1996	10.70	12.11	12.09	11.66	11.60	12.03
1997	10.58	12.18	12.16	11.71	11.63	12.09
1998	10.47	12.26	12.22	11.75	11.67	12.14
1999	10.35	12.33	12.29	11.80	11.70	12.20
2000	10.24	12.40	12.35	11.84	11.74	12.25

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-23 Midwest Commercial Distillate Oil Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	2.61	2.61	2.61	2.61	2.61	2.61
1976	2.74	2.69	2.69	2.68	2.69	2.69
1977	2.87	2.77	2.76	2.76	2.77	2.77
1978	3.01	2.85	2.84	2.83	2.86	2.86
1979	3.14	2.93	2.92	2.91	2.94	2.94
1980	3.27	3.01	2.99	2.98	3.02	3.02
1981	3.40	3.08	3.07	3.05	3.10	3.10
1982	3.53	3.16	3.15	3.12	3.18	3.18
1983	3.67	3.24	3.23	3.20	3.27	3.27
1984	3.80	3.32	3.30	3.28	3.35	3.35
1985	3.93	3.40	3.38	3.35	3.43	3.43
1986	4.12	3.43	3.41	3.37	3.45	3.47
1987	4.31	3.47	3.43	3.39	3.48	3.50
1988	4.50	3.50	3.46	3.40	3.50	3.54
1989	4.69	3.54	3.48	3.42	3.53	3.57
1990	4.88	3.57	3.51	3.44	3.55	3.61
1991	5.07	3.60	3.54	3.46	3.57	3.65
1992	5.26	3.64	3.56	3.48	3.60	3.68
1993	5.45	3.67	3.59	3.49	3.62	3.72
1994	5.64	3.71	3.61	3.51	3.65	3.75
1995	5.83	3.74	3.64	3.53	3.67	3.79
1996	6.02	3.77	3.67	3.55	3.69	3.83
1997	6.21	3.81	3.69	3.57	3.72	3.86
1998	6.40	3.84	3.72	3.58	3.74	3.90
1999	6.59	3.88	3.74	3.60	3.77	3.93
2000	6.78	3.91	3.77	3.62	3.79	3.97

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-24 Midwest Commercial Residual Oil Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	2.31	2.31	2.31	2.31	2.31	2.31
1976	2.43	2.37	2.37	2.37	2.38	2.38
1977	2.54	2.44	2.43	2.43	2.44	2.45
1978	2.66	2.50	2.50	2.48	2.51	2.51
1979	2.77	2.57	2.56	2.54	2.58	2.58
1980	2.88	2.63	2.62	2.60	2.64	2.65
1981	3.00	2.69	2.68	2.66	2.71	2.72
1982	3.12	2.76	2.74	2.72	2.78	2.79
1983	3.23	2.82	2.81	2.74	2.85	2.85
1984	3.35	2.89	2.87	2.83	2.91	2.92
1985	3.46	2.95	2.93	2.89	2.98	2.99
1986	3.64	2.98	2.96	2.91	3.00	3.02
1987	3.82	3.02	2.98	2.93	3.03	3.06
1988	4.00	3.05	3.01	2.94	3.05	3.09
1989	4.18	3.09	3.03	2.96	3.08	3.13
1990	4.36	3.12	3.06	2.98	3.10	3.16
1991	4.54	3.15	3.09	3.00	3.12	3.19
1992	4.72	3.19	3.11	3.02	3.15	3.23
1993	4.90	3.22	3.14	3.03	3.17	3.26
1994	5.08	3.26	3.16	3.05	3.20	3.30
1995	5.26	3.29	3.19	3.07	3.22	3.33
1996	5.44	3.32	3.21	3.09	3.24	3.36
1997	5.62	3.36	3.24	3.11	3.27	3.40
1998	5.80	3.39	3.27	3.12	3.29	3.43
1999	5.98	3.43	3.29	3.14	3.32	3.47
2000	6.16	3.46	3.32	3.16	3.34	3.50

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-25 Midwest Industrial Natural Gas Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	1.19	1.19	1.19	1.19	1.19	1.19
1976	1.33	1.30	1.30	1.29	1.30	1.30
1977	1.46	1.41	1.41	1.40	1.42	1.42
1978	1.60	1.53	1.52	1.50	1.54	1.53
1979	1.73	1.64	1.63	1.60	1.65	1.65
1980	1.87	1.75	1.74	1.71	1.77	1.76
1981	2.01	1.86	1.85	1.81	1.88	1.87
1982	2.14	1.97	1.96	1.91	2.00	1.99
1983	2.28	2.09	2.07	2.01	2.11	2.10
1984	2.41	2.20	2.18	2.12	2.23	2.22
1985	2.55	2.31	2.29	2.22	2.34	2.33
1986	2.91	2.47	2.46	2.41	2.50	2.49
1987	3.26	2.64	2.63	2.59	2.67	2.65
1988	3.62	2.80	2.80	2.78	2.83	2.80
1989	3.97	2.97	2.97	2.96	3.00	2.96
1990	4.33	3.13	3.14	3.15	3.16	3.12
1991	4.69	3.29	3.31	3.34	3.32	3.28
1992	5.04	3.46	3.48	3.52	3.49	3.44
1993	5.40	3.62	3.65	3.70	3.65	3.59
1994	5.75	3.79	3.82	3.89	3.82	3.75
1995	6.11	3.95	3.99	4.08	3.98	3.91
1996	6.46	4.11	4.16	4.27	4.14	4.07
1997	6.82	4.28	4.33	4.45	4.31	4.23
1998	7.18	4.44	4.50	4.64	4.47	4.38
1999	7.53	4.61	4.67	4.82	4.64	4.54
2000	7.89	4.77	4.84	5.01	4.80	4.70

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-26 Midwest Industrial Electricity Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	6.54	6.54	6.54	6.54	6.54	6.54
1976	6.76	6.77	6.78	6.76	6.76	6.78
1977	6.97	7.00	7.02	6.97	6.98	7.03
1978	7.19	7.23	7.26	7.19	7.20	7.27
1979	7.40	7.46	7.50	7.40	7.42	7.51
1980	7.62	7.70	7.74	7.62	7.64	7.76
1981	7.84	7.93	7.97	7.84	7.86	7.99
1982	8.05	8.16	8.21	8.05	8.08	8.24
1983	8.27	8.39	8.45	8.27	8.30	8.48
1984	8.48	8.62	8.69	8.48	8.52	8.72
1985	8.70	8.85	8.93	8.70	8.74	8.97
1986	8.98	8.92	8.99	8.75	8.77	9.03
1987	9.27	8.99	9.05	8.79	8.81	9.08
1988	9.55	9.07	9.11	8.84	8.84	9.14
1989	9.84	9.14	9.17	8.88	8.88	9.19
1990	10.12	9.21	9.23	8.93	8.91	9.25
1991	10.40	9.28	9.29	8.98	8.94	9.31
1992	10.69	9.35	9.35	9.02	8.98	9.36
1993	10.97	9.43	9.41	9.07	9.01	9.42
1994	11.26	9.50	9.47	9.11	9.05	9.47
1995	11.54	9.57	9.53	9.16	9.08	9.53
1996	11.82	9.64	9.59	9.21	9.11	9.59
1997	12.11	9.71	9.65	9.25	9.15	9.64
1998	12.39	9.79	9.71	9.30	9.18	9.70
1999	12.68	9.86	9.77	9.34	9.22	9.75
2000	12.96	9.93	9.83	9.39	9.25	9.81

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-27 Midwest Industrial Distillate Oil Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	2.61	2.61	2.61	2.61	2.61	2.61
1976	2.74	2.69	2.69	2.68	2.69	2.69
1977	2.87	2.77	2.76	2.76	2.77	2.77
1978	3.01	2.85	2.84	2.83	2.86	2.86
1979	3.14	2.93	2.92	2.90	2.94	2.94
1980	3.27	3.01	2.98	2.98	3.02	3.02
1981	3.40	3.08	3.07	3.05	3.10	3.10
1982	3.53	3.16	3.15	3.12	3.18	3.18
1983	3.67	3.24	3.23	3.19	3.27	3.27
1984	3.80	3.32	3.30	3.27	3.35	3.35
1985	3.93	3.40	3.38	3.34	3.43	3.43
1986	4.12	3.43	3.41	3.36	3.45	3.47
1987	4.31	3.46	3.43	3.38	3.47	3.50
1988	4.50	3.50	3.46	3.39	3.50	3.54
1989	4.69	3.53	3.48	3.41	3.52	3.57
1990	4.88	3.56	3.51	3.43	3.54	3.61
1991	5.07	3.59	3.54	3.45	3.56	3.65
1992	5.26	3.62	3.56	3.47	3.58	3.68
1993	5.45	3.66	3.59	3.48	3.61	3.72
1994	5.64	3.69	3.61	3.50	3.63	3.75
1995	5.83	3.72	3.64	3.52	3.65	3.79
1996	6.02	3.75	3.67	3.54	3.67	3.83
1997	6.21	3.78	3.69	3.56	3.69	3.86
1998	6.40	3.82	3.72	3.57	3.72	3.90
1999	6.59	3.85	3.74	3.59	3.74	3.93
2000	6.78	3.88	3.77	3.61	3.76	3.97

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-28 Midwest Industrial Residual Oil Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	2.31	2.31	2.31	2.31	2.31	2.31
1976	2.42	2.37	2.37	2.37	2.37	2.37
1977	2.54	2.43	2.43	2.42	2.44	2.44
1978	2.65	2.50	2.49	2.48	2.50	2.51
1979	2.76	2.56	2.55	2.53	2.57	2.57
1980	2.88	2.62	2.61	2.59	2.63	2.64
1981	2.99	2.68	2.66	2.65	2.69	2.71
1982	3.10	2.74	2.72	2.70	2.76	2.77
1983	3.21	2.81	2.78	2.76	2.82	2.84
1984	3.33	2.87	2.84	2.81	2.89	2.90
1985	3.44	2.93	2.90	2.87	2.95	2.97
1986	3.62	2.96	2.93	2.89	2.97	3.00
1987	3.80	3.00	2.95	2.90	3.00	3.04
1988	3.98	3.03	2.98	2.92	3.02	3.07
1989	4.16	3.07	3.00	2.93	3.05	3.11
1990	4.34	3.10	3.03	2.95	3.07	3.14
1991	4.52	3.13	3.06	2.97	3.09	3.17
1992	4.70	3.17	3.08	2.98	3.12	3.21
1993	4.88	3.20	3.11	3.00	3.14	3.24
1994	5.06	3.24	3.13	3.01	3.17	3.28
1995	5.24	3.27	3.16	3.03	3.19	3.31
1996	5.42	3.30	3.19	3.05	3.21	3.34
1997	5.60	3.34	3.21	3.06	3.24	3.38
1998	5.78	3.37	3.24	3.08	3.26	3.41
1999	5.96	3.41	3.26	3.09	3.29	3.45
2000	6.16	3.44	3.29	3.11	3.31	3.48

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-29 Midwest Industrial Coal Prices by Energy Scenario (1977 $/MMBTU)

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	1.30	1.32	1.31	1.30	1.34	1.35
1976	1.35	1.37	1.36	1.35	1.38	1.40
1977	1.40	1.41	1.40	1.39	1.43	1.44
1978	1.45	1.46	1.45	1.44	1.47	1.49
1979	1.50	1.50	1.50	1.48	1.52	1.53
1980	1.55	1.55	1.55	1.53	1.56	1.58
1981	1.60	1.60	1.59	1.57	1.60	1.63
1982	1.65	1.64	1.64	1.62	1.65	1.67
1983	1.70	1.69	1.69	1.66	1.69	1.72
1984	1.75	1.73	1.73	1.71	1.74	1.76
1985	1.80	1.78	1.78	1.75	1.78	1.81
1986	1.82	1.80	1.80	1.77	1.80	1.83
1987	1.85	1.82	1.83	1.80	1.82	1.85
1988	1.87	1.85	1.85	1.82	1.83	1.86
1989	1.90	1.87	1.88	1.85	1.85	1.88
1990	1.92	1.89	1.90	1.87	1.87	1.90
1991	1.94	1.91	1.92	1.89	1.89	1.92
1992	1.97	1.93	1.95	1.92	1.91	1.94
1993	1.99	1.96	1.97	1.94	1.92	1.95
1994	2.02	1.98	2.00	1.97	1.94	1.97
1995	2.04	2.00	2.02	1.99	1.96	1.99
1996	2.06	2.02	2.04	2.01	1.98	2.01
1997	2.09	2.04	2.07	2.04	2.00	2.03
1998	2.11	2.07	2.09	2.06	2.01	2.04
1999	2.14	2.09	2.12	2.09	2.03	2.06
2000	2.16	2.11	2.14	2.11	2.05	2.08

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

(Note: The prices indicated in this table have been obtained as averages of Met Coal and Ordinary Coal prices as yielded by the PIES model.)

Table C-30 Midwest Commercial Distillate Oil Price Index by Energy Scenario

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	90.9	94.2	94.6	94.6	94.2	94.2
1976	95.5	97.1	97.5	97.1	97.1	97.1
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	104.9	102.9	102.9	102.5	103.2	103.2
1979	109.4	105.8	105.8	105.4	106.1	106.1
1980	113.9	108.7	108.3	107.9	109.0	109.0
1981	118.5	111.2	111.2	110.5	111.9	111.9
1982	123.0	114.1	114.1	113.0	114.8	114.8
1983	127.9	116.9	117.0	115.9	118.1	118.1
1984	132.4	119.9	119.6	118.8	120.9	120.9
1985	136.9	122.7	122.5	121.4	123.8	123.8
1986	143.6	123.8	123.6	122.1	124.5	125.3
1987	150.2	125.3	124.3	122.8	125.6	126.4
1988	156.8	126.4	125.4	123.2	126.4	127.8
1989	163.4	127.8	126.1	123.9	127.4	128.9
1990	170.0	128.9	127.2	124.6	128.2	130.3
1991	176.7	130.0	128.3	125.4	128.9	131.8
1992	183.3	131.4	128.9	126.1	129.9	132.9
1993	189.9	132.5	130.0	126.4	130.7	134.3
1994	196.5	133.9	130.8	127.2	131.8	135.4
1995	203.1	135.0	131.9	127.9	132.5	136.8
1996	209.8	136.1	132.9	128.6	133.2	138.3
1997	216.4	137.5	133.7	129.3	134.3	139.4
1998	223.0	138.6	134.8	129.7	135.0	140.8
1999	229.6	140.1	135.5	130.4	136.1	141.9
2000	236.2	141.2	136.6	131.2	136.8	143.3

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-31 Midwest Commercial Residual Oil Price Index by Energy Scenario

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	90.9	94.7	95.1	95.1	94.7	94.3
1976	95.6	97.1	97.5	97.5	97.5	97.1
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	104.7	102.5	102.9	102.1	102.9	102.4
1979	109.1	105.3	105.3	104.5	105.7	105.3
1980	113.4	107.8	107.8	106.9	108.2	108.2
1981	118.1	110.2	110.3	109.5	111.1	111.0
1982	122.8	113.1	112.8	111.9	113.9	113.9
1983	127.2	115.6	115.6	112.8	116.8	116.3
1984	131.9	118.4	118.1	116.5	119.3	119.2
1985	136.2	120.9	120.6	118.9	122.1	122.0
1986	143.3	122.1	121.8	119.8	122.9	123.3
1987	150.4	123.8	122.6	120.6	124.2	124.9
1988	157.5	125.0	123.9	121.0	125.0	126.1
1989	164.6	126.6	124.7	121.8	126.2	127.8
1990	171.7	127.9	125.9	122.6	127.0	129.0
1991	178.7	129.1	127.2	123.5	127.9	130.2
1992	185.8	130.7	128.0	124.3	129.1	131.8
1993	192.9	131.9	129.2	124.7	129.9	133.1
1994	200.0	133.6	130.0	125.5	131.1	134.7
1995	207.1	134.8	131.3	126.3	131.9	136.0
1996	214.2	136.1	132.1	127.2	132.8	137.1
1997	221.3	137.7	133.3	127.9	134.0	138.8
1998	228.3	138.9	134.6	128.4	134.8	140.0
1999	235.4	140.6	135.4	129.2	136.1	141.6
2000	242.5	141.8	136.6	130.0	136.9	142.9

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-32 Midwest Industrial Distillate Oil Price Index by Energy Scenario

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	90.9	94.2	94.6	94.6	94.2	94.2
1976	95.5	97.1	97.5	97.1	97.1	97.1
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	104.9	102.9	102.9	102.5	103.2	103.2
1979	109.4	105.8	105.8	105.1	106.1	106.1
1980	113.9	108.7	108.3	107.9	109.0	109.0
1981	118.5	111.2	111.2	110.5	111.9	111.9
1982	123.0	114.1	114.1	113.0	114.8	114.8
1983	127.9	117.0	117.0	115.6	118.0	118.1
1984	132.4	119.8	119.6	118.5	120.9	120.9
1985	136.9	122.7	122.5	121.0	123.8	123.8
1986	143.6	123.8	123.6	121.7	124.5	125.3
1987	150.2	124.9	124.3	122.5	125.3	126.4
1988	156.8	126.4	125.4	122.8	126.4	127.8
1989	163.4	127.4	126.1	123.6	127.1	128.9
1990	170.0	128.5	127.2	124.3	127.8	130.3
1991	176.7	129.6	128.3	125.0	128.5	131.8
1992	183.3	130.7	128.9	125.7	129.2	132.9
1993	189.9	132.1	130.0	126.1	130.3	134.3
1994	196.5	133.2	130.8	126.1	131.0	135.4
1995	203.1	134.3	131.9	127.5	131.8	136.8
1996	209.8	135.4	132.9	128.3	132.5	138.3
1997	216.4	136.5	133.7	129.0	133.2	139.4
1998	223.0	137.9	134.8	129.3	134.3	140.8
1999	229.6	139.0	135.5	130.1	135.0	141.9
2000	236.2	140.1	136.6	130.8	135.7	143.3

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-33 Midwest Industrial Residual Oil Price Index by Energy Scenario

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	90.9	95.1	95.1	95.5	94.7	94.7
1976	95.3	97.5	97.5	97.9	97.1	97.1
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	104.3	102.9	102.5	102.5	102.5	102.9
1979	103.8	105.3	104.9	104.5	105.3	105.3
1980	113.4	107.8	107.4	107.0	107.8	108.2
1981	117.7	110.3	109.5	109.5	110.2	111.1
1982	122.0	112.8	111.9	111.6	113.1	113.5
1983	126.4	115.6	114.4	114.0	115.6	116.4
1984	131.1	118.1	116.9	116.1	118.4	118.9
1985	135.4	120.6	119.3	118.6	120.9	121.7
1986	142.5	121.8	120.6	119.4	121.7	123.0
1987	149.6	123.5	121.4	119.8	122.9	124.6
1988	156.6	124.7	122.6	120.6	123.8	125.8
1989	163.8	126.3	123.5	121.1	125.0	127.5
1990	170.9	127.6	124.7	121.9	125.8	128.7
1991	177.9	128.8	125.9	122.7	126.6	129.9
1992	185.0	130.5	126.7	123.1	127.9	131.6
1993	192.1	131.7	127.9	123.9	128.7	132.8
1994	199.2	133.3	128.8	124.4	129.9	134.4
1995	206.3	134.6	130.0	125.2	130.7	135.7
1996	213.4	135.8	131.3	126.0	131.6	136.9
1997	220.5	137.4	132.1	126.4	132.8	138.5
1998	227.6	138.7	133.3	127.3	133.6	139.8
1999	234.6	140.3	134.2	127.7	134.8	141.4
2000	242.5	141.6	135.4	128.5	135.7	142.6

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-34 Midwest Residential Natural Gas Price Index by Energy Scenario

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	85.4	87.2	87.6	88.0	87.2	87.2
1976	92.9	93.3	93.8	93.7	93.8	93.8
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	107.5	106.2	106.1	105.6	106.6	106.6
1979	115.1	112.8	112.4	111.4	113.3	112.8
1980	122.6	119.0	118.5	117.6	120.0	119.5
1981	129.6	125.1	124.7	123.3	126.2	126.2
1982	137.2	131.8	130.9	129.0	132.8	132.3
1983	144.7	138.0	137.1	135.2	139.5	138.9
1984	151.7	144.6	143.3	140.9	145.6	145.1
1985	159.3	150.8	150.0	147.1	152.3	151.8
1986	177.4	159.0	158.7	157.0	160.5	160.0
1987	194.9	167.7	167.5	166.3	169.2	167.7
1988	213.1	175.9	176.3	176.1	177.4	175.9
1989	231.2	184.6	185.0	185.5	185.6	183.6
1990	248.7	192.8	193.8	195.3	193.8	191.8
1991	266.8	201.0	202.5	205.2	202.0	199.5
1992	284.4	209.7	211.3	214.5	210.3	207.7
1993	302.5	217.9	220.1	224.4	218.9	215.9
1994	320.1	226.7	228.8	233.7	227.1	223.6
1995	338.2	234.9	237.6	243.5	235.4	231.8
1996	356.3	243.1	246.3	253.4	243.6	240.0
1997	373.9	251.8	255.1	262.7	251.8	247.7
1998	391.4	260.0	263.9	272.5	260.5	255.9
1999	409.5	268.7	272.6	281.8	268.2	263.6
2000	427.6	276.9	281.4	291.7	276.9	271.8

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-35 Midwest Commercial Natural Gas Price Index by Energy Scenario

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	83.1	85.6	86.1	86.7	85.6	85.6
1976	91.3	92.8	93.7	93.3	92.8	92.8
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	108.1	107.2	107.2	106.7	107.2	107.2
1979	116.3	114.4	114.5	113.3	114.9	114.9
1980	125.0	121.6	121.7	120.0	122.2	122.2
1981	133.1	128.7	128.3	126.6	129.3	129.3
1982	141.3	135.9	135.5	133.3	136.5	136.5
1983	149.4	143.1	142.7	140.0	143.7	143.7
1984	158.1	150.3	149.4	146.7	151.5	151.5
1985	166.3	157.5	156.6	153.3	158.7	158.7
1986	187.2	167.1	166.9	164.8	168.3	168.3
1987	207.5	176.6	177.1	175.8	178.4	177.2
1988	228.5	186.8	187.3	187.3	188.0	186.8
1989	248.8	196.4	197.5	198.2	197.6	195.8
1990	269.8	206.0	207.8	209.7	207.8	205.4
1991	290.1	215.6	218.1	221.2	217.4	215.0
1992	311.0	225.1	228.3	232.1	227.5	223.9
1993	331.9	235.3	238.5	243.6	237.1	233.5
1994	352.3	244.9	248.8	254.5	247.3	242.5
1995	373.2	254.5	259.0	266.1	256.9	252.1
1996	394.1	264.1	269.3	277.6	266.5	261.7
1997	414.5	273.7	279.5	288.5	276.6	270.7
1998	435.4	283.8	289.8	300.0	286.2	280.2
1999	455.8	293.4	300.0	310.9	296.4	289.2
2000	476.7	303.0	310.2	322.4	306.0	298.8

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

Table C-36 Midwest Industrial Natural Gas Price Index by Energy Scenario

Year	MRTSF	MRTSC	HRCSA	HRCSD	LRCSE	LRCSB
1975	81.5	84.4	84.4	85.0	83.8	83.8
1976	91.1	92.2	92.2	92.1	91.5	91.5
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	109.6	108.5	107.8	107.1	108.4	107.7
1979	118.5	116.3	115.6	114.3	116.2	116.2
1980	128.1	124.1	123.4	122.1	124.6	123.9
1981	137.7	131.9	131.2	129.3	132.4	131.7
1982	146.6	139.7	139.0	136.4	140.8	140.1
1983	156.2	148.2	146.8	143.6	148.6	147.9
1984	165.1	156.0	154.6	151.4	157.0	156.3
1985	174.7	163.8	162.4	158.6	164.8	164.1
1986	199.3	175.2	174.5	172.1	176.1	175.4
1987	223.3	187.2	186.5	185.0	188.0	186.6
1988	247.9	198.6	198.6	198.6	199.3	197.2
1989	271.9	210.6	210.6	211.4	211.3	208.5
1990	296.6	222.0	222.7	225.0	222.5	219.7
1991	321.2	233.3	234.8	238.6	233.8	230.9
1992	345.2	245.4	246.8	251.4	245.7	242.3
1993	369.9	256.7	258.9	264.3	257.0	252.8
1994	393.8	268.8	270.9	277.8	269.0	264.1
1995	418.5	280.1	282.9	291.4	280.3	275.4
1996	442.5	291.5	295.0	305.0	291.5	286.6
1997	467.1	303.5	307.1	317.9	303.5	297.9
1998	491.8	314.9	319.1	331.4	314.8	308.5
1999	515.8	326.9	331.2	344.3	326.8	319.7
2000	540.4	338.3	343.3	357.9	338.0	330.9

Source: Based on National Energy Information Administration Project Independence Evaluation System Reports.

APPENDIX D

ENERGY AND RELATED DATA SOURCES

This appendix contains a listing of data available from various published sources. Among the data listed are: (a) historic data by fuel type, (b) historic consumption and related data by customer class, and (c) fuel supply and consumption projections by fuel type.

Historic Data by Fuel Type

Type of Data	Source
A. Natural Gas	
1. Current deliverability from supplier during severe cold of 2/2/77-3/8/77:	19
a. Mcf/day,	
b. Columbia Gas of Ohio,	
c. Dayton Power and Light Co.,	
d. Cincinnati Gas and Electric Co.,	
e. East Ohio Gas Co.	
2. Current deliverability from peak shavers during severe cold of 2/2/77-3/8/77:	19
a. Mcf/day,	
b. Dayton Power and Light Co.,	
c. Cincinnati Gas and Electric.	
3. Current deliverability from storage during severe cold of 2/2/77-3/8/77:	19
a. Mcf/day,	
b. East Ohio Gas Co.	
4. Interstate shipments of natural gas to Ohio:	18
a. for 1966-1973.	
5. Interstate pipeline data:	12
a. for 1966-1975,	
b. total volume of sales to all sources,	
c. total volume of supplies available,	
d. by pipeline company.	
6. National flow patterns:	9
a. for 1975 yearly totals,	
b. summary of flows between detailed supply areas and major market areas,	
c. summary of gas flows between major supply areas and detailed market areas,	
d. interstate pipeline receipts and deliveries by company,	
e. interstate transportation of gas from supply areas to market areas,	
f. gas delivered to each state by interstate companies plus estimate of intrastate gas consumed.	

		Source
7.	Financial data:	12
	a. for 1975, b. by company, c. sales, revenues, customers, and expenses.	
8.	Wholesale prices:	15
	a. for 1966-1972, b. by census region and selected standard metropolitan statistical area (SMSA).	
9.	Natural gas prices:	16
	a. major interstate pipeline companies, b. by month, c. by purchases, d. by sales.	
10.	State production of gas:	1
	a. yearly, b. by state and region.	
11.	Consumption in Ohio:	18
	a. for 1960-1973, b. by customer class.	
12.	Storage changes in Ohio:	18
	a. for 1966-1973	
13.	Capacity of storage reservoirs in Ohio:	18
	a. for 1961-1973.	
14.	Storage cost:	14
	a. for 1975, b. by pipeline company, c. by cost category.	
15.	Comparison of storage costs:	14
	a. fixed, b. operating and maintenance, c. total.	
16.	Ohio gas utility large volume sales:	18
	a. by industry group.	

		Source
17.	Average gas prices in Ohio: a. for 1960-1973, b. value ($1,000), c. quantity (mcf), d. price ($/mcf).	18
18.	Average retail prices: a. by region, b. by month.	16
19.	Price of gas: a. by cost component, b. production, c. transportation, d. distribution, e. taxes, f. total, g. by selected SMSA.	15
20.	Operating and maintenance expenses of interstate companies: a. for 1975, b. production c. storage, d. transportation e. distribution.	12
21.	Distribution company data: a. financial, b. operating, c. plant.	7
22.	Reserves: a. by state, b. Canada, c. yearly.	1
23.	Production: a. by state, b. yearly.	1
24.	Transmission and distribution: a. by state, b. by type of pipe, c. yearly.	1

		Source
25.	Storage:	1
	a. by state, b. by type of pool, c. yearly.	
26.	Consumption:	1
	a. by state, b. by class of service, c. yearly.	
27.	Natural gas utility revenues:	1
	a. by state, b. by class of service, c. yearly.	

B. Electricity

1.	Ohio Industrial consumption:	2
	a. for 1971, b. SIC code 20-39, c. cost.	
2.	Ohio residential average charge:	18
	a. for 1960-1973, b. consumption, c. revenues, d. average price.	
3.	Ohio commercial average charge:	18
	a. for 1960-1973, b. consumption, c. revenues, d. average price.	
4.	Annual bills and average charge:	8
	a. for January 1976, b. all electric homes, c. selected cities, d. 20 Ohio cities.	
5.	Typical electric bills:	13
	a. residential, b. cities over 2,500 pop , c. by kilowatt hour (KWh) groups, d. by month.	

		Source
6.	Typical electric bills:	13
	a. commercial,	
	b. cities over 50,000 pop.,	
	c. by KWh groups,	
	d. by month.	
7.	Typical electric bills:	13
	a. industrial,	
	b. cities over 50,000 pop.,	
	c. by Kwh groups,	
	d. monthly.	
8.	Generating capacity:	6
	a. by year,	
	b. by state,	
	c. by utility type.	
9.	Generation:	6
	a. by year,	
	b. by state,	
	c. by type of fuel,	
	d. by utility type.	
10.	Electricity sales:	6
	a. by year,	
	b. by class of service,	
	c. by state.	
11.	Electricity revenues:	6
	a. by year,	
	b. by class of service,	
	c. by state.	
12.	Customers:	6
	a. by year,	
	b. by class of service,	
	c. by state.	
13.	Individual company data:	7
	a. financial,	
	b. operating,	
	c. plant.	

Source

C. Oil

1. Residential heating oil price: 16
   a. monthly,
   b. by region,
   c. purchase price and dealer margin.

2. Electric utilities average cost of oil: 18
   a. for 1960-1976.

3. Heating oil sales: 21
   a. for 1970-1976,
   b. by state,
   c. by region,
   d. by oil type.

4. Price of #2 and #6 fuel oil: 15
   a. for 1960, 1971,
   b. by cost components,
   c. by selected city,
   d. by customer class.

5. Estimated price of #2 fuel oil: 15
   a. for 1960-1971,
   b. by small commercial,
   c. by selected cities.

6. Delivered price of #2 and #6 fuel oil: 15
   a. for 1960-1973,
   b. winter, summer,
   c. by selected city,
   d. large commercial.

7. Delivered price of #2 and #6 fuel oil: 15
   a. for 1960-1973,
   b. refinery or terminal,
   c. winter, summer,
   d. by selected city.

D. Coal

1. Ohio consumption of bituminous coal: 18
   a. for 1960-1973,
   b. coke and gas plants,
   c. electric utilities,
   d. other.

Source

2. Ohio average price of coal: 18
   a. for 1960-1973,
   b. by sector.
3. Ohio industrial use of coal for heat and power: 2
   a. for 1971,
   b. by SIC codes 20-39.
4. Price of coal: 15
   a. for 1960-1973,
   b. industrial,
   c. selected city.
5. Wholesale price of coal: 15
   a. for 1960-1973,
   b. selected cities.

<u>Historic Consumption and Related Data by Customer Class</u>

A. Residential

1. Ohio household applicance data: 20
   a. for 1970,
   b. by county,
   c. by housing units,
   d. by fuel type.
2. Ohio household energy consumption: 18
   a. for 1970,
   b. by county,
   c. by fuel type.
3. Typical residential fuel bills: 15
   a. for 1960-1973,
   b. by month,
   c. by selected SMSA,
   d. by fuel type,
   e. substitutable base load,
   f. non-substitutable base load,
   g. space heating.
4. Typical residential air conditioning bills: 15
   a. for 1960-1973,
   b. gas or electricity,
   c. by selected SMSA.

Source

B. Commercial

1. Ohio commercial consumption: 18
   a. for 1970,
   b. by county,
   c. by fuel type.

2. Large commercial fuel prices: 15
   a. for 1960-1973,
   b. by selected cities,
   c. gas, oil, coal.

3. Small commercial fuel prices: 15
   a. for 1960-1973,
   b. gas, fuel oil, electricity,
   c. by selected SMSA.

C. Industrial

1. Quantities and cost of fuel by industry: 18
   a. for 1971,
   b. Ohio SMSA,
   c. by fuel type.

2. Fuels used for heat and power in Ohio: 2
   a. for 1971,
   b. by SIC codes,
   c. quantity and cost.

3. Electric utility fuel prices: 15
   a. for 1960-1972,
   b. by selected SMSA,
   c. coal, oil, gas.

4. Fuels and electric energy used for heat and power: 2
   a. for 1954, 1958, 1962, 1967, 1971,
   b. by state,
   c. by industry group.

Fuel Supply and Consumption Projections by Fuel Type

A. Natural Gas — Source

1. U.S. gas supply-demand balance: — 10
   a. for 1971-1990,
   b. annual demand,
   c. net pipeline imports,
   d. LNG imports,
   e. gas from coal,
   f. gas from Alaska,
   g. gas from liquid hydrocarbons,
   h. domestic production,
   i. annual consumption,
   j. unsatisfied demand,
   k. reserve additions,
   l. regional supply trends.

2. Synthetic gas forecast: — 5
   a. for 1975-2000,
   b. from coal,
   c. from petroleum,
   d. efficiency factor.

3. Gaseous fuel supply forecast: — 5
   a. total supply,
   b. domestic,
   c. synthetic,
   d. imports,
   e. liquid natural gas (LNG).

4. Natural gas needs: — 11
   a. for 1980 and 1990,
   b. by states,
   c. by regions,
   d. by SIC codes.

5. U.S. gas production: — 17
   a. for 1978, 1979, 1985, 1990,
   b. associated gas,
   c. non-associated gas,
   d. syngas,
   e. by National Petroleum Council (NPC) region.

		Source
6.	U.S. gas regional distribution summary:	17
	a. for 1985, 1990, b. domestic production, c. imports, d. by NPC region, e. distribution to Department of Energy (DOE) consumption regions.	
7.	Regional demand summary:	17
	a. for 1985, 1990, b. by customer class, c. interstate, d. by Department of Energy regions.	
8.	Average retail price:	17
	a. for 1985, 1990, b. by customer class, c. by Department of Energy regions.	
9.	Intrastate price:	17
	a. for 1985, 1990, b. by Department of Energy region.	
10.	Estimated consumption:	22
	a. for 1977-1982, b. by state, c. by class of service.	
11.	Estimated curtailments:	22
	a. for 1977-1985, b. by region, c. by class of service.	
12.	Estimated supplemental gas:	22
	a. by region, b. by type (Syngas, LNG).	

B. Electricity

1.	Utility industry output forecast:	5
	a. for 1975-2000, b. total generation, c. by fossil fuel, nuclear and hydropower.	

Source

2. Electrical needs: 11
   a. for 1980 and 1990,
   b. by state,
   c. by region,
   d. by SIC code.

3. Electricity generation: 17
   a. for 1978, 1979, 1985, 1990,
   b. by Department of Energy regions,
   c. by major fuels.

4. Electricity price projection: 17
   a. for 1985, 1990,
   b. by Department of Energy regions,
   c. by customer class.

5. Electricity consumption: 17
   a. for 1985, 1990,
   b. by Department of Energy regions,
   c. by customer class.

C. Oil

1. Petroleum supply forecast: 5
   a. for 1975-2000,
   b. total supply,
   c. domestic supply,
   d. lower 48,
   e. Alaskan,
   f. imports.

2. Oil needs: 11
   a. for 1980 and 1990,
   b. by state,
   c. by region,
   d. by SIC code.

3. Oil production: 17
   a. for 1979, 1980, 1985, 1990,
   b. by National Petroleum Council region,
   c. by primary, secondary or tertiary,
   d. on-shore,
   e. off-shore.

	Source
4. Crude oil distribution:	17
a. for 1985, 1990, b. by petroleum allocation districts (PAD), c. domestic and imports.	
5. Oil consumption projection:	17
a. for 1985, 1990, b. by Department of Energy regions, c. by sector, d. by refined oil type.	
6. Oil retail price projection:	17
a. for 1985, 1990, b. by Department of Energy regions, c. by sector, d. by refined oil type.	
D. Coal	
1. Coal supply forecast:	5
a. for 1975-2000 b. total U.S. supply, c. domestic demand, d. export demand.	
2. Coal needs:	11
a. for 1980, 1990, b. by state, c. by region, d. by SIC code.	
3. Coal production projection:	17
a. for 1985, 1990, b. by sulfur content, c. by coal supply regions.	
4. Coal consumption projection:	17
a. for 1985, 1990, b. by Department of Energy region.	
5. Coal price projection:	17
a. for 1985, 1990, b. by Department of Energy region, c. by customer class.	

References

1. American Gas Association, Gas Facts, Arlington, Va., 1945-1977.

2. Bureau of Census, "Fuels and Electric Energy Consumed," 1972 Census of Manufacturing, Subject and Special Statistics, Washington, 1976.

3. Bureau of Mines, Fuels and Energy Data: United States by States and Census Divisions 1973, Bureau of Mines Information Circular 8722, Washington, 1976.

4. Bureau of Mines, Historical Fuels and Energy Consumption Data: 1960-1972, Bureau of Mines Information Circular 8704, Washington, 1976.

5. Dupree, Walter G. and James A. West, United States Energy Through the Year 2000, U.S. Government Printing Office, Washington, December, 1972.

6. Edison Electric Institute, Statistical Year Book of the Electric Utility Industry, New York, New York.

7. Federal Energy Regulatory Commission, Forms 1, 1M, 2 and 2A, Public Information Office, Washington, D.C.

8. Federal Power Commission, All Electric Homes in the United States: Annual Bills January 1, 1976, Washington, 1976.

9. Federal Power Commission, National Gas Flow Patterns 1975, Washington, February, 1977.

10. Federal Power Commission, National Gas Supply and Demand 1971-1990, Washington, 1972.

11. Federal Power Commission, State Projections of Industrial Fuel Needs, Washington, August, 1976.

12. Federal Power Commission, Statistics of Interstate Natural Gas Pipeline Companies 1975, Washington, D.C., 1975.

13. Federal Power Commission, Typical Electric Bills 1976, Washington, 1976.

14. Federal Power Commission, Underground Storage of Natural Gas by Interstate Pipeline Companies, Washington, November, 1976.

15. Foster Associates, Energy Prices 1960-1973, Ballinger Publishing Co. Cambridge, Mass., 1974.

16. National Energy Information Administration, Monthly Energy Review, Washington, D.C.

17. National Energy Information Center, Project Independence Evaluation System Computer Printouts, Washington, 1977.

18. Ohio Energy Emergency Commission, Ohio Energy Profiles, Columbus, Ohio, 1975.

19. Public Announcement Backup Data, Public Utilities Commission of Ohio, 2/2/77-3/18/77.

20. U.S. Department of Commerce, General Housing Characteristics, Annual Housing Survey 1975, Washington, April, 1977.

21. U.S. Department of Energy, Office of Energy Data, Sales of Fuel Oil and Kerosene, Washington, Dec. 12, 1977.

22. University of Denver Research Institute, Gas Requirements Committee, Future Gas Consumption of the United States, Denver, Colorado, September, 1977.

APPENDIX E

REVIEW OF THE LITERATURE OF ENERGY CONSUMPTION MODELING

This appendix summarizes various studies of energy consumption in the residential, commercial and industrial sectors. Studies dealing with natural gas consumption and inter-fuel substitutability have received special attention. Only the major features of each study are presented, and no critical comparison or synthesis has been performed.

The first section of this appendix presents studies on residential and commercial energy consumption, the second, on industrial consumption, the third, on electric utilities energy consumption. The fourth section presents integrated models of residential, commercial, and industrial energy consumption and the fifth presents studies which critically review energy consumption modeling approaches. The final section deals with energy consumption in Ohio.

Residential and Commercial Energy Consumption

P. Balestra and M. Nerlove. "Pooling Cross Section and Time Series Data in the Estimation of a Dynamic Model: The Demand for Natural Gas." Econometrica 34 (1966), 585-612.

C. R. Berndt and G. C. Watkins. "Demand for Natural Gas: Residential and Commercial Markets in Ontario and British Columbia." Canadian Journal of Economics, 10 (1977), 97-111.

E. W. Erickson, R. M. Spann, and R. Cilano. "Substitution and Usage in Energy Demand: An Econometric Estimate of Long-Run and Short-Run Effects." Energy Modeling: Art, Science and Practice. Ed. Milton F. Searl. Washington, D.C.: Resources for the Future, Inc., 1973.

K. P. Anderson. Residential Energy Use: An Econometric Anslysis. Rand Report R-1297-NSF. Santa Monica, California: The Rand Corporation, 1973.

M. Baughman and P. Joskow. "The Effects of Fuel Prices on Residential Appliance Choices in the United States." Land Economics, 51 (1975), 41-49.

J. P. Stein, The Determinants of Residential Appliance Possession and Fuel Choice in Los Angeles: A Cross-Section Analysis of 1970 & 1975 Data, The Rand Paper Series P-5733, The Rand Corporation, Santa Monica, California 90406 (1976)

Morris: "Evaluation of Measures for Conserving Energy." Energy: Mathematics and Models. Ed. F. S. Roberts, Philadelphia: Society for Industrial and Applied Mathematics.

J. P. Nelson. "The Demand for Space Heating Energy." The Review of Economics and Statistics, 57 (1975), 508-512.

E. Hirst and J. Jackson. "Historical Patterns of Residential and Commercial Energy Uses." Energy, 2 (1977) 131-140.

R. S. Mowill. Residential Energy Use: Combining Disaggregated Data Sources for Policy Analysis. The Rand Paper Series P-5754. Santa Monica, California: The Rand Corporation, 1977.

A. S. Cohen, G. Fishelson, J. L. Gardner. Residential Fuel Policy and the Environment. Ballinger Publishing Company, 1974.

R. A. Grot and R. H. Socolow. "Energy Utilization in a Residential Community". Energy: Demand, Conservation, and Institutional Constraints. Ed. M. S. Macrakis. Boston: The MIT Press, 1974.

Industrial Energy Consumption

D. R. Limaye and J. R. Sharko. "Simulation of Energy Market Dynamics." Energy Policy Evaluation. Ed. D. R. Limaye. Lexington Books, D. C. Heath and Company, 1974.

D. Nissen, D. Knapp. "A Regional Model of Interfuel Substitution." Energy: Mathematics and Models. Ed. F. S. Roberts. Philadelphia: Society for Industrial and Applied Mathematics, 1975.

E. W. Erickson, R. M. Spann, and R. Ciliano, "An Econometric Analysis of Substitution and Usage Effects on Industrial Sector Energy Demands." Energy Policy Evaluation. Ed. D. R. Limaye. Lexington, Mass.: Lexington Books, D. C. Heath and Company, 1976.

M. R. Seidel. State Projections of Industrial Fuel Needs. Office of Energy Systems, Federal Power Commission, 1976.

D. Chapman, T. Mount, and T. Tyrrell. "Modeling Electricity Demand Growth". Energy Modeling: Art, Science, and Practice. Ed. Milton F. Searl. Washington, D.C.: Resources for the Future, Inc., 1973.

W. S. Chern. "Estimating Industrial Demand for Electricity: Methodology and Empirical Evidence". Energy: Mathematics and Models. Ed. F. S. Roberts. Philadelphia: Society for Industrial and Applied Mathematics, 1975.

Integrated Models of Residential, Commercial and Industrial Energy Consumption

P. K. Verleger, Jr. "The Relationship between Energy Demand and Economic Activity," Energy: Demand, Conservation, and Institutional Problems. Ed. M. S. Macrakis. Boston: MIT Press, 1974.

J. Kraft, A. Kraft and E. Reiser. "A National Energy Demand Simulation Model." Econometric Dimensions of Energy Demand and Supply. Lexington, Mass.: Lexington Books, 1976.

K. P. Anderson. A Simulation Analysis of U.S. Energy Demand, Supply, and Prices. Rand Report R-1591-NSF/EPA. Santa Monica, California: The Rand Corporation, 1975.

Electric Utilities Energy Consumption

S. E. Atkinson and R. Halvorsen. "Demand for Fossil Fuels by Electric Utilities." Econometric Dimensions of Energy Demand and Supply. Eds. A. B. Askin and J. Kraft. Lexington, Mass.: Lexington Books, 1976.

J. M. Griffin, "Inter-Fuel Substitution Possibilities: A Translog Application to Intercountry Data", International Economic Review, vol. 18, No. 3, pp. 755-770 (1977).

P. L. Joskow and F. S. Mishkin, "Electric Utility Fuel Choice Behavior in the United States", International Economic Review, vol. 18, No. 3, pp. 719-736 (1977).

Critical Reviews and Syntheses

L. Waverman, "Estimating the Demand for Energy", Energy Policy, March, 1977, pp. 2-11.

Energy Consumption in Ohio

D. Z. Czamanski, J. S. Henderson, K. A. Kelly, J. S. Detwiler. The Benefits and Costs of Gas Storage Development in Ohio. Report submitted to the Public Utilities Commission of Ohio by the Ohio State University. Columbus, Ohio, 1977.

O. Fisch et al. GASMOD 2 User's Manual: Simulation Model for Natural Gas Supply and Demand in Ohio. Research report submitted to the Ohio Department of Energy by the Ohio State University. Columbus, Ohio, 1978.

P. Balestra and M. Nerlove. "Pooling Cross Section and Time Series Data in the Estimation of a Dynamic Model: The Demand for Natural Gas." Econometrica 34 (1966), 585-612.

Balestra and Nerlove, in presenting a dynamic model of gas demand, first recognize that demand, at the household level, is closely related to the existing stock of gas appliances and is governed by such stocks to a great extent. Hence, the authors note that the demand function should incorporate both a stock effect and assumptions about possible adjustments of these stocks over a period of time.

This article also notes that most consumers will not revise appliance and fuel choices because of a short-run change in the relative price of gas. The high costs involved in a transfer to a different type of fuel preclude such a move; after a major appliance has been installed, a fuel change is rarely made. It is also noted that the short-run price elasticity of demand from current customers must be very low because the demand for space heating is probably highly inelastic.

The relative prices of different fuels, however, do affect the decision-making process in the planning stages. Since consumers are not committed by past contracts to any particular technique or form of service, their behavior is more consistent with traditional demand theory.

The new demand for gas, G^*, is a function of the relative price of gas (deflated by the consumer price index), p, and the total new requirements for all types of fuel, F^*:

$$G_t^* = F_t(p, F^*). \qquad \text{(E-1)}$$

where:

F_t = demand for all types of fuel in period t. The increment in total fuel consumption between any two periods is:

$$\Delta F_t = F_t - F_{t-1}. \qquad \text{(E-2)}$$

ΔF_t does not indicate the total new demand for fuels because not all the demand existing in period (t-1) is also committed in period t. In addition, some of the installations that existed in period (t-1) are retired during the course of the year because of obsolescence.

If W_t is the average stock of appliances, λ_t their rate of utilization, and r_t the constant, proportional rate of depreciation, then the new demand for fuel, F_t^*, may be defined as the difference between the total demand for fuel and the committed demand for fuel:

$$F_t^* = \lambda_t W_t - (1-r)\lambda_t W_{t-1}. \quad \text{(E-3)}$$

It is assumed that λ_t does not vary significantly because a high (hence constant) efficiency of combustion is easily reached for gas fuels. Thus:

$$\lambda_t = \lambda \text{ (all t)}. \quad \text{(E-4)}$$

It follows that:

$$F_t^* = F_t - (1-r)\ F_{t-1}\ ; \text{ or} \quad \text{(E-5)}$$

$$F_t^* = (F_t - F_{t-1}) + rF_{t-1}. \quad \text{(E-6)}$$

The new demand for gas can be defined as:

$$G_t^* = G_t - (1-r_g)\ G_{t-1}. \quad \text{(E-7)}$$

The rate of depreciation for gas appliances, r_g, is not necessarily the same as the depreciation rate generally appropriate to fuel-consuming appliances. In particular, the rate of depreciation of aggregate stock is clearly related to the average age of the stock. (For example, the average age of gas appliance stock is lower than that of coal appliance stock.)

It is assumed that:

$$G_t^* = \beta_0 + \beta_1 P_t + \beta_2 F_t^*. \quad \text{(E-8)}$$

The total fuel may be approximated by:

$$F_t = \gamma_0 + \gamma_1 N_t + \gamma_2 Y_t \quad \text{(E-9)}$$

where:

N_t = the total population, and

Y_t = the per capita income.

Finally:

$$G_t = \alpha_o + \alpha_1 P_t + \alpha_2 \Delta N_t + \alpha_3 N_{t-1} + \alpha_4 \Delta Y_t + \alpha_5 Y_{t-1} + \alpha_6 G_{t-1}. \quad \text{(E-10)}$$

If the following are defined:

$$N_t^* = N_t - (1-r)N_{t-1} , \quad \text{(E-11)}$$

$$Y_t^* = Y_t - (1-r)Y_{t-1} , \quad \text{(E-12)}$$

then finally:

$$G_t = \alpha_o + \alpha_1 P_t + \alpha_2 N_t^* + \alpha_4 Y_t^* + \alpha_6 G_{t-1} \quad \text{(E-13)}$$

Point estimates of the parameters of this model based on a pooled sample of 36 states over a period of 6 years indicate an implausible, negative rate of depreciation for gas appliances. The introduction of state shift variables indicated a similarly implausible rate of 30%. It may be concluded that perhaps inobservable state effects are responsible for biasing the coefficient of lagged gas consumption in the demand equations. These regional time invariant effects seem to account for approximately 75% of the total residual variance in the gas demand equation.

The estimated rate of depreciation on gas appliances (primarily furnaces) is around 5% a year. The estimated net long-run price and income elasticities of new gas demand are .63 and .62 respectively.

C. R. Berndt and G. C. Watkins. "Demand for Natural Gas: Residential and Commercial Markets in Ontario and British Columbia." Canadian Journal of Economics, 10 (1977), 97-111.

Berndt and Watkins, in their analysis of the natural gas demand in Ontario and British Columbia, have combined the residential and commercial market sectors. Although differences between the two markets do exist, the similarity in end-use application and the likelihood of some common variable (for instance number of households and per capita income) make the combining of the two sectors practical.

Residential gas requirements include space heating and appliance consumption (ranges, drivers, water heaters, refrigerators). The commercial sector includes the similar requirements of hotels, restaurants, stores, offices, and apartment blocks. For both sectors space-heating consumption is predominant.

The authors distinguish between flexible demand and captive demand. Flexible demand is potentially variable because it is not committed to past investments. Captive demand is inflexible because it is bound to existing equipment stocks. The effect of existing equipment stocks on demand arises when fixed equipment costs and associated transfer costs are substantial relative to operating costs, as is prevalent in the residential and commercial gas demand sectors.

The specifications for the model are as follows:

$$G_t = U_t S_t \qquad \text{(E-14)}$$

where:

G_t = total RC (residential-commercial) gas consumption in period t;

U_t = average utilization rate for gas equipment in period t;

S_t = stock of RC gas equipment in period t.

$$S_t = I_t + (1-r_g)S_{t-1} \qquad \text{(E-15)}$$

where:

I_t = investment in gas equipment in period t;

r_g = rate of depreciation of gas equipment in period t.

$$G_t = U_t I_t + U_t(1-r_g)S_{t-1} \qquad (E-16)$$

where:

$U_t I_t$ = flexible demand, and

$U_t\,(1-r_g)S_{t-1}$ = captive demand.

$$U_t I_t = G_t^* = F(P_t, Y_t, H_t) \qquad (E-17)$$

where:

P_t = price variable;

Y_t = income variable;

H_t = demographic variable.

$$G_t = G_t^* + (1-r_g)G_{t-1} \qquad (E-18)$$

(under the assumption that the utilization rate is constant between periods.)

$$G_t^* = \ell_o + \ell_1 P_t + \ell_2 F_t^* \qquad (E-19)$$

where:

F_t^* = flexible demand for <u>all</u> fuels in the RC market.

$$F_f^* = F_t - (1-r)F_{t-1} \qquad (E-20)$$

where:

F_t = total fuel demand in the RC market;

r = rate of depreciation in the total RC fuels market.

$$F_t = d_o + d_1H_t + D_2Y_t \qquad \text{(E-21)}$$

where:

Y_t = real income per household in year t.

Finally, it follows that:

$$G_t = \alpha_o + \alpha_1 P_t + \alpha_2 H_t^* + \alpha_3 Y_t^* + \alpha_4 G_{t-1} \qquad \text{(E-22)}$$

with:

$$H_t^* = H_t - (1-r)H_{t-1} \qquad \text{(E-23)}$$

$$Y_t^* = Y_t - (1-r)Y_{t-1} \qquad \text{(E-24)}$$

In the case of a mixed additive-multiplicative model:

$$G_t = \alpha_o + P_t^{\alpha_1} \cdot H_t^{*\alpha_2} \cdot Y_t^{*\alpha_3} + \alpha_4 G_{t-1} \qquad \text{(E-25)}$$

Since the predominant portion of the RC demand is for space heating, G_t is affected by variations in weather. The precise fraction of demand sensitive to temperature variations is, however, unknown. The following specification has been tested:

$$G_t = DD_t^{\alpha_6} [\alpha_o + P_t^{\alpha_1} \cdot H_t^{*\alpha_2} \cdot Y_t^{*\alpha_3}] + [DD_t/DD_{t-1}]^{\alpha_6}\alpha_5 G_{t-1} \qquad \text{(E-26)}$$

DD_t = ratio of degree-days in year t to average degree-days.

The first degree-day term identifies the effect of temperature on flexible gas consumption, the second term transforms captive consumption to current temperatures.

Data from British Columbia and Ontario for 1959-1974 were used to estimate the model. The variables are:

G_t = gas consumption in TBTU in year t;

DD_t = ratio of degree-days in year t to average degree-days over the period 1959-1974;

P_t = index of ratio of weighted residential and commercial gas price to weighted residential and commercial fuel oil price (1967 = 100);

H_t = number of households (in thousands) in year t;

$H_t^* = H_t - (1-r)H_{t-1}$ = new households;

Y_t = real personal disposal income per household (in thousands of 1961 dollars);

$Y_t^* = Y_t - (1-r)Y_{t-1}$ = new income;

r = depreciation rate for total fuel market.

The model is finally specified as follows:

$$G_t = DD_t^{0.759}\left[-1.824 + \left(P_t^{-0.686} \cdot H_t^{*1.081} \cdot Y_t^{*0.133}\right) + 0.916\; G_{t-1}/DD_{t-1}^{0.759}\right] \qquad R^2 = 0.99 \qquad \text{(E-27)}$$

The coefficient of lagged gas consumption, 0.916, implies a reasonable rate of depreciation equal to 8.37%.

E. W. Erickson, R. M. Spann, and R. Ciliano. "Substitution and Usage in Energy Demand: An Econometric Estimate of Long-Run and Short-Run Effects." Energy Modeling: Art, Science and Practice. Ed. Milton F. Searl. Washington, D.C.: Resources for the Future, Inc., 1973.

In the article Erickson, Spann and Ciliano are very critical of those energy-estimating approaches which forecast the total energy consumption of the economy (or one of its sectors) in some homogeneous units of energy (such as BTU's) and then apportion this demand to various sectors and fuels on the basis of constant sharing. They regard consumers' choices with regard to energy consumption as fuel and sector specific, and BTU's derived from alternative fuels are not exact substitutes.

Not only fuel usage but also choice of fuel varies with relative prices. Such is the case in residential and commercial space heating or cooling, in electric generation, and in industrial energy use (process heat, non-energy raw material input, conversion to mechanical energy, intermediate electrical generation, and space heating and cooling.)

The demand for energy within each sector-fuel combination can be divided into short and long-run components. This distinction refers, not to length of time, but to which variables are held constant. The short-run demand for a fuel is that demand under which the stock of appliances and the fuel mix characteristics of the stock are held constant. Under long-run demand both the stock of appliances and usage from that stock are allowed to vary. Given the previous considerations, the authors developed a model for the commercial and residential sectors. The formal statement of the model follows:

$$D_{it} = S_{it} \cdot N_t \cdot U_{it} , \qquad \text{(E-28)}$$

where:

S_{it} = the market share of fuel i at time t;

N_t = the total number of households at time t;

U_{it} = average usage per consuming unit using fuel i at time t;

D_{it} = residential and commercial demand for fuel i at time t.

$$S_{it} = S_{it-1} + s_{it} - l_{it} , \qquad \text{(E-29)}$$

where:

l_{it} = the loss rate of market share for fuel i at time t;

s_{it} = the percentage of new construction units using fuel i at time t.

$$s_{it} = a + b\overline{X}_t \qquad \text{(E-30)}$$

where:

$\overline{X}_t$ = the vector of variables affecting s_{it}.

$$U_{it} = a' + b'\overline{Z}_t \qquad \text{(E-31)}$$

where:

$\overline{Z}_t$ = the vector of variables affecting U_{it}.

The authors suggest this basic model may be adapted to the other sectors.

Homeowners or builders can usually choose between electric, gas, or oil heat when they construct a new home or apartment building. The choice depends on the costs of alternative heating sources (both fuel and installation equipment costs) and on consumer and locational attributes like cleanliness, safety, reliability, and availability of fuel. Because of these consumer and locational attributes all fuels are not perfect substitutes, even at the same price per BTU.

The model specification and calibration follow.

The incremental market share of natural gas is represented by:

$$\begin{aligned} \log(SGR) = {} & -6.74 - 0.0000877(PG/PO) - 0.00003(PG/PE) \\ & +0.0109(U) - 0.257(Y) + 1.318(S2) - 0.000013(AC) \qquad \text{(E-32)} \\ R^2 = {} & 0.569 . \end{aligned}$$

The incremental market share for fuel oil is represented by:

$$\begin{aligned} \log(SOR) = {} & 3.321 - 48540.9(PO/PG) + 1.022(PO/PE) \\ & +0.000335(U) - .416(Y) + 0.0424(S2) - 0.060(T1) \\ & -0.000096(AC) \qquad \text{(E-33)} \\ R^2 = {} & 0.587. \end{aligned}$$

The incremental market share for electricity is obtained by subtracting from one the two previous shares.

State data for the years 1965 through 1969 is used. The variables are:

- SOR = ratio of oil burners installed in new dwelling units to total new construction;
- SGR = natural gas heating customers added via new construction divided by total new construction;
- PO = average real price of fuel oil in dollars/barrel to the residential market sector;
- PG = average price of natural gas dollars/cubic foot to the residential market sector;
- PE = average price of residential electricity;
- U = index of urbanization;
- Y = real income per capita;
- S2 = the percent of new construction that is four-family dwelling units or less;
- T1 = winter temperature;
- AC = number of one-family homes sold with air conditioning.

The following points concerning the model are noted:

- In more urbanized areas, more apartment buildings are amenable to multi-metering and, as a result, gas heat may be chosen more frequently in those areas. Moreover, the per customer cost of distribution lines may be less in urban areas because of greater customer density and, as a result, gas may be more available.
- When choosing between oil and gas heat the prices are very important to the customer.
- The decision to use electrical heat seems to be based more on non-price considerations such as the incidence of air conditioning.
- Income is an important determinant in the choice of fuel, high income customers are more likely to choose electrical heat.
- The size of the construction unit influences the market penetration of natural gas but not of oil.
- Temperature greatly influences oil heating considerations; fuel oil has been the cheapest form of heating in the colder sections of the country.

The model for the average usage rate of electricity follows:

$$\text{Log(EUR)} = 4.12 - 1.15\ \text{logPE} - 0.149\ \text{logU} + 0.446\ \text{logY} - 0.00889T_1$$
$$R^2 = 0.853, \qquad \text{(E-34)}$$

where:

EUR = quantity of electricity/customer sold to the residential sector;
PE = total revenue/kWh from sales of electricity to the residential sector.

It it noted that:

- the price elasticity of demand for electricity usage is -1.15;
- the income elasticity is positive, but, given the stock of appliances and installed heating and cooling equipment, the rate of average usage responds less than proportionally to percentage change in per capita income;
- urbanization has a negative effect, perhaps because of smaller dwelling sizes, more protection from wind and thus less heat loss, less daily occupancy, etc.;
- winter temperature has an unexpected sign, but the effect is small and not significantly different from zero. This result probably stems from a confounding between heating and cooling demand, from a correlation between winter and summer temperatures, and from the fact that different systems peak at different times and have different structures of promotional pricing schedules.

K. P. Anderson. Residential Energy Use: An Econometric Analysis. Rand Report R-1297-NSF. Santa Monica, California: The Rand Corporation, 1973.

Anderson estimates equations for predicting energy consumption and for predicting stocks of energy-using equipment. His analysis of equipment stocks yields information about the importance of fuel choice in relation to the rates of energy use in residential energy consumption.

Because the data used for the estimations consists primarily of annual averages for individual states, a model of aggregate demand behavior is formulated, rather than a model of individual or household demand behavior.

Since utility gas and electricity are typically purchased according to declining block rate schedules, the correct price variable for the commodities, provided consumers are well-informed, is the price of a marginal unit of consumption and not the average unit price. Nevertheless, because of the probable existence of real world imperfections, the average price or average size of a typical bill may be just as good a measure of the rate that influences consumer behavior.

Under declining block-rate schedules a simultaneous demand-supply system is presented since the average and, to an extent, the marginal price decline as the quantity consumed increases. To account for this, a reduced form consumption equation which incorporates the effect of the rate schedule into the estimated parameters of the equation can be derived and estimated. It is assumed that the marginal or average price can be expressed as a function of a standardized price (for example, an average bill for some specified level of consumption).

$$P_I = J(P_I^0 , q_I , V_I) \qquad \text{(E-35)}$$

where:

P_I^0 = the standardized price;

q_I = level of consumption;

V_I = a random error term.

However, since the declining block schedules usually tend to flatten out after consumption reaches a certain level, the use of a pure demand equation that includes the standardized prices can be supported.

The American Gas Association indicates that declining block rates typically approximates a curve of the form.

$$P = a + \frac{b}{q} \qquad \text{(E-36)}$$

The marginal price faced by the consumer is constant at all levels of q:

$$\frac{d(Pq)}{dq} = a \qquad \text{(E-37)}$$

(In a sample rate schedule for 1969, the marginal price declined only once after a monthly consumption level of 20 therms was reached--from 8¢/therm to 7¢/therm at 100 therms/month. The average consumption per customer in 1970 was approximately 108 therms/month.)

In estimating the stock equations it is assumed that only one form of energy is likely to be used in any significant quantity in a household since most households use a single major unit to provide energy for the various tasks of cooking, central heating, water heating, etc. In addition, the stock equipment data used in this study only indicates the "fuel used most" for a given task.

Installations at time t can be described by the following equation:

$$N_{it} = r_i N_{it-n} + S_i \left(N_t - \sum_{i=1}^{m} r_i N_{it-n}\right) \qquad \text{(E-38)}$$

where:

N_{it} = number of households using fuel type i for a given household function in period t;

r = fraction of households that retained existing equipment between period t-n and period t;

S_i = fraction of new installations and replacements made from time t-n to t that use fuel type i for the specified function;

N_t = total number of households at time t;

m = total number of alternative fuel types (including none).

Necessarily:

$$\sum_{i=1}^{m} S_i = 1 \qquad \text{(E-39)}$$

It is assumed that:

$$r_i = \begin{cases} \rho_i \, (N_{it}/N_{it-n}) & \text{if } N_{it} \leq N_{it-n} \\ \rho_i & \text{if } N_{it} > N_{it-n} \end{cases} \qquad \text{(E-40)}$$

where ρ_i is a constant "retention" ratio.

The shares S_i may be given by:

$$S_i = \frac{g_i(\cdot) U_i}{\sum_{j=1}^{m} g_j(\cdot)} \qquad (i = 1 \rightarrow m) \qquad \text{(E-41)}$$

with:

$$g_i(\cdot) = a_i \, . \, P_i^{b_i} \, . \, v_i^{c_i} \, . \, y^{d_i} \, . \, z_i \qquad \text{(E-42)}$$

where:

P_i = price of energy type i (standardized, where appropriate;

v_i = representative purchase price for the class of household devices or installations using energy type i to perform a given task;

y = household income;

z_i = effects of all the household-characteristic variables.

The following relationship is obtained:

$$\frac{S_i}{S_m} = \frac{a_i}{a_m} \cdot P_i^{b_i} \cdot P_m^{-b_m} \cdot V_i^{c_i} \cdot V_m^{-c_m} \cdot y^{d_i - d_m} \cdot \frac{Z_i}{Z_m} \cdot \frac{U_i}{U_m} \quad (i = 1 \rightarrow m - 1) \tag{E-43}$$

Taking the logarithms of both sides of the above equation yields a set of (m-1) linear equations, which can be estimated. (The estimate of b_m and c_m must be constrained to be identical in each of the (m-1) estimated equations.)

It is possible to estimate the partial elasticity of a change in any given explanatory variables upon each of the S_i:

$$\frac{\partial S_i}{\partial y} \cdot \frac{y}{S_i} = (d_i - d_m) - \sum_{j=1}^{m-1} S_j (d_j - d_m) \tag{E-44}$$

$$\frac{\partial S_i}{\partial P_i} \cdot \frac{P_i}{S_i} = (1 - S_i) b_i \tag{E-45}$$

$$\frac{\partial S_i}{\partial P_m} \cdot \frac{P_m}{S_i} = -S_m b_m \tag{E-46}$$

These elasticities are not constant but rather vary systematically with the S_i, in ways that are initially satisfying. Cross-elasticities, for example, are proportional to the market penetration of competing equipment.

This estimation procedure reflects a dynamic view of the capital stock adjustment mechanism. This is preferable to one predicting capital stocks at a given point in time.

Since household investment proceeds continuously, the best formulation of a capital stock adjustment mechanism would be a short-interval model predicting, for example, monthly or quarterly installation shares. The stock data in this study, however, are available only for 1960 and 1970.

The use of wide intervals weakens the validity of the assumption that consumers acted during the entire period as if they responded to some fixed set of values for the explanatory variables. However, since most of the explanatory variables either changed smoothly and monotonically between 1960 and 1970 or did not vary, the seriousness of this problem is somewhat mitigated. The lack of abrupt changes suggests that a dynamic equilibrium model might be applicable, and, since static and dynamic models have similar implications under conditions of dynamic equilibrium, a static approach may provide a suitable approximation.

The length of the intercensal period also contributes to the attractiveness of a static formulation. The average economic lifetime for most household energy-using devices, with the exception of central heating, is probably well under 20 years. Hence the reputation ratio ρ_i is likely to be fairly low for an interval as long as ten years. As $\rho_i \to 0$, $S_i \to N_{it}/N_t$, that is, S_i approaches a static, capital-stock "saturation" ratio as ρ_i becomes appropriately small. Direct observations on the ρ_i are not available nor are they easily estimated from the data by using regression techniques. Because of the possible inaccuracies involved in fixing these parameters, less error may be introduced by using the simpler static approach.

With the energy equations, as with the stock equations, both dynamic and static specifications of the estimated equations are tried. The two dynamic specifications used are based upon an assumed underlying capital stock adjustment mechanism:

$$\left.\begin{array}{ll} \text{(a)} & \dfrac{Q_{it} - \bar{\rho}_i Q_{it-n}}{C_{it} - \bar{\rho}_i C_{it-n}} = \\ \text{(b)} & \dfrac{Q_{it} - \bar{\rho}_i Q_{it-n}}{C_{it}} = \end{array}\right\} g_i(\cdot)\ U_i \qquad \text{(E-47)}$$

where:

Q_{it} = total residential consumption of energy type i in period t;

C_{it} = average number of type i customers in period t;

$\bar{\rho}_i$ = fixed mean retention ratio for stocks of all types of energy-using equipment between periods t-n and t;

U_i = error term.

Version (a) assumes that there are $\bar{\rho}_i C_{t-n}$ "locked-in" customers with a zero elasticity of consumption with regard to all explanatory variables, that they are a representative cross-section of period t-n customers, and that, as such, they consume $\bar{\rho}_i Q_{it-n}$ of energy i in period t.

Version (b) assumes that the share $\bar{\rho}_i Q_{it-n}$ of period t-n demand has a zero elasticity of consumption, but this version does not attribute the fixed component of demand to any specific portion of period t-n customers.

The preceding assumptions of zero elasticity for locked-in demand are a distortion of reality since even consumers who do not change their stocks of energy-using devices are able to influence their consumption by changes in operating habits or conditions.

The specification of the $g_i(\cdot)$ is the same for both gas and electricity:

$$g_i(\cdot) = a_i \left(\prod_{j=1}^{m'} P_j^{b_{ij}}\right) y^{c_i} z_i \quad (i = 1,2) \qquad \text{(E-48)}$$

where:

P_j = own-and competing-energy prices;

z_i = household characteristics;

m' = number of energy prices included.

A simultaneous estimation of the above equations permits the cross elasticities in regard to gas and electricity prices to be constrained in accordance with classic consumer demand theory.

The data for the estimations were compiled as follows:

- the U.S. Census of Housing provided data on stocks of energy-consuming devices, on population, on occupied housing units, etc., for 1960 and 1970;
- Gas Facts and the Edison Electric Institute Statistical Yearbook provided data on consumption, number of customers, and values of sales;
- typical monthly bills for 1000 kWh, published by the F.P.C. in Typical Electric Bills, were used as the standardized electricity bills for 1960 and 1970;
- a supply-price function was estimated for gas; PGAS, the standardized price of gas, corresponds to a typical 40 therms/month bill.

All the variables used are identified in Table E-1. In estimating the stock equations it is assumed that space heating is the single largest component of residential energy demand.

Both static and dynamic specifications are tried. With static specifications only data pertinent to 1970 are used. The retention ratio is set equal to zero ($\rho_i = 0$).

In the dynamic case the explanatory variables are averages of the corresponding 1960 and 1970 variables. The retention ratio is set equal to 0.75 for all types of installations. Weighted geometric averages are used for the price and income variables and for HS. Simple arithmetic averages are used for SHU & NUHU. No averaging is necessary for WTEMP.

The form of the equation actually estimated is:

$$\ln\left(\frac{S_iH}{S_jH}\right) = A^0_{ij} + A_i \ln(P_i) + A_j \ln(P_j) + A^1_{ij} \ln(YPH) + A^2_{ij} \ln(HS) + A^3_{ij} \cdot SHU + A^4_{ij} \cdot NUHU + A^5_{ij} \cdot WTEMP + U_{ij} \qquad \text{(E-49)}$$

The results are presented in Tables E-2 through E-8.

A_i must be expected to be negative and A_j to be positive. The coefficient of ln YPH and lnHS should be positive or negative as heating type i is relatively superior or inferior (in a consumption, not a technological, sense) to heating type j. The coefficient of SHU should be positive or negative depending whether or not heating type i tends to be chosen more frequently than type j for single unit dwellings. The variable NUHU is included as a proxy measure of the degree of availability of utility gas in a given state, since utility gas service tends to be restricted to urban areas. The coefficient of NUHU should be negative in equations in which the utility gas installation variable is in the numerator of (S_iH/S_jH). A high WTEMP implies, on the average, a lower rate of operation and hence improves the competitive position of high-operating-cost installations.

The second largest component of residential heating demand is water heating. An approach identical to that used for space heating is employed. ρ_i is assumed to equal 0.5 for all installations. (Water heaters have a shorter average lifespan than space-heating systems.)

Table E-1

IDENTIFICATION OF VARIABLES

Variable[a]	Definition	Units of Measurement
S_iH	heating, type i[b]	fraction of total installations[c]
S_iWH	water heating, type i	fraction of total installations[c]
S_iC	cooking, type i	fraction of total installations[c]
S_iCW	clothes washing, type i	fraction of total installations[c]
S_iCD	clothes drying, type i	fraction of total installations[c]
S_iAC	air conditioning, type i	fraction of total installations[c]
SFF	food freezers	fraction of total installations[c]
SDW	dishwashers	fraction of total installations[c]
S_iTV	air conditioning, type i	fraction of total installations[c]
EPC	annual electricity consumption per customer	kWh/customer-year
EPH	annual electricity consumption per household	kWh/household-year
GPC	annual utility gas consumption per customer	therms/customer-year
GPH	annual utility gas consumption per household	therms/household-year
PGAS	price of gas[d]	$/40 therms
POIL	price of oil	mills/gallon
PCOAL	price of coal	$/short-ton
PELEC	price of electricity	$/1000 kWh
PBGAS	price of bottled gas	mills/gallon
PKER	price of kerosene	mills/gallon
PGR	price of gas range	$/unit
PER	price of electric range	$/unit
PWCW	price of wringer clothes washer	$/unit
PACW	price of automatic clothes washer	$/unit
PRAC	price of room air conditioner	$/unit
PEFF	price of electric food freezer	$/unit
PTV	price of television	$/unit
YPH	annual income per household	$/household-year
HS	household size	persons/household
SHU	single detached housing units	fraction of total housing
NUHU	nonurban housing units	fraction of total housing
WTEMP	mean December temperature	°F
STEMP	mean July temperature	°F
CL	cost-of-living	index number

[a]Where necessary, variables pertaining to 1960 are identified by a trailing "6"--income per household in 1960 is YPH6. Variables that represent averages of 1960 and 1970 variables are identified by a leading A--average income per household during the period 1960-70 is AYPH.

[b]Heating types include gas, oil, coal, electricity, bottled gas, wood, other, and none. Water heating types are gas, oil, electricity, bottled gas, other, and none. Cooking types consist of gas, electricity, bottled gas, other, and none. Washer types are wringer, automatic, and none. Dryer types include gas, electric, and none. Air conditioning types are room, central, and none. Television "types" consist of one, more than one, and none. The following symbols are used to designate unit types: G = utility gas, O = oil, C = coal (heating and water heating), E = electricity, BG = bottled gas, W = wood, OTH = other fuels, N = none, W = wringer, A = automatic, R = room, C = central (air conditioning), M = multiple installations (air conditioning and television), S = single installation (television).

[c]See Eq. (9) and the accompanying discussion for further clarification.

[d]All prices and income per household are divided by (CL/100) or (CLG/100) to normalize for cross-state variations in the price level.

Table E-2

RESIDENTIAL HEATING INSTALLATIONS,
CONSTRAINED ESTIMATES, 50 STATES, 1970

Dependent Variable	Explanatory Variables[a] Constant	PGAS	POIL	PCOAL	PELEC	PBGAS	YPH	HS	SHU	NUHU	WTEMP	Unconstrained R^2	Degrees of Freedom
SOH/SGH	-10.33	4.01	-1.31				1.80	-3.38	-8.92	6.56	-0.0207	.89	42
	(-0.39)	(4.47)	(-0.89)				(0.68)	(-0.90)	(-4.03)	(3.31)	(-1.37)		
SGH/SOH	-0.90	-6.95	2.13				-0.38	4.01	5.55	-4.40	0.0261		
	(-0.05)	(-13.15)	(1.77)				(-0.19)	(1.42)	(3.51)	(-3.03)	(2.32)		
SCH/SGH	-15.57	4.01		-3.22			0.04	10.11	-4.23	7.21	-0.0136	.65	42
	(-0.52)	(3.63)		(-4.59)			(0.01)	(2.35)	(-1.61)	(3.20)	(-0.78)		
SGH/SCH	14.40	-4.70		3.30			0.02	-10.13	3.50	-6.69	0.0149		
	(0.49)	(-11.46)		(4.51)			(0.01)	(-2.37)	(1.46)	(-3.13)	(0.85)		
SEH/SGH	9.78	4.01			-2.65		0.98	-1.92	-1.04	3.49	0.0560	.77	42
	(0.06)	(7.14)			(-7.29)		(0.59)	(-0.85)	(-0.75)	(2.96)	(6.29)		
SGH/SEH	2.08	-3.59			2.21		-1.08	2.11	1.43	-3.72	-0.0574		
	(0.13)	(-9.88)			(3.42)		(-0.65)	(0.92)	(1.09)	(-3.25)	(-6.42)		
SBGH/SGH	1.27	4.01				-1.71	-0.33	-3.48	4.53	2.86	0.0238	.53	42
	(0.06)	(5.40)				(-2.32)	(-0.16)	(-1.23)	(2.61)	(1.92)	(2.07)		
SGH/SBGH	-3.61	-2.73				2.23	-0.06	3.70	-2.65	-4.35	-0.0303		
	(-0.18)	(-6.87)				(2.71)	(-0.03)	(1.41)	(-1.67)	(-3.15)	(-2.75)		
SCH/SOH	-10.70		2.13	-3.39			-1.65	14.12	4.52	0.44	0.0057	.51	42
	(-0.31)		(1.02)	(-4.99)			(-0.48)	(2.87)	(1.75)	(0.18)	(0.28)		
SOH/SCH	15.10		-2.95	3.30			1.70	-14.67	-4.51	-0.01	-0.0024		
	(0.46)		(-2.20)	(4.18)			(0.50)	(-3.09)	(-1.75)	(-0.01)	(-0.12)		
SEH/SOH	1.98		2.13		-1.71		-1.03	1.61	7.79	-3.70	0.0745	.66	42
	(0.07)		(1.16)		(-3.97)		(-0.34)	(0.37)	(3.55)	(-1.75)	(4.35)		
SOH/SEH	-6.10		-1.84		2.21		0.91	-1.63	-7.91	3.43	-0.0752		
	(-0.20)		(-1.22)		(1.88)		(0.30)	(-0.38)	(-3.48)	(1.62)	(-4.44)		
SBGH/SOH	31.19		2.13			-4.18	-3.16	-0.72	11.24	-2.14	0.0557	.76	42
	(0.94)		(1.02)			(-3.74)	(-0.97)	(-0.15)	(4.29)	(-0.91)	(2.95)		
SOH/SBGH	-9.37		-2.59			2.23	2.34	-0.54	-12.90	3.[illegible]	-0.0433		
	(-0.25)		(-1.54)			(1.43)	(0.66)	(-0.11)	(-4.32)	(1.48)	(-2.08)		
SEH/SCH	9.04			3.30	-1.05		0.53	-12.79	3.51	-4.26	0.0697	.63	42
	(0.28)			(4.21)	(-1.95)		(0.16)	(-2.77)	(1.38)	(-1.86)	(3.70)		
SCH/SEH	-14.27			-3.19	2.21		-0.86	12.22	-3.24	3.82	-0.0701		
	(-0.42)			(-4.82)	(1.63)		(-0.25)	(2.52)	(-1.22)	(1.60)	(-3.63)		
SBGH/SCH	34.91			3.30		-3.51	-1.17	-14.49	7.25	-3.03	0.0468	.60	42
	(0.96)			(3.82)		(-3.62)	(-0.32)	(-2.85)	(2.50)	(-1.17)	(2.21)		
SCH/SBGH	-21.35			-3.07		2.23	0.49	13.79	-8.21	3.82	-0.0415		
	(-0.54)			(-4.74)		(1.37)	(0.13)	(2.59)	(-2.57)	(1.35)	(-1.83)		
SEH/SBGH	-2.71				-3.20	2.23	1.65	2.06	-5.20	0.39	0.0290	.75	42
	(-0.16)				(-8.34)	(3.17)	(1.00)	(0.90)	(-3.77)	(0.32)	(3.01)		
SBGH/SEH	0.67				2.21	-1.53	-1.14	-1.27	5.66	-0.65	-0.0334		
	(0.03)				(2.98)	(-2.12)	(-0.61)	(-0.49)	(3.69)	(-0.47)	(-3.15)		

[a]Figures in parentheses are t-ratios.

Table E-3

RESIDENTIAL HEATING INSTALLATIONS, CONSTRAINED ESTIMATES, 50 STATES, 1960-70

Dependent Variable[a]	Explanatory Variables[b]											Unconstrained R^2	Degrees of Freedom
	Constant	APGAS	APOIL	APCOAL	APELEC	APBGAS	AYPH	AHS	ASHU	ANUHU	WTEMP		
SOH/SGH	9.82	3.54	-2.72				0.39	-3.46	-8.22	7.46	-0.0140	.87	42
	(0.40)	(4.17)	(-1.60)				(0.16)	(-0.92)	(-3.45)	(3.13)	(-0.81)		
SGH/SOH	-19.09	-5.75	3.61				0.68	3.84	4.86	-5.31	0.0207		
	(-0.98)	(-11.17)	(2.50)				(0.36)	(1.30)	(2.72)	(-2.93)	(1.54)		
SCH/SGH	5.72	3.54		-2.97			-2.24	10.32	-3.77	4.99	-0.0301	.65	42
	(0.22)	(3.58)		(-4.40)			(-0.82)	(2.59)	(-1.46)	(2.00)	(-1.64)		
SGH/SCH	-6.69	-3.97		2.99			2.46	-10.34	3.18	-4.51	0.0319		
	(-0.26)	(-9.93)		(4.34)			(0.92)	(-2.61)	(1.36)	(-1.92)	(1.75)		
SEH/SGH	2.39	3.54			-1.41		0.17	-3.79	-0.16	2.72	0.0522	.75	42
	(0.18)	(7.38)			(-4.13)		(0.12)	(-1.85)	(-0.12)	(2.12)	(5.69)		
SGH/SEH	-0.78	-3.16			1.29		-0.03	3.85	0.32	-3.13	-0.0540		
	(-0.06)	(-9.27)			(2.54)		(-0.25)	(1.90)	(0.26)	(-2.58)	(-6.01)		
SBGH/SGH	8.21	3.54				-2.08	-0.88	-3.11	4.21	4.48	0.0260	.62	42
	(0.43)	(4.77)				(-3.00)	(-0.45)	(-1.11)	(2.28)	(2.52)	(1.99)		
SGH/SBGH	-9.85	-2.68				2.55	0.51	3.39	-2.49	-5.91	-0.0329		
	(-0.54)	(-6.79)				(3.61)	(0.28)	(1.25)	(-1.45)	(-3.54)	(-2.60)		
SCH/SOH	-8.43		3.61	-2.97			-2.69	14.28	4.14	-2.83	-0.0189	.50	42
	(-0.27)		(1.55)	(-4.59)			(-0.87)	(3.01)	(1.53)	(-1.01)	(-0.86)		
SOH/SCH	10.09		-3.95	2.99			2.70	-14.49	-4.02	2.96	0.0199		
	(0.34)		(-2.54)	(3.82)			(0.88)	(-3.13)	(-1.51)	(1.08)	(0.93)		
SEH/SOH	-14.26		3.61		-1.03		-0.32	0.04	8.20	-5.19	0.0639	.65	42
	(-0.50)		(1.73)		(-2.73)		(-0.11)	(0.01)	(3.40)	(-2.11)	(3.34)		
SOH/SEH	12.01		-3.50		1.29		0.29	-0.08	-8.15	5.09	-0.0635		
	(0.42)		(-1.98)		(1.25)		(0.10)	(-0.02)	(-3.40)	(2.08)	(-3.30)		
SBGH/SOH	17.19		3.61			-5.12	-1.80	-0.60	8.62	-0.35	0.0580	.82	42
	(0.64)		(1.78)			(-6.59)	(-0.68)	(-0.15)	(3.43)	(-0.14)	(3.12)		
SOH/SBGH	7.43		-4.63			2.55	1.47	-1.21	-11.23	3.30	-0.0370		
	(0.24)		(-2.47)			(2.20)	(0.48)	(-0.25)	(-3.72)	(1.16)	(-1.70)		
SEH/SCH	-8.67			2.99	-0.60		2.32	-14.40	4.21	-2.46	0.0833	.66	42
	(-0.32)			(4.10)	(-1.17)		(0.81)	(-3.39)	(1.72)	(-0.99)	(4.28)		
SCH/SEH	4.11			-2.93	1.29		-2.41	14.15	-3.94	2.26	-0.0828		
	(0.14)			(-4.66)	(1.15)		(-0.80)	(3.15)	(-1.53)	(0.87)	(-4.09)		
SBGH/SCH	11.09			2.99		-3.21	1.19	-13.98	6.63	0.59	0.0637	.57	42
	(0.36)			(3.63)		(-4.69)	(0.37)	(-2.93)	(2.35)	(0.21)	(2.87)		
SCH/SBGH	-5.99			-2.68		2.55	-1.37	13.67	-7.21	-0.20	-0.0616		
	(-0.19)			(-4.30)		(2.10)	(-0.42)	(2.81)	(-2.36)	(-0.07)	(-2.67)		
SEH/SBGH	-7.59				-1.68	2.55	1.14	-0.35	-3.60	-2.16	0.0227	.69	42
	(-0.45)				(-4.91)	(4.10)	(0.69)	(-0.14)	(-2.30)	(-1.42)	(1.96)		
SBGH/SEH	6.85				1.29	-2.11	-1.04	0.69	3.97	1.82	-0.0261		
	(0.38)				(1.92)	(-3.40)	(-0.60)	(0.27)	(2.40)	(1.14)	(-2.19)		

[a] $\rho = 0.75$.

[b] Figures in parentheses are t-ratios.

Table E-4

RESIDENTIAL WATER HEATING INSTALLATIONS,
CONSTRAINED ESTIMATES, 50 STATES, 1970

Dependent Variable	Explanatory Variables[a]										Unconstrained R^2	Degrees of Freedom
	Constant	PGAS	POIL	PELEC	PBGAS	YPH	HS	SHU	NUHU	WTEMP		
SOWH/SGWH	13.44	3.99	-2.47			0.34	-4.94	-15.23	6.77	-0.0184	0.91	42
	(0.50)	(4.30)	(-1.74)			(0.12)	(-1.27)	(-6.66)	(3.32)	(-1.19)		
SGWH/SOWH	-19.87	-6.45	2.65			0.84	5.11	12.45	-4.74	0.0247		
	(-0.94)	(-11.05)	(2.06)			(0.40)	(1.69)	(7.33)	(-3.05)	(2.04)		
SEWH/SGWH	8.67	3.99		-2.80		0.26	-0.32	0.40	4.34	0.0143	0.83	42
	(0.63)	(8.17)		(-6.34)		(0.18)	(-0.16)	(0.33)	(4.21)	(1.84)		
SGWH/SEWH	-8.44	-4.32		2.60		-0.06	0.42	-0.80	-4.00	-0.0134		
	(-0.61)	(-11.07)		(4.68)		(-0.04)	(0.21)	(-0.70)	(-3.98)	(-1.75)		
SBGWH/SGWH	12.05	3.99			-2.07	-1.02	-3.10	0.98	3.25	0.0138	0.53	42
	(0.67)	(6.23)			(-3.04)	(-0.57)	(-1.29)	(0.66)	(2.55)	(1.40)		
SGWH/SBGWH	-17.45	-3.35			2.76	1.01	3.42	0.33	-4.33	-0.0194		
	(-0.98)	(-8.14)			(3.66)	(0.58)	(1.44)	(0.23)	(-3.45)	(-1.95)		
SEWH/SOWH	-8.22		2.65	-2.30		-0.19	4.51	15.70	-2.65	0.0324	0.81	42
	(-0.33)		(1.78)	(-4.59)		(-0.08)	(1.29)	(8.67)	(-1.55)	(2.35)		
SOWH/SEWH	7.26		-2.74	2.60		0.12	-4.71	-15.64	2.60	-0.0319		
	(-0.29)		(-2.03)	(2.70)		(0.05)	(-1.33)	(-8.42)	(1.49)	(-2.29)		
SBGWH/SOWH	19.58		2.65		-4.30	-2.30	0.88	14.25	-1.86	0.0442	0.83	42
	(0.68)		(1.47)		(-4.45)	(-0.82)	(0.22)	(6.29)	(-0.92)	(2.71)		
SOWH/SBGWH	-11.76		-3.20		2.76	1.65	-2.01	-15.55	3.30	-0.0337		
	(-0.04)		(-1.97)		(2.00)	(0.53)	(-0.46)	(-5.94)	(1.45)	(1.85)		
SBGWH/SEWH	9.06			2.60	-2.55	-1.44	-2.93	0.13	-0.67	0.0021	0.67	42
	(0.50)			(3.76)	(3.76)	(-0.83)	(-1.22)	(0.09)	(-0.52)	(0.21)		
SEWH/SBGW	-8.42			-3.16	2.76	1.66	3.28	-0.04	0.66	-0.0036		
	(-0.49)			(-6.43)	(3.96)	(1.02)	(1.46)	(-0.03)	(0.55)	(-0.38)		

[a]Figures in parentheses are t-ratios.

Table E-5

RESIDENTIAL WATER HEATING INSTALLATIONS,
CONSTRAINED ESTIMATES, 50 STATES, 1960-70

Dependent Variable	Explanatory Variables[a]										Unconstrained R^2	Degrees of Freedom
	Constant	APGAS	APOIL	APELEC	APBGAS	AYPH	AHS	ASHU	ANUHU	WTEMP		
SOWH/SGWH	27.48	3.98	-4.29			-0.19	-5.72	-13.39	7.07	-0.0156	.91	42
	(1.16)	(4.81)	(-3.02)			(-0.08)	(-1.58)	(-5.79)	(3.08)	(-0.94)		
SGWH/SOWH	-34.87	-6.18	4.80			1.29	5.88	10.17	-4.77	0.0235		
	(-1.86)	(-12.75)	(3.44)			(0.69)	(2.07)	(5.91)	(-2.74)	(1.81)		
SEWH/SGWH	7.70	3.98		-1.86		-0.22	-1.91	0.69	3.95	0.0186	.89	42
	(0.75)	(10.79)		(-6.02)		(-0.21)	(-1.22)	(0.67)	(4.01)	(2.63)		
SGWH/SEWH	-8.19	-4.29		1.83		0.39	1.91	-1.12	-3.59	-0.0173		
	(-0.81)	(-14.22)		(4.73)		(0.37)	(1.24)	(-1.16)	(-3.82)	(-2.52)		
SBGWH/SGWH	11.56	3.98			-2.15	-0.98	-3.08	1.08	3.35	0.0179	.53	42
	(0.71)	(6.24)			(-3.62)	(-0.59)	(-1.27)	(0.68)	(2.19)	(1.60)		
SGWH/SBGWH	-15.51	-3.45			2.83	0.81	3.44	0.42	-4.61	-0.0248		
	(-0.96)	(-10.00)			(4.52)	(0.50)	(1.42)	(0.28)	(-3.10)	(-2.21)		
SEWH/SOWH	-23.53		4.80	-1.66		-0.08	4.03	13.96	-3.37	0.0328	.84	42
	(-1.11)		(3.07)	(-4.67)		(-0.04)	(1.26)	(7.74)	(-1.83)	(2.30)		
SOWH/SEWH	21.43		-4.58	1.83		0.05	-3.96	-13.98	3.25	-0.0333		
	(0.99)		(-3.34)	(2.35)		(0.03)	(-1.24)	(-7.75)	(1.77)	(-2.35)		
SBGWH/SOWH	4.23		4.80		-5.13	-1.28	1.51	10.86	-1.00	0.0524	.87	42
	(0.18)		(2.72)		(-7.03)	(-0.56)	(0.43)	(4.92)	(-0.48)	(3.24)		
SOWH/SBGWH	15.06		-5.16		2.83	0.95	-2.81	-13.39	3.41	-0.0354		
	(0.55)		(-3.33)		(2.79)	(2.79)	(0.35)	(-0.69)	(1.37)	(-1.86)		
SBGWH/SEWH	8.44			1.83	-2.73	-0.84	-1.43	-0.27	-0.03	0.0033	.67	42
	(0.52)			(3.03)	(-4.96)	(-0.54)	(-0.61)	(-0.19)	(-0.02)	(0.30)		
SEWH/SBGWH	-7.43			-2.09	2.83	0.88	1.58	0.30	-0.01	-0.0043		
	(-0.49)			(-5.68)	(5.07)	(0.59)	(0.71)	(0.21)	(-0.01)	(-0.42)		

[a]Figures in parentheses are t-ratios.

Table E-6

RESIDENTIAL COOKING UNITS,
CONSTRAINED ESTIMATES,
50 STATES, 1970

Dependent Variable	Explanatory Variables[a] Constant	PGAS	PELEC	PBGAS	PGR	PER	YPH	HS	SHU	NUHU	Unconstrained R^2	Degrees of Freedom
SEC/SGC	2.83	3.06	-1.34		2.78	-1.98	-0.54	0.89	1.76	1.83	.68	41
	(0.19)	(5.53)	(-3.25)		(2.36)	(-1.56)	(-0.34)	(0.43)	(1.33)	(1.89)		
SGC/SEC	-0.51	-3.07	1.06		-3.17	2.07	0.66	-0.83	-1.61	-1.73		
	(-0.03)	(-6.44)	(1.47)		(-2.17)	(0.94)	(0.41)	(-0.38)	(-1.15)	(-1.75)		
SBGC/SGC	6.52	3.06		-1.35	0.48		-1.07	-0.75	0.55	4.07	.73	42
	(0.49)	(6.34)		(-3.17)	(0.58)		(-0.85)	(-0.43)	(0.51)	(5.13)		
SGC/SBGC	-6.76	-3.07		1.40	-0.58		1.13	0.74	-0.47	-4.08		
	(-0.47)	(-6.37)		(2.45)	(-0.69)		(0.83)	(0.42)	(-0.43)	(-5.10)		
SBGC/SEC	6.00		1.06	-1.40	-2.49	2.07	-0.48	-1.55	-1.22	2.35	.64	41
	(0.43)		(1.81)	(-3.21)	(-2.17)	(1.20)	(-0.37)	(-0.89)	(-1.03)	(3.03)		
SEC/SBGC	-3.81		-1.42	1.40	2.37	-2.05	0.58	1.68	1.22	-2.23		
	(-0.28)		(-3.24)	(2.81)	(2.34)	(-1.56)	(0.48)	(1.04)	(1.19)	(-3.05)		

[a] Figures in parentheses are t-ratios.

Table E-7

**RESIDENTIAL WASHING AND DRYING UNITS,
CONSTRAINED ESTIMATES,
50 STATES, 1970**

Dependent Variable	Explanatory Variables[a]									Unconstrained R^2	Degrees of Freedom
	Constant	PELEC	PWCW	PACW	YPH	HS	SHU	NUHU			
SACW/SWCW	-18.47	-0.93	3.30	-1.25	1.96	0.20	-1.26	-2.02		.54	42
	(-1.52)	(-2.08)	(3.41)	(-2.04)	(1.69)	(0.13)	(-1.38)	(-2.97)			
SWCW/SACW	18.33	0.93	-3.29	1.24	-1.95	-0.19	1.26	2.02			
	(1.50)	(2.06)	(-3.03)	(0.97)	(-1.58)	(-0.12)	(1.24)	(-2.79)			
SNCW/SWCW	-14.83	-0.69	3.30		0.67	0.27	-2.57	-2.83		.52	43
	(-1.05)	(-1.33)	(3.04)		(0.51)	(0.15)	(-2.48)	(-3.64)			
SNCW/SACW	3.65	0.24		1.24	-1.29	0.07	-1.30	-0.81		.21	
	(0.60)	(0.97)		(2.06)	(-1.99)	(0.08)	(-2.37)	(-2.05)			
	Constant	**PGAS**	**PELEC**	**PECD**	**YPH**	**HS**	**SHU**	**NUHU**	**WTEMP**		
SECD/SGCD	19.01	2.17	-1.73	-0.04	-1.02	-0.46	0.09	3.39	0.0205	.64	41
	(1.17)	(3.68)	(-4.28)	(-0.04)	(-0.59)	(-0.19)	(0.06)	(2.71)	(2.16)		
SGCH/SECD	-18.81	-2.19	1.58	0.20	1.03	0.59	-0.20	-3.37	-0.0209		
	(-1.08)	(-3.45)	(2.23)	(0.09)	(0.57)	(0.23)	(-0.12)	(-2.43)	(-1.98)		
SNCD/SGCD	14.26	2.17			-1.80	-0.81	-1.23	3.18	0.0459	.56	43
	(0.86)	(3.63)			(-1.02)	(-0.33)	(-0.84)	(2.54)	(4.82)		
SNCD/SECD	-4.51		1.58	0.20	-0.78	-0.22	-1.42	-0.20	0.0250	.64	42
	(-0.54)		(4.59)	(0.21)	(-0.92)	(-0.17)	(-1.81)	(-0.35)	(5.14)		

[a]Figures in parentheses are t-ratios.

Table E-8

AIR CONDITIONING, FOOD FREEZING, DISHWASHING AND TELEVISION, CONSTRAINED ESTIMATES, 50 STATES, 1970

Dependent Variable	Explanatory Variables[a]								Adjusted R^2	Degrees of Freedom
	Constant	PELEC	YPH	HS	SHU	NUHU	STEMP			
SRAC/SNAC	-37.91	-0.14	3.54	-6.18	1.74	-0.21	0.1317		.70	43
	(-3.07)	(-0.26)	(2.74)	(-3.59)	(1.68)	(-0.25)	(7.56)			
SMAC/SNAC	-50.64	-0.76	4.69	-6.28	-1.35	0.85	0.2262		.70	43
	(-2.81)	(-0.96)	(2.49)	(-2.50)	(-0.89)	(0.68)	(8.90)			
SCAC/SNAC	-50.93	-1.09	5.21	-6.83	3.57	-0.24	0.1740		.65	43
	(-2.70)	(-1.32)	(2.64)	(-2.60)	(2.25)	(-0.18)	(6.54)			
	Constant	PELEC	PEFF	YPH	HS	SHU	NUHU	WTEMP		
SFF/SNFF	-8.02	-0.80	1.19	0.33	1.79	2.86	0.35	-0.0208	.66	42
	(-1.03)	(-2.81)	(1.35)	(0.46)	(1.80)	(5.29)	(0.60)	(-3.34)		
SFF/SNFF	-0.04	-0.62	-1.14	0.70	1.19	2.61	1.71	—	.58	43
	(-0.01)	(-1.98)	(-1.87)	(0.89)	(1.09)	(4.38)	(3.70)			
	Constant	PELEC	YPH	HS	SHU	NUHU				
SDW/SNDW	-6.98	-0.91	1.42	-0.82	0.05	-0.70			.45	44
	(-1.13)	(-3.64)	(2.24)	(-0.95)	(0.10)	(-1.90)				
	Constant	PELEC	PTV	YPH	HS	NUHU				
SMTV/SSTV	-10.24	-0.07	-0.38	1.29	0.09	-1.20			.66	44
	(-2.23)	(-0.41)	(-1.30)	(3.02)	(0.14)	(-4.60)				
SNTV/SSTV	4.78	-0.52	-0.11	-0.64	2.62	0.22			.10	44
	(0.58)	(-1.63)	(-0.20)	(-0.84)	(2.38)	(0.47)				

[a]Figures in parentheses are t-ratios.

WTEMP is included because, to the extent that climate affects the choice of space-heating systems, it will also affect the choice of water-heating units since the same fuel will generally be used for both.

In regard to cooking the equations are specified in the static case only (The results with a dynamic specification are very similar.)

In regard to clothes washing and drying the specification is very similar to that for cooking. The coefficient of NUHU suggests that if other things are equal urbanity reduces the demand for washers.

With respect to the energy consumption equations, unconstrained estimates are presented separately for gas and electricity. Constrained estimates follow the unconstrained. All the explanatory variables, except appliance prices, appearing in the stock equations are included. The additional variables used are presented in Table E-9. The form for the estimated equations is:

$$\begin{aligned} \ln X = {} & a_0 + a_1 \ln PELEC + a_2 \ln PGAS + a_3 \ln POIL + \\ & a_4 \ln PCOAL + a_5 \ln PBGAS + a_6 \ln YPH + \\ & a_7 \ln HS + a_8 SHU + a_9 NUHU + a_{10} NTEMP + \\ & a_{11} STEMP + u. \end{aligned} \tag{E-50}$$

The results are presented in Tables E-9 through E-12.

For electricity, in the static formulation, $\bar{\rho}_e = 0$. Two values for $\bar{\rho}_e$ are tried in the dynamic formulation: 0.5 and 0.75. Two types of dependent variables are used, corresponding to the two versions (a) and (b) of the dynamic adjustment mechanism. The results suggest that there is no great sensitivity either to the type of dependent variable or the level of $\bar{\rho}_e$ chosen.

In the case of gas, in contrast to electricity, it makes a great difference whether the number of customers or the number of households is used in the denominator of the dependent variable for gas. The changes in the estimated coefficients of PGAS and WTEMP are most noticeable because these two variables greatly influence the proportion of households that become gas customers. The results are troublesome because of the large number of negative signs obtained for the cross-price coefficients, especially those for PELEC.

For gas and electricity (See Table E-12), the first two equations

Table E-9

ADDITIONAL VARIABLE DEFINITIONS
AND UNITS OF MEASUREMENT

Variable	Definition	Units of Measurement
QE	Total annual residential electricity consumption	kWh/year
CE	Average number of residential electricity customers	customers
QG	Total annual residential utility gas consumption	therms/year
CG	Average number of utility gas customers	customers
NH	Number of households	households
EPC	QE/CE	kWh/customer-year
EPH	QE/NH	kWh/household-year
GPC	QG/CG	therms/customer-year
GPH	QG/NH	therms/household
DEPH[a]	$(QE_{70}-\bar{\rho}_e \cdot QG_{60})/NH_{70}$	kWh/household-year
DGPH[a]	$(QG_{70}-\bar{\rho}_g \cdot QG_{60})/NH_{70}$	therms/household-year
REPH[a]	$(QE_{70}-\bar{\rho}_e \cdot QE_{60})/(NH_{70}-\bar{\rho}_e \cdot NH_{60})$	kWh/household-year
RGPH[a]	$(QG_{70}-\bar{\rho}_g \cdot QG_{60})/(NH_{70}-\bar{\rho}_g \cdot NH_{60})$	therms/household-year
REG	QE/QG	kWh/therm
RPEPG	PELEC/PGAS	therm/kWh
GEPH	12.5 · GPH + EPH	equivalent kWh/household-year[b]
PEG	1.53 · PGAS + PELEC	\$/1000 kWh-mo. + \$/80 therms-mo.

[a]For definitions of $\bar{\rho}_e$ and $\bar{\rho}_g$, see p. 15. The subscripts 70 and 60 refer to the two census years 1970 and 1960.

[b]Based upon typical gas and electric appliance operating efficiencies.

Table E-10

RESIDENTIAL ELECTRICITY CONSUMPTION
50 STATES, 1960, 1970 AND 1960-70

Dependent Variables	Explanatory Variables[a] Constant	PELEC	PGAS	POIL	PCOAL	PBGAS	YPH	HS	SHU	NUHU	WTEMP	STEMP	Adjusted R^2	Degrees of Freedom
EPC	2.16	-1.07	0.33	0.73	-0.05	-0.09	1.06	0.04	0.69	0.42	0.0014	0.0001	.70	38
(1960)	(0.57)	(-6.70)	(2.27)	(2.52)	(-0.43)	(-0.62)	(3.05)	(0.08)	(1.71)	(1.03)	(0.39)	(0.02)		
EPH	-0.78	-0.99	0.36	0.87	0.05	0.15	1.01	0.07	1.03	-0.03	-0.0040	0.0057	.70	38
(1960)	(-0.21)	(-6.20)	(2.40)	(2.98)	(0.50)	(0.98)	(2.90)	(0.13)	(2.54)	(-0.07)		(0.70)		
EPC	10.48	-1.28	0.27	0.32	0.06	-0.27	0.67	-0.56	0.23	0.97	0.0054	0.0106	.63	38
(1970)	(2.24)	(-6.80)	(1.62)	(1.14)	(0.59)	(-1.21)	(1.52)	(-0.94)	(0.60)	(2.93)	(1.60)	(1.39)		
EPH	6.83	-1.12	0.30	0.27	0.12	0.00	0.80	-0.94	0.76	0.88	0.0030	0.0113	.66	38
(1970)	(1.47)	(-6.00)	(1.84)	(0.97)	(1.13)	(0.01)	(1.84)	(-1.60)	(2.03)	(2.68)	(0.38)	(1.49)		
DEPH	7.25	-0.99	0.35	0.01	0.26	0.06	0.76	-1.89	0.58	1.18	0.0047	0.0202	.70	38
($\bar{\rho}_e$ = 0.5)	(1.66)	(-6.17)	(2.08)	(0.05)	(2.44)	(0.32)	(1.87)	(-3.26)	(1.46)	(3.09)	(1.31)	(2.55)		
REPH	-3.90	-0.95	0.28	-0.05	0.25	0.10	0.51	-1.88	0.61	1.19	0.0019	0.0221	.76	38
($\bar{\rho}_e$ = 0.5)	(-1.05)	(-6.91)	(1.98)	(-0.19)	(2.79)	(0.63)	(1.48)	(-3.79)	(1.81)	(3.67)	(0.62)	(3.26)		
DEPH	8.60	-1.03	0.38	-0.15	0.32	0.03	0.73	-2.29	0.43	1.40	0.0067	0.0239	.65	38
($\bar{\rho}_e$ = 0.75)	(1.67)	(-5.39)	(1.94)	(-0.41)	(2.52)	(0.12)	(1.52)	(-3.33)	(0.92)	(3.09)	(1.58)	(2.54)		
REPH	0.42	-0.91	0.24	-0.25	0.29	0.10	0.18	-2.30	0.49	1.45	0.0004	0.0278	.75	38
($\bar{\rho}_e$ = 0.75)	(0.10)	(-6.20)	(1.58)	(-0.89)	(3.05)	(0.60)	(0.48)	(-4.34)	(1.33)	(4.17)	(0.12)	(3.82)		

[a]Figures in parentheses are t-ratios.

Table E-11

RESIDENTIAL GAS CONSUMPTION
50 STATES, 1960, 1970, AND 1960-70

Dependent Variable	Explanatory Variables[a] Constant	PELEC	PGAS	POIL	PCOAL	PBGAS	YPH	HS	SHU	NUHU	WTEMP	STEMP	Adjusted R^2	Degrees of Freedom
GPC	15.97	-0.98	-1.30	-0.41	-0.27	-0.37	0.49	1.47	0.55	0.70	-0.0137	-0.0049	.75	38
(1960)	(2.61)	(-3.79)	(-5.45)	(-0.87)	(-1.56)	(-1.54)	(0.88)	(1.68)	(0.83)	(1.07)	(-2.35)	(-0.37)		
GPH	13.34	-0.84	-2.92	-0.46	-0.08	-0.29	0.59	2.27	-0.43	-1.24	-0.0296	0.0407	.76	38
(1960)	(1.21)	(-1.80)	(-6.80)	(-0.54)	(-0.24)	(-0.67)	(0.58)	(1.44)	(-0.36)	(-1.05)	(-2.83)	(1.71)		
GPC	6.23	-0.62	-0.98	-0.30	-0.36	0.16	0.81	0.80	0.79	0.23	-0.0178	0.0034	.75	38
(1970)	(1.15)	(-2.84)	(-5.10)	(-0.52)	(-3.02)	(0.62)	(1.60)	(1.17)	(1.81)	(0.60)	(-4.58)	(0.38)		
GPH	-0.63	-0.67	-2.75	-0.25	-0.41	0.47	1.42	1.24	1.10	-1.70	-0.0372	0.0424	.71	38
(1970)	(-0.05)	(-1.32)	(-6.08)	(-0.32)	(-1.45)	(0.75)	(1.19)	(0.77)	(1.07)	(-1.89)	(-4.05)	(2.03)		
DGPH	5.37	-1.08	-2.55	-0.69	-0.21	0.21	1.53	0.57	0.55	-0.87	-0.0330	0.0413	.68	38
($\bar{\rho}_g$ = 0.5)	(0.44)	(-2.40)	(-5.46)	(-0.81)	(-0.71)	(0.40)	(1.35)	(0.35)	(0.50)	(-0.82)	(-3.31)	(1.86)		
RGPH	-3.47	-1.04	-2.62	-0.76	-0.22	0.25	1.29	0.58	0.59	-0.85	-0.0358	0.0431	.69	38
($\bar{\rho}_g$ = 0.5)	(-0.28)	(-2.30)	(-5.57)	(-0.88)	(-0.73)	(0.48)	(1.13)	(0.36)	(0.53)	(-0.80)	(-3.57)	(1.93)		
DGPH	3.56	-1.35	-2.66	-0.87	-0.22	0.25	1.98	0.19	0.56	-0.65	-0.0335	0.0455	.59	38
($\bar{\rho}_g$ = 0.75)	(0.24)	(-2.51)	(-4.42)	(-0.85)	(-0.61)	(0.40)	(1.46)	(0.10)	(0.42)	(-0.51)	(-2.82)	(1.72)		
RGPH	-2.32	-1.24	-2.61	-0.97	-0.24	0.33	1.43	0.17	0.62	-0.55	-0.0397	0.0494	.62	38
($\bar{\rho}_g$ = 0.75)	(-0.16)	(-2.32)	(-4.71)	(-0.96)	(-0.67)	(0.53)	(1.06)	(0.09)	(0.47)	(-0.47)	(-3.37)	(1.88)		

[a]Figures in parentheses are t-ratios.

Table E-12

RESIDENTIAL GAS AND ELECTRICITY CONSUMPTION
50 STATES, 1970

Dependent Variable	Explanatory Variables[a]: Constant	PELEC	PGAS	POIL	PCOAL	PBGAS	YPH	HS	SHU	NUHU	WTEMP	STEMP	Maximum Adjusted R^2	Degrees of Freedom
EPH	6.14	-1.19	0.11[b]	0.20	0.15	0.11	0.94	-0.92	0.63	0.99	0.0028	0.0119	.66	38
	(1.19)	(-5.74)	(0.59)	(0.64)	(1.28)	(0.43)	(1.94)	(-1.41)	(1.53)	(2.73)	(0.74)	(1.42)		
GPH	-4.03	0.20[b]	-2.68	-0.26	-0.48	0.57	1.16	0.96	1.63	-2.15	-0.0332	0.0261	.71	38
	(-0.31)	(0.38)	(-5.89)	(-0.33)	(-1.69)	(0.92)	(0.97)	(0.59)	(1.58)	(-2.38)	(-3.59)	(1.24)		
	Constant	RPEPG	PGAS	POIL	PCOAL	PBGAS	YPH	HS	SHU	NUHU	WTEMP	STEMP		
REG	-2.94	-1.92		0.15	0.77	-0.03	0.45	-1.70	-1.69	3.75	0.0337	-0.0066	0.63	39
	(-0.18)	(-4.28)		(0.15)	(2.18)	(-0.04)	(0.30)	(-0.82)	(-1.35)	(3.43)	(2.89)	(-0.26)		
REG	3.10	-0.45	2.60	0.52	0.52	-0.46	-0.62	-2.18	-0.34	2.58	0.0402	-0.0311	0.71	38
	(0.22)	(-0.76)	(3.41)	(0.58)	(1.63)	(-0.66)	(-0.45)	(-1.18)	(-0.29)	(2.51)	(3.82)	(-1.30)		
	Constant	PGE		POIL	PCOAL	PBGAS	YPH	HS	SHU	NUHU	WTEMP	STEMP		
GEPH	3.24	-1.46		0.23	-0.18	-0.01	0.95	-0.18	-1.37	-0.48	-0.0123	0.0185	.77	39
	(0.82)	(-6.73)		(0.96)	(-2.01)	(-0.04)	(2.52)	(-0.35)	(4.20)	(-1.69)	(-4.27)	(2.97)		

[a] Figures in parentheses are t-ratios

[b] The cross elasticities of consumption for gas and electricity with respect to each other's price are constrained to satisfy $\eta_{eg} = 0.55\ \eta_{ge}$, where η_{ij} is the estimated elasticity of i with respect to the price of j.

are constrained estimates for the static formulation. The next two equations test the hypothesis that the own- and cross-price effects are such that the relative amounts of electricity and gas consumed depend only upon the relative prices of electricity and gas, and not upon their absolute levels. The final equation aggregates electricity and gas into a single utility-energy commodity. A fixed weight reflecting the average efficiencies of electric and gas equipment is used (1 therm = 12.5 kWh). The utility-energy price index, PEG, is the sum of bills for equivalent amounts of energy (1000 kWh/mo. and 80 therms/mo.).

The stock equations can be used to provide indirect estimates of the magnitudes of the own- and cross-price elasticities of energy consumption. The average consumption of energy type i per household is:

$$q_i = \sum_{k=1}^{n} e_{ik} \cdot S_{ik} \qquad \text{(E-51)}$$

where:

e_{ik} = average amount of energy type i used for household function k;

S_{ik} = fraction of households using energy type i for function k.

Assuming that e_{ik} is a given constant, it follows that:

$$\frac{\partial q_i}{\partial P_j} \cdot \frac{P_j}{q_i} = \sum_{k=1}^{n} \left[\frac{e_{ik} \cdot S_{ik}}{\sum_k e_{ik} \cdot S_{ik}} \cdot \frac{\partial S_{ik}}{\partial P_j} \cdot \frac{P_j}{S_{ik}} \right] \qquad \text{(E-52)}$$

If estimates of e_{ik} are available, this equation can be used to calculate the elasticities of consumption at the sample mean values of S_{ik}. These elasticities can then be compared with those estimated directly in the energy consumption equations.

Tables E-13 through E-15 include the data for calculating price elasticities according to the procedure just described. In the last table (Table E-16) the estimated mean price elasticities of consumption for 1970 are presented.

The difference between the directly- and the indirectly-estimated own-price elasticities of demand is a measure of the responsiveness of "conservation" to price. This conservation effect amounts to about

Table E-13
ESTIMATED PATTERN OF GAS CONSUMPTION
BY HOUSEHOLD FUNCTION, 1970

Function	Typical Annual Consumption (therms/yr.)	Average U.S. Saturation	Contribution to Average Household Consumption (therms/yr.)	Share of Average Household Consumption
Heating	1000	0.552	552	0.711
Water heating	270	0.551	149	0.192
Cooking	95	0.492	47	0.061
Clothes drying	85	0.124	11	0.014
Other	--	--	17[a]	0.022
Total	--	--	776[b]	1.000

[a]Residual.

[b]Actual, not estimated.

Table E-14
ESTIMATED PATTERN OF FUEL OIL AND BOTTLED GAS CONSUMPTION
BY HOUSEHOLD FUNCTION, 1970

Function	Typical Annual Consumption[a]	Average U.S. Saturation	Contribution to Average Household Consumption[a]	Share of Average Household Consumption
Fuel oil:				
Heating	856	0.260	223	0.86
Water heating	231	0.098	23	0.09
Other[b]	--	--	12	0.05
Total	--	--	258	1.00
Bottled gas:				
Heating	1,000	0.060	60	0.70
Water heating	270	0.050	14	0.16
Cooking	95	0.084	8	0.09
Other[b]	--	--	4	0.05
Total	--	--	86	1.00

[a]Units of measurement are gal/yr. for oil and therms/yr. for gas.

[b]Assumed to be 5 percent of average household consumption.

Table E-15

ESTIMATED PATTERN OF ELECTRICITY CONSUMPTION
ACCORDING TO HOUSEHOLD FUNCTION, 1970

Function	Typical Annual Consumption (kWh/yr.)	Average U.S. Saturation	Contribution to Average Household Consumption (kWh/yr.)	Share of Average Household Consumption
Refrigerator	1,200	1.000	1,200	0.170
Heating	14,500	0.077	1,117	0.158
Water heating	4,500	0.250	1,125	0.159
Television	400	1.242	497	0.070
Cooking	1,175	0.406	477	0.068
Room air conditioning	1,350	0.178	240	0.034
Multi-room air conditioning	2,700	0.072	194	0.027
Central air conditioning	4,000	0.107	428	0.061
Food freezing	1,400	0.282	395	0.056
Clothes drying	990	0.294	291	0.041
Dishwashing	360	0.189	68	0.010
Wringer clothes washing	75	0.112	8	0.001
Automatic clothes washing	100	0.559	56	0.008
Other[a]	--	--	962[b]	0.136
Total	--	--	7,058[c]	1.000

[a]Includes lighting, pumping, small appliances, etc.

[b]Residual.

[c]Actual, not estimated.

Table E-16
ESTIMATED MEAN PRICE ELASTICITIES
OF CONSUMPTION, 1970

Energy Types	PGAS	PELEC	POIL	PBGAS	PCOAL
	Energy Prices				
Indirect Estimates[a]					
Utility gas	-1.73	0.28	0.43	0.13	0.07
Electricity	0.81	-0.84	0.10	0.05	0.02
Fuel oil	2.10	0.21	-1.58	0.13	0.08
Bottled gas	2.04	0.26	0.43	-2.04	0.01
Coal	2.21	0.17	0.55	0.13	-3.29
Direct Estimates					
Utility gas	-2.75	-0.67[b]	-0.25[b]	0.47[b]	-0.41[b]
Electricity	0.30[b]	-1.12	0.27[b]	0.00[b]	0.12[b]
Utility gas[c]	-2.68	0.20[b]	-0.26[b]	0.57[b]	-0.48[b]
Electricity[c]	0.11[b]	-1.19	0.20[b]	0.15[b]	0.11[b]

[a]The indirect estimates are based upon the following values:

Function	Utility Gas	Electricity	Bottled Gas	Oil	Coal
	Energy Type				
Heating	-4.01	-2.21	-2.23	-2.13	-3.39
Water heating	-3.99	-2.60	-2.76	-2.65	--
Cooking	-3.06	-1.06	-1.40	--	--
Clothes drying	-2.17	-1.58	--	--	--

The coefficients for food freezing, multiple room air conditioning, central air conditioning and dishwashing apply only to electricity. They are -0.30, -0.76, -1.09, and -0.90.

[b]Not significant at .05 level.

[c]Constrained estimates.

30-35% of the total mean elasticity of demand and inter-fuel substitution effects account for the remaining 65-70%.

M. Baughman and P. Joskow. "The Effects of Fuel Prices on Residential Appliance Choices in the United States." Land Economics, 51 (1975), 41-49.

Baughman and Joskow attempt to estimate the effects of fuel prices on fuel choice decisions made by residential customers concerning space heating, water heating, cooking and clothes drying. These activities constitute 80% of the residential energy consumption in the U. S.

The consumers' decision-making process is assumed to be composed of two steps. The customer first decides that he wants a particular service (e.g. water heating in his home). This decision defines some expected level of energy consumption. Next, the consumer attempts to find the fuel which will provide this service most economically. Baughman and Joskow assume that, although there is some possibility for responding to changing fuel prices by changing the utilization rate of a particular appliance, the primary response to changing prices, in the long run, is through fuel switching.

An individual is assumed to face a set of alternative techniques for providing a particular service, and each alternative has associated with it a vector of characteristics x (x_i for technique i) upon which individual choices are based. A choice index is defined:

$$I = I(x) + \varepsilon(x) \qquad \text{(E-53)}$$

where $\varepsilon(x)$ is a random disturbance, with a given distribution, assumed to be the Weibull distribution.

The probability that alternative i will be chosen is:

$$P_i = \frac{e^{I(x_i)}}{\sum_{j=1}^{k} e^{I(x_j)}} \text{ , or} \qquad \text{(E-54)}$$

$$\log (P_i/P_j) = I(x_i) - I(x_j), \qquad \text{(E-55)}$$

with:

$$\sum_i P_i = 1 \qquad \text{(E-56)}$$

For residential appliance choices, it is assumed that:

$$I_i = A + B_1F_i + B_2C_i + B_3X_i \quad , \qquad \text{(E-57)}$$

with:

F_i = effective price per BTU of fuel;

X_i = other characteristics such as "cleanliness", "convenience", "reliability", etc.;

C_i = capital cost,

The log-odds model would be:

$$\log \frac{P_i}{P_j} = B_i(F_i - F_j) + B_2(C_i - C_j) + B_3(X_i - X_j) \qquad \text{(E-58)}$$

The different burning efficiencies must be accounted for. If the price of electricity is taken as a base (fuel i), then:

$$F_j = \gamma_j F_j^* \; (j \neq i) \qquad \text{(E-59)}$$

where F_j^* is the market price of fuel j and γ_j is a conversion coefficient which converts the market price into an "electricity equivalent" price.

There is essentially no variation in the $(C_i - C_j)$ series, so a constant term has been introduced into the model to reflect the difference in capital costs among alternatives.

The household income variable is used to recognize the differential weightings of such unobservables as "cleanliness," "convenience," etc.

In the case of house heating, a measure of minimum winter temperature is introduced into the model.

The authors have also tried a number of variables to measure fuel availability (urbanization and population density) and utilization (household size) for each appliance, but the results were not significant.

The data for the model were taken from a cross-section of 48 states for 1969. They include the following:

P_g = proportion of appliance utilization accounted for by gas;

P_o = proportion of appliance utilization accounted for by oil;

P_e = proportion of appliance utilization accounted for by electricity;

F_g = price of gas measured as the typical bill per 100 Therms;

F_e = price of electricity measured as the difference between a typical electric bill for 1,000 KWH and a typical electric bill for 500 KWH per month (1970);

F_o = price of oil measured as cents per gallon;

Y = effective household buying income per capita;

TEMP = mean January temperature.

The results are as follows:

House Heating

$$\ln \frac{P_g}{P_e} = 2.11 + 0.289F_e - 30.95F_g + 0.296(10^{-3})Y - 0.456(10^{-1})\text{TEMP} \quad \text{(E-59)}$$

$$\ln \frac{P_o}{P_e} = 12.85 + 0.289F_e - 0.601F_o - 0.152(10^{-3})Y - 0.408(10^{-1})\text{TEMP} \quad (R^2 = .913) \quad \text{(E-60)}$$

Water Heating

$$\ln \frac{P_g}{P_e} = -1.69 + 0.352F_e - 45.75F_g + 0.491(10^{-3})Y \quad \text{(E-61)}$$

$$\ln \frac{P_o}{P_e} = 25.24 + 0.352F_e - 1.64F_o - 0.103(10^{-3})Y \quad (R^2 = .641) \quad \text{(E-62)}$$

Cooking

$$\ln \frac{P_g}{P_e} = 2.34 + 0.20F_e - 19.81F_g + 0.33(10^{-3})Y \quad (R^2 = .57) \quad \text{(E-63)}$$

Clothes drying

$$\ln \frac{P_g}{P_e} = -7.65 + 0.32F_e - 20.57F_g + 0.62(10^{-3})Y \quad (R^2 = .41) \quad \text{(E-64)}$$

It is evident that the signs of all the price variables are as expected and they are all statistically significant at the 5% level. In all equations, higher incomes lead to the favoring of gas over electricity, as the authors expected. The signs of the constant terms in all but the clothes-drying equation are in accord with conventional knowledge about the relative capital costs of similar appliances using different fuels.

Baughman and Joskow conclude that substantial possibilities for fuel switching in the commercial and residential sectors exist. Public policies directed toward one fuel and based on traditional own-price elasticities are bound to have a substantial, and often undesirable impact on the markets for other fuels if interfuel substitution is not taken into consideration.

J. P. Stein, The Determinants of Residential Appliance Possession and Fuel Choice in Los Angeles: A Cross-Section Analysis of 1970 & 1975 Data, The Rand Paper Series P-5733, The Rand Corporation, Santa Monica, California 90406 (1976)

In his analysis of appliance possession and fuel choice Stein employs a more disaggregated, more recent and more accurate data base than previous appliance stock regression analyses which have used nationwide samples at the state or SMSA level of aggregation. The analysis uses measures of marginal energy prices that are in better agreement with economic theory than the average energy prices.

The study recognizes that, although in the short run appliance stock is exogenous, in the long run this stock depends on energy prices and is interrelated with the demand for energy.

In his analysis Stein distinguishes between essential appliances and non-essential appliances. Essential appliances include house heaters, water heaters and stoves. Non-essential appliances include clothes dryers, dishwashers, air conditioners and freezers. Possession of these appliances, either through rental or ownership, is analyzed.

The study recognizes that appliance fuel choice is primarily a cost decision although other determinants are involved. These other determinants of the possession and use of appliances are as follows:

1. Storage space may be a significant element in the cost of possessing an appliance;
2. The age of the dwelling structure and the rental/owner status of the occupant may constrain appliance choice;
3. The number of dwelling units in the building may affect the

relative hook-up costs of electric and gas appliances;

4. Differing summer and winter climates may influence the intensity of use of heating systems and air conditioners.
5. The fuel type itself may have some influence (there is a significant income preference for electricity).

Stein bases his figures for appliance stocks and household characteristics on the 1970 U.S. Census of Population and Housing and on a 1975 Rand Residential Energy Survey which involved 1018 randomly selected individual households in the Los Angeles County.

Current patterns of appliance possession result from appliance purchases in past periods. Each purchase can be assumed to have been based on an investment analysis that involved the stream of expected future benefits and costs. Here current energy prices and household characteristics are used as proxies for both past expected values of these variables and currently-expected values for the future.

Marginal energy prices are calculated from utility rate schedules. (Ten residential electricity rate schedules and five residential natural gas rate schedules, all structured with declining block rate, apply in different parts of Los Angeles.)

The marginal costs of electricity and gas are calculated for consumers of 400 KWH and 100 therms per month under each schedule in each year. Such consumption levels may be considered appropriate for the average Los Angeles household.

Stein indicates that the average use of electricity in relation to the use of gas increased from 40% to 85% from 1970 to 1975 for all appliances except clothes dryers. The saturation rate for each non-essential appliance increased from 25% to 60%. (Saturation rates for essential appliances approached 100% in both 1970 and 1975.)

The mean real marginal price of electricity rose 32%, and the mean real marginal price of gas rose 40%.

Mean real income rose 16%. The average number of persons per family, the average number of rooms per dwelling unit, and the percentage of renters all rose less than 1%. The mean number of units per structure increased 116%.

It would seem that, due to the strong relative increase in the prices of electricity, the consumption of gas should have increased from 1970 to 1975. However, this did not occur. Stein does not explain this phenomenon, but it seems reasonable to attribute it to the gas shortage and probably to a no hook-up policy for new housing units. The 1970 data may then be assumed to be representative of a free market situation and the 1975 data to be representative of a regulated market with a gas shortage.

The low correlation coefficients obtained for the 1975 regressions seem to confirm this assumption. Hence only the results of the 1970 regressions are included here.

The 1970 data can be thought of as aggregations of individual (dichotomous) variables or as group means grouped by census tract.

The results show that almost all of the regressions using 1970 census data have R^2 coefficients above .80. Fuel choice for clothes dryers and the possession of air conditioners are less well explained.

Fuel choice (1970)

$$\ln\left(\frac{EHEAT}{GHEAT}\right) = -3.31 - 1.10\,\frac{PE}{PG} + .0417\text{ INCOME} + .0204\text{ NROOMS} - .0352\text{ AGE} + 0.543\text{ NUNITS} + 2.39\text{ RENTER} - .00242\text{ WTEMP} \quad (R^2 = .913) \tag{E-65}$$

$$\ln\left(\frac{ECOOK}{GCOOK}\right) = -.749 - 1.52\,\frac{PE}{PG} + .0761\text{ INCOME} - .301\text{ NPER} - .0246\text{ AGE} + .0192\text{ NUNITS} - 0.413\text{ RENTER} \quad (R^2 = .815) \tag{E-66}$$

$$\ln\left(\frac{EWATER}{GWATER}\right) = -2.10 - 2.47\,\frac{PE}{PG} + .0427\text{ INCOME} - .203\text{ NPER} - .0452\text{ AGE} + .0342\text{ NUNITS} + 1.80\text{ RENTER} \quad (R^2 = .895) \tag{E-67}$$

$$\ln\left(\frac{EDRY}{GDRY}\right) = -5.83 - .824\,\frac{PE}{PG} + .0419\text{ INCOME} - .179\text{ NPER} + .00726\text{ AGE} + .788\text{ RENTER} \quad (R^2 = .463) \tag{E-68}$$

Non-essential appliance possession (1970)

$$\ln\left(\frac{DRY}{NO\ DRY}\right) = -.201 - 8.39\ PE + .813\ PG + .0369\ INCOME - .0402\ NPER + .413\ NROOMS - .0224\ AGE + .0293\ NUNITS - .811\ RENTER \quad (E\text{-}69) \quad (R^2 = .806)$$

$$\ln\left(\frac{AIR}{NO\ AIR}\right) = -76.3 - 164.2\ PE + .0295\ INCOME - .0348\ AGE - .492\ RENTER + 1.09\ STEMP \quad (E\text{-}70) \quad (R^2 = .560)$$

$$\ln\left(\frac{DISH}{NO\ DISH}\right) = -6.42 + 24.1\ PE + .0356\ INCOME - 2.81\ NPER + 1.12\ NROOMS - .0455\ AGE + .0202\ NUNITS + 1.24\ RENTER \quad (E\text{-}71) \quad (R^2 = .814)$$

$$\ln\left(\frac{FREEZ}{NO\ FREEZ}\right) = -3.53 + 14.6\ PE + .000332\ INCOME + .110\ NPER + .371\ NROOMS - .00929\ AGE - .961\ RENTER \quad (E\text{-}72) \quad (R^2 = .949)$$

Definition of variables

EHEAT = % saturation of electric heating;
GHEAT = % saturation of gas heating;
WATER → water heater
AIR → air conditioner
COOK → stove
FREEZ → freezer
DISH → dishwasher
DRY → dryer

(WATER through DRY:) % saturation, with eventual distinction between electricity and gas appliances. (unit of observation = census tract);

INCOME = average income per occupied unit ($1000);
NPER = average number of persons per occupied unit;
NROOMS = average number of rooms per occupied unit;
RENTER = rental units as a % of occupied units;
AGE = average age of structure in Census tract in years;

PE = marginal cost of electricity;
PG = marginal cost of utility gas;
STEMP = mean maximum July temperature;
WTEMP = mean minimum January temperature.

Stein observes that fuel choice depends strongly on relative energy prices. All the relevant coefficients have the expected negative sign.

Energy prices, however, do not have a clearly-determined effect on the possession of non-essential appliances. Possession of such appliances is primarily explained by income and other variables.

It is evident that there is a positive income preference for electric appliances. The income effect is most significant in the choice of cooking fuel. In addition, the regressions indicate positive relationships between income and the possession of non-essential appliances. The income elasticities for possession of these appliances, however, are generally less than units, suggesting that they are not luxury items.

Mean winter and summer temperatures affect appliance possession and fuel choice in several ways. First, mean summer temperature is the most significant determinant of air conditioner possession. Next, there is a negative relationship between mean winter temperature and the relative use of electricity or gas for house heating. The use of electric heating, which is cheaper to install but more expensive to operate, is prevalent in a warmer climate where less heating fuel is required.

The age of the structure also affects fuel choice and appliance possession. Relatively recent construction technologies make buildings using electricity cheaper to construct than buildings using gas. Also new gas service is being refused in certain areas. Hence, the age of the building may determine whether it is feasible to use gas an an appliance fuel.

Stein also notes that renter/owner variables affect appliance possession and fuel choice. Rental units are more likely to use electricity for space and water heating than owner-occupied units are. Landlords prefer electric appliances which are usually cheaper to purchase and install. Fuel choice for space heating is most sensitive to rental/owner status; fuel choices for water heating and clothes drying are less so. Finally, renters have been found to be significantly less likely than owners to possess non-essential appliances, possibly because of more frequent moves.

The number of persons in a dwelling unit can determine the possession of an appliance and the choice of fuel and can affect the intensity with which several of the appliances are used. Households with more persons are much more likely to use gas, which is the cheaper fuel, for cooking, water heating, and clothes drying. A positive relationship exists between family size and possession of a clothes dryer. Larger families would presumably be able to use a dryer more intensively. A positive relationship also exists between family size and possession of a freezer. In larger families the increased demand for food and food storage facilities outweighs the negative effects of income, which is generally lower per capita in larger families. This lower per capita income generally found in larger families, however, does affect dishwasher possession negatively. It is assumed that the supply of child labor can substitute for the service of a dishwasher.

The number of rooms in a dwelling unit affects appliance possession and fuel choice in diverse ways. It is insignificantly related to fuel choice for house heating. However, as expected, possession of dishwashers, clothes dryers, and freezers is highly significantly related to the number of rooms in the house since these appliances are too bulky to be efficient in homes without much space.

Finally, the number of units in a structure is positively and highly significantly related to the use of electricity in all fuel choice situations. Also, the relative installation costs of gas and electric appliances favor the choice of electric appliances in multiple unit structures.

Stein concludes that future research should attempt to locate a times series data set, matched with billing information, at a household level.

Morris: "Evaluation of Measures for Conserving Energy." Energy: Mathematics and Models. Ed. F.S. Roberts, Philadelphia: Society for Industrial and Applied Mathematics.

Morris developed a model for estimating future energy demands in the residential sector, based on forecasts of population, saturation of appliances, energy prices, etc.[1] The model is estimated for space heating, water heating, cooking, clothes washing and drying, and television, and for natural gas, electricity, fuel oil, coal and bottled gas.

The author assumes that changes in the demand for a given kind of energy would be first influenced by changes in appliance stocks. This is a long-run effect. When replacements are needed or new homes built, changing income or changing energy prices will induce substitutions in the kinds of appliances installed. Changes in the demand for a particular type of energy will also be influenced by changes in the intensity of use of various appliance. This might be termed a conservation effect. When energy prices are higher consumers use less for a given function.

In the analysis of the substitution effects the fraction of new or replacement appliances that use energy type i during time period t-1 to t is:

$$s_i = g_i / \sum_j g_i \qquad \text{(E-73)}$$

$$g_i = a_i (P_i)^{b_i} (V_i)^{c_i} (Y)^{d_i} Z_i \qquad \text{(E-74)}$$

where:

P_i = price of energy type i;

V_i = price of the corresponding appliance;

Y = income;

Z_i = other explanatory variables.

The time varying change in saturation $(S_i)_t$ of an appliance using energy type i is:

$$(S_i)_t = (\rho/\bar{N})(S_i)_{t-1} + (1 - \rho/\bar{N})\, s_i \qquad \text{(E-75)}$$

[1]In 1970 the total residential use of energy was 10.0 x 10^{15} BTU. Energy used for space heating composed 68% of the total; that used for water heating, 14%; for cooking, 5%; lights, 2%; air conditioning, 2%; other, 9%.

where:

> ρ = retention ration of the kind of appliance (the fraction of households that retained existing equipment in the specified time--a function of the average life of the appliance.)
>
> $\overline{N}$ = ratio of the number of households at time t to that at time t-1.

J. P. Nelson. "The Demand for Space Heating Energy." <u>The Review of Economics and Statistics</u>, 57 (1975), 508-512.

Using cross-sectional data by state for 1971, Nelson analyzes the demand for space-heating energy.

Price is found to be a significant determinant of demand with an elasticity of approximately -0.3.

The variables are as follows:

> Q_i = total oil, gas, and coal consumed per capita in the residential and commercial sectors of state i in 1971 as measured in 10^6 BTU per capita;
>
> Y_i = mean personal income per capita in state i in 1971, as measured in dollars per capita;
>
> P_i = weighted average residential and commercial price of oil, gas and coal in state i in 1971 (measured in dollars per 10^6 BTU). The weights are the relative proportions of each fuel consumed in 1971;
>
> PE_i = average residential and commercial price of electricity in state i in 1971 as measured in dollars per kWh;
>
> DD_i = weighted average heating degree-days for state i in 1971. (The weights are the relative 1970 populations of SMSA's and selected other cities with reporting weather stations.)

The model estimation is as follows:

(1) Linear model

$$Q_i = -4.200 + 0.005Y_i - 15.306P_i + 15.703\, PE_i + 0.008DD_i$$

$$R^2 = 0.686 \qquad \text{(E-76)}$$

(2) Log-linear model

$$\log Q_i = -1.077 + 0.267\log Y_i - 0.280\log P_i + 0.504\log PE_i + 0.496\log DD_i \qquad \text{(E-77)}$$

$$R^2 = 0.833$$

E. Hirst and J. Jackson. "Historical Patterns of Residential and Commercial Energy Uses." Energy, 2 (1977) 131-140.

Hirst and Jackson present an analysis of energy use trends in residential and commercial buildings from 1950 to 1975.

Energy use overall grew during this period at an annual rate of 4.3%. However, from 1972-1975, this use was essentially static because of sudden, sharp increases in fuel prices and slower economic growth.

Between 1950-1975 electricity use increased from 25% to 40% of the total and gas use increased from 17% to 31% of the total while coal use decreased from 30% to 1% and oil use decreased from 27% to 20%.

Although households consume about twice as much fuel as commercial buildings, the growth in commercial energy use has been faster than the growth in residential energy use during this period.

Commercial buildings include those buildings (offices, schools, hospitals, stores) that house the service sector of the economy (retail and wholesale trade, health services and government works).

Between 1950 and 1975 energy use in the commercial sector increased overall at a rate of 4.4% a year. Electricity use increased from 34% to 61% and gas use from 14% to 26%. Oil and other fuels decreased from 52% to 13%.

Population, commercial activity per capita and fuel prices are important determinants of energy use in this sector. For the entire twenty-five year period per capita economic activity was more important than population in determining fuel use growth. Between 1972 and 1950 price increases roughly offset the increases in both population and services to produce essentially zero growth in commercial energy use.

The energy intensiveness (EI) of the commercial sector was evaluated in two ways. The ratio of energy use to the service components of the GNP increased from 13MJ/1972 - $ in 1960 to 18 MJ/1972 - $ in 1972 (MJ: Mega Joule). After 1972 this EI declined slightly. The ratio of energy use to commercial building floor space increased from 3.06GJ/m^2 in 1972 (GJ: Giga Joule). After 1972 this EI declined slightly. It can therefore be concluded that the growth in commercial energy use was due primarily to growth in commercial output and secondarily to increases in commercial floor space per dollar of economic activity.

The residential sector includes those structures (single family units, apartments, trailers) occupied by households.

Between 1950 and 1975 the overall annual growth rate of residential energy use was 3.4%. (The rate of household formation was 2%.) However, from 1972 to 1975, the growth rate was negative: -0.8%.

During the twenty-five year period electricity use increased from 18% to 43%, and gas use increased from 22% to 34%, while coal use decreased from 33% to 2% and petroleum use decreased from 26% to 18%. (Prices were declining or stable until 1970; since then they have all risen.)

Between 1950 and 1973, household expenditures on fuels remained at about 3.6% of total personal consumption expenditures (PCE). From 1973 to 1975 the percentage rose to 4% because of the sharp increases in fuel prices.

The 1973 estimates of energy use per household are:

55% - space heating;

14% - water heating;

10% - refrigeration;

20% - cooking, air conditioning, lighting, clothes washing and drying, small appliance operation.

Between 1950 and 1974 the market share of electricity rose from 15% of 1% to 46% for cooking and from 1% to 50% for air conditioning.

Household fuel use grew because of increases in population, decreases in household size, growth in income, and decline in fuel prices. These factors induced a growth in ownership of energy intensive household equipment, and a shift from small energy-efficient devices to large less-efficient ones. (For example, small manual defrost refrigerators were replaced by larger automatic defrost units which consume 50-100% more electricity.) In addition there was an increase in the use of equipment. (For example, thermostats were set higher in the winter, lights were left on, longer showers were taken.)

R. S. Mowill. Residential Energy Use: Combining Disaggregated Data Sources for Policy Analysis. The Rand Paper Series P-5754. Santa Monica, California: The Rand Corporation, 1977.

Mowill's paper examines the problems involved in combining data which have been aggregated to diverse geographical levels in order to estimate the household demand for alternative energy types and in order to estimate the stock of appliances according to energy type. Most previous studies have used data from a state or regional level. Such studies describe average behavior on a broader level and not the specific behavior of a sub-group of the population. For example such aggregate studies have often calculated an average price for a region which is in reality served, not by one, but by a variety of tariff schedules. Hence the use of more highly disaggregated data can provide more precise estimates.

Mowill suggests improvements in utility data collection and in the "coding" which combines these data with other important information.

The data examined in the paper concerns Los Angeles County which covers an area of 4069 square miles. For the purpose of providing degree-day data the county was divided into three major weather zones: mountain, desert, and coastal. Census data were supplied by the 1970 Census of Population and Housing under which 291 socio-economic variables were created. The area relevant to this study covers 849 census tracts. Socio-economic data from these tracts were aggregated to the Southern California Edison geographic area level. (See following paragraphs)

Consumption data were supplied by Southern California Edison (SCE), the Los Angeles Department of Water and Power (DWP), the Southern California Gas Company (SCG) and the Long Beach Gas Department (LBGD).

The SCE area relevant to this study is divided into more than 214 geographic areas, each located in one of 17 districts which have been established for local tax purposes. These geographic areas contain approximately 1.4 million residential customers or households that receive electricity on one of six rate schedules. The level of the schedule depends on the number of customers per unit of distribution line. (The Public Utilities Commission approves a rate rezoning on the basis of a change in the density of customers.) Hence, there are different geographic areas for each rate and for each franchise area. The SCE data included the total kilowatt hours (Kwh) sold and the number of customers billed in a geographic area.

The DWP, a municipal utility regulated by the Los Angeles City Council, has divided its service territory into 3610 "readbooks". A "readbook" refers to the area one meter reader is able to cover in one day. The consumption data were supplied at this level and then aggregated to the census tract level unit of analysis. (The DWP data covers 727 census tracts.)

The Southern California Gas Company (SCG) provides natural gas to all of Los Angeles County except the city of Long Beach. Four different residential rate schedules, based on customer density, apply to the SCG area.

The Long Beach Gas Department provides its residents with retail gas. It serves its domestic and small commercial and industrial customers on a single rate structure.

The electricity and gas tariffs in effect in Los Angeles County have a customer charge and a declining block rate schedule in which the price per unit falls as the consumption rises.

Seven different residential electricity tariff schedules are in effect for the customers covered by this study: six schedules for the SCE and one for the DWP. The customer charge by SCE, as of June 1975, ranged from $1.00 to $1.50 and the price per Kwh from 7.032¢ to 2.803¢. In June 1975, the DWP customer charge was $1.32 and the price per Kwh ranged from 4.02¢ to 2.15¢.

The SCG, as mentioned previously, uses four different residential rate schedules. Their structure is similar to most electricity tariff schedules. A fixed monthly customer charge covering a minimum level of consumption (about two therms) is followed by a declining block rate structure. The LBGD uses a single, similarly-structured schedule to serve its customers.

As of June 1975 the customer charge for the five natural gas schedules relevant to this study ranged from $2.19 to $3.60, and the unit charge ranged from 11¢ per therm to approximately 13¢ per therm (or $1.309 per 1000 cu. ft.).

A. S. Cohen, G. Fishelson, J. L. Gardner. Residential Fuel Policy and the Environment. Ballinger Publishing Company, 1974.

In analyzing the setting for their discussion of residential fuel policy the authors of this study examine residential space-heating trends. These trends have been determined from information about the average relative use of different fuels in 24 major U.S. cities. The information shows the following changes in the rate of use of various fuels.

1. Coal-using dwelling units which composed 38.5% of the total in 1950 have fallen to 3.4% in 1970.
2. Oil-using dwelling units which composed 21.8% of the total in 1950 have risen to 36.5% in 1960, but have fallen again to 28.4% in 1970.
3. Gas-using dwelling units have risen from 35.0% in 1950 to 60.0% in 1970.

The fast conversion from oil and coal to natural gas indicated by the data is related to the fuel market structure in which oil and coal are highly competitive. Natural gas and electricity, on the other hand, are supplied by regulated monopolies. This difference partially explains the swift conversion even when in certain situations a direct calculation would not justify this action.

Moreover, since natural gas and electricity are considered to be convenient fuels requiring little maintenance or janitorial labor, conversion to these fuels may result in a savings in labor costs.

The authors also discuss air quality regulatory planning practices. It is noted that fuel-switching for emissions control in the residential space-heating sector involves the premature conversion or retirement of heating equipment associated with the use of high emission fuels. The cost and effectiveness of a residential emissions control program are sensitive to the length of time allowed for compliance. Meeting environmental control requirements may involve the investment of capital whose amortization may cover fifteen years or more.

In discussing the social costs of residential fuel policies the authors discern that the cost to society of a space-heating control policy depends on:

1. the extent of usage for space heating of each fuel;
2. the cost of conversion from one fuel to another;
3. the annual costs of operating and maintaining the space-heating system.

These costs are borne by many people from disparate locations and different socio-economic backgrounds. Three groups in particular have been identified as being affected by a residential fuel policy:

1. landlords, homeowners and renters;
2. fuel distributors and their employees;
3. janitors.

The conversion costs per dwelling unit are estimated by building size and heating system to account for economies of scale, and are defined as the cost of altering the furnace to burn another fuel and the cost of an on-site storage tank or pipeline needed to supply the new fuel.

In defining conversion costs the authors note that a landlord has the option to abandon or demolish his building or to convert it to non-residential use if the costs associated with an energy policy are greater than the lost rental income. A building may be abandoned or demolished if it is marginal. Such a marginal building is usually in poor condition and requires major upgrading when converted to a new fuel. For such a building rental income may be fixed or declining and, because of neighborhood conditions, the building's life span may be relatively short.

If a building is abandoned or demolished the cost to the landlord is the value of the rents lost. The displaced tenants bear the costs of searching for new lodgings, of moving and of being inconvenienced.

The operating and maintenance costs in year t may be estimated as follows:

$$Fit = \Sigma_{j,k} (DU_{ijk}) (Q_{ijk}) (P_{it}) \qquad \text{(E-78)}$$

where:

F_{it} = annual cost of fuel i in year t;

DU_{ijkt} = number of dwellings using fuel i in buildings of size j with heating system k in year t;

Q_{ijk} = quantity of fuel i consumed per dwelling unit in buildings of size j with heating system k in year t;

P_{it} = unit price of fuel i in year t.

The amount of fuel consumed per dwelling unit is related to the efficiency of the boiler, the number of exterior walls, the degree of temperature control, and the heat value of the fuel. Boilers commonly used for residential space heating become more efficient with size. The per dwelling unit consumption of fuel decreases as the size of the building increases because fewer walls are exposed to the outside.

Prices of fuels and possible changes in price are considered in the discussion of operating costs. The author note that, since the price of gas is regulated, it does not reflect market equilibrium. Moreover, the depletion of known gas reserves raises the question of whether the current price reflects the cost of this fuel. In this study, the equilibrium price has been defined as the price equating the amount of gas demanded with the amount supplied while the ratio of reserves to production is maintained at a constant level. (Twenty is used for the ratio of reserves to production.)

Endogenous changes in the natural gas price have been taken into account. Increased demand will force the gas utilities to develop a storage capacity for winter use and the resulting costs will be passed on to the consumers.

For any fuel policy the increase in the demand for gas is estimated and possible gas price increases are estimated, assuming supply elasticities of three to five. If ε is the constant supply elasticity:

$$\Delta P/P_0 = (\Delta Q/Q_0)/\varepsilon \qquad \text{(E-79)}$$

where:

ΔQ = the increase in quantity demanded;
ΔP = the increase in price.

Endogenous oil price changes have been assumed not to occur. One probable exogenous price change for coal has been defined. Coal prices will increase because of strip mining and mine safety regulations.

The authors present three models for estimating the elasticities of fuel use in space heating with respect to fuel price.

The first model determines the percentages of dwelling units heated by gas, oil and coal as functions of the following explanatory variables:

1. the prices of the fuels;
2. per capita income (as a proxy for labor costs);
3. average January temperature;
4. percentage of single family homes;
5. percentage of dwelling units built after 1950.

The correlation coefficients obtained are rather low, and the results are not very convincing. The equations have been calibrated with 40 observations from 20 U.S. cities in 1960 and 1970.

The second model, estimated with Chicago data, includes as explanatory variables the annual space-heating cost differential between coal and gas, which is expected to have a positive coefficient, and conversion cost from coal to gas, which is expected to have a negative coefficient. The dependent variable is the rate of decline of coal-using dwelling units by building size in the 1962-1968 and 1968-1971 periods. A log-linear relation was estimated:

$$RDC = e^{6.958}(H_c - H_g)^{0.634} C^{-1.68} \quad (R^2 = 0.502) \quad \text{(E-80)}$$

where:

RDC = the rate of decline of coal-using dwelling units;
H_c = heating costs when using coal;
H_g = heating costs when using gas;
C = conversion costs from coal to gas.

The third model calculates an arc elasticity of a conversion rate with respect to the ratio of the annual space-heating cost differential between coal and gas to conversion costs:

$$E = \frac{\Delta \text{ (conversion rate)}}{\text{average conversion rate}} * \frac{\Delta\left(\text{heating cost differential} \big/ \text{conversion cost}\right)}{\text{average}\left(\text{heating cost differential} \big/ \text{conversion cost}\right)} \quad \text{(E-81)}$$

The results show that the elasticities for all building sizes do not vary strongly from unity. The method of calculating the effects of fuel price changes on conversion rates employed unitary elasticities by assuming proportionality between the fuel price differential and the change in the number of dwelling units that use coal under the different prices.

R. A. Grot and R. H. Socolow. "Energy Utilization in a Residential Community". Energy: Demand, Conservation, and Institutional Constraints. Ed. M. S. Macrakis. Boston: The MIT Press, 1974.

This article discusses a study of the use of energy in an actual community - Twin Rivers, New Jersey. The study examined those variables which affect energy consumption and investigated how energy consumption might be reduced.

Such a study of an actual community was designed to fill some of the gaps present in other approaches which typically depend on the analysis of performance of a dwelling unit in hypothetical or controlled situations or on the study of aggregated sales data.

The approach of the Twin Rivers study was based on a program of interviews, on an instrumentation program designed to develop detailed information about the behavior of selected dwelling units, and finally on statistical data available from the town's utilities.

Different size split-level and two-floor town houses of two, three, or four bedrooms were compared. Interim results were reported and further data acquisition was planned.

It was determined that the average winter gas usage is quite closely proportional to the town house width in the two-floor town houses but not in the split levels. Forty-three percent of the heat loss may be attributed to windows and 28% to infiltration.

The correlation coefficient between the average consumption of gas in the split-levels and the monthly degree-days is 0.997, calculated from twelve months of data.

The gas consumption in summer is approximately 9% of that in winter, and the electric consumption in summer is about 125% of that in winter (due to air conditioning).

D. R. Limaye and J. R. Sharko. "Simulation of Energy Market Dynamics." Energy Policy Evaluation. Ed. D. R. Limaye. Lexington, Mass., Lexington Books, D. C. Heath and Company, 1974.

Industries account for over 33% of the total energy consumption in the U. S. but there is a paucity of information regarding energy utilization at the industrial end use level.

Limaye and Sharko view total energy demand and fuel selection processes as separate mechanisms. For example, although the level of population is a prime determinant of the amount of energy demanded it is not particularly significant in fuel selection.

In this article they have employed a methodology similar to the modal split method in transportation studies:

$$MS_i = \frac{U_i}{\sum_j U_j} \qquad \text{(E-82)}$$

where:

U_i = "utility" of fuel i;

MS_i = market share of fuel i.

The model specification is:

$$MS_i = \alpha_o \frac{\prod_{j\neq i} P_j^{\alpha_j}}{P_i^{\alpha_i}} \frac{\Theta_i^{\beta_i}}{\prod_{j\neq 1} \Theta_j^{\beta_j}} \qquad \alpha_j > 0 \qquad \text{(E-83)}$$

where:

P_i = cost of fuel i to user;

θ = vector defining other factors affecting fuel choice;

α, β = derived constants.

An analysis of the fuel use trends in the industrial market indicates that some fuel uses are sensitive to prices but that others are dependent on the technology of the process.

A test is made of the following relationship:

$$\log MS = A + B_1 \log P_c + B_2 \log P_o + B_3 \log P_g + B_4 \log P_e \qquad \text{(E-84)}$$

where:

MS = market share;

P_c = price of coal;

P_o = price of oil;

P_g = price of gas;

P_c = price of electricity.

The data used are 1962 state data from the Census of Manufacturers. The estimated equations are as follows:

Coal: $\log Ms = A_o - 2.32 \log P_c + 3.04 \log P_o + 0.628 \log P_g + 0.745 \log P_e$ (E-85)

Oil: $\log MS = A_o + 1.38 \log P_c - 3.02 \log P_o + 1.14 \log P_g + 0.895 \log P_e$ (E-86)

Gas: $\log MS = A_o + 0.318 \log P_c + 2.73 \log P_o - 1.68 \log P_g + 0.013 \log P_e$ (E-87)

Electricity: $\log MS = A_o + 0.145 \log P_o + 0.0139 \log P_o + 0.763 \log P_g - 1.26 \log P_e$ (E-88)

To incorporate current changes in the fuel consumption patterns of the industrial sector, a new formulation is used:

$$MS_i' = \alpha_o + \alpha_1 RP_i \qquad \text{(E-89)}$$

with:

$$MS'_i = 1/(1-MS_i/100) \qquad \text{(E-90)}$$

$$RP_i = (P_i - PC_i)/\overline{P} \qquad \text{(E-91)}$$

where:

MS_i = market share of fuel i (%);

P_i = price of fuel i;

PC_i = composite price of the fossil fuels competing with fuel i;

$\overline{P}$ = weighted average price of oil, coal, and gas.

Because the whole industrial market will not react immediately to changes in prices of fuels, the market share as calculated from the market share curve is only applied to the "new" demand, assumed to be the incremental demand plus a portion of the existing demand. A portion of the existing market includes users who can and will make a decision to choose a different fuel from one year to the next, but there are other users that cannot make such decisions unless the price differentials amongst the fuels are extremely wide.

Thus:

$$D_{it} = (TD_t - TD_{t-1})\, MS_{it} + (1-AF)D_{it-1} + TD_{t-1}MS_{it}AF \qquad \text{(E-92)}$$

where:

D_{it} = demand of fuel i in year t;

TD_t = total industrial demand in year t;

MS_{it} = new market share of fuel i in year t;

AF = application factor, i.e., that portion of existing demand that is price sensitive in one year.

(Then, it is feasible to specify the above variables by industry group j.)

D. Nissen, D. Knapp. "A Regional Model of Interfuel Substitution." Energy: Mathematics and Models. Ed. F. S. Roberts. Philadelphia: Society for Industrial and Applied Mathematics, 1975.

Nissen and Knapp discuss a regional energy demand modeling effort related to the Project Independence Evaluation System (PIES). An analysis is made of energy demand and fuel substitution in the household/commercial and industrial sectors.

For each sector the model of demand for major fuels has two parts. The first part is an index of total major fuel demand specified to depend on the level of a total energy price index in the region, the sector's activity level in the region (measured by regional population and per capita income or value added in manufacturing) and the lagged value of the total quantity index. For example, for the industrial sector:

$$\ln(TQI_r) = \alpha_r + \beta \ln(TPI_r) + \gamma \ln(VAM_r) + \lambda \ln(TQI_r)_{-1} \quad \text{(E-93)}$$

where:

TQI_r = industrial total quantity index in region r;
TPI_r = total energy price index in region r;
VAM_r = value added in manufacturing in region r.
(-1 denotes a time lag.)

The second part of the model of demand for major fuels is the ratio of the demand for each specific fuel to the total quantity index. This ratio is specified to depend on the relative price of the fuel in the region (which is taken equal to the ratio of the regional fuel price to the regional total energy price index) and on the lagged value of this ratio.

For the industrial sector:

$$\ln(ELI_r/TQI_r) = \alpha_r^{EL} + \beta^{EL} \cdot \ln(ELPI_r/TPI_r) + \lambda^{EL} \cdot \ln(ELI_r/TQI_r)_{-1} \quad \text{(E-94)}$$

where:

ELI = industrial electricity demand ;
ELPI = industrial electricity price.

The total price index in each region is the log-linear regional value-weighted average of regional prices:

$$\ln(TPI_r) = \sum_i V_{ir} \ln(P_{ir}), \tag{E-95}$$

with:

$$V_{ir} = P_{ir}Q_{ir}/(\sum_i P_{ir}Q_{ir}) \tag{E-96}$$

where:

P_{ir} = price of fuel i in region r;
Q_{ir} = quantity of fuel i in region r.

In an overview of the model:

equation (E-93) determines the total BTU budget;
equation (E-94), subject to some normalization, shares the total BTU's into specific fuels.

However, fuel BTU's differ in end-use efficiency, and, hence, have different prices in equilibrium. There is no more reason to expect total BTU budget to be conserved in demand than to expect total barrels to be conserved in demand. Therefore, the normalization and the interpretation of the model as a sharing scheme were abandoned.

C . W. Erickson, R. M. Spann, and R. Ciliano, "An Econometric Analysis of Substitution and Usage Effects on Industrial Sector Energy Demands." Energy Policy Evaluation. Ed. D. R. Limaye. Lexington, Mass.: Lexington Books, D. C. Heath and Company, 1976.

The authors assume that industrial fuel demand is related to: (1) process heat, (2) input of non-energy raw material, (3) conversion to mechanical energy, (4) on-site electrical generation, and (5) space heating and cooling.

It is also assumed that the general industrial production function includes fuel, labor, capital, and land inputs. Substitution possibilities exist between these general classes of inputs and within each class. In the case of fuels, for example, the substitution possibilities include oil, coal, natural gas, and electricity.

It is hypothesized that:

(1) industrial fuel usage rates for each fuel behave in a predictable way in response to the own price of each specific fuel;

(2) the prices of alternative fuels are also important determinants of the industrial usage rates of specific fuels;
(3) the responsiveness of industrial demand to fuel price variation is not constant across industries;
(4) the relation of fuel requirements to industrial growth is not constant for all fuels across industries.

The fuel demand variables for the models developed by the authors are:

OIL = total residual and distillate oil consumption by all industrial sectors by state;
GAS = total industrial natural gas consumption by state (firm and interruptible contracts);
INT = total industrial natural gas consumption by state (interruptible contracts only);
FIRM = total industrial natural gas consumption by state (firm contracts only);
KWH = sales of electric power to large industrial light and power customers.

The demand determinants are:

PO = average industrial and electric utilities oil price for residual and distillate oil by state;
PG = average gas price to all industrial and electric utilities customers by state (firm and interruptible contracts);
PC = average coal price to the electric utilities sector by state;
PI = average interruptible contracts price of gas;
PF = average firm contracts price of gas;
PE = average price of electricity;

U = "index of urbanization" (population density measure);
TY = total personal disposable income component of state GNP;

S28 = value added by chemicals and allied products;
S33 = value added by primary metals industries;
S29 = value added by petroleum and coal products;
S32 = value added by stone, clay and glass products;
S26 = value added by paper and allied products;
S20 = value added by food and kindred products;
S37 = value added by transportation equipment;
S22 = value added by textile mill product;
S35 = value added by non-electrical machinery;
S34 = value added by fabricated metal products.

It is noted that:

1. all prices are expressed in terms of dollars per 10^8 BTU's, putting the analysis on a consistent cost comparison basis that is probably most relevant to industrial fuel users;

2. variables S28-S34, representing the ten most energy intensive national industries, describe the industrial composition of the state;
3. TY is a measure of economic activity;
4. industrial coal demands are not explicitly estimated, but coal prices are included in the demand functions for the other fuels.

The multiplicative form of the model is estimated:

$$\text{LogOIL} = a_0 + a_1\log PO + a_2\log PG + \ldots + a_{16}\log S_{34} \qquad \text{(E-97)}$$

The price coefficients may be read directly as elasticities. The analysis was performed with yearly data from the 1960's. Two classes of analysis have been performed. The first considers average natural gas price under all contracts and total gas use:

oil use = F(PG, other variables, but not PI and PF) $R^2 = 0.85$; (E-98)
gas use = F(PG, other variables, but not PI and PF) $R^2 = 0.90$; (E-99)
electricity use = F(PG, other variables, but not PI and PF), $R^2 = 0.95$. (E-100)

The second considers firm and interruptible natural gas prices and uses and includes:

- three equations similar to the previous ones;
- one equation describing firm gas use ($R^2 = 0.83$);
- one equation describing interruptible gas use ($R^2 = 0.80$).

The signs on the price coefficients indicate that gas is a substitute for oil and that electricity is somewhat complementary with natural gas.

The coefficient for economic activity is consistently positive; different fuels increase their contribution to energy usage at different rates as economic activity increases. This result is consistent with the hypothesis that the industrial composition of GNP is an important determinant of total energy use.

The index of urbanization may be a measure of the prices of non-fuel inputs, such as labor and land, to the industrial production processes, in addition to reflecting special locational attributes of industrial activity. Due to the net effect of many things, a variable sign for U is observed.

The coefficients of the variables S28 → S34 are also not subject to strong prior sign predictions. They, with U, add to the general explanatory power of the relations.

M. R. Seidel. State Projections of Industrial Fuel Needs. Office of Energy Systems, Federal Power Commission, 1970.

Although, in the event of higher fuel prices, industry is able to switch fuels, it is feared that it can only reduce total fuel use by decreasing output. It is also feared that, in the event of higher fuel prices, industry will transfer to areas where fuel is cheaper, thus causing labor displacement and unemployment. This study is concerned with these problems and addresses the following question: in what ways will higher prices and conservation affect fuel use and economic growth at the national, regional and state levels?

The data sources for the study are the 1972 Census of Manufactures and the special report, based on the 1971 Annual Survey of Manufacturers: "Fuels and Electric Energy Consumed". The data include volumes and costs of fuels used for heat and power by industry at the 4-digit SIC level and for state and SMSA disaggregations. Sizable amounts of fuel consumed as feedstock rather than for power are omitted however. (For example, coal for coke production is feedstock.) Captive fuel, produced and consumed in the same establishment, is also omitted. (For example, recovered energy from the coking process is captive heat.)

Within a given industry significant differences in fuel intensities in various states exist. Because of trouble with disclosures and other problems the analyses are performed at the state level for 2-digit SIC groups and for electricity, coal, oil and natural gas. (These analyses are subject to gaps when disclosure was a problem or where use is small.) The industry groups are:

SIC 33 = primary metals;
SIC 28 = chemicals and allied products;
SIC 29 = petroleum and coal products;
SIC 26 = paper and allied products;
SIC 20 = food and kindred products;
SIC 37 = transportation equipment;
SIC 22 = textile mill products;
SIC 35 = non-electric machinery;
SIC 36 = electrical machinery;
SIC 24, 25 = lumber and furniture;
SIC 27 = printing and publishing;
SIC 23 = apparel and fabric products.

Captive fuel and feedstocks for SIC 28, 29, and 33 are extrapolated from 1967 data in proportion to industrial output to give new industry row totals. The several states where those industries are most concentrated are given specific fractions of the total feedstocks.

The use and cost of fuels consumed in manufacture in each state are indicated both for heat and power purposes exclusively and for all other purposes when captive and feedstock fuels are included.

For each state and for each of the fourteen industry groups the following are indicated: industry earnings, fuel use, cost, ratios of fuel use and fuel cost to industry earnings for the total fuel figure as well as for each separate fuel.

For each industry regressions are first run on the ratio of fuel use per unit of earnings regressed on fuel price. These show a highly significant correlation. Values over 0.6 for three of the four most energy-intensive industries suggest that for these industries, which use a total of 45% of the nation's manufacturing energy, fuel price alone explains 46% of their total energy productivity with no reference to other factors such as labor, costs, location or capital intensiveness.

Next, total fuel is regressed on industry earnings and fuel prices. Of the 714 possible cells of 14 industries in 51 states, 657 show more than 0.05 TBTU of fuel use. The 606 cells in the regression are all those which showed at least 0.05 TBTU of fuel use and $5 M of earnings.

If:

F = total fuel use,
Q = industry earnings,
P = total fuel price,

then:

SIC 33: $\log F = 2.483 + 1.109 \log Q - .833 \log P \ (R = .938)$ (E-101)

SIC 28: $\log F = 1.947 + .961 \log Q - 2.682 \log P \ (R = .928)$ (E-102)

SIC 29: $\log F = 2.292 + .944 \log Q - 1.960 \log P \ (R = .933)$ (E-103)

SIC 21, 30, 31, 32, 38, 39:
$\log F = 1.734 + .963 \log Q - 1.596 \log P \ (R = .939)$ (E-104)

SIC 26: $\log F = 2.431 + 1.433 \log Q - 1.427 \log P \ (R = .889)$ (E-105)

SIC 20: $\log F = 1.859 + 1.310 \log Q - 1.222 \log P$ (R = .862) (E-106)

SIC 37: $\log F = 1.378 + 1.165 \log Q - .336 \log P$ (R = .912) (E-107)

SIC 22: $\log F = 2.352 + 1.258 \log Q + 1.336 \log P$ (R = .928) (E-108)

SIC 35: $\log F = 1.552 + 1.175 \log Q + .297 \log P$ (R = .883) (E-109)

SIC 19,34: $\log F = 1.532 + 1.212 \log Q - .500 \log P$ (R = .919) (E-110)

SIC 36: $\log F = 1.427 + 1.173 \log Q - .500 \log P$ (R = .880) (E-111)

SIC 24, 25: $\log F = 1.468 + 1.068 \log Q - 1.194 \log P$ (R = .886) (E-112)

SIC 27: $\log F = 1.215 + .918 \log Q + .292 \log P$ (R = .842) (E-113)

SIC 23: $\log F = 1.091 + .916 \log Q + .222 \log P$ (R = .839). (E-114)

The four industry groups accounting for 72% of the fuel consumed in manufacture have a weighted-average price elasticity of -1.58. These groups are:

- SIC 33: 27%;
- SIC 28: 20%;
- SIC 29: 29%;
- SIC 21, 30, 31, 32, 38, 39: 10%.

With 99% statistical confidence, the price elasticities are significantly different from zero for the six heaviest fuel users which account for 83% of manufacturing fuel use and are probably significantly greater than unity for three of them. Unfortunately, however, these log-linear regressions have a moderate degree of bias because they underestimate fuel use for the five states which use the most energy in each of the energy-intensive industries. Lower prices for captive and feedstock fuels might reduce this bias. The remedy will require that individual fuels (coal, oil, gas, and electricity) and their own prices and substitutability be treated separately.

In this study a non-linear estimation technique is applied to minimize the sum of squares of absolute fuel errors, rather than percentage fuel errors.

Three different initial approximations are used for the estimate of each industry.

The log-linear estimate of fuel as a function of earnings and price (presented previously):

$$\log F = A + B \log Q + C \log P + \text{error}. \qquad \text{(E-115)}$$

The estimate of fuel use linear in earnings:

$$\log F = A_0 Q + \text{error}. \qquad \text{(E-116)}$$

The estimate of fuel use linear in earnings times the inverse of price:

$$F = A_1 (Q/P) + \text{error}. \qquad \text{(E-117)}$$

For each state and industry, the final estimated equations are:

$$F = A_n \cdot Q^{B_n} \cdot P^{C_n} + \text{error}. \qquad \text{(E-118)}$$

Equation (E-118) is identical to equation (E-115) except that the error term is additive.

The new regression coefficients are similar to those of equation (E-115) for most of the energy-intensive industries. Paper, however, becomes less elastic and indicates significant economics of concentration.

On the assumption that regional economic growth parallels the projections of the Bureau of Economic Analysis (BEA), future industrial fuel use is extrapolated by multiplying the BEA estimates of future economic activity by the observed fuel ratios, accounting for the variations of each state and each industry from the national norm.

The extrapolation process begins by finding for each state j and industry i the error term (i,j) for the 1971 base data. Then the BEA projected 1980 earnings Q8(i,j) are inserted into equation (E-118) to yield the projected 1980 fuel use F8(i,j):

$$\text{err}(i,j) = F(i,j) - A(i)Q(i,j)^{B(i)}P(j)^{c(i)} \qquad \text{(E-119)}$$

$$F8(i,j) = A(i)Q8(i,j)^{B(i)}P(j)^{c(i)} + \text{err}(i,j) \qquad \text{(E-120)}$$

The final step is estimating the changed earnings $Q^1(i,j)$ and the changed fuel use $F^1(i,j)$, given a price change dP. The use of the ratio GR(i) of earnings to Gross Product Originating permits the determination of the ratio of the increase in fuel costs to product price:

$$dQ(i,j) = -dPQ8(i,j)/GR(i) \qquad \text{(E-121)}$$

$$Q^1(i,j) = Q8(i,j) + dQ(i,j) \qquad \text{(E-122)}$$

$$P^1(j) = P(j) + dP \qquad \text{(E-123)}$$

$$F^1(i,j) = A(i)Q^1(i,j)^{B(i)}P^1(j)^{C(i)} + err(i,j) \qquad \text{(E-124)}$$

Equation (E-121) may be interpreted as the price change of the product. Equation (E-124) recalculates the fuel use from the changed value of fuel price and earnings.

The effect of a modest increase in fuel prices is analyzed. It is learned that, although total energy use is quite sensitive to fuel prices, neither industrial nor regional growth is affected. An increase of approximately 44% in the constant-dollar price of fuels to industry (to about $1.08/MMBTU for fossil fuels) reduces energy use by 41%, of which only 2% is the result of a decline in output because of higher fuel costs.

The primary conclusions drawn from the various forecasts are:

1. growth of energy demand may have been overestimated;
2. significant price-induced conservation is likely;
3. conservation will not be disastrous to any industry group;
4. prices will accurately target the fuel inefficiencies;
5. no state or region will experience a serious impact;
6. state and regional differences will not be very large.

D. Chapman, T. Mount, and T. Tyrrell. "Modeling Electricity Demand Growth". Energy Modeling: Art, Science, and Practice. Ed. Milton F. Searl. Washington, D.C.: Resources for the Future, Inc., 1973.

The authors present the following model for projecting electricity demands:

$$Q_{ijt} = A_{ij} \left(Q_{ijt-1}\right)^{\theta_i} \left(\frac{PE_{ijt}}{PE_{ij70}}\right)^{\alpha_i} \left(\frac{N_{jt}}{N_{j70}}\right)^{\beta_i} \left(\frac{Y_{jt}}{Y_{j70}}\right)^{\partial_i} \left(\frac{PG_{ijt-1}}{PG_{ij69}}\right)^{\sigma_i} \qquad \text{(E-125)}$$

where:

i = consumer class;
j = region;
t = year;
Q = demand for electricity;
Y = per capita income;
A = constant;
θ = time response parameter;
PE = average price of electricity;
N = population;
PG = average price of gas;
$\alpha, \beta, \partial, \sigma$ = long-run elasticities for electricity price, population income and gas price.

The estimation of the model is indicated in Table E-17.

Table E-17 Long-run Elasticities and Response Factors

Factor	Residential	Commercial	Industrial
Long-run elasticities			
Average electricity price	-1.3	-1.5	-1.7
Population	+0.9	+1.0	+1.1
Income	+0.3	+0.9	+1.1
Average gas price	+0.15	+0.15	+0.15
Response factors			
Percent of response in first year	10%	11%	11%
Years for 50% of total response	8 years	7 years	7 years

W. S. Chern. "Estimating Industrial Demand for Electricity: Methodology and Empirical Evidence". Energy: Mathematics and Models. Ed. F. S. Roberts. Philadelphia: Society for Industrial and Applied Mathematics, 1975.

Chern presents an industrial model for electricity demand with consideration of the implications of block rate pricing in the use of the average price. These implications require another average price equation to be solved simultaneously with the demand equation.

It is postulated that the demand response to changes in price and other factors is gradual, rather than instantaneous, because a firm must adjust its stock of electric appliances and machinery to respond completely to current and expected exogenous changes. The long-run electricity demand is assumed to be:

$$E_{it} = F(E_{it-1}, EP_{it}, A_{it}, U_{it}) \quad \text{(E-126)}$$

or

$$\ln(E_{it}) = \alpha + (1 - \lambda)\ln(E_{it-1}) + \beta\ln(EP_{it}) + \delta\ln(A_{it}) + U_{it} \quad \text{(E-127)}$$

where:

i = industry;
t = time period;
E = amount of electricity demanded;
EP = average price of electricity;
U = error term;

A = vector of exogenous variables, including value added (V), price of gas (GP), price of petroleum products (PP), price of coal (CP), wage rate (W), new capital expenditure (K), time trend (T).

The historical data on rate schedules are incomplete and they are still not in a usable form. It is assumed, however, that the level and shape of the rate schedule are related to the underlying cost structure:

$$EP_{it} = L(E_{it}, B_{it}, V_{it}) \qquad \text{(E-128)}$$

where:

B = vector of relevant cross variables, including cost of fuel/kwh of generation (F), wage rates of workers of the utility industry (WE), and the ratio of industrial sales to total sales of electricity (RE);
V = error term.

Since transmission and distribution costs/kwh sold are expected to be lower for industrial sales than for residential and commercial sales, the variable RE is used to account for the possible effects of the composition of total sales on the price of electricity to industrial consumers. Capital costs changes are approximated by wages and fuel changes.

The model was first applied to ten manufacturing industries at the three digit SIC level (these industries were found to have a significant substitution between electricity and natural gas):

281 - industrial chemicals;
331 - blast furnace and basic steel products;
291 - petroleum refining;
371 - motor vehicles and equipment;
282 - plastic materials and synthetics;
263 - paperboard mills;
203 - canned, cured and frozen foods;
204 - grain mill products;
322 - glass and glassware;
225 - knitting mills.

Data were used from the period 1959 - 1971. The samples, however, were too small, so the data were pooled and the structural equations for all the industries in the group were assumed to be the same. The best equations are:

$$\ln E_t = -0.370\ln(EP) + 0.719\ln(E_{t-1}) + 0.428\ln(V) + 0.347\ln(GP) + 0.110\ln(CP) \qquad \text{(E-129)}$$

with:

$$R^2 = 0.998,$$

$$\ln EP = -0.339\ln E + 0.149\ln F + 0.310\ln WE \qquad \text{(E-130)}$$

with:

$$R^2 = 0.958.$$

The preceding equations, used to derive long-run demand elasticities, indicate that electricity demand is elastic in the long run. These elasticities are:

-1.32 for EP;
+1.52 for V;
-1.23 for GP;
0.39 for CP.

P.K. Verleger, Jr. "The Relationship between Energy Demand and Economic Activity," Energy: Demand, Conservation, and Institutional Problems. Ed. M.S. Macrakis. Boston : M.I.T. Press, 1974.

This study examines the structure of different models of economic activity and energy demand and looks for the best integrator of these two groups of models.

Macromodels of economic activity include production function models, input-output models, and national income account (NIA) models. The production function model is a generalization of the input-output type and it facilitates the examination of substitution between inputs (capital, labor and energy) as prices of inputs change. It is, however, a very aggregate model (the manufacturing sector is treated as a single entity) and regional disaggregation is not possible. For this reason, NIA models are preferable for use with an energy demand model.

The NIA models (Wharton, Data Resources, Inc., etc.), however, present a problem with their inherent short-term nature. Signals in the data resulting from long-term economic trends are overwhelmed by short-term cyclical information.

The models of energy demand usually distinguish four classes of consumers (household/commercial, industrial, transportation, electric utilities) and one to seven fuels (coal, natural gas, petroleum, electricity) so that:

$$Q_{ij} = F(x) \qquad \text{(E-131)}$$

where

Q_{ij} = consumption of fuel j in sector i;

x = single measure of real economic demand (population, income, real GNP, manufacturing production).

However, this model, which worked well during the postwar period, must now be modified to account for recent changes and for the non-zero price elasticity of energy demand.

The demand for energy seems to be price-sensitive in the household/commercial sector but not in the transportation sector. Costs are minimized in the electric utility sector through shifting to the lowest cost fuel mix in both the short and long run.

It is more difficult in the industrial sector to test the hypothesis that price elasticity of demand for energy is zero because of the great number of energy products, the dominance of a few industries in total demand, and the absence of adequate price data at the two-digit level.

J. Kraft, A. Kraft and E. Reiser. "A National Energy Demand Simulation Model." Econometric Dimensions of Energy Demand and Supply. Lexington, Mass. : Lexington Books, 1976.

The model developed in this study considers the total consumption of energy and the competition among all fuels consumed. The model allows for complete fuel substitution and it computes the demand for electricity and fossil fuels (coal, natural gas, kerosene, distillate fuel, liquefied petroleum gas, still gas, and petroleum coke).

Patterns of fuel choice in the household/commercial sector (HHC) and the industrial sector (IND) are analyzed by estimating a multiple logit model of fuel choice experience, thus allowing the consideration of a range of fuel choice experiences that satisfy total energy consumption. Only energy used for heat and power has been accounted for, not energy used as feedstocks.

Annual time series on fuel consumption in the HHC and IND sectors are used. All fuel quantities have been converted into BTU's and all prices into dollars per BTU. Before conversion to a BTU price, prices were defined as cents/KWh (F.P.C. typical electric bills by customer class), cents/Mcf (natural gas), dollars/barrel (petroleum products), or dollars/short ton (coal). The prices reflect transactions for quantities actually received by the user.

By using distributed lag formulations an attempt is made to include adjustment dynamics in the model. In responding to changed conditions economic agents will not move immediately to new long-run equilibrium consumption patterns but rather will adjust gradually. This phenomenon can be captured partially by assuming that the consumption of the current year is a function of the consumption of the previous year and of the long-run equilibrium level of consumption.

For the industrial sector a total energy demand equation is solved, and the total demand is partitioned into shares.

A double logarithmic form is used for the total demand equation:

$$\ln(TOTFL) = 9.523 - 0.097 \ln(TOTPR) + 0.184 \ln(TOTFL_{-1}) + 0.517 \ln(TOTPD)$$
$$(R^2 = 0.983) \qquad (E\text{-}132)$$

where:

TOTFL = total energy consumed in the industrial sector (sum of both electricity and fossil fuels);

TOTPR = weighted average of the prices of all fuels consumed;

TOTPD = potential demand for total fuel, constructed from the potential demand for electricity and fossil fuels used in the industrial production.

The potential demand provides a stock adjustment between actual and potential demand, with:

$$TOTPD = ELCPD + FOSPD \qquad (E\text{-}133)$$

(electricity + fossil fuels potential demands). The potential demand for fuel i is:

$$PD_i = \delta_i \;.\; FRB \qquad (E\text{-}134)$$

where δ_i is the ratio of electricity or fossil fuels consumed to gross product originating in manufacturing from 1955 through 1972. The energy output ratio δ_i times the index of manufacturing output provides an approximation for potential demand.

The elasticity of total energy demand with regard to the price index is -0.097 in the short-run and -0.119 in the long-run. The elasticity of total energy demand with respect to potential demand is 0.517 in the short-run and 0.634 in the long-run.

The application of the multinomial logit model to the estimation of fuel market shares is based on relative fuel prices, other choice characteristics, and lagged values of the fuel shares.

Each market share is computed as the total BTU's of fuel i relative to the total BTU's consumed. The fuel characteristics are the potential demands for electricity (ELCPD) and the potential demand for fossil fuels (FOSPD).

The fuel share splits between electricity and fossil fuels are first estimated, and the shares within fossil fuels are estimated next. (For the industrial sector it is questionable whether there is any substitution between electricity and fossil fuels since fossil fuels are used primarily for process heating and electricity is used in special processes. The present model, however, does allow for substitution.) The first sharing equation is:

$$\ln [SELC/SFOS] = 1.224 - 1.755 \ln [PELC/PFOS] + 1.914 \ln \left[\frac{ELCPD}{FOSPD}\right] \quad (E-135)$$

$(R^2 = 0.842)$

where:

PELC = price of electricity;
PFOS = weighted average of the fossil fuel prices.

For fossil fuels, a series of multiple logit models are estimated for the fuel shares:

$$\ln(\frac{SNG}{SBIT})_t = 0.125 - 0.117 \ln(\frac{PNG}{PBIT})_t + 0.978 \ln(\frac{SNG}{SBIT})_{t-1} \quad (R^2 = 0.949) \quad (E-136)$$

$$\ln(\frac{SRF}{SBIT})_t = 0.103 - 0.240 \ln(\frac{PRF}{PBIT})_t + 0.978 \ln(\frac{SRF}{SBIT})_{t-1} \quad (R^2 = 0.635) \quad (E-137)$$

$$\ln(\frac{SDF}{SBIT})_t = -0.123 - 0.520 \ln(\frac{PDF}{PBIT})_t + 0.713 \ln(\frac{SDF}{SBIT})_{t-1} \quad (R^2 = 0.749) \quad (E-138)$$

$$\ln(\frac{SSG}{SBIT})_t = -0.032 - 0.224 \ln(\frac{PSG}{PBIT})_t + 0.828 \ln(\frac{SSG}{SBIT})_{t-1} \quad (R^2 = 0.907) \quad (E-139)$$

$$\ln(\frac{SK}{SBIT})_t = -1.232 - 0.055 \ln(\frac{PK}{PBIT})_t + 0.650 \ln(\frac{SK}{SBIT})_{t-1} \quad (R^2 = 0.545) \quad (E-140)$$

$$\ln(\frac{SLG}{SBIT})_t = -2.03 - 1.005 \ln(\frac{PLG}{PBIT})_t + 0.229 \ln (\frac{SLG}{SBIT})_{t-1} \quad (R^2 = 0.569) \quad (E-141)$$

$$\ln(\frac{SPC}{SBIT})_t = -0.232 - 0.149 \ln(\frac{PPC}{PBIT})_t + 0.843 \ln(\frac{SPC}{SBIT})_{t-1} \quad (R^2 = 0.912) \quad (E-142)$$

where SNG, SBIT, SRF, SDF, SSG, SK, SLG, and SPC are shares of natural gas, bituminous coal, residual fuel, distillate fuel, still gas, kerosene, liquefied gas and petroleum coke, respectively.

From the above equations, other comparisons can easily be derived. For example:

$$\ln(\frac{SNG}{SDF})_t = \ln(\frac{SNG}{SBIT})_t - \ln(\frac{SDF}{SBIT})_t \quad (E-143)$$

Total demand for the household/commercial sector is estimated in a way similar to total demand for the industrial sector. Demand is a function of price, capital stock of housing, and real disposable income in 1958 dollars:

$$\ln(TOTFL) = 2.78 - 0.283 \ln(TOTPR) + 0.525 \ln(TOTYD) + 0.857 \ln(KHUS) \quad (R^2 = 0.983) \qquad \text{(E-144)}$$

where:

TOTPR = weighted average price of the fuels, where each fuel is weighted by the lagged fuel shares;

TOTYD = real disposable income;

KHUS = capital stock of housing (provides a structural input into the demand for energy).

The elasticity of total energy demanded is - 0.283 for price, 0.857 for the housing stock, and 0.525 for disposable income.

After total energy demand is calculated, market shares of the various fuels are calculated in a one-step procedure. There is no intermediate sharing between electricity and fossil fuels. Unlike in the industrial sector the choice is not between electricity and fossil fuels; rather, there is a hierarchy of choice between electricity and each individual fossil fuel. The following equations were obtained:

$$\ln\left(\frac{SNG}{SELC}\right)_t = -0.335 - 0.243 \ln\left(\frac{PNG}{PELC}\right)_t + 0.995 \ln\left(\frac{SNG}{SELC}\right)_{t-1} \quad (R^2 = 0.978) \qquad \text{(E-145)}$$

$$\ln\left(\frac{SRF}{SELC}\right)_t = -0.521 - 0.390 \ln\left(\frac{PRF}{PELC}\right)_t + 0.878 \ln\left(\frac{SRF}{SELC}\right)_{t-1} \quad (R^2 = 0.791) \qquad \text{(E-146)}$$

$$\ln\left(\frac{SDF}{SELC}\right)_t = -0.260 - 0.122 \ln\left(\frac{PDF}{PELC}\right)_t + 1.015 \ln\left(\frac{SDF}{SELC}\right)_{t-1} \quad (R^2 = 0.970) \qquad \text{(E-147)}$$

$$\ln\left(\frac{SLG}{SELC}\right)_{t-1} = -0.411 - 0.158 \ln\left(\frac{PLG}{PELC}\right)_t + 0.896 \ln\left(\frac{SLG}{SELC}\right)_{t-1} \quad (R^2 = 0.769) \qquad \text{(E-148)}$$

$$\ln\left(\frac{SBIT}{SELC}\right)_t = 2.43 - 0.480 \ln\left(\frac{PBIT}{PELC}\right)_t + 0.841 \ln\left(\frac{SBIT}{SELC}\right)_{t-1} \quad (R^2 = 0.989) \qquad \text{(E-149)}$$

$$\ln\left(\frac{SK}{SELC}\right)_t = -0.937 - 0.488 \ln\left(\frac{PK}{PELC}\right)_t + 0.966 \ln\left(\frac{SK}{SELC}\right)_{t-1} \quad (R^2 = 0.969) \qquad \text{(E-150)}$$

Consumption is assumed to include two steps, and a rise in fuel price will elicit two responses. First the consumer may try to substitute relatively less expensive energy for a more expensive fuel. Second, the total demand may be reduced if the consumer adjusts the rate at which the appliance or process uses a particular fuel. Thus, price adjustments result in both fuel switching and also stock adjustments that influence total demand for all energy types.

K. P. Anderson. A Simulation Analysis of U.S. Energy Demand, Supply, and Prices. Rand Report R-1591-NSF/EPA. Santa Monica, California: The Rand Corporation, 1975.

The model developed by Anderson presents a dynamic representation of the interactions between the supply sectors and the demand sectors of the U.S. energy market. Using exogenous estimates of macroeconomic conditions in the country and a supply schedule for international oil, the model simulates the determination of market-clearing prices and quantities for all forms of energy.

This is an annual model with stock and flow adjustments in both the demand and supply sectors. Demand and supply conditions are changed and markets are cleared each year.

The supply side of the model covers coal, natural gas, petroleum and electricity; the demand side is divided into industrial, commercial, residential, and transportation sectors, and a residual. These sectors consume electricity, natural gas, and petroleum products.

The models of the demand sectors, except the commercial sector, are based on econometrically-estimated fuel coefficients and elasticities. The commercial sector is represented by a simulation model of energy use based on engineering analyses. (Historical data are inadequate for econometric analysis of the commercial sector.)

The demand equations for residential energy follow:

$$D_t = (D_{t-1})^{\eta_d} (D_t^*)^{1-\eta_d} \qquad \text{(E-151)}$$

and

$$D_t^* = \eta_0 \cdot \prod_{i=1}^{m} P_{it}^{\eta_{pi}} \cdot y_t^{\eta_y} \cdot h_t^{\eta_h} \cdot n_t \qquad \text{(E-152)}$$

where:

D = actual demand;
D^* = target demand;
t = year;
m = number of energy types;
P_i = price of energy type i;
y = income per household;
h = persons per household;
n = number of households;
η = constant.

Equations (E-151) and (E-152) constitute a familiar type of lagged-adjustment model. If η_d is zero, the adjustment to target demand is immediate. The closer η_d is to unity, the longer the time necessary to achieve adjustment to a given percentage of the target level.

The η_i's are long-run price elasticities of demand, and η_y is the long-run income elasticity of demand. Short-run elasticities are $(1-\eta_d)$ times the long-run elasticities.

Estimates for the η's are based primarily on the results contained in K. P. Anderson's Residential Energy Use: An Econometric Analysis (The Rand Corporation, R-1297-NSF, October, 1973). The value of the lag coefficient η_d for electricity is from Electricity Demand in the United States: An Econometric Analysis (Oak Ridge National Laboratory, ORNL-NSF-EP-49, June 1973). Similar values are assumed to apply to gas and oil. The income and own-price coefficients for oil demand are based partly on Fossil Fuel Energy Demand Analysis (Decision Sciences Corporation, March, 1973).

The following equation for gas (i = g), electricity (i = e), and refined petroleum products (i = r) is obtained:

$$D_{it} = D_{io} \cdot \left(\frac{D_{it-1}}{D_{i,-1}}\right)^{\eta_i} \cdot \left(\frac{P_{et}}{P_{eo}}\right)^{\eta_{ie}} \cdot \left(\frac{P_{gt}}{P_{go}}\right)^{\eta_{ig}} \cdot \left(\frac{P_{rt}}{P_{ro}}\right)^{\eta_{ir}} \cdot (1 + \pi y)^{t \cdot \eta_{iy}} \cdot (1 + \pi_h)^{t \cdot (1 - \eta_i)} \cdot (1 + \pi_{pop/h})^{t \cdot \eta_{ih}} \qquad \text{(E-153)}$$

where:

D_{io} = energy type i demand in base year 1972;
$D_{i,-1}$ = energy type i demand in year 1971.

The parameters have the following values:

P_{go} = 1.1858 \$/10^6 BTU; P_{eo} = 22.9 mills/kwh; P_{ro} = 1.42 \$/10^6BTU;

D_{go} = 5.28, $D_{g,-1}$ = 5.13, D_{ro} = 2.94, $D_{r,-1}$ = 2.84 (10^{15}BTU);

D_{eo} = 0.5114, $D_{e,-1}$ = 0.4791 (10^{12}kWh).

The lag coefficients are:

η_g = 0.8859, η_e = 0.8859, η_r = 0.9000.

The short-run elasticity coefficients for prices are:

$\eta_{ge} = 0.0319$, $\eta_{gg} = -0.2362$, $\eta_{gr} = 0.0491$: gas;

$\eta_{ee} = -0.1278$, $\eta_{eg} = 0.0924$, $\eta_{er} = 0.0114$: electricity;

$\eta_{re} = 0.0210$, $\eta_{rg} = 0.2100$, $\eta_{rr} = -0.1956$: refined petroleum products.

The short-run elasticity coefficients for income and household size are:

$\eta_{gy} = 0.1620$, $\eta_{ey} = 0.0913$, $\eta_{ry} = 0.0379$: income;

$\eta_{gh} = 0.1415$, $\eta_{eh} = -0.1073$, $\eta_{rh} = 0.0000$: household size.

The annual growth rates for real personal income per household and household size are:

$\pi_y = 0.0224$, $\pi_h = -0.0065$.

The parameter $\pi_{pop/h}$ is not defined, but it is probably the annual growth rate of population, taken as equal to 0.0094 for the U.S. as a whole.

The commercial energy demand equations follow, for each type of energy:

$$D_t = \eta_d \cdot D_{t-1} + \left(\frac{P_t}{P_o}\right)^{\eta_p} \cdot ND_{t^*} , \qquad \text{(E-154)}$$

$$ND_t^* = \sum_{i=1}^{5} \left(A_t^i - \eta_d \cdot A_{t-1}^i\right) \cdot \left(\sum_{j=1}^{3} b_{jt}^i \cdot S_{jt}^i\right) \qquad \text{(E-155)}$$

where:

ND^* = potential "new" or "free" demand;
A^i = commercial floor space in region i;
b_j^i = input coefficient for a given type of energy in region i using system configuration j;
S_j^i = share of new plus renovated commercial floor space in region i using system configuration j.

As with the residential sector equations, equations (E-154) and (E-155) form a lagged-adjustment model of demand. The coefficient η_p is the long-run usage level elasticity of demand with respect to own-price. The short-run elasticity is $[1 - \eta_d \cdot (D_{t-1}/D_t)] \cdot \eta_p$.

Estimates of the η_p's are partly based on econometric studies of the residential sector and of the commercial and residential sectors combined. The lag coefficient η_d is a best guess, based on historical construction statistics, of the current rate of building replacement and renovation in the commercial sector.

The b_j^i's and S_j^i's are determined in a separate analysis for each of three systems configurations (j = 1,2,3): all electric, conventional (electric air-conditioning and fossil-fuel heating), and total energy (on-site electricity generation with waste-heat recovery). This is done for five regions of the country: 1. New England and Middle Atlantic; 2. East North Central, West North Central; 3. South Atlantic, East South Central, West South Central; 4. Mountain; 5. Pacific. (These regions are combinations of the Bureau of the Census regions.)

The b_j^i's are fixed numbers, except for a price-based allocation of fossil fuel usage between gas and oil. The S_j^i's are determined by the relative system costs of each of the three energy-use configurations in each region, with 80% of new or renovated floor space for the least expensive system and 10% for each of the other two. It is assumed that the small shares assigned to the more expensive systems reflect the combined effects of error and variations in operating conditions or costs within regions.

Both the trade-off curves used to determine the S_j^i's and the energy-use coefficients are based on engineering cost analyses of representative commercial buildings.

The following equations and parameters are used:

$$A_t^i = A_o^i \cdot \left(1 + \pi_a^i\right)^{(t+2)} \left(i = 1 \rightarrow 5 : \text{regions}\right) \qquad \text{(E-156)}$$

$A_o^1 = 6.144$, $A_o^2 = 6.440$, $A_o^3 = 6.053$, $A_o^4 = 0.842$, $A_o^5 = 3.277$ (10^9 ft^2)

(inventory of commercial floor space in base year minus two = 1970);

$\pi_a^1 = 0.045$, $\pi_a^2 = 0.046$, $\pi_a^3 = 0.052$, $\pi_a^4 = 0.050$, $\pi_a^5 = 0.047$

(projected annual rate of growth of commercial floor space).

$$P_{jt-1}^i = P_{jt-1}^{com} + \alpha_j^i \quad (i = 1 \rightarrow 5;\ j = g,r,e) \qquad \text{(E-157)}$$

The α_j^i's are regional price differences (deviations from national average), as given in Table E-18.

Table E-18 Regional Price Difference Coefficients

j \ i	1	2	3	4	5	units
g	+0.49	-0.06	-0.10	-0.24	-0.10	$\$/10^6$BTU
r	+0.07	0.00	0.00	0.00	+0.20	$\$/10^6$BTU
e	+6.5	+1.7	-2.5	-2.8	-4.0	mills/kwh

$$P^i_{f\,t-1} = \min\left(P^i_{gt-1},\, P^i_{rt-1}\right) \quad (i = 1 \rightarrow 5) \tag{E-158}$$

(the subscript f corresponds to "fossil fuels";
P^i_{gt-1} and P^i_{rt-1} are determined in equation (E-157) above).

$$S^i_{1t} = \begin{cases} \bar{S}^i_1 & \text{if } P^i_{ft-1} > M_1 + N_1 P^i_{et-1}, \\ \underline{S}^i_2 & \text{otherwise;} \end{cases} \quad (i = 1 \rightarrow 5) \tag{E-159}$$

$$S^i_{2t} = \begin{cases} \bar{S}^i_2 & \text{if } P^i_{ft-1} \begin{cases} \leq M_1 + N_1 P^i_{et-1}, \\ \text{and} \\ \geq M_2 + N_2 P^i_{et-1}, \end{cases} \\ \underline{S}^i_2 & \text{otherwise.} \end{cases} \quad (i = 1 \rightarrow 5) \tag{E-160}$$

$$S^i_{3t} = \begin{cases} \bar{S}^i_3 & \text{if } P^i_{ft-1} < M_2 + N_2 \cdot P^i_{et-1}, \\ \underline{S}^i_3 & \text{otherwise.} \end{cases} \quad (i = 1 \rightarrow 5) \tag{E-161}$$

$\bar{S}^i_{jt}$ = 0.8 (all i,j,t): maximum saturation of system type j in region i.

$\underline{S}^i_{jt}$ = 0.1 (all i,j,t): minimum saturation of system type j in region i.

M_1 = -3.1704 $\$/10^6$BTU
N_1 = 0.2345 ($\$/10^6$BTU)/(mills/kwh)
M_2 = -2.5061 $\$/10^6$BTU
N_2 = 0.1028 ($\$/10^6$BTU)/(mills/kwh)

} parameters of the normalized equal-cost curves.

$$b^i_{gkt} = \beta^i_{fk} / [1 + (P^i_{gt-1}/P^i_{rt-1})\sigma^i] \quad (i = 1 \rightarrow 5,\ k = 1 \rightarrow 3) \qquad \text{(E-162)}$$

$$b^i_{rkt} = \beta^i_{fk} - b^i_{gkt} \quad (i = 1 \rightarrow 5,\ k = 1 \rightarrow 3) \qquad \text{(E-163)}$$

$$b^i_{ekt} = \beta^i_{ek} \quad (i = 1 \rightarrow 5,\ k = 1 \rightarrow 3) \qquad \text{(E-164)}$$

$\sigma^i = 3.17$ $(i = 1 \rightarrow 5)$: gas - oil substitution coefficient.

The energy-use coefficients (at base-year prices) are indicated in Table E-19.

Table E-19 Energy Use Coefficients for the Commercial Sector

j \ i	1	2	3	4	5	Units	
e	.0250	.0267	.0246	.0296	.0217	10^3KWH/ft^2	← β^i_{j1} (all electric)
f	.046	.053	.040	.073	.027	10^6BTU/ft^2	← β^i_{j2} (conventional)
e	.0155	.0158	.0164	.0147	.0161	10^3KWH/ft^2	
f	.181	.191	.184	.197	.171	10^6BTU/ft^2	← β^i_{j3} (total energy)

$$D^{com\,*}_{jt} = \sum_{i=1}^{5} \left[\left(A^i_t - \rho^{com} A^i_{t-1} \right) \cdot \left(\sum_{k=1}^{3} b^i_{jkt} \cdot S^i_{kt} \right) \right] \quad (j = g,r,e) \qquad \text{(E-165)}$$

$\rho^{com} = 0.97$: fraction of last year's floor space that is neither replaced nor refitted.

$$D^{com}_{it} = \rho^{com} \cdot D^{com}_{it-1} + \left(\frac{P^{com}_{it}}{P^{com}_{io}} \right)^{E^{com}_i} \cdot D^{com\,*}_{it} \quad (i = g,r,e) \qquad \text{(E-166)}$$

Initial-year values for energy consumption:

$D^{com}_{go} = 0.55 \times 10^{15}$BTU; $D^{com}_{ro} = 0.66 \times 10^{15}$BTU;

$D^{com}_{eo} = 0.405 \times 10^{12}$ kwh.

Long-run elasticity of energy intensity with respect to price:

$E^{com}_g = E^{com}_r = E^{com}_e = -0.30$

Initial prices:

$P^{com}_{go} = 0.9058$ \$/10^6BTU

$P^{com}_{eo} = 22.2$ mills/KWH

$P^{com}_{ro} = 1.42$ \$/10^6BTU

The demand model for the industrial sector includes the following equations for each of two energy classes--gas and oil together, and electricity:

$$D_t = (D_{t-1})^{\eta_d} \cdot (D_t^*)^{1-\eta_d} \qquad \text{(E-167)}$$

$$D_t^* = \eta_o \prod_{i=1}^{m} P_{it}^{\eta_{pi}} \cdot V_t^{\eta_v} \qquad \text{(E-168)}$$

where V is the real value added in the industrial sector.

Adjustment lags and elasticities for the industrial sector are similar to those for the residential and commercial sectors.

Estimates of the coefficients of equation (E-168) are based on information in the previously mentioned Fossil Fuel Energy Demand Analysis.

The adjustment coefficient in equation (E-167) has a best-guess value of 0.9.

The fuel-split model for gas and oil is:

$$F_t = (F_{t-1})^{\eta_f} \cdot (F_t^*)^{1-\eta_f} \qquad \text{(E-169)}$$

$$F_t^* = \frac{D_o^{gas}}{D_o^{oil}} \cdot \left(\frac{P_t^{gas} / P_o^{gas}}{P_t^{oil} / P_o^{oil}} \right)^{-\eta_{g/o}} \qquad \text{(E-170)}$$

$$D_t^{oil} = \frac{D_t^{gas + oil}}{1 + F_t} \qquad \text{(E-171)}$$

$$D_t^{gas} = D_t^{gas + oil} - D_t^{oil} \qquad \text{(E-172)}$$

F is the actual ratio of gas-to-oil demand, and F* is the target ratio. Best-guess values for η_f and $\eta_{g/o}$ are 0.9 and 3.0 with the value of η_f matching that for η_d, and that for $\eta_{g/o}$ reflecting loosely the fuel-split results for commercial and household demand reported in Interfuel Substitution in the Consumption of Energy in the United States (MIT-EL 74-002, M.I.T. Energy Laboratory, May, 1974).

The initial specification of the model contained separate equations for oil and gas, but the estimated coefficients indicated an unacceptable pattern of own- and cross-price effects. The pattern was made more plausible by first aggregating the elasticity coefficients for oil and gas, using as weights the relative shares of oil and gas consumed in 1972 and then introducing a fuel-split model for gas and oil.

The following equations are used:

Gas and petroleum products

$$D_{g/r,t} = D_{g/r,o} \cdot \left(\frac{D_{g/r,t-1}}{D_{g/r,-1}}\right)^{\eta_{g/r}} \cdot \left(\frac{P_{alt,t}}{P_{alt,o}}\right)^{\eta_{g/r,alt}} \cdot \left(\frac{P_{et}}{P_{eo}}\right)^{\eta_{g/r,e}} \cdot \left(\frac{P_{ct}}{P_{co}}\right)^{\eta_{g/r,c}} \cdot (1 + \pi_v)^t \cdot (\eta_{g/r,v}) \qquad \text{(E-173)}$$

$$F_{g/r,t} = \left[\frac{D_{go}}{D_{ro}} \cdot \left(\frac{P_{gt}/P_{go}}{P_{rt}/P_{ro}}\right)^{\bar{\eta}_{g/r}}\right]^{\eta_{g/r}} \cdot (F_{g/r,t-1})^{1-\eta_{g/r}} \qquad \text{(E-174)}$$

$$D_{rt} = D_{g/r,t} / (1+ F_{g/r,t}) \qquad \text{(E-175)}$$

$$D_{gt} = D_{g/r,t} - D_{rt} \qquad \text{(E-176)}$$

The lag coefficient is: $\eta_{g/r} = 0.900$.

The short-run elasticities of demand with respect to price and real value added are:

$\eta_{g/r,e} = 0.030$; $\eta_{g/r,c} = 0.030$; $\eta_{g/r,alt} = -0.100$;

$\eta_{g/r,v} = 0.033$ (alt = "alternative" fuels - gas and oil).

The initial values for energy consumption are:

$D_{g/r,o} = 15.92 \times 10^{15}$BTU ; $D_{g/r,-1} = 15.01 \times 10^{15}$BTU ;

$D_{go} = 10.25 \times 10^{15}$BTU ; $D_{ro} = 5.67 \times 10^{15}$BTU.

The gas-oil coefficient is: $\overline{\eta}_{g/r} = -3.0$

The projected annual growth rate for real value added in the industrial sector is:

$\pi_v = 0.035$

The initial prices are:

$P_{ro} = 0.68\ \$/10^6$ BTU;

$P_{go} = 0.4495\ \$/10^6$ BTU;

$P_{eo} = 10.9$ mills/kwh ;

$P_{co} = 11.40$ \$/ton - initial average price of industrial coal delivered to plant;

$P_{alt,o} = 0.547\ \$/10^6$BTU - initial average price of gas and oil to industrial customers.

In addition, a weighting factor W_{rt} is computed to determine the price of gas and oil:

$$W_{rt} = D_{rt-1} / (D_{rt-1} + D_{gt-1}) \quad \text{(E-177)}$$

$$P_{alt,t} = P_{rt} \cdot W_{rt} + P_{gt} \cdot (1 - W_{rt}) \quad \text{(E-178)}$$

Electricity

$$D_{et} = D_{eo} \cdot \left(\frac{D_{et-1}}{D_{e,-1}}\right)^{\eta_e} \cdot \left(\frac{P_{et}}{P_{eo}}\right)^{\eta_{ee}} \cdot \left(\frac{P_{gt}}{P_{go}}\right)^{\eta_{eg}} \cdot \left(\frac{P_{rt}}{P_{ro}}\right)^{\eta_{er}} \cdot \left(\frac{P_{ct}}{P_{co}}\right)^{\eta_{ec}} \cdot (1 + \pi_v)^{t \cdot \eta_{ev}} \quad \text{(E-179)}$$

The lag coefficient is: $\eta_e = 0.900$.

The short-run elasticities of demand with respect to prices and real value added are:

$\eta_{ee} = -0.102$; $\eta_{ec} = 0.018$; $\eta_{eg} = 0.015$; $\eta_{er} = 0.012$; $\eta_{ev} = 0.064$.

The initial values of electricity consumption are:

$D_{eo} = 0.6395 \times 10^{12}$ kwh ; $D_{e,-1} = 0.5927 \times 10^{12}$ kwh .

S. E. Atkinson and R. Halvorsen. "Demand for Fossil Fuels by Electric Utilities." Econometric Dimensions of Energy Supply and Demand. Eds. A. B. Askin and J. Kraft. Lexington, Mass.: Lexington Books, 1976.

Twenty percent of the total U. S. energy consumption is in the form of electric energy produced from fossil fuels; the generation of electricity consumes 66% of the coal, 8% of the oil, and 19% of the natural gas used for heat & power. In light of these figures there is a need to understand at the individual fuel level fossil fuel use by electric utilities. This study estimates own- and cross-elasticities of demand and substitution for coal, oil, and natural gas.

Demand equations are estimated with aggregate monthly time series data. These monthly data cover August 1972 through September 1974 (twenty-six observations). Fuel prices are calculated from Federal Power Commission data on expenditures and quantities purchased for each kind of fuel. These prices are normalized by dividing them by the price of output, calculated from FPC data on total revenue and total quantity of electric energy sold.

The demand equations are derived from a translog normalized restricted profit function. A seasonal dummy variable is included to reflect seasonal effects on fuel demands. In preparing the model, restricted profit is defined as a short-term profit, when only operating inputs (like fuels) may be varied (notation: π). Normalized restricted profit is defined as the ratio of π to b, the price of electric energy ($\pi^* = \pi/b$). The general form is:

$$\pi^* = \pi^*(P,Z) \qquad \text{(E-180)}$$

where:

P = vector of normalized input prices;

Z = the vector of fixed inputs.

More specifically:

$$\pi^* = \pi^*(P_1,\ P_2,\ P_3;\ Z_1,\ Z_2) \qquad \text{(E-181)}$$

where:

P_1 = price of coal;

P_2 = price of oil;

P_3 = price of gas;

Z_1 = quantity of capital;

Z_2 = quantity of labor.

For labor input, data from the Bureau of Labor Statistics on employment in electric companies and systems are used. The amount of capital is equal to installed generating capacity according to the manufacturers' maximum nameplate rating as reported by the FPC.

To avoid the difficult job of modeling the profit-maximizing choice of capital stock, capital is treated as a fixed input. The choice of capital stock is complicated both by regulatory constraints and by peak-load demand. The use of a restricted profit function permits analysis of short-run profit-maximizing decisions on fuel choice if capital is fixed.

The transcendental logarithmic (translog) form is used:

$$\ln\pi^* = \alpha_0 + \sum_{i=1}^{3} \alpha_i \ln P_i + \frac{1}{2}\sum_{i=1}^{3}\sum_{h=1}^{3} \gamma_{ih}\ln P_i \ln P_h + \sum_{i=1}^{3}\sum_{j=1}^{3} \delta_{ij}\ln P_i \ln Z_j$$

$$+ \sum_{j=1}^{2} \beta_j \ln Z_j + \frac{1}{2}\sum_{j=1}^{2}\sum_{k=1}^{2} \phi_{jk}\ln Z_j \ln Z_k \quad \left(\begin{matrix}\gamma_{ih} = \gamma_{hi}\\ \phi_{jk} = \phi_{kj}\end{matrix}\right) \tag{E-182}$$

At the optimum:

$$\frac{\partial\pi^*}{\partial P_i} = -X_i^* \quad , \tag{E-183}$$

where X_i^* is the profit- maximizing amount of input i.

Then:

$$\frac{P_i X_i^*}{\pi^*} = M_i = -(\alpha_i + \sum_{h=1}^{3} \gamma_{ih}\ln P_h + \sum_{j=1}^{2} \delta_{ij}\ln Z_j) \quad (i = 1, 2, 3) \tag{E-184}$$

where M_i is the ratio of expenditures on input i to restricted profits.

The estimated equations are:

Coal: $M_1 = -0.220 \ln P_1 - 0.048 \ln P_2 - 0.047 \ln P_3 - 0.053 \ln Z_1 + 0.143 \ln Z_2 + 0.014 D + 0.720 \quad (R^2 = 0.99)$ (E-185)

(D = dummy variable).

Oil : $M_2 = -0.048 \ln P_1 - 0.217 \ln P_2 - 0.022 \ln P_3 + 0.233 \ln Z_1 + 0.457 \ln Z_2 - 0.002 D - 4.721 \quad (R^2 = 0.98)$ (E-186)

Gas : $M_3 = -0.047 \ln P_1 - 0.022 \ln P_2 + 0.090 \ln P_3 - 0.039 \ln Z_1 + 0.054 \ln Z_2 - 0.013 D + 0.104 \quad (R^2 = 0.87)$ (E-187)

The own- and cross-price elasticities of demand for fuels are:

$$E_{ii} = \frac{\partial X_i^*}{\partial P_i} \cdot \frac{P_i}{X_i^*} = \frac{-M_i^2 - M_i - \gamma_{ii}}{M_i} \quad \text{(E-188)}$$

$$E_{ih} = \frac{\partial X_i^*}{\partial P_h} \cdot \frac{P_h}{X_i^*} = \frac{-M_i \cdot M_h - \gamma_{ih}}{M_i} \quad \text{(E-189)}$$

The following values, evaluated at the means of the data are obtained:

$E_{cc} = -0.01$;

$E_{oo} = 0.01$;

$E_{gg} = -2.55$;

$E_{cg} = 0.19$;

$E_{gc} = 0.59$;

$E_{co} = 0.13$;

$E_{oc} = 0.18$;

$E_{og} = 0.04$;

$E_{go} = 0.09$.

The partial elasticities of substitution are:

$$\sigma_{ii} = \frac{1}{M_i} \cdot E_{ii} = \frac{-M_i^2 - M_i - \gamma_{ii}}{M_i^2} \quad \text{(E-190)}$$

$$\sigma_{ih} = \frac{1}{M_h} \cdot E_{ih} = \frac{-M_i \cdot M_h - \gamma_{ih}}{M_i \cdot M_h} \quad \text{(E-191)}$$

The following values, evaluated at the means of the data, are obtained:

$\sigma_{cc} = -0.03;$

$\sigma_{oo} = 0.07;$

$\sigma_{gg} = -42.17;$

$\sigma_{cg} = 3.15;$

$\sigma_{co} = 0.98;$

$\sigma_{og} = 0.69$

It is evident that eight of the nine price elasticities have the appropriate sign; seven are significant at the five percent level. The own-price elasticity of oil has an incorrect sign but this is insignificant. Five of the six elasticities of substitution have the appropriate sign; four of these are significant.

Estimated elasticities of demand and substitution indicate that substantial interfuel substitution occurs in existing plants. In general the ability of an electric utility to substitute one fuel for another is greater when the plant is being planned than after it is in operation because the characteristics of the capital in place in an operating plant constrain possible interfuel substitution. Interfuel substitution at the plant level can happen in two ways. First, individual generating units may be able to use more than one kind of fuel, and second, since a plant usually contains more than one generating unit, different units may use different fuels. Therefore, interfuel substitution can occur through changes in the merit order of individual units. Units are brought on-line in rank according to the marginal costs of generation, and changes in fuel prices alter the relative marginal costs of units using different fuels and affect the proportion of output produced with each type of fuel.

Moreover, even if substitution were not possible at the plant level, it might occur at the firm level because of changes in the merit order of plants using different fuels. In a similar way, the existence of integrated power pools facilitates further interfuel substitution through reallocations of generation requirements among firms using different fuels.

The following equation is used for demand predictions:

$$X_i^* = \frac{\pi^*}{P_i} \cdot M_i = -\frac{\pi^*}{P_i}\left(\alpha_i + \sum_{h=1}^{3} \gamma_{ih} \ln P_h + \sum_{j=1}^{3} \delta_{ij} \ln Z_j\right) \quad \text{(E-192)}$$

If F(X*, Z) is the electricity production function value for X*, then:

$$\pi^* = F(X^*, Z) - \sum_{i=1}^{3} P_i X_i^* \quad \text{(E-193)}$$

or:

$$\pi^* = F(X^*, Z) - \pi^* \sum_{i=1}^{3} M_i \quad \text{(E-194)}$$

or:

$$\pi^* = \frac{F(X^*, Z)}{(1 + \sum M_i)} \quad \text{(E-195)}$$

If the output F(X*,Z) is taken as given and the values of the M_i are calculated using the previously-estimated equations, it is possible to compute the profits π^* and the demands X_i^*.

In a comparison between predicted and actual fuel consumption in 1974 it is seen that the consumption of coal and oil is underestimated (up to 5% for coal and 15% for oil). Consumption of gas is overestimated (up to 34%). These overestimations and underestimations are related to the curtailments of gas supplies to electric utilities. Because of gas rationing utilities were not able to purchase the quantities of gas desired at existing market prices. Hence, the difference between predicted and actual gas consumption provides a measure of the extent of gas curtailment. It is also evident that gas curtailments affect the consumption of coal and oil almost equally.

P. L. Joshow and F. S. Mishkin. "Electric Utility Fuel Choice Behavior in the United States." International Economic Review, Vol. 18, No. 3, 1977, 719-736.

This study departs from the traditional specification of electricity production function (differentiable aggregate production function). It uses, instead, conditional logit analysis.

Electricity generation is not characterized by a continuum of capital-labor-fuel ratios. Instead, a firm can use a few discrete, fixed-coefficients, fuel-burning technologies for generating electricity.

The firm constructing a new fossil-fuel, base-load, steam-electric plant faces a set of a maximum of seven alternative techniques for generating electricity (coal, oil, natural gas, coal-oil, coal-gas, coal-oil-gas). For a fixed output each technique has a vector of expected cost characteristics x_i (for technique i). The preferences of the firm regarding generating technique i are described by a decision index $C(x_i)$. The probability the firm, given R alternatives, will select alternative i, is:

$$P_i = \frac{e^{-C(x_i)}}{\sum_{j=1}^{R} e^{-C(x_j)}} \qquad \text{(E-196)}$$

It is then assumed that:

$$Ci = \beta_i FCOST_i^* + \beta_2 PRODE_i^* + \beta_3 K_i^* + \partial_2 DUM_2 + \partial_3 DUM_3 + \ldots \partial_7 DUM_7 \qquad \text{(E-197)}$$

where each alternative has a set of expected cost characteristics:

$FCOST_i^*$ = fuel cost ($) per thousand Kwh;
$PRODE_i^*$ = non-fuel production expenses ($) per thousand Kwh;
K_i^* = annual capital cost ($) per kilowatt of capacity, and
$DUM_2 \downarrow DUM_7$ = technique-specific dummies for alternatives two through seven.

J. M. Griffin, "Inter-Fuel Substitution Possibilities: A Translog Application to Intercountry Data." International Economic Review, 18 (1977) 755-770.

This study estimates the interfuel substitution relationships among fossil fuels (coal, gas, and residual fuel oil) in the generation of electricity. Since considerable technical flexibility exists in electricity generation (for example, the technology permits the design of alternate fuel-burning equipment at moderate capital cost differentials) and since electric utilities consumed, in 1970, 25% of primary energy imports in the U.S., it is feasible to reduce the use of crude oil and to achieve import reductions, by substituting fuels.

Griffin develops a translog model for fuel imports, and assumed that:

1. there exists a twice-differentiable production function relating the output of electricity (Q) to technical change (t) and to the services of capital (K), labor (L), and the energy inputs: coal (Q_c), gas (Q_g), and fuel oil (Q_o);
2. there exists a cost function:

$$C = (P_k, P_L, P_c, P_g, P_o, Q) \qquad \text{(E-198)}$$

where:

P_k = input price of capital;
P_L = input price of labor;
P_c = input price of coal;
P_g = input price of gas;
P_o = input price of oil;

3. coal, gas, and fuel oil make up a separable and homogenous energy aggregate (E) with a price P_E:

$$P_E = \emptyset\,(P_c,\ P_g,\ P_o) \qquad \text{(E-199)}$$

The translog cost function is:

$$\ln\emptyset = \ln\partial^* + \sum_i \partial_i \ln P_k + \tfrac{1}{2} \sum_{ij}\sum (\ln P_i \cdot \ln P_j). \qquad \text{(E-200)}$$

L. Waverman, "Estimating the Demand for Energy", Energy Policy, March, 1977, pp. 2-11.

Waverman presents a review of the process involved in estimating the demand for energy.

It is first noted that energy is not desired for its direct effect, but rather for the utility derived from its use as heat, light, or power.

The demand for energy depends on the existing stock of energy-using goods, their depreciation rate, additions to the stocks and the rate of utilization of the stock. When the stock of energy-using assets is fixed, the time is characterized as short-run; when the stock is variable, as long-run.

Because energy use is tied to the use of assets and because assets using any fuel can be purchased,the demand for any particular energy type must be determined from the simultaneous choice of all fuels and all fuel-using assets. Hence, energy demand specification requires a simultaneous equation system.

In estimating demand, the use of average price as a surrogate for price is inappropriate. A falling averages price schedule is used for electricity and natural gas; the more a consumer uses, the lower the average price of all he consumes. Because of such pricing policies, the use of average price will lead to a biased estimate of the price elasticity of demand. Theoretically both average and marginal prices should be incorporated in the estimating equation.

Moreover, in estimating the price responsiveness of total energy demand in a particular sector one cannot use the average price of energy as it is calculated by total revenue spent on energy divided by total volume in BTU's. Such a simple weighted mean is not a correct price index of energy; it would only be as if all individual fuels were perfect substitutes.

The simultaneous equation system for estimating demand must include the choices of all fuels simultaneously, hence leading to the imposition of a number of constraints on the system.

1. The total expenditure on fuel is equivalent to the total expenditure on energy.

2. The sum of the expenditures on each separate fuel-using asset is equal to the total expenditure on all fuel-using assets.

3. The Slutsky constraints, dealing with the equality between cross-price elasticities of demand and the sum of the weighted income elasticities of demand, are imposed.

The author considers some further problems involved in the process of estimating the demand for energy. First, even if behavioral demand functions are theoretically perfect, it may not be wise to base policy decisions on demand functions run for the 1960-1972 period.

Also the nature of the feedback mechanism between energy prices and GNP is such that the impact of GNP on energy use and the effects of changes in energy consumption on GNP are simultaneous. The model of energy demand should be joined to a macro-model of the economy.

A supply side to the model may also be necessary, but the use of such a sophisticated model requires the assumption that behavioral demand functions are reversible and that a quantum jump in prices can be analyzed like small incremental changes. For this, it is necessary to use 1973-1977 data.

Finally, it must be noted that the low relative prices of energy have led to the establishment of large stocks of long-lived complements to energy. For example, the complements to the automobile which include the large number of freeways, the suburban shopping centers, and poor rapid transit facilities, mean that over time the demand function for gasoline has become more inelastic as substitutes lag.

Waverman has reviewed various studies of energy demand in the residential, commercial, and industrial sectors, and has classified them according to the following characteristics:

1. own-price elasticity (long-run);
2. type of approach (cross-section or time series);
3. dynamic nature of model;
4. consideration of stock of energy-using appliances;
5. inclusion of complements;
6. use of system of equations or single equation.

For the residential/commercial sector the following are noted.

1. Two of the four studies reviewed which examine residential demand for fossil fuels and electricity do not use a simultaneous equation system incorporating the constraints on elasticities that demand theory suggests.

2. None of studies examines complements to energy uses.

3. Only five studies differentiate residential from commercial demand.

4. While four of the residential electricity demand studies are dynamic,only two consider directly the stock of appliances.

For the industrial sector the following are noted.

1. Fewer studies have been made on industrial energy demand than on residential/commercial demand.

2. Most industrial demand studies incorporate demand theoretic elements in a simultaneous equation analysis.

3. Even though different data sets are used and different functions formulated,the estimated price elasticity of demand for total energy in the industrial sector is nearly equal to -0.5 in three studies.

4. Some studies find that capital and energy are complementary; others that they are substitutes.

5. The trans-log model is criticized for being static with capital being perfectly malleable. This model must be generalized to include the actual existing vintage stocks of capital.

6. A dynamic "putty-clay" model is required, simultaneous for all input choices, and incorporating constraints on elasticities as well as constraints on the ability to change capital in the short-run. Endogenous technical changes should also be incorporated.

7. Industrial conversion of hydrocarbons to produce electricity on site must be carefully considered.

D.Z. Czamanski, J.S. Henderson, K.A. Kelly, J.S. Detwiler. The Benefits and Costs of Gas Storage Development in Ohio. Report submitted to the Public Utilities Commission of Ohio by the Ohio State University. Columbus, Ohio, 1977.

For the long-run demand estimation, the demand curves were assumed to be linear between the point representing actual demand in 1975 for natural gas at the regulated price and the price at which demand would be zero. The latter price was found by estimating the price at which all equipment currently using gas would switch to alternate fuels. This price was based on alternate, most-preferred fuel prices and replacement costs for the existing equipment.

Demand schedules were determined for industrial, commercial and residential customers. The long-run seasonal demand curves for 1976 follow. Account has been made for the observed curtailments and for a hypothesis of low, unobserved curtailments.

Winter (Q in Bcf, P in \$/mcf) (E = price elasticity)

Industrial-Boilers:	$P = 2.348 - 3.48 \times 10^{-2} \cdot Q$	(E = 1.38)	(E-201)
Substitutable :	$P = 2.352 - 2.26 \times 10^{-2} \cdot Q$	(E = 1.37)	(E-202)
Non-Substitutable :	$P = 3.181 - 7.30 \times 10^{-2} \cdot Q$	(E = 0.44)	(E-203)
Commercial :	$P = 3.727 - 5.11 \times 10^{-2} \cdot Q$	(E = 0.67)	(E-204)
Residential :	$P = 7.204 - 5.54 \times 10^{-2} \cdot Q$	(E = 0.30)	(E-205)
Aggregate Winter :	$P = 3.511 - 8.05 \times 10^{-3} Q$		(E-206)

Summer

Aggregate summer :	$P = 3.909 - 17.61 \times 10^{-3} Q$	(E-207)

Aggregate long-run winter demand curves have been developed, corresponding to eight levels of unobserved curtailments, for industrial, commercial and residential activities (in that order):

Low, Low, Low :	$P = 3.515 - .00805 \cdot Q$	(E-208)
Low, Low, High :	$P = 3.541 - .00799 \cdot Q$	(E-209)
Low, High, Low :	$P = 3.519 - .00793 \cdot Q$	(E-210)
Low, High, High :	$P = 3.544 - .00788 \cdot Q$	(E-211)
High, Low, Low :	$P = 3.502 - .00782 \cdot Q$	(E-212)
High, Low, High :	$P = 3.526 - .00777 \cdot Q$	(E-213)
High, High, Low :	$P = 3.505 - .00771 \cdot Q$	(E-214)
High, High, High :	$P = 3.529 - .00766 \cdot Q$	(E-215)

The previous demand equations correspond to the service area of Columbia Gas of Ohio, but the methodology can be applied to any other service area. It would be necessary to know, for a given point in time the level of industrial, commercial and residential consumption - by season and end uses, the observed curtailment, and the possible figures for unobserved curtailments. The data and calculations for alternate fuels, for alternate fuel preferences (per cent of each end-use switching to oil, coal, electricity, or propane), for replacement costs for gas-burning equipment, for new equipment lifetimes and for utilization rates could be used as they are.

The short-run demand curve estimation follows:

$$Q_t = a + bP_t + cQ_{t-1} + dD_t + u \qquad \text{(E-216)}$$

where:

P_t = current price;

Q_t = current seasonal consumption (winter);

Q_{t-1} = consumption in the previous season;

D_t = current season degree-days;

u = random error term.

The short-run elasticity is based on b, and the long-run elasticity on b/(1-c), representing the responsiveness of demand to price after long-run equilibrium is reached when $Q_t = Q_{t-1}$.

Since excess demand for natural gas currently exists, however, observable consumption patterns do not lie on the demand curve. Hence it is impossible to estimate correctly the preceding equation.

The term cQ_{t-1}, has been deleted from the preceding equation and the equation has been estimated using four years of monthly data from Columbia Gas of Ohio for three customer classes (residential, commercial and industrial). The observed consumptions have been adjusted to account for the observed monthly curtailments. The three summer months of each year have been deleted. (Degree days may be negative.)

Two kinds of curtailment adjustment were used, based on the percentage curtailment for each month. These are the proportional, in which actual monthly gas usage is multiplied by a factor based on the percentage of curtailment, and the additive, in which actual monthly consumption is increased by adding that amount of gas curtailed from the group's original allocation. The estimated equations are:

Residential:		$Q_t = -.01363\ P_t + 0.01992\ D_t$	$(R^2 = .99)$	(E-217)
Commercial:	Proportional	$Q_t = -.00608\ P_t + .00847\ D_t$	$(R^2 = .979)$	(E-218)
	Additive	$Q_t = -.0081\ P_t + .00814\ D_t$	$(R^2 = .988)$	(E-219)
Industrial:	Proportional	$Q_t = -.01699\ P_t + .00243\ D_t$	$(R^2 = .34$	(E-220)
	Additive	$Q_t = -.01018\ P_t + .00299\ D_t$	$(R^2 = .30)$	(E-221)

It is noted that all the equations are statistically significant. Degree-day is significant in all the equations. Price, however, is not significant in the final equations.

The equations indicate that weather has a much less important influence on industrial demand than on residential and commercial demand. Whereas degree-days explain almost all of the month-to-month variations in residential and commercial gas consumption, the industrial load is not particularly sensitive to weather.

The results for the price coefficients are not as satisfying. The implied price elasticity for industrial customers is smaller than reasonable. It is less than the residential elasticity although the opposite is expected.

O. Fisch et al. GASMOD 2 User's Manual: Simulation Model for Natural Gas Supply and Demand in Ohio. Research report submitted to the Ohio Department of Energy by The Ohio State University. Columbus, Ohio, 1978.

The data sources for this model are the billing data reported to the PUCO (Public Utilities Commission of Ohio) by the major Ohio gas companies--Cincinnati Gas and Electric, Columbia Gas of Ohio, Dayton Power and Light, and East Ohio Gas. These data, covering eighty-nine monthly observations (January 1970-May 1977), includes volume of gas billed, sales revenues, and number of customers. The data are aggregated by calendar month and by sector--residential or commercial/industrial.

The descriptive monthly average statistics for East Ohio Gas's service area, for 1970-1976, are as follows:

Degree-days: 512

Gas Consumption

- total: 32818 MMCF
- domestic: 15407 MMCF (47%)
- non-domestic: 17411 MMCF (53%)

State's share (small distributors excluded)

- total: 40%
- domestic: 43%
- non-domestic: 39%

Number of customers and unitary consumption

- domestic: 897737 (38% of state)
- domestic unit consumption: .017 MMCF
- non-domestic: 53785 (29% of state)
- non-domestic unit consumption: .32 MMCF

Weather sensitivity

- domestic: 78%
- non-domestic: 32%

The gas demand of the domestic sector in East Ohio Gas' service area is specified for the full period 1970 - 1976 and for each year separaely.

The total gas demand equation for the full period 1970 - 1976 (monthly average) is:

$$GD(k) = 3349. + 23.52\ DD(k) \quad (R^2 = .982) \qquad \text{(E-222)}$$

where:

GD(k) = gas demand during month k (MMCF):
DD(k) = degree-days during month k.

Yearly independent estimations of monthly domestic gas demand equations are:

1970:	$GD(k) = 3288. + 22.95\ DD(k)$	$(R^2 = .983)$	(E-223)
1971:	$GD(k) = 3383. + 23.57\ DD(k)$	$(R^2 = .983)$	(E-224)
1972:	$GD(k) = 3172. + 24.22\ DD(k)$	$(R^2 = .988)$	(E-225)
1973:	$GD(k) = 4190. + 23.04\ DD(k)$	$(R^2 = .993)$	(E-226)
1974:	$GD(k) = 3147. + 24.21\ DD(k)$	$(R^2 = .976)$	(E-227)
1975:	$GD(k) = 2739. + 24.34\ DD(k)$	$(R^2 = .982)$	(E-228)
1976:	$GD(k) = 2924. + 22.52\ DD(k)$	$(R^2 = .992)$	(E-229)

Monthly gas consumption is normalized by dividing it by the total number of customers. The normalized demand equations are:

1970:	$GD(k) = 3.78 + .0259\ DD(k)$	$(R^2 = .983)$	(E-230)
1971:	$GD(k) = 3.86 + .0264\ DD(k)$	$(R^2 = .983)$	(E-231)
1972:	$GD(k) = 3.61 + .0269\ DD(k)$	$(R^2 = .989)$	(E-232)
1973:	$GD(k) = 4.70 + .0254\ DD(k)$	$(R^2 = .993)$	(E-233)
1974:	$GD(k) = 3.52 + .0266\ DD(k)$	$(R^2 = .976)$	(E-234)
1975:	$GD(k) = 3.05 + .0265\ DD(k)$	$(R^2 = .982)$	(E-235)
1976:	$GD(k) = 3.25 + .0244\ DD(k)$	$(R^2 = .992)$	(E-236)

The gas demand of the non-domestic sector in East Ohio Gas' service area follows. The time series under analysis includes almost three years of institutionally restricted demand of gas, given by the different curtailment plans and different levels of enforcement.

<u>Case of Non Restricted Gas Demand</u> (the first five years of the time series)

Specification of the model:

$$GND(k) = A(k) + b.\ DD(k) \qquad (E\text{-}237)$$

$$A(k) = Am + Cm.\ CUST(k) \qquad (E\text{-}238)$$

A(k) is related to process consumption, and b to weather variability (mainly space heating). The variablilty of A(k) is partially captured by the variability of the number of non-domestic customers (CUST). The two explanatory variables DD(k) and CUST(k) explain, for all the service areas, between 93.5% and 96% of the variations.

For East Ohio Gas' service area (61 observations), the estimate of equation (E-237) is:

$$GND(k) = -10858 + .43 * CUST(k) + 11.35 * DD(k) \quad (R^2 = .956) \quad (E\text{-}239)$$

<u>Case of Restricted Gas Demand</u> (data from the last three years).

Specification of the model:

$$GND^c(k) = GND(k) + \sum_{i=1}^{n} C_i(k)\ .\ b_i(k) \qquad (E\text{-}240)$$

$$GND^c(k) = a_m^c + C_m^c\ .\ CUST(k) + b^c\ DD(k) \qquad (E\text{-}241)$$

$GND^c(k)$ is the nominal monthly gas consumption (equivalent to potential demand), equal to the real monthly gas consumption plus monthly gas saved by the curtailment plan.

For East Ohio Gas' service area (89 observations):

$$GND(k) = 21796 - .1991 * CUST(k) + 12.419 * DD(k) \quad (R^2 = .927) \quad (E\text{-}242)$$

Appendix F

GAS CONSUMPTION DATA

The purpose of this appendix is to present various data used in developing the gas consumption models described in Chapter 4 of Volume II.

Energy consumption data for the residential, commercial and industrial sectors in 1970 in the eighteen counties which contain the EOGC service area, are presented in Tables F-1 through F-6. Table F-4 presents an aggregation of residential fuel heating consumption data at the level of the five divisions of the EOGC. These data were mostly used to determine the shares of the different sources of energy in 1970 in the three sectors and the five divisions of the EOGC service area. These shares were then assumed to be equal to those of 1977 and were used, in the various consumption models, as "base" year shares.

Total and sectoral-residential, commercial, industrial - gas sales data in the five divisions of the EOGC service area and for each year from 1970 to 1977, are presented in Tables F-7 through F-14, and include such characteristics as: total annual gas sales and revenues, average monthly number of customers and average gas charges, both per customer and per gas volume unit. Base year gas consumption rates for the different types of customers have been computed with these data. Also, the base year (1977) prices, quantities of gas sold, and number of customers used in the simulation model are directly extracted from these data. It can be noted that:

- in 1977, residential, commercial and industrial gas sales constituted 49.27%, 18.43% and 32.30% of total sales, respectively;
- in 1977, the shares from total gas sales of the five divisions were: Cleveland - 52.76%, Akron - 14.11%, Canton - 14.43%, Youngstown - 11.02%, Warren - 7.03%, unbilled and lost – 0.64%; these shares were quite stable in previous years;
- the overall average gas rate has almost tripled from 1970 to 1977 (see Table F-8), the rate of increase having been higher for industrial and commercial customers than for residential customers;
- the numbers of residential and commercial customers have slightly increased from 1970 to 1977, while their corresponding consumptions have

decreased, most probably because of energy conservation efforts; both the number and consumption of industrial gas customers have decreased since 1970, due to gas curtailments and the probable switching of some customers to other, more secure sources of energy; overall, total gas sales have decreased from 382,824 MMCF in 1970 to 351,203 MMCF in 1977, or 8.25%.

Monthly gas usage characteristics, in total and for each sector separately, (residential, commercial, industrial) from January 1970 to May 1977 are presented in Tables F-15 through F-18. These characteristics include: monthly gas usage, number of customers, gas revenues and average gas charge, and number of degree-days. Total monthly gas usage and degree-day data are displayed graphically in Figures F-1 through F-14. These figures constitute an additional illustration of the close relationship existing between monthly gas usage and degree-days, i.e., temperature*

Gas consumptions, base allocations and curtailed base allocations for the 501 major industrial customers of the EOGC during 1975 and 1976 are presented in Tables F-19 through F-37. The basic data at the level of the customer have been aggregated at the level of two-digit SIC groups. The use of the base allocation data for the determination of monthly potential industrial gas load has been described in Chapter 4. These base allocation data are displayed graphically in Figures F-15 through F-33.*

Actual and forecasted industrial gas demands for the major industrial sectors comprised in the EOGC industrial customers set are presented in Table F-38 and in Figure F-34. These estimates have been established by the company itself. In order to forecast industrial demand, the following equation has been used:

$$\begin{aligned}[\text{Industrial Demand}] = \; & A_* [\text{Gross National Product}] + \\ & B_* [\text{Steel Shipments}] + C_* [\text{Degree-Days}] - \\ & D_* [\text{Average Industrial Rate}] + \text{Error Term.}\end{aligned}$$

The above Industrial Demand is then adjusted for Alternative Fuel Usage and Self-help gas. Unfortunately, no other information could be obtained about this forecasting process, as well as about the values of the coefficients in the above regression equation.

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*All these monthly data have been provided to the Research Team by courtesy of another OSU Research Team woking on gas allocation problems and including Drs. Fisch, Gordon, Von Rabenau and Gorr.

However, the actual sales data for 1975 and 1976, as established by the company for all its industrial customers, are useful in assessing the representativity of the 501 major industrial customers in the major SIC groups. This comparison is presented in Table F-39. In general, the discrepancy is smaller in 1975 than in 1976 for most of the sectors, and, overall, is equal to 3.6% in 1975 and to 11.9% in 1976.

The relationships between residential and commercial gas requirements, on one side, and the level of outdoor temperature measured by monthly degree-days, on the other side, are displayed in Figures F-35 through F-48. The corresponding regression equations and correlation coefficients were presented in Chapter 4.

Finally, monthly base allocations aggregated at the two-digit SIC level have been regressed on 1970 monthly degree-days, and the results of these regression analyses are presented in Table F-40. Thirteen SIC sectors (on 19) display an R^2 greater than .9 and two sectors an $R^2 \varepsilon$ [.8 - .9]. Sectors 22,24, and 32 display relatively low R^2. Sector 29 - Petroleum and coal products - shows a generally higher consumption in summer than in winter; this base allocation pattern is related to the production pattern of this industry, which produces tar for roads and public works in summer.

Table F-1 Residential Energy Consumption in 1970 in the Eighteen Counties of the EOGC Service Area by Fuel Type (10^9 BTU)

County	Coal	Gas	Electricity	Oil
Ashland	137	1,691	316	550
Ashtabula	279	3,417	712	1,698
Carrol	205	469	213	394
Coshocton	362	1,014	356	424
Columbiana	857	4,146	749	1,362
Cuyahoga	583	99,074	9,304	2,919
Geauga	157	501	557	2,439
Holmes	356	412	150	337
Knox	109	1,677	347	423
Lake	63	7,775	1,294	2,425
Mahoning	682	15,178	1,547	1,595
Medina	123	3,121	523	1,041
Portage	345	3,554	848	2,206
Stark	755	17,180	2,472	2,755
Summit	280	28,894	3,137	2,923
Trumbull	353	9,688	1,434	2,794
Tuscarawas	548	2,988	645	715
Wayne	219	2,869	671	1,297
Total	6,413	203,648	25,275	28,297
(Shares)	(2.43)	(77.25)	(9.59)	(10.73)

Source: Ohio Energy Profiles

Table F-2 Residential Appliance Energy Usage as a Percent of Total Residential Energy Usage in 1970 in the Eighteen Counties of the EOGC Service Area

County	House Heating	Water Heating	Cooking	Refrig- eration	Light- ing	Others
Ashland	68.63	14.08	3.28	2.12	1.88	10.01
Ashtabula	69.78	13.67	3.37	2.11	1.86	9.21
Carrol	73.24	11.12	2.88	2.13	2.67	7.96
Coshocton	71.25	12.10	3.01	2.18	2.64	8.82
Columbiana	69.40	13.95	3.63	2.08	1.68	9.26
Cuyahoga	62.05	17.57	4.42	2.13	1.33	12.50
Geauga	76.34	10.98	2.39	1.99	2.44	5.86
Holmes	72.73	13.41	3.57	2.09	1.91	6.29
Knox	67.16	14.32	3.49	2.18	2.17	10.68
Lake	66.40	15.22	3.47	2.07	1.79	11.05
Mahoning	64.29	16.38	4.29	2.10	1.30	11.64
Medina	67.30	14.70	3.44	2.07	1.74	10.75
Portage	69.72	13.69	3.38	2.07	1.95	9.19
Stark	65.55	15.62	3.75	2.13	1.71	11.24
Summit	63.80	16.70	3.96	2.11	1.42	12.01
Trumbull	67.00	14.77	3.86	2.09	1.61	10.67
Tuscarawas	68.26	14.14	3.41	2.16	2.11	9.92
Wayne	68.98	13.78	3.23	2.13	2.12	9.76

Source: Ohio Energy Profiles

Table F-3 Residential Heating Energy Consumption in 1970 in the Eighteen Counties of the EOGC Service Area (10^9 BTU)

County	Utility Gas	Fuel Oil	Coal	Electricity	Bottled, Tank or L.P. Gas
Ashland	1,166.7	514.8	137.0	14.5	16.4
Ashtabula	2,328.0	1,535.9	275.2	37.8	84.1
Carrol	327.5	351.8	203.6	23.7	31.3
Coshocton	715.7	371.8	360.3	52.3	35.9
Columbiana	2,755.2	1,237.9	846.2	37.6	59.4
Cuyahoga	65,729.6	2,170.5	537.9	637.3	343.3
Geauga	356.7	2,200.2	155.4	26.4	50.4
Holmes	287.2	256.0	340.8	19.0	9.3
Knox	1,172.2	334.7	109.3	36.6	64.3
Lake	5,220.0	2,281.1	62.6	78.5	31.8
Mahoning	9,992.9	1,367.5	677.3	66.0	112.3
Medina	2,112.0	948.7	122.9	15.9	36.1
Portage	2,406.8	1,951.2	340.8	57.0	92.5
Stark	11,586.4	2,540.8	749.5	210.1	96.3
Summit	19,325.3	2,593.4	274.1	154.8	133.5
Trumbull	6,518.3	2,512.6	349.1	50.2	129.9
Tuscarawas	2,057.4	605.5	542.2	77.3	59.8
Wayne	1,982.8	1,170.5	213.8	57.2	63.2
Total	136,040.7	24,944.9	6,298.0	1,652.2	1,449.8
(Shares)	(79.843)	(14.640)	(3.696)	(0.969)	(0.851)

Source: Ohio Energy Profiles

Table F-4 Residential Heating Energy Consumption and Share in 1970 in the Five Divisions of the EOGC Service Area (10^9 BTU) by Fuel

Division	Utility Gas Consumption (Share)	Fuel Oil Consumption (Share)	Coal Consumption (Share)	Electricity Consumption (Share)	Other Gas Consumption (Share)
Cleveland	66,408.2 (86.38)	8,258.1 (10.74)	1,017.5 (1.32)	713.2 (0.93)	483.3 (0.63)
Akron	21,288.8 (79.85)	4,373.4 (16.40)	582.2 (2.18)	202.6 (0.76)	215.3 (0.81)
Canton	12,178.9 (70.54)	3,369.0 (19.51)	1,265.1 (7.33)	274.5 (1.59)	176.8 (1.03)
Warren	6,426.1 (67.68)	2,529.1 (26.63)	358.1 (3.77)	51.8 (0.55)	130.4 (1.37)
Youngstown	9,770.3 (80.40)	1,484.9 (12.22)	715.7 (5.89)	66.5 (0.55)	114.8 (0.94)

Table F-5 Commercial Energy Consumption in 1970 in the Eighteen Counties of the EOGC Service Area (10^9 BTU) by Fuel

County	Coal	Gas	Electricity	Oil
Ashland	193.0	674.2	257.5	218.3
Ashtabula	393.1	1,362.5	580.1	673.9
Carrol	288.8	187.0	173.6	156.4
Coshocton	510.0	404.3	290.1	1,372.7
Columbiana	1,207.4	1,653.1	610.3	540.5
Cuyahoga	821.4	39,503.5	7,581.0	1,158.5
Geauga	221.2	199.8	453.9	968.0
Holmes	501.6	164.3	122.2	133.7
Knox	153.6	668.7	282.7	167.9
Lake	88.8	3,100.1	1,054.4	962.4
Mahoning	960.8	6,051.9	1,260.5	633.0
Medina	173.3	1,244.4	426.1	413.1
Portage	486.1	1,417.1	691.0	875.5
Stark	1,063.7	6,850.1	2,014.2	1,093.4
Summit	394.5	11,520.8	2,556.1	1,160.0
Trumbull	497.3	3,862.9	1,168.4	1,108.8
Tuscarawas	772.1	1,191.4	525.6	283.8
Wayne	308.5	1,143.9	546.7	514.7
Total (Shares)	9,035.2 (7.33%)	81,200.0 (65.87%)	20,594.4 (16.71%)	12,434.6 (10.09%)

Source: Ohio Energy Profiles

Table F-6 Industrial Energy Consumption in 1970 in the Eighteen Counties of the EOGC Service Area (10^9 BTU) by Fuel

County	Coal	Gas	Electricity	Oil
Ashland	2,593.8	1,987.4	741.4	427.4
Ashtabula	10,050.8	3,656.8	1,364.1	786.5
Carrol	465.5	356.7	133.0	76.7
Coshocton	3,470.0	1,503.2	560.8	323.3
Columbiana	4,135.7	3,168.8	1,182.1	681.5
Cuyahoga	93,538.4	68,045.8	25,383.7	14,635.0
Geauga	2,159.3	1,654.4	617.2	355.8
Holmes	871.2	667.6	249.0	143.6
Knox	1,451.6	1,112.2	414.9	239.2
Lake	22,356.7	6,678.0	2,491.1	7,436.3
Mahoning	23,648.0	10,556.1	3,937.8	2,270.4
Medina	2,717.6	2,082.2	776.7	447.8
Portage	3,606.6	2,763.4	1,030.9	594.3
Stark	27,956.5	16,483.4	6,148.9	3,545.2
Summit	35,273.2	22,772.3	8,494.9	4,897.8
Trumbull	20,921.6	14,717.2	5,490.1	3,165.3
Tuscarawas	3,597.4	2,756.3	1,028.2	592.8
Wayne	4,685.9	3,590.4	1,339.3	772.2
Total (Share)	263,499.8 (50.207)	164,552.2 (31.353)	61,384.1 (11.696)	35,391.1 (6.744)

Source: Ohio Energy Profiles

Table F-7 Total Gas Sales and Average Monthly Number of Customers by Year and Division of the EOGC

Year	Total Service Area	Cleveland	Akron	Canton	Warren	Youngstown
			Total Gas Sales (MCF)			
1970	382,824,288	205,213,140	54,813,973	55,702,231	37,937,169	28,997,392
1971	397,996,927	212,014,298	56,381,469	55,935,969	41,852,855	31,649,885
1972	412,303,950	219,478,650	58,043,796	58,513,078	42,962,652	32,661,298
1973	385,231,982	201,825,239	53,149,122	58,196,399	40,127,402	30,624,196
1974	398,828,405	211,263,697	54,677,671	59,109,492	43,667,112	30,053,468
1975	359,301,239	190,089,887	51,347,365	52,982,898	39,004,985	25,393,634
1976	375,625,818	201,407,427	53,601,560	54,776,101	40,576,796	26,634,841
1977	351,203,496	185,295,330	49,538,092	50,691,241	38,718,520	24,704,492
			Average monthly number of customers (residential + commercial + industrial)			
1970	932,672	521,210	172,221	107,533	41,749	89,671
1971	938,153	521,451	174,458	109,011	42,981	89,966
1972	945,543	522,232	177,369	110,633	44,385	90,635
1973	952,333	522,268	179,942	109,558	45,569	91,534
1974	960,326	523,620	182,661	114,907	46,419	92,428
1975	966,715	524,609	184,698	116,556	47,548	93,005
1976	969,891	524,609	185,408	117,827	48,202	93,554
1977	962,733	520,118	124,279	117,197	47,969	92,868

Source: EOGC Annual Reports

Table F-8 Total Gas Sales Revenues and Average Rates by Year and Division of the EOGC

Year	Total Service Area		Cleveland		Akron	
	Total Gas Sales Revenues ($)	Average Rate ($/MCF)	Total Gas Sales Revenues ($)	Average Rate ($/MCF)	Total Gas Sales Revenues ($)	Average Rate ($/MCF)
1970	296,423,961	.7743	160,719,734	.7832	45,438,224	.8290
1971	338,127,357	.8496	183,195,274	.8641	51,724,943	.9174
1972	367,420,816	.8911	198,503,767	.9044	55,790,226	.9612
1973	349,441,249	.9071	185,690,604	.9201	52,451,526	.9869
1974	420,652,761	1.0547	255,179,317	1.2079	61,606,132	1.1267
1975	468,896,587	1.3050	250,683,302	1.3188	70,862,160	1.3801
1976	587,287,743	1.5635	317,453,179	1.5762	87,664,001	1.6355
1977	719,194,021	2.0478	380,482,259	2.0534	103,746,354	2.0943

Year	Canton		Warren		Youngstown	
	Total Gas Sales Revenues ($)	Average Rate ($/MCF)	Total Gas Sales Revenues ($)	Average Rate ($/MCF)	Total Gas Sales Revenues ($)	Average Rate ($/MCF)
1970	41,162,317	.7390	20,029,381	.6907	28,965,238	.7635
1971	45,313,407	.8101	23,431,343	.7403	34,344,606	.8206
1972	49,656,924	.2486	25,596,371	.7837	37,089,079	.8633
1973	49,948,162	.8583	24,661,208	.8053	35,376,492	.8816
1974	49,551,438	1.0075	28,764,819	..9571	44,333,730	1.0153
1975	66,244,461	1.2503	30,739,632	1.2105	49,079,887	1.2583
1976	82,668,150	1.5092	39,078,959	1.4672	61,841,199	1.5241
1977	102,735,033	2.0267	49,303,389	1.9957	77,982,941	2.0141

Source: EOGC Annual Reports

Table F-9 Residential Gas Sales, Revenues and Average Monthly Number of Customers by Year and Division of the EOGC

Year	Total Service Area	Cleveland	Akron	Canton	Warren	Youngstown
			Residential Gas Sales (MCF)			
1970	183,378,111	103,407,272	33,674,364	20,597,270	7,551,847	17,987,610
1971	186,336,836	105,954,299	33,951,886	20,547,425	7,712,839	18,007,936
1972	191,078,058	108,251,525	34,937,843	20,990,780	7,924,960	18,355,122
1973	170,133,367	94,297,230	31,445,803	19,200,054	7,332,985	16,480,451
1974	177,798,983	101,205,025	32,075,202	19,433,437	7,739,926	17,301,002
1975	173,842,117	97,836,273	31,778,668	19,315,306	7,563,155	16,886,084
1976	179,398,982	101,688,383	33,391,717	20,083,510	7,962,725	17,618,418
1977	170,849,092	96,164,729	30,981,837	19,215,684	7,583,562	16,903,280
			Residential Gas Sales Revenues ($)			
1970	165,248,383	92,755,656	30,555,019	18,685,654	6,882,923	16,260,544
1971	189,953,099	107,605,359	34,786,209	21,102,209	7,952,902	18,388,636
1972	203,133,402	114,539,471	37,292,014	22,467,927	8,528,727	19,557,104
1973	186,830,005	103,268,779	34,659,399	21,225,926	8,154,244	19,124,328
1974	218,369,613	122,891,052	39,504,843	24,047,651	9,561,414	21,196,670
1975	254,516,785	142,356,790	46,639,172	28,422,575	11,170,479	24,678,516
1976	308,894,942	174,077,292	57,430,620	34,672,402	13,799,005	30,319,553
1977	372,701,091	206,381,908	67,067,249	41,608,193	16,469,640	36,351,390
			Average Monthly Number of Residential Customers			
1970	879,999	492,993	163,247	100,147	38,821	84,504
1971	885,150	493,137	165,388	101,525	40,015	84,799
1972	892,531	494,028	168,201	103,103	41,399	85,511
1973	899,357	494,304	170,637	101,956	42,594	86,404
1974	905,228	495,018	172,468	106,983	43,348	87,120
1975	911,499	496,173	174,476	108,378	44,434	87,739
1976	915,220	496,535	175,256	109,716	45,090	88,322
1977	908,758	492,390	174,284	109,185	44,884	87,713

Source: EOGC Annual Reports

Table F-10 Yearly Residential Gas Charges (in $/MCF and $/Customer) by EOGC Division

Year	Total Service Area		Cleveland		Akron	
	$ per MCF	$ per customer	$ per MCF	$ per customer	$ per MCF	$ per customer
1970	.9011	187.78	.8670	188.15	.9074	187.17
1971	1.0194	214.60	1.0156	218.21	1.0246	210.33
1972	1.0631	227.59	1.0581	231.86	1.0674	221.71
1973	1.0981	207.74	1.0951	208.91	1.1022	203.12
1974	1.2282	241.23	1.2143	248.25	1.2316	229.06
1975	1.4641	279.23	1.4551	286.91	1.4676	267.31
1976	1.7218	337.51	1.7119	350.58	1.7199	327.69
1977	2.1538	410.12	2.1461	419.14	2.1647	384.82

	Canton		Warren		Youngstown	
	$ per MCF	$ per customer	$ per MCF	$ per customer	$ per MCF	$ per customer
1970	.9072	186.58	.9114	177.30	.9040	162.37
1971	1.0270	207.85	1.0311	198.75	1.0211	216.85
1972	1.0704	217.92	1.0762	206.01	1.0655	227.64
1973	1.1055	208.18	1.1120	191.44	1.0997	209.76
1974	1.2374	224.78	1.2353	220.57	1.2252	243.30
1975	1.4715	262.25	1.4770	251.39	1.4615	281.27
1976	1.7264	316.02	1.7330	306.03	1.7209	343.28
1977	2.1653	381.08	2.1718	366.94	2.1506	

Source: EOGC Annual Reports

Table F-11 Commercial Gas Sales, Revenues and Average Monthly Number of Customers by Year and Division of the EOGC

Year	Total Service Area	Cleveland	Akron	Canton	Warren	Youngstown
Commercial Gas Sales (MCF)						
1970	68,883,095	41,203,521	11,093,324	7,818,703	3,546,317	5,221,230
1971	71,696,396	42,622,745	12,062,036	7,992,608	3,678,382	5,340,625
1972	76,308,155	46,012,081	12,512,784	8,382,281	3,765,008	5,609,353
1973	66,709,917	38,335,292	12,014,217	7,934,286	3,381,502	5,113,201
1974	71,004,343	41,217,366	12,492,860	8,182,900	3,550,210	5,547,152
1975	67,428,371	39,019,349	12,096,400	7,543,361	3,334,586	5,415,413
1976	70,919,705	41,136,581	12,632,089	8,004,945	3,475,621	5,695,092
1977	64,658,897	37,180,095	11,382,834	7,479,572	3,196,394	5,420,002
Commercial Gas Sales Revenue ($)						
1970	52,808,626		8,615,090	6,164,931	2,756,287	4,111,527
1971	59,869,513	35,103,201	10,111,143	6,911,204	3,124,976	4,618,989
1972	66,621,642	39,491,992	11,060,965	7,577,110	3,365,083	5,090,202
1973	60,265,047	34,345,595	10,752,524	7,368,261	3,122,292	4,762,583
1974	74,906,923	43,173,607	13,104,141	8,808,058	3,785,287	5,985,434
1975	88,257,786	50,864,000	15,723,875	10,067,798	4,413,906	7,150,930
1976	111,506,434	64,519,432	19,679,288	12,758,390	5,525,354	9,037,214
1977	128,959,988	73,975,640	22,603,288	15,043,924	6,433,047	10,782,828
Average Monthly Number of Commercial Customers						
1970	51,437	27,490	8,785	7,202	2,879	5,081
1971	51,773	27,592	8,879	7,300	2,919	5,083
1972	51,794	27,489	8,977	7,345	2,940	5,043
1973	51,771	27,255	9,117	7,418	2,930	5,051
1974	53,912	27,912	10,004	7,742	3,024	5,230
1975	54,071	27,777	10,037	7,992	3,069	5,196
1976	53,577	27,451	9,973	7,934	3,068	5,151
1977	52,867	27,085	9,818	7,838	3,041	5,085

Source: EOGC Annual Reports

Table F-12 Yearly Commercial Gas Charges ($/MCF and $/Customer) by EOGC Division

Year	Total Service Area		Cleveland		Akron	
	$ per MCF	$ per customer	$ per MCF	$ per customer	$ per MCF	$ per customer
1970	.7666	1,026.66			.7766	980.66
1971	.8350	1,156.38	.8236	1,272.22	.8383	1,138.77
1972	.8731	1,286.28	.8583	1,436.64	.8840	1,232.14
1973	.9034	1,164.07	.8959	1,260.16	.8950	1,179.39
1974	1.0550	1,389.43	1.0475	1,546.78	1.0489	1,309.89
1975	1.3089	1,632.26	1.3036	1,831.15	1.2627	1,521.76
1976	1.5723	2,081.24	1.5684	2,350.35	1.5589	1,973.26
1977	1.9926	2,439.33	1.9897	2,731.24	1.9857	

Year	Canton		Warren		Youngstown	
	$ per MCF	$ per customer	$ per MCF	$ per customer	$ per MCF	$ per customer
1970	.7885	856.00	.7772	957.38	.7875	809.20
1971	.8647	946.74	.8496	1,070.56	.8649	908.71
1972	.9039	1,031.60	.8938	1,144.59	.9075	1,009.36
1973	.9287	993.30	.9233	1,065,63	.9314	942.90
1974	1.0764	1,137.70	1.0662	1,251.75	1.0790	1,144.44
1975	1.3347	1,259.73	1.3237	1,438.22	1.3205	1,376.24
1976	1.5938	1,608.07	1.5897	1,800.96	1.5868	1,754.46
1977	2.0113	1,919.36	2.0126	2,115.44	1.9895	2,120.52

Source: EOGC Annual Reports

Table F-13 Industrial Gas Sales, Revenues and Average Monthly Number of Customers by Year and Division of the EOGC

Year	Total Service Area	Cleveland	Akron	Canton	Warren	Youngstown
Industrial Gas Sales (MCF)						
1970	130,563,082	60,602,347	10,046,285	27,286,258	7,899,228	14,728,329
1971	139,963,695	63,437,254	10,367,547	27,395,936	20,258,664	18,504,294
1972	144,917,737	65,215,044	10,593,169	29,140,017	20,971,330	18,998,177
1973	148,388,698	69,192,717	9,689,102	31,062,059	19,909,709	10,633,750
1974	150,025,079	68,841,306	10,109,609	31,493,155	18,763,332	20,818,958
1975	118,030,691	53,234,265	7,472,297	26,124,231	14,495,893	16,703,488
1976	125,307,131	58,582,463	7,577,754	26,687,646	15,196,495	17,263,286
1977	113,439,686	51,950,506	7,173,421	23,995,985	13,924,536	16,395,238
Industrial Gas Sales Revenues ($)						
1970	78,366,952	36,803,287	6,268,115	16,311,732	10,390,171	8,593,167
1971	88,304,745	40,486,714	6,827,591	17,299,994	12,353,465	11,336,921
1972	97,665,772	44,472,304	7,437,247	19,611,887	13,702,561	12,441,773
1973	102,346,197	48,076,230	7,038,603	21,354,975	13,384,672	12,489,581
1974	127,376,225	59,114,648	8,997,148	26,695,729	15,418,118	17,151,626
1975	126,122,016	56,462,512	8,499,113	27,754,088	15,155,247	17,250,441
1976	166,886,367	78,856,455	10,554,093	35,237,358	19,754,600	22,484,432
1977	217,532,942	100,124,711	14,075,817	46,082,916	26,400,702	30,848,723
Average Monthly Number of Industrial Customers						
1970	1,236	727	189	184	49	86
1971	1,230	772	191	186	47	84
1972	1,218	715	191	185	46	81
1973	1,205	709	188	184	45	79
1974	1,186	690	189	182	47	78
1975	1,145	659	185	186	45	70
1976	1,094	623	179	177	44	71
1977	1,108	643	177	174	44	70

Source: EOGC Annual Reports

Table F-14 Yearly Industrial Gas Charges ($/MCF and $/Customer)by EOGC Division

Year	Total Service Area		Cleveland		Akron	
	$ per MCF	$ per customer	$ per MCF	$ per customer	$ per MCF	$ per customer
1970	.6002	63,403.68	.6073	50,623.50	.6239	33,164.63
1971	.6309	71,792.48	.6382	56,075.78	.6586	35,746.55
1972	.6739	80,185.36	.6819	62,199.03	.7021	38,938.47
1973	.6897	84,934.60	.6948	67,808.50	.7265	37,444.70
1974	.8490	107,399.85	.8587	85,673.42	.8900	47,603.96
1975	1.0685	110,150.23	1.0794	87,196.53	1.1375	45,941.15
1976	1.3318	152,547.48	1.3461	126,575.37	1.3928	58,961.41
1977	1.9176	196,329.37	1.9273	155,714.95	1.9622	79,524.39

	Canton		Warren		Youngstown	
	$ per MCF	$ per customer	$ per MCF	$ per customer	$ per MCF	$ per customer
1970	.5978	88,650.72	.5805	212,044.31	.5834	99,920.55
1971	.6315	93,010.72	.6098	262,839.68	.6127	134,964.06
1972	.6730	106,010.20	.6534	297,881.76	.6552	153,602.14
1973	.6875	116,059.65	.6723	297,437.16	.6739	158,095.96
1974	.8477	146,679.83	.8217	328,045.06	.8238	219,892.64
1975	1.0624	149,215.53	1.0455	336,783.27	1.0327	246,434.87
1976	1.3204	199,081.12	1.2999	448,968.18	1.3024	316,682.14
1977	1.9204	264,844.34	1.8960	600,015.95	1.8816	440,696.04

Source: EOGC Annual Reports

Table F-15 Total Gas Consumption by Month in the EOGC Service Area

Month	Gas Consumption (MMCF)			
	1970	1971	1972	1973
1	59,393	55,771	49,873	53,011
2	54,271	60,718	57,246	51,452
3	49,319	50,914	52,093	44,194
4	41,325	43,290	43,183	36,343
5	23,845	31,131	27,928	29,063
6	18,272	21,242	20,786	21,719
7	15,519	15,465	17,048	17,026
8	15,350	15,036	17,158	17,077
9	16,111	14,425	17,250	17,942
10	19,655	19,325	24,995	21,671
11	27,589	27,115	36,261	32,672
12	43,156	44,547	50,003	43,904
	1974	1975	1976	1977
1	54,505	50,724	52,306	59,919
2	50,718	47,964	51,465	50,346
3	46,325	45,731	36,777	36,011
4	39,356	40,971	31,718	28,536
5	28,027	24,255	25,358	21,244
6	20,244	16,000	18,296	
7	17,057	13,382	15,062	
8	17,239	14,407	15,727	
9	18,823	17,031	16,883	
10	27,767	21,341	23,038	
11	31,672	25,841	38,097	
12	47,910	43,995	51,701	

Source: EOGC Send-Outs File

Note: Month 1 = January
Month 2 = February
Month 3 = March
Month 4 = April
Month 5 = May
Month 6 = June
Month 7 = July
Month 8 = August
Month 9 = September
Month 10 = October
Month 11 = November
Month 12 = December

Table F-16 Monthly Residential Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977

Year Month	Residential Gas Consumption (MMCF)	Residential Customers	Residential Gas Revenues ($)	Average Residential Gas Charge ($/MMCF)	Degree Days
1970					
1	33,498	883,448	27,222,672	812.67	1,296
2	30,823	884,069	25,261,920	819.58	1,239
3	27,381	883,890	22,789,008	832.29	1,006
4	22,036	882,286	18,840,624	854.99	711
5	10,585	879,789	9,701,119	916.50	308
6	6,313	876,865	6,204,184	982.76	97
7	4,754	874,930	5,070,548	1,066.59	24
8	4,108	873,367	5,163,640	1,256.97	11
9	4,181	873,855	5,309,402	1,269.89	49
10	6,542	878,093	7,355,020	1,124.28	209
11	11,761	882,495	11,967,846	1,017.59	514
12	22,397	886,905	21,466,192	958.44	853
1971					
1	30,528	888,718	28,831,952	944.44	1,177
2	33,777	889,504	32,212,000	953.67	1,188
3	26,854	889,322	25,932,368	965.68	1,032
4	21,942	887,607	21,684,048	988.24	841
5	13,871	884,821	14,255,270	1,027.70	464
6	7,277	882,113	8,288,285	1,138.97	147
7	4,407	879,209	5,673,063	1,287.28	13
8	4,518	878,291	5,721,027	1,266.27	11
9	3,942	878,901	5,295,100	1,343.25	38
10	6,697	882,588	7,835,832	1,170.05	116
11	10,505	887,766	11,288,718	1,074.60	436
12	23,037	892,955	22,941,664	995.86	766

Source: EOGC Sendout File

Table F-16 Monthly Residential Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Residential Gas Consumption (MMCF)	Residential Customers	Residential Gas Revenues ($)	Average Residential Gas Charge ($/MMCF)	Degree Days
1972					
1	26,571	895,156	26,412,064	994.02	994
2	30,861	896,486	30,877,840	1,000.55	1,147
3	27,882	896,400	27,577,296	989.07	1,032
4	22,028	894,923	22,528,176	1,022.71	747
5	11,842	892,417	12,863,642	1,086.27	380
6	6,996	889,640	8,276,008	1,182.96	160
7	5,359	887,287	6,852,185'	1,278.63	78
8	4,824	886,161	6,239,798	1,293.49	30
9	4,735	886,962	6,142,302	1,297.21	61
10	9,106	888,563	10,463,054	1,149.03	290
11	16,295	896,281	17,560,128	1,077.64	619
12	26,122	900,099	27,340,864	1,046.66	845
1973					
1	27,657	902,268	28,527,968	1,031.49	1,002
2	27,052	903,707	28,234,576	1,043.71	1,050
3	22,785	903,681	24,037,120	1,054.95	801
4	17,386	901,652	18,729,280	1,077.26	510
5	12,443	899,512	13,915,595	1,118.35	352
6	7,634	897,336	9,131,602	1,196.18	129
7	4,583	894,700	6,230,552	1,359.49	3
8	4,115	893,132	5,631,325	1,368.49	6
9	4,693	893,897	6,095,676	1,298.89	41
10	6,579	895,588	7,958,199	1,209.64	154
11	13,624	901,436	14,750,812	1,082.71	421
12	22,511	905,375	23,587,280	1,047.81	776

Source: EOGC Sendout File

Table F-16 Monthly Residential Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Residential Gas Consumption (MMCF)	Residential Customers	Residential Gas Revenues ($)	Average Residential Gas Charge ($/MMCF)	Degree Days
1974					
1	28,999	907,723	27,798,432	958.60	981
2	26,689	908,315	28,140,496	1,054.39	1,025
3	23,928	908,237	26,019,136	1,087.39	906
4	19,210	906,435	22,013,600	1,145.94	598
5	11,728	903,781	15,396,776	1,312.82	350
6	6,472	901,314	9,242,518	1,428.08	165
7	4,535	899,688	7,031,766	1,550.55	26
8	4,113	898,687	6,693,581	1,627.42	4
9	4,892	899,995	7,778,954	1,590.14	91
10	10,165	905,626	14,248,888	1,401.76	300
11	13,204	909,685	18,056,560	1,367.51	542
12	24,921	913,248	35,948,864	1,442.51	843
1975					
1	27,553	914,619	33,644,272	1,221.07	1,024
2	26,895	915,590	36,302,960	1,349.80	992
3	25,797	916,315	35,401,472	1,372.31	948
4	22,194	915,057	30,656,768	1,381.31	813
5	11,392	912,059	17,348,560	1,522.87	423
6	5,447	908,777	9,272,045	1,702.23	96
7	4,286	906,047	7,681,205	1,792.16	22
8	3,948	904,283	7,107,901	1,800.38	5
9	4,841	905,301	8,252,093	1,704.63	96
10	8,388	908,935	13,313,180	1,587.17	266
11	11,150	913,183	17,276,688	1,549.48	439
12	24,461	917,819	38,259,552	1,564.10	774

Source: EOGC Sendout File

Table F- 16 Monthly Residential Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Residential Gas Consumption (MMCF)	Residential Customers	Residential Gas Revenues ($)	Average Residential Gas Charge ($/MMCF)	Degree Days
1976					
1	29,034	920,456	42,811,408	1,474.53	1,176
2	28,837	921,639	44,142,992	1,530.70	1,086
3	19,175	920,657	30,592,000	1,595.41	725
4	16,008	918,436	25,890,992	1,617.32	554
5	11,562	916,060	18,856,000	1,630.86	401
6	6,543	913,000	11,628,000	1,777.17	167
7	4,361	910,116	8,676,000	1,989.45	14
8	4,032	908,314	8,273,000	2,051.84	17
9	4,752	908,585	9,409,000	1,980.01	97
10	9,086	911,904	17,572,000	1,933.06	349
11	18,673	915,729	35,360,000	1,893.64	741
12	28,292	917,739	55,682,992	1,968.15	1,125
1977					
1	35,653	918,607	69,166,992	1,940.00	1,398
2	32,222	918,481	64,902,992	2,014.24	1,311
3	20,566	917,410	43,850,992	2,132.21	915
4	14,476	915,272	31,188,000	2,154.46	568
5	8,920	910,813	20,112,992	2,254.82	304

Source: EOGC Send-outs File

Table F-17 Monthly Commercial Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977

Year Month	Commercial Gas Consumption (MMCF)	Commercial Customers	Commercial Gas Revenues ($)	Average Commercial Gas Charge ($/MMCF)	Degree Days
1970					
1	12,121	51,603	8,785,744	724.84	1,296
2	11,370	51,690	8,348,116	734.22	1,239
3	9,992	51,676	7,450,818	745.68	1,006
4	8,040	52,105	6,110,009	759.95	711
5	3,572	51,772	2,776,630	777.33	308
6	2,324	51,306	1,783,187	767.29	97
7	1,792	50,917	1,397,678	779.95	24
8	1,659	50,730	1,384,598	834.60	11
9	1,817	50,646	1,506,408	829.06	49
10	2,738	51,002	2,257,838	824.63	209
11	4,939	51,654	4,056,288	821.28	514
12	8,896	52,138	7,174,354	806.47	853
1971					
1	11,521	52,330	9,239,396	801.96	1,177
2	12,544	52,419	10,201,905	813.29	1,188
3	10,182	52,378	8,372,025	822.24	1,032
4	7,974	52,294	6,713,502	841.92	841
5	4,913	51,937	4,175,791	849.95	464
6	2,717	51,578	2,327,486	856.64	147
7	1,810	51,216	1,554,051	858.59	13
8	2,070	51,011	1,754,358	847.52	11
9	1,911	50,908	1,631,332	853.65	38
10	2,623	51,177	2,251,972	858.55	116
11	4,707	51,748	3,994,778	848.69	436
12	9,117	52,283	7,654,102	839.54	766

Source: EOGC Sendout File

Table F-17 Monthly Commercial Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Commercial Gas Consumption (MMCF)	Commercial Customers	Commercial Gas Revenues ($)	Average Commercial Gas Charge ($/MMCF)	Degree Days
1972					
1	10,655	52,461	8,978,790	842.68	994
2	12,046	52,524	10,304,408	855.42	1,147
3	10,680	52,488	9,161,220	857.79	1,032
4	8,440	52,543	7,312,044	866.36	747
5	4,475	52,164	3,945,647	881.71	380
6	2,977	51,605	2,558,718	859.50	160
7	2,314	51,241	2,023,063	874.27	78
8	2,350	50,951	2,038,171	867.31	30
9	2,113	50,867	1,852,612	876.77	61
10	3,770	50,744	3,344,828	887.22	290
11	6,758	51,801	6,075,746	899.04	619
12	10,147	52,133	9,026,304	889.55	845
1973					
1	11,074	52,195	9,815,836	886.39	1,002
2	10,548	52,186	9,441,096	895.06	1,050
3	8,639	52,054	7,823,701	905.63	801
4	6,617	52,006	6,060,963	915.97	510
5	4,663	51,518	4,316,436	925.68	352
6	2,847	51,180	2,634,382	925.31	129
7	1,971	50,803	1,805,681	916.12	3
8	1,958	50,545	1,716,366	876.59	6
9	2,154	50,372	1,895,532	880.01	41
10	2,888	52,501	2,570,444	890.04	154
11	5,638	52,647	5,022,220	890.78	420
12	8,076	53,244	7,162,383	886.87	776

Source: EOGC Sendout File

Table F- 17 Monthly Commercial Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Commercial Gas Consumption (MMCF)	Commercial Customers	Commercial Gas Revenues ($)	Average Commercial Gas Charge ($/MMCF)	Degree Days
1974					
1	11,196	53,744	9,894,530	883.76	981
2	10,381	53,945	9,442,172	909.56	1,025
3	9,265	54,072	8,730,983	942.36	906
4	7,441	54,431	7,560,371	1,016.04	598
5	4,385	54,339	4,966,346	1,132.58	350
6	2,494	54,034	2,904,455	1,164.58	165
7	1,972	53,624	2,327,694	1,180.37	26
8	1,864	53,321	2,305,068	1,236.62	4
9	2,245	53,465	2,759,649	1,229.24	91
10	4,336	53,600	5,169,749	1,192.29	300
11	5,524	53,988	6,628,479	1,199.94	542
12	10,091	54,327	12,217,421	1,210.72	843
1975					
1	10,947	54,532	13,362,456	1,220,65	1,024
2	10,397	54,714	12,924,933	1,243.14	992
3	9,720	54,793	12,289,582	1,264.36	948
4	8,348	54,690	10,543,507	1,263.00	813
5	3,996	54,362	5,384,902	1,347.57	423
6	2,208	53,980	3,104,792	1,406.16	96
7	1,804	53,610	2,623,777	1,454.42	22
8	1,713	53,319	2,465,693	1,439.40	5
9	2,095	53,185	2,891,341	1,380.12	96
10	3,138	53,481	4,246,340	1,353.20	266
11	4,483	53,886	6,108,433	1,362.58	439
12	8,751	54,297	12,312,024	1,406.93	774

Source: EOGC Sendout File

Table F- 17 Monthly Commercial Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Commercial Gas Consumption (MMCF)	Commercial Customers	Commercial Gas Revenues ($)	Average Commercial Gas Charge ($/MMCF)	Degree Days
1976					
1	11,912	54,595	16,810,640	1,411.24	1,176
2	11,273	54,706	16,099,000	1,428.10	1,086
3	7,522	54,514	11,032,000	1,466.63	725
4	5,928	54,149	8,733,000	1,473.18	554
5	4,168	53,750	6,085,000	1,459.93	401
6	2,475	53,201	3,776,000	1,521.62	167
7	1,796	52,882	2,980,000	1,659.24	14
8	1,859	52,611	3,126,000	1,681.55	17
9	2,050	52,539	3,413,000	1,664.88	97
10	3,601	52,914	6,183,000	1,717.02	349
11	7,624	53,397	13,369,000	1,753.54	741
12	10,919	53,667	19,910,992	1,823.52	1,125
1977					
1	13,500	53,731	25,620,000	1,897.78	1,398
2	11,550	53,755	22,382,992	1,937.92	1,311
3	7,516	53,636	15,215,000	2,024.35	915
4	5,172	53,364	10,347,000	2,000.58	568
5	3,138	52,970	6,350,000	2,023.58	304

Source: EOGC Sendout File

Table F- 18 Monthly Industrial Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977

Year Month	Industrial Gas Consumption (MMCF)	Industrial Customers	Industrial Gas Revenues ($)	Average Industrial Gas Charge ($/MMCF)	Degree Days
1970					
1	13,775	1,240	8,000,074	580.77	1,296
2	12,077	1,239	7,107,817	588.54	1,239
3	11,946	1,244	7,136,209	597.37	1,006
4	11,250	1,246	6,808,678	605.22	711
5	9,687	1,240	5,830,832	601.92	308
6	9,634	1,239	5,776,989	598.61	97
7	8,973	1,235	5,438,254	606.07	24
8	9,583	1,231	5,844,551	609.89	11
9	10,114	1,228	6,167,226	609.77	49
10	10,375	1,227	6,341,555	611.23	209
11	10,889	1,230	6,681,186	613.57	514
12	11,863	1,236	7,288,356	614.38	853
1971					
1	13,722	1,238	8,372,124	610.12	1,177
2	14,397	1,235	8,971,968	623.18	1,188
3	13,879	1,237	8,639,879	622.52	1,032
4	13,374	1,234	8,417,445	629.39	841
5	12,348	1,231	7,718,194	625.06	464
6	11,248	1,228	7,164,634	636.97	147
7	9,248	1,227	5,924,080	640.58	13
8	8,448	1,221	5,448,253	644.92	11
9	8,572	1,221	5,543,434	646.69	38
10	10,005	1,221	6,417,074	641.39	116
11	11,903	1,230	7,604,966	638.91	436
12	12,394	1,234	8,082,633	652.14	766

Source: EOGC Sendout File

Table F- 18 Monthly Industrial Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Industrial Gas Consumption (MMCF)	Industrial Customers	Industrial Gas Revenues ($)	Average Industrial Gas Charge ($/MMCF)	Degree Days
1972					
1	12,646	1,229	8,264,320	653.51	994
2	14,339	1,224	9,540,192	665.33	1,147
3	13,531	1,231	9,005,809	665.57	1,032
4	12,715	1,228	8,464,337	665.70	747
5	11,611	1,221	7,754,011	667.82	380
6	10,813	1,219	7,251,602	670.64	160
7	9,375	1,218	6,400,833	682.76	78
8	9,984	1,213	6,807,082	681.80	30
9	10,402	1,206	7,082,562	680.88	61
10	12,119	1,209	8,359,846	689.81	290
11	13,208	1,211	9,183,751	695.32	619
12	13,734	1,212	9,551,422	695.46	845
1973					
1	14,279	1,215	9,935,311	695.80	1,002
2	13,852	1,215	9,697,825	700.10	1,050
3	12,770	1,212	8,958,121	701.50	801
4	12,340	1,209	8,651,085	701.06	510
5	11,957	1,207	8,426,420	704.73	352
6	11,238	1,208	7,907,745	703.66	129
7	10,472	1,201	7,372,347	704.01	3
8	11,004	1,198	7,463,029	678.21	6
9	11,095	1,196	7,523,867	678.13	41
10	12,204	1,198	8,262,000	677.04	154
11	13,410	1,202	9,093,060	678.08	420
12	13,316	1,203	9,054,783	679.99	776

Source: EOGC Sendout File

Table F- 18 Monthly Industrial Gas Consumption, Gas Customers, Gas' Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Industrial Gas Consumption (MMCF)	Industrial Customers	Industrial Gas Revenues ($)	Average Industrial Gas Charge ($/MMCF)	Degree Days
1974					
1	14,310	1,198	9,779,223	683.38	981
2	13,647	1,202	9,689,698	710.02	1,025
3	13,132	1,197	9,649,475	734.81	906
4	12,706	1,191	10,414,343	819.64	598
5	11,914	1,189	10,227,369	858.43	350
6	11,278	1,184	9,794,796	868.49	165
7	10,550	1,183	9,194,566	871.52	26
8	11,262	1,180	10,279,318	912.74	4
9	11,686	1,180	10,769,150	921.54	91
10	13,266	1,182	12,397,200	934.51	300
11	12,945	1,174	12,448,252	961.63	542
12	12,897	1,171	12,732,840	987.27	843
1975					
1	12,224	1,165	12,174,335	995.94	1,024
2	10,673	1,155	10,878,322	1,019.24	992
3	10,214	1,158	10,541,435	1,032.06	948
4	10,429	1,148	10,696,110	1,025.61	813
5	8,867	1,142	9,801,884	1,105.43	423
6	8,345	1,142	9,148,848	1,096.33	96
7	7,292	1,141	8,021,949	1,100.10	22
8	8,746	1,141	9,239,143	1,056.39	5
9	10,096	1,140	10,523,883	1,042.38	96
10	9,815	1,137	10,686,030	1,088.74	266
11	10,209	1,137	11,637,433	1,139.92	432
12	10,783	1,136	12,772,638	1,184.52	774

Source: EOGC Sendout File

Table F- 18 Monthly Industrial Gas Consumption, Gas Customers, Gas Revenues, Average Gas Charge and Degree-Days for the EOGC in 1970 - 1977 (cont'd)

Year Month	Industrial Gas Consumption (MMCF)	Industrial Customers	Industrial Gas Revenues ($)	Average Industrial Gas Charge ($/MMCF)	Degree Days
1976					
1	11,360	1,120	13,767,102	1,211.89	1,176
2	11,355	1,112	13,837,000	1,218.58	1,086
3	10,080	1,099	12,498,000	1,239.88	725
4	9,782	1,095	12,011,000	1,227.87	554
5	9,628	1,091	14,219,000	1,476.84	401
6	9,278	1,090	12,798,000	1,379.39	167
7	8,905	1,088	11,381,000	1,278.05	14
8	9,836	1,087	12,820,000	1,303.38	17
9	10,081	1,087	13,308,000	1,320.11	97
10	10,351	1,099	15,466,000	1,494.16	349
11	11,800	1,088	18,386,000	1,558.14	741
12	12,490	1,087	16,393,000	1,312.49	1,125
1977					
1	10,766	1,112	19,810,992	1,840.14	1,398
2	6,574	1,111	12,546,000	1,908.43	1,311
3	7,929	1,112	15,412,000	1,943.75	915
4	8,888	1,106	17,064,000	1,919.89	568
5	9,186	1,107	17,614,000	1,917.48	304

Source: EOGC Sendout File

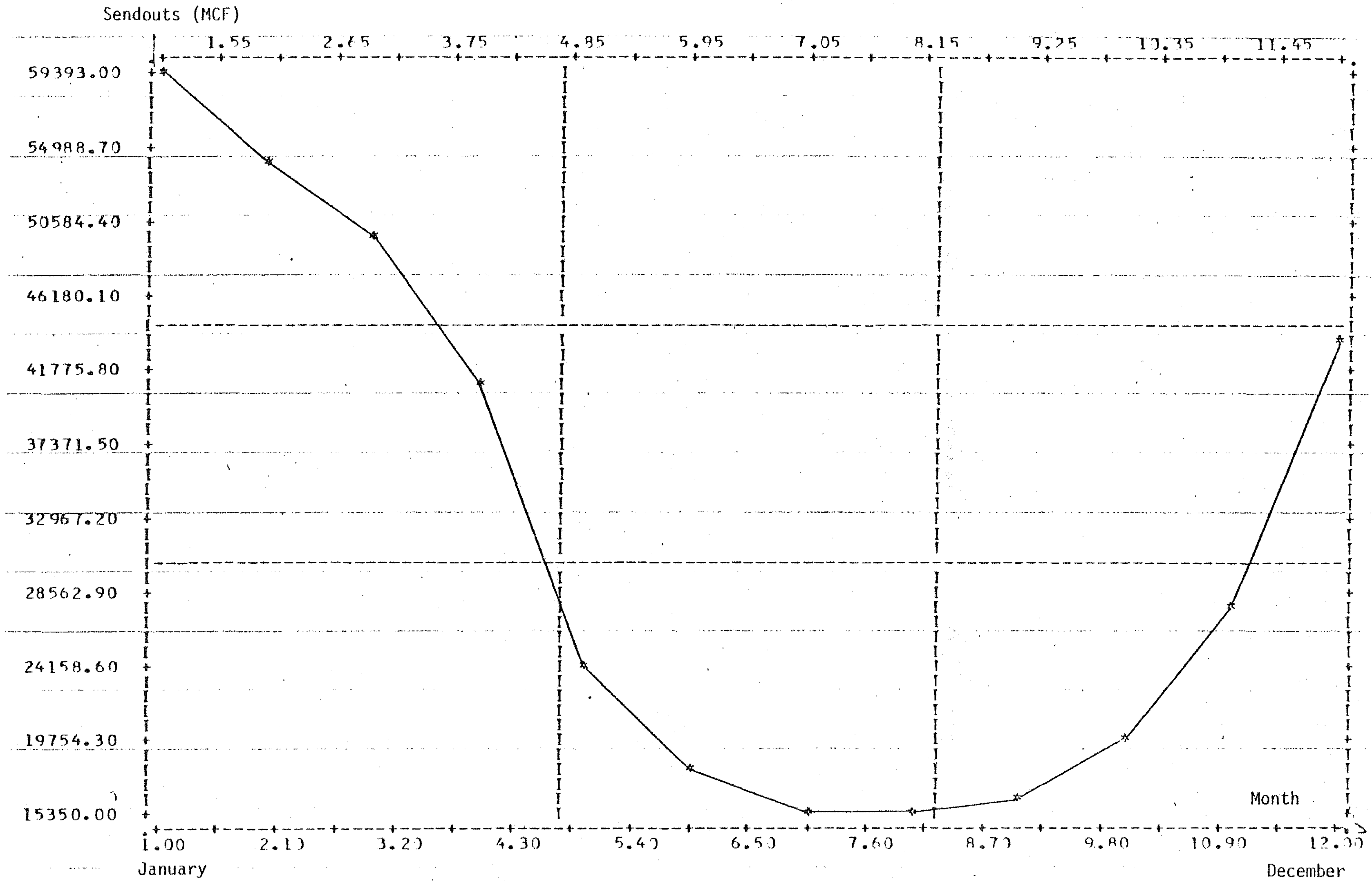


Figure F-1 Total Monthly Gas Usage in the EOGC Service Area in 1970

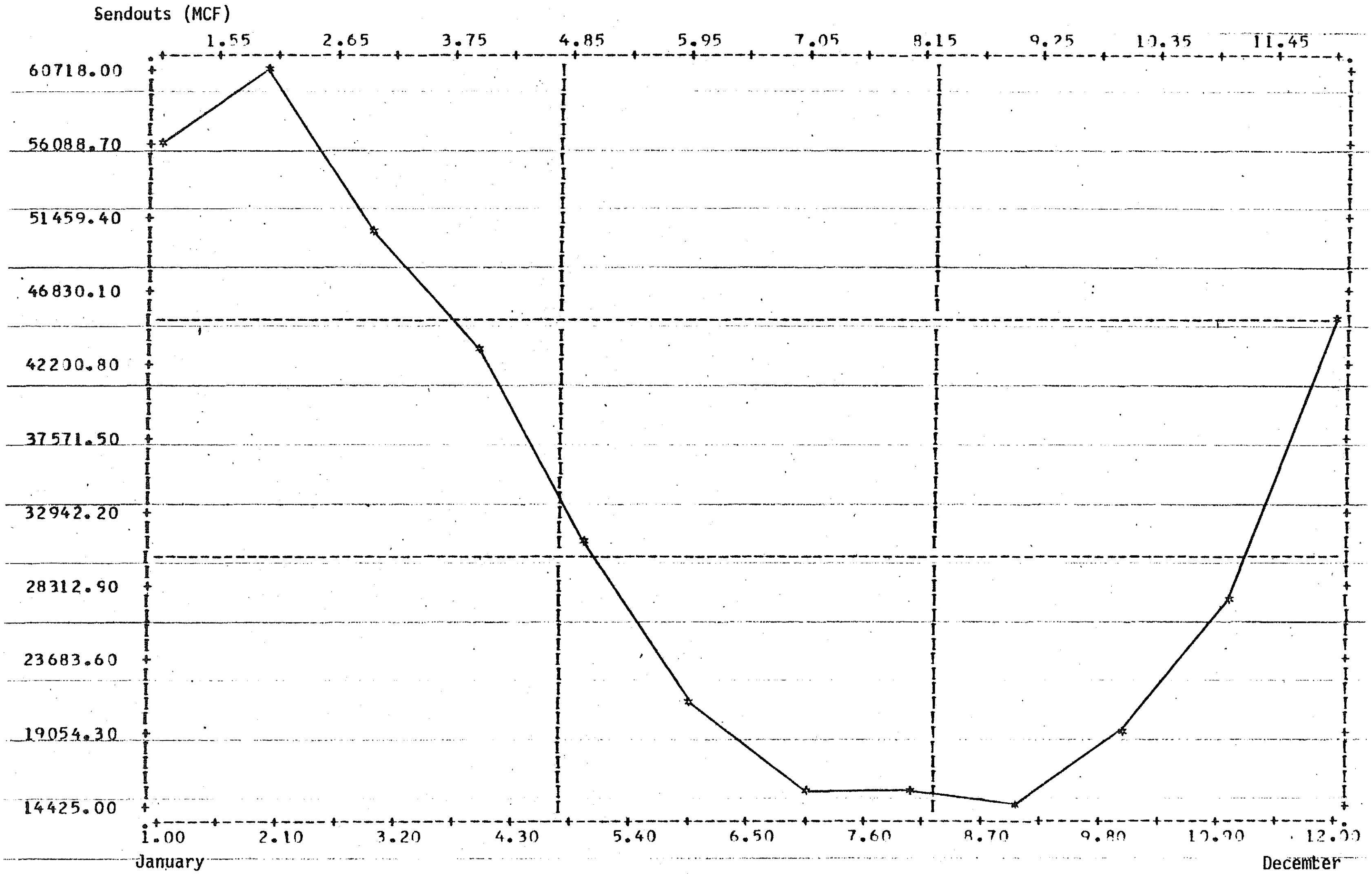


Figure F-2 Total Monthly Gas Usage in the EOGC Service Area in 1971

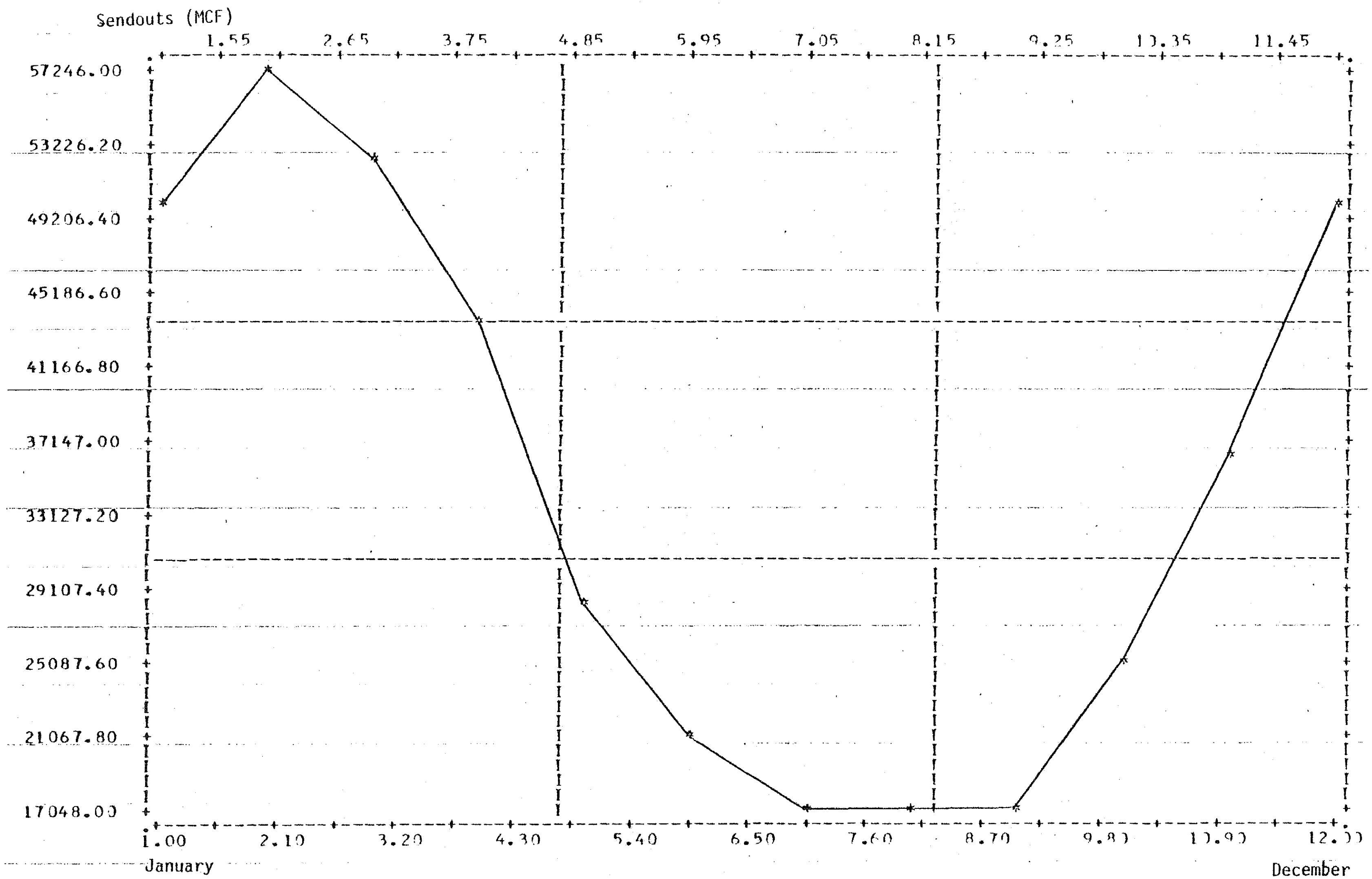


Figure F-3 Total Monthly Gas Usage in the EOGC Service Area in 1972

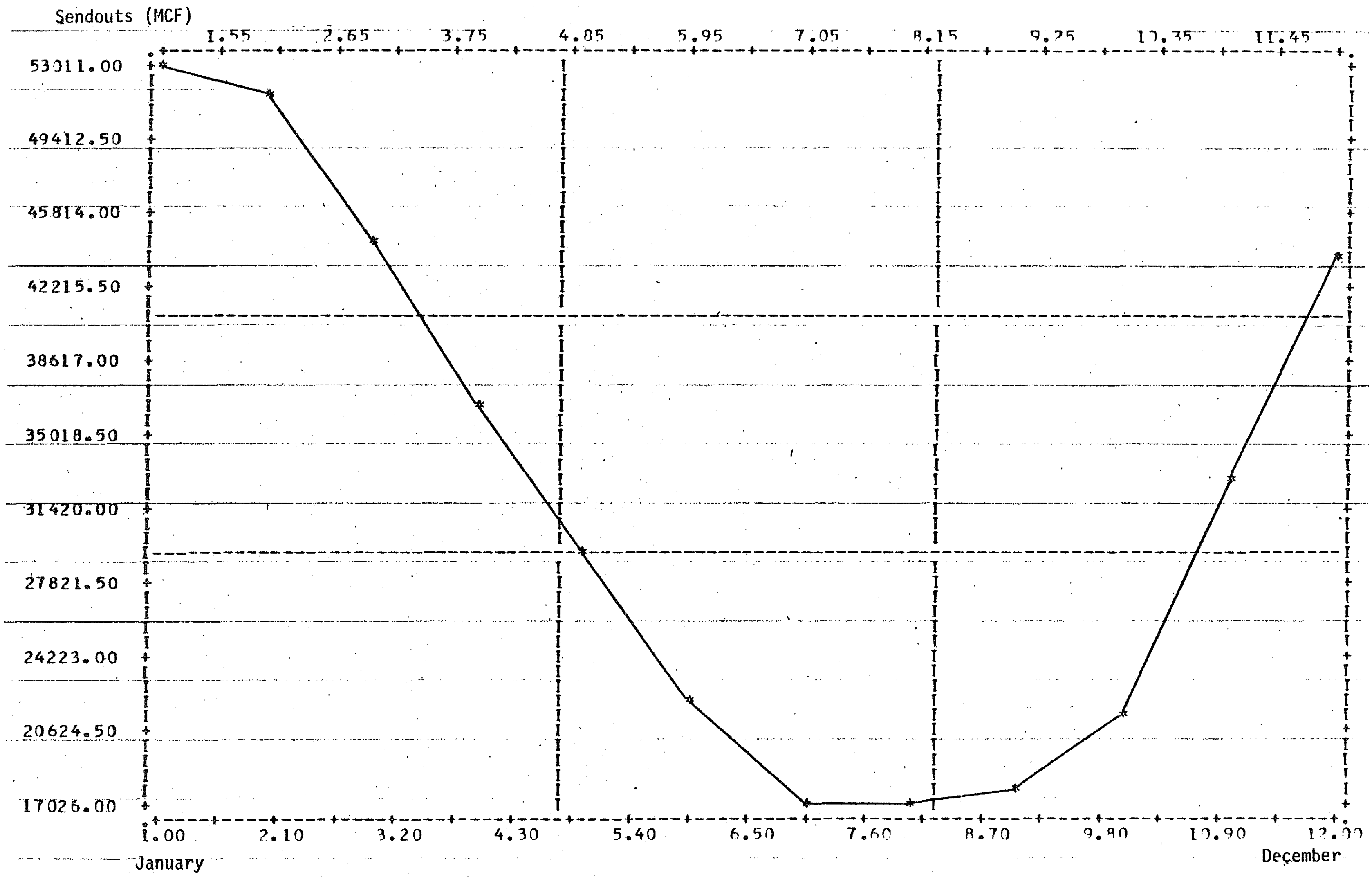


Figure F-4 Total Monthly Gas Usage in the EOGC Service Area in 1973

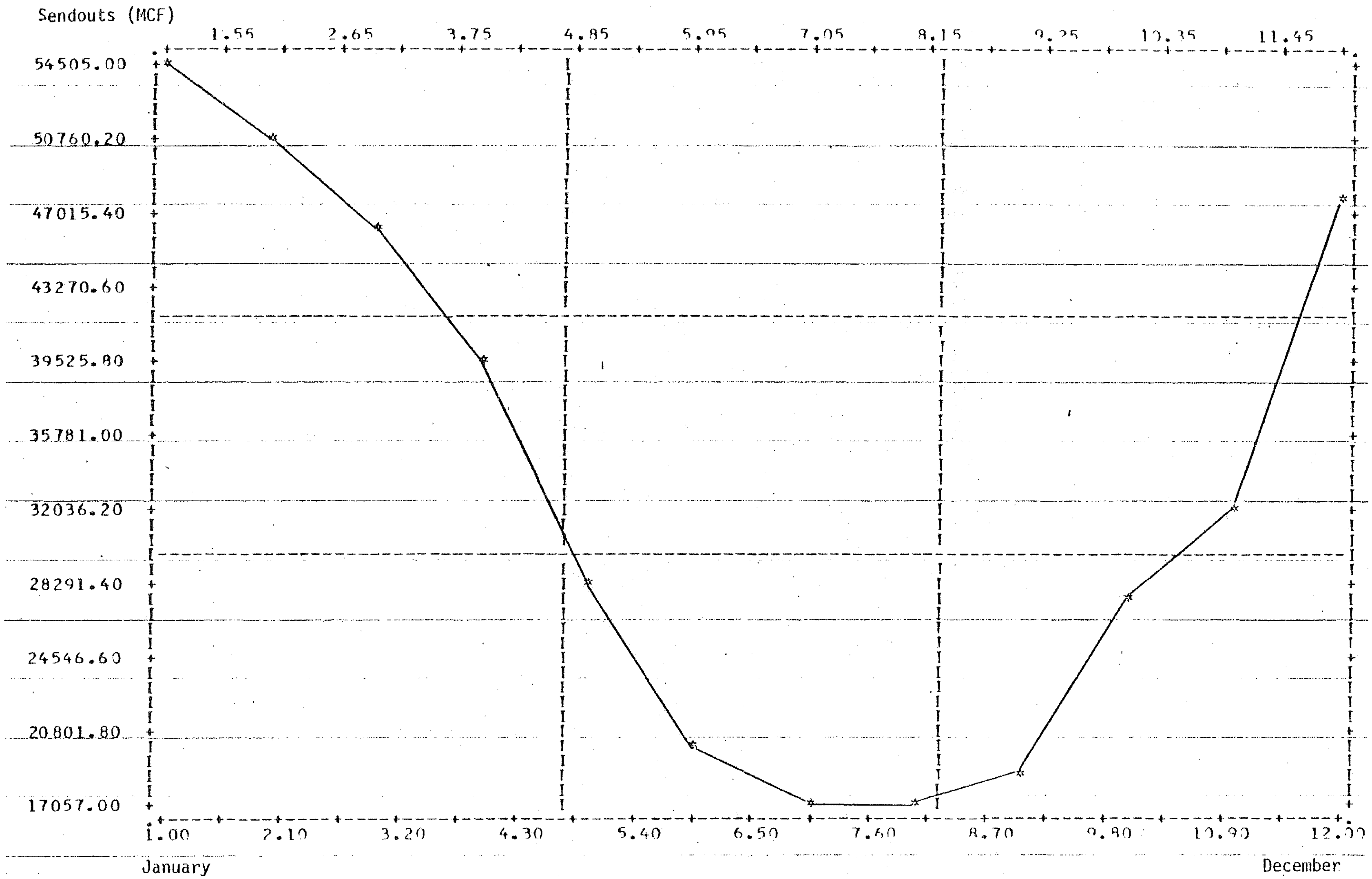


Figure F-5 Total Monthly Gas Usage in the EOGC Service Area in 1974

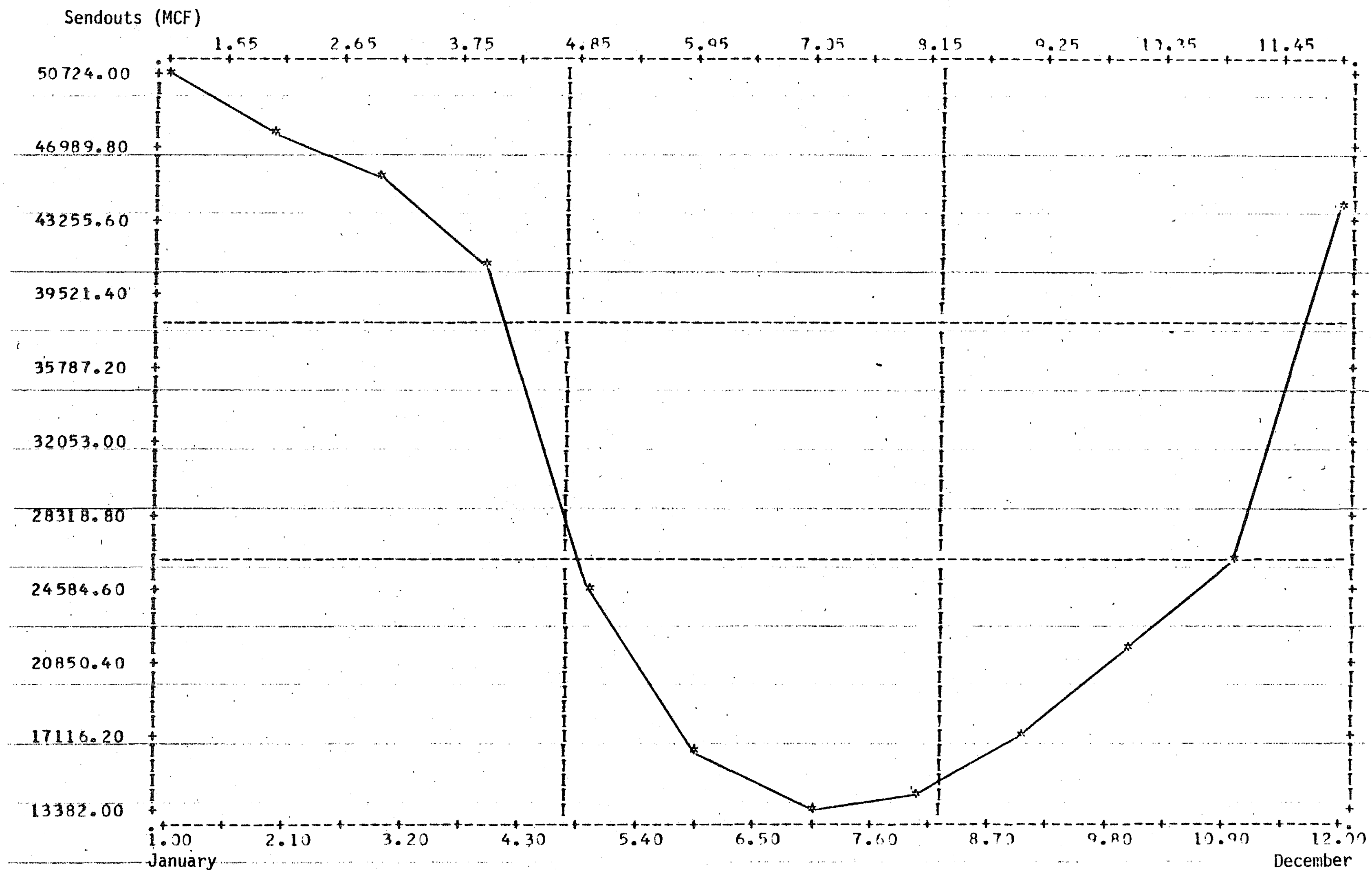


Figure F-6 Total Monthly Gas Usage in the EOGC Service Area in 1975

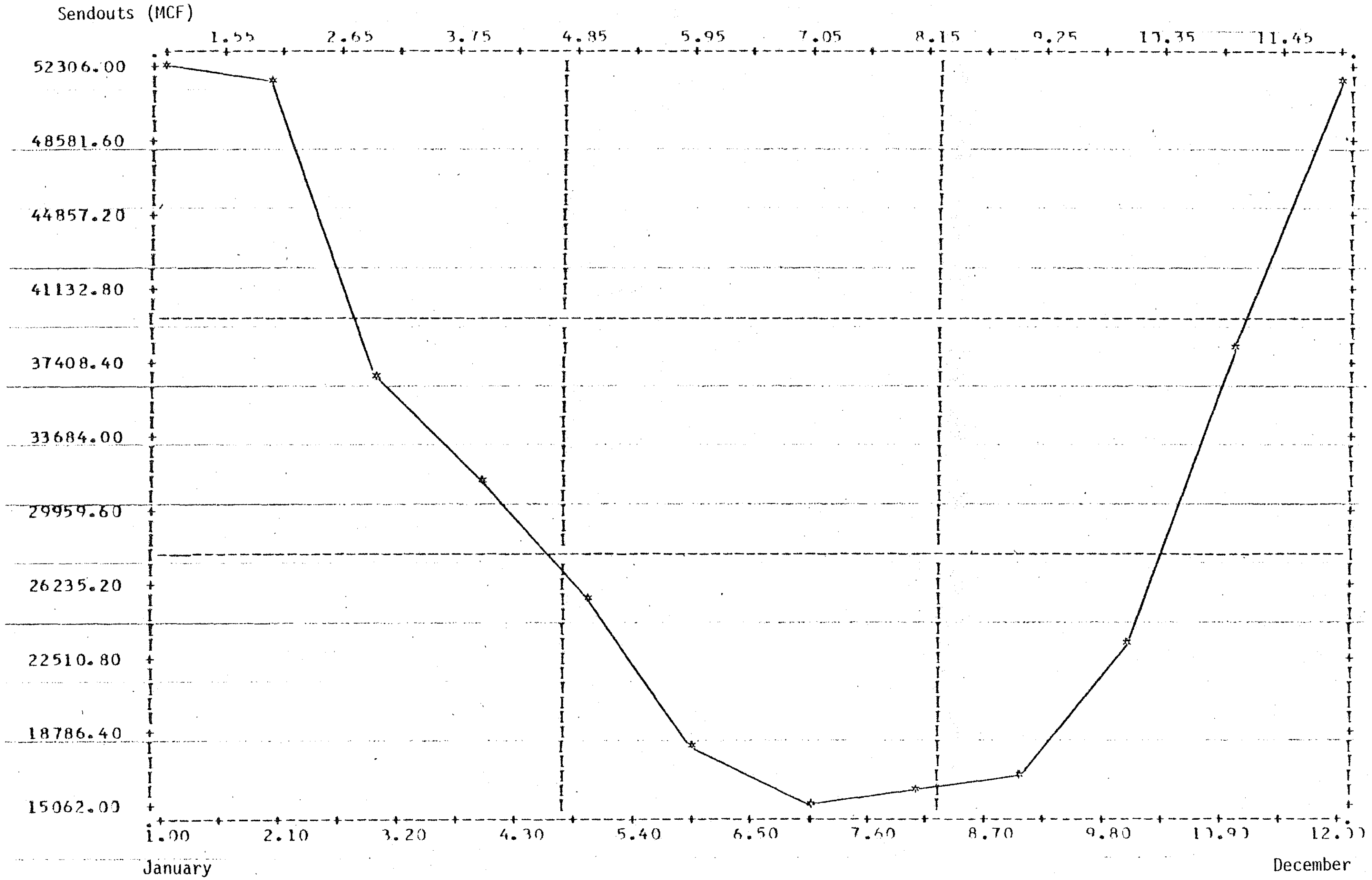


Figure F-7 Total Monthly Gas Usage in the EOGC Service Area in 1976

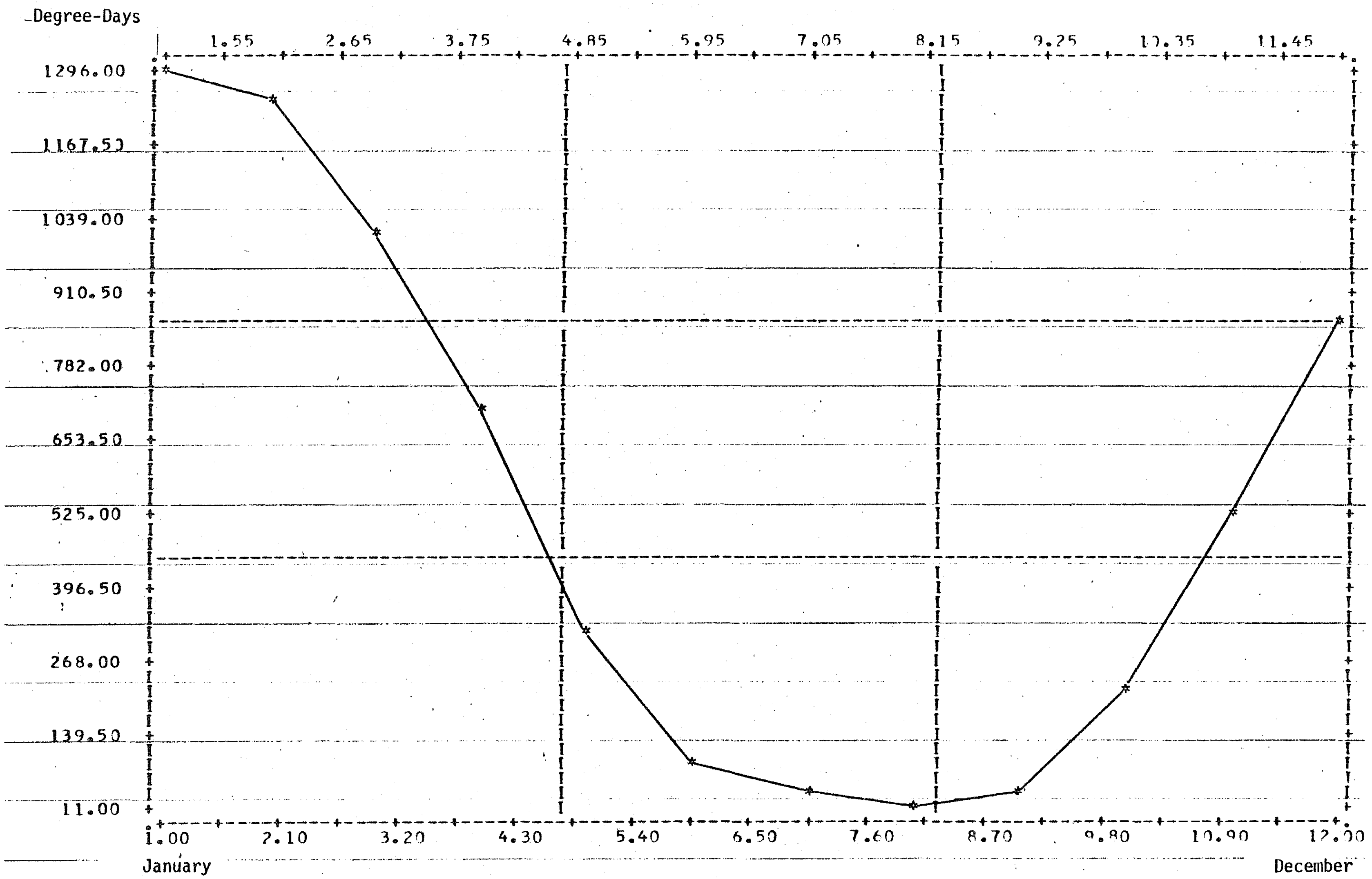


Figure F-8 Monthly Degree - Days in the EOGC Service Area in 1970

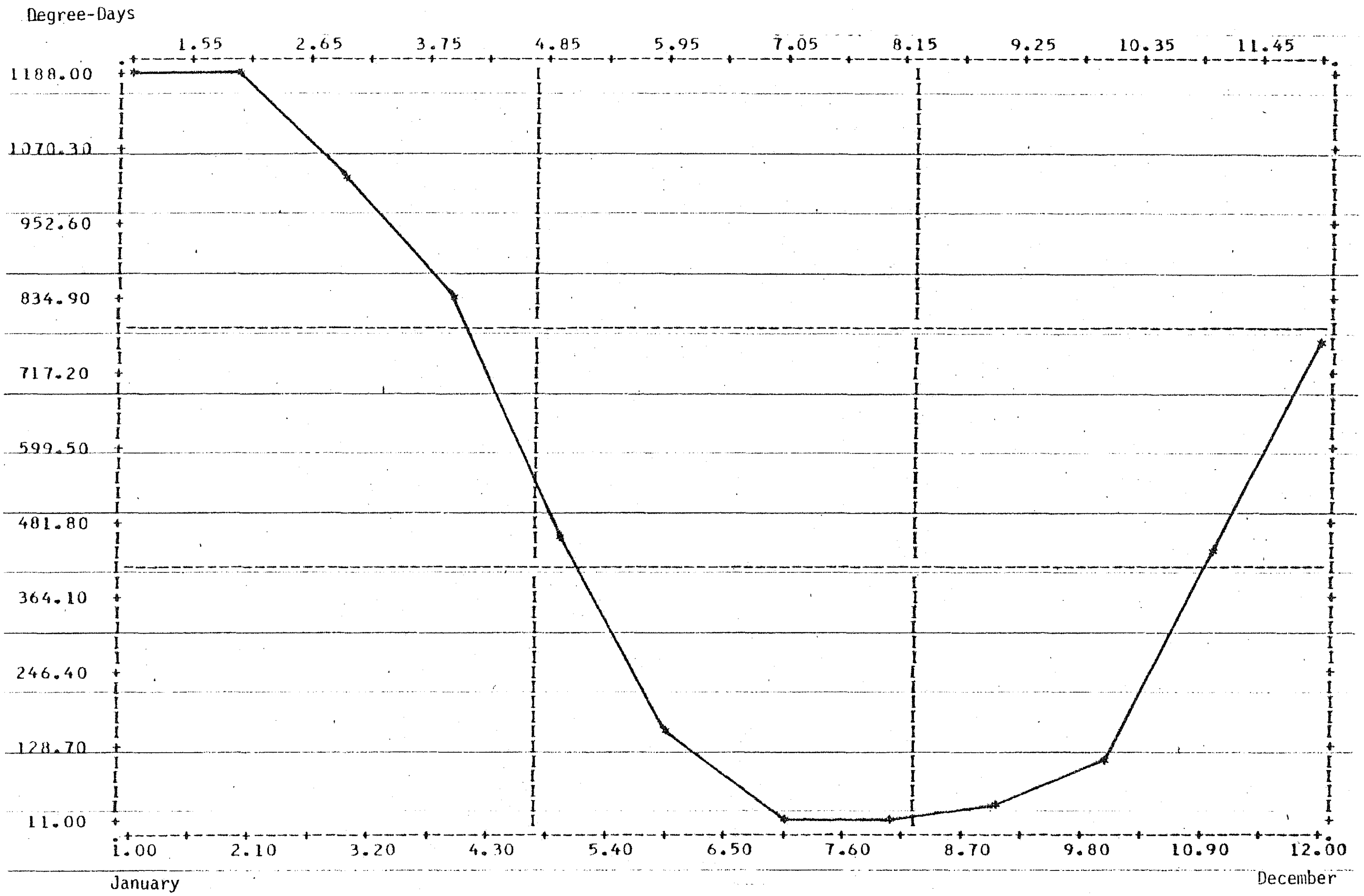


Figure F-9 Monthly Degree-Days in the EOGC Service Area in 1971

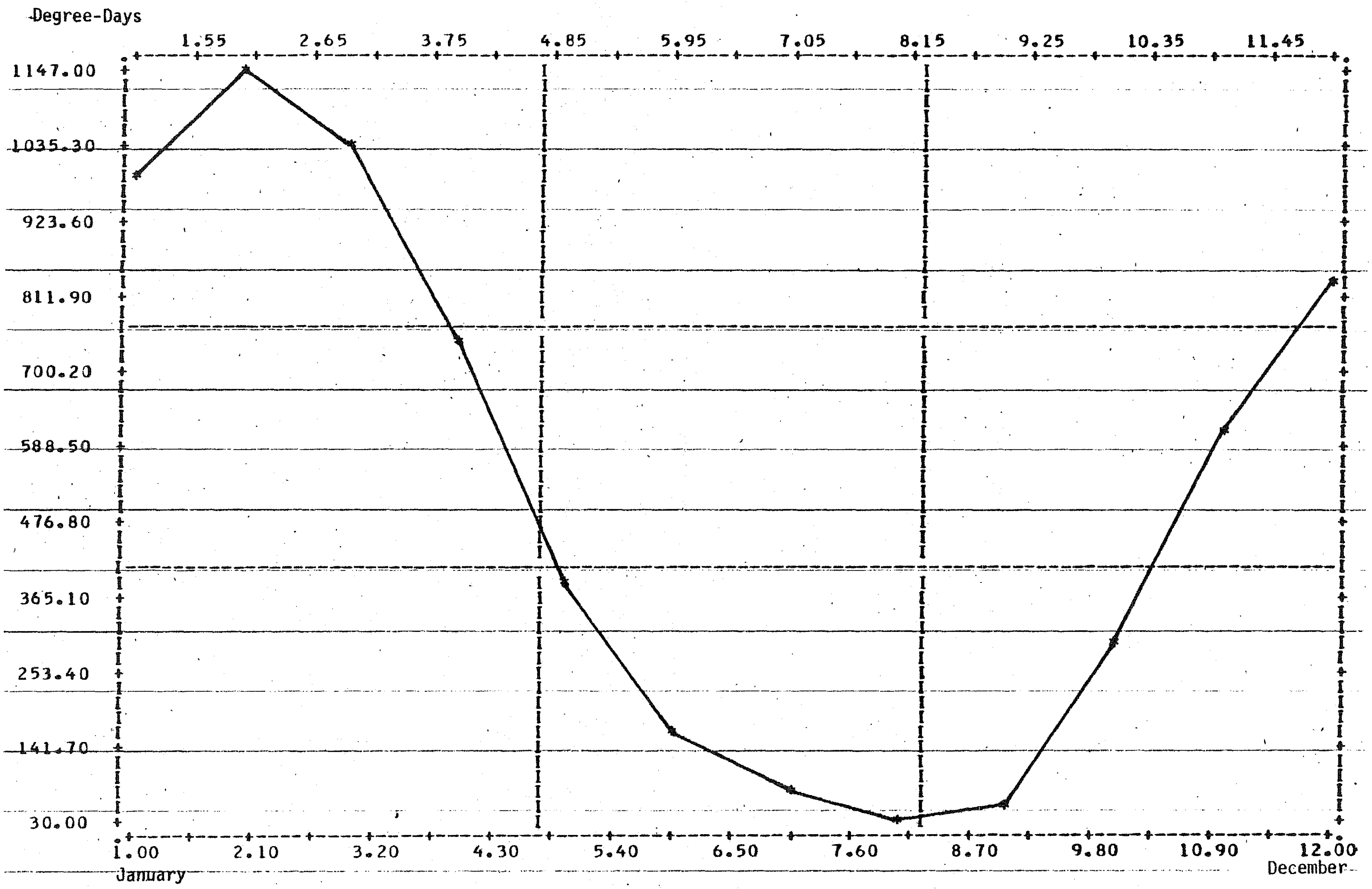


Figure F-10 Monthly Degree-Days in the EOGC Service Area in 1972

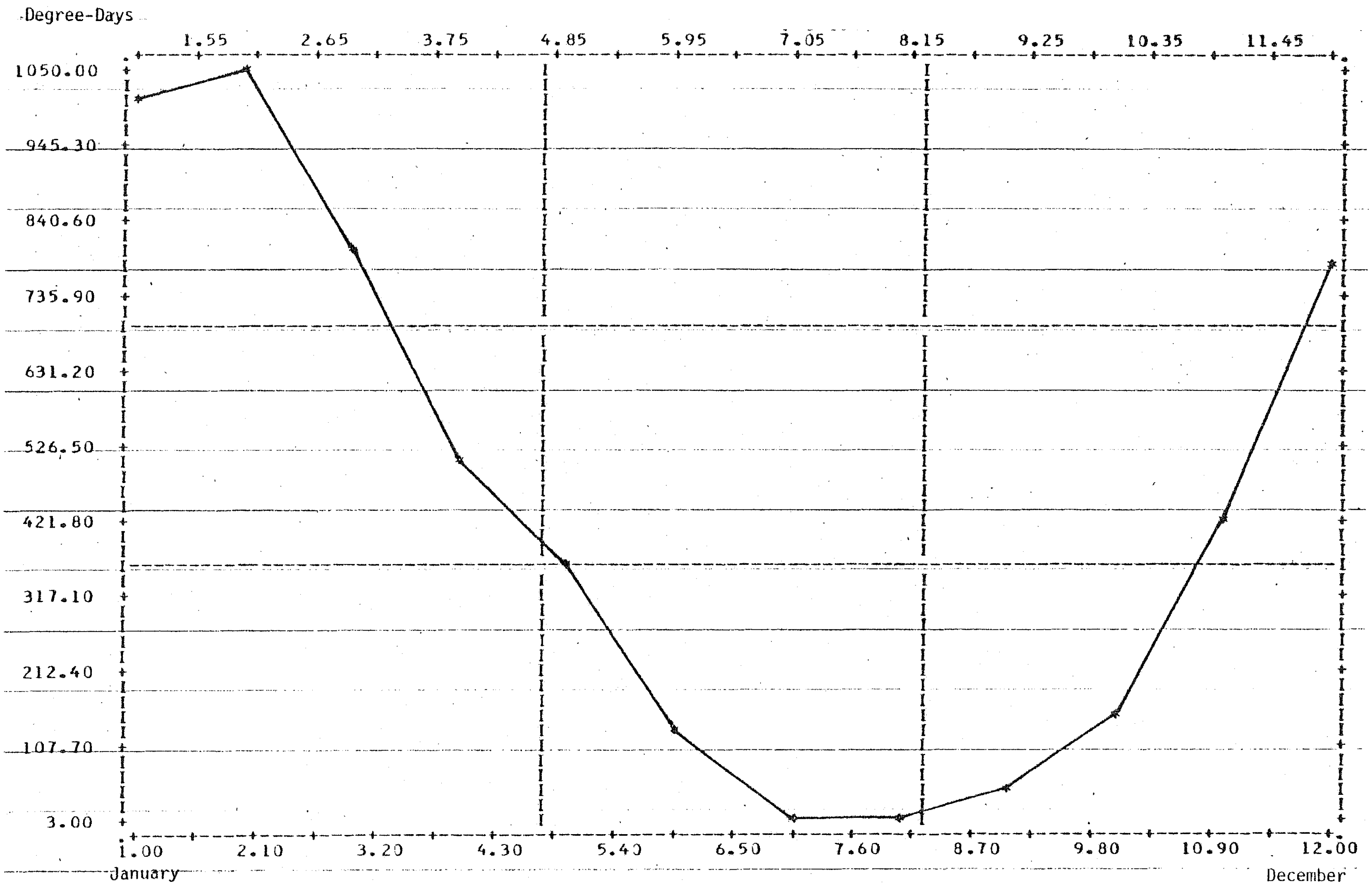


Figure F-11 Monthly Degree-Days in the EOGC Service Area in 1973

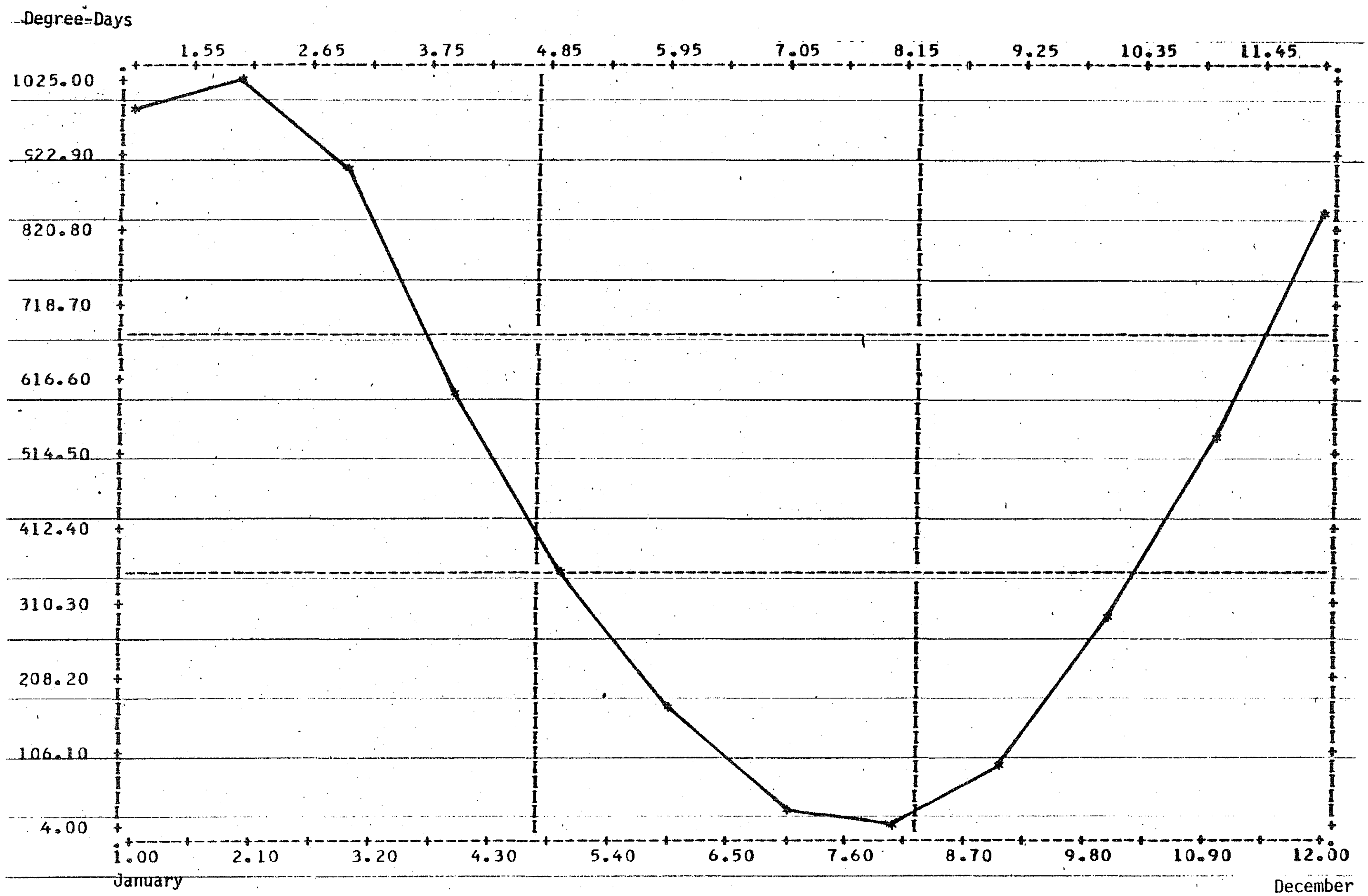


Figure F-12 Monthly Degree-Days in the EOGC Service Area in 1974

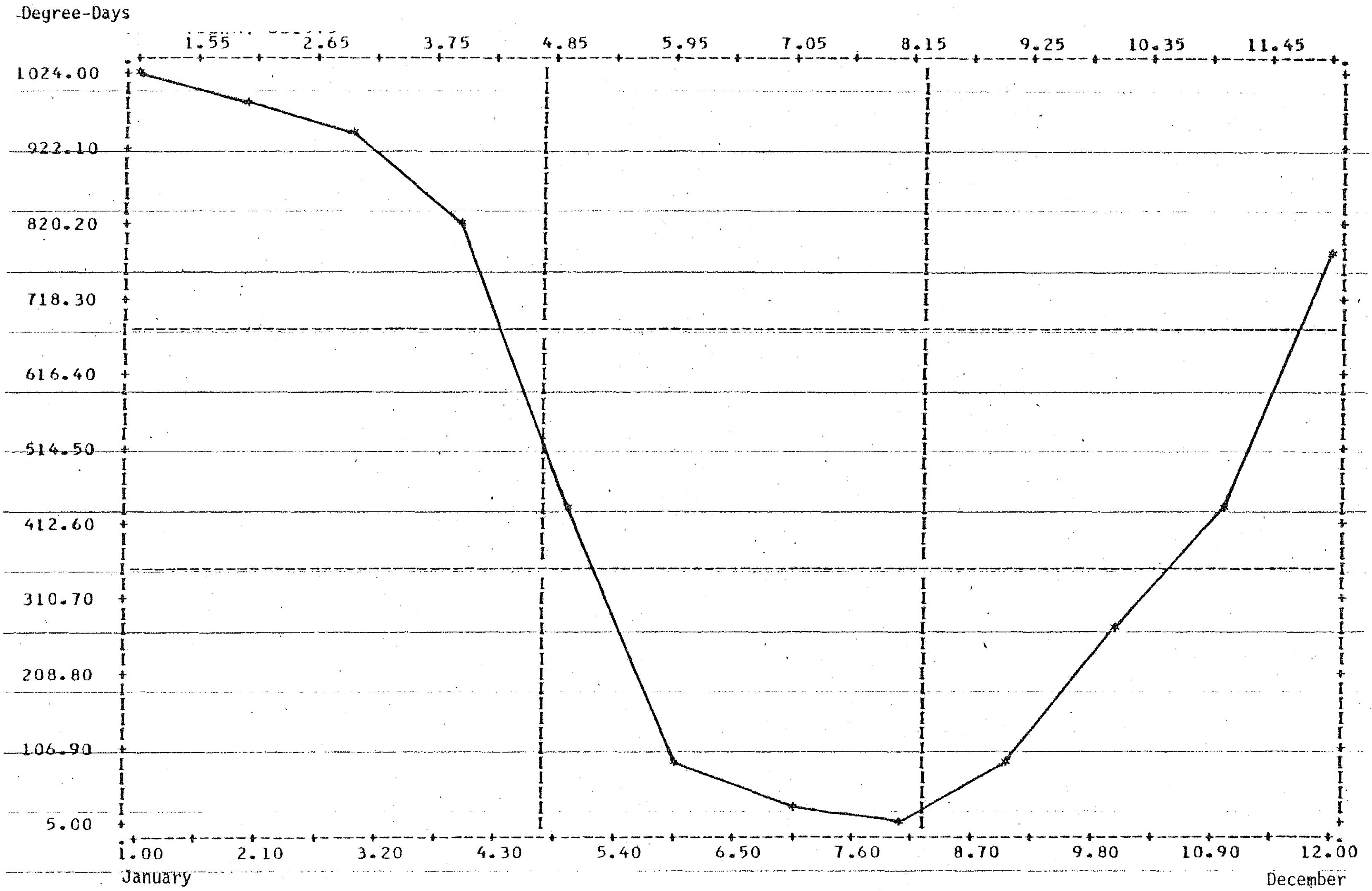


Figure F-13 Monthly Degree-Days in the EOGC Service Area in 1975

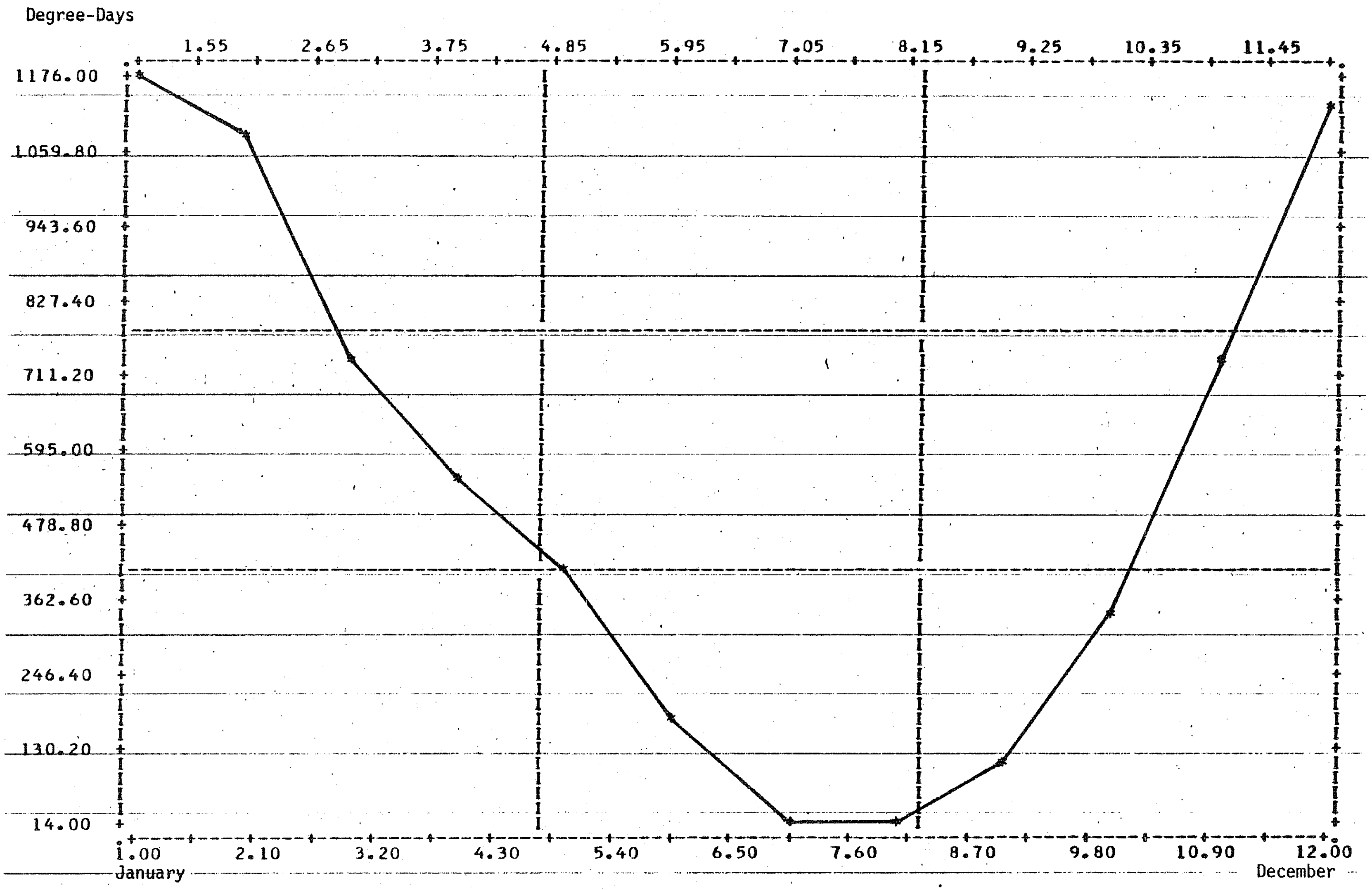


Figure F-14 Monthly Degree-Days in the EOGC Service Area in 1976

Table F-19 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 20 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	195,373	224,086	224,086
2	159,574	167,526	203,817
3	150,211	166,690	203,971
4	161,271	167,033	205,611
5	175,531	150,640	186,393
6	175,369	159,310	197,226
7	134,526	142,799	175,981
8	127,385	182,732	182,732
9	165,036	174,480	174,480
10	159,498	193,027	193,027
11	162,074	164,444	186,828
12	171,164	173,047	196,056
Total	1,940,012	2,065,814	2,331,208
1976			
1	201,409	196,589	224,086
2	116,365	179,954	204,817
3	105,697	179,117	203,971
4	147,069	179,891	205,611
5	161,015	174,472	186,393
6	188,281	184,582	197,226
7	174,970	175,981	175,981
8	181,830	182,732	182,732
9	176,635	174,480	174,480
10	178,061	193,027	193,027
11	224,830	186,828	186,828
12	228,262	196,056	196,056
Total	2,094,504	2,203,709	2,331,208

Source: EOGC data files

Table F-20 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 22 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	16,883	18,479	18,479
2	18,816	15,550	18,673
3	14,057	12,686	15,766
4	16,827	12,134	15,344
5	13,969	12,443	15,937
6	12,128	11,548	14,565
7	8,008	12,135	15,656
8	5,318	14,071	14,671
9	10,740	14,133	14,133
10	15,086	17,737	17,737
11	13,139	13,960	16,305
12	9,872	14,283	16,449
Total	154,843	169,159	193,115
1976			
1	13,613	16,163	18,479
2	6,088	16,591	18,673
3	17,276	13,713	15,766
4	15,249	13,204	15,344
5	21,990	14,772	15,937
6	22,117	13,559	14,569
7	22,644	15,656	15,656
8	23,103	14,071	14,071
9	20,636	14,133	14,133
10	14,315	17,737	17,737
11	191,02	16,305	16,305
12	24,587	16,449	16,449
Total	223,230	182,353	193,115

Source: EOGC data files

Table F-21 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 23 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	11,842	13,802	13,802
2	11,794	11,028	11,028
3	7,042	9,530	9,530
4	5,156	7,319	7,319
5	4,931	4,485	4,485
6	3,389	3,248	3,248
7	2,928	2,243	2,243
8	1,958	2,834	2,834
9	1,964	3,054	3,054
10	3,587	5,595	5,595
11	5,020	7,965	7,965
12	9,522	11,116	11,116
Total	68,883	82,219	82,219
1976			
1	13,980	12,802	12,802
2	7,243	11,028	11,028
3	6,786	9,530	9,530
4	4,727	7,319	7,319
5	3,289	4,485	4,485
6	2,616	3,248	3,248
7	2,955	2,243	2,243
8	1,788	2,834	2,834
9	3,075	3,054	3,054
10	4,201	5,595	5,595
11	9,295	7,965	7,965
12	11,040	11,116	11,116
Total	70,927	82,219	92,219

Source: EOGC data files

Table F-22 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 24 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	1,385	6,526	6,526
2	5,032	4,207	5,922
3	1,302	5,348	7,526
4	2,033	5,838	8,217
5	2,861	4,660	6,557
6	2,660	4,884	6,873
7	2,248	3,492	4,914
8	1,445	5,999	5,999
9	618	6,844	6,844
10	409	5,720	5,720
11	1,287	6,189	7,670
12	1,960	3,978	4,828
Total	23,244	63,685	77,697
1976			
1	3,729	5,267	6,526
2	1,538	4,779	5,922
3	512	6,074	7,526
4	595	5,924	6,557
5	695	5,924	6,557
6	662	6,210	6,873
7	1,248	4,914	4,914
8	852	5,999	5,999
9	989	6,844	6,844
10	1,320	5,720	5,720
11	2,170	7,670	7,670
12	3,019	4,828	4,828
Total	17.329	70,961	77,697

Source: EOGC data files

Table F-23 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 25 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	108,728	136,855	136,855
2	88,436	187,992	127,503
3	71,077	94,617	111,012
4	65,438	83,961	100,003
5	54,840	58,491	70,276
6	38,502	53,303	63,446
7	28,793	37,694	45,111
8	27,604	49,865	49,865
9	34,537	55,719	55,719
10	40,595	72,796	72,696
11	61,235	77,827	87,211
12	85,880	103,850	114,954
Total	206,845	932,879	1,034,651
1976			
1	90,407	123,067	136,855
2	59,446	114,495	127,503
3	51,310	100,082	111,012
4	50,736	89,308	100,003
5	46,066	66,347	70,276
6	38,412	60,064	63,446
7	15,625	45,111	45,111
8	17,204	48,865	8,255
9	21,954	55,719	55,719
10	51,939	72,696	72,696
11	86,694	87,211	87,211
12	99,151	114,954	112,954
Total	628,944	978,919	1,114,954

Source: EOGC data files

Table F-24 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 26 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	102,125	119,301	119,301
2	98,093	110,619	118,240
3	83,335	103,442	110,781
4	81,358	88,596	84,822
5	73,068	74,814	79,976
6	58,507	66,385	71,019
7	40,077	59,786	63,250
8	47,952	70,579	70,578
9	52,514	73,159	73,159
10	67,269	92,033	92,033
11	76,264	98,210	103,175
12	97,809	102,796	107,936
Total	878,371	1,059,720	1,104,071
1976			
1	95,595	114,194	119,301
2	62,770	113,158	118,240
3	66,527	105,888	110,781
4	63,707	90,604	94,622
5	61,345	78,253	79,976
6	58,179	69,473	71,019
7	51,131	63,250	63,250
8	59,239	70,579	70,579
9	60,525	73,159	73,159
10	69,367	92,033	92,033
11	95,206	103,175	103,175
12	105,944	107,936	107,936
Total	849,944	1,081,702	1,104,071

Source: EOGC data files

Table F-25 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 27 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	15,554	20,880	20,880
2	15,809	20,006	20,006
3	11,114	17,569	17,569
4	10,268	14,249	14,249
5	9,830	11,273	11,273
6	7,570	9,772	9,772
7	4,998	8,211	8,210
8	5,792	9,040	9,040
9	5,291	8,876	8,876
10	6,467	12,082	12,082
11	8,740	13,293	13,293
12	13,179	17,424	17,424
Total	115,612	162,674	162,674
1976			
1	17,931	20,880	20,880
2	12,900	20,006	20,006
3	12,158	17,569	17,569
4	5,488	14,248	14,248
5	5,003	11,273	11,273
6	4,671	9,772	9,772
7	6,525	8,211	8,210
8	7,146	9,040	9,040
9	7,211	8,876	8,876
10	10,718	12,082	12,082
11	16,078	13,293	13,293
12	16,671	17,424	17,424
Total	122,500	162,674	162,674

Source: EOGC data files

Table F-26 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 26 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	716,775	999,823	999,823
2	687,084	714,672	922,924
3	627,804	694,458	898,011
4	615,296	700,718	821,417
5	594,136	611,156	796,996
6	570,129	604,607	796,236
7	504,142	552,269	730,923
8	604,814	736,872	736,872
9	546,157	761,710	761,710
10	559,410	796,377	796,377
11	543,396	686,504	846,776
12	604,947	749,630	821,334
Total	7,174,090	8,608,796	10,129,399
1976			
1	661,762	805,397	999,823
2	344,747	746,839	922,924
3	412,735	726,599	898,011
4	558,225	734,680	921,417
5	495,087	665,409	796,996
6	553,672	663,455	796,236
7	555,081	730,923	730,923
8	626,588	736,872	736,872
9	658,361	761,710	761,710
10	675,421	796,377	796,377
11	710,172	846,776	846,776
12	809,032	921,334	921,334
Total	7,060,883	9,136,371	10,129,399

Source: EOGC data files

Table F-27 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 29 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	130,491	139,091	139,087
2	130,956	117,580	136,570
3	128,821	124,655	144,657
4	129,568	118,520	138,183
5	140,119	175,466	210,967
6	153,984	186,104	227,101
7	153,984	200,171	240,413
8	136,278	258,150	258,150
9	221,809	269,315	269,315
10	271,788	251,193	251,193
11	190,224	196,764	219,062
12	113,963	173,135	190,779
Total	1,950,804	2,210,110	2,426,477
1976			
1	102,585	127,122	139,087
2	37,647	123,910	126,570
3	85,351	131,322	144,657
4	120,291	125,406	139,183
5	164,663	199,123	210,967
6	216,841	213,431	227,101
7	176,553	240,413	240,413
8	226,880	259,150	258,150
9	235,414	269,315	269,315
10	223,615	251,193	251,193
11	218,230	219,063	219,062
12	174,999	189,781	190,778
Total	1,983,019	2,349,215	2,426,477

Source: EOGC data files

Table F-28 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 30 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	217,349	406,344	406,344
2	214,376	226,617	366,703
3	177,706	211,500	333,222
4	168,623	181,125	531,847
5	152,660	165,228	288,417
6	159,818	144,375	264,882
7	87,263	124,522	241,921
8	117,885	266,002	266,001
9	115,221	274,094	274,094
10	126,200	288,925	288,925
11	163,050	106,076	328,244
12	194,202	226,227	249,805
Total	1,894,363	2,731,033	3,740,415
1976			
1	245,932	270,659	406,344
2	98,588	245,316	366,703
3	117,570	228,944	333,222
4	138,892	206,350	331,947
5	130,291	191,029	288,427
6	172,718	166,469	264,882
7	146,615	241,922	241,921
8	165,215	266,002	266,002
9	167,443	274,094	274,094
10	180,774	288,925	288,925
11	285,414	328,244	328,244
12	293,756	349,985	349,985
Total	2,143,008	3,057,757	3,740,415

Source: EOGC data files

Table F-29 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 31 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	5,993	4,808	4,808
2	5,512	4,603	4,603
3	2,336	3,730	3,730
4	395	3,457	3,457
5	2,519	2,858	2,858
6	2,820	2,408	2,408
7	851	2,253	2,253
8	1,403	1,967	1,967
9	1,393	2,219	2,219
10	3,615	3,021	3,021
11	4,182	2,986	2,986
12	4,351	4,607	4,607
Total	36,370	38,917	38,917
1976			
1	4,168	4,808	4,808
2	5,121	4,603	4,603
3	3,211	3,730	3,730
4	3,450	3,457	3,457
5	2,880	2,858	2,858
6	2,647	2,408	2,408
7	2,225	2,253	2,253
8	3,491	1,967	1,967
9	3,104	2,219	2,219
10	3,013	3,021	3,021
11	5,351	2,986	2,986
12	5,440	4,607	4,607
Total	43,101	38,917	38,917

Source: EOGC data files

Table F-30 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 32 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	920,703	1,098,214	1,087,213
2	896,642	1,041,195	1,073,060
3	834,268	1,040,041	1,070,993
4	877,854	1,081,422	1,113,904
5	977,121	1,013,557	1,041,699
6	884,835	1,015,264	1,043,970
7	810,849	1,004,880	1,029,840
8	893,904	1,031,488	1,031,488
9	934,863	1,086,264	1,086,264
10	959,309	1,105,927	1,105,927
11	926,812	1,117,189	1,186,082
12	866,281	1,130,840	1,159,499
Total	10,681,209	12,755,275	12,969,929
1976			
1	757,230	1,066,748	1,087,213
2	508,227	1,051,815	1,073,060
3	670,779	1,050,357	1,070,993
4	781,040	1,092,249	1,114,904
5	786,423	1,032,315	1,041,699
6	813,927	1,033,731	1,042,970
7	758,732	1,029,840	1,029,840
8	777,307	1,031,488	1,021,488
9	866,360	1,086,264	1,086,264
10	927,321	1,105,927	1,105,927
11	1,024,883	1,136,082	1,136,082
12	902,162	1,150,489	1,150,489
Total	9,574,546	12,867,299	12,969,929

Source: EOGC data files

Table F-31 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 33 in the EOGC Service Area.

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	6,336,905	7,970,491	7,970,491
2	6,478,859	6,349,720	7,636,235
3	5,944,947	6,228,751	7,463,056
4	5,828,388	6,195,304	7,343,502
5	5,899,356	5,744,601	6,887,168
6	5,934,845	5,560,473	6,686,762
7	4,513,268	5,122,510	6,154,890
8	5,677,963	6,348,277	6,348,277
9	6,700,477	6,723,765	6,713,765
10	6,059,179	6,982,265	6,982,265
11	6,258,547	6,346,648	7,333,661
12	6,728,205	6,614,292	7,625,665
Total	71,833,027	76,087,097	85,145,227
1976			
1	6,044,800	6,916,978	7,970,491
2	3,541,220	6,617,842	7,636,235
3	4,813,964	6,488,776	7,463,056
4	5,405,947	6,362,285	7,343,592
5	5,991,929	6,222,494	6,887,168
6	6,407,561	6,028,278	6,686,762
7	6,011,543	6,154,890	6,154,890
8	6,705,334	6,348,277	6,348,277
9	6,639,922	6,713,765	6,713,765
10	6,443,152	6,982,265	6,982,265
11	6,878,082	7,333,661	7,333,661
12	7,262,771	7,625,065	7,625,065
Total	71,979,445	79,793,576	85,145,227

Source: EOGC data files

Table F-32 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 34 in the EOGC Service Area

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	777,450	936,883	936,883
2	770,116	843,857	924,489
3	581,177	752,108	821,540
4	520,190	679,607	743,712
5	473,693	522,070	574,867
6	353,582	454,152	500,338
7	226,028	305,027	332,447
8	351,342	437,280	437,280
9	369,961	452,040	452,040
10	425,563	580,601	580,101
11	506,149	685,657	727,322
12	676,083	798,340	843,895
Total	6,031,334	7,447,622	7,875,414
1976			
1	782,509	884,507	936,883
2	482,696	870,732	924,489
3	470,440	775,249	821,540
4	414,541	700,971	743,712
5	367,751	557,259	574,867
6	333,462	484,935	500,338
7	243,764	332,447	332,447
8	337,628	437,280	437,280
9	346,555	452,040	452,040
10	473,629	580,601	580,601
11	726,118	727,322	727,322
12	814,975	943,895	843,895
Total	5,794,068	7,647,238	7,875,414

Source: EOGC data files

Table F-33 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 35 in the EOGC Service Area

Year, Month	Gas Consumption (Mcf)	Curtailed Base Allocation (Mcf)	Base Allocation (Mcf)
1975			
1	354,999	512,017	512,017
2	344,001	418,560	474,642
3	251,469	357,239	405,319
4	193,073	285,994	325,287
5	144,141	191,789	219,397
6	84,451	132,687	153,343
7	67,816	100,948	117,180
8	62,410	115,145	115,143
9	70,902	139,647	139,646
10	130,729	222,783	222,783
11	168,505	312,805	340,193
12	252,169	431,666	469,275
Total	2,125,555	3,221,272	3,494,230
1976			
1	334,399	473,098	512,017
2	213,079	437,252	474,642
3	172,149	373,263	405,319
4	158,382	299,089	325,287
5	98,800	210,189	219,397
6	70,748	146,456	153,348
7	61,910	117,184	117,180
8	73,692	115,145	115,143
9	77,600	139,647	139,646
10	138,001	222,783	222,783
11	275,350	340,193	340,193
12	362,839	469,275	469,275
Total	2,037,097	3,343,566	3,494,230

Source: EOGC data files

Table F-34 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 36 in the EOGC Service Area.

Year, Month	Gas Consumption (MCF)	Curtailed Base Allocation (MCF)	Base Allocation (MCF)
1975			
1	270,261	312,594	312,593
2	255,889	264,144	289,566
3	188,173	254,614	280,679
4	184,699	218,300	242,758
5	167,565	174,101	193,501
6	142,422	141,254	157,237
7	107,884	112,414	125,368
8	103,020	111,503	111,501
9	141,655	149,605	149,603
10	152,811	194,373	194,373
11	174,135	229,173	245,604
12	228,264	277,961	297,349
Total	2,116,778	2,440,029	2,600,182
1976			
1	238,868	293,907	312,593
2	162,376	272,617	289,566
3	153,199	263,301	280,679
4	160,371	226,445	242,758
5	149,943	187,031	193,501
6	150,361	151,938	157,287
7	121,187	125,370	125,368
8	108,843	111,503	111,501
9	150,414	149,605	149,503
10	172,101	194,373	194,373
11	221,593	245,604	245,604
12	223,607	297,349	297,349
Total	2,012,863	2,519,042	2,600,182

Source: EOGC data files

Table F-35 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 37 in the EOGC Service Area.

Year, Month	Gas Consumption (MCF)	Curtailed Base Allocation (MCF)	Base Allocation (MCF)
1975			
1	762,318	941,625	941,625
2	738,917	705,332	922,237
3	520,966	613,873	791,840
4	444,884	582,463	689,254
5	388,189	400,978	519,499
6	249,149	285,523	370,351
7	238,274	237,337	304,547
8	157,405	262,144	262,143
9	291,568	359,063	359,062
10	398,354	486,525	486,524
11	511,341	576,474	732,092
12	734,751	721,836	918,850
Total	5,436,116	6,123,274	7,298,033
1976			
1	654,609	744,578	941,625
2	417,987	722,638	922,237
3	413,100	630,294	791,840
4	385,368	546,038	689,254
5	251,372	421,097	419,499
6	212,339	300,595	370,351
7	189,141	304,548	304,547
8	202,565	282,144	362,148
9	233,927	359,063	359,062
10	362,206	486,525	486,524
11	622,525	732,092	732,092
12	754,560	918,858	918,859
Total	4,699,699	6,428,467	7,298,033

Source: EOGC data files

Table F-36 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 38 in the EOGC Service Area.

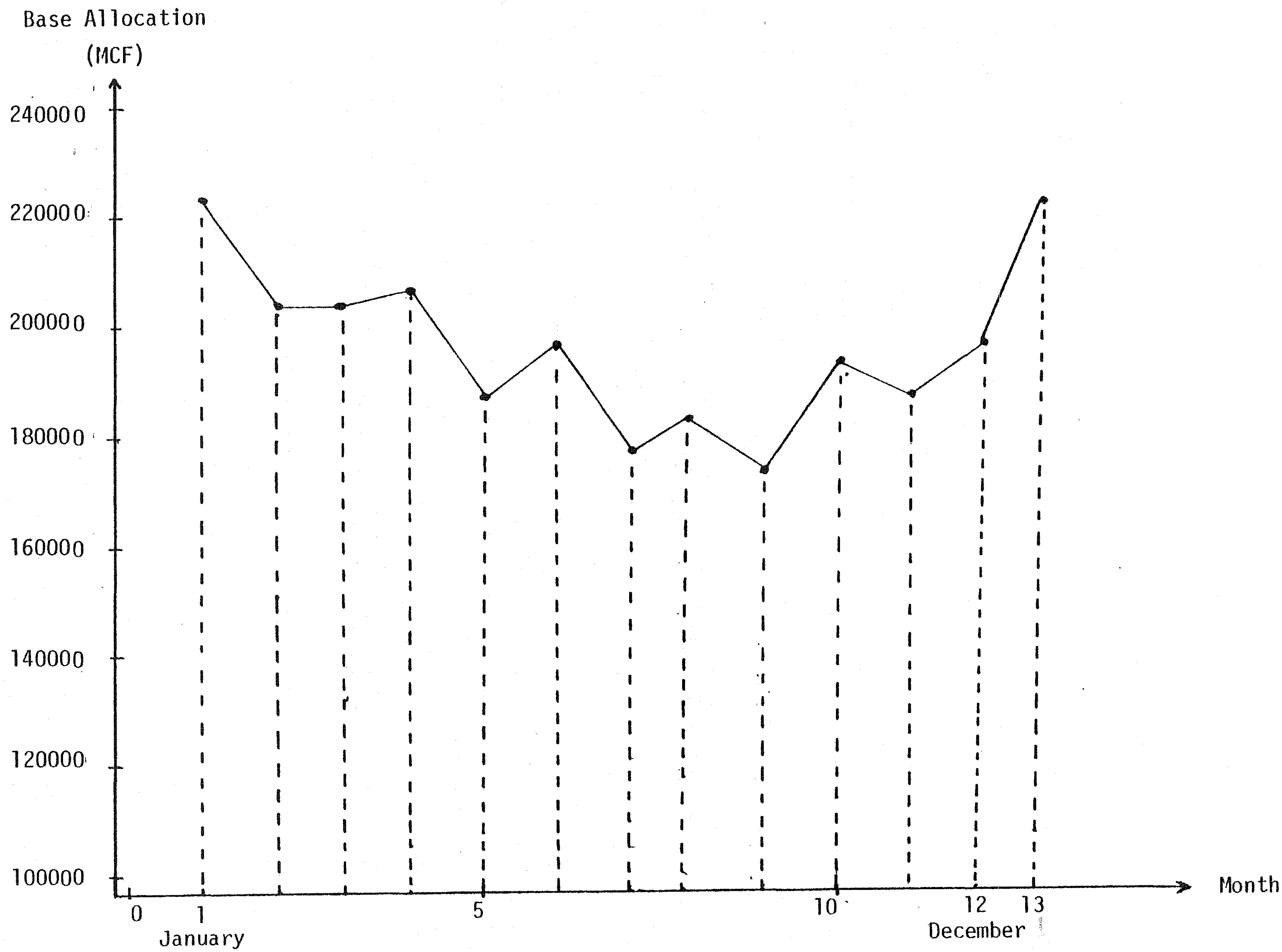
Year, Month	Gas Consumption (MCF)	Curtailed Base Allocation (MCF)	Base Allocation (MCF)
1975			
1	12,473	17,007	17,007
2	9,603	10,647	12,228
3	7,050	9,276	10,787
4	4,586	5,765	6,682
5	2,410	3,458	3,903
6	837	1,396	1,489
7	1,062	1,411	1,469
8	1,687	1,261	1,261
9	1,378	1,202	1,202
10	2,008	4,893	4,893
11	3,982	8,979	9,776
12	8,937	11,873	12,858
Total	55,873	77,167	83,565
1976			
1	9,429	15,478	17,007
2	3,492	11,174	12,228
3	6,812	9,780	10,787
4	3,492	6,074	6,692
5	1,205	3,754	3,903
6	856	1,458	1,489
7	824	1,469	1,469
8	696	1,261	1,261
9	933	1,202	1,202
10	4,078	4,893	4,893
11	8,505	9,776	9,776
12	11,224	12,858	12,858
Total	51,546	79,177	83,565

Source: EOGC data files

Table F-37 Monthly Industrial Gas Consumption, Curtailed Base Allocation and Base Allocation in 1975 and 1976 for SIC 39 in the EOGC Service Area.

Year, Month	Gas Consumption (MCF)	Curtailed Base Allocation (MCF)	Base Allocation (MCF)
1975			
1	55,821	73,702	73,702
2	60,248	69,532	76,753
3	69,756	65,463	62,560
4	62,493	77,793	85,641
5	59,408	57,396	64,094
6	48,760	48,619	54,036
7	31,557	36,654	40,062
8	23,185	33,442	33,442
9	47,791	48,782	48,782
10	54,652	55,467	55,467
11	62,590	58,291	62,340
12	71,436	60,159	64,436
Total	647,697	676,300	721,315
1976			
1	59,597	68,834	73,702
2	34,488	71,939	76,753
3	43,656	58,495	62,560
4	54,019	80,409	85,641
5	48,621	61,860	64,094
6	46,191	52,230	54,036
7	38,316	40,062	40,062
8	24,322	33,442	33,442
9	41,435	48,782	48,782
10	514,30	55,467	55,467
11	72,200	62,340	62,340
12	70,429	64,436	64,436
Total	584,704	698,296	721,315

Source: EOGC data files



F[illegible]e F.[illegible] Mo[illegible]ly I[illegible]str[illegible] Bas[illegible] Alloc[illegible]ons [illegible] SIC [illegible] in [illegible] EOC[illegible] Serv[illegible] Are[illegible]

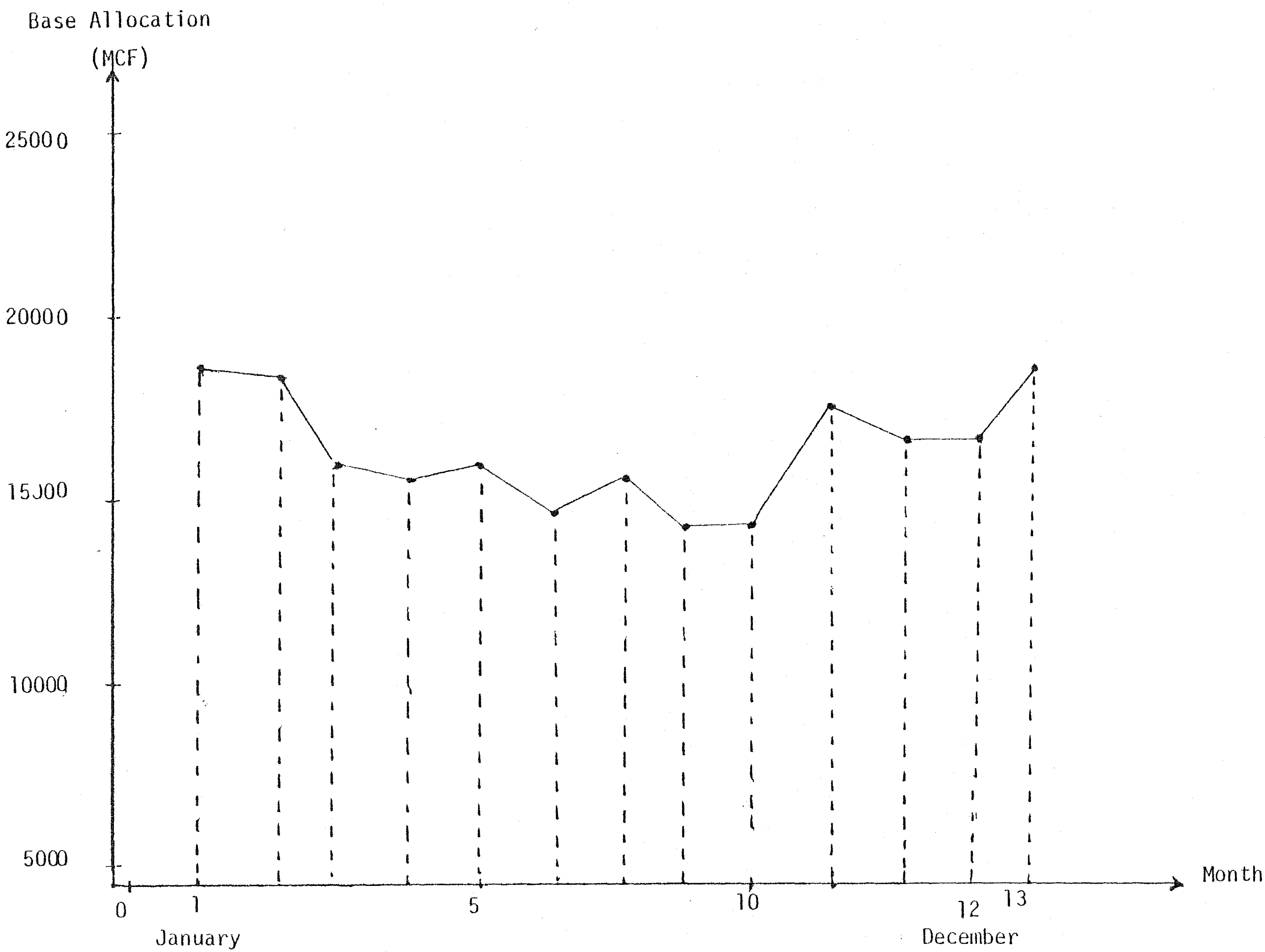


Figure F-16 Monthly Industrial Base Allocations for SIC 22 in the EOGC Service Area

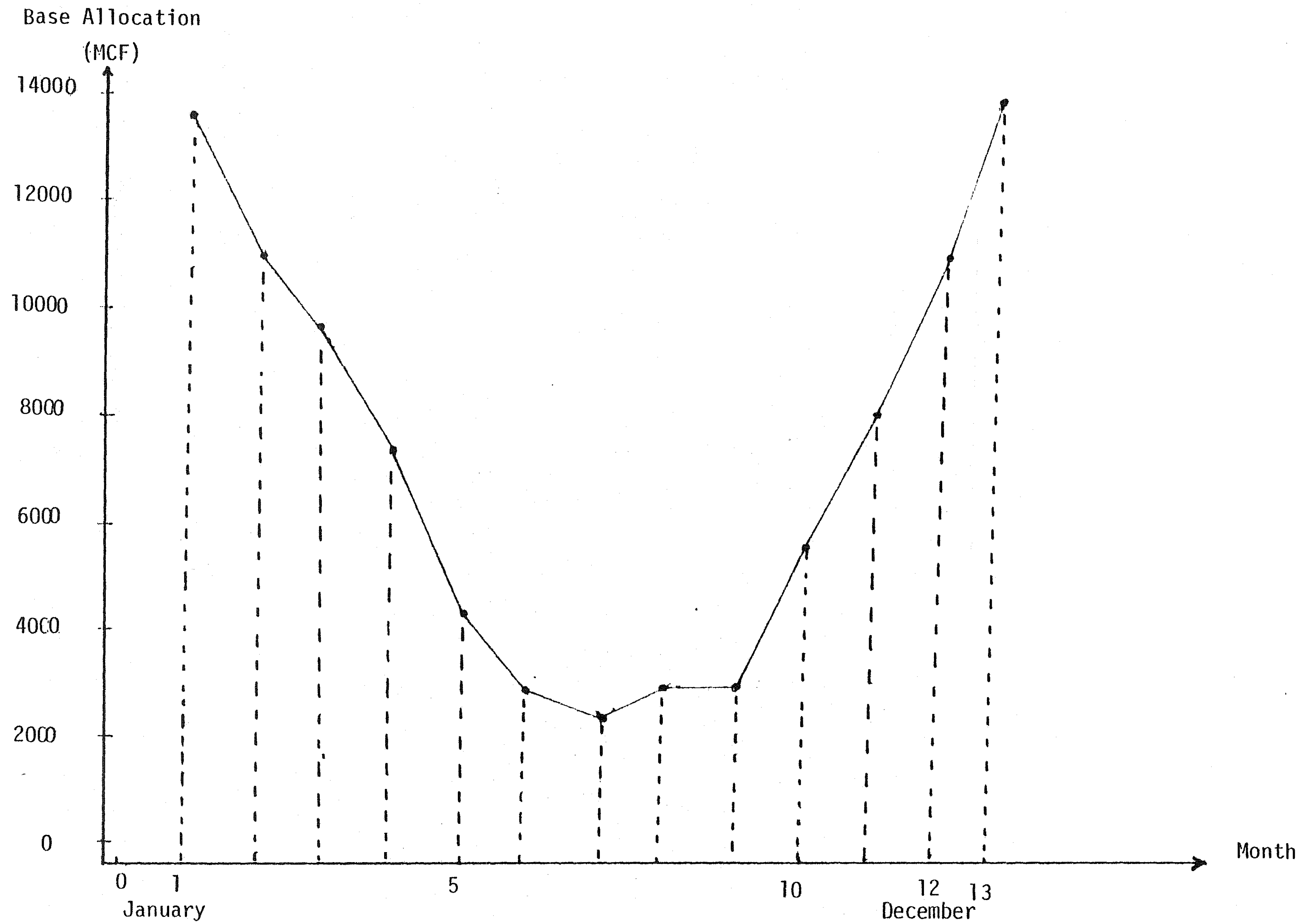


Figure F-17 Monthly Industrial Base Allocations for SIC 23 in the EOGC Service Area

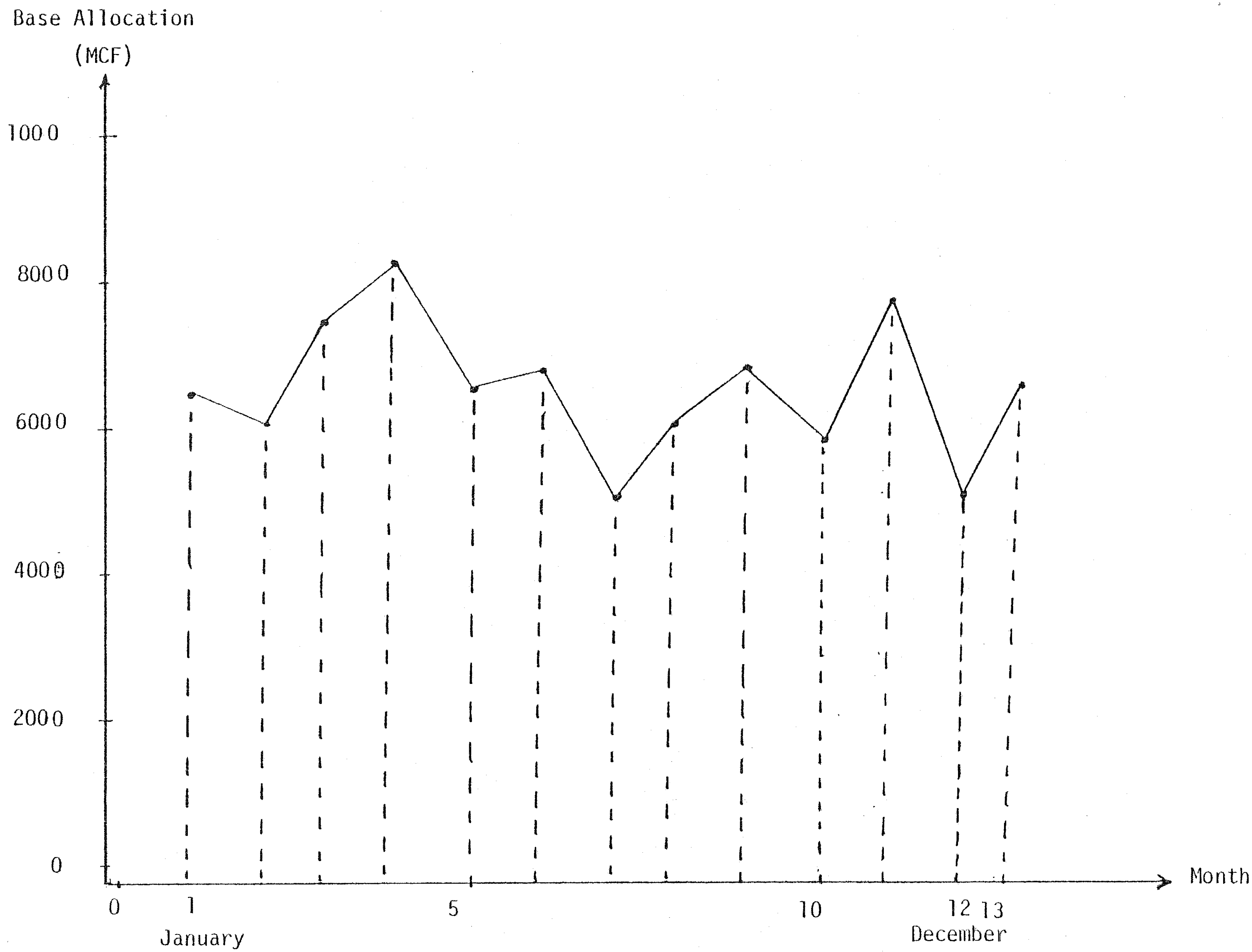


Figure F-18 Monthly Industrial Base Allocations for SIC 24 in the EOGC Service Area

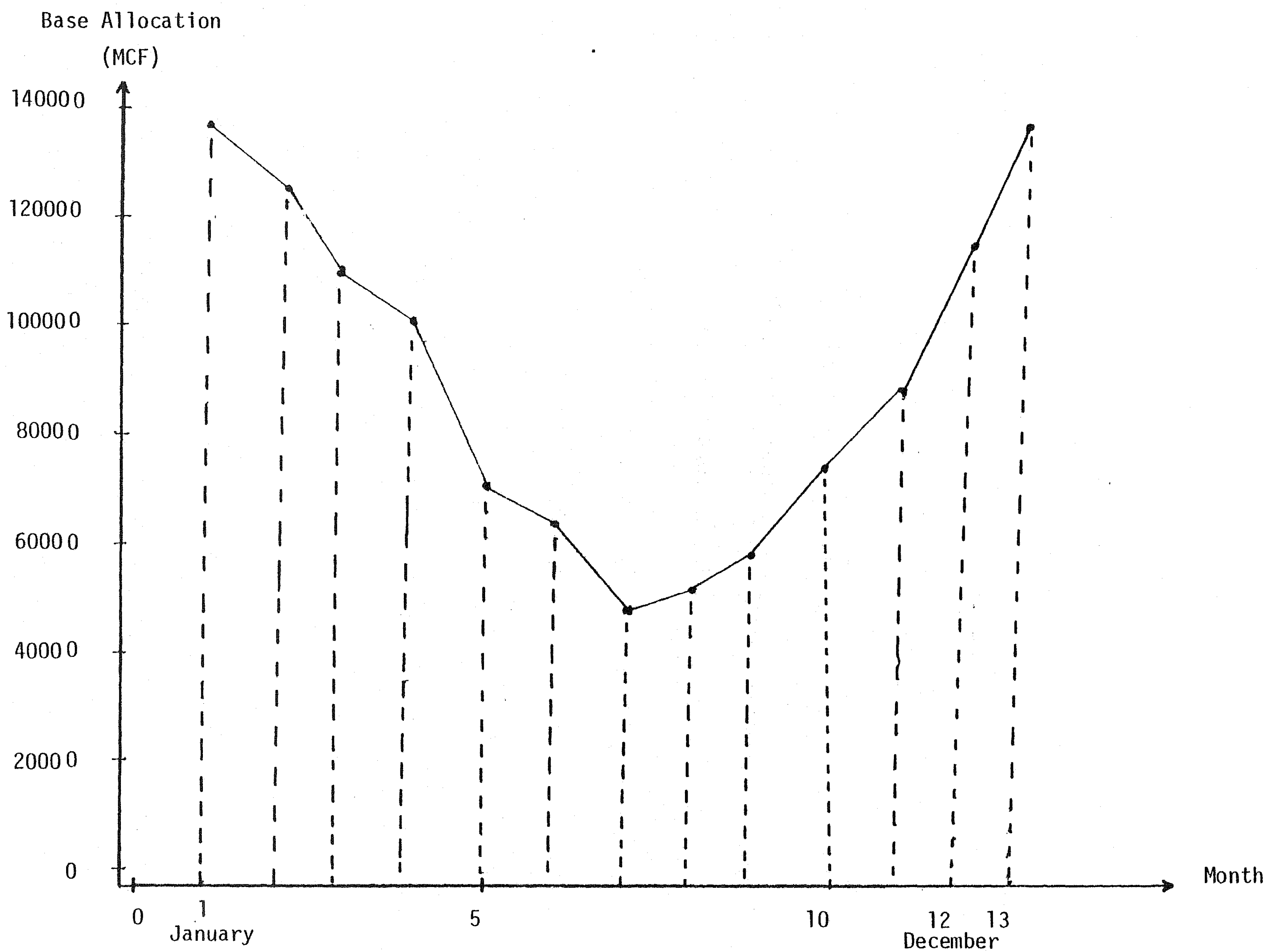


Figure F-19 Monthly Industrial Base Allocations for SIC 25 in the EOGC Service Area

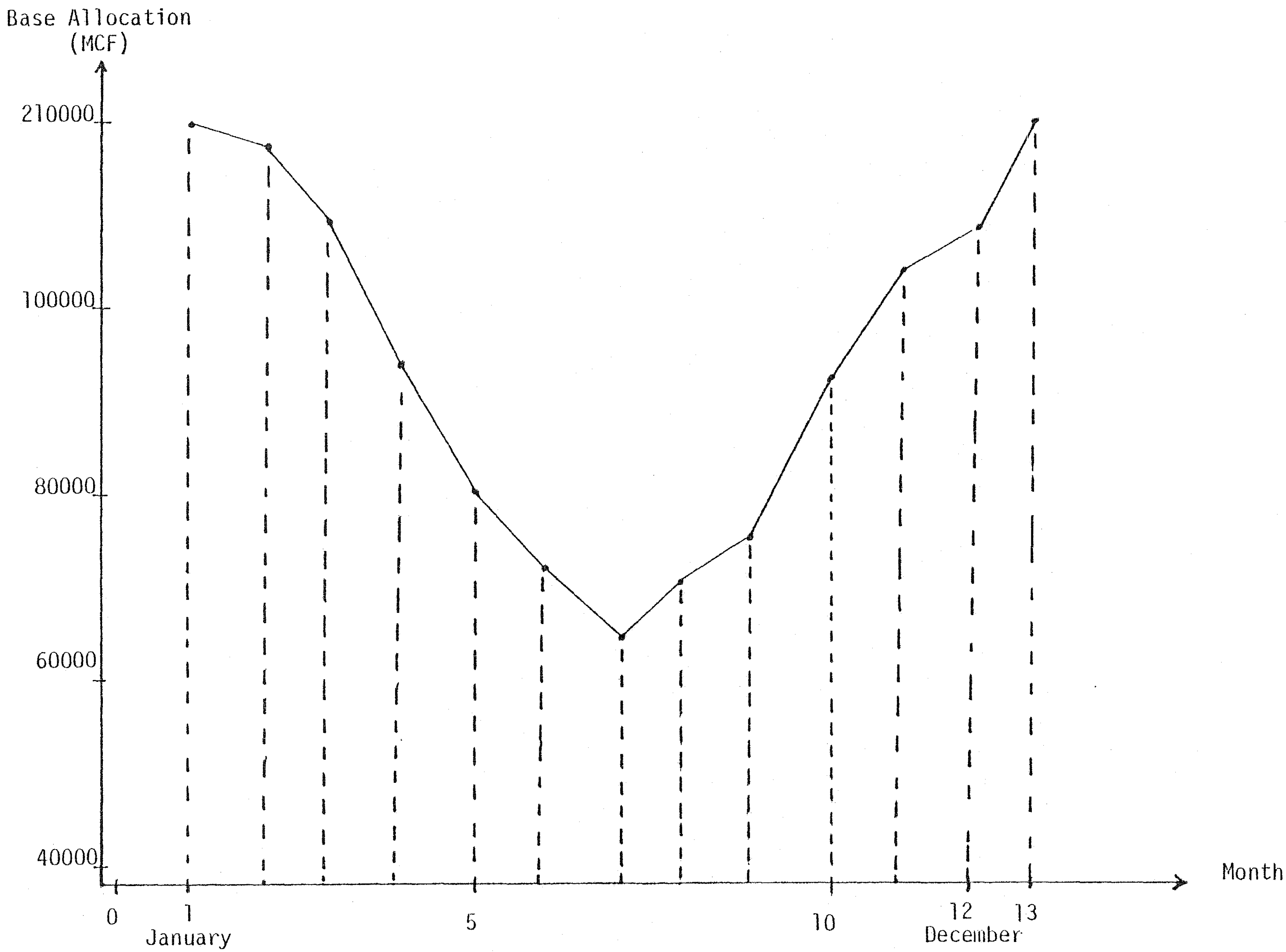


Figure F-20 Monthly Industrial Base Allocations for SIC 26 in the EOGC Service Area

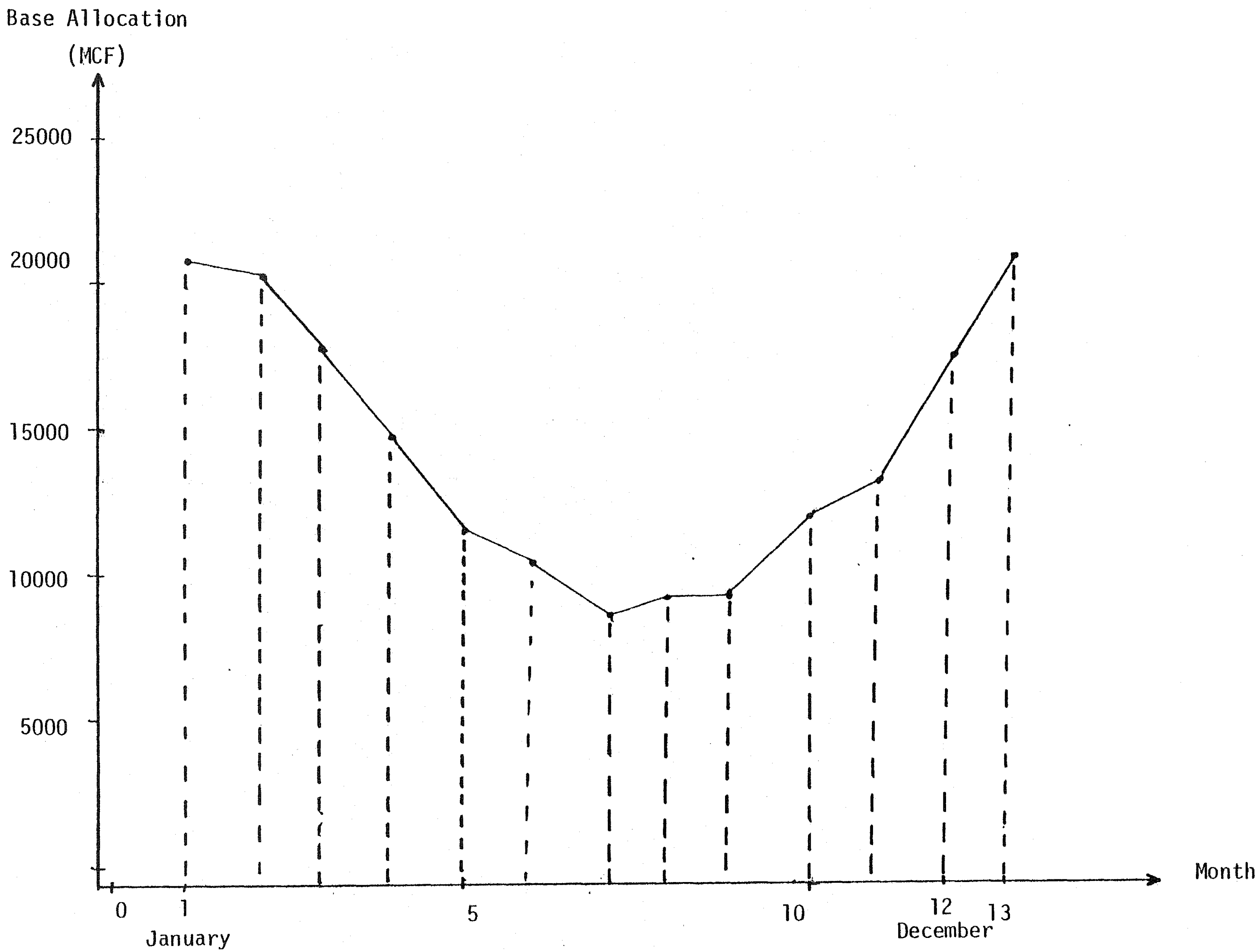


Figure F-21 Monthly Industrial Base Allocations for SIC 27 in the EOGC Service Area

336

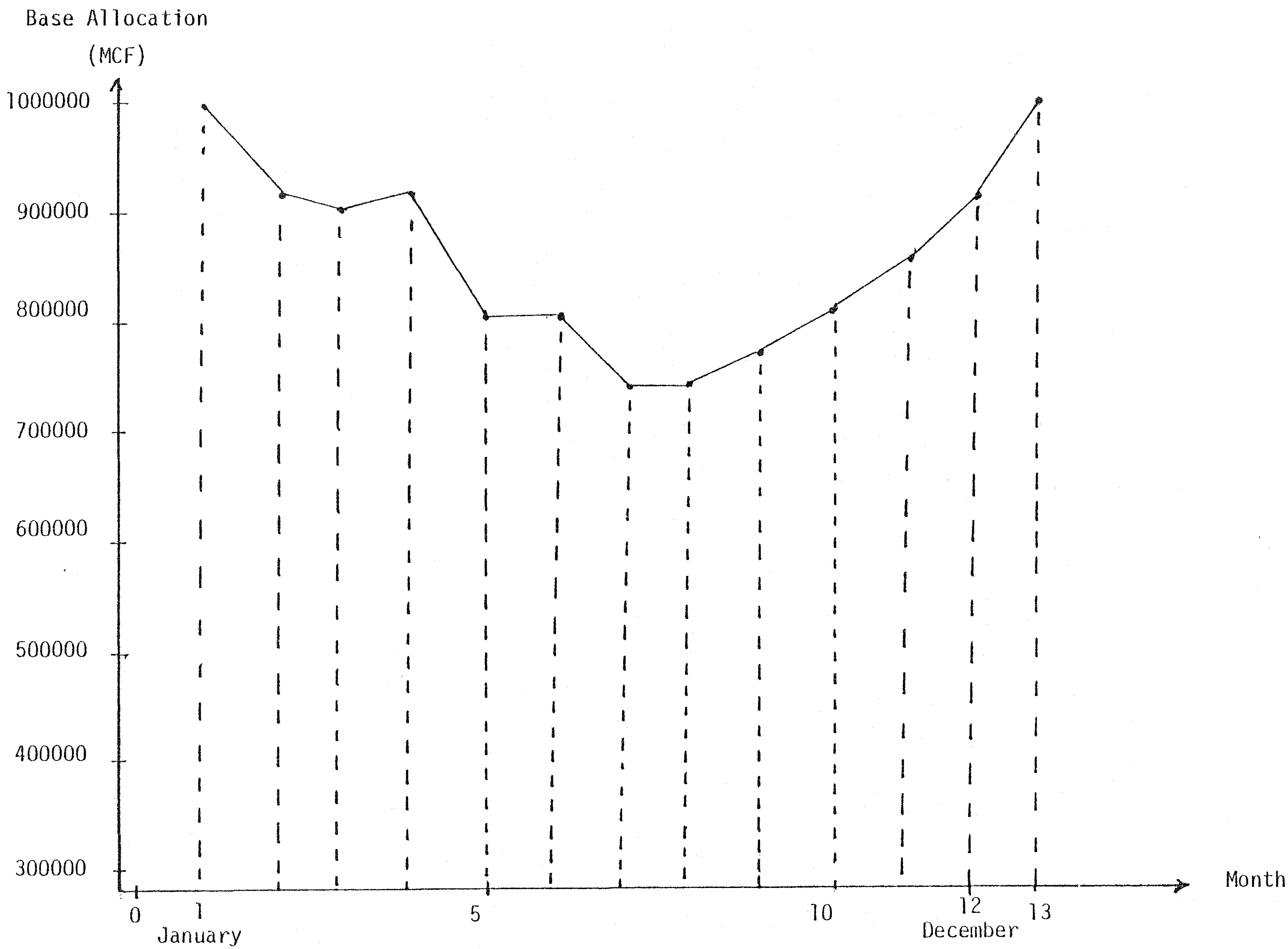


Figure F-22 Monthly Industrial Base Allocations for SIC 28 in the EOGC Service Area

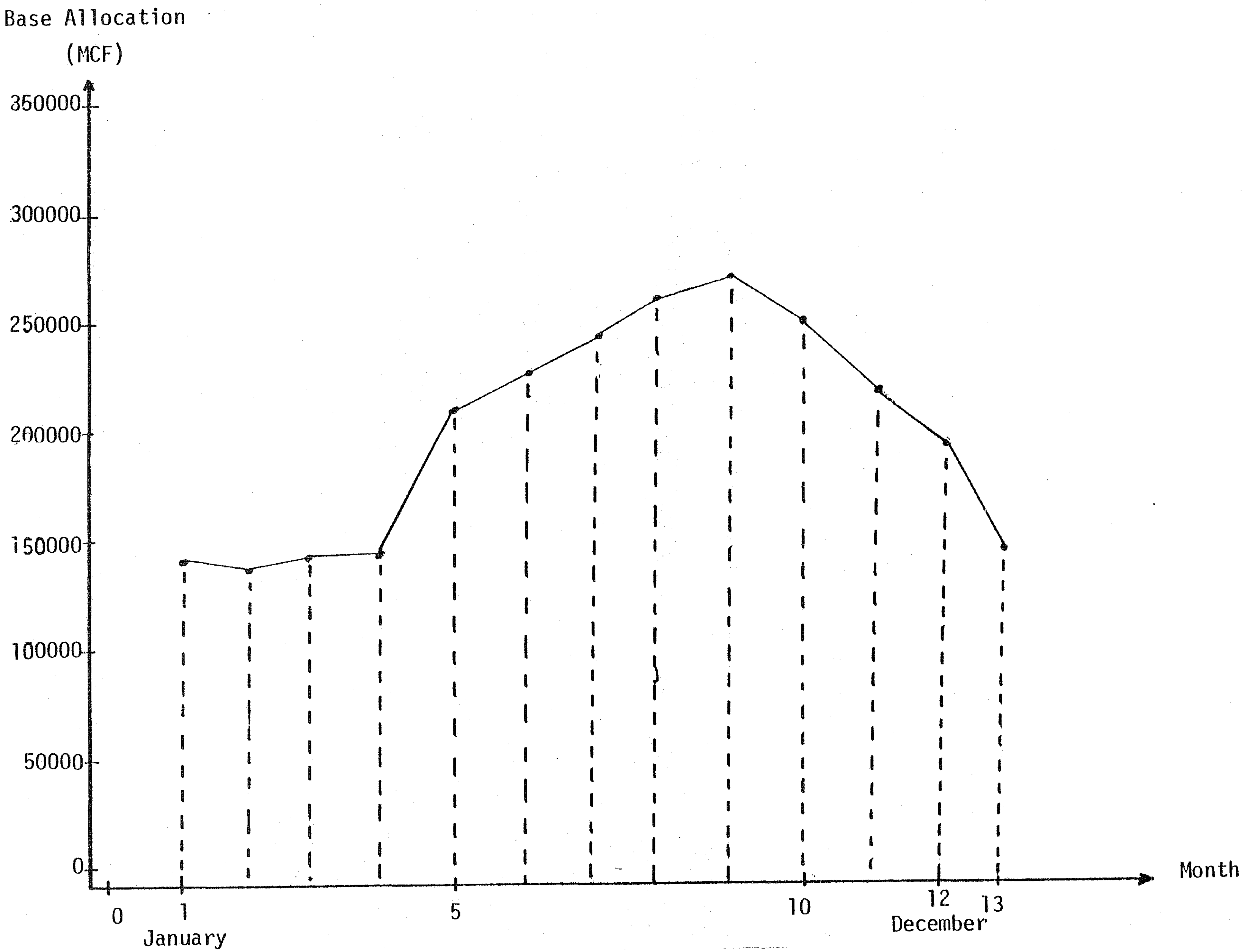


Figure F-23 Monthly Industrial Base Allocations for SIC 29 in the EOGC Service Area

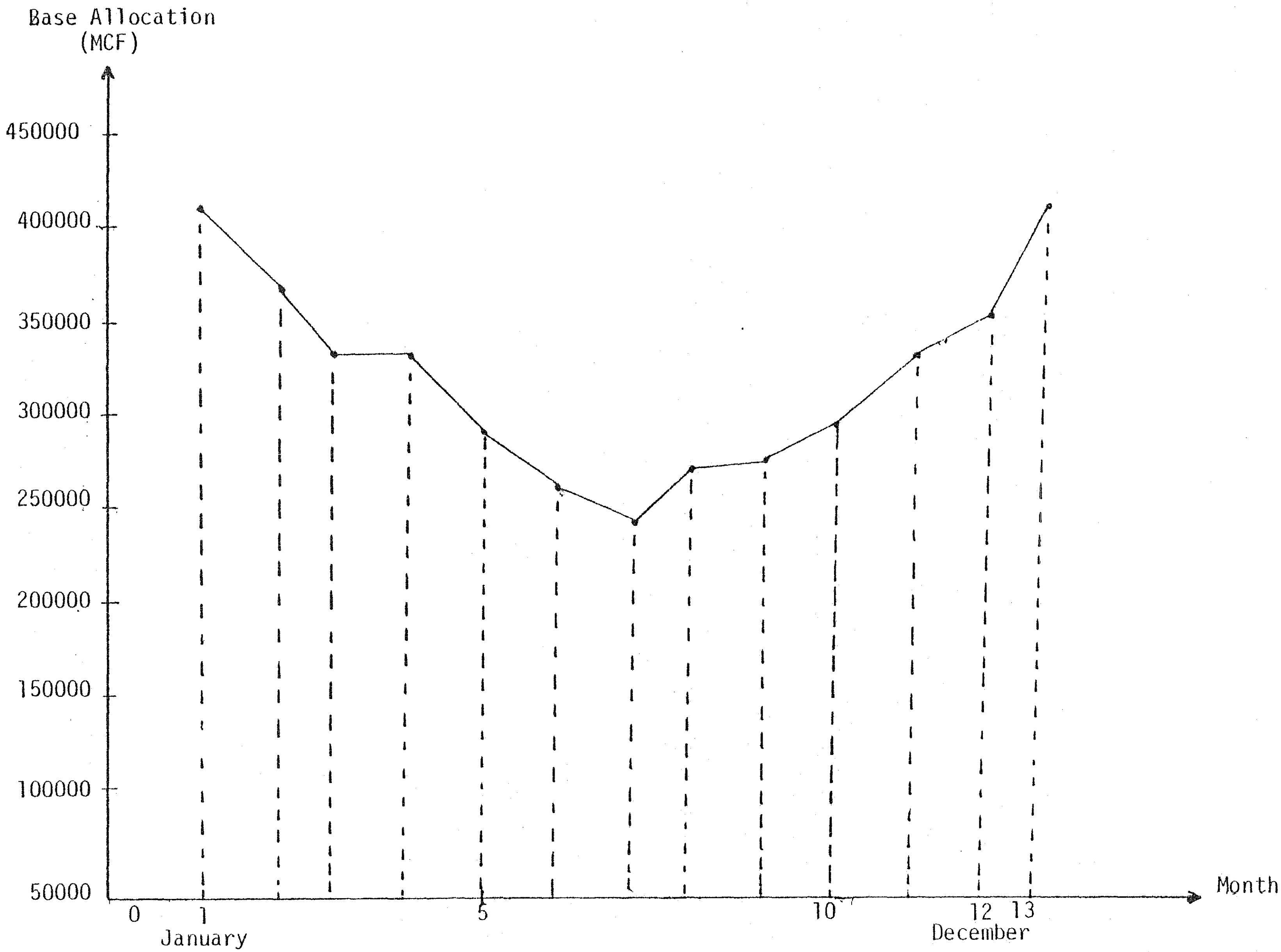


Figure F-24 Monthly Industrial Base Allocations for SIC 30 in the EOGC Service Area

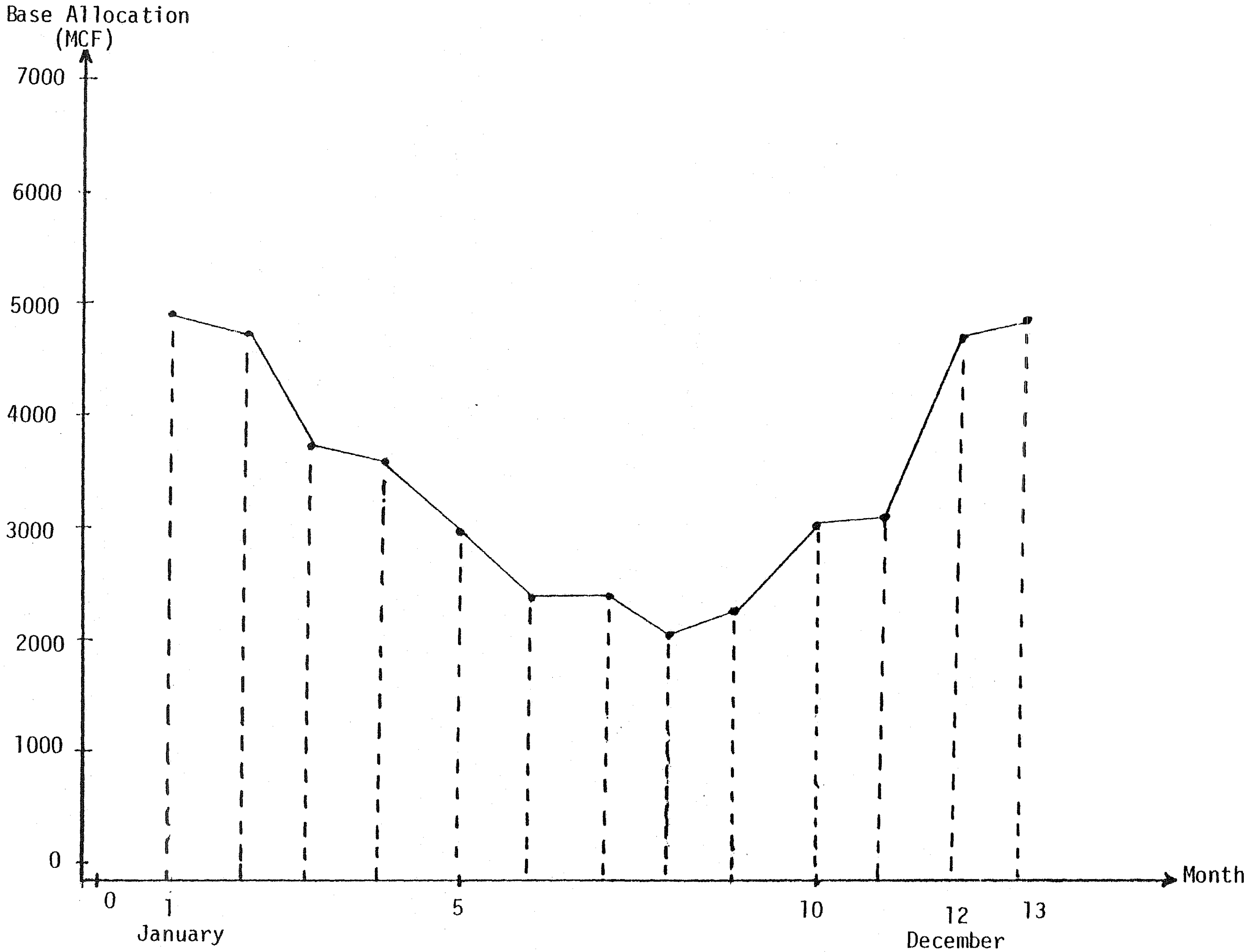


Figure F-25 Monthly Industrial Base Allocations for SIC 31 in the EOGC Service Area

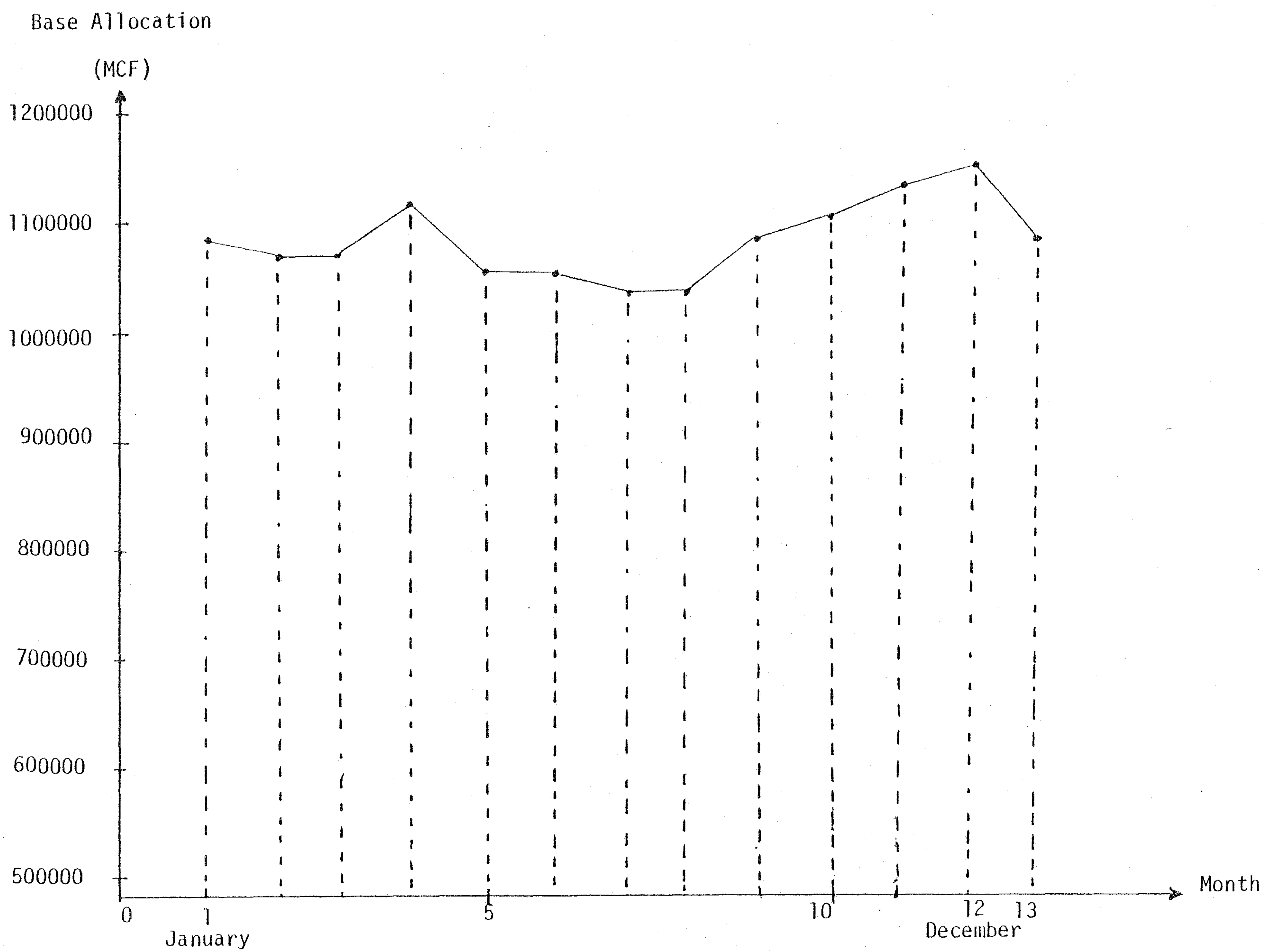


Figure F-26 Monthly Industrial Base Allocations for SIC 32 in the EOGC Service Area

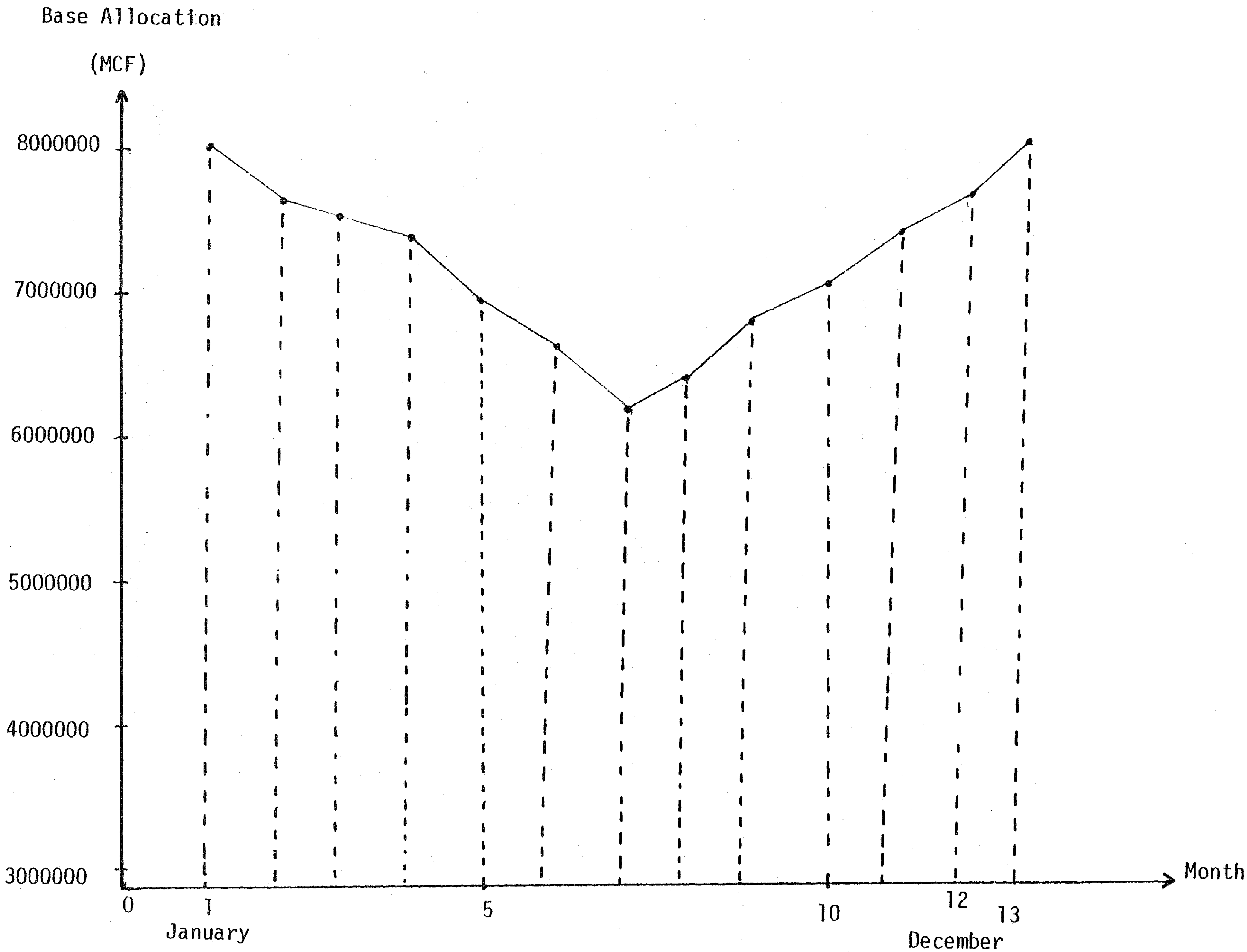


Figure F-27 Monthly Industrial Base Allocations for SIC 33 in the EOGC Service Area

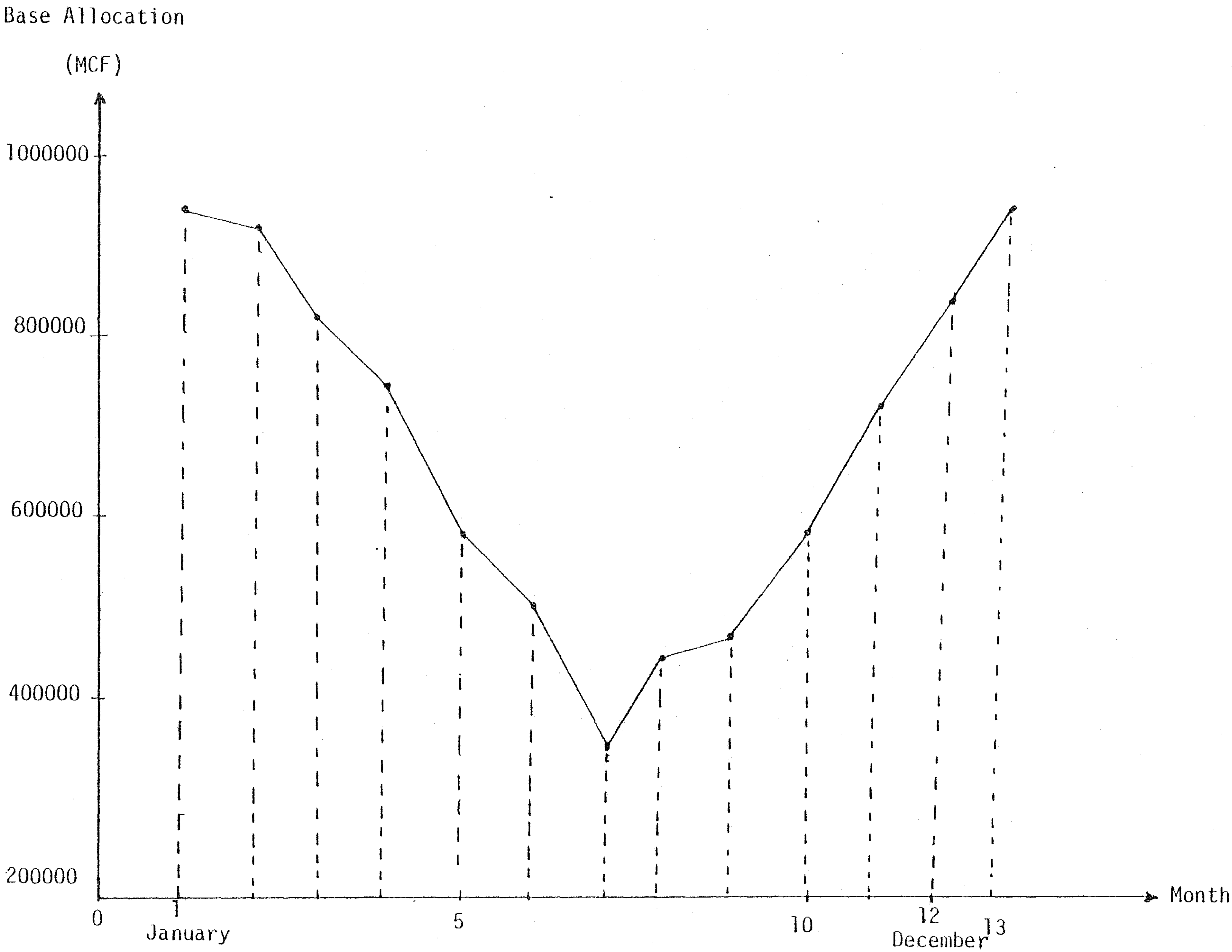


Figure F-28 Monthly Industrial Base Allocations for SIC 34 in the EOGC Service Area

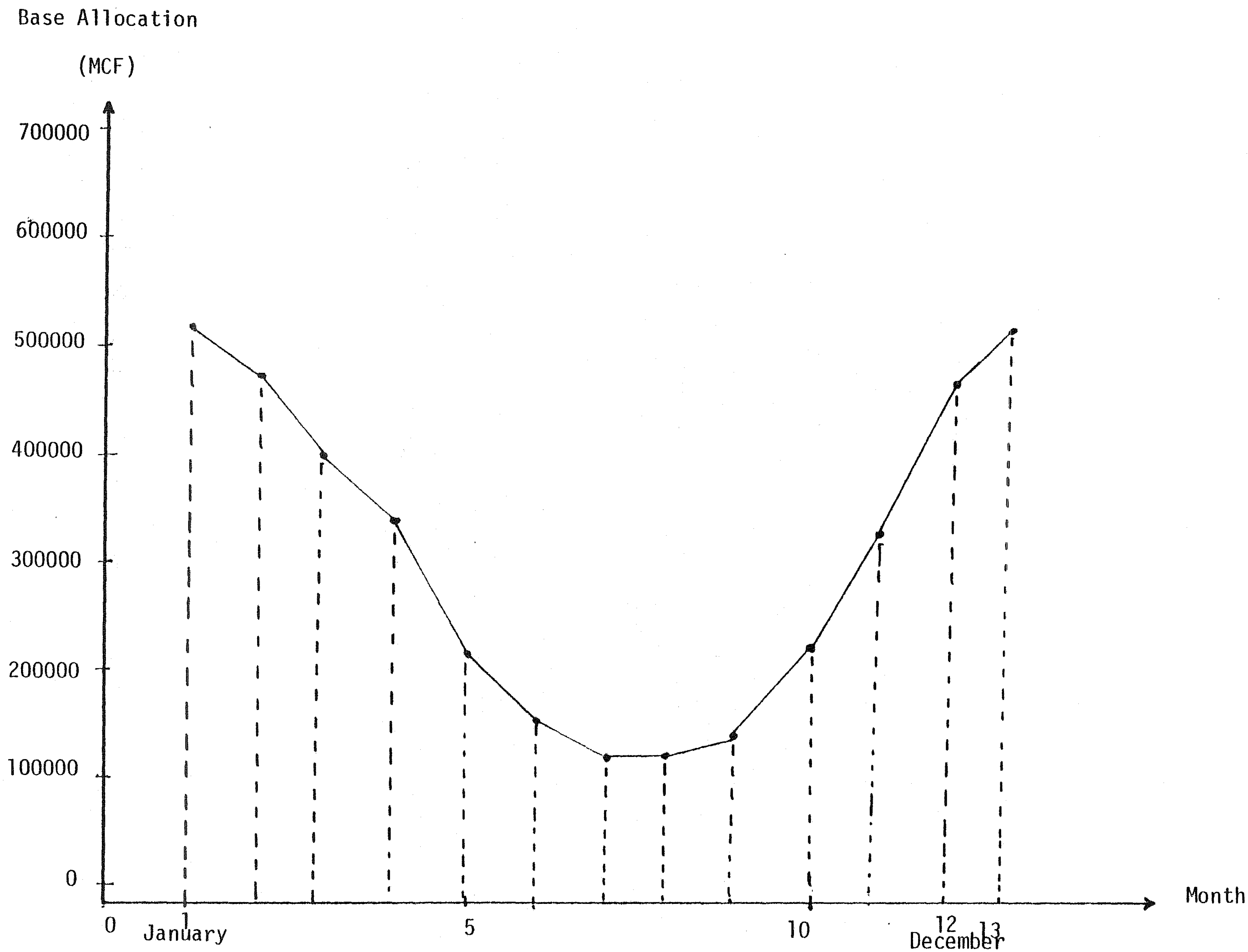


Figure F-29 Monthly Industrial Base Allocations for SIC 35 in the EOGC Service Area

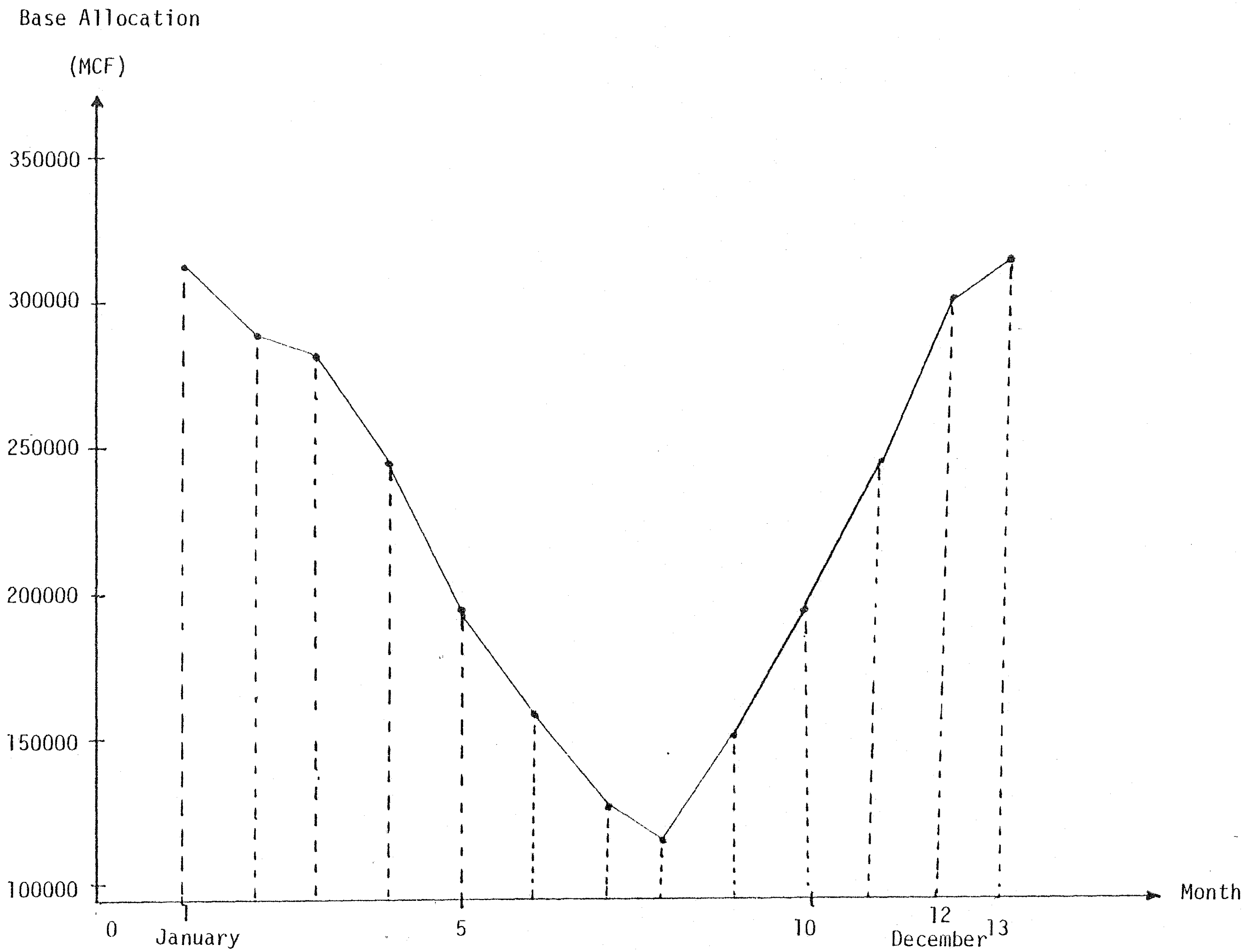


Figure F-30 Monthly Industrial Base Allocations for SIC 36 in the EOGC Service Area

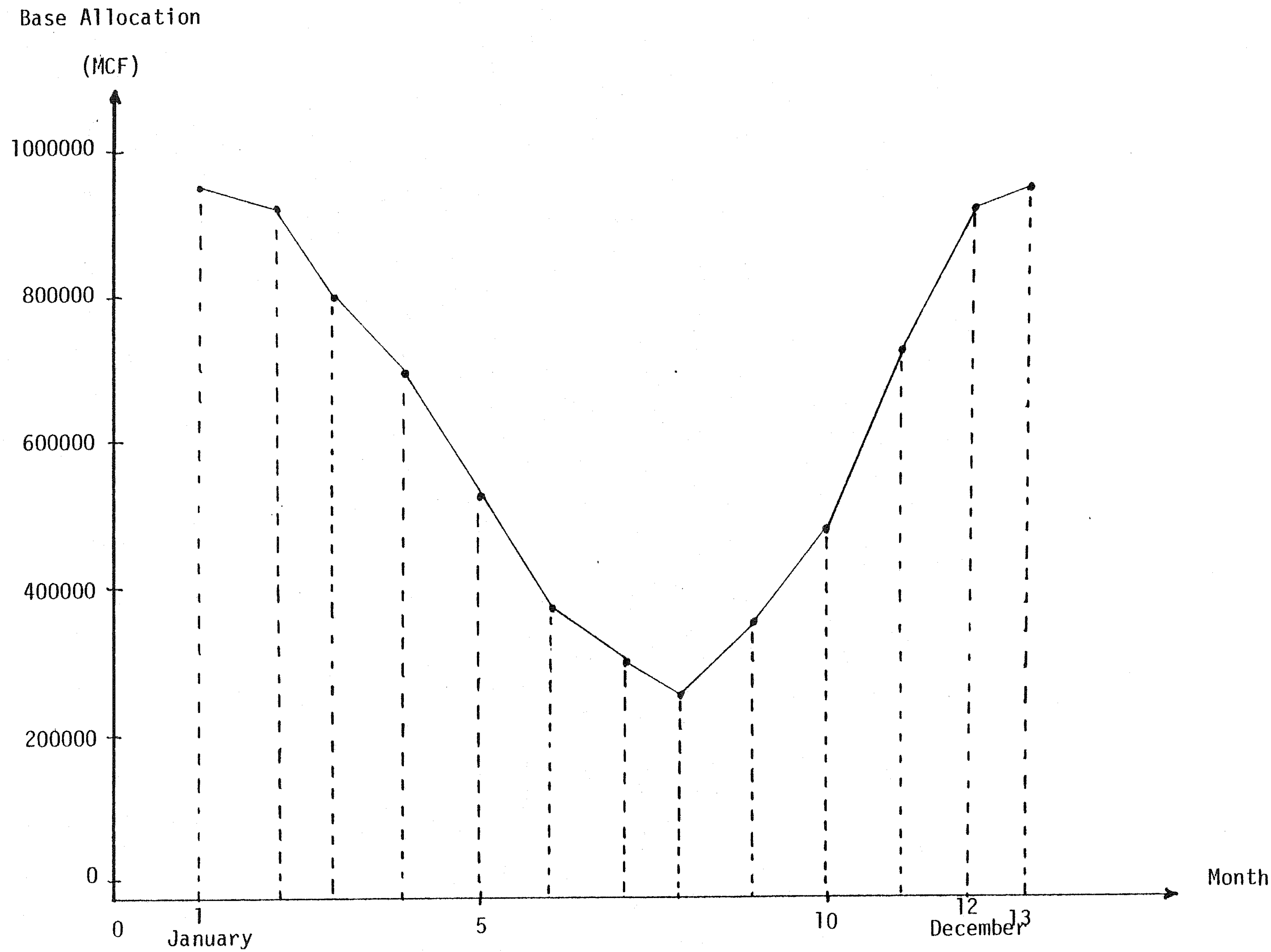


Figure F-31 Monthly Industrial Base Allocations for SIC 37 in the EOGC Service Area

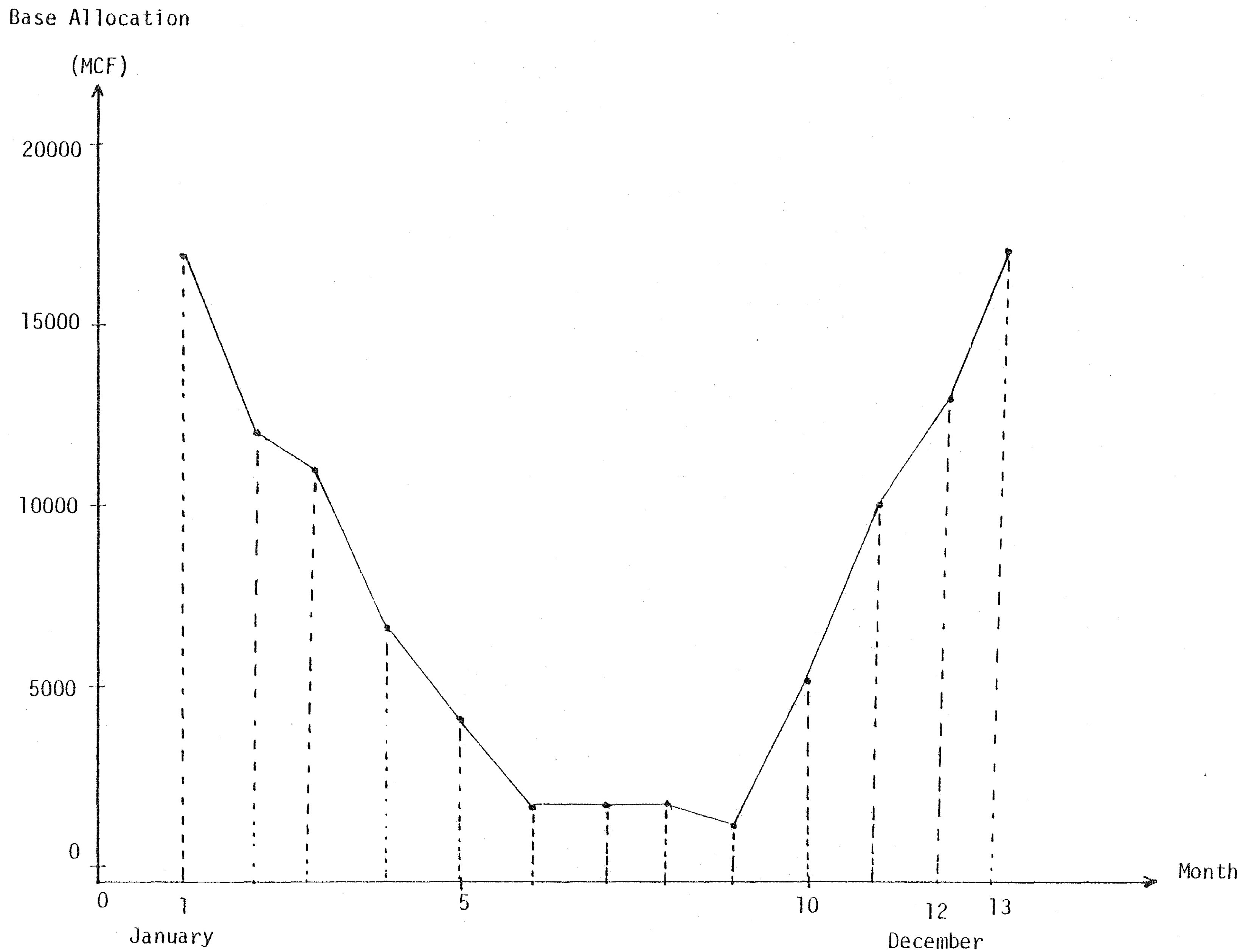


Figure F-32 Monthly Industrial Base Allocations for SIC 38 in the EOGC Service Area

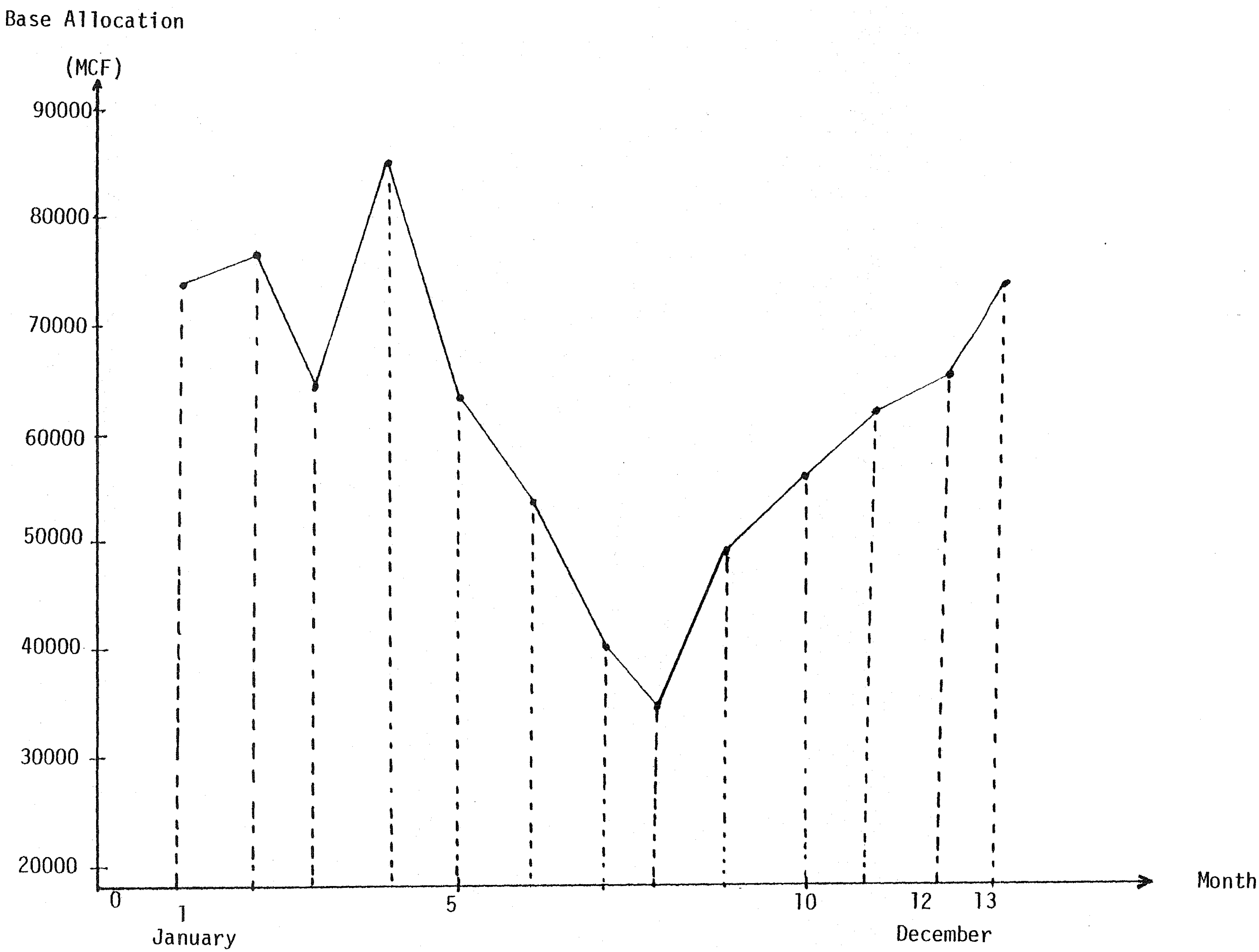


Figure F-33 Monthly Industrial Base Allocations for SIC 39 in the EOGC Service Area

Table F-38 Forecast of Industrial Sector Gas Demand by the East Ohio Gas Company (MMCF Per Year at 14.73 psia)

SIC ar	20 Goods & Kindred Products	28 Chemicals & Allied Products	29 Petroleum & Coal Products	30 Rubber & Misc. Plastics	32 Stone, Clay & Glass Products	33 Primary Metals	34 - 36 Fabricated & Metal Products	All Other Industrials	Total Industrial
'72 Actual	2,350	9,372	2,156	4,711	11,827	87,384	14,332	12,787	144,919
'73 "	2,411	8,862	2,597	4,417	13,325	89,856	13,352	13,568	148,388
'74 "	2,305	9,173	2,412	4,175	13,046	90,514	14,751	13,673	150,049
'75 "	2,361	6,846	2,007	3,069	10,387	73,415	10,741	9,204	118,030
'76 "	2,506	7,268	2,130	3,258	11,027	77,942	11,403	9,774	125,308
'77[a] Act+Est	2,280	6,612	1,938	2,964	10,032	70,907	10,374	8,891	113,998
'78 Forecast[a]	2,830	8,207	2,406	3,679	12,452	88,013	12,877	11,036	141,500
'79 "	2,876	8,340	2,445	3,739	12,654	89,444	13,086	11,216	143,800
'80 "	2,926	8,485	2,487	3,804	12,874	90,999	13,313	11,412	146,300
'81 "	2,984	8,654	2,536	3,879	13,130	92,802	13,577	11,638	149,200
'82 "	3,032	8,793	2,577	3,942	13,341	94,295	13,796	11,824	151,600
'83 "	3,062	8,880	2,603	3,981	13,473	95,228	13,932	11,941	153,100
84 "	3,092	8,967	2,628	4,020	13,605	96,161	14,069	12,058	154,600
85 "	3,102	8,996	2,637	4,033	13,649	96,472	14,114	12,097	155,100
86 "	3,178	9,216	2,701	4,131	13,983	98,836	14,460	12,395	158,900
87 "	3,262	9,460	2,773	4,241	14,353	101,448	14,842	12,721	163,100

emand by Industrial Section based on 1976 actual relationship of SIC Industrial Sales ÷ Total Industrial Sales as follows:

SIC	Percent
20	2.0
28	5.8
29	1.7
30	2.6
32	8.8
33	62.2
34-36	9.1
All Other	7.8
	100.0%

TABLE F-39 Comparison of Total Gas Consumption of the EOGC Industrial Customers With the Consumption of the 501 Major Industrial Customers (MMCF)

SIC	Year	Total Gas Consumption X1 (MMCF)	Consumption of the 501 major industrial X2 (MMCF)	X1 - X2	(X1 - X2) / X1 x 100
20					
	1975	2,361	1,940	421	17.8
	1976	2,506	2,094	412	16.4
28					
	1975	6,846	7,174	-328	-4.8
	1976	7,268	7,061	207	2.8
29					
	1975	2,007	1,951	56	2.8
	1976	2,130	1,983	147	6.9
30					
	1975	3,069	1,894	1,175	38.3
	1976	3,258	2,143	1,115	34.2
32					
	1975	10,387	10,681	-294	-2.8
	1976	11,027	9,574	1,453	13.2
33					
	1975	73,415	71,833	1582	2.1
	1976	77,942	71,979	5963	7.6
34-36					
	1975	10,741	10,273	468	4.3
	1976	11,403	9,844	1559	13.6
Others					
	1975	9,204	8,124	1080	11.7
	1976	9,774	7,291	2483	25.4
Total					
	1975	118,030	113,870	4160	3.6
	1976	125,308	111,969	13,339	11.9

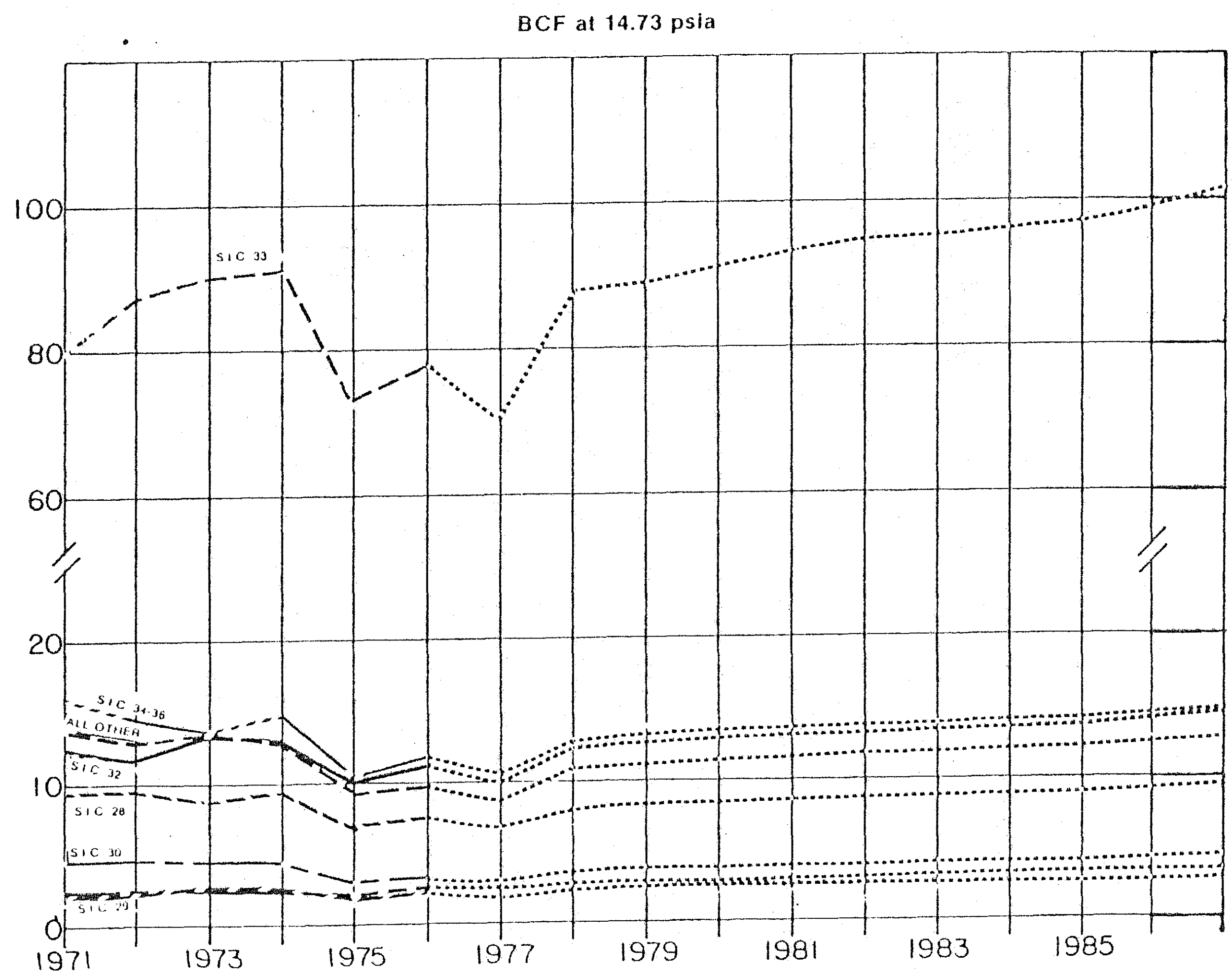


Figure F-34 Forecasts of Industrial Gas Demand by the East Ohio Gas Company

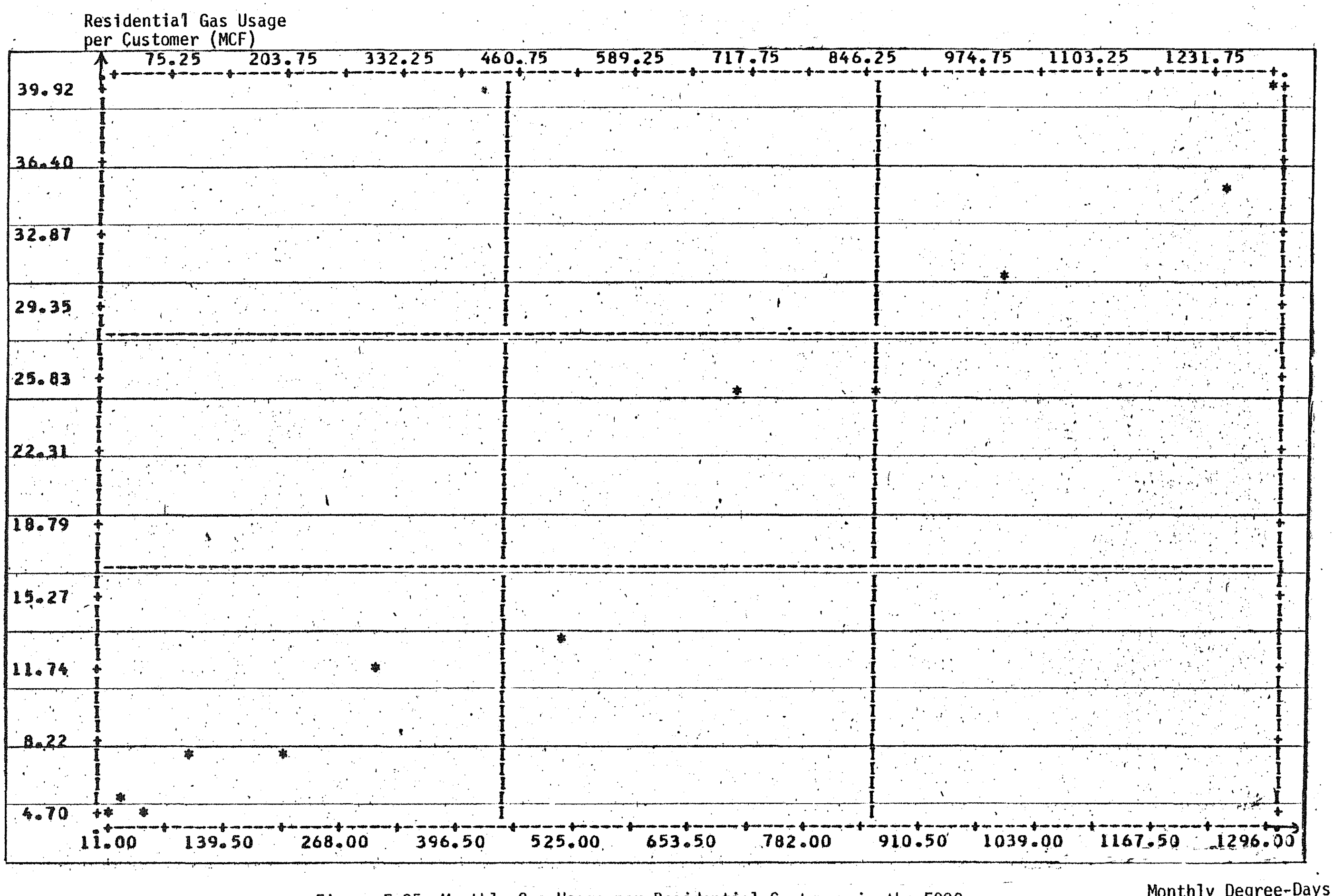


Figure F-35 Monthly Gas Usage per Residential Customer in the EOGC Service Area as a Function of Monthly Degree-Days in 1970

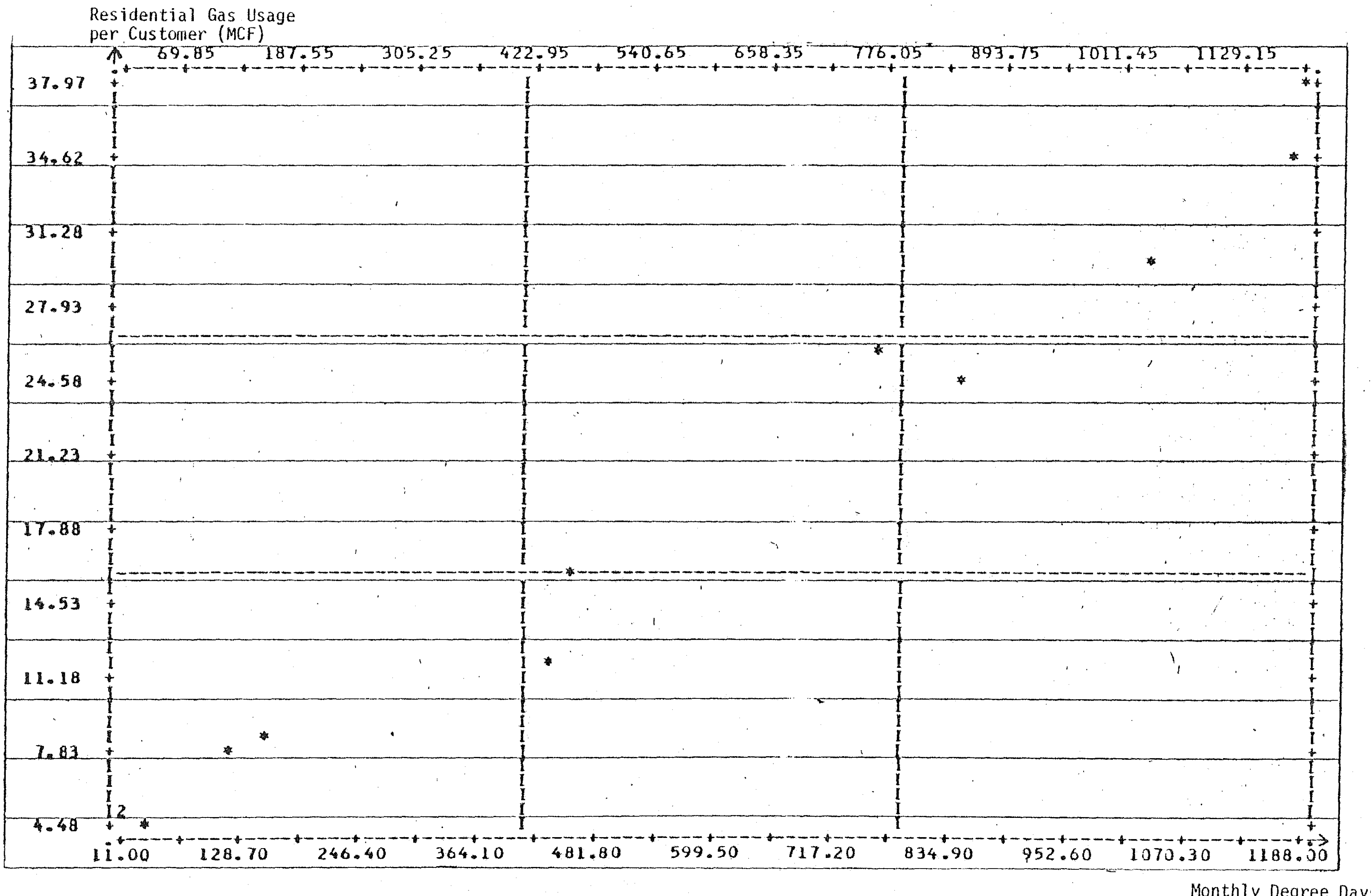


Figure F-36 Monthly Gas Usage per Residential Customer in the EOGC Service Area as a Function of Monthly Degree-Days in 1971

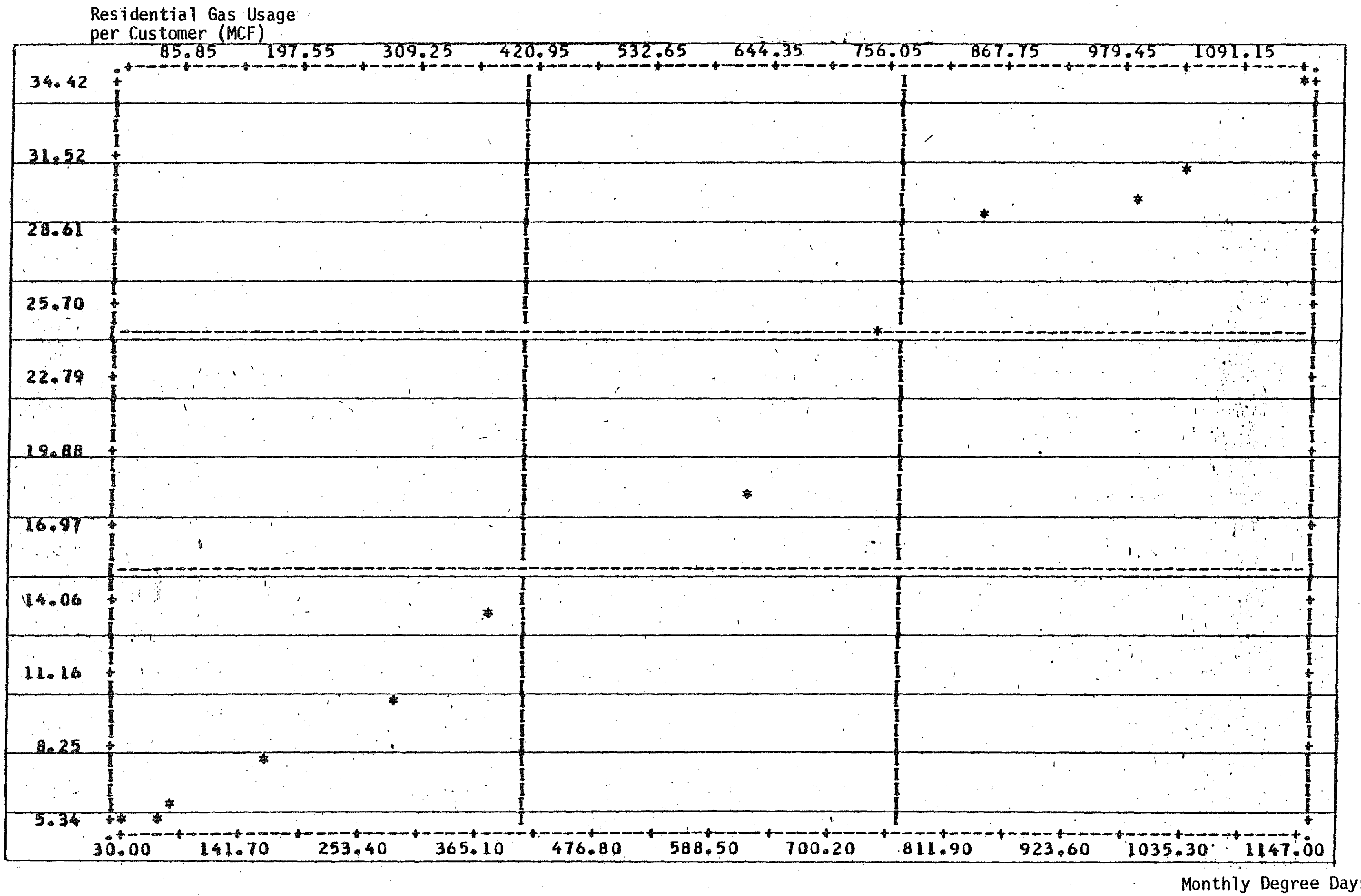


Figure F-37 Monthly Gas Usage per Residential Customer in the EOGC Service Area as a Function of Monthly Degree-Days in 1972

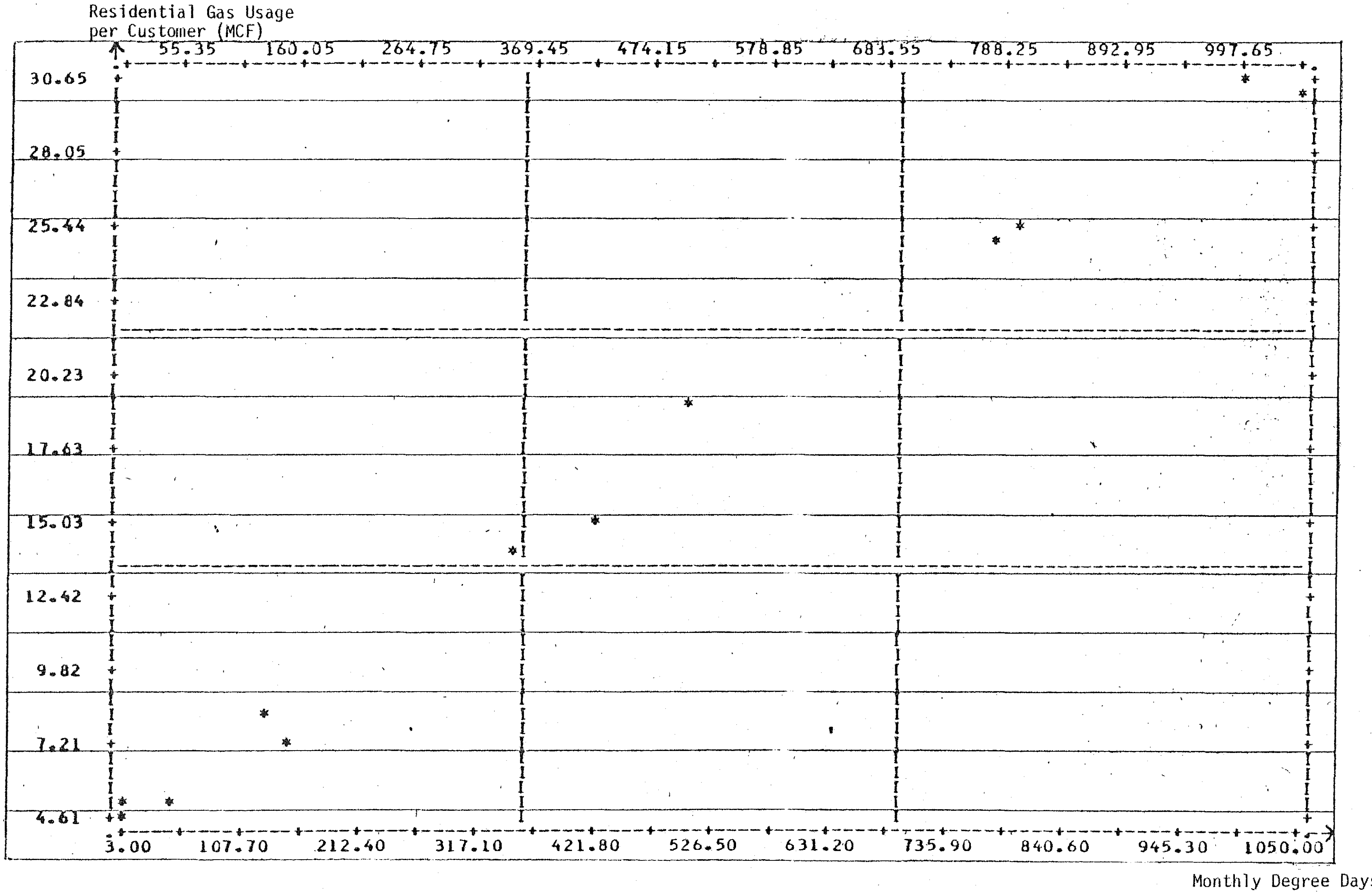


Figure F-38 Monthly Gas Usage per Residential Customer in the EOGC Service Area as a Function of Monthly Degree-Days in 1973

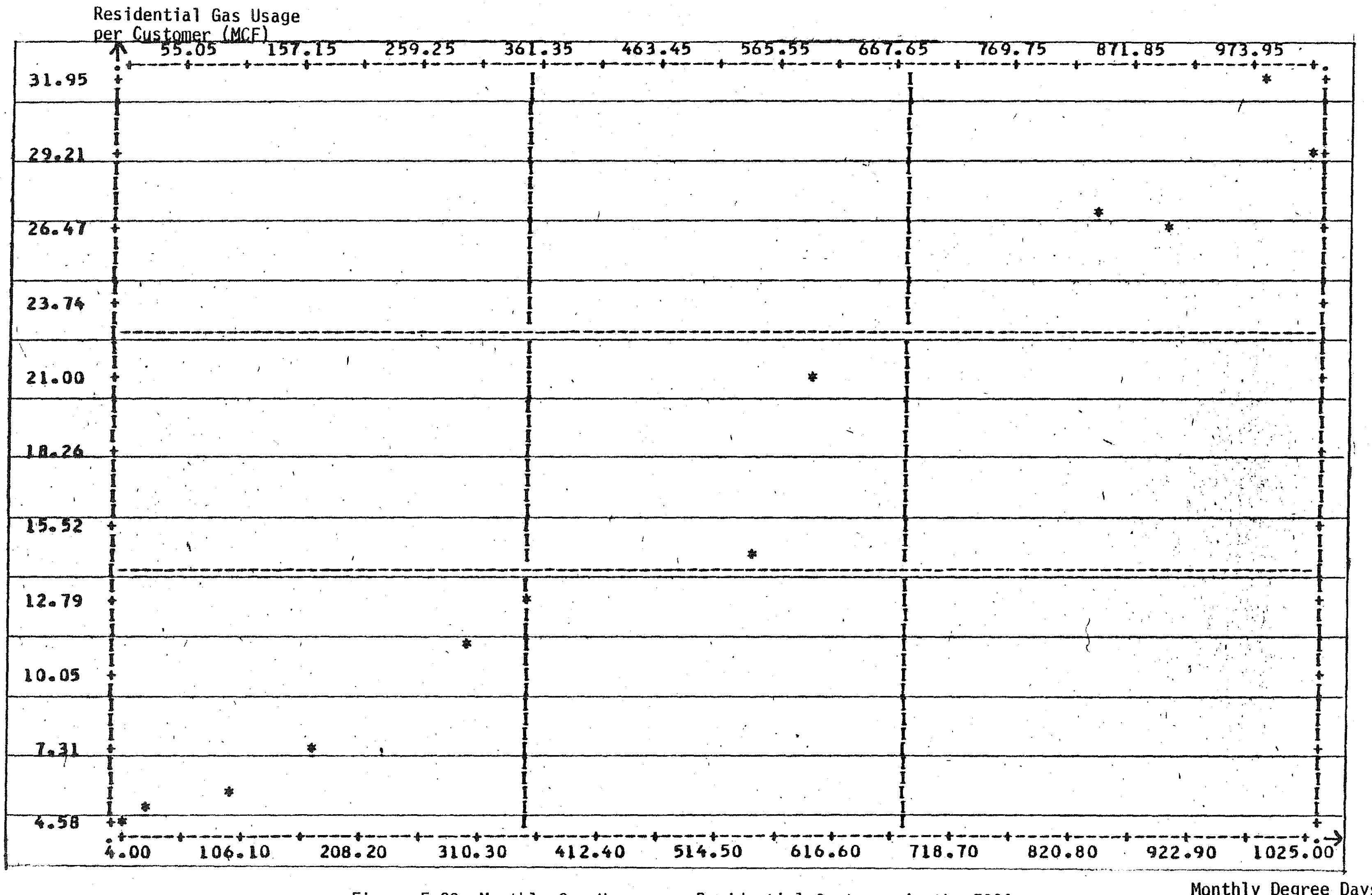


Figure F-39 Monthly Gas Usage per Residential Customer in the EOGC Service Area as a Function of Monthly Degree-Days in 1974

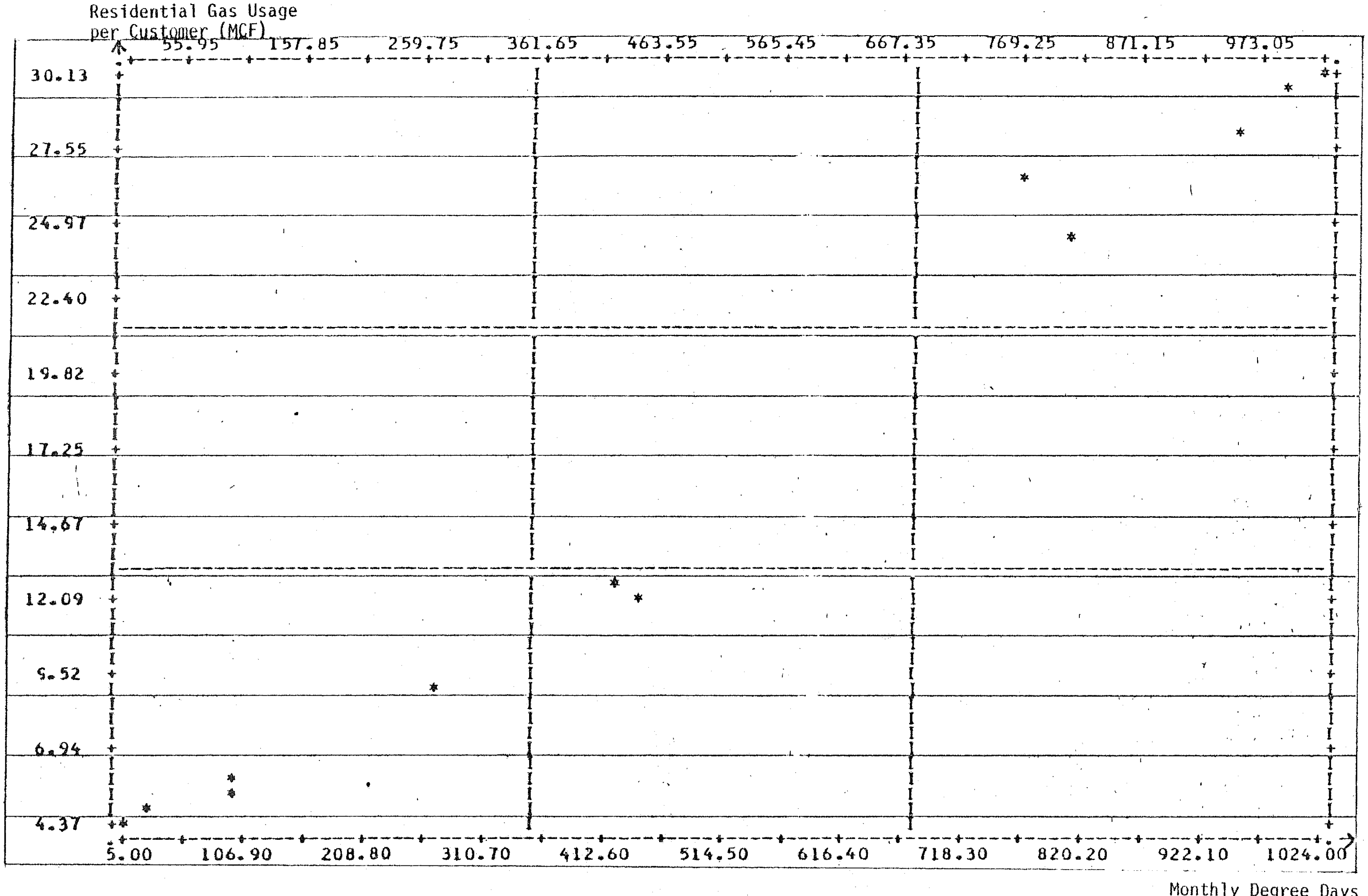


Figure F-40 Monthly Gas Usage per Residential Customer in the EOGC Service Area as a Function of Monthly Degree-Days in 1975

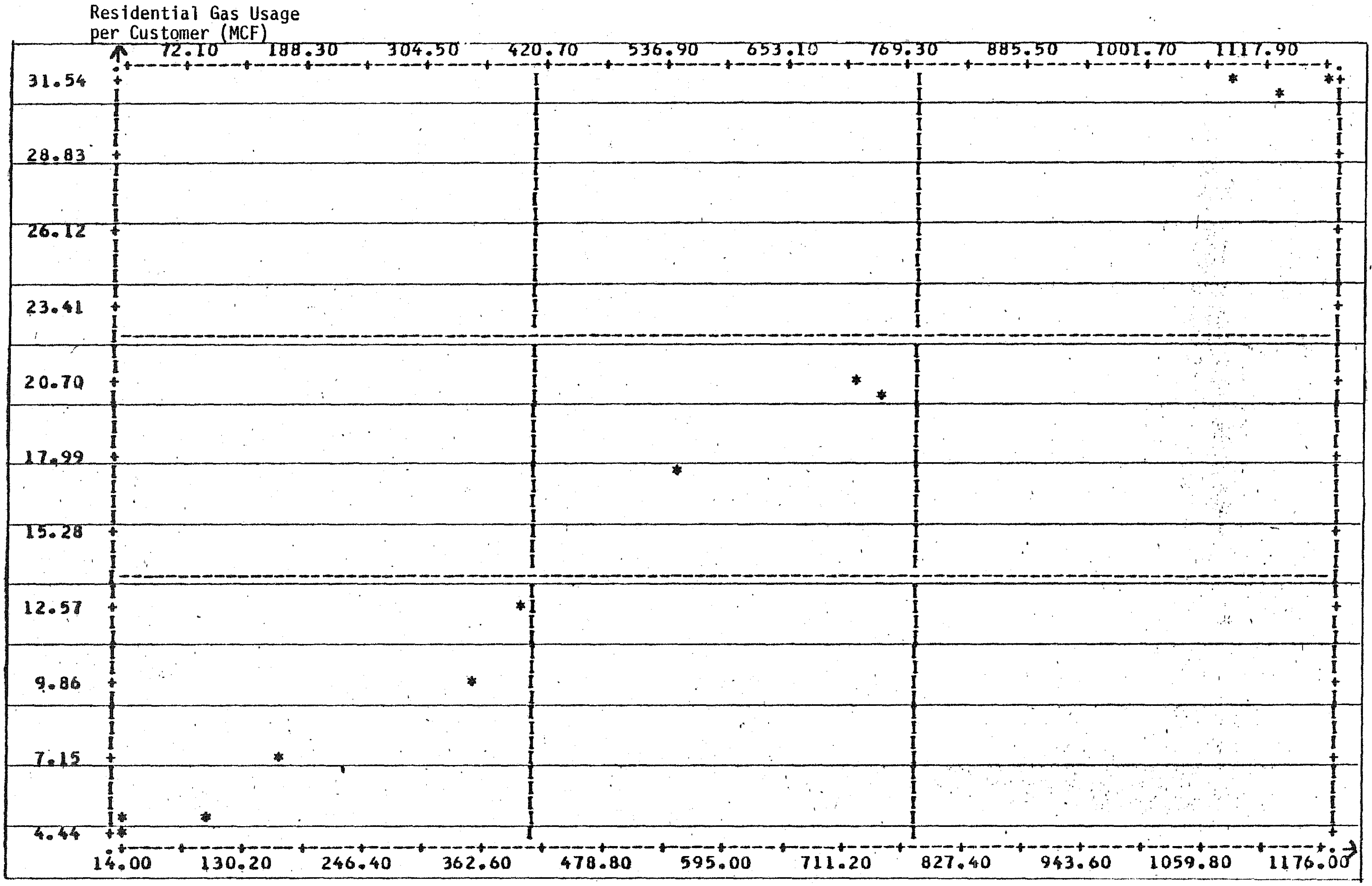


Figure F-41 Monthly Gas Usage per Residential Customer in the EOGC Service Area as a Function of Monthly Degree-Days in 1976

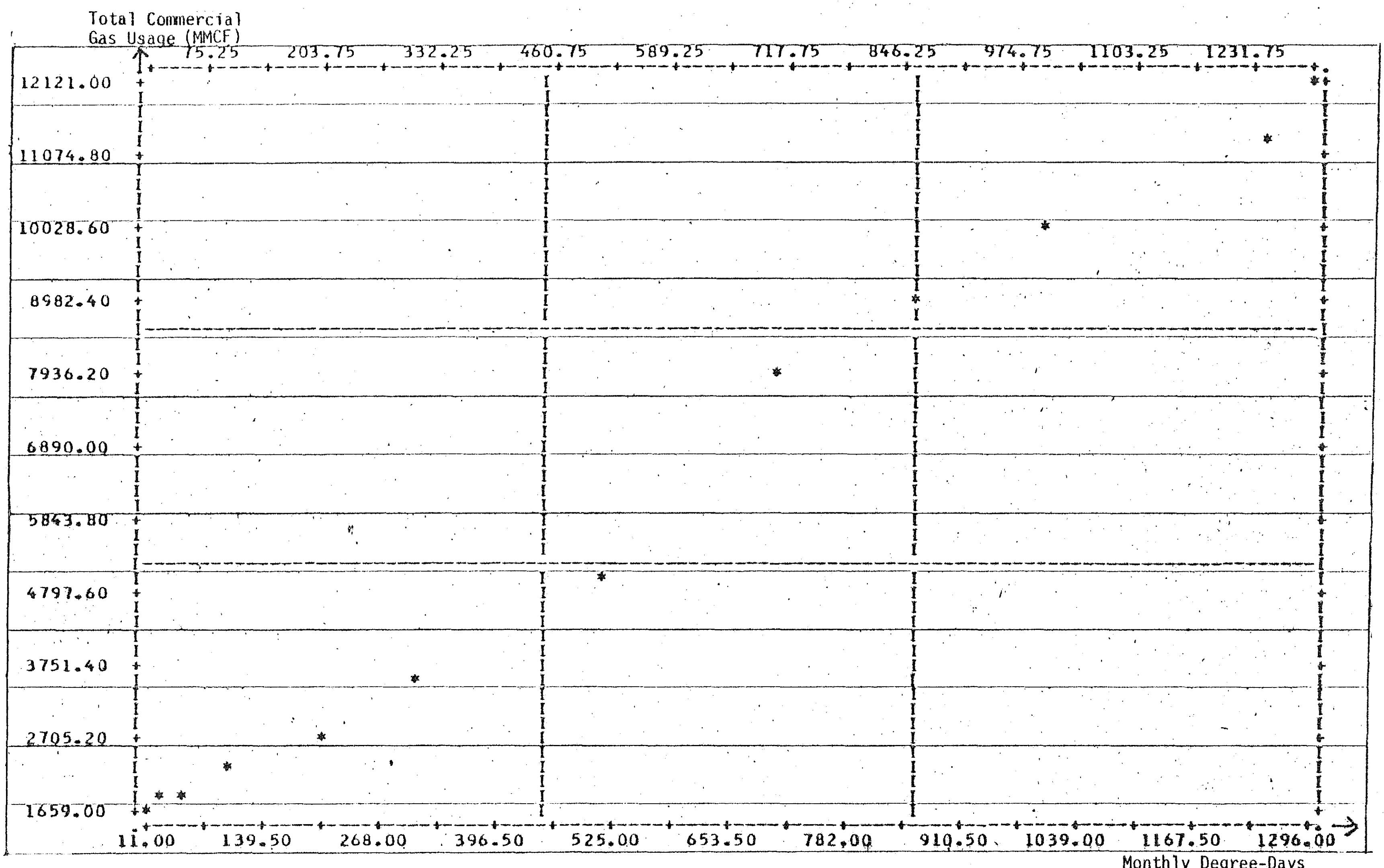


Figure F-42 Monthly Commercial Gas Usage in the EOGC Service Area as a Function of Monthly Degree-Days in 1970

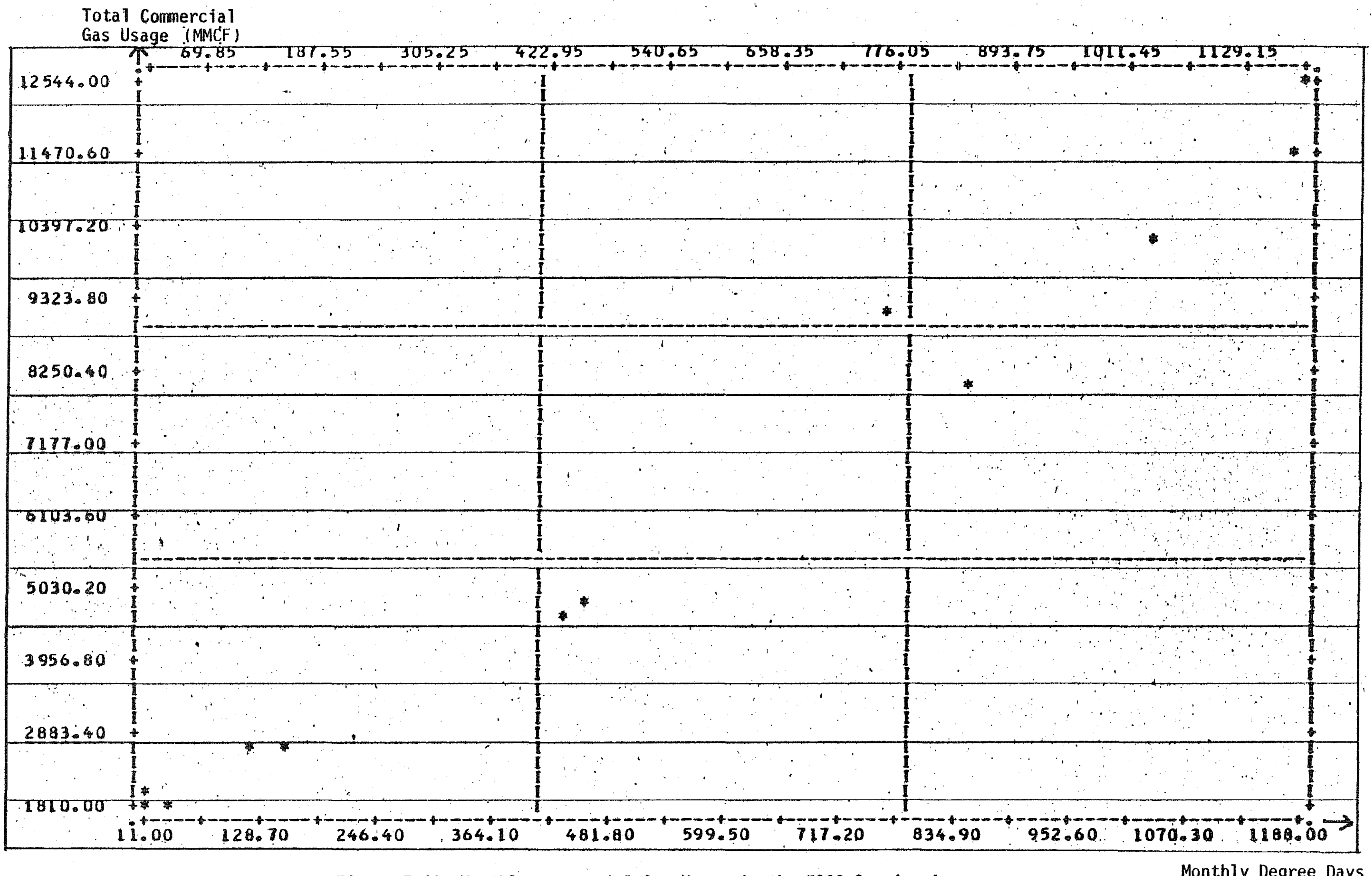


Figure F-43 Monthly Commercial Gas Usage in the EOGC Service Area as a Function of Monthly Degree-Days in 1971

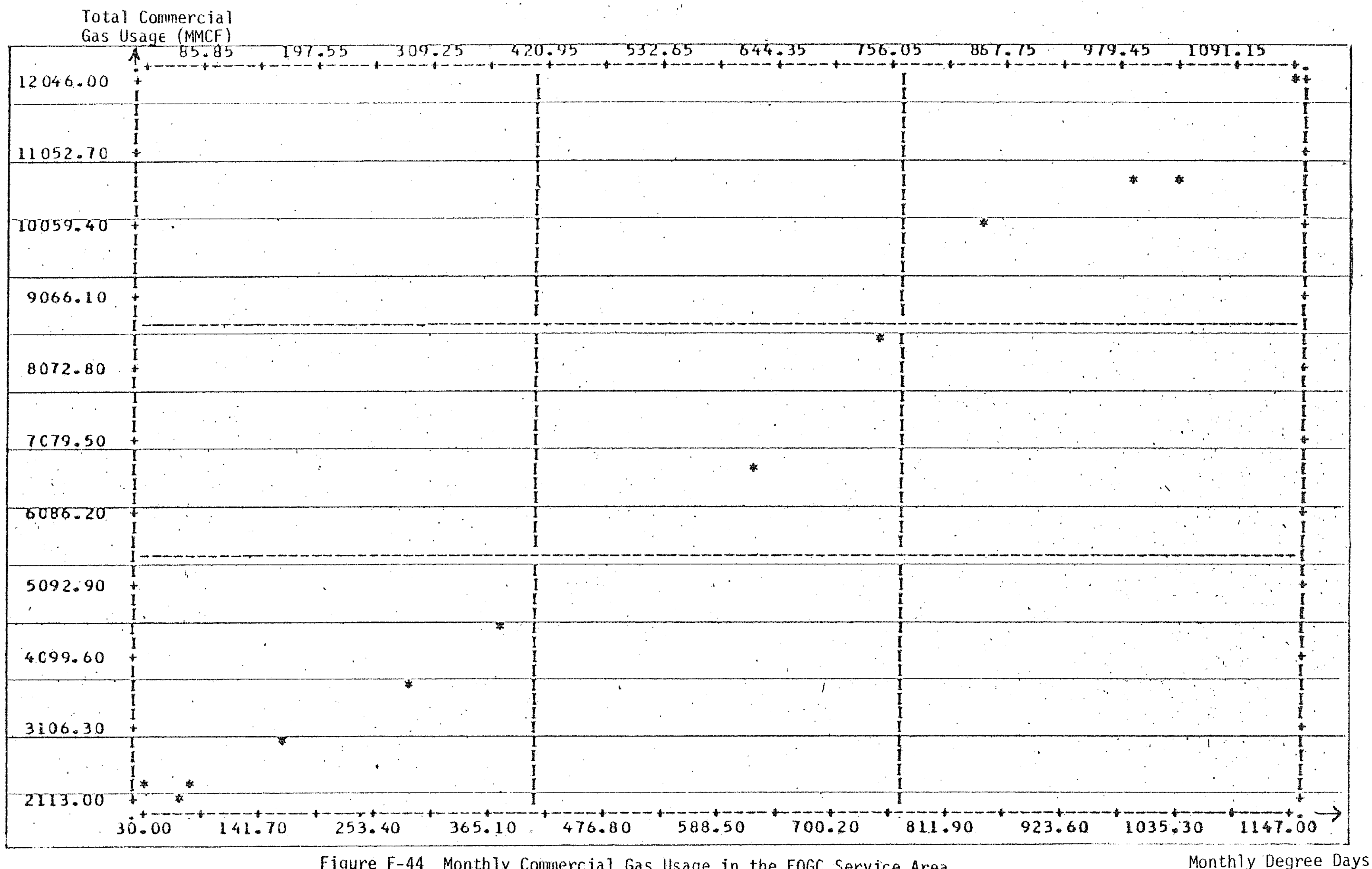


Figure F-44 Monthly Commercial Gas Usage in the EOGC Service Area as a Function of Monthly Degree-Days in 1972

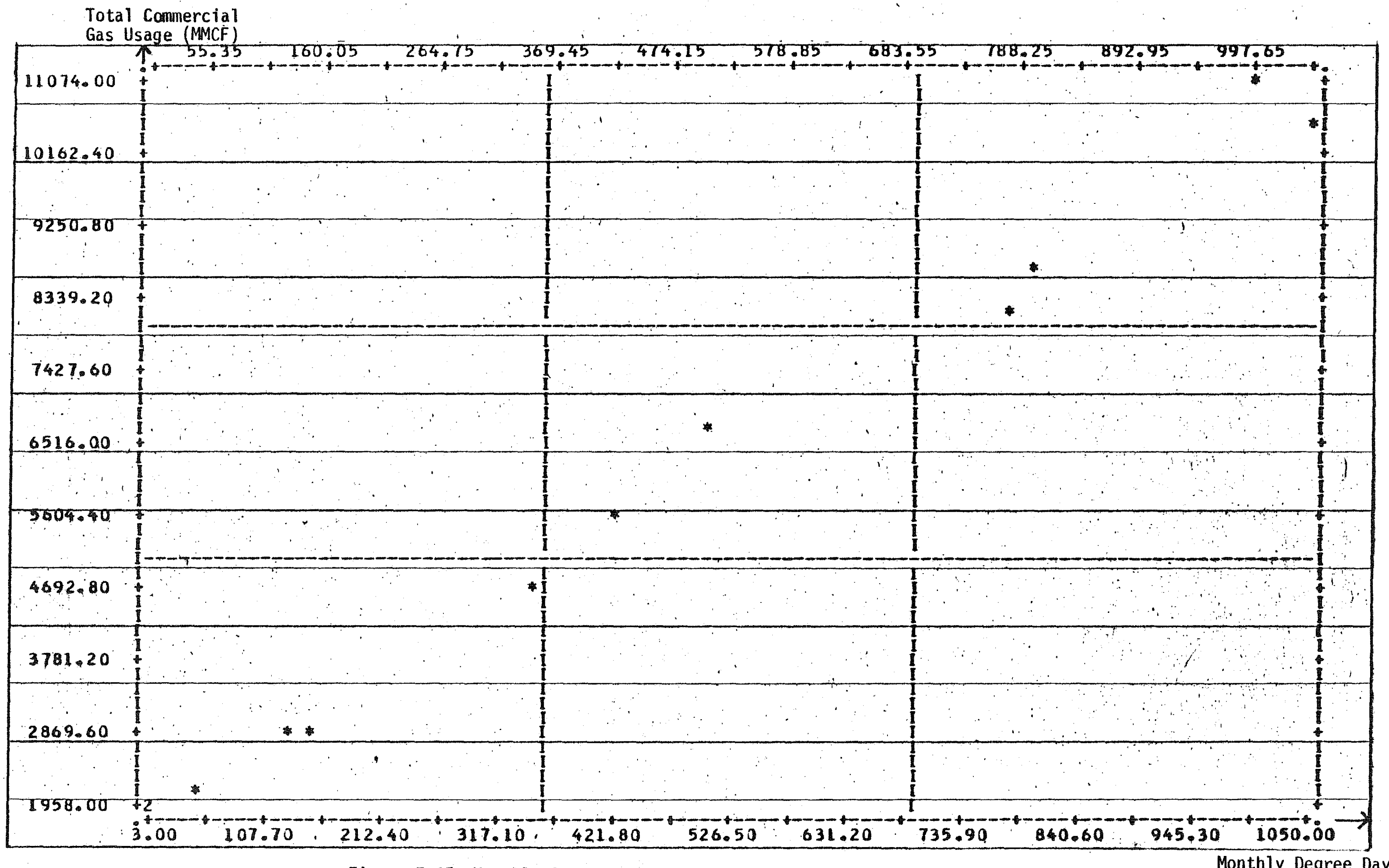


Figure F-45 Monthly Commercial Gas Usage in the EOGC Service Area as a Function of Monthly Degree-Days in 1973

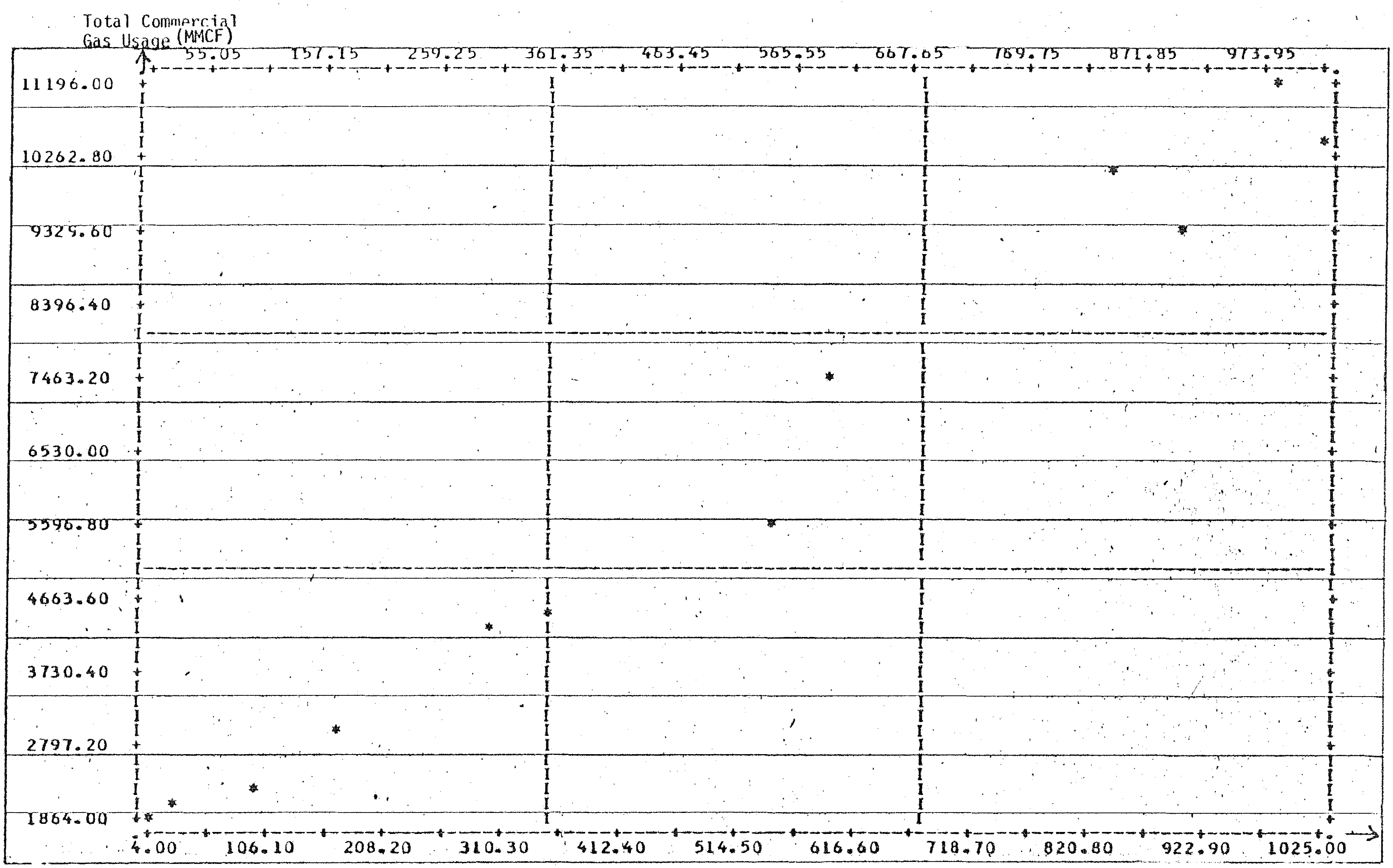


Figure F-46 Monthly Commercial Gas Usage in the EOGC Service Area as a Function of Monthly Degree-Days in 1974

363

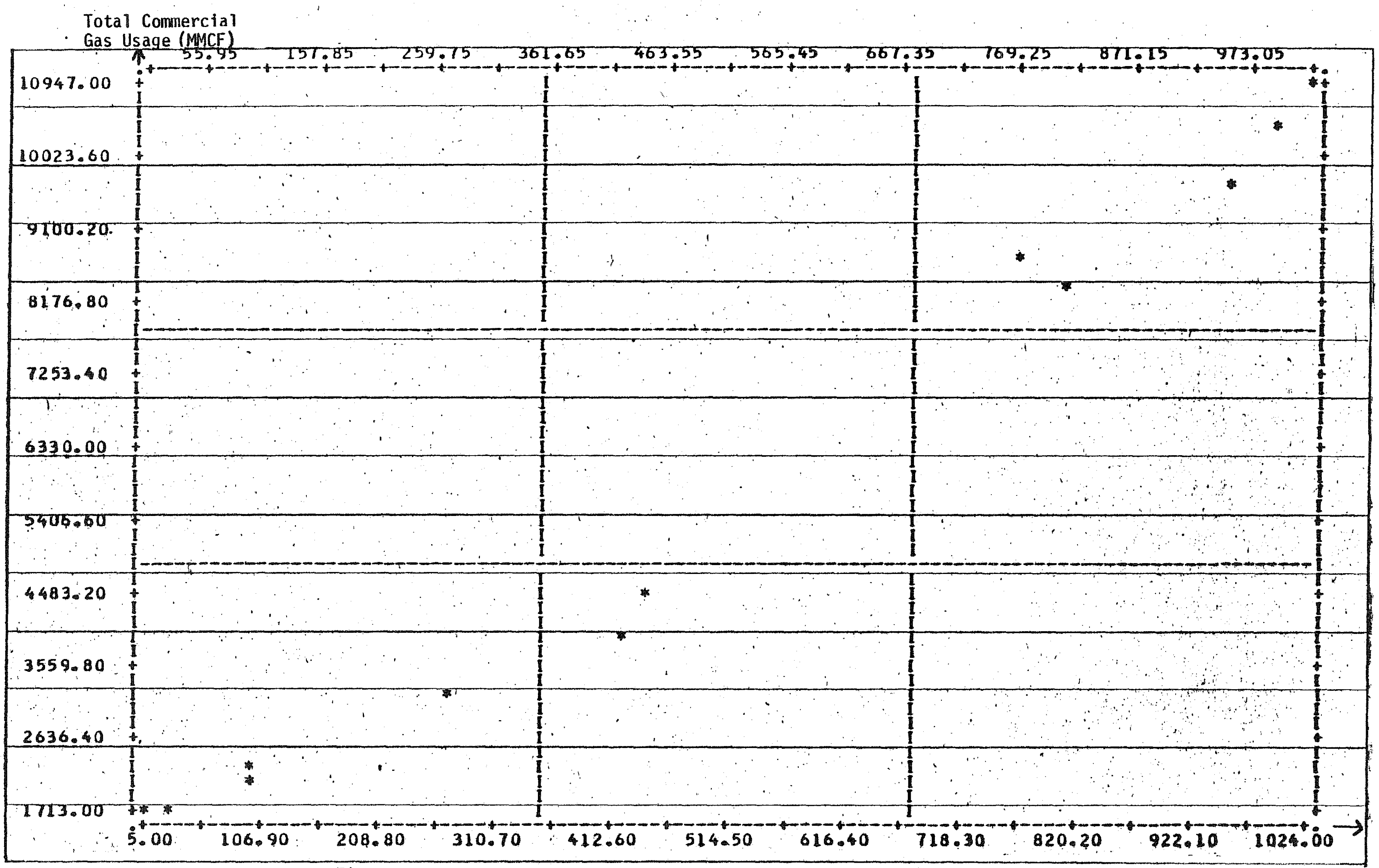


Figure F-47 Monthly Commercial Gas Usage in the EOGC Service Area as a Function of Monthly Degree-Days in 1975

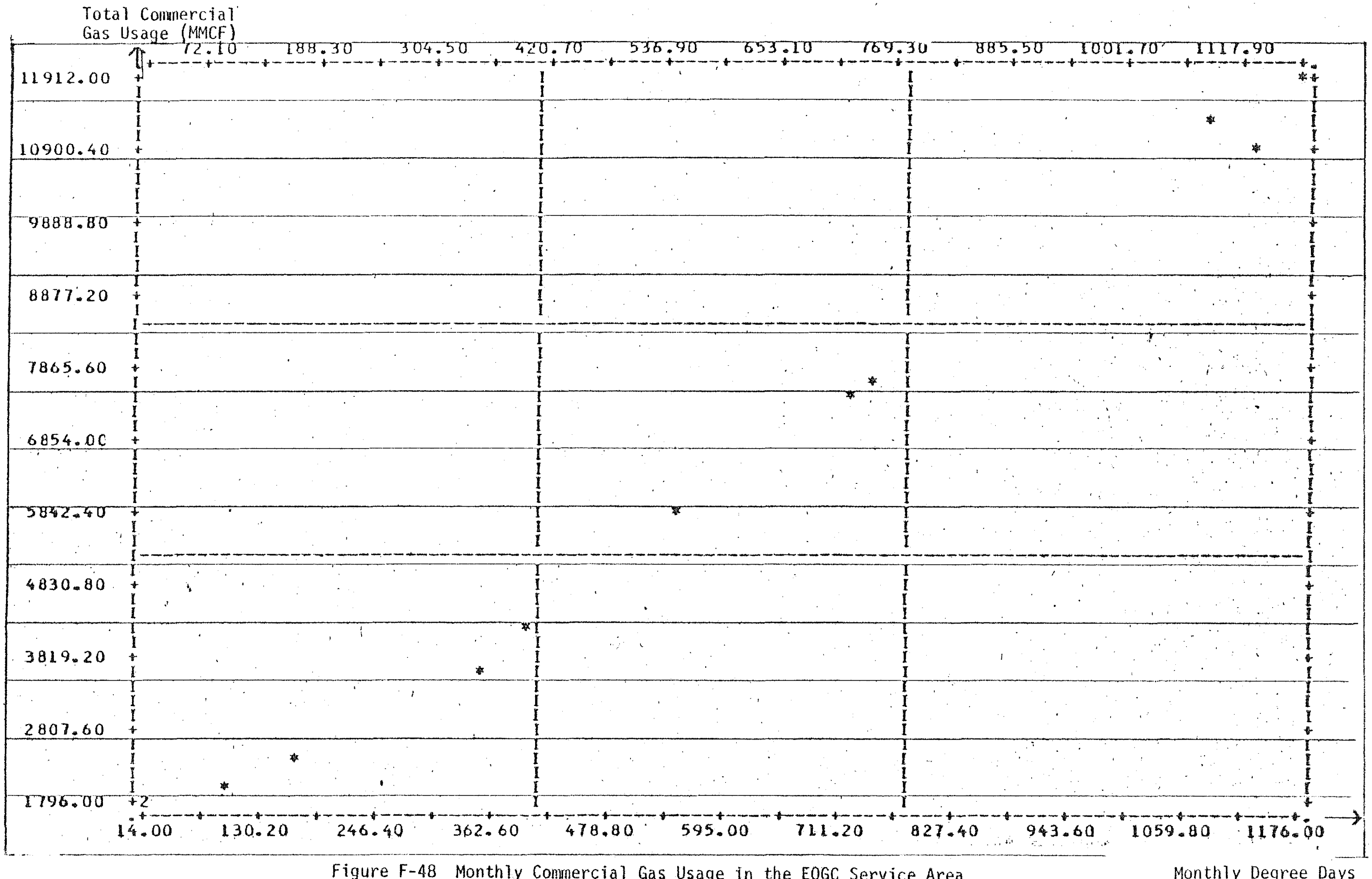


Figure F-48 Monthly Commercial Gas Usage in the EOGC Service Area as a Function of Monthly Degree-Days in 1976

TABLE F-40 Regression Equations: SIC Base Allocation as a Function of Degree-Days

SIC	Number of firms	Equation	Correlation
20	21	DG = 180.824 + 0.025536 × DD	R^2 = .847
22	2	DG = 149.021 + 0.022447 × DD	R^2 = .680
23	2	DG = 2.802 + 0.007750 × DD	R^2 = .943
24	1	DG = 6.244 + 0.000441 × DD	R^2 = .200
25	8	DG = 52.173 + 0.065059 × DD	R^2 = .978
26	19	DG = 71.186 + 0.039515 × DD	R^2 = .928
27	4	DG = 8.645 + 0.009133 × DD	R^2 = .972
28	41	DG = 752.260 + 0.175737 × DD	R^2 = .951
29	23	DG = 202.206 (Monthly average)	
30	24	DG = 260.431 + 0.097899 × DD	R^2 = .943
31	1	DG = 2.199 + 0.001997 × DD	R^2 = .937
32	55	DG = 1063.644 + 0.032738 × DD	R^2 = .383
33	113	DG = 6525.673 + 1.090098 × DD	R^2 = .922
34	76	DG = 438.649 + 0.416302 × DD	R^2 = .961
35	42	DG = 132.510 + 0.303330 × DD	R^2 = .958
36	36	DG = 142.244 + 0.141956 × DD	R^2 = .944
37	28	DG = 339.588 + 0.513708 × DD	R^2 = .947
38	2	DG = 1.388 + 0.010670 × DD	R^2 = .923
39	3	DG = 46.445 + 0.025942 × DD	R^2 = .808

APPENDIX G

GAS DISTRIBUTION SYSTEM DATA

The data presented in this Appendix complement those presented in Chapter 5 of Volume II, and are related to the technical and economic description of the EOGC gas distribution system. The values of the various components of the plant in service, from 1970 to 1977, are presented in Table G-1. The characteristics of the field and underground storage compressors, from 1970 to 1977, are presented in Table G-2, and the locations of the major stations are indicated in Figure G-1. Finally, the operation and maintenance expenses of the EOGC, from 1970 to 1977, are presented in Table G-3. These expenses are broken down according to major categories such as production, exploration, wholesale purchases, storage, transmission, distribution, etc.

Table G-1 Value of the EOGC Plant in Service
By Year and Plant Category

Plant Category	1970 Plant Value Dec. 31, 1970 (1000 $)	1970 % of Total Plant	1971 Plant Value Dec. 31, 1971 (1000 $)	1971 % of Total Plant
1. Production Plant				
a) land rights, etc	1,096	.23	1,227	.25
b) compressor structures & equipment	4,025	.84	4,447	.89
c) gas wells structures & equipment	8,837	1.84	9,326	1.87
d) field lines	14,126	2.94	16,203	3.24
e) other	128	.03	128	.03
Total Production	28,214	5.88	31,332	6.27
2. Gas Storage Plant				
a) land rights, etc	423	.09	211	.04
b) wells & storage rights	18,116	3.78	20,514	4.10
c) non-recoverable gas	---	---	5,364	1.07
d) lines	8,170	1.70	8,374	1.67
e) compressors & regulators	4,253	.89	4,391	.88
f) other	940	.20	958	.19
Total Storage Plant	31,903	6.65	39,853	7.97
3. Transmission Plant				
a) land rights, rights of way	2,727	.57	2,737	.55
b) mains	75,862	15.81	76,701	15.34
c) regulating equipment	8,997	1.88	9,344	1.87
d) other	1,864	.39	1,867	.37
Total Transmission Plant	89,450	18.64	90,650	18.13
4. Distribution Plant				
a) land and land rights	2,169	.45	2,171	.43
b) structures	11,985	2.50	12,095	2.42
c) mains	228,127	47.56	233,035	46.60
d) regulators	9,077	1.89	9,385	1.88
e) services	39,917	8.32	41,650	8.33
f) meters	1,446	.30	4,109	.82
g) other	2,581	.54	58	.01
Total Distribution	320,807	66.87	328,342	65.66
5. General Plant Total General Plant	9,408	1.96	9,881	1.98
Total Plant in Service	497,782	100.00	500,058	100.00

Source: EOGC Annual Reports 1970 & 1971

Table G-1 Value of the EOGC Plant in Service
By Year and Plant Category (Cont'd)

Plant Category	1972 Plant Value 0 Dec. 31, 1972 (1000 $)	1972 % of Total Plant	1973 Plant Value 1 Dec. 31, 1973 (1000 $)	1973 % of Total Plant
1. Production Plant				
a) land rights, etc	1,353	.28	1,469	.27
b) compressor structures & equipment	5,053	1.04	5,728	1.05
c) gas wells structures & equipment	9,942	2.06	19,582	3.60
d) field lines	17,943	3.71	20,512	3.77
e) other	130	.03	129	.02
Total Production	34,421	7.11	47,419	8.71
2. Gas Storage Plant				
a) land rights, etc	260	.06	284	.05
b) wells & storage rights	22,667	4.68	25,167	4.62
c) non-recoverable gas	5,363	1.11	5,356	.98
d) lines	8,858	1.83	9,385	1.72
e) compressors & regulators	2,340	.49	7,709	1.42
f) other	3,186	.66	1,353	.25
Total Storage Plant	42,684	8.83	49,255	9.04
3. Transmission Plant				
a) land rights, rights of way	2,796	.58	2,797	.51
b) mains	78,156	16.15	80,021	14.69
c) regulating equipment	9,823	2.03	7,975	1.46
d) other	1,878	.39	1,530	.28
Total Transmission Plant	92,654	19.15	92,323	16.95
4. Distribution Plant				
a) land and land rights	2,149	.45	2,089	.38
b) structures	12,178	2.52	11,675	2.14
c) mains	238,593	49.31	244,485	44.89
d) regulators	9,632	1.99	9,764	1.79
e) services	43,521	8.99	45,297	8.32
f) meters	26,546	5.49	27,272	5.02
g) other	4,289	.89	4,332	.80
Total Distribution	336,909	69.63	344,915	63.33
5. General Plant Total General Plant	10,161	2.10	10,715	1.97
Total Plant in Service	516,829	100.00	544,627	100.00

Source: EOGC Annual Reports 1972 & 1973

Table G-1 Value of the EOGC Plant in Service By Year and Plant Category (Cont'd)

	1974		1975	
Plant Category	Plant Value 0 Dec. 31, 1974 (1000 $)	% of Total Plant	Plant Value 1 Dec. 31, 1975 (1000 $)	% of Total Plant
1. Production Plant				
a) land rights, etc	1,521	.27	1,579	.27
b) compressor structures & equipment	6,954	1.23	7,175	1.23
c) gas wells structures & equipment	24,000	4.23	28,642	4.89
d) field lines	21,205	3.75	22,442	3.83
e) other	129	.02	134	.02
Total Production	53,680	9.48	59,971	10.24
2. Gas Storage Plant				
a) land rights, etc	314	.06	316	.05
b) wells & storage rights	27,135	4.79	29,137	4.98
c) non-recoverable gas	5,357	.94	4,357	.91
d) lines	9,271	1.64	9,848	1.68
e) compressors & regulators	8,366	1.48	8,454	1.44
f) other	1,463	.26	1,469	.25
Total Storage Plant	52,355	9.24	54,479	9.32
3. Transmission Plant				
a) land rights, rights of way	2,810	.49	2,820	.48
b) mains	81,424	14.38	83,422	14.24
c) regulating equipment	9,082	1.60	9,242	1.58
d) other	1,857	.33	1,873	.32
Total Transmission Plant	95,173	16.81	97,350	16.63
4. Distribution Plant				
a) land and land rights	2,108	.37	2,102	.36
b) structures	11,425	2.01	11,549	1.97
c) mains	251,195	44.37	255,926	43.71
d) regulators	9,339	1.65	9,601	1.64
e) services	47,260	8.34	49,257	8.41
f) meters	28,002	4.94	28,840	4.93
g) other	4,439	.78	4,537	.77
Total Distribution	353,769	62.48	361,812	61.79
5. General Plant Total General Plant	11,200	1.98	11,815	2.01
Total Plant in Service	566,178	100.00%	585,534	100.00%

Source: EOGC Annual Reports 1974 & 1975

Table G-1 Value of the EOGC Plant in Service
By Year and Plant Category (Cont'd)

Plant Category	1976 Plant Value 0 Dec. 31, 1976 (1000 $)	1976 % of Total Plant	1977 Plant Value 1 Dec. 31, 1977 (1000 $)	1977 % of Total Plant
1. Production Plant				
a) land rights, etc	1,598	.26	1,659	.27
b) compressor structures & equipment	7,490	1.24	7,963	1.29
c) gas wells structures & equipment	36,776	6.09	39,649	6.45
d) field lines	23,244	3.85	23,872	3.88
e) other	142	.02	156	.02
Total Production	69,253	11.47	73,299	11.92
2. Gas Storage Plant				
a) land rights, etc	306	.05	312	.05
b) wells & storage rights	29,928	4.96	30,076	4.89
c) non-recoverable gas	5,357	.89	5,357	.87
d) lines	9,912	1.64	9,940	1.62
e) compressors & regulators	7,762	1.29	7,777	1.26
f) other	1,383	.23	1,387	.23
Total Storage Plant	54,647	9.05	54,848	8.92
3. Transmission Plant				
a) land rights, rights of way	2,825	0.47	2,829	.46
b) mains	86,154	14.27	88,493	14.39
c) regulating equipment	9,461	1.47	9,674	1.57
d) other	1,871	.31	2,616	.43
Total Transmission Plant	100,311	16.62	102,838	16.73
4. Distribution Plant				
a) land and land rights	2,105	.35	2,105	.34
b) structures	11,696	1.94	11,755	1.91
c) mains	260,903	43.21	264,543	43.02
d) regulators	9,789	1.62	9,935	1.62
e) services	49,989	8.28	50,723	8.25
f) meters	28,627	4.74	28,618	4.65
g) other	4,606	.76	4,604	.75
Total Distribution	367,286	60.84	372,284	60.55
5. General Plant				
Total General Plant	11,812	1.96	11,594	1.89
Total Plant in Service	603,738	100.00	614,863	100.00

Source: EOGC Annual Reports 1976 & 1977

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year

Year - 1970			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Adams	4	660	287.33
Siron	1	300	315.48
Queen	2	330	311.75
Emler	1	165	362.04
Cambridge	3	2,250	175.17
Chief	1	165	123.39
Guernsey	4	4,400	219.25
Total	12	8,270	
Underground Storage Compressors			
Columbiana	1	660	719.34
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	376.79
Wertz	1	34	560.53
Total	6	7,194	

Source: EOGC Annual Report 1970

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year (Cont'd)

Year - 1971			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Columbiana	1	750	166.80
Adams	4	660	287.94
Siron	1	300	324.64
Queen	2	330	312.27
Emler	1	165	362.41
Cambridge	3	2,250	188.74
Western	1	150	246.28
Guernsey	4	4,400	218.24
Clay	1	115	432.93
Total	18	9,120	
Underground Storage Compressors			
Columbiana	1	660	528.04
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	276.98
Wertz	1	34	Not Operated
Total	6	7,194	

Source: EOGC Annual Report 1971

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year (Cont'd)

Year - 1972			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Columbiana	1	750	166.80
Adams	3	495	415.02
Siron	1	300	318.80
Queen	2	330	318.79
Emler	1	165	378.37
Cambridge	4	3,000	194.36
Western	1	150	268.49
Guernsey	4	4,400	219.38
Clay	3	395	180.05
Total	20	9,925	
Underground Storage Compressors			
Columbiana	1	660	528.04
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	377.16
Wertz	1	34	Not Operated
Total	6	7,194	

Source: EOGC Annual Report 1972

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year (Cont'd)

Year - 1973			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Columbiana	1	750	166.80
Adams	3	495	415.02
Siron	1	300	318.80
Queen	2	330	318.55
Emler	1	165	378.56
Cambridge	4	3,000	194.48
Mills	2	370	300.84
Marlo	2	370	299.59
Flint	1	185	382.28
Western	1	150	268.49
Guernsey	4	4,400	219.47
Clay	3	395	178.70
Total	25	10,910	
Underground Storage Compressors			
Columbiana	1	660	528.04
Robinson (Also Used as Transmission Compressor)	12	13,150	239.23
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	377.58
Wertz	1	34	Not Operated
Total	18	20,344	

Source: EOGC Annual Report 1973

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year (Cont'd)

Year - 1974			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Columbiana	1	750	166.80
Adams	2	330	508.66
Siron	1	300	324.64
Queen	2	330	318.55
Emler	2	330	316.79
Cambridge	4	3,000	203.92
Mills	2	370	300.84
Noble	3	3,480	270.39
Marlo	2	370	303.88
Flint	1	185	382.28
Western	1	150	268.49
Guernsey	4	4,400	222.69
Clay	3	395	177.60
Total	28	14,390	
Underground Storage Compressors			
Columbiana	1	660	528.04
Robinson (Also Used as Transmission Compressor)	13	16,700	222.18
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	377.58
Wertz	1	34	Not Operated
Total	19	23,894	

Source: EOGC Annual Report 1974

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year (Cont'd)

Year - 1975			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Columbiana	1	750	172.73
Adams	2	330	358.64
Siron	1	300	324.64
Queen	1	165	421.13
Emler	2	330	316.79
Cambridge	4	3,000	206.32
Mills	2	370	300.84
Noble	3	3,480	271.11
Mantau	1	165	513.44
Marlo	2	370	303.88
Flint	1	185	382.28
Western	1	150	268.49
Guernsey	4	4,400	231.62
Clay	3	395	301.66
Total	28	14,390	
Underground Storage Compressors			
Columbiana	1	660	556.41
Robinson (Also Used as Transmission Compressor)	13	16,700	222.98
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	387.71
Wertz	1	34	Not Operated
Total	19	23,894	

Source: EOGC Annual Report 1975

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year (Cont'd)

Year - 1976			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Columbiana	1	750	172.73
Adams	2	330	358.64
Siron	1	300	324.64
Queen	1	165	421.13
Emler	2	330	321.38
Cambridge	4	3,000	206.50
Mills	2	370	300.84
Noble	3	3.480	271.93
Mantau	1	165	547.96
Marlo	2	370	303.88
Flint	1	185	382.28
Western	1	150	268.49
Guernsey	4	4.400	234.99
Clay	3	395	304.23
Total	28	14,390	
Underground Storage Compressors			
Columbiana	1	660	557.87
Robinson (Also Used as Transmission Compressor)	13	16,700	236.15
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	380.41
Wertz	1	34	Not Applicable
Total	19	23,894	

Source: EOGC Annual Report 1976

Table G-2 Number of Units, Total Horsepower (H.P.), and Plant Cost ($/H.P.) for EOGC Field and Underground Compressor Stations by Year (Cont'd)

Year - 1977			
Station	Number of Units	Total H.P.	Plant Cost ($/H.P)
Field Compressors			
Columbiana	1	750	172.73
Adams	1	165	469.86
Siron	1	300	324.64
Queen	1	165	421.13
Emler	2	330	321.38
Cambridge	4	3,000	206.50
Mills	2	370	300.84
Noble	3	3,480	272.25
Mantau	1	165	541.32
Marlo	2	370	303.88
Flint	1	185	382.28
Western	1	150	268.49
Guernsey	4	4,400	235.13
Clay	3	395	304.23
Total	27	14,225	
Underground Storage Compressors			
Columbiana	1	660	558.52
Robinson (Also Used as Transmission Compressor)	6	12,500	236.96
Chippewa #2 (Also Used as Transmission Compressor)	4	6,500	380.34
Total	11	19,660	

Source: EOGC Annual Report 1977

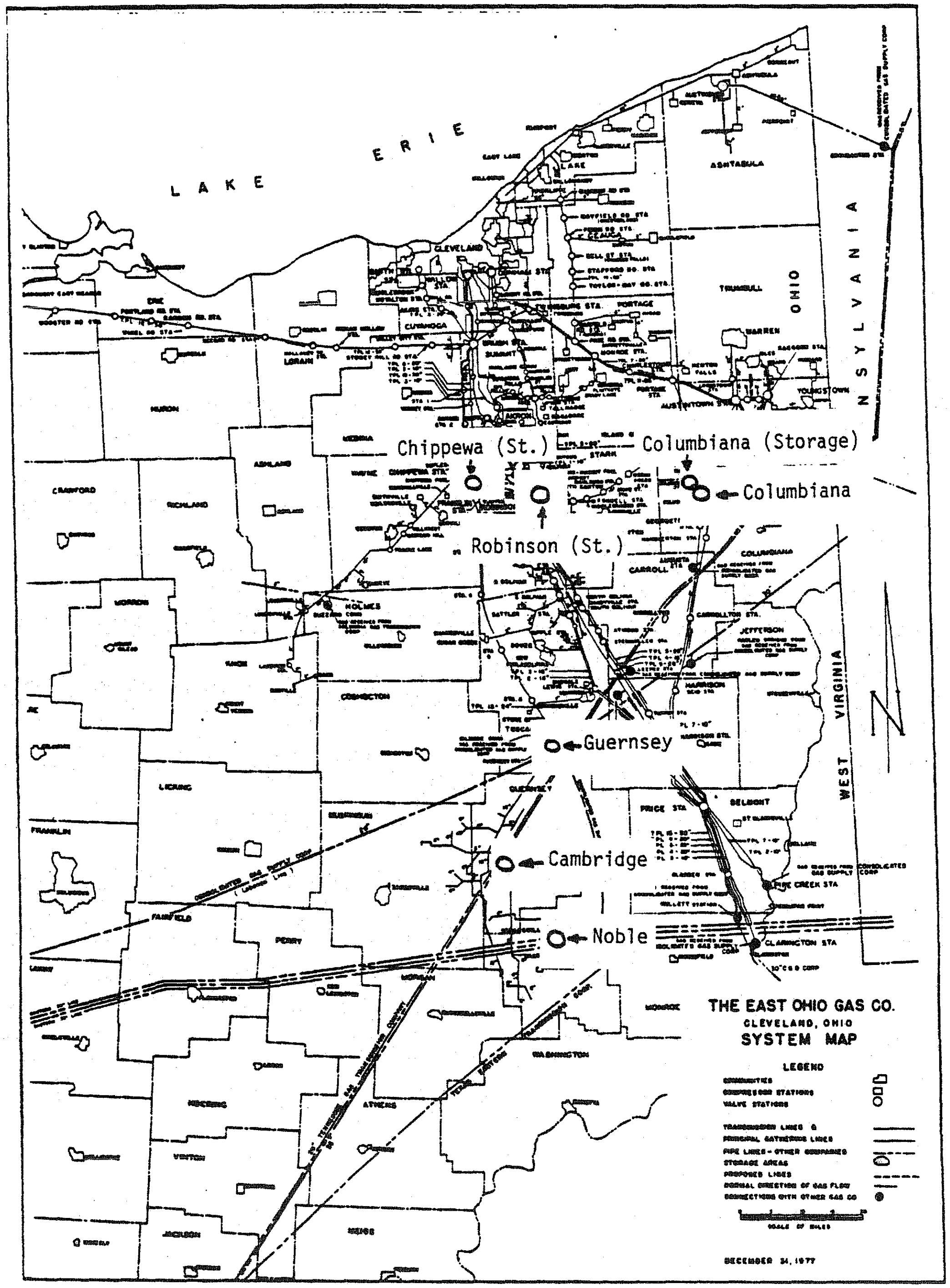


Figure G-1 EOGC Major Compressor Stations

Table G-3 EOGC Operation, Maintenance and Total Operation and Maintenance Expenses by Year

Expenses Category	Operation Expenses (1000 $)	% of Grand Total Exp.	Maintenance Expenses (1000 $)	% of Grand Total Exp.	Total Expenses (1000 $)
Year - 1970					
Natural Gas*	168,908	75.79	297	.13	169,206
a) Production	1,125	.50	297	.13	1,423
b) Exploration	267	.12	---	---	267
c) Transmission	167,516	75.17	---	---	167,516
Storage	1,631	.73	347	.16	1,979
Transmission	1,076	.48	375	.17	1,451
Distribution	12,227	5.49	5,341	2.40	17,568
Customer Expenses	9,590	4.30	---	---	9,590
Administrative and Other	22,791	10.23	287	.13	23,078
Total	216,224	97.02	6,647	2.98	222,872
Year - 1971					
Natural Gas	186,832	76.58	343	.14	187,175
a) Production	1,364	.56	343	.14	1,706
b) Exploration	453	.19	---	---	453
c) Transmission	185,016	75.84	---	---	185,016
Storage	2,284	.94	464	.19	2,748
Transmission	1,180	.48	394	.17	1,573
Distribution	12,546	5.14	5,483	2.25	18,029
Customer Expenses	10,259	4.21	---	---	10,259
Administrative and Other	23,812	9.76	360	.15	24,172
Total	236,913	97.11	7,043	2.89	243,956

* - Includes Well Head, Field Line and Transmission Purchases

Source: EOGC Annual Reports - 1970 & 1971

Table G-3 EOGC Operation, Maintenance and Total Operation and Maintenance Expenses by Year (Cont'd)

Expenses Category	Operation Expenses (1000 $)	% of Grand Total Exp.	Maintenance Expenses (1000 $)	% of Grand Total Exp.	Total Expenses (1000 $)
Year - 1972					
Natural Gas	212,790	77.88	360	.13	213,150
a) Production	1,563	.57	360	.13	1,923
b) Exploration	573	.21	---	---	573
c) Transmission	210,654	77.10	---	---	210,150
Storage	1,964	.72	478	.17	2,442
Transmission	1,211	.44	525	.19	1,735
Distribution	12,952	4.74	5,841	2.14	18,793
Customer Expenses	11,279	4.13	---	---	11,279
Administrative and Other	25,473	9.32	340	.12	20,657
Total	265,670	97.24	7,543	2.76	273,213
Year - 1973					
Natural Gas	207,751	76.34	442	.16	208,092
a) Production	2,225	.82	442	---	2,667
b) Exploration	1,190	.44	---	---	1,190
c) Transmission	204,236	75.08	---	---	204,236
Storage	2,297	.84	748	.27	3,045
Transmission	1,294	.48	602	.22	1,897
Distribution	14,988	5.51	5,885	2.16	20,873
Customer Expenses	11,383	4.18	---	---	11,383
Administrative and Other	26,320	9.68	402	.15	26,722
Total	263,933	97.03	8,080	2.97	272,013

Source: EOGC Annual Reports - 1972 & 1973

Table G-3 EOGC Operation, Maintenance and Total Operation and Maintenance Expenses by Year (Cont'd)

Expenses Category	Operation Expenses (1000 $)	% of Grand Total Exp.	Maintenance Expenses (1000 $)	% of Grand Total Exp.	Total Expenses (1000 $)
Year - 1974					
Natural Gas	258,720	78.52	532	.16	259,252
a) Production	2,794	.84	---	.16	3,326
b) Exploration	992	.30	---	---	998
c) Transmission	254,928	77.37	---	---	254,928
Storage	2,525	.93	824	.25	3,349
Transmission	1,510	.46	952	.29	2,462
Distribution	16,367	4.97	6,410	1.95	22,777
Customer Expenses	12,625	3.83	---	---	12,625
Administrative and Other	28,572	8.67	471	.14	29,332
Total	320,318	97.21	9,819	2.79	329,507
Year - 1975					
Natural Gas	289,770	78.85	533	.15	290,303
a) Production	3,427	.93	533	.15	3,960
b) Exploration	1,384	.38	---	---	1,384
c) Transmission	284,959	77.55	---	---	284,959
Storage	2,972	.81	766	.21	3,738
Transmission	1,607	.44	801	.22	2,408
Distribution	17,577	4.78	7,217	1.96	24,794
Customer Expenses	15,253	4.15	---	---	15,253
Administrative and Other	30,520	8.13	463	.13	30,973
Total	357,699	97.34	9,770	2.66	367,469

Source: EOGC Annual Reports - 1974 & 1975

Table G-3 EOGC Operation, Maintenance and Total Operation and Maintenance Expenses by Year (Cont'd)

Expenses Category	Operation Expenses (1000 $)	% of Grand Total Exp.	Maintenance Expenses (1000 $)	% of Grand Total Exp.	Total Expenses (1000 $)
Year - 1976					
Natural Gas	393,912	83.21	607	.13	394,519
a) Production	4,809	1.02	607	.13	5,416
b) Exploration	1,290	.27	---	---	1,290
c) Transmission	387,813	81.93	---	---	287,813
Storage	2,970	.63	728	.15	3,698
Transmission	1,546	.33	916	.19	2,462
Distribution	14,272	3.14	7,814	1.65	22,685
Customer Expenses	20,030	4.23	---	---	20,030
Administrative and Other	29,495	6.23	423	.10	29,980
Total	462,827	97.77	10,548	2.23	473,375
Year - 1977					
Natural Gas	483,386	84.69	588	.10	483,945
a) Production	5,153	.90	558	.10	5,711
b) Exploration	1,088	.19	---	---	1,088
c) Transmission	477,146	83.60	---	---	477,146
Storage	6,141	1.08	516	.09	6,657
Transmission	1,786	.31	512	.09	2,299
Distribution	16,369	2.87	6,997	1.23	23,367
Customer Expenses	23,117	4.05	---	---	23,117
Administrative and Other	30,556	5.35	832	.15	31,388
Total	561,355	98.35	9,416	1.65	570,771

Source: EOGC Annual Reports - 1976 & 1977

APPENDIX H

MONTHLY METEOROLOGICAL, GAS SUPPLY, AND GAS STORAGE FIELDS DATA

The basic degree-day data used in generating weather scenarios, data describing monthly gas deliveries to the EOGC, and data describing the operations of the individual storage fields of the EOGC are presented in this appendix. These data complement those presented in Chapter 7 of Volume II.

Degree-Day Data

The monthly numbers of degree-days for the years of 1950 through 1976 and at the Akron-Canton, Cleveland and Youngstown airports meteorological stations are presented in Tables H-1 through H-27. Degree-day averages for the three stations are also listed in these tables.

Gas Supply Data

Monthly gas deliveries to EOGC as a percentage of total, summer and winter deliveries are listed in Tables H-28 and H-29 (according to Proposals A and B, as described in chapter 7). Monthly gas deliveries to EOGC are graphically shown in Figures H-1 through H-6 for the years 1971 and 1973 through 1976.

Storage Fields Operations Data

The gas storage system of the EOGC comprises five storage fields: Stark-Summit, Chippewa, Columbiana, Gabor, and Wertz. The Wertz pool was an experimental project implemented in 1967, but gas has been progressively withdrawn in recent years, and therefore this pool no longer plays any significant role in the storage system.

The major pool is Stark-Summit, with a certified storage capacity of 130,322,000 Mcf. The Chippewa pool is thirteen times smaller than the Stark-Summit pool, but three times larger than the Columbiana and Gabor pools.

The state of the storage pools at the end of each year, from 1970 through 1977, is described in Tables H-30 through H-33. As is apparent in Table H-33, the storage capacity increase from 1970 to 1977 has taken place at the Stark-Summit pool.

The actual maximum total daily gas withdrawals for each year, from 1970 to 1977, are indicated in Table H-34. This is a maximum for the whole storage system, and not necessarily for each of the storage pools. As could be expected, these maximum withdrawals occurred mostly in January and February. The maximum daily withdrawal capacity of the whole storage system for each year from 1970 through 1977 is indicated in Table H-35. This maximum withdrawal capacity is, in fact, equal to the highest of all the maximum daily withdrawal rates for each day of the year. It was pointed out to the research team by EOGC officials that the maximum withdrawal rate on a given day and for a given storage field depends upon the volume of gas in this storage field on that given day and upon the pressure of gas in the mains which the storage field is feeding on that same day.

Monthly gas deliveries and withdrawals for each pool are presented in Tables H-36 through H-51. These same data are shown in Figures H-6 through H-9 for the years 1975 and 1976. Computer generated graphs for 1971-1975 are shown in Figures H-10 through H-19. The start of deliveries to the Chippewa, Columbiana and Gabor pools lags somewhat behind the start of deliveries to the Stark-Summit pool. In other words, the Stark-Summit pool is saturated first, and then additional gas is delivered to the secondary pools. With respect to withdrawals, it is interesting to note that the minor peak of March is achieved by withdrawing gas from the Chippewa pool. This is, according to EOGC officials, related to the fact that the Chippewa field is a highly permeable pool, with average well flow potentials higher than any of the other fields.

Table H-1 Monthly Degree-Days - 1950

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	889	1013	1032	712	205	67	7	33	137	310	895	1299
Cleveland Airport	868	880	983	655	174	41	2	18	77	246	828	1231
Youngstown Airport	892	1034	1057	694	211	66	5	37	148	322	868	1268
Average	883	976	1024	687	197	58	5	29	121	293	864	1266

Table H-2 Monthly Degree-Days - 1951

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1135	1012	877	582	198	43	9	29	155	338	928	1106
Cleveland Airport	1080	976	828	540	168	26	0	12	107	268	874	1065
Youngstown Airport	1116	1013	889	578	193	44	7	31	154	329	918	1098
Average	1110	1000	865	567	186	38	5	24	139	312	907	1090

Table H-3 Monthly Degree-Days - 1952

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1050	976	915	484	265	33	7	15	116	570	690	994
Cleveland Airport	1012	947	870	450	222	13	3	6	79	486	623	929
Youngstown Airport	1057	990	935	484	297	41	9	24	123	564	678	994
Average	1040	971	907	473	261	29	6	15	106	540	664	972

Source: Climatological Data: Ohio

Table H-4 Monthly Degree-Days - 1953

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1014	927	823	624	157	29	11	10	124	309	668	1020
Cleveland Airport	969	874	765	581	129	10	2	3	92	253	590	948
Youngstown Airport	994	920	825	627	166	37	22	12	141	335	651	993
Average	992	907	804	611	452	25	12	8	119	299	636	987

Table H-5 Monthly Degree-Days - 1954

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1150	871	969	356	334	44	11	11	79	393	736	1099
Cleveland Airport	1124	796	920	327	263	36	3	2	45	328	663	1014
Youngstown Airport	1180	879	964	375	335	50	15	22	90	374	743	1105
Average	1151	849	951	353	311	43	10	12	71	365	714	1073

Table H-6 Monthly Degree-Days - 1955

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1241	1006	858	330	171	76	0	3	82	387	833	1194
Cleveland Airport	1173	950	812	268	126	35	0	1	52	320	785	1152
Youngstown Airport	1251	1011	871	335	190	70	0	7	110	392	830	1185
Average	1222	989	847	311	162	60	0	4	81	366	816	1177

Source: Climatological Data: Ohio

Table H-7 Monthly Degree-Days - 1956

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1217	1006	946	596	303	73	5	27	209	279	735	877
Cleveland Airport	1151	967	891	600	265	69	4	13	159	198	665	828
Youngstown Airport	1221	1011	956	596	321	78	8	24	214	298	719	874
Average	1196	995	931	597	296	73	6	21	194	258	706	860

Table H-8 Monthly Degree-Days - 1957

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1344	935	858	479	219	36	11	12	133	491	730	973
Cleveland Airport	1295	891	825	471	221	29	0	6	97	403	656	891
Youngstown Airport	1339	939	854	492	234	40	12	20	148	486	721	961
Average	1326	922	846	481	225	35	8	13	126	460	702	942

Table H-9 Monthly Degree-Days - 1958

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1225	1227	936	461	256	98	5	29	116	407	680	1373
Cleveland Airport	1137	1164	907	413	218	73	0	21	86	316	608	1283
Youngstown Airport	1200	1238	949	462	276	130	1	40	131	428	675	1362
Average	1187	1210	931	445	250	100	2	30	111	384	654	1339

Source: Climatological Data: Ohio

Table H-10 Monthly Degree-Days - 1959

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1306	1006	931	484	157	62	0	0	91	403	824	970
Cleveland Airport	1261	998	877	451	133	43	0	0	78	348	769	894
Youngstown Airport	1309	1023	958	489	172	75	3	4	107	423	833	970
Average	1292	1009	922	475	154	60	1	1	92	391	809	945

Table H-11 Monthly Degree-Days - 1960

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1075	1083	1261	392	260	38	15	0	49	373	672	1328
Cleveland Airport	1039	1023	1262	430	265	60	38	7	67	427	671	1299
Youngstown Airport	1081	1085	1253	400	284	48	24	2	60	426	670	1316
Average	1065	1064	1259	407	270	49	26	3	59	409	671	1314

Table H-12 Monthly Degree-Days - 1961

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1341	897	787	664	351	80	14	3	74	311	701	1109
Cleveland Airport	1336	930	771	640	341	95	19	3	74	258	668	1085
Youngstown Airport	1345	922	812	681	385	85	18	7	89	329	731	1150
Average	1341	916	790	662	359	87	17	4	79	299	700	1115

Source: Climatological Data: Ohio

Table H-13 Monthly Degree-Days - 1962

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1265	1067	928	518	104	24	11	10	165	356	722	1250
Cleveland Airport	1264	1085	958	547	124	43	10	17	151	331	674	1206
Youngstown Airport	1319	1109	952	559	140	36	18	23	222	397	773	1277
Average	1283	1087	946	541	123	34	13	17	179	361	723	1244

Table H-14 Monthly Degree-Days - 1963

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1412	1282	786	490	275	45	22	30	134	189	661	1372
Cleveland Airport	1452	1327	793	500	328	52	30	32	152	191	627	1326
Youngstown Airport	1442	1326	817	515	330	63	29	55	197	231	661	1368
Average	1435	1312	799	502	311	53	27	39	161	204	650	1355

Table H-15 Monthly Degree-Days - 1964

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1117	1154	849	447	157	68	2	46	121	458	602	1020
Cleveland Airport	1084	1139	859	481	179	80	3	46	117	483	617	1009
Youngstown Airport	1145	1198	875	482	174	93	8	57	140	490	603	1044
Average	1115	1164	861	470	170	80	4	50	126	477	607	1024

Source: Climatological Data: Ohio

Table H-16 Monthly Degree-Days - 1965

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1226	1081	1005	524	94	56	8	40	82	442	675	878
Cleveland Airport	1165	1032	1025	576	130	64	24	49	67	418	671	852
Youngstown Airport	1266	1098	1053	589	123	80	24	66	100	481	694	908
Average	1219	1070	1028	563	116	67	19	52	83	447	680	879

Table H-17 Monthly Degree-Days - 1966

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1329	1019	807	568	344	46	3	10	148	445	680	1054
Cleveland Airport	1328	1067	837	562	346	53	6	15	162	452	645	1070
Youngstown Airport	1367	1049	844	605	398	65	5	19	211	494	719	1138
Average	1341	1046	829	578	363	55	5	15	174	464	681	1087

Table H-18 Monthly Degree-Days - 1967

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1014	1116	825	433	368	8	17	22	146	366	841	949
Cleveland Airport	1011	1087	858	461	393	17	21	19	137	341	784	934
Youngstown Airport	1101	1200	919	508	453	18	34	48	214	446	908	1023
Average	1042	1134	867	467	405	14	24	30	166	384	844	969

Source: Climatological Data: Ohio

Table H-19 Monthly Degree-Days - 1968

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1296	1198	763	379	246	19	9	19	48	338	655	1067
Cleveland Airport	1295	1224	845	459	328	59	26	34	93	414	672	1080
Youngstown Airport	1378	1315	865	476	384	91	32	39	73	400	710	1150
Average	1323	1246	824	438	319	56	22	31	71	384	679	1099

Table H-20 Monthly Degree-Days - 1969

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1156	963	959	441	215	0	1	6	133	401	768	1181
Cleveland Airport	1220	1032	946	471	234	0	1	7	121	406	736	1265
Youngstown Airport	1243	1066	1032	491	275	21	13	17	167	440	803	1252
Average	1206	1020	979	468	208	7	5	10	140	416	769	1233

Table H-21 Monthly Degree-Days - 1970

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1402	1073	972	458	161	33	10	2	61	281	664	1015
Cleveland Airport	1425	1052	960	462	154	39	9	12	86	332	696	1009
Youngstown Airport	1457	1128	1036	509	180	77	20	19	101	347	716	1077
Average	1428	1084	989	476	165	50	13	11	83	320	692	1034

Source: Climatological Data: Ohio

Table H-22 Monthly Degree-Days - 1971

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1309	962	946	554	248	9	0	18	68	202	786	899
Cleveland Airport	1344	1032	1031	650	277	16	9	13	63	168	704	828
Youngstown Airport	1367	1055	1070	642	314	18	16	26	76	221	788	898
Average	1340	1016	1016	615	280	14	8	19	69	197	759	875

Table H-23 Monthly Degree-Days - 1972

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1214	1182	1004	608	184	110	25	16	84	470	755	905
Cleveland Airport	1240	1280	936	589	196	124	32	37	122	575	752	937
Youngstown Airport	1186	1198	1035	639	208	157	51	39	154	580	842	972
Average	1213	1220	992	612	196	130	36	31	120	542	783	938

Table H-24 Monthly Degree-Days - 1973

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1082	1043	538	450	243	1	2	12	78	240	587	988
Cleveland Airport	1067	1033	569	450	254	3	3	9	73	234	605	946
Youngstown Airport	1157	1116	630	512	324	6	8	17	120	308	659	1037
Average	1102	1064	579	471	274	3	4	13	90	261	617	990

Source: Climatological Data: Ohio

Table H-25 Monthly Degree-Days - 1974

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1063	1059	790	402	241	45	0	0	169	438	637	1029
Cleveland Airport	1023	1035	777	419	280	49	2	5	176	423	660	1026
Youngstown Airport	1085	1103	878	465	288	60	8	10	216	480	692	1064
Average	1057	1066	815	429	270	51	3	5	187	447	663	1040

Table H-26 Monthly Degree-Days - 1975

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1015	940	895	626	122	38	2	1	183	344	519	971
Cleveland Airport	1021	962	934	691	154	38	5	4	187	411	532	1015
Youngstown Airport	1069	995	972	717	149	48	8	8	189	389	559	1063
Average	1035	966	934	678	142	41	5	4	186	381	537	1016

Table H-27 Monthly Degree-Days - 1976

Station	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Akron-Canton Airport	1293	811	666	484	308	24	15	56	171	564	948	1272
Cleveland Airport	1336	969	741	493	309	25	42	25	150	519	932	1286
Youngstown Airport	1391	873	672	468	313	22	18	59	183	584	969	1321
Average	1340	884	693	482	310	24	25	47	168	556	962	1293

Source: Climatological Data: Ohio

Table H-28 Monthly Deliveries to EOGC as a Percentage of Total, Summer and Winter Deliveries*

Year	Percentage of:	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.
1970-1971	total	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	winter	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.					
	summer							28,234	21.623	15.290	11.775	11.636	11.440
1971-1972	total	6.337	5.422	9.170	9.341	11.951	10.865	12.498	9.339	6.951	5.639	6.320	6.159
	winter	11.937	10.213	17.274	17.597	22.512	20.467						
	summer							26.639	19.905	14.817	11.020	13.490	12.129
1972-1973	total	7.057	6.780	9.305	10.080	10.745	9.051	11.145	9.523	7.531	6.321	6.239	6.222
	winter	13.310	12.788	17.551	10.012	20.267	17.072						
	summer							23.722	20.269	16.030	13.455	13.281	13.243
1973-1974	total	6.901	6.347	7.419	10.573	10.284	9.504	12.046	9.543	7.547	6.674	6.395	6.767
	winter	13.523	12.438	14.540	20.720	20.154	18.625						
	summer							24.598	19.487	15.411	13.629	12.058	13.817
1974-1975	total	8.671	5.641	8.816	9.831	10.293	9.745	12.506	9.244	6.729	5.944	5.995	6.583
	winter	16.362	10.644	16.634	18.550	19.422	18.388						
	summer							26.608	19.668	14.316	12.647	12.754	14.007
1975-1976	total	7.916	5.801	8.936	10.882	12.749	8.609	9.025	8.574	7.420	6.609	6.687	6.792
	winter	14.421	10.567	16.279	19.824	23.226	15.683						
	summer							20.009	19.007	16.450	14.652	14.825	15.057
1970-1976	total	7.376	5.998	8.729	10.141	11.204	9.555	11.444	9.245	7.236	6.237	6.329	6.506
	(s.d.)	(.919)	(.555)	(.757)	(.607)	(1.099)	(.852)	(1.461)	(.395)	(.373)	(.441)	(.251)	(.384)
	winter	13.910	11.330	16.456	19.141	21.116	18.047						
	(s.d.)	(1.634)	(1.189)	(1.183)	(1.195)	(1.652)	(1.792)						
	summer							24.968	19.993	15.386	13.030	13.174	13.449
	(s.d.)							(2.913)	(.903)	(.778)	(1.087)	(1.038)	(1.201)

*According to proposal A, the winter season encompasses the months November through April.
**n.a.: not applicable.

TABLE H-29 Monthly Deliveries to EOGC as a Percentage of Total, Summer and Winter Deliveries*

Year	Percentage of:	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.
1970-1971	total	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	winter	n.a.	n.a.	n.a.	n.a.	n.a.							
	summer						24.337	19.021	13.450	13.450	10.236	10.084	12.035
1971-1972	total	5.380	9.099	9.269	11.858	10.781	12.401	9.267	6.898	5.596	6.280	6.112	7.059
	winter	11.597	19.615	19.982	25.564	23.241							
	summer						23.132	17.284	12.866	10.438	11.714	11.400	13.166
1972-1973	total	6.798	9.330	10.107	10.775	9.076	11.175	9.549	7.552	6.338	6.256	6.239	6.806
	winter	14.752	20.245	21.931	23.379	19.693							
	summer						20.727	17.711	14.007	11.756	11.604	11.572	12.623
1973-1974	total	6.258	7.316	10.426	10.140	9.372	11.877	9.410	7.442	6.581	6.305	6.672	8.201
	winter	14.383	16.813	23.960	23.305	21.538							
	summer						21.026	16.658	13.174	11.650	11.162	11.811	14.519
1974-1975	total	5.709	8.921	9.949	10.416	9.862	12.656	9.355	6.809	6.015	6.066	6.662	7.580
	winter	12.726	19.881	22.179	23.221	21.985							
	summer						22.950	16.964	12.348	10.908	11.001	12.082	13.747
1975-1976	total	5.798	8.931	10.876	12.743	8.605	9.021	8.569	7.416	6.606	6.684	6.788	7.962
	winter	12.348	19.022	23.164	27.140	18.326							
	summer						17.006	16.154	13.981	12.453	12.600	12.797	15.009
1970-1976	total	5.989	8.719	10.125	11.186	9.539	11.426	9.230	7.223	6.227	6.318	6.495	7.523
	(s.d.)	(.551)	(8.02)	(.596)	(1.097)	(.831)	(1.459)	(.383)	(.343)	(.425)	(.225)	(.229)	(.588)
	winter	13.161	19.115	22.243	24.523	20.958							
	(s.d.)	(1.353)	(1.362)	(1.501)	(1.762)	(1.945)							
	summer						21.613	17.299	13.304	11.261	11.386	11.621	13.516
	(s.d.)						(2.714)	(.997)	(.648)	(.829)	(.794)	(.906)	(1.132)

* According to proposal B, the winter season encompasses the months November through March

** n.a.: not applicable

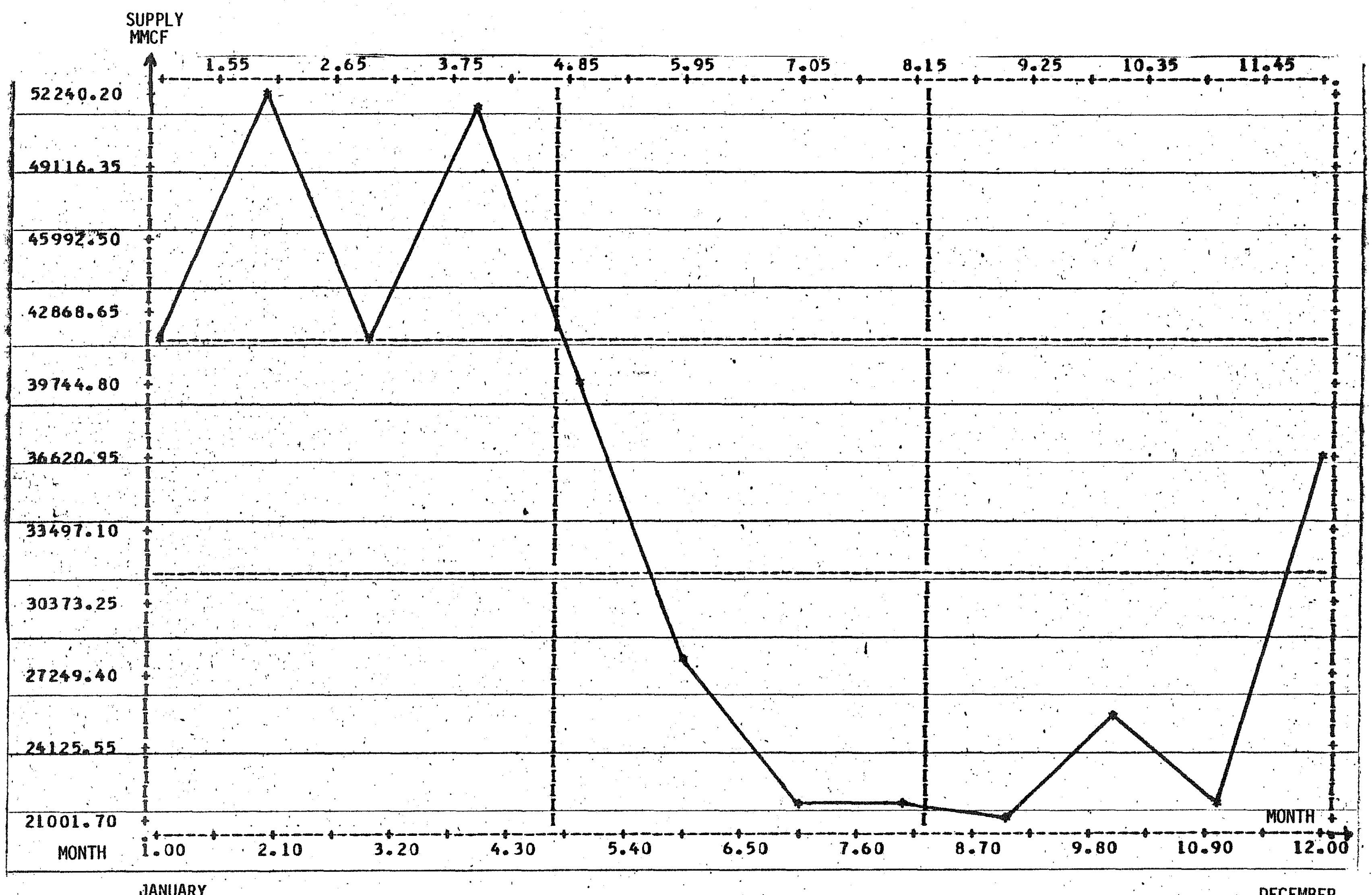


FIGURE H-1 MONTHLY WHOLESALE GAS SUPPLY - YEAR: 1971

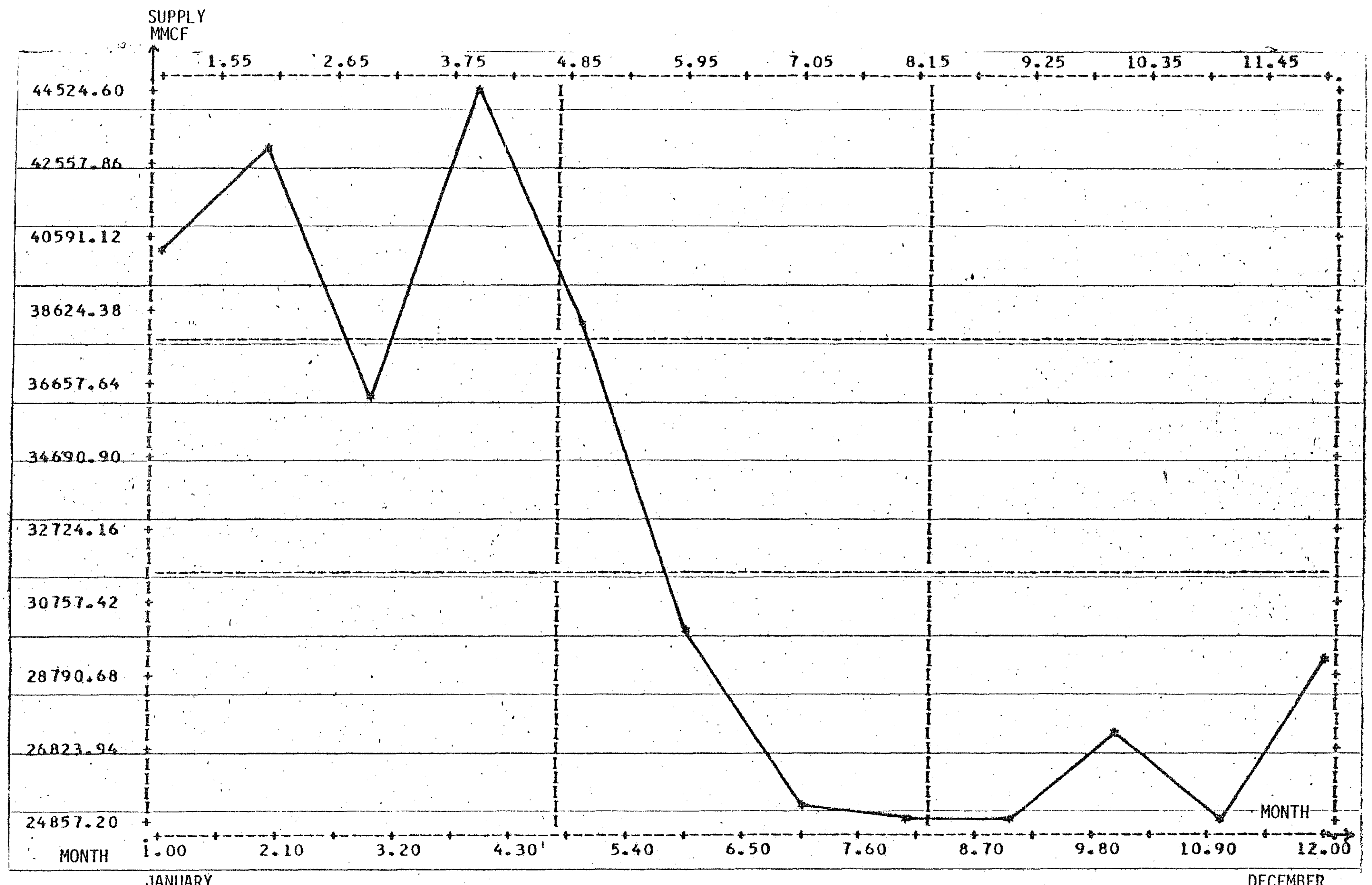


FIGURE H-2 MONTHLY WHOLESALE GAS SUPPLY - YEAR: 1973

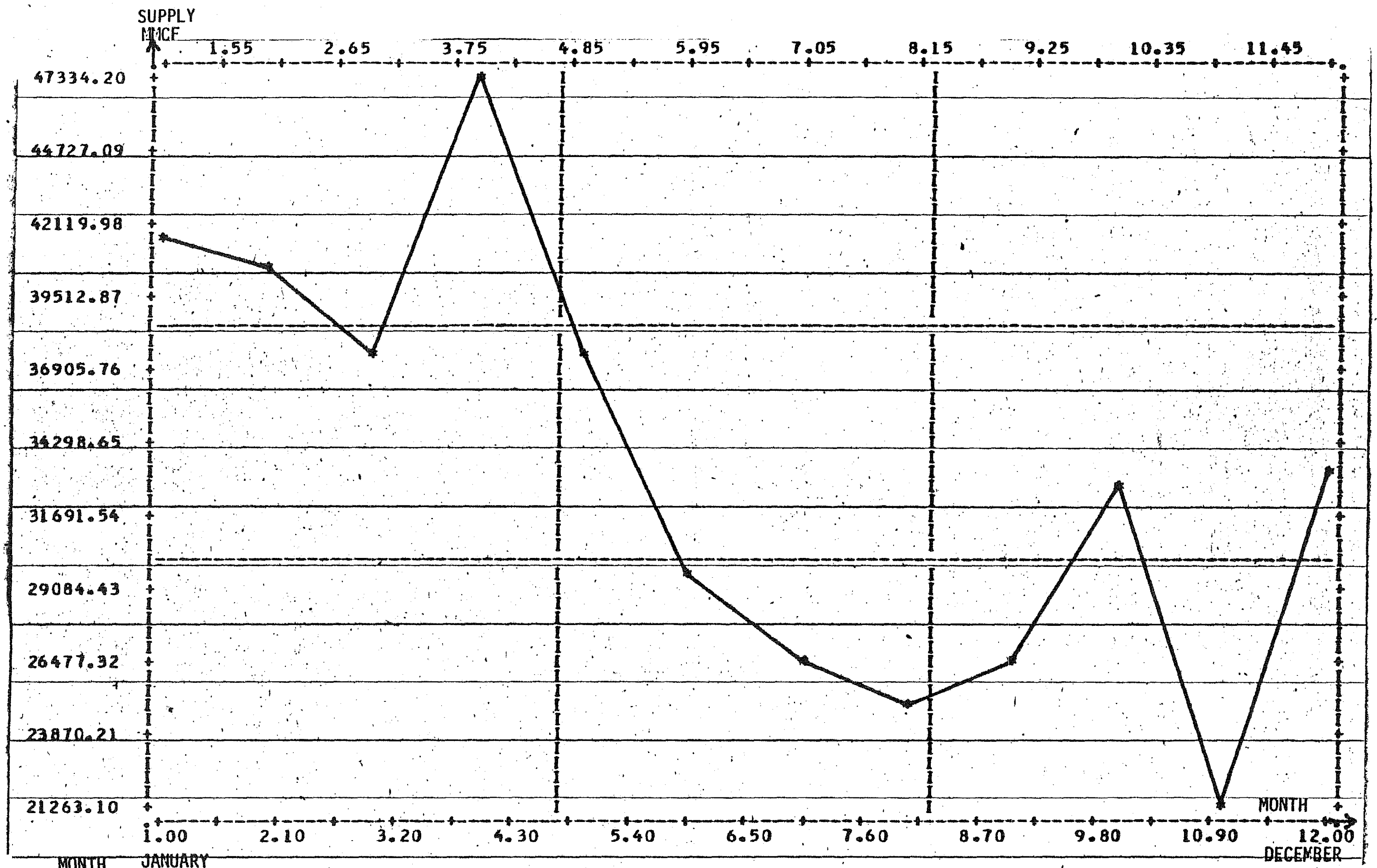


FIGURE H-3 MONTHLY WHOLESALE GAS SUPPLY - YEAR: 1974

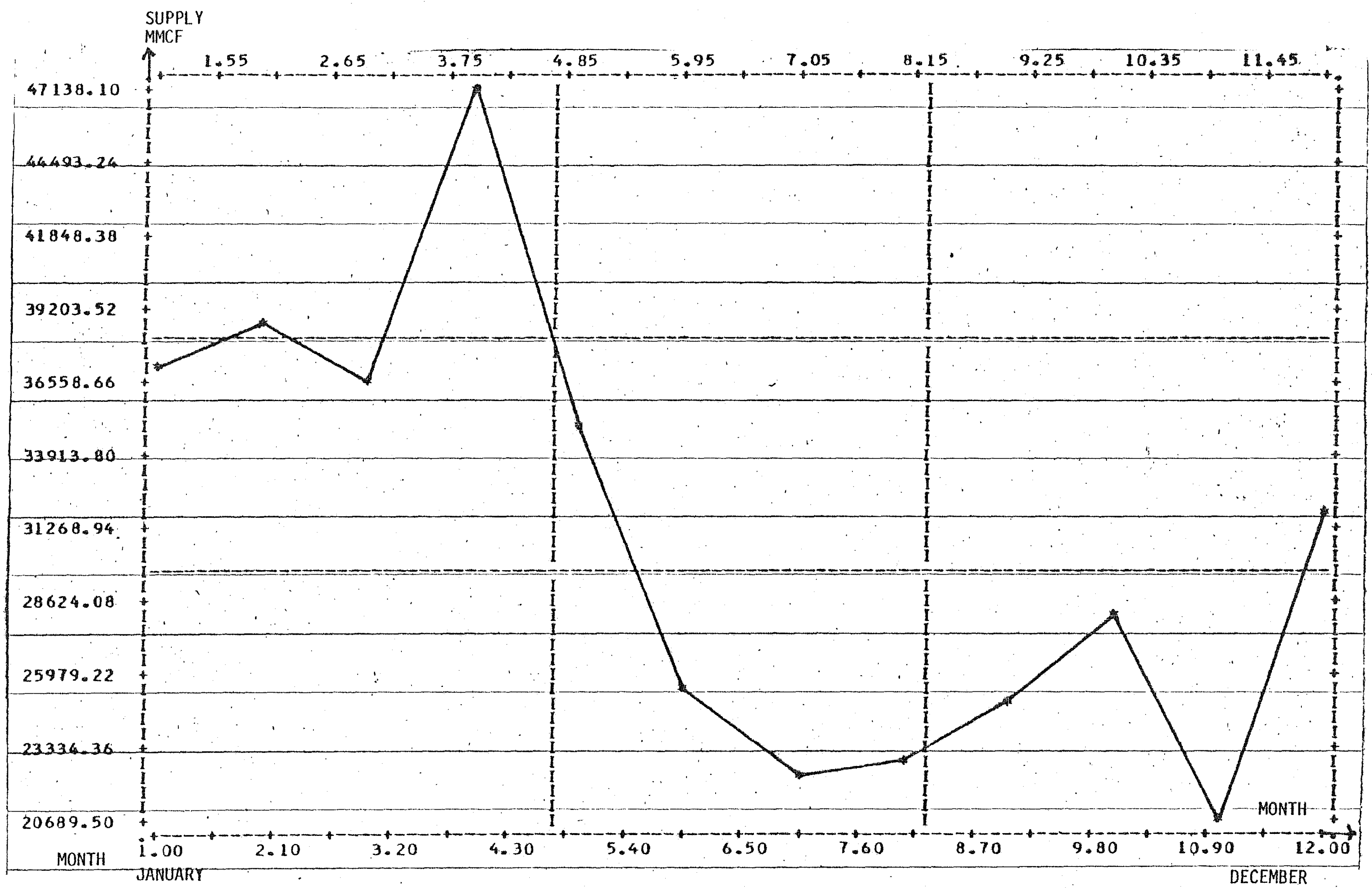


FIGURE H-4 MONTHLY WHOLESALE GAS SUPPLY - YEAR: 1975

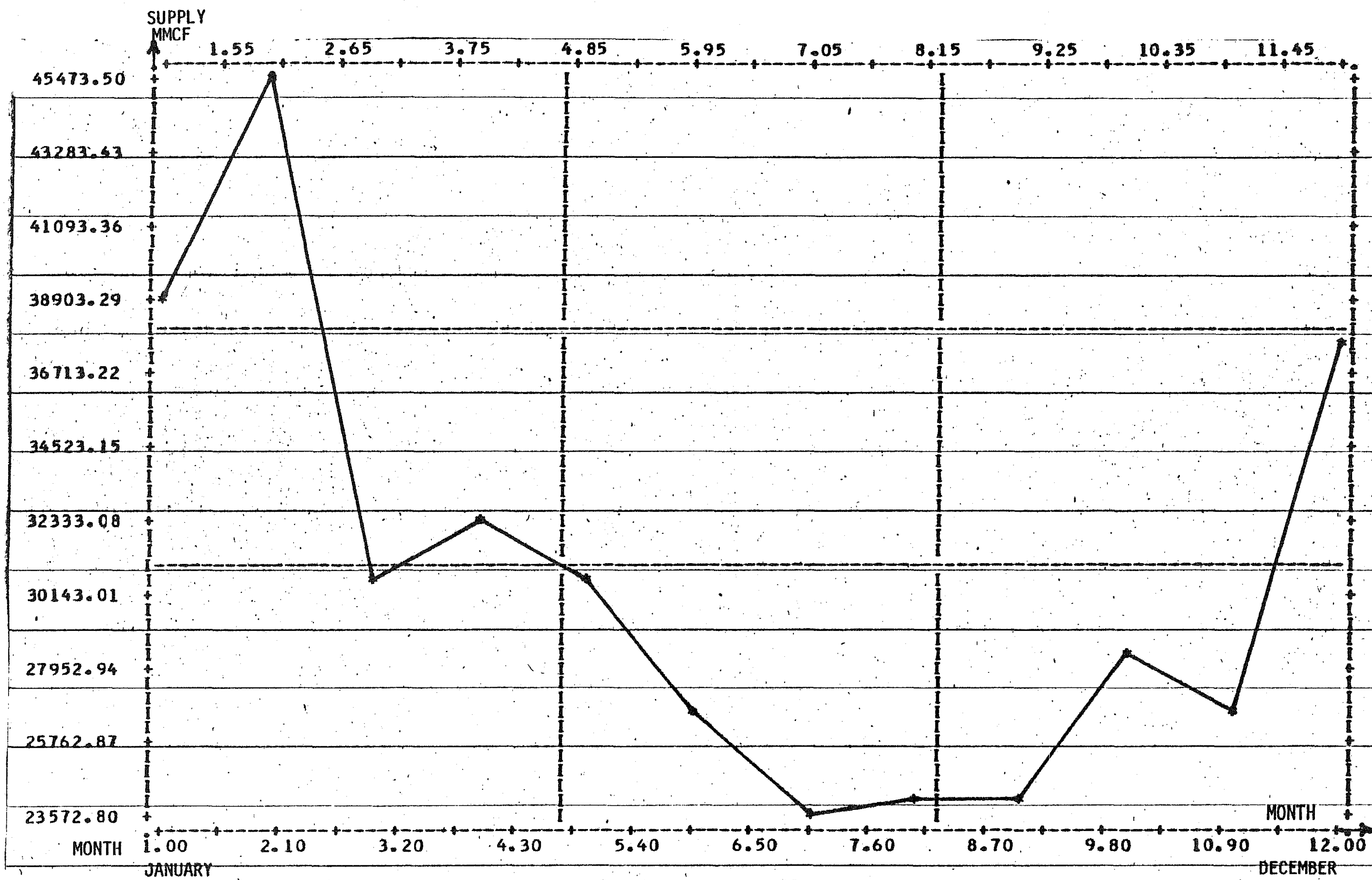


FIGURE H-5 MONTHLY WHOLESALE GAS SUPPLY - YEAR: 1976

Table H-30 Total Working Gas in Storage - End of Year (MCF)

Year	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz	Total
1970	not listed	not listed	not listed	not listed	not listed	not listed
1971	not listed	not listed	not listed	not listed	not listed	not listed
1972	44,396,965	6,202,445	403,752	1,668,638	61,756	54,927,326
1973	46,781,577	6,078,053	362,084	1,666,336	39,276	54,927,326
1974	45,977,517	6,077,823	443,376	1,676,624	25,772	54,201,112
1975	54,690,123	6,174,280	544,265	1,681,160	10,059	63,099,887
1976	47,456,325	5,832,108	341,963	1,688,403	791	55,319,590
1977	44,798,224	6,173,564	445,840	1,687,350	0	53,103,859

Table H-31 Total Cushion Gas in Storage - End of Year (MCF)

Year	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz	Total
1970	not listed	not listed	not listed	not listed	not listed	not listed
1971	not listed	not listed	not listed	not listed	not listed	not listed
1972	80,987,042	5,377,617	2,052,349	2,194,030	83,600	90,695,638
1973	81,229,842	5,377,117	2,052,849	2,194,430	83,600	90,937,838
1974	81,229,842	5,377,117	2,052,849	2,194,430	83,600	90,937,838
1975	81,229,842	5,377,117	2,052,849	2,194,430	83,600	90,937,838
1976	81,229,842	5,377,117	2,052,849	2,194,430	83,600	90,937,838
1977	81,229,842	5,377,117	2,052,849	2,194,430	82,481	90,937,838

Source: Annual Reports - EOGC

Table H-32 Total Gas in Storage - End of Year (MCF)

Year	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz	Total
1970	130,294,902	11,846,528	2,510,875	3,886,823	164,315	142,703,443
1971	133,194,499	11,848,132	2,446,844	3,858,224	148,360	151,496,059
1972	125,384,007	11,580,062	2,457,101	3,862,668	145,356	143,429,194
1973	128,011,419	11,455,170	2,414,933	3,860,766	122,876	145,865,164
1974	127,207,359	11,454,940	2,496,225	3,871,054	109,372	145,138,950
1975	135,919,965	11,551,397	2,597,114	3,875,590	93,659	154,037,725
1976	128,686,167	11,209,225	2,394,812	3,882,833	84,391	146,257,428
1977	126,028,066	11,550,681	2,498,689	3,881,780	82,481	144,041,697

Table H-33 Certified Storage Capacity - End of Year (MCF) and Year of Start of Storage Operations

Year	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz	Total
1970	122,862,300	10,934,700	3,111,100	3,012,100	214,200	140,134,400
1971	122,862,300	10,934,700	3,111,100	3,012,100	214,200	140,134,400
1972	125,287,900	10,934,700	3,111,100	3,012,100	214,200	142,560,000
1973	128,599,900	10,934,700	3,111,100	3,012,100	214,200	145,872,000
1974	128,599,900	10,934,700	3,111,100	3,012,100	214,200	145,872,000
1975	129,822,000	10,934,700	3,111,100	3,012,100	214,200	147,094,100
1976	130,322,000	10,934,700	3,111,100	3,012,100	214,200	147,594,100
1977	130,322,000	10,934,700	3,111,100	3,012,100	214,200	147,594,100
Year of Start of Storage Operations	1941	1941	1950	1961	1967	---

Source: Annual Reports - EOGC

Table H-34 Maximum Total Daily Gas Withdrawal - Date of Occurrence and Corresponding Individual Storage Pools Withdrawals (MCF)

Year	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz	Total
1970	835,327	361,688	11,855	---	55	1,208,925 (1/8/70)
1971	698,040	317,444	6,855	3,470	116	1,025,925 (2/1/71)
1972	515,750	214,845	9,183	---	---	739,778 (1/15/72)
1973	510,970	199,937	5,352	---	97	716,356 (2/16/73)
1974	514,986	14,868	3,284	53,729	46	586,913 (3/25/74)
1975	542,985	140	25,056	---	29	586,210 (12/3/75)
1976	800,218	138	9,247	---	1	809,604 (1/9/76)
1977	722,209	273,632	6,441	---	13	722,209 (1/16/77)

Source: Annual Reports - EOGC

Table H- 35 Maximum Daily Withdrawal Capacity Rates for All Fields (MCF)

Year	Maximum Daily Withdrawal Capacity
1970	1,186,000
1971	1,587,000
1972	1,500,000
1973	1,680,000
1974	1,735,000
1975	1,835,000
1976	1,423,000
1977	1,454,000

Source: Annual Reports - EOGC

Table H-36 Monthly Gas Deliveries to Storage - 1970 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January...........	1,770,882	988,873	782,009	---	---	---
February..........	1,242,484	960,448	282,036	---	---	---
March.............	227,933	212,601	15,332	---	---	---
April.............	5,711,523	5,711,523	---	---	---	---
May...............	8,481,143	8,460,881	---	20,262	---	---
June..............	8,002,828	7,925,406	---	77,422	---	---
July..............	8,384,750	7,971,006	---	413,744	---	---
August............	7,995,504	7,028,278	479,473	357,664	130,089	---
September.........	6,937,137	6,258,407	276,072	275,178	127,480	---
October...........	5,291,380	4,374,180	601,067	239,560	76,573	---
November..........	458,971	280,950	178,021	---	---	---
December..........	612,245	372,710	239,535	---	---	---
Total..........	55,116,780	50,545,263	2,853,545	1,383,830	334,142	---

Source: EOGC Annual Report - 1970

Table H-37 Monthly Gas Deliveries to Storage - 1971 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January...........	690,129	149,907	540,222	---	---	---
February..........	2,451,706	1,480,086	971,620	---	---	---
March.............	---	---	---	---	---	---
April.............	8,609,219	8,609,219	---	---	---	---
May...............	8,720,266	8,608,478	12,804	98,984	---	---
June..............	7,120,161	6,935,550	---	184,611	---	---
July..............	6,346,980	5,791,693	438,316	116,971	---	---
August............	6,512,648	5,655,901	377,028	368,040	111,679	---
September.........	6,676,969	5,787,267	503,660	286,615	99,427	---
October...........	5,939,986	4,907,067	654,596	246,249	132,074	---
November..........	141,718	86,448	55,270	---	---	---
December..........	748,565	459,609	288,956	---	---	---
Total..........	53,958,347	48,471,225	3,842,472	1,301,470	343,180	---

Source: EOGC Annual Report - 1971

Table H-38 Monthly Gas Deliveries to Storage - 1972 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	435,986	---	435,986	---	---	---
February...........	411,840	172,221	239,619	---	---	---
March..............	---	---	---	---	---	---
April..............	6,935,585	6,935,585	---	---	---	---
May................	9,182,152	9,085,646	---	96,506	---	---
June...............	6,770,913	6,452,189	(4,039)	320,583	2,180	---
July...............	5,398,898	5,124,437	---	270,993	3,468	---
August.............	8,044,627	7,057,517	614,778	295,221	77,111	---
September..........	7,256,191	6,870,235	19,654	289,658	76,644	---
October............	3,286,046	1,783,977	1,121,631	182,058	198,380	---
November...........	635	164	389	---	82	---
December...........	53,015	---	53,015	---	---	---
Total...........	47,775,888	43,481,971	2,481,033	1,455,019	357,865	---

Source: EOGC Annual Report - 1972

Table H-39 Monthly Gas Deliveries to Storage - 1973 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	669,875	150,207	519,668	---	---	---
February...........	376,542	162,349	214,193	---	---	---
March..............	---	---	---	---	---	---
April..............	8,305,397	8,305,397	---	---	---	---
May................	9,050,675	8,946,798	---	103,877	---	---
June...............	8,455,821	8,189,850	---	265,971	---	---
July...............	8,312,326	8,083,804	---	228,522	---	---
August.............	7,940,234	7,190,916	441,437	307,881	---	---
September..........	6,989,810	6,411,437	135,001	306,218	137,154	---
October............	5,518,543	4,121,262	978,589	191,260	227,432	---
November...........	247	---	205	---	42	---
December...........	---	---	---	---	---	---
Total...........	55,619,470	51,562,020	2,289,093	1,403,729	364,628	---

Sou[illegible] E[illegible] Ann[illegible] Rep[illegible] - 1[illegible]

Table H-40 Monthly Gas Deliveries to Storage - 1974 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	---	---	---	---	---	---
February...........	---	---	---	---	---	---
March..............	822		---	---	---	---
April..............	8,216,465	8,216,465	---	---	---	---
May................	9,544,057	9,531,549	---	12,508	---	---
June...............	9,459,829	9,1621284	---	297,545	---	---
July...............	9,319,470	8,838,587	122,081	358,802	---	---
August.............	7,992,164	6,723,702	814,759	280,574	168,129	---
September..........	7,837,336	6,927,047	571,585	277,614	61,090	---
October............	5,010,744	3,984,700	540,952	229,478	155,614	---
November...........	34,094	30,178	3,916	---	---	---
December...........	---	---	---	---	---	---
Total...........	57,414,981	53,420,334	2,153,293	1,456,521	384,833	---

Source: EOGC Annual Report - 1974

Table H-41 Monthly Gas Deliveries to Storage - 1975 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	---	---	---	---	---	---
February...........	---	---	---	---	---	---
March..............	---	---	---	---	---	---
April..............	6,867,016	6,867,016	---	---	---	---
May................	10,721,065	10,491,657	---	229,408	---	---
June...............	9,563,819	9,331,581	---	232,238	---	---
July...............	9,206,006	8,633,368	374,968	197,670	---	---
August.............	8,359,688	7,739,703	168,233	301,750	150,002	---
September..........	7,953,852	6,865,382	829,595	197,460	61,415	---
October............	6,999,304	5,883,695	802,496	180,564	132,549	---
November...........	219,394	219,394	---	---	---	---
December...........	7,403	7,403	---	---	---	---
Total...........	59,897,547	56,039,199	2,175,292	1,339,090	343,966	---

Source: EOGC Annual Report - 1975

Table H-42 Monthly Gas Deliveries to Storage - 1976 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	---	---	---	---	---	---
February..........	---	---	---	---	---	---
March.............	120,966	120,966	---	---	---	---
April..............	1,336,869	1,336,869	---	---	---	---
May...............	5,348,258	5,327,491	---	20,767	---	---
June..............	8,281,959	8,071,717	---	210,242	---	---
July..............	8,680,399	8,334,987	2,299	343,113	---	---
August............	8,265,892	7,367,269	502,085	336,788	59,750	---
September.........	7,480,609	6,898,554	255,754	275,039	51,262	---
October...........	5,661,246	4,787,436	584,727	144,535	144,548	---
November..........	---	---	---	---	---	---
December..........	65,829	---	65,829	---	---	---
Total..........	45,242,027	42,245,289	1,410,694	1,330,484	255,560	---

Source: EOGC Annual Report - 1976

Table H-43 Monthly Gas Deliveries to Storage - 1977 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	939,800	390,320	549,480	---	---	---
February..........	1,298,830	618,635	680,195	---	---	---
March.............	440,874	440,874	---	---	---	---
April..............	8,685,619	8,684,257	---	1,362	---	---
May...............	9,743,153	9,519,677	---	223,476	---	---
June..............	7,890,414	7,681,836	---	208,578	---	---
July..............	7,525,128	7,317,096	---	208,032	---	---
August............	8,171,390	7,358,824	532,189	280,377	---	---
September.........	7,459,162	6,452,077	594,133	321,799	91,153	---
October...........	5,444,933	4,761,125	502,264	123,875	57,669	---
November..........	322,844	322,844	---	---	---	---
December..........	55,584	---	55,584	---	---	---
Total..........	57,977,731	53,547,565	2,913,845	1,367,499	148,822	---

Source: EOGC Annual Report - 1977

Table H-44 Monthly Gas Withdrawals from Storage - 1970 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	15,036,210	13,590,690	1,108,077	330,635	1,799	5,009
February..........	9,244,066	8,777,139	297,324	168,857	600	146
March..............	8,519,546	7,176,482	1,077,438	139,841	125,785	---
April..............	319,082	181,518	32,201	416	96,324	8,623
May................	86,303	70,577	2,581	875	233	12,037
June...............	150,959	136,416	2,264	415	5,221	6,643
July...............	114,986	95,645	8,653	25	5,709	4,954
August.............	231,011	111,098	118,471	---	1,134	308
September..........	213,181	116,465	4,242	124	92,350	---
October............	77,582	74,452	2,570	225	335	---
November...........	3,499,840	3,410,155	83,212	2,438	121	3,914
December...........	12,124,555	11,467,702	2,791,635	597,587	374	4,290
Total..........	49,617,321	45,208,339	2,791,635	1,241,438	329,985	45,924

Source: EOGC Annual Report - 1970

Table H-45 Monthly Gas Withdrawals from Storage - 1971 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	14,985,243	13,511,027	1,127,440	343,484	1,197	2,095
February..........	10,929,462	9,847,061	901,916	176,827	3,540	118
March..............	9,382,825	7,767,204	1,210,375	123,487	281,759	---
April..............	67,281	75,449	10,891	(21,674)	2,079	536
May................	155,801	68,604	78,330	845	3,675	4,347
June...............	292,701	72,617	213,155	573	3,564	2,792
July...............	195,149	124,672	68,856	17	858	746
August.............	187,517	122,481	5,419	10	57,933	1,737
September..........	100,305	94,756	3,623	94	1,832	---
October............	149,857	120,832	24,289	393	4,321	22
November...........	5,768,506	5,504,586	53,270	209,015	366	1,269
December...........	8,951,084	8,262,403	143,303	532,430	10,656	2,292
Total..........	51,165	45,571,629	3,840,867	1,365,501	371,780	15,954

Source: EOGC Annual Report - 1971

Table H-46 Monthly Gas Withdrawals from Storage - 1972 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January	13,284,944	12,351,116	634,374	297,665	1,056	733
February	10,292,049	9,884,705	243,484	163,339	350	171
March	9,030,889	7,264,789	1,345,228	115,035	305,736	101
April	583,693	104,915	440,186	799	37,662	131
May	96,857	90,000	4,417	862	1,578	---
June	105,105	96,352	5,478	939	2,189	147
July	95,416	86,718	6,234	265	2,166	33
August	118,131	115,447	2,112	102	437	33
September	93,598	88,168	4,888	353	185	4
October	87,182	82,445	2,285	1,810	598	44
November	9,174,278	8,762,478	3,187	407,848	699	66
December	12,880,612	12,365,331	57,230	455,745	765	1,541
Total	55,842,754	51,292,464	2,749,103	1,444,762	353,421	3,004

Source: EOGC Annual Report - 1972

Table H-47 Monthly Gas Withdrawals from Storage - 1973 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January	13,409,824	12,572,261	578,742	252,887	1,478	4,456
February	8,899,952	8,138,971	600,249	156,993	681	3,058
March	8,033,062	6,406,311	1,151,726	111,781	360,528	2,716
April	123,754	71,332	48,320	1,264	983	1,855
May	69,117	64,474	3,096	50	173	1,324
June	86,938	77,916	6,182	455	701	1,684
July	84,615	81,328	1,855	22	301	1,009
August	89,819	87,095	1,315	17	35	1,357
September	74,639	70,684	1,458	446	94	1,957
October	73,550	68,046	2,541	1,185	457	1,321
November	7,730,937	7,346,439	3,427	380,025	362	684
December	14,749,493	14,192,551	14,574	540,272	1,037	1,059
Total	53,425,700	49,177,408	2,413,485	1,445,397	366,930	22,480

Source: EOGC Annual Report - 1973

Table H-48 Monthly Gas Withdrawals from Storage - 1974 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	12,956,935	12,684,906	27,603	241,956	1,111	1,359
February..........	10,306,382	9,667,570	482,252	154,823	215	1,522
March.............	8,978,341	7,044,661	1,466,100	116,655	348,956	1,969
April..............	238,293	83,804	150,740	957	1,170	1,622
May...............	71,184	61,594	1,174	407	7,671	338
June..............	47,947	45,198	1,348	459	428	514
July..............	150,703	142,444	3,978	1,153	2,143	985
August............	103,359	86,984	4,082	10,594	921	778
September.........	70,954	61,629	2,315	5,828	150	1,032
October...........	93,065	75,492	4,269	6,064	5,701	1,539
November..........	10,442,973	10,031,962	4,022	400,822	5,279	888
December..........	14,681,059	14,238,150	5,640	435,511	800	958
Total..........	58,141,195	54,224,394	2,153,523	1,375,229	374,545	13,504

Source: EOGC Annual Report - 1974

Table H-49 Monthly Gas Withdrawals from Storage - 1975 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	13,667,494	13,369,895	47,090	247,213	1,130	2,166
February..........	9,166,799	8,532,283	490,093	141,800	765	1,858
March.............	8,998,562	7,397,890	1,167,139	104,813	327,453	1,267
April..............	699,946	355,356	341,229	1,155	723	1,483
May...............	132,552	126,373	2,282	1,857	571	1,469
June..............	201,705	186,430	7,707	4,413	1,702	1,452
July..............	183,296	177,097	2,062	2,347	397	1,393
August............	171,121	163,990	1,777	4,139	64	1,151
September.........	170,303	159,839	6,613	2,717	379	755
October...........	105,804	96,267	3,892	3,807	1,198	640
November..........	5,370,913	5,178,721	3,752	182,826	4,531	1,083
December..........	12,130,277	11,582,452	5,199	541,114	516	996
Total..........	50,998	47,326,593	2,078,835	1,238,201	339,430	15,713

Source: EOGC Annual Report - 1975

Table H-50 Monthly Gas Withdrawals from Storage - 1976 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	13,493,199	13,205,978	5,050	279,778		349
February...........	5,911,546	5,706,996	32,079	171,414	553	504
March..............	6,191,667	4,927,632	903,038	119,375	240,424	1,198
April..............	863,431	484,537	375,723	729	1,383	1,059
May................	126,841	120,666	4,219	775	295	886
June...............	112,261	104,333	3,584	3,008	310	1,026
July...............	169,557	160,660	3,055	4,558	314	970
August.............	141,219	132,327	3,660	4,293	289	650
September..........	139,085	131,159	2,858	4,260	113	695
October............	286,966	277,882	2,747	3,416	1,299	622
November...........	11,313,374	10,723,020	21,684	566,921	1,077	672
December...........	14,273,178	13,502,897	394,169	374,259	1,216	637
Total..........	53,022,324	49,479,087	1,752,866	1,532,786	248,317	9,268

Source: EOGC Annual Report

Table H-51 Monthly Gas Withdrawals from Storage - 1977 (MCF)

Month	Total	Stark - Summit	Chippewa	Columbiana	Gabor	Wertz
January............	17,215,361	15,529,473	1,473,660	210,349	1,500	379
February...........	8,047,601	7,825,032	98,536	123,127	647	259
March..............	5,285,354	4,235,613	914,934	88,287	46,336	184
April..............	218,101	115,632	4,168	494	97,708	99
May................	122,469	115,833	3,722	2,626	233	55
June...............	124,025	117,305	2,992	3,273	241	214
July...............	110,133	104,709	2,227	2,749	367	81
August.............	118,831	113,205	2,180	3,191	143	112
September..........	132,319	123,449	3,209	5,409	63	189
October............	145,768	138,450	3,923	2,834	414	147
November...........	9,102,449	8,686,912	3,807	410,405	1,256	69
December...........	16,083,224	15,612,226	59,031	410,878	967	122
Total..........	56,705,635	52,717,839	2,572,389	1,263,622	149,875	1,910

Source: EOGC Annual Report - 1977

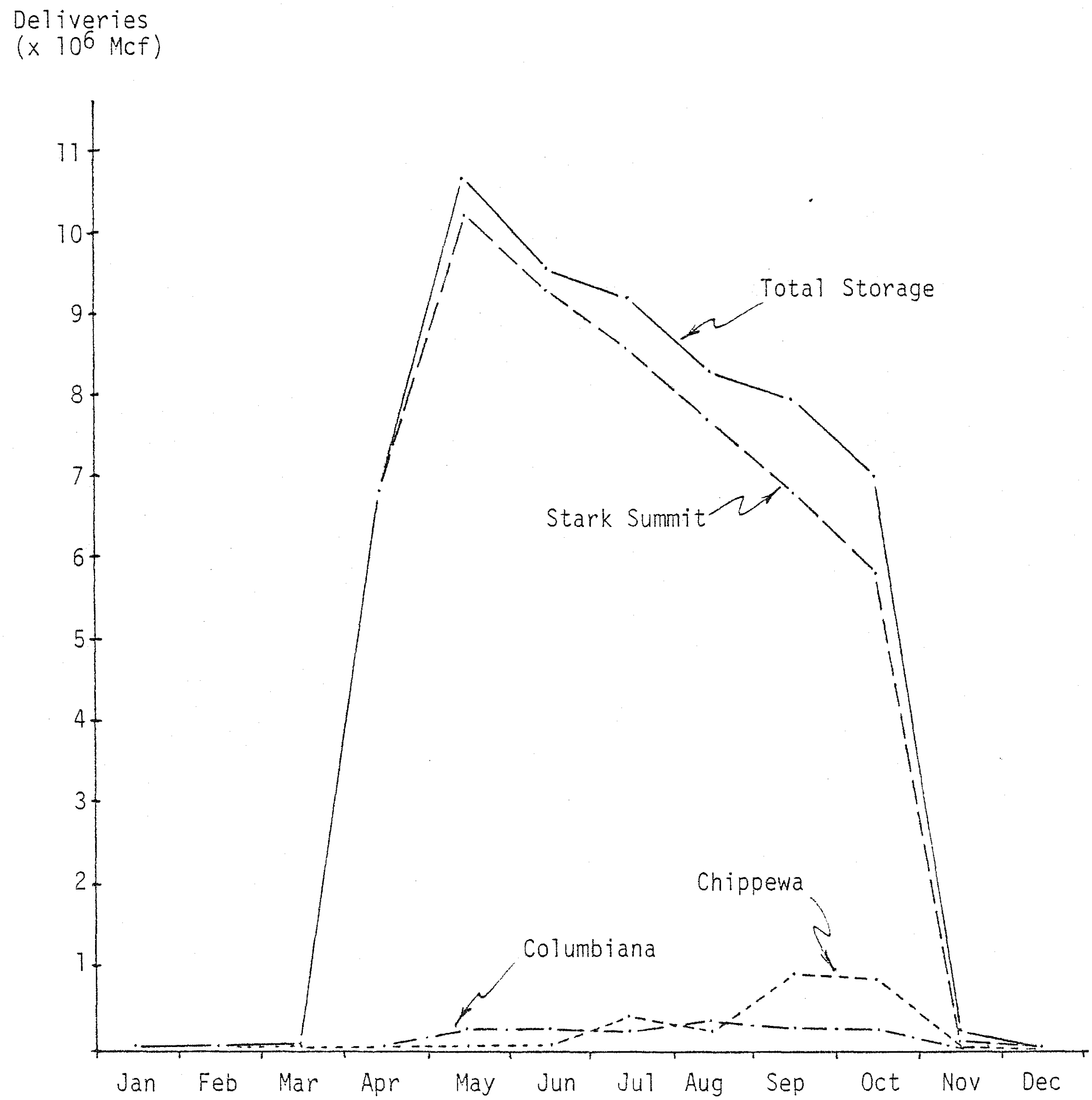


Figure H-6 Monthly Gas Deliveries to Storage in 1975

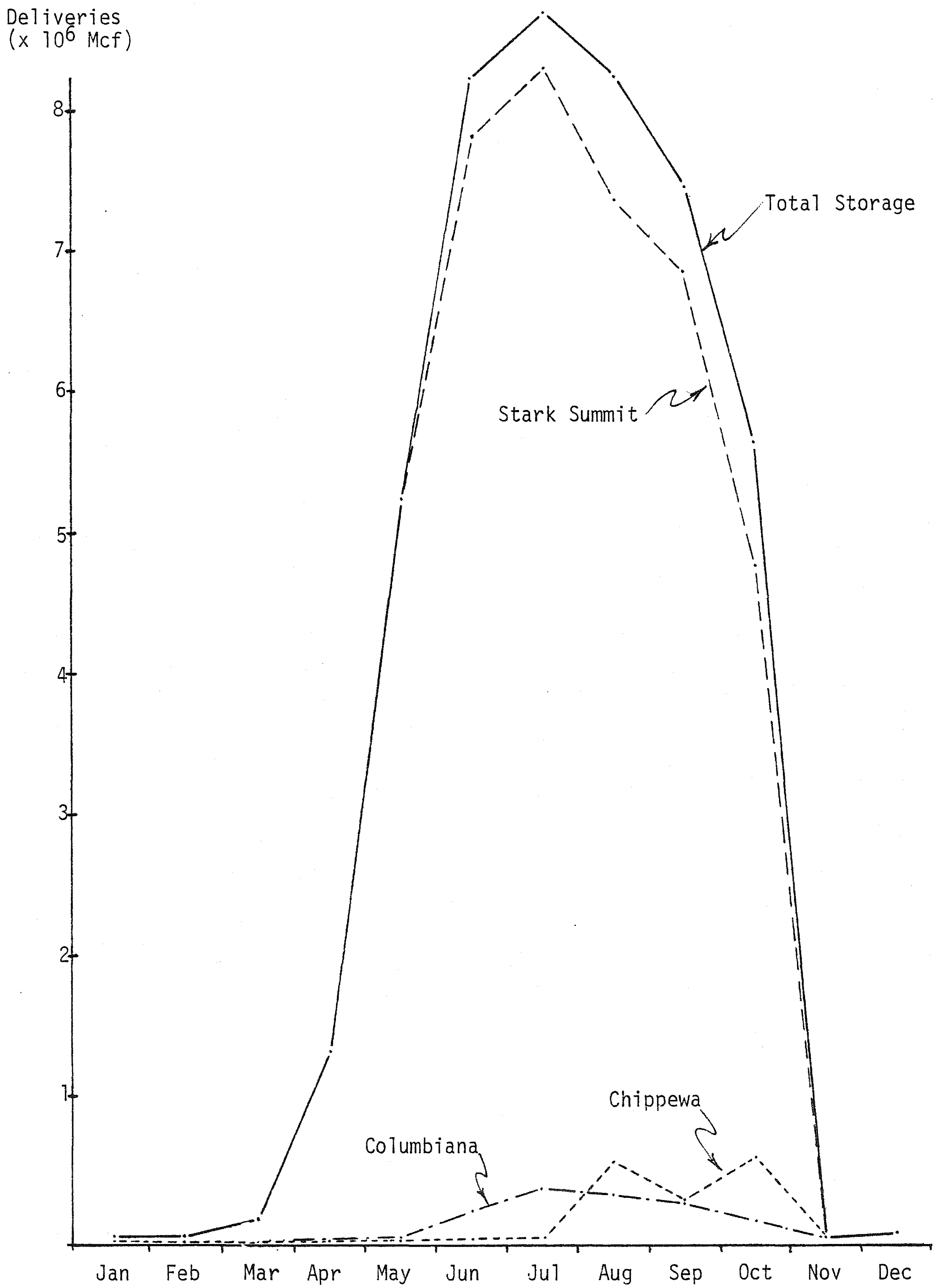


Figure H-7 Monthly Gas Deliveries to Storage in 1976

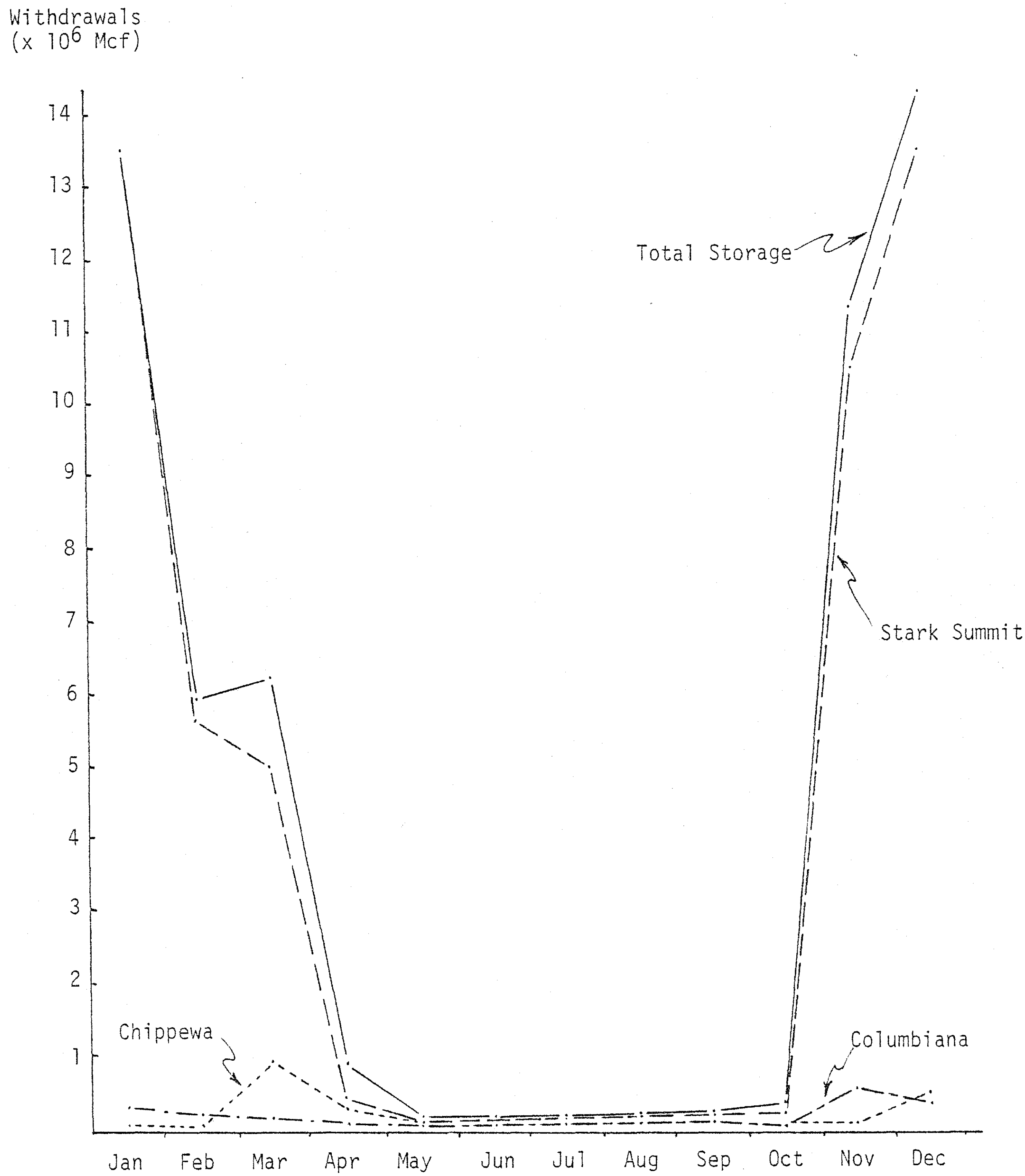


Figure H-8 Monthly Gas Withdrawals from Storage in 1975

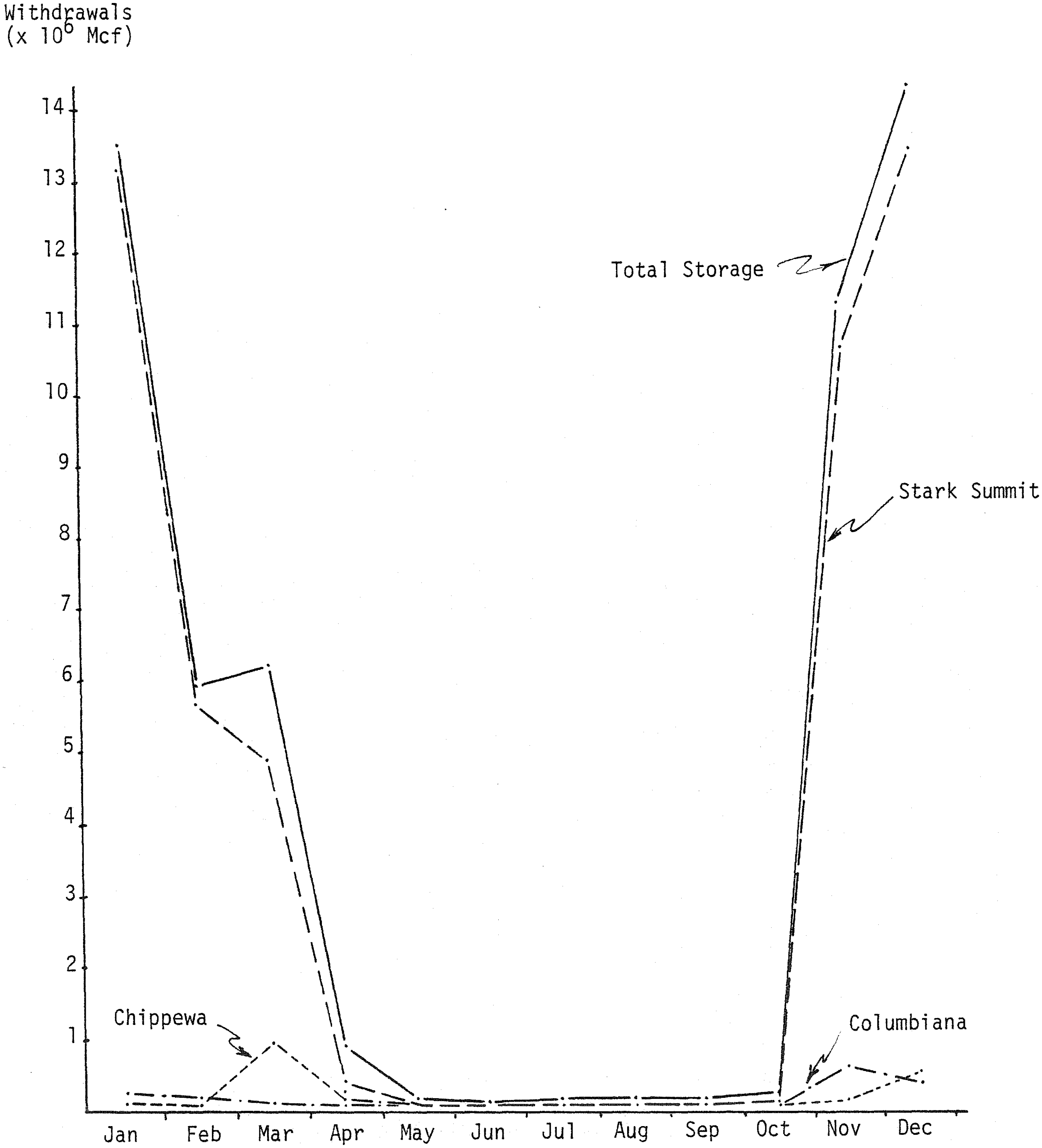


Figure H-9 Monthly Gas Withdrawels from Storage in 1976

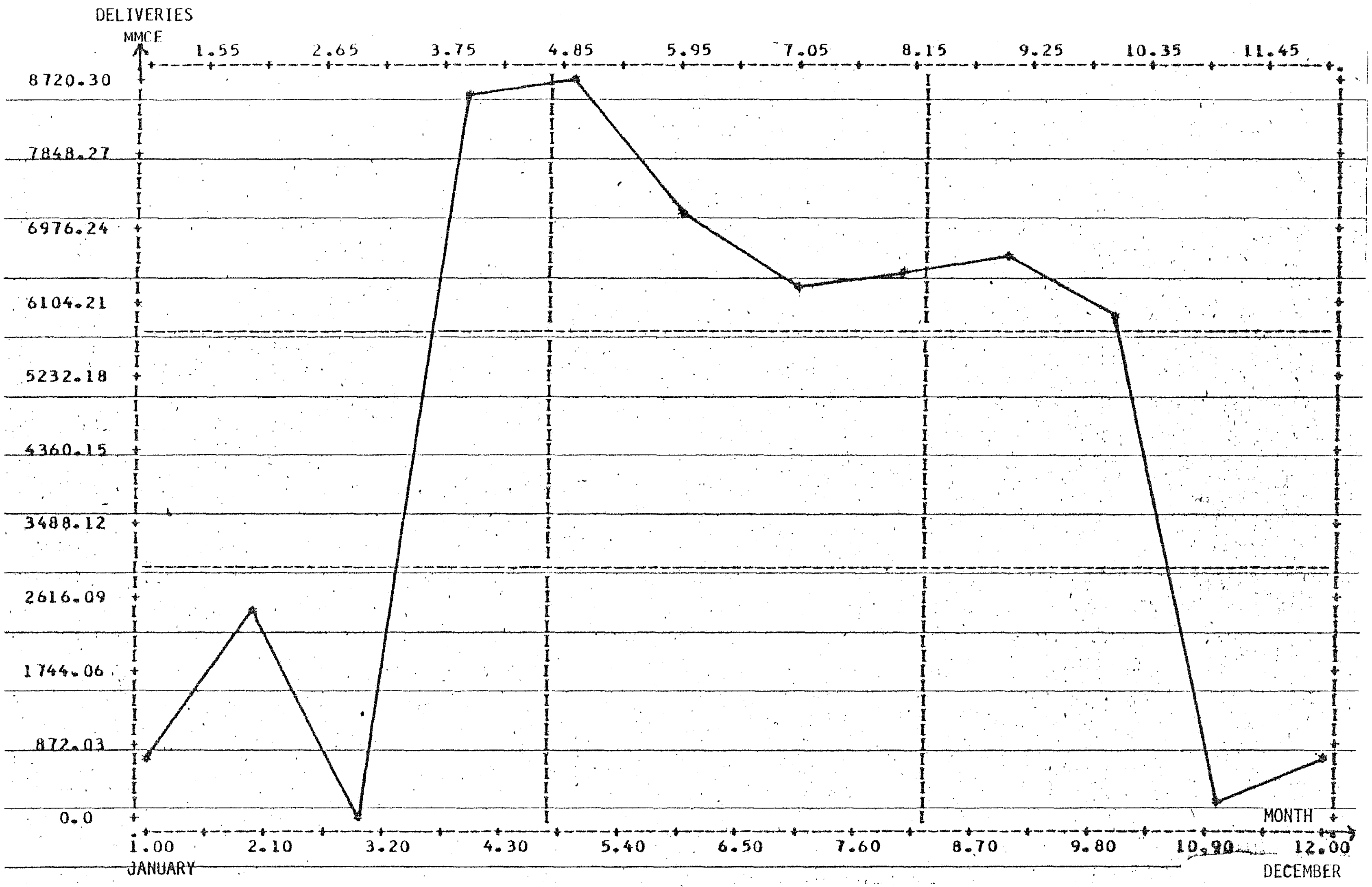


Figure H-10 MONTHLY DELIVERIES TO STORAGE - YEAR: 1971

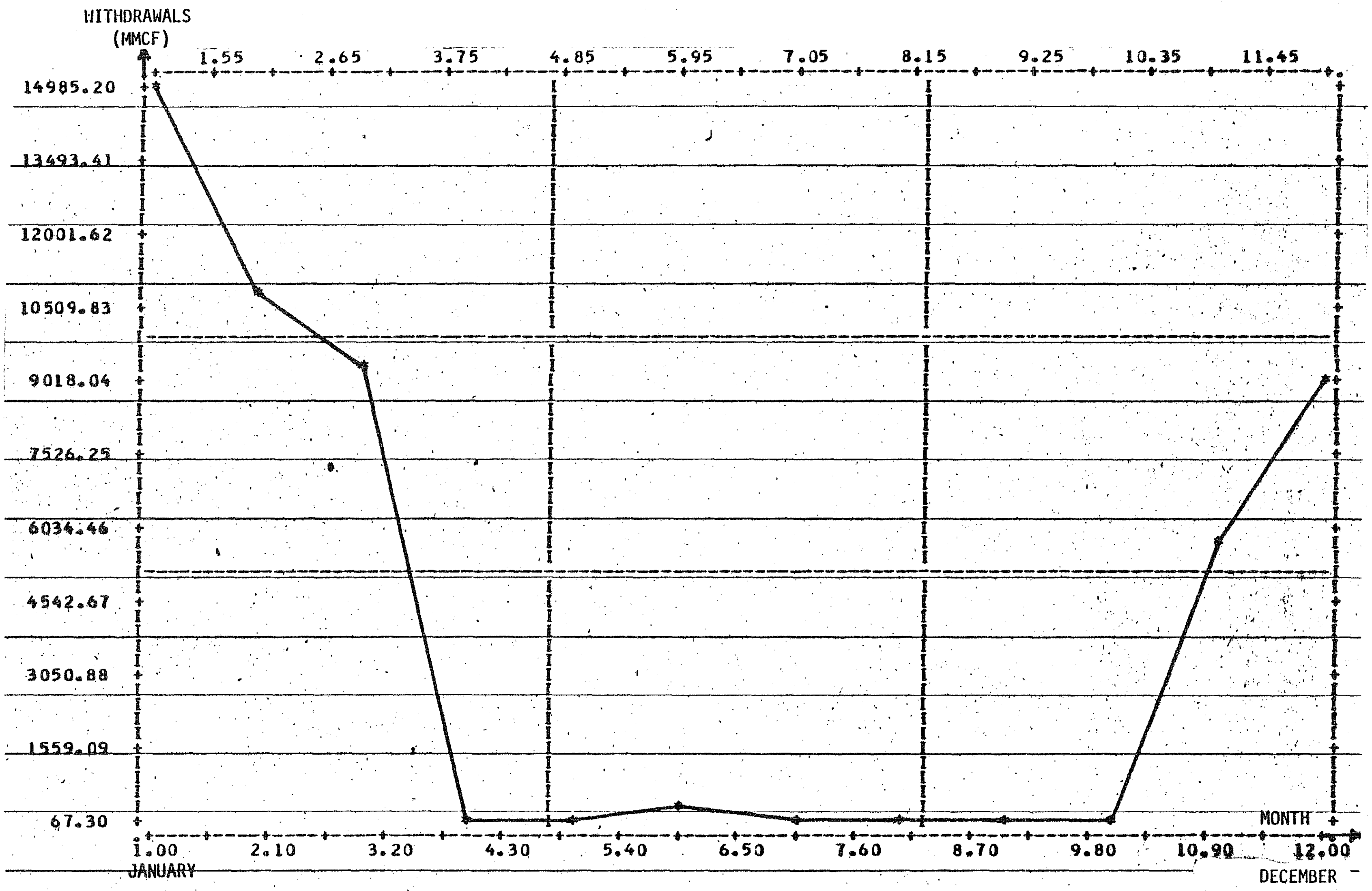


FIGURE H-11 MONTHLY WITHDRAWALS FROM STORAGE YEAR: 1971

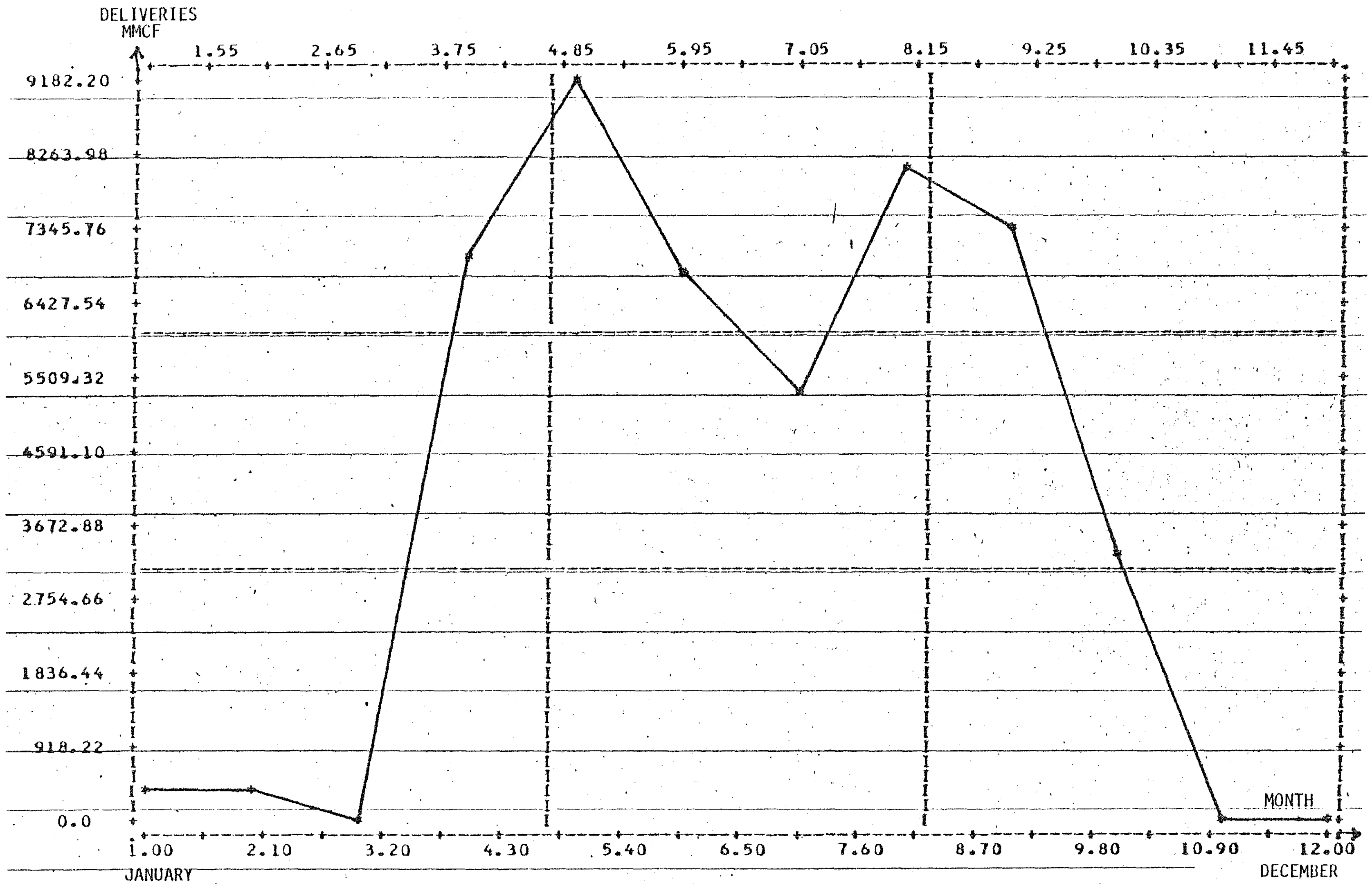


FIGURE H-12 MONTHLY DELIVERIES TO STORAGE - YEAR: 1972

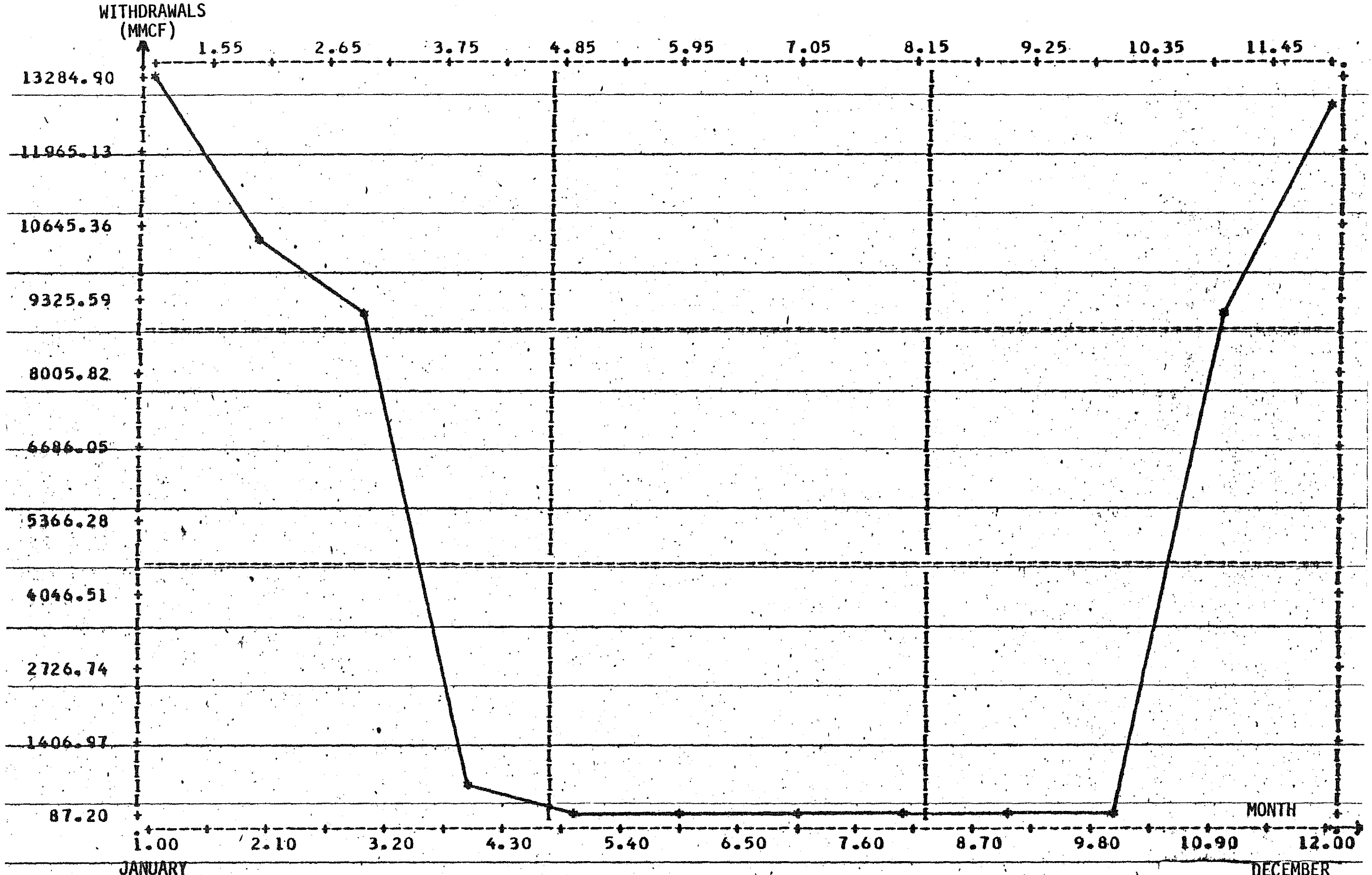


FIGURE H-13 MONTHLY WITHDRAWALS FROM STORAGE - YEAR: 1972

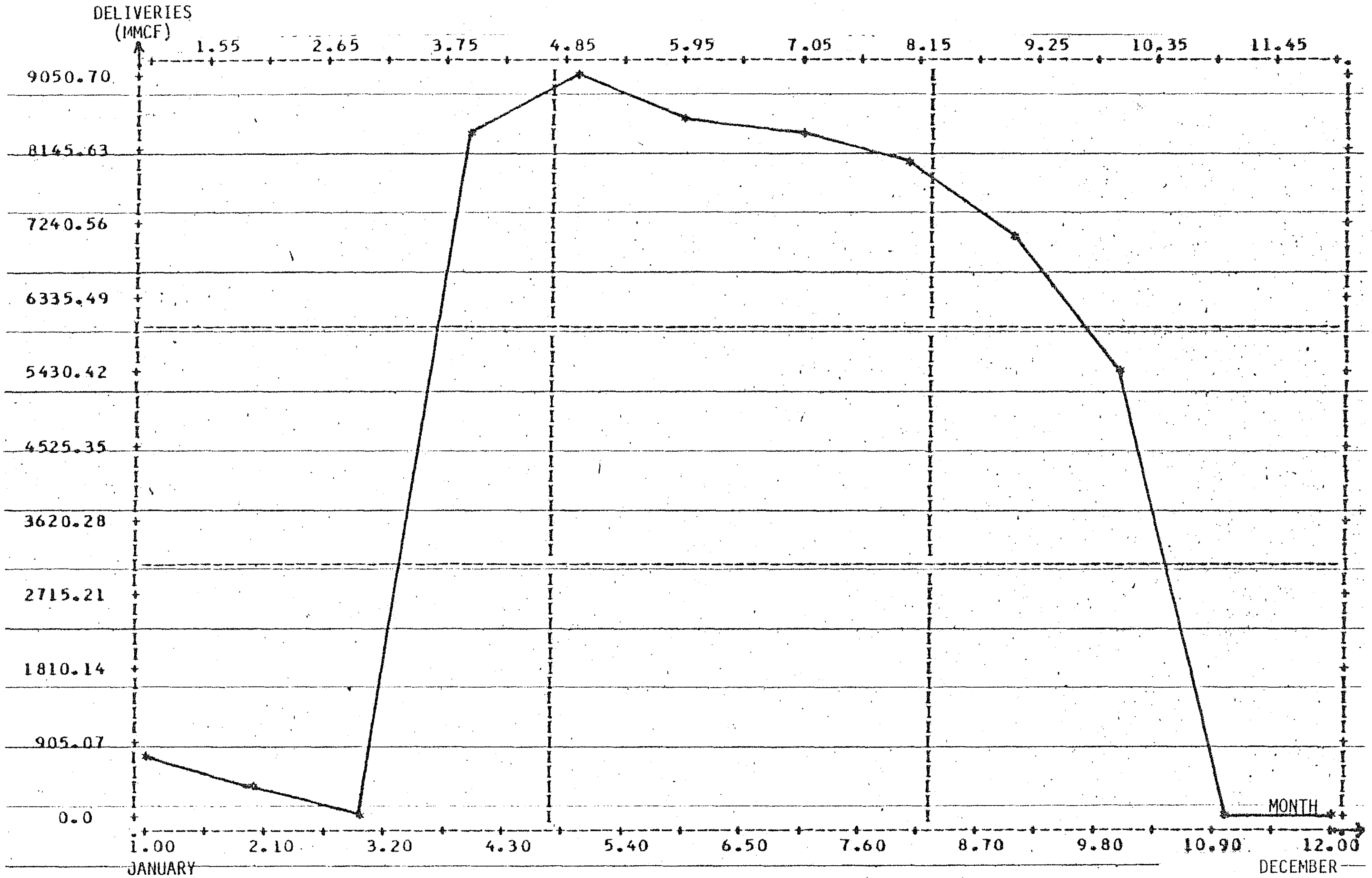


FIGURE H-14 MONTHLY DELIVERIES TO STORAGE - YEAR: 1973

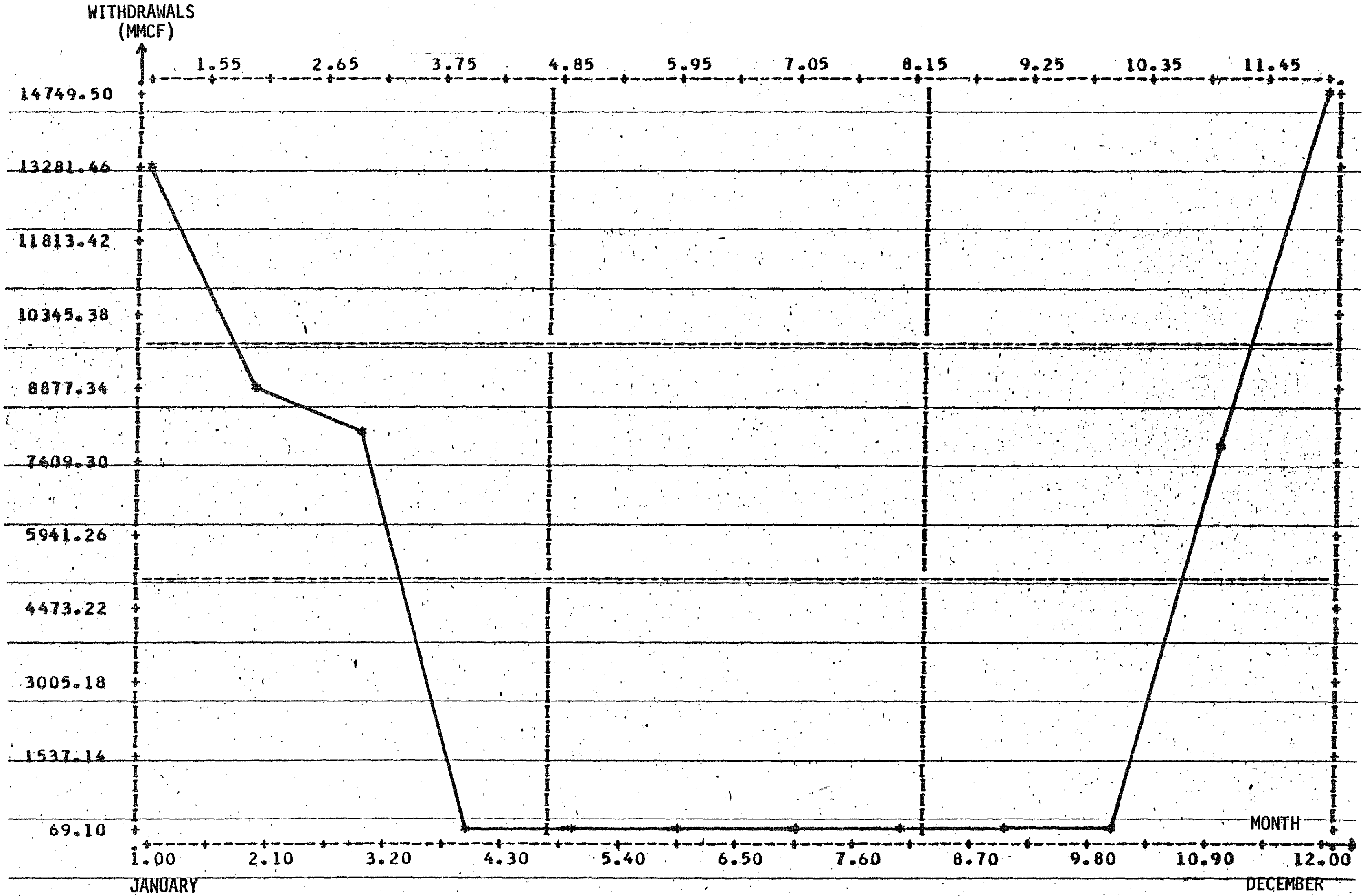


FIGURE H-15 MONTHLY WITHDRAWALS FROM STORAGE - YEAR: 1973

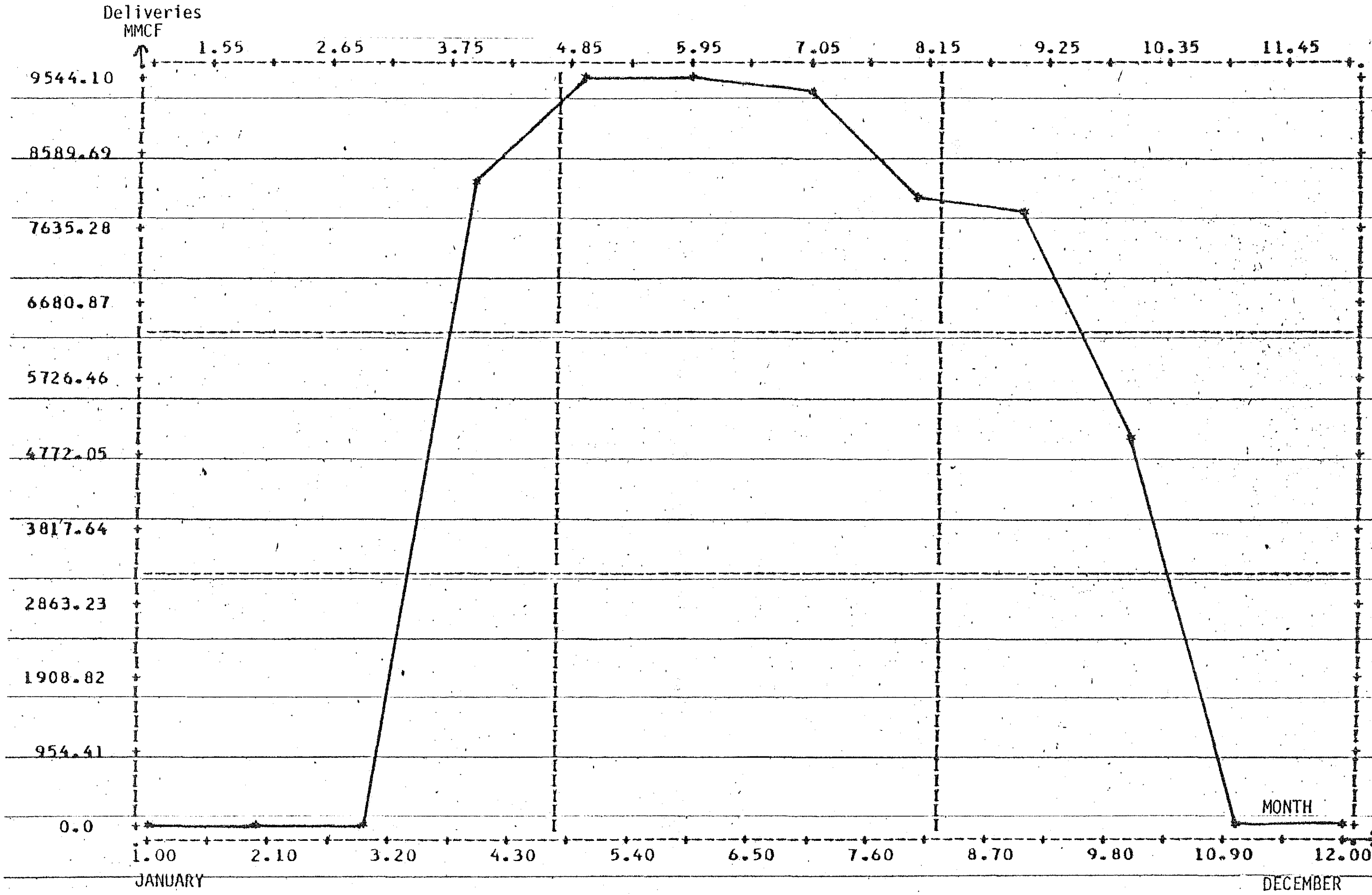


FIGURE H-16 MONTHLY DELIVERIES TO STORAGE - YEAR: 1974

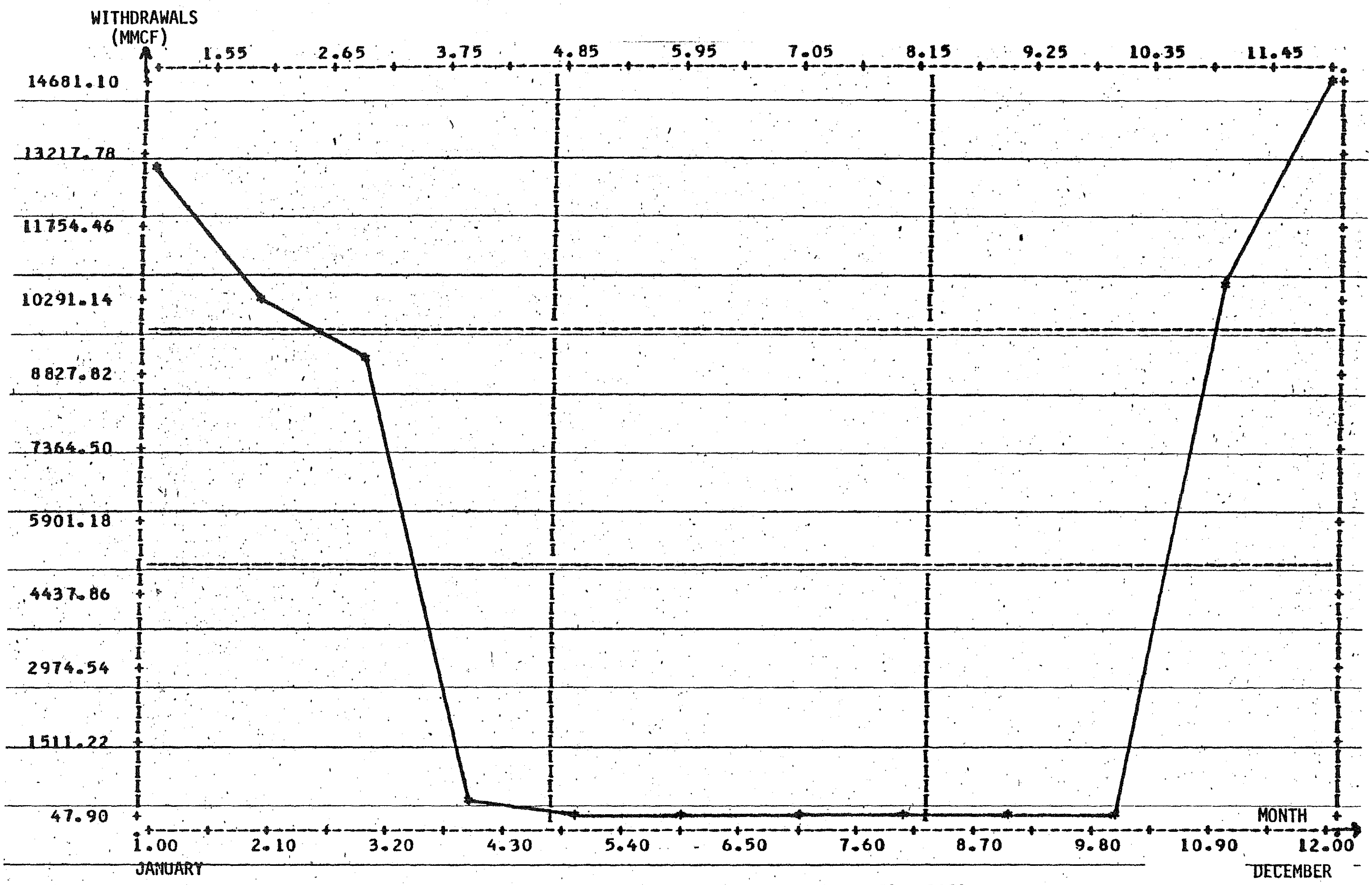


FIGURE H-17 MONTHLY WITHDRAWALS FROM STORAGE - YEAR: 1974

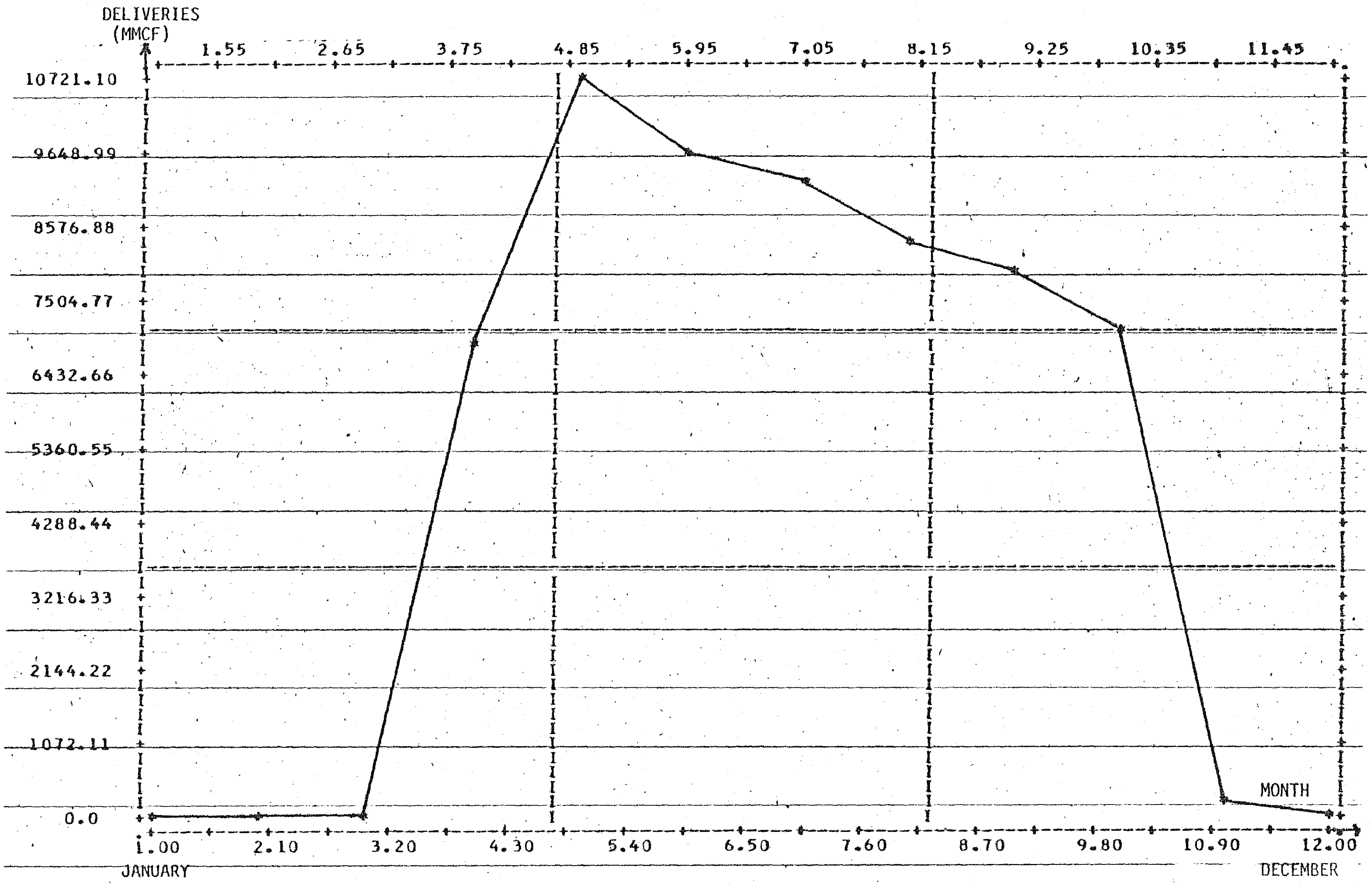


FIGURE H-18 MONTHLY DELIVERIES TO STORAGE - YEAR: 1975

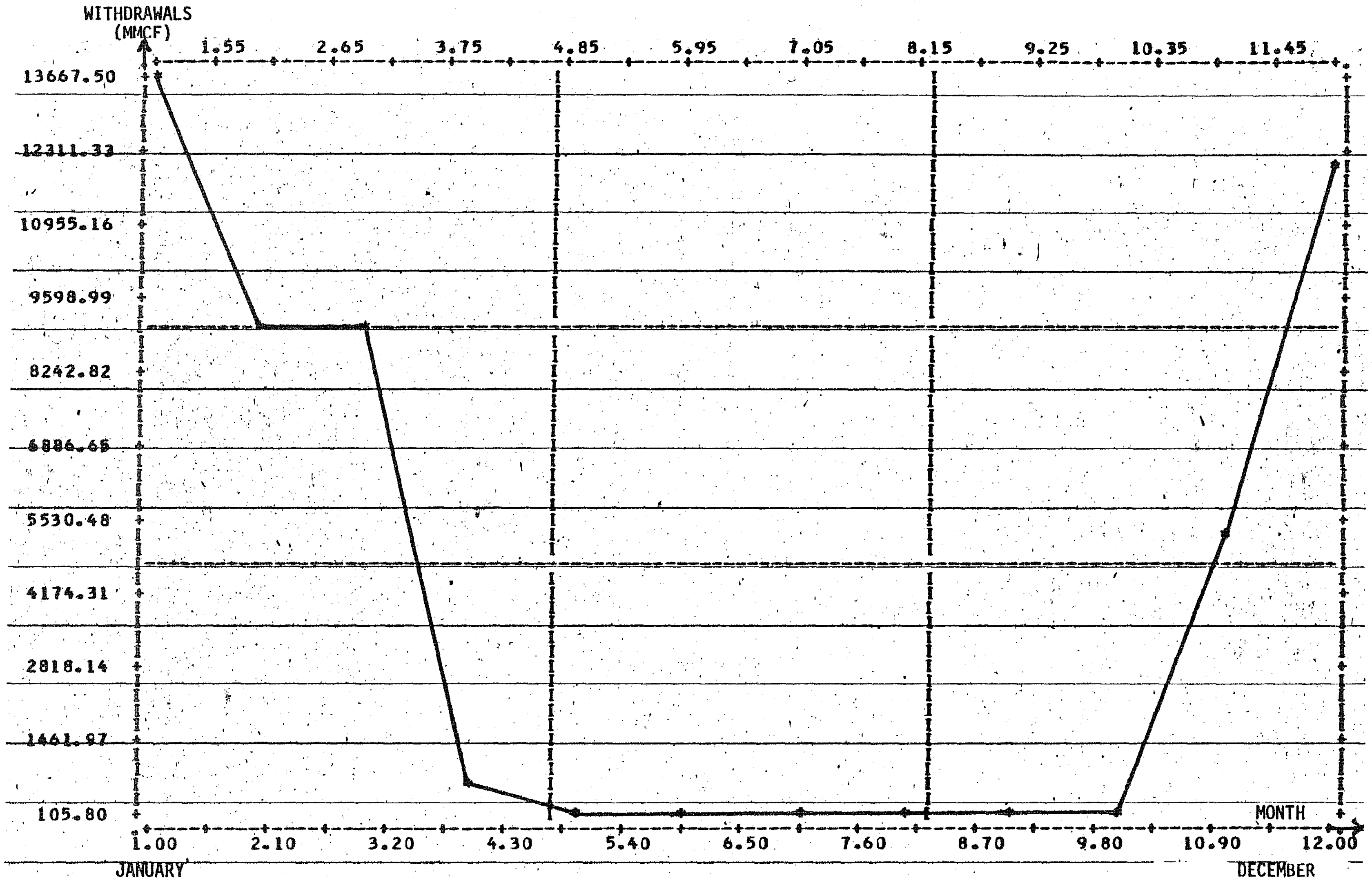


FIGURE H-19 MONTHLY WITHDRAWALS FROM STORAGE - YEAR: 1975

APPENDIX I

SELECTED FINANCIAL DATA

The purpose of this appendix is to present various financial data used in the financial analysis, fully described in Chapter 8 of Volume II.

Table I-1 East Ohio Gas Company Total Plant in Service, Total Depreciation and Net Utility Plant

Year	Plant in Service (end of year) $	Accumulated Provision for Depreciation Amortization and Depletion (end of year) $	Net Utility Plant (current year) $
1	2	3	4
1970	401,302,059	128,138,459	353,163,600
1971	502,277,309	138,851,062	363,426,427
1972	518,330,411	150,485,800	369,748,812
1973	546,496,716	164,831,011	388,111,959
1974	568,535,640	179,100,199	393,465,941
1975	587,988,407	194,751,555	396,811,971
1976	606,205,797	209,302,267	401,845,178
1977	617,338,511	224,690,519	397,827,222

Source: EOGC Annual Reports

Table I-2 East Ohio Gas Company Construction Work in Progress and Additions to Utility and Non-Utility Plant

Year	Construction Work in Progress (end of year) $	Gross Additions to Utility Plant (end of year) $	Gross Additions to Non-Utility Plant (end of year) $
1	2	3	4
1970	879,559	15,885,645	70
1971	1,207,156	19,033,015	1,616,518
1972	1,904,201	21,684,720	469,417
1973	6,546,254	35,762,814	86,614
1974	4,030,500	24,150,099	8,500
1975	3,575,119	23,185,388	0
1976	4,941,648	24,202,245	0
1977	5,179,230	15,105,301	0

Source: EOGC Annual Reports

Table I-3 East Ohio Gas Company Utility Plant Held for Future Use, Applications to Construction and Plant Expenditures and Working Capital Increase.

Year	Utility Plant Held for Future Use (Current year) $	Total Applications to Construction and Plant Expenditure (Current year) $	Working Capital Increase or (Decrease) (End of year) $
1	2	3	4
1970	640,608	15,885,715	3,494,938
1971	1,011,902	20,960,840	8,927,137
1972	1,501,721	22,154,137	6,899,240
1973	1,769,517	35,849,428	3,072,371
1974	2,357,577	24,158,599	9,701,165
1975	2,454,717	23,185,388	5,969,557
1976	2,467,402	24,202,245	(6,616,287)
1977	2,475,145	15,105,301	282,825

Source: EOGC Annual Reports

Table I-4 East Ohio Gas Company Operating, Operation, Maintenance and Interest Expenses.

Year	Operating Expenses ($)	Operation Expenses ($)	Maintenance Expenses ($)	Interest Charges ($)
1	2	3	4	5
1970	270,198,168	216,224,049	6,647,611	2,376,382
1971	302,783,100	236,913,409	7,042,750	8,355,492
1972	333,174,441	265,669,510	7,543,173	8,930,621
1973	322,043,009	263,933,390	8,079,632	9,802,220
1974	390,452,313	320,318,083	9,189,346	10,696,035
1975	434,228,942	357,698,586	9,770,116	10,115,809
1976	544,757,045	462,826,606	10,547,917	11,106,402
1977	665,197,785	561,355,394	9,415,766	10,685,249

Source: EOGC Annual Reports

Table I-5 East Ohio Gas Company Income and Revenues

Year	Net Utility Operative Income ($)	Operating Revenues ($)	Other Utility Income ($)
1	2	3	4
1970	27,865,705	292,063,873	1,715,500
1971	35,573,311	338,256,411	1,506,675
1972	34,368,607	367,543,048	1,202,090
1973	27,731,476	349,784,485	2,106,499
1974	31,115,239	421,567,552	1,596,308
1975	35,851,610	470,080,552	1,125,823
1976	44,973,122	589,730,167	1,463,441
1977	57,704,138	722,901,923	2,497,193

Source: EOGC Annual Reports.

Table I-6 East Ohio Gas Company Other Operating Revenue, Other Nonutility Income and Interest Charges as a Percent of Plant in Service

Year	Other Operating Revenue $	Other Nonutility Income $	Interest Charges $	Plant in Service $	Ratio of Other Revenue (2) Other Income (3) and Interest Charges (4) to Plant in Service (5).		
1	2	3	4	5	6	7	8
					(2 ÷ 5) %	(3 ÷ 5) %	(4 ÷ 5) %
1970	1,639,912	1,715,500	8,376,382	481,302,059	0.34	0.36	1.74
1971	229,054	1,506,675	8,355,492	502,277,309	0.05	0.30	1.66
1972	122,232	1,202,090	8,930,621	518,330,411	0.02	0.23	1.72
1973	343,236	2,106,499	9,802,220	546,496,716	0.06	0.38	1.79
1974	914,791	1,596,308	10,696,035	568,535,640	0.16	0.28	1.88
1975	1,183,965	1,125,823	10,115,809	587,988,407	0.20	0.19	1.72
1976	2,442,424	1,463,441	11,106,402	606,205,797	0.40	0.24	1.83
1977	3,707,902	2,497,193	10,685,249	617,338,511	0.60	0.40	1.73

Note:

Average of 6 is 0.2288% with a standard deviation of 0.19%
Average of 7 is 0.2975% with a standard deviation of 0.71%
Average of 8 is 1.759% with a standard deviation of 0.066%

Source: EOGC Annual Reports

Table I-7 GNP Inflator (1977 = 1.000)

Year	GNP Inflator	Year	GNP Inflator
1965	2.2722	1985	0.6487
1966	2.1301	1986	0.6098
1967	1.9969	1987	0.5732
1968	1.8715	1988	0.5388
1969	1.7549	1989	0.5065
1970	1.6451	1990	0.4761
1971	1.5374	1991	0.4475
1972	1.4385	1992	0.4207
1973	1.3369	1993	0.3955
1974	1.2158	1994	0.3717
1975	1.1101	1995	0.3494
1976	1.0541	1996	0.3285
1977	1.0000	1997	0.3088
1978	0.9448	1998	0.2902
1979	0.8966	1999	0.2728
1980	0.8545	2000	0.2564
1981	0.8137	2001	0.2411
1982	0.7719	2002	0.2266
1983	0.7293	2003	0.2130
1984	0.6878	2004	0.2002

Source: PUCO, Regulatory Analysis Financial Model Adjustment File, 1978.

APPENDIX J

LISTING OF THE COMPUTER PROGRAM

The purpose of this appendix is to list the computer program as used in the study.

SOURCE LISTING

```
STMT LEV NT

              /*         G A S   A L L O C A T I O N   M O D E L              */

   1      0  GAS:     PROCEDURE OPTIONS(MAIN);
   2    1 0           DCL  NT  INIT(24);  /* # OF YEARS IN STUDY (1977-2000)      */
   3    1 0           DCL  NR  INIT(5);   /* # OF REGIONS IN STUDY                 */
   4    1 0           DCL  NP  INIT(4);   /* # OF CAPACITY EXPANSION POLICIES     */
   5    1 0           DCL  NS  INIT(7);   /* # OF ENERGY SCENARIOS                 */
   6    1 0           DCL  NTH INIT(26);  /* # OF HISTORICAL YEARS OF DEGREE-DAYS */
   7    1 0           DCL  EXO  FILE INPUT;          /* EXOGENOUS DATA FILE */
   8    1 0           DCL  ECHO  FILE PRINT;         /* ECHO EXOGENOUS DATA */
   9    1 0           DCL  PARAM FILE INPUT;         /* PARAMETER FILE */
  10    1 0           DCL  GRAF  FILE OUTPUT         /* GRAPH DATA FILE */
                            ENV (VS RECSIZE(312) BLKSIZE(316));
  11    1 0           DCL  HM            CHAR(10);
  12    1 0           DCL  HMST          CHAR(9);
  13    1 0           DCL  HR            FIXED BIN(15);
  14    1 0           DCL  HR1           PIC '99';
  15    1 0           DCL  TODAY         CHAR(8);
  16    1 0           DCL  YMD           CHAR(6);
  17    1 0           DCL  EPGNO         FIXED BIN(15) INIT(0);
  18    1 0           DCL  EFTSW         BIT(1) INIT('1'B);
  19    1 0           DCL  SPGNO         FIXED BIN(15) INIT(0);
  20    1 0           DCL  SFTSW         BIT(1) INIT('1'B);
  21    1 0           DCL  (DATE,TIME)   BUILTIN;
  22    1 0           DCL  TITLE  CHAR(60) VARYING;
  23    1 0           DCL  MONAMES(12)  CHAR(3) INIT('MAY','JUN','JUL','AUG','SEP',
                                   'OCT','NOV','DEC','JAN','FEB','MAR','APR');
  24    1 0           DCL  CTL(NS,NP)  BIT(1);
  25    1 0           DCL  (IT,IR,IP,ITH,IM)  FIXED BIN(15);
  26    1 0           DCL  (TPOP(NR,NT),BPOP(NR,NT),HS(NR,NT))  FLOAT DEC(6);
  27    1 0           DCL  (WGS(NT),WGP(NT))  FLOAT DEC(6);
  28    1 0           DCL  (PRGR(NR,NT),PRGC(NR,NT),PRGI(NR,NT),PROR(NR,NT),
                            PROC(NR,NT),PROI(NR,NT),PRER(NR,NT),PREC(NR,NT),
                            PREI(NR,NT),PRCI(NR,NT))  FLOAT DEC(6);
  29    1 0           DCL  (GSTORD(NT+1,12),RSTOR(NT+1,12))  FLOAT DEC(6);
  30    1 0           DCL  (TGCSA(NR,NT),TNGCSA(NR,NT),TNGCNS(NR,NT),ATRG(NR,NT),
                            ATRO(NR,NT),RGCRAT(NT),PECSA(NR,NT),PECNSA(NR,NT),
                            NGCSA(NR,NT),NGCNSA(NR,NT),HKRGC(NR,NT),CONSVR,
                            SHGR(NR,NT),SHER(NR,NT),SHOR(NR,NT),TCDR(NR,NT))
                            FLOAT DEC(6);
  31    1 0           DCL  (CFA(NR,NT),TCDC(NR,NT),CGCRAT(NT),ATC(NR,NT),
                            CONSVC(NT))  FLOAT DEC(6);
  32    1 0           DCL  (S1(NR,NT),S2(NR,NT),S3(NR,NT))  FLOAT DEC(6);
  33    1 0           DCL  (TENCI(NR,NT),TCDI(NR,NT),ATI(NR,NT),SHCI(NR,NT),
                            SHGI(NR,NT),SHOI(NR,NT),CONSVI,IGCRAT(NT))
                            FLOAT DEC(6);
  34    1 0           DCL  (DPSA(NR,NT),SPOP(NR,NT),REXTSA(NR,NT),PNDGRS(NR,NT),
                            PNDGRN(NR,NT),PNDGC(NR,NT),PNDGI(NR,NT))  FLOAT DEC(6);
  35    1 0           DCL  (BASEDR(NT),BASEDC(NT),BASEDI(NT),BASEDT(NT),EXCSUP(NT),
                            CNDGRS(NR,NT),CNDGRN(NR,NT),CNDGC(NR,NT),CNDGI(NR,NT),
                            NCGC(NR,NT),NIGC(NR,NT),TCYDR(NT),TCYDC(NT),TCYDI(NT))
                            FLOAT DEC(6);
  36    1 0           DCL  (PDGRST(NT),PDGRNT(NT),PDGCT(NT),PDGIT(NT),CNDRST(NT),
                            CNDRNT(NT),CNDGCT(NT),CNDGIT(NT))  FLOAT DEC(6);
  37    1 0           DCL  (DDH(NTH,12),DDMIN(NTH),DDMAX(NTH))  FLOAT DEC(6);
  38    1 0           DCL  (DDS(NTH,12),DGMR(NT,12),DGMC(NT,12),DGMI(NT,12),
                            DGMT(NT,12),WINETL(NT),SUMETL(NT),RESUEN(NT,12),
                            MAXINS(NT,12),MAXOUS(NT,12),GINST(NT,12),GOUST(NT,12),
                            CURT(NT,12),SUPM(NT,12),REWIEN(NT,12))  FLOAT DEC(6);
  39    1 0           DCL  (PGCSA(NR,NT),PGCNSA(NR,NT))  FLOAT DEC(6);
  40    1 0           DCL  (DGMRE(NT,12),DGMCE(NT,12),DGMIE(NT,12),CURTR(NT,12),
                            CURTC(NT,12),CURTI(NT,12))  FLOAT DEC(6);
  41    1 0           DCL  (CACRS(NR,NT),CACRN(NR,NT),CACC(NR,NT),CACI(NR,NT),
                            CACRST(NT),CACRNT(NT),CACCT(NT),CACIT(NT),NEWPIS(NT))
                            FLOAT DEC(6);
  42    1 0           DCL  (GASSUP(NT),GSALES(NT),GDELIV(NT),GPURCH(NT),
                            OMSTOC(NT),OMGENC(NT))  FLOAT DEC(6);
```

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STMT LEV NT

  43   1  0          DCL  (RORHI(NT),RORME(NT),RORLO(NT))  FLOAT DEC(6);
  44   1  0          DCL  (REPPIS(NT),PISBEG(NT+1),DEPEXP(NT),TAPDAD(NT),
                           TOTPIS(NT),NETPIS(NT),AOPINC(NT),ACOPEX(NT),
                           GASREV(NT),OOPREV(NT),ONUINC(NT),INTCHG(NT),
                           INCAT(NT),INCDEF(NT),TAXADJ,DPR(NT))  FLOAT DEC(6);
  45   1  0          DCL  (ATRGB,ATROB,ATCB,ATIB,SHGO)  FLOAT DEC(6);
  46   1  0          DCL  (IWGS(NT,NS),IWGP(NT,NS),IPRER(NT,NS),IPROR(NT,NS),
                           IPREC(NT,NS),IPROC(NT,NS),IPREI(NT,NS),IPROI(NT,NS),
                           IPRCI(NT,NS),ICOMGR(NR,NT),IINDGR(NR,NT))  FLOAT DEC(6);
  47   1  0          DCL  (MAXSUS,MINSUS,MAXSUW,MINSUW,MAXSU1,MINSU1,MAXGST)
                           FLOAT DEC(6);
  48   1  0          DCL  PRFC(NR,NT)  FLOAT DEC(6);
  49   1  0          DCL  (NPMR(NT),IRBC(NT),IORI(NT),MWRC(NT),MWCC(NT),MWIC(NT))
                           FLOAT DEC(6);
  50   1  0          DCL  (IORIT,INTCOV(NT),LOADF(NT))  FLOAT DEC(6);
  51   1  0          DCL  (TATR(NT),GPMR(NT),RTAR(NT),ROCER(NT),ACOPRV(NT))
                           FLOAT DEC(6);
  52   1  0          DCL  (ROINC(NT),AED(NT),AMCIR(NT),AMCIC(NT),AMCII(NT))
                           FLOAT DEC(6);
  53   1  0          DCL  (DSF(NT),WRSA(NT),WRNS(NT),WC(NT),WI(NT))  FLOAT DEC(6);
  54   1  0          DCL  (QRB1(NT),QRB2(NT),QRE1(NT),QRE2(NT),PRB(NT))
                           FLOAT DEC(6);
  55   1  0          DCL  (QCB(NT),QCE(NT),PCB(NT),QIB(NT),QIE(NT),PIB(NT))
                           FLOAT DEC(6);
  56   1  0          DCL  (PRA(NT),PCA(NT),PIA(NT),PRE1(NT),PRE2(NT),PCE(NT),
                           PIE(NT))  FLOAT DEC(6);
  57   1  0          DCL  (CGFL(NT),COFL(NT),CEFL(NT),CTFL(NT))  FLOAT DEC(6);
  58   1  0          DCL  (AVGFIN(10),SUM(10))  FLOAT DEC(6);
  59   1  0          DCL  (AEIY(NT),EUEIY(NT),PEIY(NT),WRSAY(NT),WRNSY(NT),
                           WCY(NT),WIY(NT))  FLOAT DEC(6);
  60   1  0          DCL  1  GREC,                         /* GRAPH DATA RECORD  */
                              3  HDR      CHAR(100),       /* GRAPH HEADING      */
                              3  NWH      FIXED BIN(31),   /* # WORDS IN HEADING */
                              3  NVAR     FIXED BIN(31),   /* # POINTS TO GRAPH  */
                              3  X(25)    FLOAT DEC(6),    /* X-VALUES           */
                              3  Y(25)    FLOAT DEC(6);    /* Y-VALUES           */

  61   1  0  F1:     FORMAT ((NT) (COL(11),(NS) (F(5,1),X(5))));
  62   1  0  F2:     FORMAT (COL(11),A(3),F(2),X(5),A(8),(NS) (F(6,2),X(3)));
  63   1  0  F10:    FORMAT((NT) (COL(11),A(3),F(2),X(5),A(7),(NR) (F(7,2),X(3))));

  64   1  0          ON ENDFILE(SYSIN) GO TO CTLIN;

  65   1  0          ON UNDEFINEDFILE(PARAM) GO TO SETPIS;

  66   1  0          ON ENDFILE(PARAM) GO TO CLSPARM;

  67   1  0          ON ENDPAGE(SYSPRINT)  BEGIN;
  68   2  0              IF ¬SFTSW THEN PUT PAGE;
  69   2  0              SFTSW = '0'B;
  70   2  0              SPGNO = SPGNO + 1;
  71   2  0              PUT EDIT ('DATE: ',TODAY,'  TIME: ',HM,
                                   'G A S   A L L O C A T I O N   M O D E L',
                                   'PAGE',SPGNO)
                                 (COL(1),4 A,COL(47),A,COL(124),A,F(4));
  72   2  0              PUT SKIP(2);
  73   2  0              END;

  74   1  0          ON ENDPAGE(ECHO)  BEGIN;
  75   2  0              IF ¬EFTSW THEN PUT FILE(ECHO) PAGE;
  76   2  0              EFTSW = '0'B;
  77   2  0              EPGNO = EPGNO + 1;
  78   2  0              PUT FILE(ECHO) EDIT ('DATE: ',TODAY,'  TIME: ',HM,
                                   'G A S   A L L O C A T I O N   M O D E L',
                                   'PAGE',EPGNO,'E X O G E N O U S   D A T A')
                                   (COL(1),4 A,COL(47),A,COL(124),A,F(4),
                                    SKIP(2),COL(53),A);
  79   2  0              PUT FILE(ECHO) SKIP(2);
  80   2  0              END;
```

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STMT LEV NT

  81   1  0          OPEN FILE(SYSPRINT) LINESIZE(132) PAGESIZE(76);

  82   1  0          OPEN FILE(ECHO) LINESIZE(132) PAGESIZE(76);

               /*********************************************************************
               *         OBTAIN DATE AND TIME OF THIS RUN AND FORMAT FOR PRINTING     *
               *********************************************************************/

  83   1  0          YMD = DATE;
  84   1  0          TODAY = SUBSTR(YMD,3,2) || '/' || SUBSTR(YMD,5,2) ||
                           '/' || SUBSTR(YMD,1,2);
  85   1  0          HMST = TIME;
  86   1  0          HM = SUBSTR(HMST,1,2) || ':' || SUBSTR(HMST,3,2) || ' A.M.';
  87   1  0          HR = SUBSTR(HMST,1,2);
  88   1  0          IF HR > 11 THEN SUBSTR(HM,6,5) = ' P.M.';
  89   1  0          IF HR > 12 THEN DO;
  90   1  1              HR1 = HR - 12;
  91   1  1              SUBSTR(HM,1,2) = HR1;
  92   1  1              END;
  93   1  0          SIGNAL ENDPAGE(ECHO);

               /*********************************************************************
               *         READ WHICH ENERGY SCENARIOS & CAPACITY EXPANSION POLICIES    *
               *         ARE TO BE RUN (FROM SYSIN)                                   *
               *********************************************************************/

  94   1  0          CTL = '0'B;
  95   1  0 RDCTL:   GET LIST (IS,IP);
  96   1  0          IF (IS < 1) & (IP < 1) THEN DO;
  97   1  1              CTL = '1'B;                /* PROCESS ALL CASES */
  98   1  1              GO TO CTLIN;
  99   1  1              END;
 100   1  0          IF IS < 1 THEN DO;
 101   1  1              CTL(*,IP) = '1'B;      /* ALL SCENARIOS FOR THIS POLICY */
 102   1  1              GO TO RDCTL;
 103   1  1              END;
 104   1  0          IF IP < 1 THEN DO;
 105   1  1              CTL(IS,*) = '1'B;     /* ALL POLICIES FOR THIS SCENARIO */
 106   1  1              GO TO RDCTL;
 107   1  1              END;
 108   1  0          CTL(IS,IP) = '1'B;        /* PROCESS THIS SCENARIO & POLICY */
 109   1  0          GO TO RDCTL;
 110   1  0 CTLIN:   CLOSE FILE(SYSIN);

               /*********************************************************************
               *         READ ENERGY PRICES AND GAS SUPPLY INDICES                    *
               *********************************************************************/

 111   1  0          GET FILE(EXO) EDIT
                         (((IWGS(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 112   1  0          GET FILE(EXO) EDIT
                         (((IWGP(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 113   1  0          GET FILE(EXO) EDIT
                         (((IPRER(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 114   1  0          GET FILE(EXO) EDIT
                         (((IPROR(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 115   1  0          GET FILE(EXO) EDIT
                         (((IPREC(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 116   1  0          GET FILE(EXO) EDIT
                         (((IPROC(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 117   1  0          GET FILE(EXO) EDIT
                         (((IPREI(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 118   1  0          GET FILE(EXO) EDIT
                         (((IPROI(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 119   1  0          GET FILE(EXO) EDIT
                         (((IPRCI(IT,IS) DO IS=1 TO NS) DO IT=1 TO NT)) (R(F1));
 120   1  0          PUT FILE(ECHO) EDIT ('ENERGY PRICES, GAS SUPPLY INDICES',
                                   'SCENARIO',(IS DO IS=1 TO 7))
                                  (COL(35),A,COL(11),A,COL(24),7 F(9));
 121   1  0          DO IT = 1 TO NT;
```

```
STMT LEV NT

 122   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IWGS  =',(IWGS(IT,IS)
                                  DO IS=1 TO NS)) (R(F2)) SKIP(2);
 123   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IWGP  =',(IWGP(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 124   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IPRER =',(IPRER(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 125   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IPROR =',(IPROR(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 126   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IPREC =',(IPREC(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 127   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IPROC =',(IPROC(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 128   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IPREI =',(IPREI(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 129   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IPROI =',(IPROI(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 130   1  1            PUT FILE(ECHO) EDIT ('IT=',IT,'IPRCI =',(IPRCI(IT,IS)
                                  DO IS=1 TO NS)) (R(F2));
 131   1  1            END;
 132   1  0         GET FILE(EXO) EDIT ((DDMIN(ITH),DDMAX(ITH) DO ITH=1 TO NTH))
                              ((NTH) (COL(1),2 F(10,3)));
 133   1  0         PUT FILE(ECHO) EDIT (('ITH=',ITH,'DDMIN =',DDMIN(ITH),
                           'DDMAX =',DDMAX(ITH) DO ITH=1 TO NTH))
                           ((NTH) (COL(11),A,F(2),2 (X(4),A,F(10,4))));
 134   1  0         GET FILE(EXO) EDIT
                       (((DDH(ITH,IM) DO IM=1 TO 12) DO ITH=1 TO NTH))
                       ((NTH) (COL(1),12 F(5)));
 135   1  0         PUT FILE(ECHO) EDIT ('HISTORICAL DEGREE-DAY AVG. BY MONTH',
                           ('ITH=',ITH,'DDH   =',(DDH(ITH,IM)
                           DO IM=1 TO 12) DO ITH=1 TO NTH))
                           (COL(11),A,(NTH) (COL(11),A,F(2),X(4),A,
                           12 (F(6),X(2)))) SKIP(2);
 136   1  0         GET FILE(EXO) EDIT (((TPOP(IR,IT),BPOP(IR,IT) DO IR=1 TO NR)
                       DO IT=1 TO NT)) ((NT) (COL(1),(NR*2) F(8)));
 137   1  0         PUT FILE(ECHO) EDIT (('IT=',IT,'TPOP  =',(TPOP(IR,IT)
                           DO IR=1 TO NR),'IT=',IT,'BPOP  =',(BPOP(IR,IT)
                           DO IR=1 TO NR) DO IT=1 TO NT))
                           ((NT*2) (COL(11),A,F(2),X(5),A,
                           (NR) (F(8),X(3))));
 138   1  0         GET FILE(EXO) EDIT (((HS(IR,IT) DO IR=1 TO NR) DO IT=1 TO NT))
                              ((NT) (COL(1),(NR) F(5,2)));
 139   1  0         PUT FILE(ECHO) EDIT (('IT=',IT,'HS    =',(HS(IR,IT)
                           DO IR=1 TO NR) DO IT=1 TO NT))
                        ((NT) (COL(11),A,F(2),X(5),A,(NR) (F(5,2),X(3))));
 140   1  0         GET FILE(EXO) EDIT
                       (((ICOMGR(IR,IT) DO IR=1 TO NR) DO IT=1 TO NT))
                       ((NT) (COL(1),(NR) F(10,2)));
 141   1  0         PUT FILE(ECHO) EDIT (('IT=',IT,'ICOMGR=',(ICOMGR(IR,IT)
                           DO IR=1 TO NR) DO IT=1 TO NT)) (R(F10));
 142   1  0         GET FILE(EXO) EDIT
                       (((IINDGR(IR,IT) DO IR=1 TO NR) DO IT=1 TO NT))
                       ((NT) (COL(1),(NR) F(10,2)));
 143   1  0         PUT FILE(ECHO) EDIT (('IT=',IT,'IINDGR=',(IINDGR(IR,IT)
                           DO IR=1 TO NR) DO IT=1 TO NT)) (R(F10));

               /*       READ THE RATE OF RETURN PROJECTIONS                           */

 144   1  0         GET FILE(EXO) EDIT ((RORHI(IT),RORLO(IT) DO IT=1 TO NT))
                              ((NT) (COL(1),2 F(10,4)));
 145   1  0         RORME = .1206;
 146   1  0         PUT FILE(ECHO) EDIT (('IT=',IT,'RORHI=',RORHI(IT),'RORME=',
                           RORME(IT),'RORLO=',RORLO(IT) DO IT=1 TO NT))
                           ((NT) (COL(11),A,F(2),X(2),3 (X(3),A,F(6,4))));
 147   1  0         CLOSE FILE(EXO);

               /**********************************************************************
               *        BASE YEAR 1977 PRICES AND SUPPLY DATA                        *
               **********************************************************************/

 148   1  0         WGS(1) = 350742.058;   /* WHOLESALE GAS SUPPLY IN MMCF-1977 */
```

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STMT LEV NT

 149   1  0          WGP(1) = 1.41816;    /* WHOLESALE GAS PRICE IN $/MMBTU-1977 */
 150   1  0          PRGR(*,1) = 2.2292;
 151   1  0          PRGC(*,1) = 2.0623;
 152   1  0          PRGI(*,1) = 1.9847;
 153   1  0          PROR(*,1) = 3.3814;
 154   1  0          PROC(*,1) = 3.1109;
 155   1  0          PROI(*,1) = 3.1109;
 156   1  0          PRER(*,1) = 13.6862;
 157   1  0          PREC(*,1) = 12.3088;
 158   1  0          PREI(*,1) = 7.8249;
 159   1  0          PRCI(*,1) = 1.4000;

       /*******************************************************************
       *         BASE YEAR 1977 STORAGE CONDITIONS - MMCF                  *
       ******************************************************************/

 160   1  0          STCAP = 147594.1;
 161   1  0          GSTORD(2,1) = 120795.534;
 162   1  0          RSTOR(2,1) = GSTORD(2,1)/STCAP;

       /*        ZERO DEMAND SHARE                                        */

 163   1  0          SHGO = 0.05;
 164   1  0          TGCSA(1,1) = 492390;
 165   1  0          TGCSA(2,1) = 174284;
 166   1  0          TGCSA(3,1) = 109185;
 167   1  0          TGCSA(4,1) =  44884;
 168   1  0          TGCSA(5,1) =  87713;
 169   1  0          TNGCSA(1,1) = 81657;
 170   1  0          TNGCSA(2,1) = 39640;
 171   1  0          TNGCSA(3,1) = 31142;
 172   1  0          TNGCSA(4,1) = 17752;
 173   1  0          TNGCSA(5,1) =  7941;
 174   1  0          TNGCNS(1,1) = 34114;
 175   1  0          TNGCNS(2,1) =  2882;
 176   1  0          TNGCNS(3,1) =  4475;
 177   1  0          TNGCNS(4,1) = 14450;
 178   1  0          TNGCNS(5,1) =  5547;
 179   1  0          ATRGB = 0.005;
 180   1  0          ATROB = ATRGB/2;
 181   1  0          RGCRAT(1) = 197.08;
 182   1  0          PECSA, PECNSA, NGCSA, NGCNSA, HKRGC = 0;
 183   1  0          CONSVR = 0.01;
 184   1  0          SHER(1,1) = .0908;
 185   1  0          SHER(2,1) = .0957;
 186   1  0          SHER(3,1) = .1208;
 187   1  0          SHER(4,1) = .1037;
 188   1  0          SHER(5,1) = .0860;
 189   1  0          SHGR(1,1) = .8302;
 190   1  0          SHGR(2,1) = .7829;
 191   1  0          SHGR(3,1) = .7281;
 192   1  0          SHGR(4,1) = .6923;
 193   1  0          SHGR(5,1) = .8193;
 194   1  0          SHOR(1,1) = .0790;
 195   1  0          SHOR(2,1) = .1214;
 196   1  0          SHOR(3,1) = .1511;
 197   1  0          SHOR(4,1) = .2040;
 198   1  0          SHOR(5,1) = .0947;
 199   1  0          TCDR(1,1) = 1.035 * 96164729;
 200   1  0          TCDR(2,1) = 1.035 * 30981837;
 201   1  0          TCDR(3,1) = 1.035 * 19215684;
 202   1  0          TCDR(4,1) = 1.035 *  7583562;
 203   1  0          TCDR(5,1) = 1.035 * 16903280;
 204   1  0          CFA(1,1) = 516244000;
 205   1  0          CFA(2,1) = 171339000;
 206   1  0          CFA(3,1) = 137979000;
 207   1  0          CFA(4,1) =  56737000;
 208   1  0          CFA(5,1) =  83373000;
 209   1  0          TCDC(1,1) = 38481398;
 210   1  0          TCDC(2,1) = 11781233;
```

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STMT LEV NT

 211   1  0           TCDC(3,1) =  7741357;
 212   1  0           TCDC(4,1) =  3308268;
 213   1  0           TCDC(5,1) =  5609702;
 214   1  0           CGCRAT(1) = 1267.054;
 215   1  0           ATCB = 0.005;
 216   1  0           TENCI(1,1) = 152708820;
 217   1  0           TENCI(2,1) = 20318803;
 218   1  0           TENCI(3,1) = 69529239;
 219   1  0           TENCI(4,1) = 38026108;
 220   1  0           TENCI(5,1) = 57366705;
 221   1  0           TCDI(1,1) = 53768774;
 222   1  0           TCDI(2,1) =  7424491;
 223   1  0           TCDI(3,1) = 24835844;
 224   1  0           TCDI(4,1) = 14411895;
 225   1  0           TCDI(5,1) = 16969071;
 226   1  0           IGCRAT(1) = 105965.37;
 227   1  0           ATIB = 0.005;
 228   1  0           CONSVI = 0.02;
 229   1  0           SHCI(1,1) = 0.5722;
 230   1  0           SHCI(2,1) = 0.5560;
 231   1  0           SHCI(3,1) = 0.5660;
 232   1  0           SHCI(4,1) = 0.5394;
 233   1  0           SHCI(5,1) = 0.6406;
 234   1  0           SHGI(1,1) = 0.3521;
 235   1  0           SHGI(2,1) = 0.3654;
 236   1  0           SHGI(3,1) = 0.3572;
 237   1  0           SHGI(4,1) = 0.3790;
 238   1  0           SHGI(5,1) = 0.2958;
 239   1  0           SHOI(1,1) = 0.0757;
 240   1  0           SHOI(2,1) = 0.0786;
 241   1  0           SHOI(3,1) = 0.0768;
 242   1  0           SHOI(4,1) = 0.0816;
 243   1  0           SHOI(5,1) = 0.0636;
 244   1  0           PISBEG(1) = 606205797;
 245   1  0           PISBEG(2) = 617338511;
 246   1  0           TAPDAD(1) = 224690519;

                /*****************************************************************
                *         READ IN ANY CHANGES TO PARAMETERS FROM FILE(PARAM)           *
                *****************************************************************/

 247   1  0           OPEN FILE(PARAM) INPUT;
 248   1  0           GET FILE(PARAM) DATA (ATCB,ATIB,ATRGB,ATROB,CONSVI,CONSVR);
 249   1  0  CLSPARM: CLOSE FILE(PARAM);

                /*        NET PLANT IN SERVICE (END OF YEAR)                        */

 250   1  0  SETPIS:  NETPIS(1) = 397827222;
 251   1  0           DO IT = 1 TO NT;
 252   1  1              DO IR = 1 TO NR;
 253   1  2                 CFA(IR,IT) = CFA(IR,1) * ICOMGR(IR,IT) / 100;
 254   1  2                 END;
 255   1  1              PUT FILE(ECHO) EDIT (IT,'CFA=',(CFA(IR,IT) DO IR=1 TO NR))
                                  (COL(11),F(4),X(5),A,(NR) (F(12),X(2)));
 256   1  1              END;

                /*        COMPUTATION OF COMMERCIAL FLOOR AREA FORECASTS            */

 257   1  0           DO IT = 2 TO NT;
 258   1  1              DO IR = 1 TO NR;
 259   1  2                 DINGR = (IINDGR(IR,IT)-IINDGR(IR,IT-1))/100;
 260   1  2                 IF DINGR < 0 THEN
                                TENCI(IR,IT) = TENCI(IR,IT-1)+DINGR*TENCI(IR,1);
 261   1  2                    ELSE TENCI(IR,IT) = TENCI(IR,IT-1) +
                                   DINGR*TENCI(IR,1)*(1.-CONSVI*FLOAT(IT-1));
 262   1  2                 END;
 263   1  1              PUT FILE(ECHO) EDIT ('IT=',IT,'TENCI =',(TENCI(IR,IT)
                                  DO IR=1 TO NR))
                                 (COL(11),A,F(2),X(5),A,(NR) (F(18,3),X(2)));
 264   1  1              END;
```

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STMT LEV NT

 265   1  0          CLOSE FILE(ECHO);                                    00003890
```

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STMT LEV NT

                 /*********************************************************************
                 *                                                                    *
                 *      S T A R T   O F   T H E   S I M U L A T I O N                 *
                 *                                                                    *
                 *********************************************************************/

 266   1  0           DO IS = 1 TO NS;
 267   1  1              DO IP = 1 TO NP;
 268   1  2                 IF ¬CTL(IS,IP) THEN GO TO NORUN;
 269   1  2                 SIGNAL ENDPAGE(SYSPRINT);
 270   1  2                 PUT EDIT('ENERGY SCENARIO #',IS,
                                     'EXPANSION POLICY #',IP)
                                    (COL(41),A,F(2),COL(71),A,F(2)) SKIP(3);
 271   1  2              PUT EDIT ('PARAMETERS USED:','RESIDENTIAL','COMMERCIAL',
                           'INDUSTRIAL','ATRGB  =',ATRGB,'ATCB   =',ATCB,
                           'ATIB   =',ATIB,'ATROB  =',ATROB,'CONSVI =',CONSVI,
                           'CONSVR =',CONSVR)
                           (SKIP(5),COL(21),A,SKIP(2),COL(32),A,COL(62),A,
                           COL(92),A,SKIP(2),COL(30),A,F(7,4),COL(60),A,
                           F(7,4),COL(90),A,F(7,4),SKIP(2),COL(30),A,F(7,4),
                           COL(90),A,F(7,4),SKIP(2),COL(30),A,F(7,4));

                 /*     COMPUTATION OF EXOGENOUS PRICES AND SUPPLY FORECASTS        */
 272   1  2                 DO IT = 2 TO NT;
 273   1  3                    WGS(IT) = WGS(1) * IWGS(IT,IS) / 100;
 274   1  3                    WGP(IT) = WGP(1) * IWGP(IT,IS) / 100;
 275   1  3                    DO IR = 1 TO NR;
 276   1  4                       PROR(IR,IT) = PROR(IR,1) * IPROR(IT,IS) / 100;
 277   1  4                       PROC(IR,IT) = PROC(IR,1) * IPROC(IT,IS) / 100;
 278   1  4                       PROI(IR,IT) = PROI(IR,1) * IPROI(IT,IS) / 100;
 279   1  4                       PRER(IR,IT) = PRER(IR,1) * IPRER(IT,IS) / 100;
 280   1  4                       PREC(IR,IT) = PREC(IR,1) * IPREC(IT,IS) / 100;
 281   1  4                       PREI(IR,IT) = PREI(IR,1) * IPREI(IT,IS) / 100;
 282   1  4                       PRCI(IR,IT) = PRCI(IR,1) * IPRCI(IT,IS) / 100;
 283   1  4                       END;
 284   1  3                    END;
 285   1  2                 DO IT = 2 TO NT;
 286   1  3                    CALL RESIDC;
 287   1  3                    CALL COMMEC;
 288   1  3                    CALL INDUSC;
 289   1  3                    CALL CAPEXP;
 290   1  3                    CALL GASALL;
 291   1  3                    CALL CAPCST;
 292   1  3                    CALL OMCOST;
 293   1  3                    CALL RATBAS;
 294   1  3                    CALL INCOME;
 295   1  3                    CALL NEWRAT;
 296   1  3                    END;
 297   1  2                 CALL CRITER;
 298   1  2                 CALL LIST;
 299   1  2                 CALL GRAPH;

 300   1  2  NORUN:         END;
 301   1  1              END;
 302   1  0           RETURN;
```

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STMT LEV NT

                /**********************************************************************
                *                                                                     *
                *       R E S I D C   P R O C E D U R E                               *
                *                                                                     *
                **********************************************************************/

 303   1  0  RESIDC:  PROC;

 304   2  0           DO IR = 1 TO NR;
 305   2  1              IF IT = 2 THEN DO;
 306   2  2                 DPSA(IR,IT-1) = 0;
 307   2  2                 SPOP(IR,IT) = BPOP(IR,IT);
 308   2  2                 END;
 309   2  1              ELSE DO;
 310   2  2                 DPSA(IR,IT-1) = NGCNSA(IR,IT-1) *
                                            HS(IR,IT-1)/SHGR(IR,IT-1);
 311   2  2                 SPOP(IR,IT) = TPOP(IR,IT)*(SPOP(IR,IT-1) +
                                          DPSA(IR,IT-1))/TPOP(IR,IT-1);
 312   2  2                 END;
 313   2  1              REXTSA(IR,IT-1) = DPSA(IR,IT-1)/(TPOP(IR,IT-1) -
                                          SPOP(IR,IT-1));
 314   2  1              CALL SHRES;
 315   2  1              RP = TPOP(IR,IT)/TPOP(IR,IT-1);
 316   2  1              IF RP < 1 THEN DO;
 317   2  2                 ATRG(IR,IT-1) = ATRGB + 1 - RP;
 318   2  2                 ATRO(IR,IT-1) = ATROB + 1 - RP;
 319   2  2                 END;
 320   2  1              ELSE DO;
 321   2  2                 ATRG(IR,IT-1) = ATRGB;
 322   2  2                 ATRO(IR,IT-1) = ATROB;
 323   2  2                 END;
 324   2  1              TGCSA(IR,IT) = TGCSA(IR,IT-1)+HKRGC(IR,IT-1) -
                                   ATRG(IR,IT-1)*TGCSA(IR,1);
 325   2  1              TNGCSA(IR,IT) = TNGCSA(IR,IT-1)+PECSA(IR,IT-1) -
                            NGCSA(IR,IT-1)+REXTSA(IR,IT-1)*(PECNSA(IR,IT-1) -
                            NGCNSA(IR,IT-1))-ATRO(IR,IT-1)*TNGCSA(IR,1) -
                            ATRO(IR,IT-1)*REXTSA(IR,IT-1)*TNGCNS(IR,1);
 326   2  1              TNGCNS(IR,IT) = TNGCNS(IR,IT-1)+(1-REXTSA(IR,IT-1)) *
                            (PECNSA(IR,IT-1)-NGCNSA(IR,IT-1)-ATRO(IR,IT-1) *
                            TNGCNS(IR,1));
 327   2  1              PECSA(IR,IT) = SPOP(IR,IT)/HS(IR,IT)-TGCSA(IR,IT) -
                            TNGCSA(IR,IT);
 328   2  1              PECNSA(IR,IT) = ((TPOP(IR,IT)-SPOP(IR,IT))/HS(IR,IT)) -
                            TNGCNS(IR,IT);
 329   2  1              PECSA(IR,IT) = MAX(PECSA(IR,IT),0);
 330   2  1              PECNSA(IR,IT) = MAX(PECNSA(IR,IT),0);

                /*     COMPUTATION OF POTENTIAL RESIDENTIAL CUSTOMERS              */

 331   2  1              PGCSA(IR,IT) = PECSA(IR,IT)*SHGR(IR,IT);
 332   2  1              PGCNSA(IR,IT) = PECNSA(IR,IT)*SHGR(IR,IT);

                /*     COMPUTATION OF POTENTIAL NEW RESIDENTIAL GAS DEMANDS-MMBTU  */
 333   2  1              CONSR = RGCRAT(1)*(1-CONSVR*FLOAT(IT-1));
 334   2  1              PNDGRS(IR,IT) = CONSR*PGCSA(IR,IT);
 335   2  1              PNDGRN(IR,IT) = CONSR*PGCNSA(IR,IT);
 336   2  1              END;

 337   2  0           RETURN;
 338   2  0           END RESIDC;
```

```
STMT LEV NT

              /***********************************************************************
              *
              *       S H R E S   P R O C E D U R E
              *
              ***********************************************************************/

 339   1  0   SHRES:  PROC;

              /*      COMPUTATION OF RESIDENTIAL GAS AND OIL PRICE INDICES        */
 340   2  0           PEA = PRER(IR,IT-1)*SHER(IR,IT-1)+PRGR(IR,IT-1)*SHGR(IR,IT-1)
                          +PROR(IR,IT-1)*SHOR(IR,IT-1);
 341   2  0           A = SHER(IR,IT-1)+SHOR(IR,IT-1);
 342   2  0           B = SHER(IR,IT-1)+SHGR(IR,IT-1);
 343   2  0           CPEO = (PRER(IR,IT-1)*SHER(IR,IT-1)+PROR(IR,IT-1) *
                          SHOR(IR,IT-1))/A;
 344   2  0           CPEG = (PRER(IR,IT-1)*SHER(IR,IT-1)+PRGR(IR,IT-1) *
                          SHGR(IR,IT-1))/B;
 345   2  0           PIG = (PRGR(IR,IT-1)-CPEO)/PEA;
 346   2  0           PIO = (PROR(IR,IT-1)-CPEG)/PEA;

              /*      COMPUTATION OF THE RESIDENTIAL MARKET SHARE OF GAS          */

 347   2  0           A = -3.5;
 348   2  0           B = -1.4;
 349   2  0           C = -0.6;
 350   2  0           IF PIG <= A THEN SHGR(IR,IT) = 0.84;
 351   2  0               ELSE IF (PIG > A) & (PIG <= B) THEN
                              SHGR(IR,IT) = 0.84*EXP(-.051*(PIG+3.5)**2.);
 352   2  0               ELSE IF (PIG > B) & (PIG <= C) THEN
                              SHGR(IR,IT) = 1.242*EXP(-.140*(PIG+3.5)**2.);
 353   2  0               ELSE SHGR(IR,IT) = 11.059*EXP(-.400*(PIG+3.5)**2.);
 354   2  0           IF SHGR(IR,IT) <= SHGO THEN SHGR(IR,IT) = 0;

              /*      COMPUTATION OF THE RESIDENTIAL MARKET SHARE OF OIL          */

 355   2  0           A = -2.4;
 356   2  0           B = -1.4;
 357   2  0           C = -0.8;
 358   2  0           IF PIO <= A THEN SHOR(IR,IT) = 0.83;
 359   2  0               ELSE IF (PIO > A) & (PIO <= B) THEN
                              SHOR(IR,IT) = .830*EXP(-.170*(PIO+2.4)**2.);
 360   2  0               ELSE IF (PIO > B) & (PIO <= C) THEN
                              SHOR(IR,IT) = .916*EXP(-.269*(PIO+2.4)**2.);
 361   2  0               ELSE SHOR(IR,IT) = 2.441*EXP(-.652*(PIO+2.4)**2.);
 362   2  0           IF SHOR(IR,IT) <= SHGO THEN SHOR(IR,IT) = 0;

              /*      COMPUTATION OF THE RESIDENTIAL MARKET SHARE OF ELECTRICITY  */

 363   2  0           SHGOR = SHGR(IR,IT)+SHOR(IR,IT);
 364   2  0           IF SHGOR > 1 THEN DO;
 365   2  1               SHGR(IR,IT) = SHGR(IR,IT)/SHGOR;
 366   2  1               SHOR(IR,IT) = SHOR(IR,IT)/SHGOR;
 367   2  1               SHER(IR,IT) = 0;
 368   2  1               END;
 369   2  0           ELSE SHER(IR,IT) = 1-SHGOR;

 370   2  0           RETURN;
 371   2  0           END SHRES;
```

```
STMT LEV NT

               /***********************************************************************00005450
               *                                                                      *00005460
               *         C O M M E C   P R O C E D U R E                              *00005470
               *                                                                      *00005480
               ***********************************************************************/00005490

 372   1  0  COMMEC:  PROC;                                                            00005500

 373   2  0           DO IR = 1 TO NR;                                                 00005510
 374   2  1               RP = CFA(IR,IT)/CFA(IR,IT-1);                                00005520
 375   2  1               IF RP >= 1 THEN ATC(IR,IT-1) = ATCB;                         00005530
 376   2  1                   ELSE ATC(IR,IT-1) = ATCB+1-RP;                           00005540
 377   2  1               PRFC(IR,IT-1) = MIN(PROC(IR,IT-1),PRGC(IR,IT-1));            00005550
 378   2  1               A = -3.1704+0.8000*PREC(IR,IT-1);                            00005560
 379   2  1               B = -2.5061+0.3507*PREC(IR,IT-1);                            00005570
 380   2  1               IF (PRFC(IR,IT-1) <= A) & (PRFC(IR,IT-1) >= B) THEN DO;      00005580
 381   2  2                   S1(IR,IT) = 0.1;                                         00005590
 382   2  2                   S2(IR,IT) = 0.8;                                         00005600
 383   2  2                   S3(IR,IT) = 0.1;                                         00005610
 384   2  2                   END;                                                     00005620
 385   2  1                   ELSE IF PRFC(IR,IT-1) < B THEN DO;                       00005630
 386   2  2                       S1(IR,IT) = 0.1;                                     00005640
 387   2  2                       S2(IR,IT) = 0.1;                                     00005650
 388   2  2                       S3(IR,IT) = 0.8;                                     00005660
 389   2  2                       END;                                                 00005670
 390   2  1                       ELSE DO;                                             00005680
 391   2  2                           S1(IR,IT) = 0.8;                                 00005690
 392   2  2                           S2(IR,IT) = 0.1;                                 00005700
 393   2  2                           S3(IR,IT) = 0.1;                                 00005710
 394   2  2                           END;                                             00005720
 395   2  1               A = CFA(IR,IT)-CFA(IR,IT-1)+ATC(IR,IT-1)*CFA(IR,1);          00005730
 396   2  1               IF A <= 0 THEN PNDGC(IR,IT) = 0;                             00005740
 397   2  1                   ELSE DO;                                                 00005750
 398   2  2                       B = 0.053*S2(IR,IT)+0.191*S3(IR,IT);                 00005760
 399   2  2                       C = 1+(PRGC(IR,IT-1)/PROC(IR,IT-1))**3.17;           00005770
 400   2  2                       D = (PRGC(IR,IT-1)/1.2998)**(-.3);                   00005780
 401   2  2                       E = C-1;                                             00005790
 402   2  2                       F = 0.091*S1(IR,IT)+0.054*S2(IR,IT);                 00005800
 403   2  2                       CFG = B*D/C;                                         00005810
 404   2  2                       CFO = (B*E/C)*((PROC(IR,IT-1)/1.168)**(-.3));        00005820
 405   2  2                       CFE = F*((PREC(IR,IT-1)/10.02195)**(-.3));           00005830
 406   2  2                       CFT = CFG+CFO+CFE;                                   00005840
 407   2  2                       SH = CFG/CFT;                                        00005850
 408   2  2                       IF SH > SHGO THEN PNDGC(IR,IT) = A*B*D/C;            00005860
 409   2  2                           ELSE PNDGC(IR,IT) = 0;                           00005870
 410   2  2                       END;                                                 00005880
 411   2  1               END;                                                         00005890

 412   2  0           RETURN;                                                          00005900
 413   2  0           END COMMEC;                                                      00005910
```

```
STMT LEV NT

               /**********************************************************************00005920
               *                                                                      *00005930
               *         I N D U S C   P R O C E D U R E                              *00005940
               *                                                                      *00005950
               **********************************************************************/00005960

  414   1  0   INDUSC:  PROC;                                                          00005970

  415   2  0            DCL  A  FLOAT DEC(6);                                          00005980

  416   2  0            DO IR = 1 TO NR;                                               00005990
  417   2  1                RP = TENCI(IR,IT)/TENCI(IR,IT-1);                          00006000
  418   2  1                IF RP < 1 THEN ATI(IR,IT-1) = ATIB+1-RP;                   00006010
  419   2  1                    ELSE ATI(IR,IT-1) = ATIB;                              00006020
  420   2  1                A = TENCI(IR,IT)-TENCI(IR,IT-1)+ATI(IR,IT-1)*TENCI(IR,1);  00006030
  421   2  1                A = MAX(A,0);                                              00006040
  422   2  1                CALL SHIND;                                                00006050
  423   2  1                PNDGI(IR,IT) = A*SHGI(IR,IT);                              00006060
  424   2  1                END;                                                       00006070

  425   2  0            RETURN;                                                        00006080
  426   2  0            END INDUSC;                                                    00006090
```

```
STMT LEV NT

                /**********************************************************************
                *
                *       S H I N D   P R O C E D U R E
                *
                **********************************************************************/

 427   1  0  SHIND:  PROC;

             /*      COMPUTATION OF INDUSTRIAL GAS AND OIL PRICE INDICES          */

 428   2  0          PEA = PRCI(IR,IT-1)*SHCI(IR,IT-1)+PRGI(IR,IT-1)*SHGI(IR,IT-1)
                           +PROI(IR,IT-1)*SHOI(IR,IT-1);
 429   2  0          A = SHCI(IR,IT-1)+SHOI(IR,IT-1);
 430   2  0          B = SHCI(IR,IT-1)+SHGI(IR,IT-1);
 431   2  0          CPCO = (PRCI(IR,IT-1)*SHCI(IR,IT-1)+PROI(IR,IT-1) *
                             SHOI(IR,IT-1))/A;
 432   2  0          CPCG = (PRCI(IR,IT-1)*SHCI(IR,IT-1)+PRGI(IR,IT-1) *
                             SHGI(IR,IT-1))/B;
 433   2  0          PIG = (PRGI(IR,IT-1)-CPCO)/PEA;
 434   2  0          PIO = (PROI(IR,IT-1)-CPCG)/PEA;

             /*      COMPUTATION OF THE INDUSTRIAL MARKET SHARE OF GAS             */

 435   2  0          A = -1.6;
 436   2  0          B = -0.1;
 437   2  0          C = 0.6;
 438   2  0          IF PIG <= A THEN SHGI(IR,IT) = 1;
 439   2  0              ELSE IF (PIG > A) & (PIG <= B) THEN
                             SHGI(IR,IT) = EXP(-.218*(PIG+1.6)**2);
 440   2  0                  ELSE IF (PIG > B) & (PIG <= C) THEN
                                 SHGI(IR,IT) = 1.9643*EXP(-.5175*(PIG+1.6)**2);
 441   2  0                      ELSE SHGI(IR,IT) = 0.4146*EXP(-.19515 *
                                                   (PIG+1.6)**2);
 442   2  0          IF SHGI(IR,IT) <= SHGO THEN SHGI(IR,IT) = 0;

             /*      COMPUTATION OF THE INDUSTRIAL MARKET SHARE OF OIL             */

 443   2  0          A = -1;
 444   2  0          B = 0;
 445   2  0          C = 0.3;
 446   2  0          IF PIO <= A THEN SHOI(IR,IT) = 1;
 447   2  0              ELSE IF (PIO > A) & (PIO <= B) THEN
                             SHOI(IR,IT) = EXP(-.26*(PIO+1)**2);
 448   2  0                  ELSE IF (PIO > B) & (PIO <= C) THEN
                                 SHOI(IR,IT) = 5.4496*EXP(-1.9556*(PIO+1)**2);
 449   2  0                      ELSE SHOI(IR,IT) = 0.50785*EXP(-.5514 *
                                                   (PIO+1)**2);
 450   2  0          IF SHOI(IR,IT) <= SHGO THEN SHOI(IR,IT) = 0;

             /*      COMPUTATION OF THE INDUSTRIAL MARKET SHARE OF COAL            */

 451   2  0          SHGOI = SHGI(IR,IT)+SHOI(IR,IT);
 452   2  0          IF SHGOI <= 1 THEN SHCI(IR,IT) = 1-SHGOI;
 453   2  0              ELSE DO;
 454   2  1                  SHGI(IR,IT) = SHGI(IR,IT)/SHGOI;
 455   2  1                  SHOI(IR,IT) = SHOI(IR,IT)/SHGOI;
 456   2  1                  SHCI(IR,IT) = 0;
 457   2  1                  END;

 458   2  0          RETURN;
 459   2  0          END SHIND;
```

```
STMT LEV NT

                /********************************************************************00006610
                 *                                                                  *00006620
                 *       C A P E X P   P R O C E D U R E                            *00006630
                 *                                                                  *00006640
                 ********************************************************************/00006650

 460   1  0  CAPEXP:  PROC;                                                           00006660

 461   2  0           DCL  POLICY(4)  LABEL INIT(POL#1,POL#2,POL#3,POL#4);            00006670

             /*       COMPUTATION OF BASE DEMANDS OF GAS                            */00006680

 462   2  0           BASEDR(IT) = 0;                                                 00006690
 463   2  0           BASEDC(IT) = 0;                                                 00006700
 464   2  0           BASEDI(IT) = 0;                                                 00006710
 465   2  0           DO IR = 1 TO NR;                                                00006720
 466   2  1               BASEDR(IT) = BASEDR(IT)+TCDR(IR,IT-1)-ATRG(IR,IT-1)*         00006730
                                       TCDR(IR,1);                                    00006740
 467   2  1               BASEDC(IT) = BASEDC(IT)+TCDC(IR,IT-1)-ATC(IR,IT-1)*          00006750
                                       TCDC(IR,1);                                    00006760
 468   2  1               BASEDI(IT) = BASEDI(IT)+TCDI(IR,IT-1)-ATI(IR,IT-1)*          00006770
                                       TCDI(IR,1);                                    00006780
 469   2  1               END;                                                        00006790
 470   2  0           BASEDT(IT) = BASEDR(IT)+BASEDC(IT)+BASEDI(IT);                  00006800

             /*       COMPUTATION OF AVAILABLE EXCESS SUPPLY FOR YEAR IT - MMBTU    */00006810

 471   2  0           EXCSUP(IT) = WGS(IT)*1035-BASEDT(IT);                           00006820
 472   2  0           PDGRST(IT) = 0;                                                 00006830
 473   2  0           PDGRNT(IT) = 0;                                                 00006840
 474   2  0           PDGCT(IT) = 0;                                                  00006850
 475   2  0           PDGIT(IT) = 0;                                                  00006860
 476   2  0           DO IR = 1 TO NR;                                                00006870
 477   2  1               PDGRST(IT) = PDGRST(IT)+PNDGRS(IR,IT);                      00006880
 478   2  1               PDGRNT(IT) = PDGRNT(IT)+PNDGRN(IR,IT);                      00006890
 479   2  1               PDGCT(IT) = PDGCT(IT)+PNDGC(IR,IT);                         00006900
 480   2  1               PDGIT(IT) = PDGIT(IT)+PNDGI(IR,IT);                         00006910
 481   2  1               END;                                                        00006920

 482   2  0           IF EXCSUP(IT) <= 0 THEN GO TO POL#1;                            00006930
 483   2  0               ELSE GO TO POLICY(IP);                                      00006940

             /*       ANALYSIS OF POLICY 1                                          */00006950

 484   2  0  POL#1:   DO IR = 1 TO NR;                                                00006960
 485   2  1               CNDGRS(IR,IT) = 0;                                          00006970
 486   2  1               CNDGRN(IR,IT) = 0;                                          00006980
 487   2  1               CNDGC(IR,IT) = 0;                                           00006990
 488   2  1               CNDGI(IR,IT) = 0;                                           00007000
 489   2  1               END;                                                        00007010
 490   2  0           GO TO NEWCUST;                                                  00007020

             /*       ANALYSIS OF POLICY 2                                          */00007030

 491   2  0  POL#2:   A = PDGRST(IT)+PDGRNT(IT)+PDGCT(IT)+PDGIT(IT);                  00007040
 492   2  0           B = PDGRST(IT)+PDGCT(IT)+PDGIT(IT);                             00007050
 493   2  0           C = PDGRST(IT)+PDGCT(IT);                                       00007060
 494   2  0           D = PDGRST(IT);                                                 00007070
 495   2  0           IF EXCSUP(IT) >= A THEN DO;                                     00007080
 496   2  1               DO IR = 1 TO NR;                                            00007090
 497   2  2                   CNDGRS(IR,IT) = PNDGRS(IR,IT);                          00007100
 498   2  2                   CNDGRN(IR,IT) = PNDGRN(IR,IT);                          00007110
 499   2  2                   CNDGC(IR,IT) = PNDGC(IR,IT);                            00007120
 500   2  2                   CNDGI(IR,IT) = PNDGI(IR,IT);                            00007130
 501   2  2                   END;                                                    00007140
 502   2  1               GO TO NEWCUST;                                              00007150
 503   2  1               END;                                                        00007160
 504   2  0           IF EXCSUP(IT) >= B THEN DO;                                     00007170
 505   2  1               SH = (EXCSUP(IT)-B)/PDGRNT(IT);                             00007180
 506   2  1               DO IR = 1 TO NR;                                            00007190
```

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STMT LEV NT

 507   2  2                   CNDGC(IR,IT) = PNDGC(IR,IT);
 508   2  2                   CNDGI(IR,IT) = PNDGI(IR,IT);
 509   2  2                   CNDGRS(IR,IT) = PNDGRS(IR,IT);
 510   2  2                   CNDGRN(IR,IT) = PNDGRN(IR,IT)*SH;
 511   2  2                   END;
 512   2  1               GO TO NEWCUST;
 513   2  1               END;
 514   2  0           IF EXCSUP(IT) >= C THEN DO;
 515   2  1               SH = (EXCSUP(IT)-C)/PDGIT(IT);
 516   2  1               DO IR = 1 TO NR;
 517   2  2                   CNDGRS(IR,IT) = PNDGRS(IR,IT);
 518   2  2                   CNDGRN(IR,IT) = 0;
 519   2  2                   CNDGC(IR,IT) = PNDGC(IR,IT);
 520   2  2                   CNDGI(IR,IT) = PNDGI(IR,IT)*SH;
 521   2  2                   END;
 522   2  1               GO TO NEWCUST;
 523   2  1               END;
 524   2  0           IF EXCSUP(IT) >= D THEN DO;
 525   2  1               SH = (EXCSUP(IT)-D)/PDGCT(IT);
 526   2  1               DO IR = 1 TO NR;
 527   2  2                   CNDGRS(IR,IT) = PNDGRS(IR,IT);
 528   2  2                   CNDGRN(IR,IT) = 0;
 529   2  2                   CNDGC(IR,IT) = PNDGC(IR,IT)*SH;
 530   2  2                   CNDGI(IR,IT) = 0;
 531   2  2                   END;
 532   2  1               GO TO NEWCUST;
 533   2  1               END;
 534   2  0           SH = EXCSUP(IT)/PDGRST(IT);
 535   2  0           DO IR = 1 TO NR;
 536   2  1               CNDGRS(IR,IT) = PNDGRS(IR,IT)*SH;
 537   2  1               CNDGRN(IR,IT) = 0;
 538   2  1               CNDGC(IR,IT) = 0;
 539   2  1               CNDGI(IR,IT) = 0;
 540   2  1               END;
 541   2  0           GO TO NEWCUST;

              /*      ANALYSIS OF POLICY 3                                    */

 542   2  0  POL#3:   IF EXCSUP(IT) < PDGRST(IT) THEN SH = EXCSUP(IT)/PDGRST(IT);
 543   2  0               ELSE SH = 1;
 544   2  0           DO IR = 1 TO NR;
 545   2  1               CNDGRS(IR,IT) = PNDGRS(IR,IT)*SH;
 546   2  1               CNDGRN(IR,IT) = 0;
 547   2  1               CNDGC(IR,IT) = 0;
 548   2  1               CNDGI(IR,IT) = 0;
 549   2  1               END;
 550   2  0           GO TO NEWCUST;

              /*      ANALYSIS OF POLICY 4                                    */

 551   2  0  POL#4:   IF EXCSUP(IT) < PDGIT(IT) THEN SH = EXCSUP(IT)/PDGIT(IT);
 552   2  0               ELSE SH = 1;
 553   2  0           DO IR = 1 TO NR;
 554   2  1               CNDGRS(IR,IT) = 0;
 555   2  1               CNDGRN(IR,IT) = 0;
 556   2  1               CNDGC(IR,IT) = 0;
 557   2  1               CNDGI(IR,IT) = PNDGI(IR,IT)*SH;
 558   2  1               END;

              /*      COMPUTATION OF NEW HOOKED-UP CUSTOMERS                  */

 559   2  0  NEWCUST: CONSR = RGCRAT(1)*(1-CONSVR*FLOAT(IT-1));
 560   2  0           CONSVC(IT) = (((PRGC(1,IT-1)/1.2998)**(-.3)) -
                          ((PRGC(1,1)/1.2998)**(-.3)))/((PRGC(1,1)/1.2998)**(-.3));
 561   2  0           CONSC = CGCRAT(1)*(1+CONSVC(IT));
 562   2  0           CONSI = IGCRAT(1)*(1-CONSVI*FLOAT(IT-1));
 563   2  0           CNDRST(IT) = 0;
 564   2  0           CNDRNT(IT) = 0;
 565   2  0           CNDGCT(IT) = 0;
 566   2  0           CNDGIT(IT) = 0;
```

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STMT LEV NT

 567   2  0             DO IR = 1 TO NR;
 568   2  1                NGCSA(IR,IT) = CNDGRS(IR,IT)/CONSR;
 569   2  1                NGCNSA(IR,IT) = CNDGRN(IR,IT)/CONSR;
 570   2  1                HKRGC(IR,IT) = NGCSA(IR,IT)+NGCNSA(IR,IT);
 571   2  1                NCGC(IR,IT) = CNDGC(IR,IT)/CONSC;
 572   2  1                NIGC(IR,IT) = CNDGI(IR,IT)/CONSI;
 573   2  1                CNDRST(IT) = CNDRST(IT)+CNDGRS(IR,IT);
 574   2  1                CNDRNT(IT) = CNDRNT(IT)+CNDGRN(IR,IT);
 575   2  1                CNDGCT(IT) = CNDGCT(IT)+CNDGC(IR,IT);
 576   2  1                CNDGIT(IT) = CNDGIT(IT)+CNDGI(IR,IT);
 577   2  1                END;

                 /*     COMPUTATION OF FINAL GAS REQUIREMENTS                         */

 578   2  0             TCYDR(IT) = 0;
 579   2  0             TCYDI(IT) = 0;
 580   2  0             TCYDC(IT) = 0;
 581   2  0             DO IR = 1 TO NR;
 582   2  1                TCDR(IR,IT) = TCDR(IR,IT-1)-ATRG(IR,IT-1)*TCDR(IR,1) +
                                         CNDGRS(IR,IT)+CNDGRN(IR,IT);
 583   2  1                TCDC(IR,IT) = TCDC(IR,IT-1)-ATC(IR,IT-1)*TCDC(IR,1) +
                                         CNDGC(IR,IT);
 584   2  1                TCDI(IR,IT) = TCDI(IR,IT-1)-ATI(IR,IT-1)*TCDI(IR,1) +
                                         CNDGI(IR,IT);
 585   2  1                TCYDR(IT) = TCYDR(IT)+(TCDR(IR,IT)/1035);
 586   2  1                TCYDC(IT) = TCYDC(IT)+(TCDC(IR,IT)/1035);
 587   2  1                TCYDI(IT) = TCYDI(IT)+(TCDI(IR,IT)/1035);
 588   2  1                END;

 589   2  0             RETURN;
 590   2  0             END CAPEXP;
```

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STMT LEV NT

              /*********************************************************************
              *                                                                   *
              *         G A S A L L    P R O C E D U R E                          *
              *                                                                   *
              *********************************************************************/

 591   1  0  GASALL:  PROC;

              /*      GENERATION OF MONTHLY DEGREE-DAYS SERIES                   */

 592   2  0           CALL WEATHR;

              /*      COMPUTATION OF MONTHLY GAS REQUIREMENTS                    */

 593   2  0           A1 = TCYDR(IT)*FLOAT(0.211898)/FLOAT(12);
 594   2  0           B1 = TCYDR(IT)*FLOAT(0.788102)/FLOAT(6317);
 595   2  0           A2 = TCYDC(IT)*FLOAT(0.252083)/FLOAT(12);
 596   2  0           B2 = TCYDC(IT)*FLOAT(0.747917)/FLOAT(6317);
 597   2  0           A3 = TCYDI(IT)*FLOAT(0.874367)/FLOAT(12);
 598   2  0           B3 = TCYDI(IT)*FLOAT(0.125633)/FLOAT(6317);
 599   2  0           DO IM = 1 TO 12;
 600   2  1               DGMR(IT,IM) = A1+B1*DDS(IT,IM);
 601   2  1               DGMC(IT,IM) = A2+B2*DDS(IT,IM);
 602   2  1               DGMI(IT,IM) = A3+B3*DDS(IT,IM);
 603   2  1               DGMT(IT,IM) = DGMR(IT,IM)+DGMC(IT,IM)+DGMI(IT,IM);
 604   2  1               END;

              /*      ALL GAS FLOWS IN THIS SUB-MODEL ARE EXPRESSED IN MMCF      */
              /*      COMPUTATION OF SEASONAL AND MONTHLY SUPPLY CONSTRAINTS     */

 605   2  0           WENT = 0.57;
 606   2  0           WINETL(IT) = WGS(IT)*WENT;
 607   2  0           SUMETL(IT) = WGS(IT)-WINETL(IT);
 608   2  0           MAXSUS = SUMETL(IT)*0.22;
 609   2  0           MINSUS = SUMETL(IT)*0.14;
 610   2  0           MAXSUW = WINETL(IT)*0.20;
 611   2  0           MINSUW = WINETL(IT)*0.10;

              /*      SUMMER ALLOCATION PROCEDURE                                */

              /*      INITIAL RESIDUAL SUMMER ENTITLEMENT                        */

 612   2  0           RESUEN(IT,1) = SUMETL(IT);
 613   2  0           DO IM = 1 TO 6;

              /*      MAXIMUM DELIVERY TO AND WITHDRAWAL FROM STORAGE            */

 614   2  1               IF RSTOR(IT,IM) >= 1.18 THEN MAXINS(IT,IM) = 0;
 615   2  1                   ELSE MAXINS(IT,IM) =
                                    13121*((1.18-RSTOR(IT,IM))**0.24913);
 616   2  1               IF RSTOR(IT,IM) <= 0.76 THEN MAXOUS(IT,IM) = 0;
 617   2  1                   ELSE MAXOUS(IT,IM) =
                                    23112*((RSTOR(IT,IM)-0.76)**0.37548);

              /*      NEW UPPER AND LOWER LIMITS ON MONTHLY SUPPLY               */
 618   2  1               MAXSU1 = MIN(MAXSUS,RESUEN(IT,IM));
 619   2  1               IF MAXSU1 <= MINSUS THEN MINSU1 = 0;
 620   2  1                   ELSE MINSU1 = MINSUS;

              /*      CASE A:  DGMT(IT,IM) <= MAXSU1                             */

 621   2  1               IF DGMT(IT,IM) <= MAXSU1 THEN DO;
 622   2  2                   MAXGST = MAXSU1-DGMT(IT,IM);
 623   2  2                   GINST(IT,IM) = MIN(MAXGST,MAXINS(IT,IM));
 624   2  2                   GOUST(IT,IM) = 0;
 625   2  2                   SUPM(IT,IM) = DGMT(IT,IM)+GINST(IT,IM);
 626   2  2                   CURT(IT,IM) = 0;
 627   2  2                   END;

              /*      CASE B:  DGMT(IT,IM) > MAXSU1                              */
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 628   2  1              IF DGMT(IT,IM) > MAXSU1 THEN DO;                       00008660
 629   2  2                 EXCD = DGMT(IT;IM)-MAXSU1;                           00008670

              /*      CASE B-1:  EXCD <= MAXOUS(IT,IM)                        */00008680
 630   2  2                 IF EXCD <= MAXOUS(IT,IM) THEN DO;                   00008690
 631   2  3                    GINST(IT,IM) = 0;                                 00008700
 632   2  3                    GOUST(IT,IM) = EXCD;                              00008710
 633   2  3                    SUPM(IT,IM) = MAXSU1;                             00008720
 634   2  3                    CURT(IT,IM) = 0;                                  00008730
 635   2  3                    END;                                              00008740

              /*      CASE B-2:  EXCD > MAXOUS(IT,IM)                         */00008750
 636   2  2                 IF EXCD > MAXOUS(IT,IM) THEN DO;                    00008760
 637   2  3                    GINST(IT,IM) = 0;                                 00008770
 638   2  3                    GOUST(IT,IM) = MAXOUS(IT,IM);                     00008780
 639   2  3                    SUPM(IT,IM) = MAXSU1;                             00008790
 640   2  3                    CURT(IT,IM) = 1;                                  00008800
 641   2  3                    END;                                              00008810
 642   2  2                 END;                                                 00008820

              /*      UPDATING OF STORAGE CONDITIONS                          */00008830
 643   2  1              GSTORD(IT,IM+1) = GSTORD(IT,IM)+GINST(IT,IM)-GOUST(IT,IM);00008840
 644   2  1              RSTOR(IT,IM+1) = GSTORD(IT,IM+1)/STCAP;                00008850

              /*      UPDATING OF RESIDUAL SUMMER ENTITLEMENT                 */00008860
 645   2  1              IF (IM=6) & (RESUEN(IT,IM) > SUPM(IT,IM)) THEN         00008870
                            WINETL(IT) = WINETL(IT)+RESUEN(IT,IM)-SUPM(IT,IM);  00008880
 646   2  1                 ELSE RESUEN(IT,IM+1) = RESUEN(IT,IM)-SUPM(IT,IM);   00008890

              /*      COMPUTATION OF MONTHLY SUPPLY AND CURTAILMENT LEVELS    */00008900

 647   2  1              CALL SUPCUR;                                           00008910
 648   2  1              END;                                                   00008920

              /*      WINTER ALLOCATION PROCEDURE                             */00008930

              /*      INITIAL RESIDUAL WINTER ENTITLEMENT                     */00008940

 649   2  0           REWIEN(IT,7) = WINETL(IT);                                00008950
 650   2  0           DO IM = 7 TO 12;                                          00008960

              /*      MAXIMUM DELIVERY TO AND WITHDRAWAL FROM STORAGE         */00008970
 651   2  1              IF RSTOR(IT,IM) >= 1.18 THEN MAXINS(IT,IM) = 0;        00008980
 652   2  1                 ELSE MAXINS(IT,IM) =                                00008990
                                  13121*((1.18-RSTOR(IT,IM))**0.24913);         00009000
 653   2  1              IF RSTOR(IT,IM) <= 0.76 THEN MAXOUS(IT,IM) = 0;        00009010
 654   2  1                 ELSE MAXOUS(IT,IM) =                                00009020
                                  23112*((RSTOR(IT,IM)-0.76)**0.37548);         00009030

              /*      NEW UPPER AND LOWER LIMITS ON MONTHLY SUPPLY            */00009040

 655   2  1              MAXSU1 = MIN(MAXSUW,REWIEN(IT,IM));                    00009050
 656   2  1              IF MAXSU1 <= MINSUW THEN MINSU1 = 0;                   00009060
 657   2  1                 ELSE MINSU1 = MINSUW;                               00009070

              /*      CASE A:  DGMT(IT,IM) <= MINSU1                          */00009080

 658   2  1              IF DGMT(IT,IM) <= MINSU1 THEN DO;                      00009090
 659   2  2                 GOUST(IT,IM) = 0;                                   00009100
 660   2  2                 EXCS = MINSU1-DGMT(IT,IM);                          00009110
 661   2  2                 IF EXCS > MAXINS(IT,IM) THEN DO;                    00009120
 662   2  3                    GINST(IT,IM) = MAXINS(IT,IM);                     00009130
 663   2  3                    SUPM(IT,IM) = DGMT(IT,IM)+GINST(IT,IM);           00009140
 664   2  3                    IK = 1;                                           00009150
 665   2  3                    END;                                              00009160
 666   2  2                    ELSE DO;                                          00009170
 667   2  3                       GINST(IT,IM) = EXCS;                           00009180
 668   2  3                       SUPM(IT,IM) = DGMT(IT,IM)+GINST(IT,IM);        00009190
 669   2  3                       IK = 2;                                        00009200
 670   2  3                       END;                                           00009210
```

```
STMT LEV NT

 671   2  2                   CURT(IT,IM) = 0;
 672   2  2                   GO TO UPSTCD;
 673   2  2                   END;

               /*        CASE B:  DGMT(IT,IM) <= MINSU1 + MAXOUS(IT,IM)            */

 674   2  1               IF DGMT(IT,IM) <= (MINSU1+MAXOUS(IT,IM)) THEN DO;
 675   2  2                   GINST(IT,IM) = 0;
 676   2  2                   GOUST(IT,IM) = DGMT(IT,IM)-MINSU1;
 677   2  2                   SUPM(IT,IM) = MINSU1;
 678   2  2                   CURT(IT,IM) = 0;
 679   2  2                   IK = 3;
 680   2  2                   GO TO UPSTCD;
 681   2  2                   END;

               /*        CASE C:  DGMT(IT,IM) <= (MAXSU1 + MAXOUS(IT,IM))          */

 682   2  1               IF DGMT(IT,IM) <= (MAXSU1+MAXOUS(IT,IM)) THEN DO;
 683   2  2                   GINST(IT,IM) = 0;
 684   2  2                   GOUST(IT,IM) = MAXOUS(IT,IM);
 685   2  2                   SUPM(IT,IM) = DGMT(IT,IM)-GOUST(IT,IM);
 686   2  2                   CURT(IT,IM) = 0;
 687   2  2                   IK = 3;
 688   2  2                   GO TO UPSTCD;
 689   2  2                   END;

               /*        CASE D:  DGMT(IT,IM) > (MAXSU1 + MAXOUS(IT,IM))           */

 690   2  1               GINST(IT,IM) = 0;
 691   2  1               GOUST(IT,IM) = MAXOUS(IT,IM);
 692   2  1               SUPM(IT,IM) = MAXSU1;
 693   2  1               CURT(IT,IM) = 1;
 694   2  1               IK = 5;

               /*        UPDATING OF STORAGE CONDITIONS                            */

 695   2  1  UPSTCD:      IF IM ¬= 12 THEN DO;
 696   2  2                   GSTORD(IT,IM+1) = GSTORD(IT,IM)+GINST(IT,IM) -
                                                  GOUST(IT,IM);
 697   2  2                   RSTOR(IT,IM+1) = GSTORD(IT,IM+1)/STCAP;
 698   2  2                   REWIEN(IT,IM+1) = REWIEN(IT,IM)-SUPM(IT,IM);
 699   2  2                   GO TO CURSUP;
 700   2  2                   END;

 701   2  1               GSTORD(IT+1,1) = GSTORD(IT,IM)+GINST(IT,IM)-GOUST(IT,IM);
 702   2  1               RSTOR(IT+1,1) = GSTORD(IT+1,1)/STCAP;
 703   2  1               EXWIEN = REWIEN(IT,IM)-SUPM(IT,IM);
 704   2  1               IF EXWIEN = 0 THEN GO TO CURSUP;
 705   2  1               IF IK = 1 THEN GO TO UPSTCD2;
 706   2  1               IF IK = 2 THEN DO;
 707   2  2                   EX1 = MAXINS(IT,IM)-GINST(IT,IM);
 708   2  2                   EXWIEN = EXWIEN-EX1;
 709   2  2                   GINST(IT,IM) = MAXINS(IT,IM);
 710   2  2                   SUPM(IT,IM) = SUPM(IT,IM)+EX1;
 711   2  2                   GO TO UPSTCD2;
 712   2  2                   END;
 713   2  1               IF IK = 3 THEN DO;
 714   2  2                   IF EXWIEN <= GOUST(IT,IM) THEN DO;
 715   2  3                       GOUST(IT,IM) = GOUST(IT,IM)-EXWIEN;
 716   2  3                       SUPM(IT,IM) = SUPM(IT,IM)+EXWIEN;
 717   2  3                       EXWIEN = 0;
 718   2  3                       GO TO UPSTCD2;
 719   2  3                       END;
 720   2  2                   EXWIEN = EXWIEN-GOUST(IT,IM);
 721   2  2                   SUPM(IT,IM) = SUPM(IT,IM)+GOUST(IT,IM);
 722   2  2                   GOUST(IT,IM) = 0;
 723   2  2                   IF EXWIEN <= MAXINS(IT,IM) THEN DO;
 724   2  3                       GINST(IT,IM) = EXWIEN;
 725   2  3                       SUPM(IT,IM) = SUPM(IT,IM)+GINST(IT,IM);
 726   2  3                       EXWIEN = 0;
```

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STMT LEV NT

 727   2  3                      GO TO UPSTCD2;                                  00009830
 728   2  3                      END;                                            00009840
 729   2  2                  GINST(IT,IM) = MAXINS(IT,IM);                       00009850
 730   2  2                  SUPM(IT,IM) = SUPM(IT,IM)+GINST(IT,IM);             00009860
 731   2  2                  EXWIEN = EXWIEN-GINST(IT,IM);                       00009870
 732   2  2                  GO TO UPSTCD2;                                      00009880
 733   2  2                  END;                                                00009890
 734   2  1              EXD = DGMT(IT,IM)-SUPM(IT,IM)-GOUST(IT,IM);             00009900
 735   2  1              IF EXWIEN <= EXD THEN DO;                               00009910
 736   2  2                  SUPM(IT,IM) = SUPM(IT,IM)+EXWIEN;                   00009920
 737   2  2                  GO TO UPSTCD2;                                      00009930
 738   2  2                  END;                                                00009940
 739   2  1              CURT(IT,IM) = 0;                                        00009950
 740   2  1              SUPM(IT,IM) = SUPM(IT,IM)+EXD;                          00009960
 741   2  1              EXWIEN = EXWIEN-EXD;                                    00009970
 742   2  1              IF EXWIEN <= GOUST(IT,IM) THEN DO;                      00009980
 743   2  2                  GOUST(IT,IM) = GOUST(IT,IM)-EXWIEN;                 00009990
 744   2  2                  SUPM(IT,IM) = SUPM(IT,IM)+EXWIEN;                   00010000
 745   2  2                  GO TO UPSTCD2;                                      00010010
 746   2  2                  END;                                                00010020
 747   2  1              EXWIEN = EXWIEN-GOUST(IT,IM);                           00010030
 748   2  1              SUPM(IT,IM) = SUPM(IT,IM)+GOUST(IT,IM);                 00010040
 749   2  1              GOUST(IT,IM) = 0;                                       00010050
 750   2  1              IF EXWIEN <= MAXINS(IT,IM) THEN DO;                     00010060
 751   2  2                  GINST(IT,IM) = EXWIEN;                              00010070
 752   2  2                  GO TO UPSTCD2;                                      00010080
 753   2  2                  END;                                                00010090
 754   2  1              GINST(IT,IM) = MAXINS(IT,IM);                           00010100
 755   2  1              EXWIEN = EXWIEN-MAXINS(IT,IM);                          00010110

 756   2  1  UPSTCD2:    GSTORD(IT+1,1) = GSTORD(IT,IM)+GINST(IT,IM)-GOUST(IT,IM); 00010120
 757   2  1              RSTOR(IT+1,1) = GSTORD(IT+1,1)/STCAP;                   00010130

             /*       COMPUTATION OF MONTHLY SUPPLY AND CURTAILMENT LEVELS      */00010140

 758   2  1  CURSUP:     CALL SUPCUR;                                            00010150
 759   2  1              END;                                                    00010160

 760   2  0          RETURN;                                                     00010170
 761   2  0          END GASALL;                                                 00010180
```

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STMT LEV NT

              /*********************************************************************
              *                                                                    *
              *        W E A T H R   P R O C E D U R E                             *
              *                                                                    *
              *********************************************************************/

 762   1  0   WEATHR:  PROC;

 763   2  0            DCL  FIRST  BIT(1) INIT('1'B) STATIC;
 764   2  0            DCL  (IX,IY)  FIXED BIN(31) STATIC;
 765   2  0            DCL  RANDOM  FLOAT DEC(6);

 766   2  0            IF FIRST THEN DO;
 767   2  1                FIRST = '0'B;
 768   2  1                IX = DATE;      /* INITIALIZE RANDOM NUMBER GENERATOR */
 769   2  1                IY = TIME;
 770   2  1                IX = IX + IY;
 771   2  1                IF MOD(IX,2) = 0 THEN IX = IX + 1;    /* IX MUST BE ODD */
 772   2  1                CALL RN2(IX,IY,RANDOM);            /* IGNORE FIRST CALL */
 773   2  1                IX = IY;
 774   2  1                END;

              /*       CALL RANDOM NUMBER GENERATOR                               */

 775   2  0            CALL RN2(IX,IY,RANDOM);
 776   2  0            IX = IY;

              /*       CHECK IN WHICH INTERVAL RANDOM FALLS                       */

 777   2  0            DO ITH = 1 TO NTH;
 778   2  1                IF (RANDOM < DDMAX(ITH)) & (RANDOM >= DDMIN(ITH))
                               THEN GO TO GOTIT;
 779   2  1                END;

 780   2  0            PUT EDIT ('INTERVAL FOR RANDOM NUMBER NOT FOUND',RANDOM)
                                 (COL(11),A,E(16,8));
 781   2  0            STOP;

              /*       DUPLICATE WEATHER DATA BY MONTH                            */

 782   2  0   GOTIT:   DO IM = 1 TO 12;
 783   2  1                DDS(IT,IM) = DDH(ITH,IM);
 784   2  1                END;

 785   2  0            RETURN;
 786   2  0            END WEATHR;

              /*********************************************************************
              *        RN2 - RANDOM NUMBER GENERATOR PROCEDURE                     *
              *********************************************************************/

 787   1  0   (NOFOFL): RN2:  PROCEDURE (IX,IY,YFL);
 788   2  0            DCL  (IX,IY)   FIXED BINARY(31);
 789   2  0            DCL  YFL       FLOAT DECIMAL(6);

 790   2  0            DCL  RNW(24)  FLOAT DEC(6) INIT (.07429,.02017,.35188,.03205,
                            .20332,.65384,.26093,.02578,.75682,.58957,.46515,.32061,
                            .20703,.17697,.12364,.00507,.95300,.90613,.86326,.78458,
                            .75525,.74370,.71162,.68572) STATIC;

 791   2  0            YFL = RNW(IT);                /* FOR TESTING PURPOSES */
 792   2  0            RETURN;
 793   2  0            IY = IX * 65539;
 794   2  0            IF IY < 0 THEN IY = IY + 2147483647 + 1;
 795   2  0            YFL = IY;
 796   2  0            YFL = YFL * .4656613E-9;
 797   2  0            RETURN;
 798   2  0            END RN2;
```

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STMT LEV NT

               /*********************************************************************
               *                                                                   *
               *        S U P C U R   P R O C E D U R E                            *
               *                                                                   *
               *********************************************************************/

 799   1  0    SUPCUR:  PROC;

               /*       ANALYSIS OF THE NO-CURTAILMENT CASE                        */

 800   2  0             IF CURT(IT,IM) = 0 THEN DO;
 801   2  1                 DGMRE(IT,IM) = DGMR(IT,IM);
 802   2  1                 DGMCE(IT,IM) = DGMC(IT,IM);
 803   2  1                 DGMIE(IT,IM) = DGMI(IT,IM);
 804   2  1                 CURTR(IT,IM) = 0;
 805   2  1                 CURTC(IT,IM) = 0;
 806   2  1                 CURTI(IT,IM) = 0;
 807   2  1                 RETURN;
 808   2  1                 END;

               /*       ANALYSIS OF THE CURTAILMENT CASE                           */

 809   2  0             GASDEF = DGMT(IT,IM)-SUPM(IT,IM)-GOUST(IT,IM);
 810   2  0             IF GASDEF < DGMI(IT,IM) THEN DO;
 811   2  1                 DGMIE(IT,IM) = DGMI(IT,IM)-GASDEF;
 812   2  1                 DGMCE(IT,IM) = DGMC(IT,IM);
 813   2  1                 DGMRE(IT,IM) = DGMR(IT,IM);
 814   2  1                 GO TO CURTLVL;
 815   2  1                 END;
 816   2  0             DGMIE(IT,IM) = 0;
 817   2  0             GASDEF = GASDEF-DGMI(IT,IM);
 818   2  0             IF GASDEF < DGMC(IT,IM) THEN DO;
 819   2  1                 DGMCE(IT,IM) = DGMC(IT,IM)-GASDEF;
 820   2  1                 DGMRE(IT,IM) = DGMR(IT,IM);
 821   2  1                 GO TO CURTLVL;
 822   2  1                 END;
 823   2  0             DGMCE(IT,IM) = 0;
 824   2  0             GASDEF = GASDEF-DGMC(IT,IM);
 825   2  0             DGMRE(IT,IM) = DGMR(IT,IM)-GASDEF;

               /*       COMPUTATION OF THE CURTAILMENT LEVELS                      */

 826   2  0    CURTLVL: CURTR(IT,IM) = 1-DGMRE(IT,IM)/DGMR(IT,IM);
 827   2  0             CURTC(IT,IM) = 1-DGMCE(IT,IM)/DGMC(IT,IM);
 828   2  0             CURTI(IT,IM) = 1-DGMIE(IT,IM)/DGMI(IT,IM);

 829   2  0             RETURN;
 830   2  0             END SUPCUR;
```

```
STMT LEV NT

               /*********************************************************************
               *
               *       C A P C S T   P R O C E D U R E                              *
               *                                                                    *
               *********************************************************************/

 831   1  0    CAPCST:  PROC;

               /*       UNIT COST ESTIMATES - $/CUSTOMER                            */

 832   2  0             C1 = 27.60;
 833   2  0             C2 = 2.021;
 834   2  0             C3 = 49.256;
 835   2  0             C4 = 49.256;
 836   2  0             C8 = 12.2104;
 837   2  0             C9 = 2.1869;
 838   2  0             C10 = 12.0424;

               /*       UNIT COST ESTIMATES - $/MMCF                                */

 839   2  0             C5  = 1896.37;
 840   2  0             C6  =  144.43;
 841   2  0             C7  =  29.29;
 842   2  0             C11 =  208.71;
 843   2  0             C12 =  156.17;
 844   2  0             C13 =  292.82;

               /*       SHARE COEFFICIENTS                                          */
               /*       A2 = FRACTION OF HOMES WITH REGULATORS                      */
               /*       A3 = FRACTION OF COMMERCIAL CUSTOMERS WITH REGULATORS       */
               /*       A4 = FRACTION OF INDUSTRIAL CUSTOMERS WITH REGULATORS       */
               /*       A51 = STANDARD MAINLINE EXPANSION FACTOR                    */
               /*       A52 = MAINLINE EXPANSION NON-SERVICED AREA                  */
               /*       A10 = FRACTION OF EXPANSION - TOTAL GENERAL PLANT           */
               /*       A11 = FRACTION OF EXPANSION - TOTAL PRODUCTION PLANT        */
               /*       A12 = FRACTION OF EXPANSION - TOTAL GAS STORAGE PLANT       */
               /*       A13 = FRACTION OF EXPANSION - TOTAL TRANSMISSION PLANT      */

 845   2  0             A2 = 1;
 846   2  0             A3 = 1;
 847   2  0             A4 = 1;
 848   2  0             A51 = 1;
 849   2  0             A52 = 3;
 850   2  0             A10 = 1;
 851   2  0             A11 = 0.20;
 852   2  0             A12 = 0;
 853   2  0             A13 = 0;

               /*       COMPUTATION OF CAPACITY EXPANSION COSTS                     */

 854   2  0             CACRST(IT) = 0;
 855   2  0             CACRNT(IT) = 0;
 856   2  0             CACCT(IT) = 0;
 857   2  0             CACIT(IT) = 0;
 858   2  0             DO IR = 1 TO NR;
 859   2  1             CACRS(IR,IT) = NGCSA(IR,IT)*(C1+A2*C2+C8+C9+A10*C10) +
                            CNDGRS(IR,IT)*(A51*C5+C6+C7+A11*C11+A12*C12+A13*C13)/1035;
 860   2  1             CACRN(IR,IT) = NGCNSA(IR,IT)*(C1+A2*C2+C8+C9+A10*C10) +
                            CNDGRN(IR,IT)*(A52*C5+C6+C7+A11*C11+A12*C12+A13*C13)/1035;
 861   2  1             CACC(IR,IT) = NCGC(IR,IT)*(C1+A3*C3+C8+C9+A10*C10) +
                            CNDGC(IR,IT)*(A51*C5+C6+C7+A11*C11+A12*C12+A13*C13)/1035;
 862   2  1             CACI(IR,IT) = NIGC(IR,IT)*(C1+A4*C4+C8+C9+A10*C10) +
                            CNDGI(IR,IT)*(A51*C5+C6+C7+A11*C11+A12*C12+A13*C13)/1035;
 863   2  1                 CACRST(IT) = CACRST(IT)+CACRS(IR,IT);
 864   2  1                 CACRNT(IT) = CACRNT(IT)+CACRN(IR,IT);
 865   2  1                 CACIT(IT) = CACIT(IT)+CACI(IR,IT);
 866   2  1                 CACCT(IT) = CACCT(IT)+CACC(IR,IT);
 867   2  1                 END;

               /*       COMPUTATION OF NEW PLANT IN SERVICE                         */
```

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STMT LEV NT

 868   2  0          NEWPIS(IT) = CACRST(IT)+CACRNT(IT)+CACCT(IT)+CACIT(IT);       00011720

 869   2  0          RETURN;                                                       00011730
 870   2  0          END CAPCST;                                                   00011740
```

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STMT LEV NT

               /**********************************************************************
               *
               *        O M C O S T   P R O C E D U R E
               *
               **********************************************************************/

 871   1  0    OMCOST:  PROC;

               /*       COMPUTATION OF TOTAL YEARLY GAS PURCHASES, SALES AND         */
               /*       DELIVERIES TO STORAGE - MMCF                                  */

 872   2  0             GASSUP(IT) = 0;
 873   2  0             GSALES(IT) = 0;
 874   2  0             GDELIV(IT) = 0;
 875   2  0             DO IM = 1 TO 12;
 876   2  1                 GASSUP(IT) = GASSUP(IT)+SUPM(IT,IM);
 877   2  1                 GSALES(IT) = GSALES(IT)+DGMRE(IT,IM)+DGMCE(IT,IM) +
                                             DGMIE(IT,IM);
 878   2  1                 GDELIV(IT) = GDELIV(IT)+GINST(IT,IM);
 879   2  1                 END;
 880   2  0             GPURCH(IT) = GASSUP(IT)*WGP(IT)*1035;
 881   2  0             OMSTOC(IT) = GDELIV(IT)*1000*(0.126169-0.99385E-6*GDELIV(IT));
 882   2  0             OMGENC(IT) = GSALES(IT)*1000 *
                            (.47064-(.6356E-6*GSALES(IT)))*(1+0.04*FLOAT(IT-1));

 883   2  0             RETURN;
 884   2  0             END OMCOST;
```

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STMT LEV NT

             /*********************************************************************00011980
             *                                                                    *00011990
             *       R A T B A S   P R O C E D U R E                              *00012000
             *                                                                    *00012010
             ********************************************************************/00012020

 885   1  0  RATBAS:  PROC;                                                        00012030

             /*       COMPUTATION OF REPLACEMENT PLANT IN SERVICE                */00012040

 886   2  0           ATPIS = 0.03625;                                             00012050
 887   2  0           REPPIS(IT) = ATPIS*PISBEG(IT);                               00012060

             /*       COMPUTATION OF DEPRECIATION EXPENSE                        */00012070

 888   2  0           DEPAVG = 0.02939;                                            00012080
 889   2  0           DEPEXP(IT) = DEPAVG*(PISBEG(IT)+REPPIS(IT)+NEWPIS(IT));      00012090

             /*       COMPUTATION OF ACCUMULATED PROVISION FOR DEPRECIATION      */00012100

 890   2  0           TAPDAD(IT) = TAPDAD(IT-1)+0.82528*DEPEXP(IT);                00012110

             /*       COMPUTATION OF TOTAL PLANT IN SERVICE                      */00012120

 891   2  0           TOTPIS(IT) = PISBEG(IT)+REPPIS(IT)+NEWPIS(IT);               00012130
 892   2  0           PISBEG(IT+1) = TOTPIS(IT);                                   00012140

             /*       COMPUTATION OF RATE BASE                                   */00012150

 893   2  0           NETPIS(IT) = TOTPIS(IT)-TAPDAD(IT);                          00012160

 894   2  0           RETURN;                                                      00012170
 895   2  0           END RATBAS;                                                  00012180
```

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STMT LEV NT

               /*******************************************************************00012190
               *                                                                  *00012200
               *        I N C O M E   P R O C E D U R E                           *00012210
               *                                                                  *00012220
               *******************************************************************/00012230

 896   1  0    INCOME:  PROC;                                                      00012240

               /*       ALLOWED RATE OF RETURN                                   */00012250

 897   2  0             ALLROR = RORME(IT);                                        00012260

               /*       COMPUTATION OF ALLOWED OPERATING INCOME                  */00012270

 898   2  0             AOPINC(IT) = ALLROR*NETPIS(IT);                            00012280

               /*       COMPUTATION OF ACTUAL OPERATING EXPENSES                 */00012290

 899   2  0             ACOPEX(IT) = GPURCH(IT)+OMSTOC(IT)+OMGENC(IT)+DEPEXP(IT);  00012300

               /*       COMPUTATION OF ACTUAL REVENUES                           */00012310
               /*       (1)  GAS REVENUES                                        */00012320

 900   2  0             GASREV(IT) = 0;                                            00012330
 901   2  0             DO IM = 1 TO 12;                                           00012340
 902   2  1                 GASREV(IT) = GASREV(IT)+(PRGR(1,IT-1)*DGMRE(IT,IM) +   00012350
                                PRGC(1,IT-1)*DGMCE(IT,IM)+PRGI(1,IT-1)*DGMIE(IT,IM)) 00012360
                                *1035;                                             00012370
 903   2  1                 END;                                                   00012380

               /*       (2)  OTHER OPERATING REVENUES                            */00012390

 904   2  0             OOPREV(IT) = .002288*TOTPIS(IT);                           00012400

               /*       (3)  OTHER NON-UTILITY INCOME                            */00012410

 905   2  0             ONUINC(IT) = 0.002975*TOTPIS(IT);                          00012420

               /*       COMPUTATION OF INTEREST CHARGES                          */00012430

 906   2  0             INTCHG(IT) = 0.01759*TOTPIS(IT);                           00012440

               /*       COMPUTATION OF AFTER TAX INCOME                          */00012450

 907   2  0             REVTXR = 0.04+0.0009845+0.0001599;                         00012460
 908   2  0             FEDITR = 0.48;                                             00012470

               /*       TAXADJ = TAX ADJUSTMENT FACTOR = (1 - TAXRATE)           */00012480

 909   2  0             TAXADJ = (1-REVTXR)*(1-FEDITR);                            00012490
 910   2  0             INCAT(IT) = (GASREV(IT)+OOPREV(IT)+ONUINC(IT)-ACOPEX(IT)) * 00012500
                                    TAXADJ-INTCHG(IT);                             00012510

               /*       COMPUTATION OF INCOME DEFICIT                            */00012520

 911   2  0             INCDEF(IT) = AOPINC(IT)-INCAT(IT);                         00012530

 912   2  0             RETURN;                                                    00012540
 913   2  0             END INCOME;                                                00012550
```

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STMT LEV NT

                /***********************************************************************00012560
                 *                                                                     *00012570
                 *       N E W R A T   P R O C E D U R E                               *00012580
                 *                                                                     *00012590
                 **********************************************************************/00012600

  914   1  0  NEWRAT:  PROC;                                                            00012610

                /*       COMPUTATION OF THE AVERAGE PRICE INCREMENT                   */00012620

  915   2  0           DPR(IT) = INCDEF(IT)/(GSALES(IT)*1035*TAXADJ);                   00012630

                /*       COMPUTATION OF THE NEW RATES                                 */00012640

  916   2  0           DO IR = 1 TO NR;                                                 00012650
  917   2  1               PRGR(IR,IT) = PRGR(IR,IT-1)+DPR(IT);                         00012660
  918   2  1               PRGC(IR,IT) = PRGC(IR,IT-1)+DPR(IT);                         00012670
  919   2  1               PRGI(IR,IT) = PRGI(IR,IT-1)+DPR(IT);                         00012680
  920   2  1               END;                                                         00012690

  921   2  0           RETURN;                                                          00012700
  922   2  0           END NEWRAT;                                                      00012710
```

```
STMT LEV NT

              /*******************************************************************
              *
              *       C R I T E R   P R O C E D U R E                            *
              *                                                                  *
              *******************************************************************/

 923   1  0   CRITER:  PROC;

 924   2  0            TITLE = 'E V A L U A T I O N   S U M M A R Y';
 925   2  0            CALL PRTIT;                          /* PRINT TITLE */
 926   2  0            SUM = 0;
 927   2  0            DO IT = 2 TO NT;
 928   2  1                A = GASREV(IT)+OOPREV(IT);
 929   2  1                TATR(IT) = A/NETPIS(IT);
 930   2  1                GPMR(IT) = (A-ACOPEX(IT))/A;
 931   2  1                INTCOV(IT) = (A-ACOPEX(IT))/INTCHG(IT);
 932   2  1                ACOPRV(IT) = GASREV(IT)+OOPREV(IT)+ONUINC(IT);
 933   2  1                NPMR(IT) = ((ACOPRV(IT)-ACOPEX(IT))*TAXADJ-INTCHG(IT)) /
                                      ACOPRV(IT);
 934   2  1                RTAR(IT) = TATR(IT)*NPMR(IT);
 935   2  1                ROCER(IT) = RTAR(IT)*(A-ACOPEX(IT))/((A-ACOPEX(IT)) *
                                       TAXADJ-INTCHG(IT));
 936   2  1                SUM(1) = SUM(1)+TATR(IT);
 937   2  1                SUM(2) = SUM(2)+GPMR(IT);
 938   2  1                SUM(3) = SUM(3)+INTCOV(IT);
 939   2  1                SUM(4) = SUM(4)+ROCER(IT);
 940   2  1                SUM(5) = SUM(5)+RTAR(IT);
 941   2  1                SUM(8) = SUM(8)+NPMR(IT);
 942   2  1                IRBC(IT) = (NETPIS(IT)-NETPIS(IT-1))/NETPIS(IT-1);
 943   2  1                SUM(6) = SUM(6)+IRBC(IT);
 944   2  1                DPW = WGP(IT)-WGP(IT-1);
 945   2  1                IF DPR(IT) > DPW THEN IORI(IT) = 1;
 946   2  1                    ELSE IORI(IT) = 0;
 947   2  1                AED(IT) = -EXCSUP(IT)/BASEDT(IT);
 948   2  1                AMCIR(IT) = 0;
 949   2  1                AMCIC(IT) = 0;
 950   2  1                AMCII(IT) = 0;
 951   2  1                MWRC(IT) = 0;
 952   2  1                MWCC(IT) = 0;
 953   2  1                MWIC(IT) = 0;
 954   2  1                DO IM = 7 TO 12;
 955   2  2                    AMCIR(IT) = AMCIR(IT)+(CURTR(IT,IM)/6);
 956   2  2                    AMCIC(IT) = AMCIC(IT)+(CURTC(IT,IM)/6);
 957   2  2                    AMCII(IT) = AMCII(IT)+(CURTI(IT,IM)/6);
 958   2  2                    IF CURTR(IT,IM) ¬= 0 THEN MWRC(IT) = MWRC(IT)+1;
 959   2  2                    IF CURTC(IT,IM) ¬= 0 THEN MWCC(IT) = MWCC(IT)+1;
 960   2  2                    IF CURTI(IT,IM) ¬= 0 THEN MWIC(IT) = MWIC(IT)+1;
 961   2  2                    END;
 962   2  1                END;
 963   2  0            AEDI = 0;
 964   2  0            AEDFI = 0;
 965   2  0            WMCRT = 0;
 966   2  0            WMCCT = 0;
 967   2  0            WMCIT = 0;
 968   2  0            IORIT = 0;
 969   2  0            DO IT = 2 TO NT;
 970   2  1                IORIT = IORIT+IORI(IT);
 971   2  1                IF AED(IT) > 0 THEN DO;
 972   2  2                    AEDI = AEDI+(AED(IT)/23);
 973   2  2                    AEDFI = AEDFI+(FLOAT(1)/FLOAT(23));
 974   2  2                    END;
 975   2  1                WMCRT = WMCRT+(MWRC(IT)/23);
 976   2  1                WMCCT = WMCCT+(MWCC(IT)/23);
 977   2  1                WMCIT = WMCIT+(MWIC(IT)/23);
 978   2  1                LOADF(IT) = (WGS(IT)-GSALES(IT))/WGS(IT);
 979   2  1                SUM(7) = SUM(7)+LOADF(IT);
 980   2  1                END;

              /*       COMPUTATION OF AVERAGE RATIOS                             */
```

```
STMT LEV NT

 981   2  0        DO I = 1 TO 8;
 982   2  1            IF I <= 5 THEN AVGFIN(I) = SUM(I)/(NT-2);
 983   2  1                ELSE AVGFIN(I) = SUM(I)/(NT-1);
 984   2  1            END;
 985   2  0        PUT EDIT ('FINANCIAL CRITERIA') (COL(11),A) SKIP(3);
 986   2  0        PUT EDIT ('YEAR','TATR','NPMR','ACOPRV','GPMR','RTAR','ROCER',
                            'IRBC','IORI','INTCOV')
                           (COL(1),A,X(6),A,X(8),A,X(6),A,X(8),A,X(8),A,X(8),A,
                            X(8),A,X(5),A,X(4),A) SKIP(2);
 987   2  0        PUT SKIP(2);
 988   2  0        DO IT = 2 TO NT;
 989   2  1            PUT EDIT (IT,TATR(IT),NPMR(IT),ACOPRV(IT),GPMR(IT),
                                RTAR(IT),ROCER(IT),IRBC(IT),IORI(IT),INTCOV(IT))
                               (COL(2),F(2),2 (X(2),F(10,5)),X(2),F(11,0),
                                4 (X(2),F(10,5)),X(2),F(5,0),X(2),F(10,5));
 990   2  1            END;
 991   2  0        PUT EDIT ('AVERAGE FINANCIAL RATIOS','AVG TATR  =',AVGFIN(1),
                            'AVG NPMR  =',AVGFIN(8),'AVG GPMR  =',AVGFIN(2),
                            'AVG RTAR  =',AVGFIN(5),'AVG ROCER =',AVGFIN(4),
                            'AVG IRBC  =',AVGFIN(6),'AVG INTCOV=',AVGFIN(3))
                           (SKIP(2),COL(11),A,SKIP(2),7 (COL(11),A,F(8,5)));
 992   2  0        SIGNAL ENDPAGE(SYSPRINT);
 993   2  0        PUT EDIT ('ADEQUACY OF SERVICE CRITERIA') (COL(11),A) SKIP(3);
 994   2  0        PUT EDIT ('YEAR','AED','AMCIR','AMCIC','AMCII','MWRC',
                            'MWCC','MWIC','LOADF')
                           (COL(1),A,X(7),A,X(3),A,X(5),A,X(5),A,X(7),A,X(4),A,
                            X(4),A,X(4),A) SKIP(2);
 995   2  0        PUT SKIP(2);
 996   2  0        DO IT = 2 TO NT;
 997   2  1            PUT EDIT (IT,AED(IT),AMCIR(IT),AMCIC(IT),AMCII(IT),
                                MWRC(IT),MWCC(IT),MWIC(IT),LOADF(IT))
                               (COL(1),F(2),X(2),F(10,5),X(2),3 (F(8,5),X(2)),
                                3 (F(5,0),X(3)),F(10,5));
 998   2  1            END;
 999   2  0        PUT EDIT ('AVG LOADF =',AVGFIN(7)) (SKIP(2),A,F(8,5));
1000   2  0        PUT EDIT ('SYNTHETIC CRITERIA') (COL(11),A) SKIP(3);
1001   2  0        PUT EDIT ('AEDI= ',AEDI,'AEDFI=',AEDFI,'WMCRT=',WMCRT,
                            'WMCCT=',WMCCT,'WMCIT=',WMCIT,'IORIT=',IORIT)
                           (6 (COL(1),A,F(10,5))) SKIP(2);
1002   2  0        PUT EDIT ('FAIRNESS CRITERIA') (COL(11),A) SKIP(3);
1003   2  0        AEPDIR, AEPDIC, ACPDII, AOPDIR, AOPDIC, AOPDII = 0;
1004   2  0        DO IT = 2 TO NT;
1005   2  1            AEPDIR = AEPDIR+(PRGR(1,IT)/PRER(1,IT))/23;
1006   2  1            AEPDIC = AEPDIC+(PRGC(1,IT)/PREC(1,IT))/23;
1007   2  1            ACPDII = ACPDII+(PRGI(1,IT)/PRCI(1,IT))/23;
1008   2  1            AOPDIR = AOPDIR+(PRGR(1,IT)/PROR(1,IT))/23;
1009   2  1            AOPDIC = AOPDIC+(PRGC(1,IT)/PROC(1,IT))/23;
1010   2  1            AOPDII = AOPDII+(PRGI(1,IT)/PROI(1,IT))/23;
1011   2  1            END;
1012   2  0        PUT EDIT ('AOPDIR=',AOPDIR,'AOPDIC=',AOPDIC,'AOPDII=',AOPDII,
                            'AEPDIR=',AEPDIR,'AEPDIC=',AEPDIC,'ACPDII=',ACPDII)
                           (6 (COL(1),A,F(10,5))) SKIP(2);
1013   2  0        SIGNAL ENDPAGE(SYSPRINT);
1014   2  0        PUT EDIT ('EFFICIENCY CRITERIA') (COL(11),A) SKIP(3);
1015   2  0        RO = 0.08;

              /*   COMPUTATION OF DISCOUNT FACTORS                           */

1016   2  0        DSF(NT) = 1/((1+RO)**24);
1017   2  0        DO IT = 1 TO NT-1;
1018   2  1            ITT = NT-IT;
1019   2  1            DSF(ITT) = DSF(ITT+1)+1/((1+RO)**FLOAT(ITT));
1020   2  1            END;

              /*   COMPUTATION OF PRODUCTION EFFICIENCY INDEX                */

1021   2  0        PEI = 0;
1022   2  0        DO IT = 2 TO NT;
1023   2  1            PEIY(IT) = INCAT(IT)*1/((1+RO)**FLOAT(IT));
1024   2  1            PEI = PEI+PEIY(IT);
```

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STMT LEV NT

1025   2  1              END;
1026   2  0          PUT EDIT ('PRODUCTION EFFICIENCY INDEX=',PEI)
                           (COL(11),A,F(20,5)) SKIP(2);
1027   2  0          PUT SKIP(2);

              /*     COMPUTATION OF END USE EFFICIENCY INDEX                     */

              /*     RESIDENTIAL END-USE EFFICIENCY                              */
1028   2  0          DO IT = 2 TO NT;
1029   2  1              QRB1(IT), QRB2(IT), QRE1(IT), QRE2(IT) = 0;
1030   2  1              DO IR = 1 TO NR;
1031   2  2                  QRB1(IT) = QRB1(IT)+PNDGRS(IR,IT);
1032   2  2                  QRB2(IT) = QRB2(IT)+PNDGRN(IR,IT);
1033   2  2                  QRE1(IT) = QRE1(IT)+CNDGRS(IR,IT);
1034   2  2                  QRE2(IT) = QRE2(IT)+CNDGRN(IR,IT);
1035   2  2                  END;
1036   2  1              PRB(IT) = PRGR(1,IT-1);
1037   2  1              IF SHGR(1,IT-1) <= SHGO THEN DO;
1038   2  2                  WRSA(IT), WRNS(IT) = 0;
1039   2  2                  END;
1040   2  1                  ELSE DO;
1041   2  2                      V1 = -LOG(SHGO/11.059)/0.4;
1042   2  2                      V2 = SQRT(V1);
1043   2  2                      PIGO = V2-3.5;
1044   2  2                      A = SHER(1,IT-1)+SHOR(1,IT-1);
1045   2  2                      B = PRER(1,IT-1)*SHER(1,IT-1)+PROR(1,IT-1) *
                                      SHOR(1,IT-1);
1046   2  2                      CPEO = B/A;
1047   2  2                      C = PIGO*B+CPEO;
1048   2  2                      D = 1-PIGO*SHGR(1,IT-1);
1049   2  2                      PRA(IT) = C/D;

              /*     COMPUTATION OF WRSA(IT)                                     */
1050   2  2                      IF QRB1(IT) > 0 THEN DO;
1051   2  3                          PRE1(IT) = PRA(IT)-(PRA(IT)-PRB(IT)) *
                                                 QRE1(IT)/QRB1(IT);
1052   2  3                          SB1 = (PRE1(IT)-PRB(IT)) *
                                            (QRB1(IT)-QRE1(IT))/2;
1053   2  3                          SA1 = (PRA(IT)-PRB(IT))*QRB1(IT)/2-SB1;
1054   2  3                          WRSA(IT) = SA1-SB1;
1055   2  3                          END;
1056   2  2                              ELSE WRSA(IT) = 0;

              /*     COMPUTATION OF WRNS(IT)                                     */
1057   2  2                      IF QRB2(IT) > 0 THEN DO;
1058   2  3                          PRE2(IT) = PRA(IT)-(PRA(IT)-PRB(IT)) *
                                                 QRE2(IT)/QRB2(IT);
1059   2  3                          SB2 = (PRE2(IT)-PRB(IT)) *
                                            (QRB2(IT)-QRE2(IT))/2;
1060   2  3                          SA2 = (PRA(IT)-PRB(IT))*QRB2(IT)/2-SB2;
1061   2  3                          WRNS(IT) = SA2-SB2;
1062   2  3                          END;
1063   2  2                              ELSE WRNS(IT) = 0;
1064   2  2                  END;
1065   2  1              END;

              /*     INDUSTRIAL END-USE EFFICIENCY                               */

1066   2  0          DO IT = 2 TO NT;
1067   2  1              QIB(IT), QIE(IT) = 0;
1068   2  1              DO IR = 1 TO NR;
1069   2  2                  QIB(IT) = QIB(IT)+PNDGI(IR,IT);
1070   2  2                  QIE(IT) = QIE(IT)+CNDGI(IR,IT);
1071   2  2                  END;
1072   2  1              PIB(IT) = PRGI(1,IT-1);
1073   2  1              WI(IT) = 0;
1074   2  1              IF SHGI(1,IT-1) > SHGO THEN DO;
1075   2  2                  V1 = -LOG(SHGO/0.4146)/0.19515;
1076   2  2                  V2 = SQRT(V1);
1077   2  2                  PIGO = V2-1.6;
```

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STMT LEV NT

1078   2  2                A = SHCI(1,IT-1)+SHOI(1,IT-1);                             00014680
1079   2  2                B = PRCI(1,IT-1)*SHCI(1,IT-1) +                            00014690
                               PROI(1,IT-1)*SHOI(1,IT-1);                             00014700
1080   2  2                CPCO = B/A;                                                00014710
1081   2  2                C = PIGO*B+CPCO;                                           00014720
1082   2  2                D = 1-PIGO*SHGI(1,IT-1);                                   00014730
1083   2  2                PIA(IT) = C/D;                                             00014740

               /*      COMPUTATION OF WI(IT)                                        */00014750
1084   2  2                IF QIB(IT) > 0 THEN DO;                                    00014760
1085   2  3                    PIE(IT) = PIA(IT)-(PIA(IT)-PIB(IT)) *                  00014770
                                         QIE(IT)/QIB(IT);                             00014780
1086   2  3                    SB = (PIE(IT)-PIB(IT))*(QIB(IT)-QIE(IT))/2;            00014790
1087   2  3                    SA = (PIA(IT)-PIB(IT))*QIB(IT)/2-SB;                   00014800
1088   2  3                    WI(IT) = SA-SB;                                        00014810
1089   2  3                    END;                                                   00014820
1090   2  2                    ELSE WI(IT) = 0;                                       00014830
1091   2  2                END;                                                       00014840
1092   2  1            END;                                                           00014850

               /*      COMMERCIAL END-USE EFFICIENCY                                */00014860

1093   2  0        DO IT = 2 TO NT;                                                   00014870
1094   2  1            QCB(IT), QCE(IT) = 0;                                          00014880
1095   2  1            DO IR = 1 TO NR;                                               00014890
1096   2  2                QCB(IT) = QCB(IT)+PNDGC(IR,IT);                            00014900
1097   2  2                QCE(IT) = QCE(IT)+CNDGC(IR,IT);                            00014910
1098   2  2                END;                                                       00014920
1099   2  1            PCB(IT) = PRGC(1,IT-1);                                        00014930
1100   2  1            A = 0.053*S2(1,IT)+0.191*S3(1,IT);                             00014940
1101   2  1            B = 1+(PRGC(1,IT-1)/PROC(1,IT-1))**3.17;                       00014950
1102   2  1            C = B-1;                                                       00014960
1103   2  1            D = 0.091*S1(1,IT)+0.054*S2(1,IT);                             00014970
1104   2  1            CGFL(IT) = (A/B)*((PRGC(1,IT-1)/1.2998)**(-.3));               00014980
1105   2  1            COFL(IT) = (A*C/B)*((PROC(1,IT-1)/1.168)**(-.3));              00014990
1106   2  1            CEFL(IT) = D*((FREC(1,IT-1)/10.02195)**(-.3));                 00015000
1107   2  1            CTFL(IT) = CGFL(IT)+COFL(IT)+CEFL(IT);                         00015010
1108   2  1            PUT EDIT ('CGFL=',CGFL(IT),'COFL=',COFL(IT),                   00015020
                                 'CEFL=',CEFL(IT),'CTFL=',CTFL(IT))                   00015030
                                (COL(5),4 (A,F(12,7),X(3)));                          00015040
1109   2  1            CGFLO = CTFL(IT)*SHGO;                                         00015050
1110   2  1            IF (CGFL(IT) <= CGFLO) | (QCB(IT) = 0) THEN DO;                00015060
1111   2  2                WC(IT) = 0;                                                00015070
1112   2  2                GO TO CRITERL;                                             00015080
1113   2  2                END;                                                       00015090

               /*      SEARCH FOR THE ZERO DEMAND PRICE PCA(IT)                     */00015100

1114   2  1            PFA = -3.1704+0.8000*PREC(1,IT-1);                             00015110
1115   2  1            PFB = -2.5061+0.3507*PREC(1,IT-1);                             00015120
1116   2  1            DPGC = PRGC(1,IT-1)/100;                                       00015130
1117   2  1            DO IC = 1 TO 3000;                                             00015140
1118   2  2                PGC = DPGC*FLOAT(IC);                                      00015150
1119   2  2                B = 1+(PGC/PROC(1,IT-1))**3.17;                            00015160
1120   2  2                C = (PGC/1.2998)**(-.3);                                   00015170
1121   2  2                IF PGC > PROC(1,IT-1) THEN PF = PROC(1,IT-1);              00015180
1122   2  2                    ELSE PF = PGC;                                         00015190
1123   2  2                IF PF < PFB THEN A = 0.058*0.1+0.191*0.8;                  00015200
1124   2  2                    ELSE IF PF < PFA THEN A = 0.058*0.8+0.191*0.1;         00015210
1125   2  2                        ELSE A = 0.058*0.1+0.191*0.1;                      00015220
1126   2  2                QGC = A*C/B;                                               00015230
1127   2  2                IF QGC <= CGFLO THEN GO TO SETPCA;                         00015240
1128   2  2                END;                                                       00015250
1129   2  1    SETPCA:     PCA(IT) = PGC;                                             00015260

               /*      COMPUTATION OF COMMERCIAL CONSUMERS SURPLUS WC(IT)           */00015270

1130   2  1            PCE(IT) = PCA(IT)-(PCA(IT)-PCB(IT))*QCE(IT)/QCB(IT);           00015280
1131   2  1            SB =(PCE(IT)-PCB(IT))*(QCB(IT)-QCE(IT))/2;                     00015290
1132   2  1            SA = (PCA(IT)-PCB(IT))*QCB(IT)/2-SB;                           00015300
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STMT LEV NT

1133  2  1              WC(IT) = SA-SB;
1134  2  1  CRITERL:    END;
1135  2  0           SIGNAL ENDPAGE(SYSPRINT);
1136  2  0           PUT EDIT ('YEARLY SECTORAL CONSUMERS SURPLUSES')
                          (COL(11),A) SKIP(3);
1137  2  0           PUT SKIP(2);
1138  2  0           DO IT = 2 TO NT;
1139  2  1              PUT EDIT ('IT=',IT,'WRSA=',WRSA(IT),'WRNS=',WRNS(IT),
                             'WC=',WC(IT),'WI=',WI(IT))
                           (COL(1),A,F(4),X(2),4 (A,F(15,5),X(3)));
1140  2  1              END;
1141  2  0           PUT EDIT ('SECTORAL INTEGRATED END-USE EFFICIENCY INDEXES')
                          (COL(11),A) SKIP(3);
1142  2  0           PUT SKIP(3);
1143  2  0           WRSAT, WRNST, WCT, WIT = 0;
1144  2  0           DO IT = 2 TO NT;
1145  2  1              WRSAY(IT) = WRSA(IT)*DSF(IT);
1146  2  1              WRNSY(IT) = WRNS(IT)*DSF(IT);
1147  2  1              WCY(IT) = WC(IT)*DSF(IT);
1148  2  1              WIY(IT) = WI(IT)*DSF(IT);
1149  2  1              EUEIY(IT) = WRSAY(IT)+WRNSY(IT)+WCY(IT)+WIY(IT);
1150  2  1              AEIY(IT) = EUEIY(IT)+PEIY(IT);
1151  2  1              WRSAT = WRSAT+WRSAY(IT);
1152  2  1              WRNST = WRNST+WRNSY(IT);
1153  2  1              WCT = WCT+WCY(IT);
1154  2  1              WIT = WIT+WIY(IT);
1155  2  1              END;
1156  2  0           EUEI = WRSAT+WRNST+WCT+WIT;
1157  2  0           PUT EDIT ('WRSAT=',WRSAT,'WRNST=',WRNST,'WCT=',WCT,
                           'WIT=',WIT,'EUEI=',EUEI)
                          (5 (COL(15),A(6),F(20,5)));
1158  2  0           AEI = EUEI+PEI;
1159  2  0           PUT EDIT ('AGGREGATE EFFICIENCY INDEX=',AEI)
                          (COL(30),A,F(20,5)) SKIP(3);
1160  2  0           PUT EDIT ('DISCOUNTED YEARLY SECTORAL CONSUMERS SURPLUSES')
                          (COL(11),A) SKIP(3);
1161  2  0           PUT EDIT ('YEAR','WRSAY','WRNSY',' WCY ',' WIY ','EUEIY',
                           ' PEIY',' AEIY') (COL(3),A,7 (X(7),A,X(3))) SKIP(2);
1162  2  0           PUT SKIP(2);
1163  2  0           DO IT = 2 TO NT;
1164  2  1              PUT EDIT (IT,WRSAY(IT),WRNSY(IT),WCY(IT),WIY(IT),
                             EUEIY(IT),PEIY(IT),AEIY(IT))
                           (COL(5),F(2),7 F(15,2));
1165  2  1              END;

1166  2  0           RETURN;
1167  2  0           END CRITER;
```

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STMT LEV NT

                /*********************************************************************
                 *                                                                   *
                 *       L I S T   P R O C E D U R E                                 *
                 *                                                                   *
                 *********************************************************************/

1168  1  0  LIST:   PROC;

1169  2  0          DCL  (DGMRYT(NT),DGMCYT(NT),DGMIYT(NT),DGMTYT(NT))
                          FLOAT DEC(6);

1170  2  0  F3:     FORMAT (SKIP(3),COL(3),A(9),9 A(12),A(9));
1171  2  0  F4:     FORMAT (COL(5),F(2),X(3),10 (F(10,0),X(2)));
1172  2  0  F5:     FORMAT (COL(5),F(2),X(3),10 (F(10,2),X(2)));
1173  2  0  F6:     FORMAT (COL(5),F(2),X(3),15 (F(6,4),X(2)));
1174  2  0  F7:     FORMAT (COL(5),F(2),X(3),12 (F(9,0),X(1)));
1175  2  0  F8:     FORMAT (COL(5),F(2),X(3),12 (F(9,5),X(1)));
1176  2  0  F9:     FORMAT (SKIP(3),COL(3),A,COL(56),A);

1177  2  0          TITLE = 'P R I C E S   S U M M A R Y';
1178  2  0          CALL PRTIT;                           /* PRINT TITLE */
1179  2  0          PUT EDIT ('YEAR','PRGR','PROR','PRER','PRGC','PROC',
                               'PREC','PRGI','PROI','PREI','PRCI')
                              (SKIP(3),COL(3),A,X(6),A,9 (X(7),A));
1180  2  0          PUT SKIP(2);
1181  2  0          DO IT = 1 TO NT;
1182  2  1              PUT EDIT (IT,PRGR(1,IT),PROR(1,IT),PRER(1,IT),PRGC(1,IT),
                                  PROC(1,IT),PREC(1,IT),PRGI(1,IT),PROI(1,IT),
                                  PREI(1,IT),PRCI(1,IT))
                                 (COL(5),F(2),X(3),10 (F(7,4),X(4)));
1183  2  1              END;

1184  2  0          TITLE = 'RESIDENTIAL CONSUMPTION SUMMARY';
1185  2  0          CALL PRTIT;                           /* PRINT TITLE */
1186  2  0          PUT EDIT ('YEAR','TGCSA(1)','TGCSA(2)','TGCSA(3)','TGCSA(4)',
                               'TGCSA(5)','TNGCSA(1)','TNGCSA(2)','TNGCSA(3)',
                               'TNGCSA(4)','TNGCSA(5)') (R(F3));
1187  2  0          PUT SKIP(2);
1188  2  0          DO IT = 1 TO NT;
1189  2  1              PUT EDIT (IT,(TGCSA(IR,IT) DO IR=1 TO NR),
                                   (TNGCSA(IR,IT) DO IR=1 TO NR)) (R(F4));
1190  2  1              END;
1191  2  0          PUT EDIT ('YEAR','TNGCNS(1)','TNGCNS(2)','TNGCNS(3)',
                               'TNGCNS(4)','TNGCNS(5)') (R(F3));
1192  2  0          PUT SKIP(2);
1193  2  0          DO IT = 1 TO NT;
1194  2  1              PUT EDIT (IT,(TNGCNS(IR,IT) DO IR=1 TO NR)) (R(F4));
1195  2  1              END;
1196  2  0          SIGNAL ENDPAGE(SYSPRINT);
1197  2  0          PUT EDIT ('YEAR','PECSA(1)','PECSA(2)','PECSA(3)','PECSA(4)',
                               'PECSA(5)','PECNSA(1)','PECNSA(2)','PECNSA(3)',
                               'PECNSA(4)','PECNSA(5)') (R(F3));
1198  2  0          PUT SKIP(2);
1199  2  0          DO IT = 2 TO NT;
1200  2  1              PUT EDIT (IT,(PECSA(IR,IT) DO IR=1 TO NR),
                                   (PECNSA(IR,IT) DO IR=1 TO NR)) (R(F5));
1201  2  1              END;
1202  2  0          PUT EDIT ('YEAR','PGCSA(1)','PGCSA(2)','PGCSA(3)','PGCSA(4)',
                               'PGCSA(5)','PGCNSA(1)','PGCNSA(2)','PGCNSA(3)',
                               'PGCNSA(4)','PGCNSA(5)') (R(F3));
1203  2  0          PUT SKIP(2);
1204  2  0          DO IT = 2 TO NT;
1205  2  1              PUT EDIT (IT,(PGCSA(IR,IT) DO IR=1 TO NR),
                                   (PGCNSA(IR,IT) DO IR=1 TO NR)) (R(F5));
1206  2  1              END;
1207  2  0          SIGNAL ENDPAGE(SYSPRINT);
1208  2  0          PUT EDIT ('YEAR','TCDR(1)','TCDR(2)','TCDR(3)','TCDR(4)',
                               'TCDR(5)') (R(F3));
1209  2  0          PUT SKIP(2);
1210  2  0          DO IT = 1 TO NT;
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STMT LEV NT

1211  2  1          PUT EDIT (IT,(TCDR(IR,IT) DO IR=1 TO NR)) (R(F4));
1212  2  1          END;
1213  2  0      SIGNAL ENDPAGE(SYSPRINT);
1214  2  0      PUT EDIT ('  YEAR  SHGR(1) SHGR(2) SHGR(3) SHGR(4) SHGR(5) ',
                          'SHOR(1) SHOR(2) SHOR(3) SHOR(4) SHOR(5) SHER(1) ',
                          'SHER(2) SHER(3) SHER(4) SHER(5)') (SKIP(3),3 A);
1215  2  0      PUT SKIP(2);
1216  2  0      DO IT = 1 TO NT;
1217  2  1          PUT EDIT (IT,(SHGR(IR,IT) DO IR=1 TO NR),
                             (SHOR(IR,IT) DO IR=1 TO NR),
                             (SHER(IR,IT) DO IR=1 TO NR))
                            (COL(5),F(2),X(3),15 (F(6,4),X(2)));
1218  2  1          END;
1219  2  0      PUT EDIT ('YEAR','DPSA(1)','DPSA(2)','DPSA(3)','DPSA(4)',
                          'DPSA(5)','REXTSA(1)','REXTSA(2)','REXTSA(3)',
                          'REXTSA(4)','REXTSA(5)') (R(F3));
1220  2  0      PUT SKIP(2);
1221  2  0      DO IT = 1 TO NT;
1222  2  1          PUT EDIT (IT,(DPSA(IR,IT) DO IR=1 TO NR),
                             (REXTSA(IR,IT) DO IR=1 TO NR))
                      (COL(5),F(2),X(3),5 (F(10,2),X(2)),5 (F(10,5),X(2)));
1223  2  1          END;
1224  2  0      SIGNAL ENDPAGE(SYSPRINT);
1225  2  0      PUT EDIT ('YEAR','SPOP(1)','SPOP(2)','SPOP(3)','SPOP(4)',
                          'SPOP(5)','BPOP(1)','BPOP(2)','BPOP(3)',
                          'BPOP(4)','BPOP(5)') (R(F3));
1226  2  0      PUT SKIP(2);
1227  2  0      DO IT = 1 TO NT;
1228  2  1          PUT EDIT (IT,(SPOP(IR,IT) DO IR=1 TO NR),
                             (BPOP(IR,IT) DO IR=1 TO NR)) (R(F4));
1229  2  1          END;
1230  2  0      PUT EDIT ('YEAR','TPOP(1)','TPOP(2)','TPOP(3)','TPOP(4)',
                          'TPOP(5)') (R(F3));
1231  2  0      PUT SKIP(2);
1232  2  0      DO IT = 1 TO NT;
1233  2  1          PUT EDIT (IT,(TPOP(IR,IT) DO IR=1 TO NR)) (R(F4));
1234  2  1          END;

1235  2  0      TITLE = 'COMMERCIAL CONSUMPTION SUMMARY';
1236  2  0      CALL PRTIT;                          /* PRINT TITLE */
1237  2  0      PUT EDIT ('YEAR','  CFA(1)','  CFA(2)','  CFA(3)','  CFA(4)',
                          '  CFA(5)',' TCDC(1)',' TCDC(2)',' TCDC(3)',
                          ' TCDC(4)',' TCDC(5)') (R(F3));
1238  2  0      PUT SKIP(2);
1239  2  0      DO IT = 2 TO NT;
1240  2  1          PUT EDIT (IT,(CFA(IR,IT) DO IR=1 TO NR),
                             (TCDC(IR,IT) DO IR=1 TO NR)) (R(F4));
1241  2  1          END;
1242  2  0      PUT EDIT ('YEAR','CONSVC','S1','S2','S3')
                        (SKIP(3),COL(3),A,X(3),A,X(8),A,2 (X(5),A));
1243  2  0      PUT SKIP(2);
1244  2  0      DO IT = 2 TO NT;
1245  2  1          PUT EDIT (IT,CONSVC(IT),S1(1,IT),S2(1,IT),S3(1,IT))
                            (COL(5),F(2),X(3),F(8,4),X(3),3 F(7,2));
1246  2  1          END;
1247  2  0      TITLE = 'INDUSTRIAL CONSUMPTION SUMMARY';
1248  2  0      CALL PRTIT;                          /* PRINT TITLE */
1249  2  0      PUT EDIT ('YEAR','TENCI(1)','TENCI(2)','TENCI(3)','TENCI(4)',
                          'TENCI(5)','TCDI(1)','TCDI(2)','TCDI(3)','TCDI(4)',
                          'TCDI(5)') (R(F3));
1250  2  0      PUT SKIP(2);
1251  2  0      DO IT = 2 TO NT;
1252  2  1          PUT EDIT (IT,(TENCI(IR,IT) DO IR=1 TO NR),
                             (TCDI(IR,IT) DO IR=1 TO NR)) (R(F4));
1253  2  1          END;
1254  2  0      PUT EDIT ('  YEAR  SHGI(1) SHGI(2) SHGI(3) SHGI(4) SHGI(5) ',
                          'SHOI(1) SHOI(2) SHOI(3) SHOI(4) SHOI(5) SHCI(1) ',
                          'SHCI(2) SHCI(3) SHCI(4) SHCI(5)') (SKIP(3),3 A);
1255  2  0      PUT SKIP(2);
1256  2  0      DO IT = 1 TO NT;
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STMT LEV NT

1257   2  1         PUT EDIT (IT,(SHGI(IR,IT) DO IR=1 TO NR),
                             (SHOI(IR,IT) DO IR=1 TO NR),
                             (SHCI(IR,IT) DO IR=1 TO NR)) (R(F6));
1258   2  1         END;
1259   2  0     TITLE = 'SUMMARY OF POTENTIAL & EFFECTIVELY SUPPLIED DEMAND';
1260   2  0     CALL PRTIT;                        /* PRINT TITLE */
1261   2  0     PUT EDIT ('YEAR','PNDGRS(1)','PNDGRS(2)','PNDGRS(3)',
                          'PNDGRS(4)','PNDGRS(5)','CNDGRS(1)','CNDGRS(2)',
                          'CNDGRS(3)','CNDGRS(4)','CNDGRS(5)') (R(F3));
1262   2  0     PUT SKIP(2);
1263   2  0     DO IT = 2 TO NT;
1264   2  1         PUT EDIT (IT,(PNDGRS(IR,IT) DO IR=1 TO NR),
                             (CNDGRS(IR,IT) DO IR=1 TO NR)) (R(F5));
1265   2  1         END;
1266   2  0     PUT EDIT ('YEAR','NGCSA(1)','NGCSA(2)','NGCSA(3)','NGCSA(4)',
                          'NGCSA(5)','NGCNSA(1)','NGCNSA(2)','NGCNSA(3)',
                          'NGCNSA(4)','NGCNSA(5)') (R(F3));
1267   2  0     PUT SKIP(2);
1268   2  0     DO IT = 2 TO NT;
1269   2  1         PUT EDIT (IT,(NGCSA(IR,IT) DO IR=1 TO NR),
                             (NGCNSA(IR,IT) DO IR=1 TO NR)) (R(F5));
1270   2  1         END;
1271   2  0     SIGNAL ENDPAGE(SYSPRINT);
1272   2  0     PUT EDIT ('YEAR','PDGRST','PDGRNT','PDGCT','PDGIT','CNDRST',
                          'CNDRNT','CNDGCT','CNDGIT') (R(F3));
1273   2  0     PUT SKIP(2);
1274   2  0     DO IT = 2 TO NT;
1275   2  1         PUT EDIT (IT,PDGRST(IT),PDGRNT(IT),PDGCT(IT),PDGIT(IT),
                             CNDRST(IT),CNDRNT(IT),CNDGCT(IT),CNDGIT(IT))
                            (R(F5));
1276   2  1         END;
1277   2  0     SIGNAL ENDPAGE(SYSPRINT);
1278   2  0     PUT EDIT ('YEAR','PNDGRN(1)','PNDGRN(2)','PNDGRN(3)',
                          'PNDGRN(4)','PNDGRN(5)','CNDGRN(1)','CNDGRN(2)',
                          'CNDGRN(3)','CNDGRN(4)','CNDGRN(5)') (R(F3));
1279   2  0     PUT SKIP(2);
1280   2  0     DO IT = 2 TO NT;
1281   2  1         PUT EDIT (IT,(PNDGRN(IR,IT) DO IR=1 TO NR),
                             (CNDGRN(IR,IT) DO IR=1 TO NR)) (R(F5));
1282   2  1         END;
1283   2  0     PUT EDIT ('YEAR','PNDGC(1)','PNDGC(2)','PNDGC(3)','PNDGC(4)',
                          'PNDGC(5)','CNDGC(1)','CNDGC(2)','CNDGC(3)',
                          'CNDGC(4)','CNDGC(5)') (R(F3));
1284   2  0     PUT SKIP(2);
1285   2  0     DO IT = 2 TO NT;
1286   2  1         PUT EDIT (IT,(PNDGC(IR,IT) DO IR=1 TO NR),
                             (CNDGC(IR,IT) DO IR=1 TO NR)) (R(F5));
1287   2  1         END;
1288   2  0     SIGNAL ENDPAGE(SYSPRINT);
1289   2  0     PUT EDIT ('YEAR','NCGC(1)','NCGC(2)','NCGC(3)','NCGC(4)',
                          'NCGC(5)','PNDGI(1)','PNDGI(2)','PNDGI(3)',
                          'PNDGI(4)','PNDGI(5)') (R(F3));
1290   2  0     PUT SKIP(2);
1291   2  0     DO IT = 2 TO NT;
1292   2  1         PUT EDIT (IT,(NCGC(IR,IT) DO IR=1 TO NR),
                             (PNDGI(IR,IT) DO IR=1 TO NR)) (R(F5));
1293   2  1         END;
1294   2  0     PUT EDIT ('YEAR','CNDGI(1)','CNDGI(2)','CNDGI(3)','CNDGI(4)',
                          'CNDGI(5)','NIGC(1)','NIGC(2)','NIGC(3)',
                          'NIGC(4)','NIGC(5)') (R(F3));
1295   2  0     PUT SKIP(2);
1296   2  0     DO IT = 2 TO NT;
1297   2  1         PUT EDIT (IT,(CNDGI(IR,IT) DO IR=1 TO NR),
                             (NIGC(IR,IT) DO IR=1 TO NR))
                    (COL(5),F(2),X(3),5 (F(10,2),X(2)),5 (F(10,5),X(2)));
1298   2  1         END;
1299   2  0     TITLE = 'SUMMARY OF YEARLY COMMITTED REQUIREMENTS';
1300   2  0     CALL PRTIT;
1301   2  0     PUT EDIT ('YEAR','BASEDR','BASEDC','BASEDI','BASEDT',
                          'EXCSUP','TCYDR','TCYDC','TCYDI')
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STMT LEV NT

                         (SKIP(3),COL(3),A,5 (X(7),A),3 (X(8),A));
1302   2  0        PUT SKIP(2);
1303   2  0        DO IT = 2 TO NT;
1304   2  1            PUT EDIT (IT,BASEDR(IT),BASEDC(IT),BASEDI(IT),BASEDT(IT),
                                EXCSUP(IT),TCYDR(IT),TCYDC(IT),TCYDI(IT))
                               (COL(5),F(2),X(3),8 (F(10,0),X(3)));
1305   2  1            END;
1306   2  0        TITLE = 'SUMMARY OF MONTHLY GAS FLOWS';
1307   2  0        CALL PRTIT;                          /* PRINT TITLE */
1308   2  0        PUT EDIT ('YEAR','DDS BY MONTH') (R(F9));
1309   2  0        CALL PRMON1;                    /* PRINT MONTH SUB-HEADING */
1310   2  0        DO IT = 2 TO NT;
1311   2  1            PUT EDIT (IT,(DDS(IT,IM) DO IM=1 TO 12)) (R(F7));
1312   2  1            END;
1313   2  0        PUT EDIT ('YEAR','DGMR BY MONTH') (R(F9));
1314   2  0        CALL PRMON1;                    /* PRINT MONTH SUB-HEADING */
1315   2  0        DO IT = 2 TO NT;
1316   2  1            PUT EDIT (IT,(DGMR(IT,IM) DO IM=1 TO 12)) (R(F7));
1317   2  1            END;
1318   2  0        SIGNAL ENDPAGE(SYSPRINT);
1319   2  0        PUT EDIT ('YEAR','CURTR BY MONTH') (R(F9));
1320   2  0        CALL PRMON2;                    /* PRINT MONTH SUB-HEADING */
1321   2  0        DO IT = 2 TO NT;
1322   2  1            PUT EDIT (IT,(CURTR(IT,IM) DO IM=1 TO 12)) (R(F8));
1323   2  1            END;
1324   2  0        PUT EDIT ('YEAR','DGMC BY MONTH') (R(F9));
1325   2  0        CALL PRMON1;                    /* PRINT MONTH SUB-HEADING */
1326   2  0        DO IT = 2 TO NT;
1327   2  1            PUT EDIT (IT,(DGMC(IT,IM) DO IM=1 TO 12)) (R(F7));
1328   2  1            END;
1329   2  0        SIGNAL ENDPAGE(SYSPRINT);
1330   2  0        PUT EDIT ('YEAR','CURTC BY MONTH') (R(F9));
1331   2  0        CALL PRMON2;                    /* PRINT MONTH SUB-HEADING */
1332   2  0        DO IT = 2 TO NT;
1333   2  1            PUT EDIT (IT,(CURTC(IT,IM) DO IM=1 TO 12)) (R(F8));
1334   2  1            END;
1335   2  0        PUT EDIT ('YEAR','DGMI BY MONTH') (R(F9));
1336   2  0        CALL PRMON1;                    /* PRINT MONTH SUB-HEADING */
1337   2  0        DO IT = 2 TO NT;
1338   2  1            PUT EDIT (IT,(DGMI(IT,IM) DO IM=1 TO 12)) (R(F7));
1339   2  1            END;
1340   2  0        SIGNAL ENDPAGE(SYSPRINT);
1341   2  0        PUT EDIT ('YEAR','CURTI BY MONTH') (R(F9));
1342   2  0        CALL PRMON2;                    /* PRINT MONTH SUB-HEADING */
1343   2  0        DO IT = 2 TO NT;
1344   2  1            PUT EDIT (IT,(CURTI(IT,IM) DO IM=1 TO 12)) (R(F8));
1345   2  1            END;
1346   2  0        PUT EDIT ('YEAR','DGMT BY MONTH') (R(F9));
1347   2  0        CALL PRMON1;                    /* PRINT MONTH SUB-HEADING */
1348   2  0        DO IT = 2 TO NT;
1349   2  1            PUT EDIT (IT,(DGMT(IT,IM) DO IM=1 TO 12)) (R(F7));
1350   2  1            END;
1351   2  0        SIGNAL ENDPAGE(SYSPRINT);
1352   2  0        PUT EDIT ('YEAR','DGMRYT','DGMCYT','DGMIYT','DGMTYT')
                         (SKIP(3),COL(3),A,4 (X(6),A));
1353   2  0        PUT SKIP(2);
1354   2  0        DO IT = 2 TO NT;
1355   2  1            DGMRYT(IT) = 0;
1356   2  1            DGMCYT(IT) = 0;
1357   2  1            DGMIYT(IT) = 0;
1358   2  1            DGMTYT(IT) = 0;
1359   2  1            DO IM = 1 TO 12;
1360   2  2                DGMRYT(IT) = DGMRYT(IT)+DGMR(IT,IM);
1361   2  2                DGMCYT(IT) = DGMCYT(IT)+DGMC(IT,IM);
1362   2  2                DGMIYT(IT) = DGMIYT(IT)+DGMI(IT,IM);
1363   2  2                DGMTYT(IT) = DGMTYT(IT)+DGMT(IT,IM);
1364   2  2                END;
1365   2  1            PUT EDIT (IT,DGMRYT(IT),DGMCYT(IT),DGMIYT(IT),DGMTYT(IT))
                               (COL(5),F(2),X(3),4 (F(10,0),X(2)));
1366   2  1            END;
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STMT LEV NT

1367   2  0        PUT EDIT ('YEAR','SUPM BY MONTH') (R(F9));
1368   2  0        CALL PRMON1;                   /* PRINT MONTH SUB-HEADING */
1369   2  0        DO IT = 2 TO NT;
1370   2  1            PUT EDIT (IT,(SUPM(IT,IM) DO IM=1 TO 12)) (R(F7));
1371   2  1            END;
1372   2  0        SIGNAL ENDPAGE(SYSPRINT);
1373   2  0        PUT EDIT ('YEAR','GOUST BY MONTH') (R(F9));
1374   2  0        CALL PRMON1;                   /* PRINT MONTH SUB-HEADING */
1375   2  0        DO IT = 2 TO NT;
1376   2  1            PUT EDIT (IT,(GOUST(IT,IM) DO IM=1 TO 12)) (R(F7));
1377   2  1            END;
1378   2  0        PUT EDIT ('YEAR','MAXINS BY MONTH') (R(F9));
1379   2  0        CALL PRMON1;                   /* PRINT MONTH SUB-HEADING */
1380   2  0        DO IT = 2 TO NT;
1381   2  1            PUT EDIT (IT,(MAXINS(IT,IM) DO IM=1 TO 12)) (R(F7));
1382   2  1            END;
1383   2  0        SIGNAL ENDPAGE(SYSPRINT);
1384   2  0        PUT EDIT ('YEAR','RSTOR BY MONTH') (R(F9));
1385   2  0        CALL PRMON1;                   /* PRINT MONTH SUB-HEADING */
1386   2  0        DO IT = 2 TO NT;
1387   2  1            PUT EDIT (IT,(RSTOR(IT,IM) DO IM=1 TO 12)) (R(F8));
1388   2  1            END;
1389   2  0        SIGNAL ENDPAGE(SYSPRINT);
1390   2  0        PUT EDIT ('YEAR','GSTORD BY MONTH') (R(F9));
1391   2  0        CALL PRMON1;                   /* PRINT MONTH SUB-HEADING */
1392   2  0        DO IT = 2 TO NT;
1393   2  1            PUT EDIT (IT,(GSTORD(IT,IM) DO IM=1 TO 12)) (R(F7));
1394   2  1            END;
1395   2  0        PUT EDIT ('YEAR','GINST BY MONTH') (R(F9));
1396   2  0        CALL PRMON1;                   /* PRINT MONTH SUB-HEADING */
1397   2  0        DO IT = 2 TO NT;
1398   2  1            PUT EDIT (IT,(GINST(IT,IM) DO IM=1 TO 12)) (R(F7));
1399   2  1            END;
1400   2  0        SIGNAL ENDPAGE(SYSPRINT);
1401   2  0        PUT EDIT ('YEAR','MAXOUS BY MONTH') (R(F9));
1402   2  0        CALL PRMON1;                   /* PRINT MONTH SUB-HEADING */
1403   2  0        DO IT = 2 TO NT;
1404   2  1            PUT EDIT (IT,(MAXOUS(IT,IM) DO IM=1 TO 12)) (R(F7));
1405   2  1            END;
1406   2  0        TITLE = 'SUMMARY OF FINANCIAL DATA';
1407   2  0        CALL PRTIT;                    /* PRINT TITLE */
1408   2  0        PUT EDIT ('YEAR','CACRST','CACRNT','CACCT','CACIT','NEWPIS')
                          (SKIP(3),COL(3),A,2 (X(7),A),2 (X(8),A),X(7),A);
1409   2  0        PUT SKIP(2);
1410   2  0        DO IT = 2 TO NT;
1411   2  1            PUT EDIT (IT,CACRST(IT),CACRNT(IT),CACCT(IT),CACIT(IT),
                                NEWPIS(IT)) (COL(5),F(2),X(3),5 (F(10,0),X(3)));
1412   2  1            END;
1413   2  0        PUT EDIT ('YEAR','GASSUP','GSALES','DIFSTO','GDELIV',
                           'GPURCH','OMSTOC','OMGENC')
                          (SKIP(3),COL(3),A,7 (X(7),A));
1414   2  0        PUT SKIP(2);
1415   2  0        DO IT = 2 TO NT;
1416   2  1            DIFSTO = GASSUP(IT)-GSALES(IT);
1417   2  1            PUT EDIT (IT,GASSUP(IT),GSALES(IT),DIFSTO,GDELIV(IT),
                                GPURCH(IT),OMSTOC(IT),OMGENC(IT))
                               (COL(5),F(2),X(3),4 (F(10,0),X(3)),F(11,0),
                                X(2),2 (F(10,0),X(3)));
1418   2  1            END;
1419   2  0        SIGNAL ENDPAGE(SYSPRINT);
1420   2  0        PUT EDIT ('YEAR','PISBEG','REPPIS','NEWPIS','DEPEXP',
                                'NETPIS','TAPDAD','TOTPIS')
                           (SKIP(3),COL(3),A,7 (X(9),A));
1421   2  0        PUT SKIP(2);
1422   2  0        DO IT = 2 TO NT;
1423   2  1            PUT EDIT (IT,PISBEG(IT),REPPIS(IT),NEWPIS(IT),DEPEXP(IT),
                                NETPIS(IT),TAPDAD(IT),TOTPIS(IT))
                               (COL(5),F(2),X(3),7 (F(12,0),X(3)));
1424   2  1            END;
1425   2  0        PUT EDIT ('YEAR','AOPINC','GASREV','OOPREV','ONUINC',
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STMT LEV NT

                              'ACOPEX','TAXADJ','INCAT','INCDEF','DPR')
                             (SKIP(3),COL(3),A,5 (X(8),A),X(4),A,X(8),A,X(7),
                              A,X(10),A);
1426   2  0          PUT SKIP(2);
1427   2  0          DO IT = 2 TO NT;
1428   2  1             PUT EDIT (IT,AOPINC(IT),GASREV(IT),OOPREV(IT),ONUINC(IT),
                                  ACOPEX(IT),TAXADJ,INCAT(IT),INCDEF(IT),DPR(IT))
                                 (COL(5),F(2),X(3),5 (F(11,0),X(3)),F(7,5),X(3),
                                  2 (F(10,0),X(3)),F(10,5));
1429   2  1             END;

1430   2  0          RETURN;
1431   2  0          END LIST;
```

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STMT LEV NT

            /************************************************************************
             *                                                                      *
             *        G R A P H   P R O C E D U R E                                 *
             *                                                                      *
             ***********************************************************************/

1432   1  0  GRAPH:   PROC;

1433   2  0           DCL  (POLNUM,SCENUM)      PIC'9';
1434   2  0           DCL  DT                   CHAR(32);
1435   2  0           DCL  PS                   CHAR(26);

1436   2  0           POLNUM = IP;
1437   2  0           SCENUM = IS;
1438   2  0           PS = 'POLICY # ' || POLNUM ||
                           ', SCENARIO # ' || SCENUM || ', ';
1439   2  0           DT = 'DATE: ' || TODAY || '  TIME: ' || HM;

             /*       WRITE OUT AEIY (AGGREGATE EFFICIENCY INDEX - YEARLY)        */

1440   2  0           HDR = 'AEIY - AGGREGATE EFFICIENCY INDEX-YEARLY, ' ||
                             PS || DT;
1441   2  0           NWH = 25;
1442   2  0           NVAR = 23;
1443   2  0           DO IT = 2 TO NT;
1444   2  1               X(IT-1) = IT;
1445   2  1               Y(IT-1) = AEIY(IT);
1446   2  1               END;
1447   2  0           WRITE FILE(GRAF) FROM (GREC);

             /*       WRITE OUT RTAR (RETURN ON TOTAL ASSETS RATIO)                */

1448   2  0           HDR = 'RTAR - RETURN ON TOTAL ASSETS RATIO, ' || PS || DT;
1449   2  0           NWH = 24;
1450   2  0           NVAR = 22;
1451   2  0           DO IT = 2 TO NT-1;
1452   2  1               X(IT-1) = IT;
1453   2  1               Y(IT-1) = RTAR(IT);
1454   2  1               END;
1455   2  0           WRITE FILE(GRAF) FROM (GREC);

             /*       WRITE OUT MWIC (# WINTER MONTHS WITH INDUSTRIAL CURTAIL.)   */

1456   2  0           HDR = 'MWIC - # WINTER MONTHS W/ IND. CURTAIL., ' ||
                             PS || DT;
1457   2  0           NWH = 25;
1458   2  0           NVAR = 23;
1459   2  0           DO IT = 2 TO NT;
1460   2  1               X(IT-1) = IT;
1461   2  1               Y(IT-1) = MWIC(IT);
1462   2  1               END;
1463   2  0           WRITE FILE(GRAF) FROM (GREC);
1464   2  0           RETURN;

1465   2  0           END GRAPH;
```

```
STMT LEV NT

              /**********************************************************************
              *                                                                     *
              *       PRINT UTILITY PROCEDURES                                      *
              *                                                                     *
              **********************************************************************/

1466  1  0  PRTIT:   PROC;
1467  2  0           SIGNAL ENDPAGE(SYSPRINT);
1468  2  0           J = (132-LENGTH(TITLE))/2;
1469  2  0           PUT EDIT (('*' DO I=1 TO 132),'*',TITLE,'*',
                               ('*' DO I=1 TO 132)) (COL(1),132 A,
                               COL(1),A,COL(J),A,COL(132),A,COL(1),132 A);
1470  2  0           RETURN;
1471  2  0           END PRTIT;

1472  1  0  PRMON1:  PROC;
1473  2  0           PUT EDIT ((MONAMES(IM) DO IM=1 TO 12))
                              (SKIP(2),COL(9),12 (X(7),A));
1474  2  0           PUT SKIP(2);
1475  2  0           RETURN;
1476  2  0           END PRMON1;

1477  1  0  PRMON2:  PROC;
1478  2  0           PUT EDIT ((MONAMES(IM) DO IM=1 TO 12))
                              (SKIP(2),COL(5),12 (X(7),A));
1479  2  0           PUT SKIP(2);
1480  2  0           RETURN;
1481  2  0           END PRMON2;

1482  1  0           END GAS;
```

APPENDIX K

SELECTED RESULTS

The purpose of this appendix is to illustrate the variety of calculations that are performed by the model. The appendix contains computer-generated print-outs of calculations based on new service policy #3 and energy scenario #2.

DATE: 10/16/78 TIME: 10:13 P.M.

G A S   A L L O C A T I O N   M O D E L

ENERGY SCENARIO # 2 EXPANSION POLICY # 3

PARAMETERS USED:

RESIDENTIAL	COMMERCIAL	INDUSTRIAL
ATRGB = 0.0050	ATCB = 0.0050	ATIB = 0.0050
ATROB = 0.0025		CONSVI = 0.0200
CONSVR = 0.0100		

****
*   E V A L U A T I O N   S U M M A R Y
****

FINANCIAL CRITERIA

YEAR	TATR	NPMR	ACOPRV	GPMR	RTAR	ROCER	IRBC	IORI	INTCOV
2	1.80256	0.11711	728452608	0.17414	0.21109	0.46470	0.00423	0	11.24366
3	1.84841	0.11272	760384768	0.11317	0.20836	0.48358	0.01780	0	7.36094
4	1.79232	0.05194	750887424	0.20692	0.09310	0.20251	0.01812	1	12.82395
5	2.00844	0.12678	856872448	0.12806	0.25462	0.57663	0.01844	0	8.74222
6	1.94905	0.07150	847377408	0.12028	0.13936	0.32039	0.01877	1	7.83503
7	1.98078	0.06090	877748992	0.14208	0.12063	0.27125	0.01909	1	9.25140
8	2.07537	0.09487	937594368	0.21225	0.19689	0.42470	0.01941	0	14.24721
9	2.24408	0.12884	1035656448	0.09427	0.28912	0.68077	0.01973	0	6.74621
10	2.08663	0.03336	987724800	0.13320	0.06962	0.15764	0.02364	1	8.75415
11	2.21036	0.06125	1073647360	0.15033	0.13539	0.30064	0.02724	1	10.32602
12	2.32143	0.07980	1156038400	0.12587	0.18524	0.41818	0.02530	0	8.96188
13	2.34194	0.06904	1195602176	0.05549	0.16168	0.43478	0.02532	1	3.93396
14	2.22798	0.06336	1165380608	0.14032	0.14116	0.31706	0.02500	1	9.33669
15	2.31596	0.07791	1240248576	0.13908	0.18043	0.40447	0.02386	1	9.49321
16	2.37196	0.08502	1300749568	0.17921	0.20165	0.44001	0.02390	0	12.36698
17	2.50452	0.07572	1407203584	0.14647	0.18965	0.42022	0.02419	0	10.54158
18	2.58820	0.07646	1490193664	0.08227	0.19791	0.47564	0.02516	0	6.04237
19	2.51180	0.06473	1481867776	0.13414	0.16258	0.36469	0.02442	1	9.44482
20	2.59058	0.06815	1566937344	0.16875	0.17654	0.38592	0.02469	1	12.11397
21	2.75077	0.08479	1705999360	0.10707	0.23323	0.53396	0.02590	0	8.06597
22	2.71194	0.06271	1724978176	0.04101	0.17006	0.51061	0.02502	1	3.01185
23	2.55655	0.05976	1668062720	0.10465	0.15279	0.35615	0.02605	1	7.16285
24	0.00000	0.06983	1722454784	0.00000	0.00000	0.00000	0.02518	1	0.00000

AVERAGE FINANCIAL RATIOS

AVG TATR = 2.26325
AVG NPMR = 0.07811
AVG GPMR = 0.13177
AVG RTAR = 0.17596
AVG ROCER = 0.40657
AVG IRBC = 0.02219
AVG INTCOV= 8.99122

ADEQUACY OF SERVICE CRITERIA

YEAR	AED	AMCIR	AMCIC	AMCII	MWRC	MWCC	MWIC	LOADF
2	0.03113	0.00000	0.00000	0.00000	0	0	0	0.01169
3	0.04895	0.00000	0.00000	0.11800	0	0	2	-0.02620
4	0.04148	0.00000	0.00000	0.07955	0	0	2	0.01602
5	0.03394	0.00000	0.00000	0.08521	0	0	3	-0.02204
6	0.02648	0.00000	0.00000	0.30707	0	0	3	-0.00075
7	0.02024	0.00000	0.00000	0.07356	0	0	2	0.02389
8	0.01319	0.00000	0.00000	0.00000	0	0	0	0.02940
9	0.00743	0.00000	0.04355	0.17937	0	1	2	-0.03267
10	-0.00212	0.00000	0.00000	0.09159	0	0	3	0.00773
11	-0.00903	0.00000	0.00000	0.06029	0	0	2	0.01898
12	-0.01391	0.00000	0.00000	0.00000	0	0	0	0.00759
13	-0.02010	0.00000	0.00000	0.00000	0	0	0	0.01359
14	-0.02532	0.00000	0.00000	0.00000	0	0	0	0.08311
15	-0.03158	0.00000	0.00000	0.00000	0	0	0	0.08155
16	-0.03881	0.00000	0.00000	0.00000	0	0	0	0.07680
17	-0.04513	0.00000	0.00000	0.00000	0	0	0	0.03304
18	-0.05257	0.00000	0.00000	0.01563	0	0	1	0.01275
19	-0.05950	0.00000	0.00000	0.00000	0	0	0	0.04908
20	-0.06723	0.00000	0.00000	0.00000	0	0	0	0.04057
21	-0.07388	0.00000	0.00000	0.00000	0	0	0	-0.00392
22	-0.08089	0.00000	0.00000	0.00000	0	0	0	0.00340
23	-0.08888	0.00000	0.00000	0.00000	0	0	0	0.07500
24	-0.09510	0.00000	0.00000	0.00000	0	0	0	0.09068

AVG LOADF = 0.02562

SYNTHETIC CRITERIA

AEDI= 0.00969
AEDFI= 0.34783
WMCRT= 0.00000
WMCCT= 0.04348
WMCIT= 0.86957
IORIT= 13.00000

FAIRNESS CRITERIA

AOPDIR= 0.92035
AOPDIC= 0.92595
AOPDII= 0.91495
AEPDIR= 0.26206
AEPDIC= 0.27450
ACPDII= 1.94592

YEARLY SECTORAL CONSUMERS SURPLUSES

IT= 2	WRSA=-13558264.00000	WRNS= -966496.00000	WC= -467003.93750	WI= -2284458.00000
IT= 3	WRSA=-16427472.00000	WRNS= -847060.00000	WC= -477383.37500	WI= -2362179.00000
IT= 4	WRSA=-12881912.00000	WRNS= -667926.50000	WC= -484426.56250	WI= -2418614.00000
IT= 5	WRSA=-12144360.00000	WRNS= -627930.00000	WC= -488836.18750	WI= -2960985.00000
IT= 6	WRSA= -8741976.00000	WRNS= -439061.62500	WC= -510022.68750	WI= -2738910.00000
IT= 7	WRSA=-11012872.00000	WRNS= -576823.50000	WC= -482834.56250	WI= -2631100.00000
IT= 8	WRSA= -8363361.00000	WRNS= -426154.06250	WC= -449707.00000	WI= -2097436.00000
IT= 9	WRSA=-10214728.00000	WRNS= -538255.50000	WC= -446303.56250	WI= -1834767.00000
IT= 10	WRSA= 3358454.00000	WRNS= -210397.00000	WC= -534598.00000	WI= -2140779.00000
IT= 11	WRSA= 6770712.00000	WRNS= -327342.62500	WC= -458462.81250	WI= -1775984.00000
IT= 12	WRSA= 3864649.00000	WRNS= -186201.37500	WC= -415674.25000	WI= -1259158.00000
IT= 13	WRSA= 4265721.00000	WRNS= -206972.18750	WC= -392162.12500	WI= -1010752.50000
IT= 14	WRSA= 3204096.00000	WRNS= -158897.18750	WC= -361630.87500	WI= -810507.50000
IT= 15	WRSA= 2239875.00000	WRNS= -84155.93750	WC= -395603.81250	WI= -657604.50000
IT= 16	WRSA= 1836795.00000	WRNS= -68743.68750	WC= -370702.31250	WI= -579922.00000
IT= 17	WRSA= 1954442.00000	WRNS= -88062.43750	WC= -349120.56250	WI= -529281.00000
IT= 18	WRSA= 2435711.00000	WRNS= -99087.68750	WC= -329721.93750	WI= -491527.81250
IT= 19	WRSA= 1647635.00000	WRNS= -61913.12500	WC= -308273.62500	WI= -454250.00000
IT= 20	WRSA= 1585167.00000	WRNS= -61068.87500	WC= -281344.43750	WI= -420347.00000
IT= 21	WRSA= 2410010.00000	WRNS= -99685.31250	WC= -256989.68750	WI= -368589.25000
IT= 22	WRSA= 1418102.00000	WRNS= -54659.46875	WC= -254081.93750	WI= -347810.37500
IT= 23	WRSA= 2080224.00000	WRNS= -86246.25000	WC= -227794.12500	WI= -308343.25000
IT= 24	WRSA= 1098210.00000	WRNS= -33932.34375	WC= -196612.87500	WI= -252852.06250

SECTORAL INTEGRATED END-USE EFFICIENCY INDEXES

WRSAT=	-582856448.00000
WRNST=	-42344096.00000
WCT=	-38042464.00000
WIT=	-167662416.00000
EUEI=	-830905088.00000

AGGREGATE EFFICIENCY INDEX= -499224064.00000

PRICES SUMMARY

YEAR	PRGR	PROR	PRER	PRGC	PROC	PREC	PRGI	PROI	PREI	PRCI
1	2.2292	3.3814	13.6862	2.0623	3.1109	12.3088	1.9847	3.1109	7.8249	1.4000
2	2.2953	3.4727	13.7546	2.1284	3.2073	12.3950	2.0508	3.1949	8.0831	1.4490
3	2.3657	3.5505	13.8231	2.1988	3.2913	12.4811	2.1212	3.2789	8.3413	1.4896
4	2.5867	3.6282	13.8915	2.4198	3.3753	12.5673	2.3422	3.3629	8.6074	1.5386
5	2.6040	3.7094	13.9462	2.4371	3.4562	12.6658	2.3595	3.4562	8.8656	1.5890
6	2.7712	3.7872	14.0284	2.6043	3.5402	12.7396	2.5267	3.5402	9.1238	1.6282
7	2.9719	3.8785	14.0831	2.8050	3.6366	12.8381	2.7274	3.6242	9.3821	1.6786
8	3.0729	3.9562	14.1652	2.9060	3.7206	12.9119	2.8284	3.7082	9.6324	1.7178
9	3.0474	4.0340	14.2200	2.8805	3.8046	13.0104	2.8029	3.7922	9.8907	1.7668
10	3.3307	4.0678	14.3158	3.1638	3.8513	13.0843	3.0862	3.8295	9.9689	1.7878
11	3.5285	4.1152	14.3979	3.3616	3.8886	13.1704	3.2840	3.8637	10.0472	1.8074
12	3.6552	4.1490	14.5074	3.4883	3.9353	13.2566	3.4107	3.9135	10.1411	1.8368
13	3.8221	4.1929	14.5895	3.6552	3.9726	13.3427	3.5776	3.9477	10.2193	1.8564
14	4.0409	4.2267	14.6716	3.8740	4.0193	13.4289	3.7964	3.9851	10.2976	1.8760
15	4.1976	4.2606	14.7674	4.0307	4.0691	13.5028	3.9531	4.0193	10.3758	1.8970
16	4.3208	4.3045	14.8495	4.1539	4.1033	13.5889	4.0763	4.0566	10.4541	1.9166
17	4.4619	4.3383	14.9590	4.2950	4.1530	13.6751	4.2174	4.1033	10.5401	1.9460
18	4.5901	4.3857	15.0411	4.4232	4.1873	13.7612	4.3456	4.1406	10.6184	1.9656
19	4.7899	4.4195	15.1232	4.6230	4.2370	13.8351	4.5454	4.1748	10.6966	1.9852
20	4.9676	4.4533	15.2191	4.8007	4.2837	13.9212	4.7231	4.2122	10.7749	2.0062
21	5.0417	4.4973	15.3012	4.8748	4.3179	13.9951	4.7972	4.2464	10.8531	2.0258
22	5.2339	4.5311	15.4107	5.0670	4.3646	14.0936	4.9894	4.2962	10.9470	2.0552
23	5.4815	4.5750	15.4928	5.3146	4.4019	14.1674	5.2370	4.3304	11.0253	2.0748
24	5.6834	4.6088	15.5749	5.5165	4.4517	14.2536	5.4389	4.3677	11.1035	2.0944

****

* RESIDENTIAL CONSUMPTION SUMMARY

****

YEAR	TGCSA(1)	TGCSA(2)	TGCSA(3)	TGCSA(4)	TGCSA(5)	TNGCSA(1)	TNGCSA(2)	TNGCSA(3)	TNGCSA(4)	TNGCSA(5)
1	492390	174284	109185	44884	87713	81657	39640	31142	17752	7941
2	485687	172165	108639	44660	87274	80750	39257	31064	17708	7921
3	479450	170135	108093	44435	86836	91909	43408	33791	19067	9936
4	473602	168193	107547	44211	86397	101693	46980	36191	20325	11780
5	468141	166389	107001	43986	85959	113741	51410	39196	21875	13704
6	462984	164648	106455	43762	85520	121888	54378	41308	23051	15374
7	458268	162997	105909	43537	85031	130201	57401	43990	24286	16746
8	453968	161507	105363	43313	84592	138692	60500	46257	25578	17908
9	450046	160184	104818	43089	84154	147364	63684	49254	26916	19761
10	446386	158818	104272	42864	83715	156211	66911	51668	28266	21293
11	445281	158397	104486	42938	83704	158927	67892	52875	28814	22000
12	446486	158857	105173	43228	83729	161675	68873	53700	29167	22320
13	446085	158698	105719	43431	83895	163777	69629	54677	29584	22888
14	445684	158565	106285	43666	83871	165890	70365	55645	29975	23258
15	445563	158544	106477	43852	83994	168297	71238	56402	30419	23876
16	444342	158218	106760	43843	83937	169517	71760	57271	30618	24292
17	443046	157853	106988	43816	83854	170813	72321	58195	30835	24734
18	441739	157489	107213	43912	83771	172119	72882	59122	31204	25176
19	441364	157468	107405	43877	83672	174838	73980	60082	31429	25634
20	439999	157078	107591	43843	83570	176202	74567	61047	31654	26094
21	438594	156784	107822	43835	83416	177605	75348	62152	31942	26508
22	438085	156827	108282	43825	83415	180474	76684	63655	32233	27175
23	436633	156507	108479	43809	83248	181925	77492	64798	32533	27601
24	435973	156481	108866	43784	83214	184963	78908	66394	32844	28307

YEAR	TNGCNS(1)	TNGCNS(2)	TNGCNS(3)	TNGCNS(4)	TNGCNS(5)
1	34114	2882	4475	14450	5547
2	33735	2854	4464	14414	5533
3	34403	2954	4548	14690	5608
4	34640	2976	4607	14929	5689
5	35036	3013	4686	15235	5775
6	35215	3030	4736	15454	5846
7	35431	3048	4804	15688	5897
8	35683	3071	4860	15935	5939
9	35969	3096	4938	16192	6021
10	36280	3122	4998	16452	6084
11	36377	3130	5043	16595	6125
12	36615	3150	5092	16744	6145
13	36717	3158	5141	16887	6187
14	36820	3166	5190	17031	6207
15	36958	3178	5220	17177	6250
16	36958	3181	5257	17221	6271
17	36958	3183	5294	17265	6292
18	36959	3186	5331	17372	6313
19	37100	3201	5368	17416	6333
20	37100	3204	5404	17460	6354
21	37101	3211	5447	17525	6369
22	37243	3230	5510	17590	6408
23	37243	3236	5553	17656	6423
24	37386	3256	5616	17722	6462

YEAR	PECSA(1)	PECSA(2)	PECSA(3)	PECSA(4)	PECSA(5)	PECNSA(1)	PECNSA(2)	PECNSA(3)	PECNSA(4)	PECNSA(5)
2	11990.25	4513.00	2804.48	1403.77	2034.48	1015.12	126.11	95.25	312.20	88.49
3	10548.75	3915.57	2477.67	1302.86	1864.11	556.54	47.40	70.54	274.94	95.18
4	12750.00	4740.32	3083.67	1594.16	1943.86	688.97	58.82	89.90	342.20	99.82
5	8798.06	3265.26	2189.36	1219.93	1689.42	451.53	38.51	61.32	255.78	85.07
6	8890.94	3299.91	2760.29	1279.55	1397.04	457.54	39.03	79.56	269.56	68.23
7	8999.75	3338.59	2344.73	1336.74	1182.13	464.36	39.61	66.29	282.76	55.81
8	9118.94	3385.41	3074.29	1382.49	1872.79	471.96	40.31	89.66	293.33	95.67
9	9249.75	3438.46	2491.86	1393.93	1551.11	480.02	41.15	70.99	295.96	77.08
10	4835.63	1775.06	2045.48	890.30	1154.67	215.30	18.14	56.70	179.68	54.16
11	7178.81	2657.19	2136.19	911.56	802.88	356.30	30.42	59.61	184.57	33.82
12	4925.19	1812.88	2146.84	889.37	1193.15	220.90	18.76	59.95	179.46	56.42
13	4938.75	1817.69	2158.12	894.18	804.07	221.70	18.83	60.33	180.57	33.92
14	4952.25	1822.63	1572.76	898.81	1199.82	222.53	18.92	41.57	181.63	56.80
15	2665.88	1167.13	1775.64	458.81	817.52	85.66	9.95	48.05	80.04	34.68
16	2665.88	1167.06	1775.73	458.87	817.13	85.66	9.98	48.07	80.04	34.66
17	2665.38	1167.13	1775.32	734.25	817.54	85.67	9.97	48.05	143.64	34.68
18	5010.06	2047.50	1775.71	459.56	817.16	226.52	22.10	48.05	80.20	34.66
19	2665.88	1167.88	1775.67	459.50	817.49	85.67	9.96	48.05	80.20	34.68
20	2665.13	1457.38	1959.18	548.56	717.36	85.73	13.98	53.96	100.75	28.89
21	5027.44	2348.94	2587.06	550.62	1124.23	227.27	26.28	74.06	101.23	52.44
22	2665.56	1459.25	1964.14	552.37	718.05	85.35	14.00	54.12	101.63	28.90
23	5045.50	2361.38	2606.39	554.75	1130.08	228.73	26.43	74.66	102.20	52.75
24	2665.50	1461.19	1969.06	270.00	719.32	85.35	14.01	54.27	36.43	28.98

YEAR	PGCSA(1)	PGCSA(2)	PGCSA(3)	PGCSA(4)	PGCSA(5)	PGCNSA(1)	PGCNSA(2)	PGCNSA(3)	PGCNSA(4)	PGCNSA(5)
2	8955.94	3179.69	1926.15	867.09	1480.43	758.23	88.85	65.42	192.84	64.39
3	7886.49	2859.63	1775.05	909.88	1382.86	416.08	34.62	50.54	192.01	70.61
4	8921.40	3224.93	2098.30	958.02	1338.13	482.09	40.01	61.17	205.65	68.72
5	6207.14	2292.50	1529.26	833.90	1190.43	318.56	27.04	42.83	174.84	59.94
6	5980.85	2143.19	1815.62	716.98	918.78	307.78	25.35	52.33	151.04	44.87
7	6148.87	2273.69	1596.34	876.85	806.63	317.26	26.98	45.13	185.48	38.08
8	5622.27	1996.31	1848.79	704.58	1120.37	290.98	23.77	53.92	149.49	57.23
9	5799.71	2140.62	1555.56	829.25	968.76	300.98	25.62	44.32	176.07	48.14
10	2800.75	990.82	1160.72	455.14	651.85	124.70	10.13	32.17	91.85	30.58
11	4147.15	1531.19	1232.42	514.17	463.36	205.83	17.53	34.39	104.11	19.52
12	2540.23	912.26	1092.20	427.26	604.71	113.93	9.44	30.50	86.22	28.60
13	2541.72	937.57	1112.21	459.54	414.65	114.10	9.71	31.09	92.80	17.49
14	2340.63	850.21	737.91	410.46	561.73	105.18	8.83	19.51	82.94	26.59
15	1241.83	545.92	829.12	215.33	382.03	39.90	4.65	22.44	37.56	16.21
16	1165.61	506.92	773.52	197.40	355.56	37.46	4.33	20.94	34.43	15.08
17	1155.13	507.48	770.85	320.46	355.18	37.13	4.34	20.86	62.69	15.07
18	2086.76	849.92	738.19	189.88	339.51	94.35	9.18	19.98	33.13	14.40
19	1097.67	481.89	732.01	190.10	337.13	35.27	4.11	19.81	33.18	14.30
20	1057.91	577.45	776.89	216.83	284.37	34.03	5.54	21.40	39.82	11.45
21	1953.90	914.02	1006.15	214.59	437.32	88.33	10.23	28.80	39.45	20.40
22	1009.73	551.33	742.92	207.98	271.48	32.33	5.29	20.47	38.27	10.93
23	1803.41	846.08	932.90	199.38	404.65	81.76	9.47	26.72	36.73	18.89
24	869.80	475.17	641.28	87.41	234.13	27.85	4.55	17.68	11.79	9.43

YEAR	TCDR(1)	TCDR(2)	TCDR(3)	TCDR(4)	TCDR(5)
1	99530480	32066192	19888224	7848986	17494880
2	98175584	31676304	19788768	7809741	17407392
3	96914720	31302848	19689312	7770496	17319904
4	95732736	30945520	19589856	7731251	17232416
5	94628880	30613632	19490400	7692006	17144928
6	93586464	30293296	19390944	7652761	17057440
7	92633216	29989552	19291488	7613516	16959856
8	91763952	29715424	19192032	7574271	16872368
9	90971200	29471888	19092576	7535026	16784880
10	90560624	29337120	19129536	7549277	16774022
11	90701696	29411696	19248672	7601231	16768733
12	90552640	29374704	19340784	7636927	16787312
13	90398800	29340208	19434208	7677379	16771750
14	90205312	29288896	19461264	7708512	16780576
15	89918112	29221072	19502320	7705762	16757851
16	89615696	29145648	19532432	7699584	16729938
17	89309280	29069312	19560576	7713390	16701262
18	89152960	29048000	19581856	7705204	16669322
19	88832672	28965536	19600688	7696679	16636329
20	88503728	28897376	19625248	7692048	16594249
21	88313968	28881136	19684416	7686636	16575724
22	87973360	28806624	19700624	7679772	16530516
23	87752816	28776336	19744560	7671176	16505245
24	87386992	28688096	19742416	7645195	16453299

YEAR	SHGR(1)	SHGR(2)	SHGR(3)	SHGR(4)	SHGR(5)	SHOR(1)	SHOR(2)	SHOR(3)	SHOR(4)	SHOR(5)	SHER(1)	SHER(2)	SHER(3)	SHER(4)	SHER(5)
1	0.8302	0.7829	0.7281	0.6923	0.8193	0.0790	0.1214	0.1511	0.2040	0.0947	0.0908	0.0957	0.1208	0.1037	0.0860
2	0.7469	0.7046	0.6868	0.6177	0.7277	0.0559	0.0622	0.0839	0.0760	0.0537	0.1972	0.2332	0.2293	0.3063	0.2186
3	0.7476	0.7303	0.7164	0.6984	0.7418	0.1243	0.1501	0.1521	0.2018	0.1385	0.1280	0.1196	0.1315	0.0998	0.1197
4	0.6997	0.6803	0.6805	0.6010	0.6884	0.0831	0.0797	0.0889	0.0700	0.0786	0.2171	0.2399	0.2306	0.3290	0.2331
5	0.7055	0.7021	0.6985	0.6836	0.7046	0.1450	0.1594	0.1552	0.2118	0.1546	0.1495	0.1385	0.1463	0.1046	0.1408
6	0.6727	0.6495	0.6578	0.5603	0.6577	0.1031	0.0969	0.1021	0.0774	0.0980	0.2242	0.2536	0.2401	0.3622	0.2444
7	0.6832	0.6810	0.6808	0.6560	0.6824	0.1506	0.1683	0.1608	0.2270	0.1626	0.1662	0.1506	0.1584	0.1170	0.1550
8	0.6165	0.5897	0.6014	0.5096	0.5982	0.1218	0.1135	0.1179	0.0963	0.1157	0.2616	0.2969	0.2808	0.3941	0.2860
9	0.6270	0.6226	0.6243	0.5949	0.6246	0.1790	0.1983	0.1898	0.2467	0.1924	0.1940	0.1791	0.1859	0.1584	0.1830
10	0.5792	0.5582	0.5675	0.5112	0.5645	0.1402	0.1332	0.1365	0.1265	0.1349	0.2806	0.3086	0.2960	0.3623	0.3006
11	0.5777	0.5762	0.5769	0.5641	0.5771	0.1979	0.2128	0.2062	0.2412	0.2085	0.2244	0.2110	0.2168	0.1948	0.2144
12	0.5158	0.5032	0.5087	0.4804	0.5068	0.1815	0.1758	0.1783	0.1710	0.1771	0.3028	0.3210	0.3129	0.3486	0.3161
13	0.5146	0.5158	0.5154	0.5139	0.5157	0.2324	0.2416	0.2376	0.2564	0.2391	0.2530	0.2426	0.2470	0.2296	0.2452
14	0.4726	0.4665	0.4692	0.4567	0.4682	0.2202	0.2158	0.2177	0.2111	0.2169	0.3072	0.3177	0.3131	0.3322	0.3149
15	0.4658	0.4677	0.4669	0.4693	0.4673	0.2587	0.2637	0.2615	0.2709	0.2624	0.2755	0.2685	0.2715	0.2598	0.2703
16	0.4372	0.4344	0.4356	0.4302	0.4351	0.2573	0.2544	0.2557	0.2509	0.2551	0.3055	0.3112	0.3087	0.3189	0.3097
17	0.4334	0.4348	0.4342	0.4365	0.4345	0.2796	0.2822	0.2811	0.2858	0.2815	0.2870	0.2830	0.2847	0.2778	0.2840
18	0.4165	0.4151	0.4157	0.4132	0.4155	0.2807	0.2790	0.2798	0.2769	0.2795	0.3027	0.3059	0.3045	0.3100	0.3051
19	0.4117	0.4126	0.4122	0.4137	0.4124	0.2939	0.2952	0.2947	0.2970	0.2949	0.2944	0.2921	0.2931	0.2893	0.2927
20	0.3969	0.3962	0.3965	0.3953	0.3964	0.2992	0.2983	0.2987	0.2971	0.2985	0.3038	0.3055	0.3048	0.3076	0.3050
21	0.3886	0.3891	0.3889	0.3897	0.3890	0.3133	0.3139	0.3136	0.3148	0.3138	0.2981	0.2970	0.2974	0.2955	0.2972
22	0.3788	0.3778	0.3782	0.3765	0.3781	0.3168	0.3163	0.3165	0.3157	0.3164	0.3044	0.3059	0.3053	0.3078	0.3055
23	0.3574	0.3583	0.3579	0.3594	0.3581	0.3283	0.3291	0.3288	0.3302	0.3289	0.3143	0.3126	0.3133	0.3104	0.3130
24	0.3263	0.3252	0.3257	0.3237	0.3255	0.3477	0.3470	0.3473	0.3460	0.3472	0.3260	0.3278	0.3270	0.3302	0.3274

YEAR	DPSA(1)	DPSA(2)	DPSA(3)	DPSA(4)	DPSA(5)	REXTSA(1)	REXTSA(2)	REXTSA(3)	REXTSA(4)	REXTSA(5)
1	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
4	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
7	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
19	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000

YEAR	SPOP(1)	SPOP(2)	SPOP(3)	SPOP(4)	SPOP(5)	BPOP(1)	BPOP(2)	BPOP(3)	BPOP(4)	BPOP(5)
1	0	0	0	0	0	1716402	639634	423789	192918	286962
2	1700575	634849	424673	193226	287801	1700575	634849	424673	193226	287801
3	1687532	630629	425867	193767	288016	1686544	630546	425805	193752	287980
4	1675927	626755	427250	194423	288349	1674102	626587	427147	194408	288278
5	1665718	623401	428838	195207	288854	1662755	623141	428671	195188	288767
6	1656599	620290	430497	196106	289483	1652717	619952	430291	196082	289459
7	1649014	617515	432374	197107	289316	1644172	617133	432122	197082	289091
8	1642855	615323	434693	198172	290159	1636565	614792	434395	198144	289902
9	1637982	613726	436811	199203	291087	1631387	613534	436459	199223	290795
10	1633995	611986	439197	200217	291947	1626412	611429	438636	200261	291621
11	1632403	611286	441807	201277	292894	1624035	610658	440449	201248	292922
12	1630811	610586	444415	202263	293842	1621658	609887	442262	202234	294224
13	1629220	609886	447025	203250	294789	1619281	609116	444075	203221	295525
14	1627628	609186	449634	204237	295737	1616904	608345	445888	204208	296827
15	1627627	609705	452802	204758	296718	1616277	608835	448985	204727	297461
16	1627626	610224	455969	205279	297697	1615649	609326	452082	205247	298095
17	1627624	610743	459136	205800	298677	1615022	609816	455178	205767	298729
18	1627623	611261	462304	206321	299656	1614394	610307	458275	206286	299363
19	1627622	611780	465471	206842	300636	1613767	610797	461372	206806	299997
20	1627617	613060	469144	206845	301343	1613316	612153	464969	206813	300663
21	1627613	614340	472817	206848	302050	1612866	613508	468566	206821	301329
22	1627609	615621	476489	206850	302757	1612416	614864	472164	206828	301994
23	1627605	616901	480163	206854	303464	1611965	616219	475761	206836	302660
24	1627601	618181	483835	206857	304171	1611515	617575	479358	206843	303326

YEAR	TPOP(1)	TPOP(2)	TPOP(3)	TPOP(4)	TPOP(5)
1	1818403	648252	437304	237424	303603
2	1802740	643611	438259	237846	304441
3	1788915	639333	439491	238512	304669
4	1776614	635405	440919	239320	305021
5	1765792	632005	442558	240285	305555
6	1756126	628851	444270	241391	306221
7	1748086	626038	446207	242623	306044
8	1741558	623816	448600	243935	306936
9	1736393	622197	450786	245204	307918
10	1732168	620433	453249	246452	308828
11	1730481	619723	455942	247757	309830
12	1728794	619014	458634	248971	310833
13	1727108	618304	461327	250186	311835
14	1725421	617595	464020	251401	312838
15	1725421	618121	467289	252042	313875
16	1725421	618647	470558	252683	314911
17	1725420	619173	473826	253325	315948
18	1725420	619699	477095	253966	316984
19	1725420	620225	480364	254607	318021
20	1725416	621523	484154	254611	318769
21	1725412	622821	487945	254615	319517
22	1725408	624119	491735	254618	320264
23	1725405	625417	495526	254622	321012
24	1725401	626715	499316	254626	321760

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*   COMMERCIAL CONSUMPTION SUMMARY   *
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YEAR	CFA(1)	CFA(2)	CFA(3)	CFA(4)	CFA(5)	TCDC(1)	TCDC(2)	TCDC(3)	TCDC(4)	TCDC(5)
2	512629760	170430784	138779184	56844736	83514640	38019616	11659891	7702650	3291726	5581653
3	509067776	169522704	139579472	56958192	83656416	37559840	11538222	7663943	3275184	5553604
4	505454080	168614624	140393552	57071696	83798128	37094288	11416216	7625236	3258642	5525555
5	503802112	168117728	141511184	57429104	84039920	36776144	11322600	7586529	3242100	5497506
6	502150144	167630016	142628816	57786560	84273344	36457584	11230086	7547822	3225558	5469457
7	500498176	167141088	143746448	58144016	84515136	36138608	11136266	7509115	3209016	5441408
8	498846208	166661360	144864080	58501440	84756928	35819216	11043555	7470408	3192474	5413359
9	497194240	166164480	145981680	58858896	84998704	35499392	10949533	7431701	3175932	5385310
10	497400576	166181600	147458080	59284432	85415552	35306976	10890626	7392994	3159390	5357261
11	497555456	166215872	148920640	59715616	85832448	35114560	10831719	7354287	3142848	5329212
12	497762048	166250160	150397040	60141152	86249296	34922144	10772812	7315580	3126306	5301163
13	497916928	166267280	151859600	60572336	86674512	34729728	10713905	7276873	3109764	5273114
14	498123264	166301568	153335968	60997872	87091360	34537312	10654998	7238166	3093222	5245065
15	499155968	167072560	155033104	61298592	87533232	34344896	10596091	7199459	3076680	5217016
16	500188416	167860704	156730272	61604944	87975104	34152480	10537184	7160752	3060138	5188967
17	501220864	168631744	158427408	61905664	88425344	33960064	10478277	7122045	3043596	5160918
18	502253312	169419888	160124544	62212048	88867216	33767648	10419370	7083338	3027054	5132869
19	503285760	170190928	161821696	62512736	89309088	33575232	10360463	7044631	3010512	5104820
20	504576512	170516480	163905152	62631888	89734304	33382816	10301556	7005924	2993970	5076771
21	505867008	170842016	166002480	62756736	90159504	33190400	10242649	6967217	2977428	5048722
22	507209216	171184688	168085952	62875888	90593024	32997984	10183742	6928510	2960886	5020673
23	508499968	171510240	170183216	63000688	91018240	32805568	10124835	6889803	2944344	4992624
24	509790464	171835792	172266688	63119840	91443440	32613152	10065928	6851096	2927802	4964575

YEAR	CONSVC	S1	S2	S3
2	0.0000	0.10	0.80	0.10
3	-0.0094	0.10	0.80	0.10
4	-0.0190	0.10	0.80	0.10
5	-0.0468	0.10	0.80	0.10
6	-0.0489	0.10	0.80	0.10
7	-0.0676	0.10	0.80	0.10
8	-0.0881	0.10	0.80	0.10
9	-0.0978	0.10	0.80	0.10
10	-0.0954	0.10	0.80	0.10
11	-0.1205	0.10	0.80	0.10
12	-0.1363	0.10	0.80	0.10
13	-0.1459	0.10	0.80	0.10
14	-0.1578	0.10	0.80	0.10
15	-0.1723	0.10	0.80	0.10
16	-0.1821	0.10	0.80	0.10
17	-0.1895	0.10	0.80	0.10
18	-0.1976	0.10	0.80	0.10
19	-0.2046	0.10	0.80	0.10
20	-0.2151	0.10	0.80	0.10
21	-0.2239	0.10	0.80	0.10
22	-0.2275	0.10	0.80	0.10
23	-0.2364	0.10	0.80	0.10
24	-0.2472	0.10	0.80	0.10

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* INDUSTRIAL CONSUMPTION SUMMARY *

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YEAR	TENCI(1)	TENCI(2)	TENCI(3)	TENCI(4)	TENCI(5)	TCDI(1)	TCDI(2)	TCDI(3)	TCDI(4)	TCDI(5)
2	152556096	20215168	69897168	37984256	57338016	53446192	7349507	24711648	14323990	16875728
3	152418656	20113568	70257600	37942416	57315056	53128944	7275075	24587456	14236067	16784096
4	152265936	20009936	70617056	37900576	57286368	52806256	7199705	24463264	14148127	16690771
5	152659312	20066016	71314288	37907568	57318032	52537408	7162582	24339072	14076067	16605925
6	153057888	20122704	71996368	37917824	57349008	52268560	7125459	24214880	14004007	16521079
7	153447584	20176336	72663280	37924512	57379296	51999712	7088336	24090688	13931947	16436233
8	153815296	20230496	73315040	37934320	57408896	51730864	7051213	23966496	13859887	16351387
9	154187296	20281696	73951632	37940704	57437792	51462016	7014090	23842304	13787827	16266541
10	154625552	20356656	74715616	37956288	57475424	51193168	6976967	23718112	13715767	16181695
11	155065344	20428176	75466512	37968448	57512128	50924320	6939844	23593920	13643707	16096849
12	155482240	20499488	76193216	37983264	57547920	50655472	6902721	23469728	13571647	16012003
13	155900048	20567424	76906576	37994816	57582784	50386624	6865598	23345536	13499587	15927157
14	156295552	20635072	77596016	38008880	57616736	50117776	6828475	23221344	13427527	15842311
15	156735360	20716992	78146688	38022560	57653904	49848928	6791352	23097152	13355467	15757465
16	157162928	20798048	78682064	38033200	57694048	49580080	6754229	22972960	13283407	15672619
17	157567904	20876800	79206848	38046128	57729152	49311232	6717106	22848768	13211347	15587773
18	157971056	20951888	79711632	38056160	57767008	49042384	6679983	22724576	13139287	15502927
19	158361984	21026000	80201120	38068320	57800048	48773536	6642860	22600384	13067227	15418081
20	158769088	21111648	80787376	38077744	57839168	48504688	6605737	22476192	12995167	15333235
21	159163072	21193328	81358896	38086864	57877024	48235840	6568614	22352000	12923107	15248389
22	159543920	21273456	81911360	38097888	57913616	47966992	6531491	22227808	12851047	15163543
23	159911648	21349680	82440880	38106400	57948944	47698144	6494368	22103616	12778987	15078697
24	160266224	21424288	82955248	38114608	57983008	47429296	6457245	21979424	12706927	14993851

YEAR	SHGI(1)	SHGI(2)	SHGI(3)	SHGI(4)	SHGI(5)	SHOI(1)	SHOI(2)	SHOI(3)	SHOI(4)	SHOI(5)	SHCI(1)	SHCI(2)	SHCI(3)	SHCI(4)	SHCI(5)
1	0.3521	0.3654	0.3572	0.3790	0.2958	0.0757	0.0786	0.0768	0.0816	0.0636	0.5722	0.5560	0.5660	0.5394	0.6406
2	0.3526	0.3583	0.3548	0.3643	0.3305	0.0758	0.0776	0.0764	0.0794	0.0683	0.5716	0.5641	0.5688	0.5562	0.6012
3	0.3527	0.3557	0.3539	0.3589	0.3408	0.0777	0.0785	0.0780	0.0794	0.0743	0.5696	0.5657	0.5681	0.5617	0.5849
4	0.3503	0.3518	0.3509	0.3534	0.3446	0.0792	0.0796	0.0793	0.0801	0.0774	0.5705	0.5686	0.5698	0.5665	0.5780
5	0.3057	0.3065	0.3060	0.3072	0.3029	0.0897	0.0900	0.0898	0.0903	0.0887	0.6045	0.6035	0.6042	0.6025	0.6084
6	0.3243	0.3247	0.3245	0.3251	0.3228	0.0838	0.0840	0.0839	0.0841	0.0833	0.5918	0.5913	0.5916	0.5908	0.5939
7	0.2928	0.2930	0.2928	0.2932	0.2920	0.0909	0.0910	0.0909	0.0911	0.0906	0.6163	0.6161	0.6162	0.6158	0.6174
8	0.2640	0.2641	0.2640	0.2642	0.2636	0.0950	0.0951	0.0950	0.0951	0.0948	0.6410	0.6409	0.6410	0.6407	0.6416
9	0.2541	0.2541	0.2541	0.2542	0.2539	0.0925	0.0925	0.0925	0.0925	0.0924	0.6534	0.6534	0.6534	0.6533	0.6537
10	0.2723	0.2724	0.2723	0.2724	0.2722	0.0881	0.0881	0.0881	0.0881	0.0880	0.6396	0.6396	0.6396	0.6395	0.6398
11	0.2218	0.2218	0.2218	0.2219	0.2218	0.1008	0.1008	0.1008	0.1008	0.1008	0.6774	0.6774	0.6774	0.6773	0.6775
12	0.1933	0.1933	0.1933	0.1933	0.1933	0.0989	0.0989	0.0989	0.0989	0.0989	0.7078	0.7078	0.7078	0.7078	0.7078
13	0.1748	0.1748	0.1748	0.1748	0.1747	0.0954	0.0954	0.0954	0.0955	0.0954	0.7298	0.7298	0.7298	0.7298	0.7298
14	0.1574	0.1574	0.1574	0.1574	0.1574	0.0945	0.0945	0.0945	0.0945	0.0945	0.7481	0.7481	0.7481	0.7481	0.7481
15	0.1466	0.1466	0.1466	0.1466	0.1466	0.0944	0.0944	0.0944	0.0944	0.0944	0.7590	0.7590	0.7590	0.7590	0.7590
16	0.1399	0.1399	0.1399	0.1399	0.1399	0.0946	0.0946	0.0946	0.0946	0.0946	0.7655	0.7655	0.7655	0.7655	0.7655
17	0.1354	0.1354	0.1354	0.1354	0.1354	0.0946	0.0946	0.0946	0.0946	0.0946	0.7701	0.7701	0.7701	0.7701	0.7701
18	0.1312	0.1312	0.1312	0.1312	0.1312	0.0957	0.0957	0.0957	0.0957	0.0957	0.7731	0.7731	0.7731	0.7731	0.7731
19	0.1272	0.1272	0.1272	0.1272	0.1272	0.0964	0.0964	0.0964	0.0964	0.0964	0.7765	0.7765	0.7765	0.7765	0.7765
20	0.1201	0.1201	0.1201	0.1201	0.1201	0.0984	0.0984	0.0984	0.0984	0.0984	0.7815	0.7815	0.7815	0.7815	0.7815
21	0.1144	0.1144	0.1144	0.1144	0.1144	0.0988	0.0988	0.0988	0.0988	0.0988	0.7869	0.7869	0.7869	0.7869	0.7869
22	0.1125	0.1125	0.1125	0.1125	0.1125	0.0976	0.0976	0.0976	0.0976	0.0976	0.7899	0.7899	0.7899	0.7899	0.7899
23	0.1073	0.1073	0.1073	0.1073	0.1073	0.0994	0.0994	0.0994	0.0994	0.0994	0.7934	0.7934	0.7934	0.7934	0.7934
24	0.0996	0.0996	0.0996	0.0996	0.0996	0.1009	0.1009	0.1009	0.1009	0.1009	0.7996	0.7996	0.7996	0.7996	0.7996

SUMMARY OF POTENTIAL & EFFECTIVELY SUPPLIED DEMAND

YEAR	PNDGRS(1)	PNDGRS(2)	PNDGRS(3)	PNDGRS(4)	PNDGRS(5)	CNDGRS(1)	CNDGRS(2)	CNDGRS(3)	CNDGRS(4)	CNDGRS(5)
2	1747385.00	620386.75	375808.63	169176.75	288845.75	0.00	0.00	0.00	0.00	0.00
3	1523184.00	552303.81	342831.00	175733.56	267083.81	0.00	0.00	0.00	0.00	0.00
4	1705482.00	616501.25	401127.75	183143.19	255806.13	0.00	0.00	0.00	0.00	0.00
5	1174371.00	433732.75	289331.69	157771.81	225224.56	0.00	0.00	0.00	0.00	0.00
6	1119770.00	401261.50	339931.44	134236.69	172018.69	0.00	0.00	0.00	0.00	0.00
7	1139109.00	421212.31	295731.00	162441.88	149432.00	0.00	0.00	0.00	0.00	0.00
8	1030474.25	365892.88	338854.44	129139.31	205346.50	0.00	0.00	0.00	0.00	0.00
9	1051565.00	388122.88	282043.63	150354.81	175649.56	0.00	0.00	0.00	0.00	0.00
10	502294.88	177696.25	208166.00	81626.25	116904.56	329193.56	116458.38	136427.63	53496.14	76616.75
11	735588.63	271589.94	218595.88	91199.25	82186.69	735588.63	271589.94	218595.88	91199.25	82186.69
12	445560.13	160011.13	191573.00	74941.75	106066.63	445560.13	160011.13	191573.00	74941.75	106066.63
13	440811.56	162602.31	192891.25	79697.75	71912.13	440811.56	162602.31	192891.25	79697.75	71912.13
14	401324.00	145777.19	126521.88	70378.06	96313.94	401324.00	145777.19	126521.88	70378.06	96313.94
15	210476.00	92526.56	140526.31	36495.84	64749.23	210476.00	92526.56	140526.31	36495.84	64749.23
16	195261.19	84917.69	129579.31	33067.48	59562.05	195261.19	84917.69	129579.31	33067.48	59562.05
17	191228.31	84012.19	127612.06	53051.93	58799.68	191228.31	84012.19	127612.06	53051.93	58799.68
18	341345.44	139027.38	120750.19	31059.57	55535.98	341345.44	139027.38	120750.19	31059.57	55535.98
19	177389.44	77876.13	118297.69	30720.62	54482.39	177389.44	77876.13	118297.69	30720.62	54482.39
20	168879.50	92181.56	124018.88	34614.14	45395.99	168879.50	92181.56	124018.88	34614.14	45395.99
21	308058.94	144108.63	158634.19	33833.69	68950.31	308058.94	144108.63	158634.19	33833.69	68950.31
22	157207.56	85837.75	115667.25	32381.42	42267.01	157207.56	85837.75	115667.25	32381.42	42267.01
23	277224.94	130061.56	143406.88	30649.93	62204.39	277224.94	130061.56	143406.88	30649.93	62204.39
24	131993.63	72108.06	97315.94	13264.23	35529.68	131993.63	72108.06	97315.94	13264.23	35529.68

YEAR	NGCSA(1)	NGCSA(2)	NGCSA(3)	NGCSA(4)	NGCSA(5)	NGCNSA(1)	NGCNSA(2)	NGCNSA(3)	NGCNSA(4)	NGCNSA(5)
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	1835.55	649.36	760.71	298.29	427.21	0.00	0.00	0.00	0.00	0.00
11	4147.15	1531.19	1232.41	514.17	463.36	0.00	0.00	0.00	0.00	0.00
12	2540.23	912.26	1092.20	427.26	604.71	0.00	0.00	0.00	0.00	0.00
13	2541.72	937.57	1112.21	459.54	414.65	0.00	0.00	0.00	0.00	0.00
14	2340.63	850.21	737.91	410.46	561.73	0.00	0.00	0.00	0.00	0.00
15	1241.83	545.92	829.12	215.33	382.03	0.00	0.00	0.00	0.00	0.00
16	1165.61	506.92	773.52	197.40	355.56	0.00	0.00	0.00	0.00	0.00
17	1155.13	507.48	770.85	320.46	355.18	0.00	0.00	0.00	0.00	0.00
18	2086.76	849.92	738.19	189.68	339.51	0.00	0.00	0.00	0.00	0.00
19	1097.67	481.89	732.01	190.10	337.13	0.00	0.00	0.00	0.00	0.00
20	1057.91	577.45	776.89	216.83	284.37	0.00	0.00	0.00	0.00	0.00
21	1953.90	914.02	1006.15	214.59	437.32	0.00	0.00	0.00	0.00	0.00
22	1009.73	551.33	742.92	207.98	271.48	0.00	0.00	0.00	0.00	0.00
23	1803.41	846.08	932.90	199.38	404.65	0.00	0.00	0.00	0.00	0.00
24	869.80	475.17	641.28	87.41	234.13	0.00	0.00	0.00	0.00	0.00

YEAR	PNDGRN(1)	PNDGRN(2)	PNDGRN(3)	PNDGRN(4)	PNDGRN(5)	CNDGRN(1)	CNDGRN(2)	CNDGRN(3)	CNDGRN(4)	CNDGRN(5)
2	147937.50	17335.81	12763.25	37624.66	12563.70	0.00	0.00	0.00	0.00	0.00
3	80361.88	6686.32	9760.38	37084.29	13637.64	0.00	0.00	0.00	0.00	0.00
4	92159.25	7649.23	11694.11	39313.61	13136.60	0.00	0.00	0.00	0.00	0.00
5	60270.68	5115.90	8103.71	33079.34	11341.14	0.00	0.00	0.00	0.00	0.00
6	57624.32	4745.54	9797.68	28279.11	8400.78	0.00	0.00	0.00	0.00	0.00
7	58774.51	4997.95	8361.25	34360.95	7055.21	0.00	0.00	0.00	0.00	0.00
8	53332.94	4356.66	9882.08	27399.93	10490.15	0.00	0.00	0.00	0.00	0.00
9	54571.00	4644.62	8035.33	31923.96	8728.44	0.00	0.00	0.00	0.00	0.00
10	22364.52	1815.91	5770.20	16473.31	5483.45	0.00	0.00	0.00	0.00	0.00
11	36508.54	3109.18	6099.41	18465.44	3462.42	0.00	0.00	0.00	0.00	0.00
12	19984.07	1656.00	5349.92	15122.39	5015.68	0.00	0.00	0.00	0.00	0.00
13	19787.92	1684.81	5392.09	16094.07	3033.82	0.00	0.00	0.00	0.00	0.00
14	18033.64	1513.25	3344.47	14221.52	4559.93	0.00	0.00	0.00	0.00	0.00
15	6763.34	788.90	3802.79	6366.38	2746.69	0.00	0.00	0.00	0.00	0.00
16	6274.44	725.81	3508.10	5767.54	2526.43	0.00	0.00	0.00	0.00	0.00
17	6146.56	718.01	3453.95	10378.55	2494.26	0.00	0.00	0.00	0.00	0.00
18	15433.22	1500.89	3267.51	5420.05	2355.57	0.00	0.00	0.00	0.00	0.00
19	5700.41	664.28	3201.21	5361.63	2311.52	0.00	0.00	0.00	0.00	0.00
20	5432.43	884.12	3415.80	6357.34	1828.00	0.00	0.00	0.00	0.00	0.00
21	13926.30	1612.58	4541.14	6220.01	3216.05	0.00	0.00	0.00	0.00	0.00
22	5033.80	823.74	3186.94	5957.98	1701.06	0.00	0.00	0.00	0.00	0.00
23	12567.80	1455.96	4107.67	5646.54	2903.58	0.00	0.00	0.00	0.00	0.00
24	4226.55	691.17	2682.33	1789.51	1431.24	0.00	0.00	0.00	0.00	0.00

YEAR	PNDGC(1)	PNDGC(2)	PNDGC(3)	PNDGC(4)	PNDGC(5)	CNDGC(1)	CNDGC(2)	CNDGC(3)	CNDGC(4)	CNDGC(5)
2	108670.44	36067.25	62744.79	16483.34	23518.80	0.00	0.00	0.00	0.00	0.00
3	108619.94	35904.90	62114.11	16553.73	23285.41	0.00	0.00	0.00	0.00	0.00
4	108134.38	35594.57	61796.27	16319.95	22951.16	0.00	0.00	0.00	0.00	0.00
5	99035.38	32730.41	68427.00	24269.68	24934.59	0.00	0.00	0.00	0.00	0.00
6	100360.56	33142.73	69196.19	24544.32	24894.53	0.00	0.00	0.00	0.00	0.00
7	95197.19	31435.44	65497.03	23232.20	23866.91	0.00	0.00	0.00	0.00	0.00
8	89328.19	29471.11	61328.32	21752.46	22347.85	0.00	0.00	0.00	0.00	0.00
9	87492.31	28866.66	59937.94	21260.75	21841.07	0.00	0.00	0.00	0.00	0.00
10	95496.81	29935.39	74213.44	24296.69	28561.58	0.00	0.00	0.00	0.00	0.00
11	83883.56	27315.37	65990.19	21916.54	25561.55	0.00	0.00	0.00	0.00	0.00
12	79085.06	25275.55	61453.78	20119.30	23650.91	0.00	0.00	0.00	0.00	0.00
13	74380.56	23754.57	58514.25	19433.64	22891.89	0.00	0.00	0.00	0.00	0.00
14	71106.06	22727.57	55257.93	18091.11	21266.71	0.00	0.00	0.00	0.00	0.00
15	84752.31	38171.84	55979.69	13705.24	20138.77	0.00	0.00	0.00	0.00	0.00
16	80317.31	36558.14	53054.81	13114.15	19086.28	0.00	0.00	0.00	0.00	0.00
17	76894.25	34636.09	50792.97	12435.39	18450.89	0.00	0.00	0.00	0.00	0.00
18	73504.06	33456.97	48553.57	12002.35	17467.21	0.00	0.00	0.00	0.00	0.00
19	70286.56	31659.76	46428.56	11366.18	16702.63	0.00	0.00	0.00	0.00	0.00
20	70196.81	21433.51	50279.41	7303.22	15266.50	0.00	0.00	0.00	0.00	0.00
21	66077.25	20176.73	47568.62	6972.29	14371.25	0.00	0.00	0.00	0.00	0.00
22	65737.94	20095.67	46468.45	6749.63	14248.41	0.00	0.00	0.00	0.00	0.00
23	60779.20	18557.98	43750.66	6412.08	13218.34	0.00	0.00	0.00	0.00	0.00
24	55396.98	16915.72	39681.66	5763.84	12048.37	0.00	0.00	0.00	0.00	0.00

YEAR	NCGC(1)	NCGC(2)	NCGC(3)	NCGC(4)	NCGC(5)	PNDGI(1)	PNDGI(2)	PNDGI(3)	PNDGI(4)	PNDGI(5)
2	0.00	0.00	0.00	0.00	0.00	269213.38	36396.55	253876.44	69261.19	94786.13
3	0.00	0.00	0.00	0.00	0.00	269326.88	36321.41	250568.81	68249.94	97744.38
4	0.00	0.00	0.00	0.00	0.00	267566.25	36110.16	248129.00	67215.50	98830.31
5	0.00	0.00	0.00	0.00	0.00	353710.44	48320.12	319739.69	60560.30	96482.25
6	0.00	0.00	0.00	0.00	0.00	376894.88	51395.82	334110.50	65151.38	102585.81
7	0.00	0.00	0.00	0.00	0.00	337621.19	45473.93	297095.31	57699.19	92601.50
8	0.00	0.00	0.00	0.00	0.00	298618.00	41130.28	263852.25	52819.64	83404.75
9	0.00	0.00	0.00	0.00	0.00	288508.56	38828.82	250086.44	49950.67	80150.75
10	0.00	0.00	0.00	0.00	0.00	327275.94	48084.80	302734.00	56033.08	88321.63
11	0.00	0.00	0.00	0.00	0.00	266936.38	38404.34	243696.06	44880.18	71752.13
12	0.00	0.00	0.00	0.00	0.00	228178.81	33424.09	207675.25	39619.50	62353.55
13	0.00	0.00	0.00	0.00	0.00	206454.19	29627.99	185424.63	35248.06	56214.85
14	0.00	0.00	0.00	0.00	0.00	182448.63	26640.95	163250.75	32143.16	50494.55
15	0.00	0.00	0.00	0.00	0.00	176395.25	26900.76	131681.56	29876.01	47493.77
16	0.00	0.00	0.00	0.00	0.00	166668.88	25557.73	123558.94	28093.30	45752.82
17	0.00	0.00	0.00	0.00	0.00	158194.69	24415.34	118110.13	27490.15	43583.98
18	0.00	0.00	0.00	0.00	0.00	153051.50	23177.82	111825.06	26258.08	42593.93
19	0.00	0.00	0.00	0.00	0.00	146800.25	22342.42	106448.31	25722.86	40674.44
20	0.00	0.00	0.00	0.00	0.00	140644.44	22495.71	112201.31	23974.97	39160.83
21	0.00	0.00	0.00	0.00	0.00	132393.50	20962.17	105130.69	22789.50	37136.70
22	0.00	0.00	0.00	0.00	0.00	128784.00	20450.08	101293.88	22636.91	36396.68
23	0.00	0.00	0.00	0.00	0.00	121348.25	19074.03	94091.13	21307.82	34557.36
24	0.00	0.00	0.00	0.00	0.00	111347.25	17546.97	85843.19	19751.43	31956.39

YEAR	CNDGI(1)	CNDGI(2)	CNDGI(3)	CNDGI(4)	CNDGI(5)	NIGC(1)	NIGC(2)	NIGC(3)	NIGC(4)	NIGC(5)
2	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
4	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
7	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
19	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000

YEAR	PDGRST	PDGRNT	PDGCT	PDGIT	CNDRST	CNDRNT	CNDGCT	CNDGIT
2	3201600.00	228224.81	247484.44	723533.63	0.00	0.00	0.00	0.00
3	2861134.00	147530.44	246477.94	722211.38	0.00	0.00	0.00	0.00
4	3162059.00	163952.63	244796.25	717851.19	0.00	0.00	0.00	0.00
5	2280429.00	117910.69	249396.94	878812.69	0.00	0.00	0.00	0.00
6	2167216.00	108847.31	252138.25	930138.38	0.00	0.00	0.00	0.00
7	2167925.00	113549.81	239228.69	830491.06	0.00	0.00	0.00	0.00
8	2069706.00	105461.63	224227.81	739824.88	0.00	0.00	0.00	0.00
9	2047733.00	107903.31	219398.69	707525.19	0.00	0.00	0.00	0.00
10	1086687.00	51907.40	252503.88	822449.38	712192.44	0.00	0.00	0.00
11	1399159.00	67644.94	224667.06	665669.00	1399159.00	0.00	0.00	0.00
12	978152.63	47128.05	209584.44	571251.13	978152.63	0.00	0.00	0.00
13	947915.00	45992.70	198974.88	512969.63	947915.00	0.00	0.00	0.00
14	840315.06	41672.82	188449.25	454977.94	840315.06	0.00	0.00	0.00
15	544773.88	20468.09	212747.75	412347.31	544773.88	0.00	0.00	0.00
16	502387.63	18802.31	202130.56	389631.56	502387.63	0.00	0.00	0.00
17	514704.06	23191.33	193209.50	371794.19	514704.06	0.00	0.00	0.00
18	687718.50	27977.23	184984.06	356906.31	687718.50	0.00	0.00	0.00
19	458766.19	17239.05	176443.63	341988.19	458766.19	0.00	0.00	0.00
20	465090.00	17917.69	164479.31	338477.19	465090.00	0.00	0.00	0.00
21	713585.75	29516.08	155166.00	318412.50	713585.75	0.00	0.00	0.00
22	433360.94	16703.51	153300.00	309561.44	433360.94	0.00	0.00	0.00
23	643547.63	26681.55	142718.13	290378.50	643547.63	0.00	0.00	0.00
24	350211.44	10820.79	129806.44	266445.13	350211.44	0.00	0.00	0.00

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* SUMMARY OF YEARLY COMMITTED REQUIREMENTS

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YEAR	BASEDR	BASEDC	BASEDI	BASEDT	EXCSUP	TCYDR	TCYDC	TCYDI
2	174857776	66255488	116707040	357820160	-11138304	168945	64015	112760
3	172997264	65590736	116011616	354599424	-17356032	167147	63373	112088
4	171231776	64919888	115308096	351459584	-14579200	165441	62725	111409
5	169569840	64424848	114721008	348715520	-11835136	163835	62246	110842
6	167980896	63930464	114133952	346045184	-9164800	162300	61769	110274
7	166487616	63434368	113546880	343468800	-6951424	160857	61289	109707
8	165118032	62938960	112959808	341016576	-4499200	159534	60811	109140
9	163855552	62441808	112372720	338670080	-2515712	158314	60330	108573
10	162638400	62107184	111785664	336531200	712192	157826	60007	108005
11	162332848	61772576	111198592	335303936	3028736	158195	59684	107438
12	162714208	61437952	110611536	334763520	4657920	158157	59360	106871
13	162674432	61103328	110024464	333801984	6708480	158089	59037	106304
14	162604256	60768720	109437392	332810240	8426496	157917	58714	105737
15	162560368	60434096	108850320	331844608	10481152	157589	58390	105169
16	162220912	60099472	108263248	330583552	12831232	157220	58067	104602
17	161839136	59764864	107676176	329280000	14860800	156863	57744	104035
18	161469600	59430224	107089120	327988736	17241088	156674	57421	103468
19	161273136	59095600	106502032	326870528	19448320	156263	57097	102901
20	160847552	58760992	105914976	325523456	21884416	155857	56774	102333
21	160428304	58426384	105327904	324182528	23951360	155693	56451	101766
22	160257520	58091760	104740848	323089920	26133248	155257	56127	101199
23	159806592	57757120	104153776	321717248	28594688	155024	55804	100632
24	159565776	57422512	103566704	320554752	30483200	154508	55481	100064

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SUMMARY OF MONTHLY GAS FLOWS

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DDS BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	452	25	12	8	119	299	636	987	1151	849	951	353
3	270	51	3	5	187	447	663	1040	1035	966	934	678
4	452	25	12	8	119	299	636	987	1151	849	951	353
5	165	50	13	11	83	320	692	1034	1340	1016	1016	615
6	405	14	24	30	166	384	844	969	1323	1246	824	438
7	296	73	6	21	194	258	706	860	1326	922	846	481
8	452	25	12	8	119	299	636	987	1151	849	951	353
9	359	87	4	79	299	700	1115	1283	1087	946	541	662
10	311	53	27	39	161	204	650	1355	1115	1164	861	470
11	225	35	8	13	126	460	702	942	1187	1210	931	445
12	363	55	5	15	174	464	681	1087	1042	1134	867	467
13	165	50	13	11	83	320	692	1034	1340	1016	1016	615
14	274	3	4	13	90	261	617	990	1057	1066	815	429
15	142	41	5	4	186	381	537	1016	1340	884	693	482
16	452	25	12	8	119	299	636	987	1151	849	951	353
17	170	80	4	50	126	477	607	1024	1219	1070	1028	563
18	208	7	5	10	140	416	769	1233	1428	1084	989	476
19	162	60	0	4	81	366	816	1177	1196	995	931	597
20	250	100	2	30	111	384	654	1339	1292	1009	922	475
21	359	87	4	79	299	700	1115	1283	1087	946	541	662
22	359	87	4	79	299	700	1115	1283	1087	946	541	662
23	197	58	5	29	121	293	864	1266	1110	1000	865	567
24	280	14	8	19	69	197	759	875	1213	1220	992	612

DGMR BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	12510	3510	3236	3152	5491	9285	16388	23787	27243	20878	23028	10424
3	8582	4015	3014	3056	6851	12273	16777	24639	24534	23096	22428	17090
4	12251	3437	3169	3087	5378	9093	16049	23293	26678	20445	22550	10207
5	6266	3915	3159	3118	4590	9434	17037	24028	30283	23660	23660	15464
6	11067	3149	3352	3473	6227	10641	19956	22487	29655	28095	19551	11735
7	8781	4305	2961	3262	6734	8018	17009	20099	29451	21344	19818	12493
8	11813	3315	3056	2976	5186	8768	15476	22462	25726	19715	21745	9843
9	9886	4514	2875	4356	8701	16621	24818	28136	24265	21480	13481	15871
10	8911	3831	3319	3555	5957	6804	15586	29467	24742	25706	19740	12041
11	7234	3484	2951	3050	5280	11872	16648	21385	26220	26674	21168	11576
12	9955	3878	2891	3089	6226	11948	16230	24241	23353	25168	19900	12007
13	6046	3778	3048	3009	4429	9103	16440	23185	29220	22830	22830	14921
14	8187	2848	2867	3045	4562	7931	14944	22293	23613	23790	18845	11241
15	5575	3589	2881	2861	6440	10273	13341	22758	29128	20163	16408	12259
16	11642	3267	3012	2933	5110	8641	15251	22136	25353	19429	21430	9700
17	6097	4336	2848	3748	5236	12105	14649	22810	26626	23710	22688	13788
18	6832	2903	2864	2962	5503	10898	17798	26867	30679	23955	22098	12071
19	5918	3929	2759	2837	4338	9895	18667	25705	26075	22157	20909	14398
20	7613	4697	2791	3335	4911	10219	15469	28788	27875	22372	20680	11988
21	9722	4439	2827	4284	8557	16346	24407	27670	23863	21124	13258	15608
22	9695	4427	2819	4272	8533	16300	24339	27593	23796	21065	13221	15564
23	6548	3859	2834	3298	5078	8404	19448	27223	24206	22078	19467	13704
24	81	[illegible]	[illegible]	[illegible]	[illegible]	6524	17359	19595	26110	26245	21850	14525

YEAR	CURTR BY MONTH											
	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

YEAR	DGMC BY MONTH											
	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	4771	1534	1436	1405	2247	3611	6165	8825	10068	7780	8553	4020
3	3357	1714	1354	1369	2734	4685	6306	9135	9097	8579	8339	6418
4	4674	1503	1407	1377	2201	3538	6041	8648	9265	7623	8380	3939
5	2524	1676	1403	1389	1919	3666	6407	8928	11183	8795	8795	5840
6	4259	1400	1473	1517	2512	4106	7470	8384	10973	10410	7324	4501
7	3435	1817	1331	1440	2695	3160	6411	7528	10910	7978	7426	4778
8	4532	1457	1364	1335	2134	3430	5857	8384	9564	7390	8124	3819
9	3832	1889	1296	1832	3403	6267	9232	10432	9032	8025	5132	5996
10	3470	1637	1452	1538	2404	2710	5879	10887	9182	9530	7378	4600
11	2844	1501	1310	1346	2144	4504	6214	7910	9642	9804	7833	4398
12	3798	1634	1282	1352	2470	4508	6033	8887	8570	9217	7340	4529
13	2394	1590	1331	1317	1820	3477	6077	8468	10607	8342	8342	5539
14	3138	1254	1261	1324	1859	3048	5523	8115	8581	8644	6899	4216
15	2208	1510	1261	1254	2512	3861	4939	8250	10490	7338	6018	4559
16	4327	1392	1302	1275	2038	3275	5592	8005	9133	7057	7758	3647
17	2375	1760	1240	1555	2074	4474	5363	8214	9547	8528	8241	5062
18	2620	1254	1240	1274	2158	4034	6434	9589	10914	8576	7930	4442
19	2295	1605	1199	1226	1747	3674	6716	9156	9285	7926	7493	5235
20	2873	1865	1206	1394	1939	3774	5589	10193	9877	7975	7390	4386
21	3585	1767	1213	1714	3184	5864	8638	9761	8451	7509	4802	5610
22	3565	1757	1206	1704	3166	5831	8589	9705	8403	7466	4774	5578
23	2474	1555	1205	1364	1972	3108	6881	9537	8506	7779	6887	4918
24	3005	1257	1218	1290	1619	2460	6151	6913	9133	9179	7682	51[illegible]

CURTC BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.26128
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DGMI BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	9230	8272	8243	8234	8483	8887	9642	10430	10797	10120	10349	9008
3	8769	8281	8174	8178	8584	9164	9645	10486	10474	10321	10249	9679
4	9119	8173	8144	8135	8381	8780	9527	10305	10668	9999	10225	8900
5	8440	8187	8105	8101	8259	8782	9602	10356	11030	10316	10316	9432
6	8923	8066	8088	8101	8399	8877	9886	10160	10937	10768	9842	8996
7	8640	8153	8007	8039	8417	8557	9534	9870	10887	10005	9840	9043
8	8933	8007	7978	7970	8211	8601	9333	10095	10451	9795	10017	8719
9	8686	8099	7920	8082	8557	9423	10319	10681	10258	9954	9079	9340
10	8538	7984	7928	7953	8216	8308	9266	10780	10265	10370	9719	8879
11	8309	7903	7845	7856	8098	8811	9328	9841	10365	10414	9818	8779
12	8559	7904	7798	7819	8157	8773	9234	10097	10002	10197	9630	8780
13	8095	7851	7773	7769	7921	8422	9209	9932	10579	9894	9894	9046
14	8281	7711	7713	7732	7894	8253	9002	9786	9927	9946	9418	8607
15	7960	7749	7674	7671	8052	8460	8786	9788	10466	9512	9113	8671
16	8562	7674	7647	7638	7869	8244	8945	9675	10016	9388	9600	8356
17	7932	7746	7589	7684	7841	8567	8836	9699	10103	9794	9707	8745
18	7967	7553	7549	7560	7827	8395	9121	10076	10478	9770	9574	8519
19	7829	7621	7498	7506	7663	8247	9168	9906	9945	9534	9403	8719
20	7965	7660	7460	7517	7682	8238	8787	10182	10086	9510	9333	8423
21	8142	7591	7423	7575	8020	8832	9672	10012	9615	9330	8510	8755
22	8096	7549	7382	7533	7976	8783	9618	9956	9561	9278	8463	8706
23	7727	7448	7342	7390	7575	7919	9062	9866	9554	9334	9064	8467
24	7848	7319	7307	7329	7428	7683	8802	9032	9705	9719	9265	8509

CURTI BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.37770	0.33032
4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.08126	0.00000	0.39605	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.34344	0.00000	0.03343	0.13436
6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.56443	0.76473	0.00000	0.51323
7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.43948	0.00000	0.00189	0.00000
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.49330	0.00000	0.07622	0.00000	0.00000	0.00000	1.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10570	0.00000	0.08573	0.00000	0.35814
11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.20358	0.15813	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.09381	0.00000	0.00000	0.00000
19	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

DGMT BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	26511	13317	12915	12791	16221	21783	32196	43042	48109	38778	41929	23452
3	20708	14010	12542	12603	18169	26122	32728	44259	44106	41996	41017	33187
4	26044	13114	12720	12599	15960	21411	31616	42245	47212	38066	41155	23046
5	17229	13778	12667	12607	14768	21881	33047	43312	52496	42771	42771	30736
6	24249	12615	12913	13091	17138	23624	37312	41031	51564	49273	36716	25231
7	20856	14276	12299	12741	17846	19734	32953	37497	51248	39327	37084	26314
8	25279	12779	12398	12281	15530	20800	30665	40940	45741	36900	39886	22380
9	22404	14502	12090	14269	20661	32311	44368	49249	43555	39458	27692	31207
10	20918	13451	12699	13046	16577	17822	30730	51135	44189	45607	36837	25520
11	18387	12888	12107	12252	15522	25188	32191	39136	46227	46892	38818	24754
12	22312	13415	11971	12260	16853	25229	31497	43225	41925	44582	36870	25316
13	16534	13219	12152	12095	14170	21002	31726	41585	50406	41066	41066	29506
14	19605	11813	11841	12100	14314	19232	29469	40195	42121	42380	35162	24063
15	15743	12848	11816	11787	17004	22594	27066	40797	50084	37013	31538	25489
16	24531	12332	11961	11846	15018	20160	29788	39816	44502	35874	38788	21703
17	16404	13841	11677	12987	15151	25146	28848	40723	46275	42033	40837	27595
18	17420	11711	11654	11796	15488	23327	33353	46532	52071	42300	39602	25032
19	16041	13155	11456	11570	13749	21815	34551	44768	45305	39617	37805	28353
20	18452	14221	11458	12247	14532	22231	29845	49163	47838	39857	37403	24797
21	21449	13798	11463	13573	19761	31042	42717	47443	41929	37963	26569	29973
22	21356	13733	11406	13509	19675	30914	42545	47254	41760	37808	26457	29849
23	16748	12863	11382	12053	14624	19431	35390	46626	42266	39191	35418	27089
24	18979	11575	11408	11714	13106	16668	32312	35541	44949	45144	38797	28220

YEAR	DGMRYT	DGMCYT	DGMIYT	DGMTYT
2	158933	60415	111695	331042
3	166354	63088	112003	341445
4	155637	59197	110356	325190
5	164612	62526	110925	338063
6	169387	64328	111042	344757
7	154275	58909	108991	322175
8	150080	57391	108109	315579
9	175004	66366	110397	351767
10	159657	60668	108205	328530
11	157543	59450	107368	324361
12	158887	59620	106949	325456
13	158838	59303	106384	324525
14	144165	53862	104269	302295
15	145675	54201	103902	303777
16	147903	54801	103614	306319
17	158840	58434	104244	321518
18	165430	60466	104389	330286
19	157588	57557	103039	318184
20	160738	58461	102844	322043
21	172106	62098	103476	337680
22	171624	61743	102899	336266
23	156146	56187	100747	313080
24	153371	55093	99947	308410

SUPM BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	31687	23245	22288	21531	24210	21071	19093	29433	36721	30054	37089	34129
3	30824	23701	21647	21029	25773	17137	18573	31563	33786	34671	37146	29990
4	30791	23495	22600	21919	24638	16517	18553	30444	37106	32335	37106	29985
5	27590	23635	21960	21254	22644	22877	18553	29516	37106	33779	37106	29468
6	30791	23004	22801	22420	25826	15118	23999	29987	37106	37106	36716	20614
7	30758	24522	22029	21891	26324	14285	18872	25567	37066	33344	37066	33414
8	30758	22865	21950	21227	23767	19242	18533	27657	34731	28659	36058	33060
9	30725	24293	21309	22829	28431	12071	30740	37026	34804	34567	27692	20300
10	30824	23694	22425	22190	25049	15928	18573	37146	33687	37146	36837	22340
11	28958	22979	21663	21202	23764	21996	18633	26328	35773	37266	37266	31063
12	31023	23287	21280	20925	24751	19749	18693	30152	31161	36661	33945	35984
13	26731	22894	21239	20499	21747	27485	18753	26570	37422	30406	33282	40062
14	29679	21349	20770	20316	21653	25369	18793	24749	28656	31158	26649	34556
15	25747	22307	20654	19896	24205	28520	18853	24993	36222	25334	22450	35921
16	31388	21897	20922	20101	22406	25960	18913	24472	31149	24783	30442	32212
17	26426	23320	20538	21123	22387	29183	18953	25349	32891	30905	32443	38100
18	27436	21184	20509	19924	22714	29293	19013	31448	38025	31548	31696	35578
19	26104	22680	20371	19770	21067	27921	19073	29877	32461	29121	30241	38925
20	28543	23778	20409	20491	21905	28420	19133	33743	34401	28668	28932	35294
21	31458	23262	20307	21688	26971	20950	27827	34599	31434	30399	26569	40545
22	31447	23290	20358	21752	27048	21193	27744	34510	31383	30405	26457	40432
23	26851	22433	20349	20315	22021	25655	19293	31864	29565	28866	28086	37677
24	29087	21151	20381	19984	20513	22907	19333	20407	31832	34328	30808	38760

MAXINS BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	10184	9928	9373	8740	7989	7045	7145	8511	9453	10068	10472	10677
3	10207	9691	9105	8426	7604	6521	7757	8969	9747	10264	10588	10588
4	10588	10381	9880	9320	8677	7913	8370	9317	9977	10414	10660	10660
5	10360	9857	9293	8646	7876	6894	6735	8401	9384	10022	10443	10670
6	10670	10389	9889	9329	8688	7927	8674	9556	10137	10514	10680	10680
7	10680	10246	9730	9150	8478	7669	8216	9272	9947	10395	10653	10653
8	10345	10087	9552	8946	8237	7365	7555	8689	9566	10143	10518	10680
9	10209	9792	9219	8560	7770	6751	8500	9446	10063	10469	10677	10677
10	10677	10242	9726	9145	8472	7662	7865	8900	9702	10234	10571	10571
11	10571	10090	9556	8950	8243	7372	7745	8919	9714	10242	10576	10576
12	10297	9871	9309	8665	7899	6924	7639	8795	9634	10188	10545	10668
13	10197	9675	9087	8404	7577	6482	4614	7447	8838	9661	10207	10556
14	10073	9537	8928	8216	7339	6137	3634	6952	8592	9504	10102	10493
15	10004	9459	8838	8109	7200	5926	2348	6417	8359	9359	10005	10432
16	9937	9565	8961	8255	7389	6211	4206	7081	8653	9542	10128	10509
17	10021	9479	8861	8136	7236	5981	4635	7045	8636	9532	10120	10504
18	10016	9473	8855	8128	7226	5965	2733	7375	8800	9637	10191	10546
19	10063	9525	8915	8200	7318	6106	3512	7569	8903	9703	10235	10572
20	10091	9557	8951	8243	7374	6189	3818	6985	8607	9514	10108	10497
21	10008	9464	8844	8116	7210	5940	7570	8903	9703	10235	10572	10572
22	10091	9557	8951	8244	7374	6189	7653	8948	9733	10254	10583	10583
23	10103	9570	8967	8262	7397	6224	3932	7688	8967	9745	10263	10588
24	10108	9576	8973	8270	7407	6238	3977	7323	8773	9620	10179	10540

MAXOUS BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	7957	9493	11635	13185	14397	15373	15291	13609	11388	8723	4840	0
3	7783	10543	12371	13754	14854	15742	14683	12696	10320	7325	0	0
4	0	6148	9726	11794	13306	14494	13845	11801	9239	5732	0	0
5	6389	9836	11870	13365	14541	15490	15603	13795	11602	8992	5321	0
6	0	6059	9687	11767	13286	14478	13312	11044	8285	3933	0	0
7	0	7470	10386	12259	13666	14783	14082	11930	9397	5983	0	0
8	6558	8607	11058	12749	14051	15094	14906	13283	11010	8241	3828	0
9	7764	10129	12075	13523	14668	15592	13628	11410	8751	4892	0	0
10	0	7503	10404	12272	13676	14791	14554	12850	10502	7572	0	0
11	0	8585	11043	12739	14043	15087	14697	12809	10453	7507	0	0
12	7024	9770	11825	13330	14513	15467	14816	13073	10764	7921	2925	0
13	7858	10606	12417	13790	14883	15765	16459	15014	12984	10660	7784	2388
14	8690	11110	12788	14082	15119	15954	16600	15446	13466	11222	8514	4430
15	9093	11369	12983	14236	15243	16053	16672	15803	13862	11679	9087	5482
16	9449	11011	12715	14024	15072	15916	16531	15344	13353	11091	8346	4071
17	8995	11305	12935	14198	15212	16029	16455	15373	13305	11128	8394	4176
18	9023	11323	12948	14209	15221	16035	16659	15085	13063	10752	7906	2872
19	8753	11150	12818	14105	15138	15969	16611	14890	12845	10496	7564	0
20	8581	11041	12737	14041	15086	15928	16581	15420	13437	11189	8471	4342
21	9068	11353	12970	14226	15235	16047	14890	12844	10496	7564	0	0
22	8580	11041	12737	14041	15086	15928	14801	12744	10377	7403	0	0
23	8504	10993	12702	14013	15063	15910	16568	14762	12700	10325	7332	0
24	8472	10973	12687	14001	15054	15902	16562	15133	13117	10816	7989	3147

GINST BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	5177	9928	9373	8740	7989	0	0	0	0	0	0	10677
3	10116	9691	9105	8426	7604	0	0	0	0	0	0	0
4	4747	10381	9880	9320	8677	0	0	0	0	0	0	6939
5	10360	9857	9293	8646	7876	996	0	0	0	0	0	0
6	6542	10389	9889	9329	8688	0	0	0	0	0	0	0
7	9902	10246	9730	9150	8478	0	0	0	0	0	0	7100
8	5479	10087	9552	8946	8237	0	0	0	0	0	0	10680
9	8321	9792	9219	8560	7770	0	0	0	0	0	0	0
10	9906	10242	9726	9145	8472	0	0	0	0	0	0	0
11	10571	10090	9556	8950	8243	0	0	0	0	0	0	6309
12	8711	9871	9309	8665	7899	0	0	0	0	0	0	10668
13	10197	9675	9087	8404	7577	6482	0	0	0	0	0	10556
14	10073	9537	8928	8216	7339	6137	0	0	0	0	0	10493
15	10004	9459	8838	8109	7200	5926	0	0	0	0	0	10432
16	6857	9565	8961	8255	7389	5800	0	0	0	0	0	10509
17	10021	9479	8861	8136	7236	4036	0	0	0	0	0	10504
18	10016	9473	8855	8128	7226	5965	0	0	0	0	0	10546
19	10063	9525	8915	8200	7318	6106	0	0	0	0	0	10572
20	10091	9557	8951	8243	7374	6189	0	0	0	0	0	10497
21	10008	9464	8844	8116	7210	0	0	0	0	0	0	10572
22	10091	9557	8951	8244	7374	0	0	0	0	0	0	10583
23	10103	9570	8967	8262	7397	6224	0	0	0	0	0	10588
24	10108	9576	8973	8270	7407	6238	0	0	0	0	0	10540

GOUST BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	0	0	0	0	0	712	13103	13609	11388	8723	4840	0
3	0	0	0	0	0	8985	14155	12696	10320	7325	0	0
4	0	0	0	0	0	4894	13063	11801	9239	5732	0	0
5	0	0	0	0	0	0	14494	13795	11602	8992	5321	0
6	0	0	0	0	0	8507	13312	11044	8285	3933	0	0
7	0	0	0	0	0	5449	14082	11930	9397	5983	0	0
8	0	0	0	0	0	1558	12132	13283	11010	8241	3828	0
9	0	0	0	0	0	15592	13628	11410	8751	4892	0	0
10	0	0	0	0	0	1893	12157	12850	10502	7572	0	0
11	0	0	0	0	0	3191	13558	12809	10453	7507	0	0
12	0	0	0	0	0	5481	12805	13073	10764	7921	2925	0
13	0	0	0	0	0	0	12973	15014	12984	10660	7784	0
14	0	0	0	0	0	0	10676	15446	13466	11222	8514	0
15	0	0	0	0	0	0	8213	15803	13862	11679	9087	0
16	0	0	0	0	0	0	10876	15344	13353	11091	8346	0
17	0	0	0	0	0	0	9895	15373	13385	11128	8394	0
18	0	0	0	0	0	0	14341	15085	13063	10752	7906	0
19	0	0	0	0	0	0	15478	14890	12845	10496	7564	0
20	0	0	0	0	0	0	10712	15420	13437	11189	8471	0
21	0	0	0	0	0	10092	14890	12844	10496	7564	0	0
22	0	0	0	0	0	9721	14801	12744	10377	7403	0	0
23	0	0	0	0	0	0	16098	14762	12700	10325	7332	0
24	0	0	0	0	0	0	12979	15133	13117	10816	7989	0

RSTOR BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	0.81843	0.85350	0.92077	0.98428	1.04349	1.09762	1.09279	1.00401	0.91181	0.83465	0.77555	0.74276
3	0.81510	0.88364	0.94930	1.01099	1.06808	1.11959	1.05872	0.96281	0.87679	0.80687	0.75724	0.75724
4	0.75724	0.78941	0.85974	0.92668	0.98983	1.04862	1.01546	0.92695	0.84699	0.78439	0.74556	0.74556
5	0.79257	0.86277	0.92955	0.99252	1.05110	1.10446	1.11121	1.01301	0.91954	0.84093	0.78001	0.74396
6	0.74396	0.78828	0.85867	0.92567	0.98887	1.04774	0.99010	0.89991	0.82508	0.76895	0.74230	0.74230
7	0.74230	0.80939	0.87881	0.94474	1.00673	1.06417	1.02725	0.93184	0.85101	0.78734	0.74681	0.74681
8	0.79491	0.83204	0.90038	0.96509	1.02570	1.08151	1.07095	0.98876	0.89876	0.82416	0.76833	0.74239
9	0.81475	0.87112	0.93746	0.99993	1.05792	1.11057	1.00492	0.91259	0.83529	0.77599	0.74285	0.74285
10	0.74285	0.80997	0.87936	0.94526	1.00722	1.06462	1.05179	0.96942	0.88236	0.81121	0.75990	0.75990
11	0.75990	0.83153	0.89989	0.96464	1.02528	1.08113	1.05950	0.96764	0.88086	0.81003	0.75917	0.75917
12	0.80192	0.86094	0.92782	0.99090	1.04961	1.10312	1.06599	0.97923	0.89066	0.81773	0.76407	0.74425
13	0.81653	0.88562	0.95117	1.01273	1.06967	1.12101	1.16493	1.07703	0.97530	0.88733	0.81511	0.76237
14	0.83389	0.90214	0.96675	1.02725	1.08291	1.13264	1.17422	1.10189	0.99723	0.90600	0.82997	0.77228
15	0.84338	0.91115	0.97524	1.03512	1.09006	1.13885	1.17900	1.12335	1.01628	0.92236	0.84323	0.78167
16	0.85235	0.89881	0.96361	1.02433	1.08026	1.13032	1.16961	1.09593	0.99196	0.90149	0.82635	0.76981
17	0.84101	0.90890	0.97312	1.03316	1.08828	1.13731	1.16465	1.09761	0.99345	0.90276	0.82737	0.77050
18	0.84167	0.90953	0.97372	1.03371	1.08878	1.13774	1.17816	1.08099	0.97879	0.89028	0.81743	0.76387
19	0.83533	0.90351	0.96804	1.02844	1.08400	1.13359	1.17496	1.07009	0.96920	0.88218	0.81106	0.75981
20	0.83144	0.89981	0.96456	1.02521	1.08106	1.13102	1.17295	1.10037	0.99589	0.90485	0.82904	0.77165
21	0.84277	0.91058	0.97470	1.03462	1.08961	1.13845	1.07007	0.96919	0.88216	0.81105	0.75981	0.75981
22	0.83144	0.89981	0.96456	1.02520	1.08105	1.13101	1.06515	0.96487	0.87853	0.80822	0.75806	0.75806
23	0.82976	0.89821	0.96306	1.02381	1.07979	1.12990	1.17207	1.06300	0.96299	0.87694	0.80699	0.75731
24	0.82905	0.89754	0.96242	1.02321	1.07924	1.12943	1.17169	1.08376	0.98122	0.89235	0.81907	0.76494

GSTORD BY MONTH

YEAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
2	120796	125972	135900	145273	154013	162002	161290	148186	134577	123190	114466	109626
3	120304	130420	140111	149216	157642	165246	156261	142105	129409	119090	111765	111765
4	111765	116512	126893	136773	146093	154770	149876	136812	125011	115772	110040	110040
5	116979	127339	137196	146490	155136	163012	164008	149514	135719	124117	115125	109804
6	109804	116346	126735	136623	145952	154640	146133	132821	121777	113492	109559	109559
7	109559	119461	129708	139438	148588	157066	151617	137535	125605	116207	110224	110224
8	117324	122804	132890	142442	151388	159625	158067	145934	132651	121642	113400	109572
9	120252	128572	138364	147583	156143	163913	148321	134693	123283	114532	109640	109640
10	109640	119546	129789	139515	148659	157132	155238	143081	130231	119729	112157	112157
11	112157	122729	132819	142375	151325	159568	156376	142818	130010	119556	112050	112050
12	118359	127070	136941	146251	154916	162814	157334	144529	131456	120692	112772	109847
13	120515	130712	140387	149473	157877	165454	171936	158963	143949	130965	120305	112521
14	123077	133150	142687	151615	159832	167171	173308	162632	147186	133720	122498	113984
15	124477	134481	143940	152778	160887	168087	174013	165800	149997	136135	124456	115369
16	125801	132658	142224	151185	159440	166828	172628	161752	146408	133055	121964	113619
17	124127	134149	143627	152488	160624	167860	171896	162000	146627	133243	122115	113721
18	124225	134242	143715	152570	160698	167924	173889	159548	144463	131401	120649	112743
19	123289	133352	142877	151792	159992	167311	173417	157939	143049	130204	119708	112144
20	122716	132807	142364	151315	159558	166932	173121	162408	146988	133551	122362	113891
21	124387	134396	143860	152704	160819	168029	157937	143047	130202	119707	112143	112143
22	122715	132806	142363	151314	159557	166931	157210	142410	129665	119288	111885	111885
23	122468	132571	142141	151108	159370	166767	172991	156893	142132	129432	119107	111775
24	122363	132471	142047	151020	159290	166697	172935	159956	144823	131706	120890	112900

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*   SUMMARY OF FINANCIAL DATA   *
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YEAR	CACRST	CACRNT	CACCT	CACIT	NEWPIS
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	1675791	0	0	0	1675791
11	3297090	0	0	0	3297090
12	2308468	0	0	0	2308468
13	2240548	0	0	0	2240548
14	1989341	0	0	0	1989341
15	1291756	0	0	0	1291756
16	1193206	0	0	0	1193206
17	1224508	0	0	0	1224508
18	1638925	0	0	0	1638925
19	1095219	0	0	0	1095219
20	1112307	0	0	0	1112307
21	1709741	0	0	0	1709741
22	1040277	0	0	0	1040277
23	1547798	0	0	0	1547798
24	843954	0	0	0	843954

YEAR	GASSUP	GSALES	DIFSTO	GDELIV	GPURCH	OMSTOC	OMGENC
2	330550	331042	-491	51884	519627776	3870763	89592816
3	325839	334377	-8538	44942	546655744	3662936	93210432
4	325488	320273	5215	49945	579987968	3822336	95801104
5	325488	332662	-7174	47029	611041536	3735480	100022128
6	325488	325732	-244	44836	645439488	3659024	103037344
7	325137	317371	7766	54607	678627584	3926122	105830368
8	318507	315579	2928	52980	698448896	3894818	109087408
9	324787	335397	-10611	43662	746066688	3614135	113984416
10	325839	323321	2518	47491	794396672	3750375	116585152
11	326891	320689	6202	53720	842544128	3909707	119788096
12	327613	325456	2157	55124	892971264	3934966	123622208
13	327087	324524	2563	61978	937148928	4002054	126976848
14	303696	302295	1401	60724	912923136	3996761	127968016
15	305102	303777	1325	59968	959691776	3992063	131533008
16	304645	306318	-1673	57335	1000735744	3966820	135242592
17	321616	321517	99	58273	1104161792	3977390	140408128
18	328367	329302	-935	60210	1173610240	3993689	144577920
19	317611	318184	-573	60700	1178988032	3996629	146890048
20	323715	322042	1673	60902	1247259648	3997702	150738800
21	336008	337680	-1672	54214	1341476864	3919039	155609184
22	336019	336265	-246	54799	1391334912	3929476	158957200
23	312975	313080	-105	61110	1339559936	3998725	159888272
24	309488	308410	1078	61112	1368244992	3998735	162612128

YEAR	PISBEG	REPPIS	NEWPIS	DEPEXP	NETPIS	TAPDAD	TOTPIS
2	617338368	22378512	0	18801264	399510016	240206816	639716864
3	639716864	23189728	0	19482816	406620672	256285584	662906368
4	662906368	24030352	0	20189056	413989376	272947200	686936576
5	686936576	24901440	0	20920912	421625344	290212608	711837952
6	711837952	25804112	0	21679296	429538048	308103936	737641984
7	737641984	26739520	0	22465168	437737472	326643968	764381440
8	764381440	27708816	0	23279520	446234112	345856000	792090112
9	792090112	28713264	0	24123408	455038976	365764352	820803328
10	820803328	29754112	1675791	25047120	465798144	386435072	852233216
11	852233216	30893440	3297090	26051984	478488320	407935232	886423552
12	886423552	32132848	2308468	27064192	490593792	430270720	920864512
13	920864512	33381328	2240548	28111120	503015936	453470208	956486144
14	956486144	34672608	1989341	29188608	515588864	477558784	993147648
15	993147648	36001600	1291756	30284640	527888640	502552064	1030440704
16	1030440704	37353472	1193206	31417520	540506880	528480256	1068987136
17	1068987136	38750768	1224508	32592400	553584384	555377920	1108962304
18	1108962304	40199872	1638925	33822032	567510528	583290368	1150800896
19	1150800896	41716528	1095219	35080272	581371136	612241408	1193612544
20	1193612544	43268448	1112307	36384608	595724288	642268672	1237992960
21	1237992960	44877232	1709741	37753792	611153664	673425920	1284579584
22	1284579584	46566000	1040277	39152928	626447616	705737984	1332185600
23	1332185600	48291712	1547798	40617712	642766080	739258880	1382024960
24	1382024960	50098400	843954	42114896	658951680	774015232	1432966912

YEAR	AOPINC	GASREV	OOPREV	ONUINC	ACOPEX	TAXADJ	INCAT	INCDEF	DPR
2	48180896	725085952	1463672	1903157	631892224	0.49860	36892848	11288048	0.06608
3	49038432	756896256	1516729	1972146	663011584	0.49860	36890208	12148224	0.07040
4	49927104	747272448	1571710	2043636	699800320	0.49860	13389060	36538032	0.22107
5	50848000	853126144	1628685	2117717	735719680	0.49860	47886128	2961872	0.01725
6	51802272	843495424	1687724	2194484	773814784	0.49860	23703568	28098704	0.16716
7	52791120	873726464	1748904	2274034	810848768	0.49860	19911296	32879824	0.20075
8	53815824	933425920	1812302	2356468	834710272	0.49860	37365648	16450176	0.10101
9	54877680	1031336960	1877997	2441889	887788288	0.49860	59289856	-4412176	-0.02549
10	56175248	983239936	1949909	2535393	939778816	0.49860	8915316	47259920	0.28324
11	57705680	1068982272	2028137	2637110	992293632	0.49860	24971168	32734512	0.19780
12	59165600	1151192064	2106937	2739571	1047592192	0.49860	37873792	21291808	0.12677
13	60663712	1190568448	2188440	2845546	1096238848	0.49860	32718464	27945248	0.16686
14	62180000	1160153856	2272321	2954614	1074076416	0.49860	28055264	34124736	0.21875
15	63663360	1234825728	2357648	3065561	1125500928	0.49860	39088304	24575056	0.15676
16	65185120	1295123712	2445842	3180236	1171362304	0.49860	45709648	19475472	0.12320
17	66762256	1401367296	2537305	3299162	1281139456	0.49860	43349552	23412704	0.14111
18	68441760	1484137216	2633032	3423632	1356003584	0.49860	46665248	21776512	0.12814
19	70113344	1475586048	2730985	3550997	1364954624	0.49860	37297840	32815504	0.19985
20	71844336	1560422144	2832527	3683029	1438380544	0.49860	42322768	29521568	0.17764
21	73705120	1699238912	2939118	3821624	1538758400	0.49860	60791424	12913696	0.07411
22	75549568	1717967104	3048040	3963252	1593374208	0.49860	42185248	33364320	0.19227
23	77517568	1660789504	3162073	4111524	1544064256	0.49860	37516432	40001136	0.24758
24	79469552	1714913280	3278628	4263076	1576970496	0.49860	47333312	32136240	0.20192