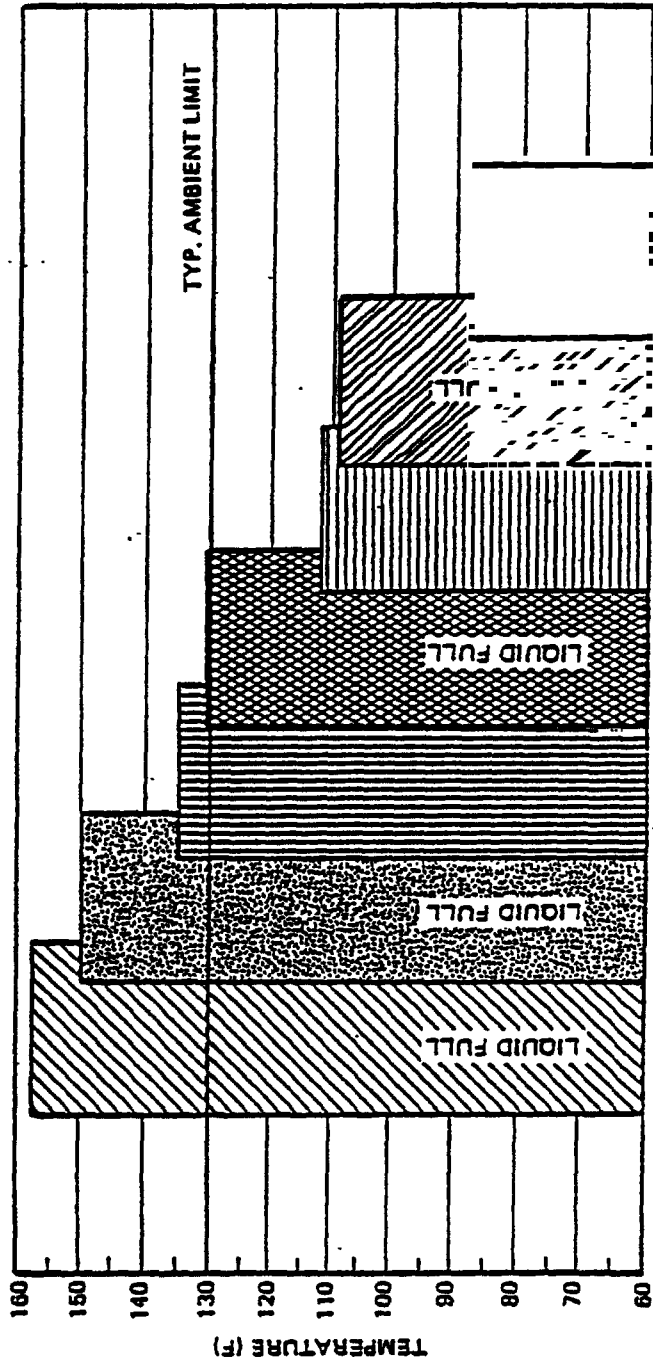


Source: Selpac & M.B. Sturgis

Figure 5-19 CYLINDER VALVE AND QUICK CONNECT COUPLING WITH INTEGRAL THERMAL SHUT-OFF

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Assumes 375 psig S.T.D.

• Relief operation due to liquid full condition rather than high vapor pressure

- Pure propane
- 94.5 propane, 5.5 ethane
- Mixture with air in tank
- Mixture - 5% overfill
- Mixture, 5% over with air
- Mixture - 10% overfill
- Mixture 10% over with air

Figure 4-0 TEMPERATURE AT WHICH A DOT SPECIFICATION RELIEF VALVE WILL OPEN FOR SELECTED CASES (5-20)

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There has been activity to increase allowable pressures at the burner for self-contained (i.e., LP-Gas fired) grills. The accident record indicates that a limited number of incidents occur from leaks on the low pressure side of the system, such as manual burner control leakage. Since for any orifice equivalent of a particular leak the quantity of gas flowing increases with pressure, this is a move in an unsafe direction. It would have to be demonstrated what action was being taken to insure increased leakage rates would not occur.

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Appendix "A"

Selected Background Information on Accident/Injury
Data and Sources

The materials contained in this appendix include skeletal compilations of data obtained from national computerized data bases maintained by CPSC, the National Burn Information Exchange (NBIE) and the National Fire Protection Association (NFPA). The data compilations come from more inclusive data base reviews as follows:

1. CPSC data including information taken from in-depth-investigation reports of accidents from 1974 through September, 1985. The data compilations included leak source, ignition source and ignition or intensity factors associated with LP accidents involving major appliance or equipment types. The appliances and equipment types summarized include portable grills, water heaters, furnaces, regulators, connectors/fittings and tanks.
2. NFPA data including information taken from FIDO system fire analysis department reports specific to LP-Gas use of incidents from 1971 through February, 1985. The data compilations included numbers of incidents and numbers of civilian and firefighter deaths and injuries by location type. Location type included mobile homes, apartments, two-family dwellings, one-family dwellings and recreational vehicles (RV's)
3. NBIE data consisting of information taken from a sampling of severe burn incidents in the U.S. The NBIE data base presently includes approximately 25% of all severe burn admissions covering 625 burn beds from a total of 1740 in the nation. There are currently 178 hospitals in the U.S. with burn treatment centers and 145 hospitals with significant burn treatment capability. The data summaries included data from 1967 through 1984. Numerical compilations included: number of cases and percent of total for propane burns and natural gas burns. Further breakdowns

by age, sex, severity of burn and survival outcome were included as well as summaries by accident location, objects involved, activity when burned, and victim participation (own action, bystander).

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Table A-1
GAS IGNITION ACCIDENTS RESULTING IN SEVERE BURN INJURIES
HOMES (OTHER THAN MOBILE HOMES), 1967-1984

	LP-GAS	%	NAT. GAS	%
<u>BY LOCATION</u>				
TOTAL WHERE LOCATION KNOWN	290	100	435	100
KITCHEN	84	29	191	43.9
YARD	64	22	18	4.1
BASEMENT	56	19.3	116	26.7
GARAGE	25	8.6	6	1.4
LIVING ROOM	24	8.3	37	8.5
BEDROOM	15	5.2	31	7.1
BATH	10	3.4	12	2.8
ALL OTHER LOCATIONS	11	3.8	24	5.5
<u>BY PRODUCT INVOLVED</u>				
TOTAL WHERE KNOWN	431	100	538	100
CYLINDER OR TANK	96	22.3	-0-	-0-
COOKING APPLIANCE (INDOOR)	84	19.5	212	39.6
FURNACE	41	9.5	121	22.6
SPACE HEATER	38	8.8	40	7.5
WATER HEATER	36	8.4	45	8.4
PIPING, TUBING, HOSE, FITTING, ETC.	15	3.5	35	6.5
OUTDOOR GRILL OR BARBEQUE (EXCLUSIVE OF FUEL SUPPLY)	9	2.1	6	1.1
ALL OTHER	112	26	77	14.4
<u>BY ACTIVITY WHEN BURNED</u>				
TOTAL WHERE KNOWN	293	100	511	100
IGNITION ATTEMPT	107	36.5	300	58.7
INSTALLATION, INSPECTION OR MAINTENANCE	57	19.5	49	9.6
FILLING TANKS	9	3.1	-0-	-0-
ALL OTHER DIRECT ACTIVITIES	25	8.5	47	9.2
BYSTANDER	99	33.8	115	22.5

Source: NBIE

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Table A-2
GAS IGNITION ACCIDENTS RESULTING IN SEVERE BURN INJURIES
DATA NORMALIZED FOR USER POPULATION DIFFERENCES

ESTIMATED CUSTOMER BASE

NATURAL GAS ~ 44.5×10^6 RESIDENTIAL - Derived from Census Bureau and AGA Figures
LP-GAS ~ 6.2×10^6 RESIDENTIAL - Derived from Census Figures

OVERALL RATIO 7.2:1 NATURAL/LP

RATIO OF NATURAL GAS TO LP GAS CUSTOMERS BY END USE

WATER HEATING 10.1:1 - Derived from Census Figures
HOME HEATING 9.4:1 - Derived from Census Figures
COOKING 5.8:1 - Derived from Census Figures

	ACTUAL NATURAL GAS REPORTED	"EXPECTED LP-GAS"	ACTUAL LP-GAS REPORTED	RATIO
REPORTED SEVERE BURN FIGURES OCCURRING AT HOME (NBIE Totals, 1967 thru 1984)	742	103	575	5.8:1
WATER HEATING	46	4+	37	9.2:1
COOKING	216	37+	145	3.9:1
HOME HEATING (Furnaces)	123	13	56	4.3:1

"EXPECTED" TOTAL ARRIVED AT BY DIVIDING NATURAL GAS TOTAL BY RELATIVE POPULATION RATIO. NORMALIZED TOTALS SHOW LP FIGURES MULTIPLIED BY POPULATION RATIO.

NORMALIZED INJURY DATA	NATURAL GAS	LP GAS
SEVERE BURN INJURIES OCCURRING AT HOME	742	4140
WATER HEATING	46	392
COOKING	216	841
HOME HEATING (Furnaces)	123	526

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**Table A-3
PORTABLE OUTDOOR COOKING EQUIPMENT**

NO. OF INCIDENTS - 61

	NO.	% OF TOTAL
SOURCE OF GAS		
FAILED HOSE OR HOSE CONNECTOR	24	39
REGULATOR/VENT RELIEF/CYLINDER VALVE/SAFETY RELIEF	27	44
OTHER	10	16
IGNITION OR INTENSITY FACTOR		
FUEL SUPPLY RELATED:		
EXCESSIVE PRESSURE (OVERFILL/REGULATOR FAILURE/IMPROPER PURGE/OVERHEATING)	20	33
HIGH RATE OF FUEL RELEASE/CONTINUING FLOW (MELTING & BURN THROUGH/CYLINDER FAILURE/OTHER)	15	25
OTHER OR UNKNOWN	26	42
LOCATION RELATED:		
PATIO DECK	18	30
GARAGE/BREEZEWAY/CARPORT/COVERED PATIO/SCREENED-IN PORCH	7	11
OTHER OR UNKNOWN	36	59
EXCESSIVE PRESSURE/FILL RELATIONSHIP		
TOTAL INCIDENTS	20	100
INITIAL FILL OF CYLINDER*	5	25
FIRST USE AFTER FILL AND/OR OVERFILL INDICATED	9	45
OTHER OR UNKNOWN FILL STATUS	6	30

*NEW CYLINDER OR FIRST FILL FROM TOTALLY EMPTY STATUS

Source: CPSC Data - IDI

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NATIONAL BURN INFORMATION EXCHANGE
I. Feller, M.D. - Director

I. ANALYSIS OF PATIENTS WITH GAS BURN
INJURIES BY TYPE OF GAS BY YEAR

Year	All NBIE Pts.	Propane Burn Pts.		Natural Gas Burn Pts.	
	# pts.	# pts	% pts.	# pts	% pts.
1967	2020	24	1.2%	43	2.1%
1968	1917	21	1.1%	29	1.5%
1969	2045	21	1.0%	10	0.5%
1970	2235	27	1.2%	16	0.7%
1971	2628	56	2.1%	52	2.0%
1972	2682	50	1.9%	37	1.4%
1973	2886	79	2.7%	60	2.1%
1974	3767	74	2.0%	52	1.4%
1975	4567	83	1.8%	83	1.8%
1976	5222	67	1.3%	103	2.0%
1977	4603	62	1.3%	60	1.3%
1978	4432	67	1.5%	55	1.2%
1979	4607	73	1.6%	53	1.2%
1980	5164	127	2.5%	84	1.6%
1981	5193	115	2.2%	86	1.7%
1982	5176	101	2.0%	77	1.5%
1983	4752	116	2.4%	69	1.5%
1984	4687	89	1.9%	77	1.6%
Total	68583	1252	1.8%	1046	1.5%

February, 1986

5-year summary (1980-1984):

$$n=5; \bar{X} = 4994$$

$$\sigma = 252$$

$$n=5; \bar{X} = 110$$

$$\sigma = 45$$

2.2% of total

$$n=5; \bar{X} = 79$$

$$\sigma < 7$$

1.6% of total.

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NATIONAL BURN INFORMATION EXCHANGE
I. Feller, M.D. - Director

2. ANALYSIS OF PATIENTS WITH GAS BURNS
COUNT OF CASES, AGE, SEX, AND SEVERITY OF BURN INFORMATION
BY TYPE OF BURN AGENT

All NBIE Burn Patients

Cases = 68583
Males = 49265
Average % Total Area Burn = 19%
Average % Full Thickness Burn = 8%
Average age = 27.4
Average % Survival = 90%
Average Days Hospitalized = 26

Patients with Propane/Butane Burns

Cases = 1252
Males = 1028
Average % Total Area Burn = 29%
Average % Full Thickness Burn = 9%
Average age = 35.7
Average % Survival = 87%
Average Days Hospitalized = 24

Patients with Natural Gas Burns

Cases = 1046
Males = 780
Average % Total Area Burn = 32%
Average % Full Thickness Burn = 12%
Average age = 35.1
Average % Survival = 83%
Average Days Hospitalized = 26

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NFPA DATA - LP GAS FIRES

Accident Location	No. of Incidents	No. of Civilian Deaths	Civilian Injuries	No. of Firefighters Deaths	Firefighters Injuries	Approx. Units w/LP-Gas
Mobile Homes	79	40	46	0	10	1x10 ⁶
One Fam. Dwell.	61	82	51	1	3	4x10 ⁶
RV's	43	17	46	0	2	> 2x10 ⁶ (3)
Apartments	9	3	18	0	23	(2)
2 Fam. Dwell.	5	3	5	0	9	-

(1) Est. from Census Bureau, GAMA, and RVI information

(2) Many of the casualty producing incidents from portable equipment, including portable grills.

(3) Totals higher considering portable & motor fuel use.

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NEISS Estimates Reports
(Estimated Total Number of Injuries)

Product	Est. (1) % LP	Code	YEAR						TOTAL	TOTAL LP (2)
			1979	1980	1981	1982	1983	1984		
Gas Grills	app. 95%	3248*	1,811	904	2,184	1,781	1,968	1,460	10,105	9,503
LP Tanks or Fittings	100%	0131	1,449	1,357	1,552	1,843	1,616	2,176	9,795	9,595
Gas Furnaces	app. 10%	0310	1,861	2,406	2,569	1,624	2,192	1,844	12,496	11,250
Gas Water Heaters	app. 9%	0118	870	1,547	1,747	1,281	1,306	1,450	8,201	738
Gas Ranges with Ovens	app. 15%	0260	2,812	4,639	4,120	4,815	3,946	3,800	24,132	3,620
Gas Ovens	app. 15%	0262	3,913	3,111	3,532	3,804	2,050	2,898	19,308	2,896
Gas Countertop-Mounted Cooking Surfaces	-	0204	51	118	253	68	0	0	490(4 years)	
Boilers	app. 10%	0308	569	621	574	784	410	666	3,624	362
Floor Furnaces	-	0326	646	980	765	na	700	1,253	4,344(5 years)	
Gas or LP Floor or Wall Heaters	-	0386					1,014	944	1,955	-
Gas or LP Heaters not elsewhere classified	-	0389	na	na	na	na	1,569	733	2,102(2 years)	
Other Heaters or Heating Systems	-	0369	1,063	1,519	1,361	2,103	2,076	1,391	9,533	-
Gas Clothes Dryers	-	0107	32	32	47	81	45	125	362	-

(1) % LP est. from Census Data & BAMA Data

(2) Proportion based on approx. distribution by gas type - Not an official estimate

* Previously Code 1253

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DEATH CERTIFICATES

(1979-9/1985) (Total Number)

Product	Code	# of Deaths
Boilers	0308	16
Gas or LP Heaters Not Elsewhere Classified	0389	106
Other Heaters or Heating Systems	0369	32
Floor Furnaces	0326	22
Gas Water Heaters	0118	44
Gas Furnaces	0310	75
Gas Ranges & Gas Ovens	0260 0262	163
Gas or LP Floor or Wall Heaters	0386	18
Gas Grills	3248	24
Gas Clothes Dryers	0107	3
LP Tanks of Fittings	0131	125

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REPORTED INCIDENTS

(1979-9/1985) (Total Number of Incidents Reported)

Product	Code	# of Incidents
Boilers	0308	128
Gas or LP Heaters Not Elsewhere Classified	0389	361
Gas Counter Top Mounted Cooking Surfaces	0204	13
Other Heaters or Heating Systems	0369	1,418
Floor Furnaces	0326	238
Gas Water Heaters	0118	654
Gas Furnaces	0310	758
Gas Ranges & Gas Ovens	0260 0262	1395
Gas or LP Floor or Wall Heaters	0386	106
Gas Grills	3248	280
Gas Clothes Dryers	0107	142

Note: Significant Duplication of Reports in this File

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APPENDIX B: CHARACTERIZATION OF THE
LP-GAS USER POPULATION

Characterization of the LP-Gas User Population

The "population-at-risk" with respect to LP-gas utilization cannot be considered as a homogeneous set. The geographic distribution, quantity, and character of the user group associated with portable outdoor cooking equipment is profoundly different from those associated with the use of stationary appliances. Among stationary appliances the "mix", i.e. use of multiple appliances in a single occupancy significantly affects the LP distribution equipment used. Exchange cylinders and predominance of single stage regulation will often be found in areas with light duty loads such as cooking. When central space heating is involved the use of stationary tanks will predominate. LP-gas utilization has a strong rural bias. These and similar factors make it necessary to be careful in interpreting data which may be unbiased in terms of population demographics but may be biased due to the distinctly non-uniform distribution patterns by specific fuel use, types of supply, and utilization equipment employed which may correlate poorly with general population.

We have derived some user population estimates largely from Bureau of Census data to give the reader a feel for the magnitude and distribution of the user population. Figure E-1 identifies the regional divisions appearing in the statistical tables following. Table 2 provides a distribution of occupied housing units by region and population density group.

Table 3 provides an analysis of LP use by major class of utilization equipment. The "exposed population" numbers are the product of occupied housing units by average number of persons per occupancy times the percentage of occupancies using LP-gas. The resulting potential "exposed population" figures are not additive since appliances in each category may be present in a single occupancy. The 1980 appliance

population of ranges, househeating equipment and waterheating equipment aggregated to approximately 14 million units. This total would only be slightly higher in 1985. We would note that the 1985 population of portable LP-gas fired cooking equipment may well-exceed the figures for the "permanent" type appliances, based on probable new sales versus replacement rates, a phenomenon of this decade.

Table 4 through 7 provide regional breakdowns of the data given in Table 3. Tables 8 through 10 provide a breakdown for a specific use by region and population density groups.

Table 11 presents a distribution of occupied housing units utilizing LP gas for heating by class of occupancy. It may be observed that over 90% of all occupancies using LP for heating are single family residences. It may also be observed that mobile homes (manufactured housing) and trailers account for over 20% of total LP users for househeating while accounting for less than 6% of total housing occupancies.

Figures 10 through 14 graphically illustrate the distribution of LP fuel users by state and region, disaggregated by end use. Figures 15 through 19 present similar figures in terms of "saturation" of LP versus competing fuels. These figures demonstrate sharp regional variations and clearly show that the use of a generalized estimate of multiple appliance usage in a single occupancy can be highly misleading. For example, the disparity between number of cooking units versus waterheating and househeating in the Northeast region is very high. Likewise there is a significant difference between waterheating and househeating users. Therefore, for this region there will be not less than a nearly 2:1 ratio between occupancies with a cooking appliance as the only appliance and those with

either a single appliance of another type, or multiple appliance installations. This may be expected to have a strong impact on the accident patterns observed, and as noted before, the supply equipment utilized furnishing fuel to the household.

In other parts of the country no such variation is observed. In areas of high space heating penetration the type of supply equipment will be largely dictated by that use factor, irrespective of other utilization equipment found in the home.

Figures 20 through 22 plot on a U.S. map occupied housing units using LP gas by actual number and as a per cent of the total housing units in a given state for a given class of utilization equipment. This presentation gives the reader a good feel for the regional character of the LP gas market. In establishing total numbers of occupied units using LP gas for fixed appliances, the numbers may be derived by taking the single highest number reported for any given utilization in a state and aggregating these figures.

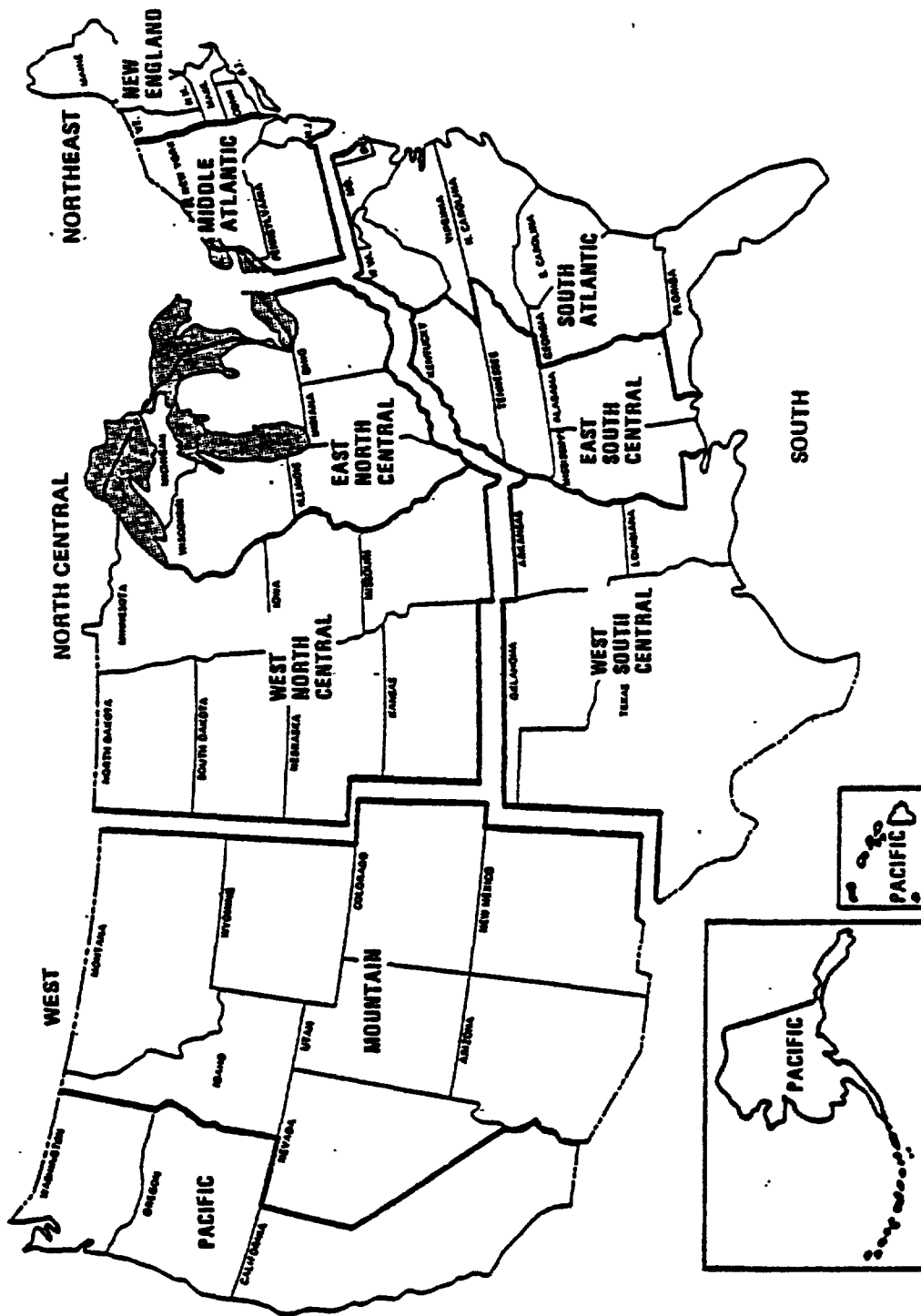


Figure B-1 REGIONS AND CENSUS DIVISIONS OF THE UNITED STATES: 1980

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Table 2
 Distribution of Occupied Housing Units By Region and Population Density Group.

Total Occup. Units	Inside SMSA's			Outside SMSA's		
	Total	Central City	Non- Central	Total	Rural	
		Farm	Rural			
N.E. Region 17,470,616	14,887,608	5,944,076	8,943,532	2,583,008	101,561	2,481,477
N.C. Region 20,859,206	14,769,917	6,111,903	8,658,014	6,089,289	915,033	5,174,256
S. Region 26,486,217	17,900,747	7,804,941	10,095,806	8,585,470	609,883	7,975,587
W. Region 15,573,634	12,939,317	5,414,924	7,524,393	2,634,317	194,051	2,440,266
U.S. Totals 80,389,673	60,497,589	25,275,844	35,221,745	19,892,084	1,820,528	18,071,556

Source: 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary HC80-1-B1, Issued December 1983.

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Table 3.

Analysis of LP Fuel Use And Population Exposed To Hazards Associated With Its Use

U.S. TOTALS

	Inside SMSA's			Outside SMSA's	
	Total	Central City	Non Central	Rural Farm	Non Farm
Persons in Occupied Units	220,796,160	64,989,230	100,293,660	55,513,276	49,891,299
Occupied Units	80,389,673	25,275,851	35,221,738	19,892,084	18,071,556
Occupancy Person/Unit	2.75	2.57	2.85	2.79	2.76
House Heating Fuel					
Utility Gas	42,657,625	16,309,072	18,826,682	7,521,871	7,372,230
All Other Excluding LP	33,397,223	8,646,009	14,886,878	9,664,336	8,562,582
LP	4,534,825	320,770	1,508,178	2,705,887	2,136,737
LP As % Of Total Exposed Pop.	5.64	1.27	4.28	13.60	11.82
Waterheating Fuel	12,497,254	829,597	4,287,438	7,563,821	5,916,641
Utility Gas	42,148,105	16,855,744	18,769,441	6,522,920	6,404,659
All Other Excluding LP	34,251,523	7,951,578	15,061,921	11,238,037	9,959,991
LP	3,990,045	468,529	1,390,381	2,131,135	1,706,914
LP As % Of Total Exposed Pop.	4.96	1.85	3.95	10.71	9.45
Cooking Fuel	10,975,043	1,206,696	3,958,197	5,941,838	4,704,255
Utility	32,375,170	14,733,068	13,085,004	4,557,098	4,470,601
All Other Excluding LP	42,445,157	10,163,795	20,074,565	12,206,797	10,930,096
LP	5,569,346	378,988	2,062,169	3,128,189	2,670,854
LP As % Of Total Exposed Pop.	6.93	1.50	5.85	15.73	14.78
	15,331,575	977,864	5,879,622	8,729,432	7,374,402

Derived From:

1) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary. HC80-1-B1, Issued December 1983.

2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part 1 United States Summary HC80-1-A1, Issued May 1983.

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Table 4.

Analysis of LP Fuel Use And Population Exposed To Hazards Associated With Its Use

Northeast Region

	U.S.			Inside SMSA's			Outside SMSA's		
	Total	Central City	Non Central	Total	Central City	Non Central	Total	Rural Farm	Non Farm
Persons in Occupied Units	47,841,139	40,705,089	15,077,525	25,627,564	7,136,050	357,295	6,778,755		
Occupied Units	17,470,616	14,887,608	5,944,076	8,943,532	2,583,008	101,561	2,481,447		
Occupancy Person/Unit	2.74	2.73	2.54	2.87	2.76	3.52	2.73		
House Heating Fuel									
Utility Gas	6,744,366	6,109,440	2,596,349	3,513,091	634,926	8,362	626,564		
All Other Excluding LP	10,514,143	8,629,420	3,288,065	5,341,355	1,884,723	90,926	1,793,797		
LP	212,107	148,748	59,662	89,086	63,359	2,273	61,086		
LP As % Of Total	1.21	1.00	1.00	1.10	2.45	2.24	2.46		
Exposed Pop.	581,173	406,082	151,541	255,677	174,871	8,001	166,765		
Waterheating Fuel									
Utility Gas	7,660,005	7,029,047	3,031,246	3,997,801	630,958	7,295	623,663		
All Other Excluding LP	9,268,893	7,497,068	2,803,714	4,693,354	1,771,825	85,323	1,686,502		
LP	541,718	361,493	109,116	252,377	180,225	8,943	171,282		
LP As % Of Total	3.10	2.43	1.84	2.82	6.98	8.81	6.90		
Exposed Pop.	1,484,307	986,876	277,155	724,322	497,421	31,479	467,600		
Cooking Fuel									
Utility	9,032,758	8,514,622	4,707,615	3,807,007	518,136	6,030	512,106		
All Other Excluding LP	7,195,022	5,625,657	1,120,689	41,504,968	1,569,365	71,249	1,498,116		
LP	1,242,836	747,329	115,772	631,557	495,507	24,282	471,225		
LP As % Of Tot.	8.59	5.02	1.95	7.06	19.18	23.91	18.99		
Exposed Pop.	3,405,371	2,040,208	294,061	1,812,569	1,367,599	85,473	1,286,444		

Derived From:

1) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary. HC80-1-B1, Issued December 1983.

2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part 1 United States Summary HC80-1-A1, Issued May 1983.

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Table 5.

Analysis of LP Fuel Use And Population Exposed To Hazards Associated With Its Use

North Central

	U.S. Total	Inside SMSA's			Outside SMSA's		
		Total	Central City	Non Central	Rural Farm	Total	Non Farm
Persons in Occupied Units	57,368,110	40,756,695	15,758,978	24,997,717	16,611,415	2,882,354	13,729,061
Occupied Units	20,859,206	14,796,917	6,111,903	8,658,014	6,089,289	915,033	5,174,256
Occupancy Person/Unit	2.75	2.76	2.58	2.89	2.73	3.15	2.65
House Heating Fuel							
Utility Gas	14,527,158	11,511,300	5,212,873	6,298,427	3,015,858	67,600	2,948,258
All Other Excluding LP	4,942,155	2,832,955	843,115	1,989,840	2,109,200	518,663	1,590,537
LP	1,389,893	425,662	55,915	369,747	964,231	328,770	635,461
LP As % Of Total Exposed Pop.	6.66	2.88	0.91	4.27	15.83	35.93	12.28
	3,822,206	1,174,827	144,261	1,068,569	2,632,351	1,035,626	1,683,972
Waterheating Fuel							
Utility Gas	13,713,287	11,102,019	5,196,323	5,905,696	2,661,268	48,486	2,562,782
All Other Excluding LP	5,923,891	3,223,262	817,521	2,405,741	2,700,629	631,556	2,069,073
LP	1,222,028	444,636	98,059	346,577	777,392	234,991	542,401
LP As % Of Total Exposed Pop.	5.86	3.01	1.60	4.00	12.77	25.68	10.48
	3,360,577	1,227,195	252,992	1,001,608	2,122,280	740,222	1,437,363
Cooking Fuel							
Utility Gas	9,024,074	7,423,695	3,845,542	3,578,153	1,600,379	34,834	1,565,545
All Other Excluding LP	10,442,881	6,896,490	2,214,637	4,681,853	3,546,391	628,615	2,917,776
LP	1,392,251	449,732	51,724	398,008	942,519	251,584	690,930
LP As % Of Tot. Exposed Pop.	6.67	3.04	0.85	4.60	15.48	27.49	13.35
	3,628,690	1,241,260	133,448	1,150,243	2,573,077	792,490	1,830,965

Derived From:

1) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary. HC80-1-B1, Issued December 1983.

2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part 1 United States Summary HC80-1-A1, Issued May 1983.

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Table 6.

Analysis of LP Fuel Use And Population Exposed To Hazards Associated With Its Use

South Region

	U.S.			Inside SMSA's			Outside SMSA's		
	Total	Central City	Non Central	Total	Central City	Non Central	Rural Farm	Non Farm	Total
Persons in Occupied Units	73,439,747	20,472,124	28,581,833	49,053,957	20,472,124	28,581,833	1,776,962	22,608,828	24,385,790
Occupied Units	26,486,217	7,804,941	10,095,806	17,900,747	7,804,941	10,095,806	609,883	7,975,587	8,585,470
Occupancy Person/Unit	2.77	2.62	2.83	2.74	2.62	2.83	2.91	2.83	2.84
House Heating Fuel									
Utility Gas	11,340,841	4,620,472	3,859,066	8,479,538	4,620,472	3,859,066	50,067	2,811,286	2,861,353
All Other Excluding LP	12,913,346	3,021,609	5,402,519	8,424,128	3,021,609	5,402,519	368,425	3,920,793	4,289,218
LP	2,431,980	162,860	834,221	997,081	162,860	834,221	191,391	1,243,508	1,434,899
LP As % Of Total Exposed Pop.	9.18	2.09	8.26	5.57	2.09	8.26	31.38	15.59	16.71
Waterheating Fuel	6,736,585	426,693	2,360,845	2,732,002	426,693	2,360,845	556,948	3,519,128	4,075,113
Utility Gas	10,627,600	4,638,287	3,618,457	8,256,744	4,638,287	3,618,457	42,278	2,328,578	2,370,856
All Other Excluding LP	14,243,803	2,996,389	5,934,967	8,931,351	2,996,389	5,934,967	427,634	4,884,818	5,312,452
LP	1,614,814	170,265	542,387	712,652	170,265	542,387	139,971	762,191	902,162
LP As % Of Total Exposed Pop.	6.10	2.18	5.37	3.98	2.18	5.37	22.95	9.56	10.51
Cooking Fuel	4,473,035	446,094	1,534,955	1,952,666	446,094	1,534,955	407,316	2,157,001	2,562,140
Utility Gas	7,990,867	3,566,241	2,507,599	6,073,840	3,566,241	2,507,599	34,546	1,882,481	1,917,027
All Other Excluding LP	16,067,476	4,068,927	6,737,582	10,806,509	4,068,927	6,737,582	424,050	4,836,917	5,260,967
LP	2,427,874	169,773	850,625	1,020,398	169,773	850,625	151,287	1,256,189	1,407,476
LP As % Of Tot. Exposed Pop.	9.17	2.18	8.43	5.70	2.18	8.43	24.81	15.75	16.39
	6,725,211	444,805	2,407,269	2,795,891	444,805	2,407,269	440,245	3,555,015	3,997,232

Derived From:

1) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary. IIC80-1-B1, Issued December 1983.

2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part 1 United States Summary IIC80-1-A1, Issued May 1983.

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Table 7 Analysis of LP Fuel Use And Population Exposed To Hazards Associated With Its Use

	West Region					
	U.S.			West Region		
	U.S. Total	Inside SMSA's	Outside SMSA's	Central City	Non Central	Total
Persons in Occupied Units	43,147,161	34,767,140	13,680,603	21,086,537	7,380,021	6,774,655
Occupied Units	15,573,634	12,939,317	5,414,931	7,524,386	2,634,317	2,440,266
Occupancy Person/Unit	2.71	2.69	2.53	2.80	2.80	2.78
House Heating Fuel						
Utility Gas	10,045,210	9,035,476	3,879,378	5,156,098	1,009,734	986,129
All Other Excluding LP	5,027,579	3,646,384	1,493,220	2,153,164	1,381,195	1,257,455
LP	500,845	257,457	42,333	215,124	243,388	196,682
LP As % Of Total Exposed Pop.	3.22	1.99	0.78	2.86	9.24	8.06
Waterheating Fuel	1,357,290	692,554	107,102	602,347	681,486	542,776
Utility Gas	10,147,213	9,237,375	3,989,888	5,247,487	909,838	889,636
All Other Excluding LP	4,814,936	3,361,813	1,333,954	2,027,859	1,453,131	1,319,598
LP	611,485	340,129	91,089	249,040	271,356	231,040
LP As % Of Total Exposed Pop.	3.93	2.63	1.68	3.31	10.30	9.47
Cooking Fuel	1,657,124	914,947	230,455	697,312	759,797	642,291
Utility Gas	6,327,471	5,805,915	2,613,670	3,192,245	521,556	510,469
All Other Excluding LP	8,739,778	6,909,704	2,759,542	4,150,162	1,830,074	1,677,287
LP	506,385	223,698	41,719	181,979	282,687	252,510
LP As % of Tot. Exposed Pop.	3.25	1.73	0.77	2.42	10.73	10.35
	1,372,303	601,748	105,550	509,541	791,524	701,978

Derived From:

1) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part I United States Summary, HC80-1-B1, Issued December 1983.

2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part I United States Summary HC80-1-A1, Issued May 1983.

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Table 8 Distribution of Occupied Housing Units Utilizing LP
For House Heating by Region and Population Density Group.

	Total Occupied Units	Total Utilizing LP	Inside SMSA's			Outside SMSA's		
			Total	Central City	Non-Central City	Total	Rural Farm	Non- Farm
North East Region	17,470,616	212,107	148,748	59,662	89,086	63,359	2,273	61,086
% of Group		1.21%*	1.00%	1.00%	1.10%	2.45%	2.24%	2.46%
Estimated Exposed Pop.		581,173	406,082	151,541	255,677	174,871	8,001	166,765
North Central Region	20,859,206	1,389,893	425,662	55,915	369,747	964,231	328,770	635,461
% of Group		6.66%	2.88%	0.91%	4.27%	15.83%	35.93%	12.28%
Estimated Exposed Pop.		3,822,206	1,174,827	144,261	1,068,569	2,632,351	1,035,626	1,683,972
South Region	26,486,217	2,431,980	997,081	162,860	834,221	1,434,899	191,391	1,243,508
% of Group		9.18%	5.57%	2.09%	8.26%	16.71%	31.38%	15.59%
Estimated Exposed Pop.		6,736,585	2,732,002	426,693	2,360,845	4,075,113	556,948	3,519,128
West Region	15,573,634	500,845	257,457	42,333	215,124	243,388	46,706	196,682
% of Group		3.22%	1.99%	0.78%	2.86%	9.24%	24.07%	8.06%
Estimated Exposed Pop.		1,357,290	692,559	107,102	602,347	681,486	145,723	546,776
U.S. Total	80,389,873	4,534,825	1,828,948	320,770	1,508,178	2,705,877	569,140	2,136,737
% of Group		5.64%	3.02%	1.27%	4.20%	13.60%	31.26%	11.82%
Estimated Exposed Pop.		12,497,254	5,005,470	829,597	4,287,438	7,563,821	1,746,298	5,916,641

* $\frac{\text{Total Utilizing LP}}{\text{Total Units in Group}} \times 100$

Derived From:

- 1) 1980 Census Of Housing, Vol. 1 Characteristics Of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary. HC80-1-B1, Issued December 1983.
- 2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part 1 United States Summary HC80-1-A1, Issued May 1983.

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Table 9.

Distribution of Occupied Housing Units Utilizing LP
For Water Heater Fuel by Region and Population Density Group.

	Total Occupied Units	Total Utilizing LP	Total	Inside SMSA's		Total	Outside SMSA's	
				City	Central City		Non-Central City	Farm
North East Region	17,470,616	541,718	361,493	109,116	252,377	180,225	8,943	171,282
% of Group		3.10%	2.43%	1.84%	2.82%	6.98%	8.81%	6.90%
Estimated Exposed Pop.		1,484,307	986,876	277,155	724,322	497,421	31,479	467,600
North Central Region	20,859,206	1,222,028	444,636	98,059	346,577	777,392	234,991	542,401
% of Group		5.86%	3.01%	1.60%	4.00%	12.77%	25.68%	10.48%
Estimated Exposed Pop.		3,360,577	1,227,195	252,992	1,001,608	2,122,280	740,222	1,437,363
South Region	26,486,217	1,614,814	712,652	179,265	542,387	902,162	139,971	762,191
% of Group		6.10%	3.98%	2.18%	5.37%	10.51%	22.95%	9.56%
Estimated Exposed Pop.		4,473,035	1,952,666	446,094	1,534,955	2,562,140	407,316	2,157,001
West Region	15,573,634	611,485	340,129	91,084	249,040	271,356	40,316	231,040
% of Group		3.93%	2.63%	1.68%	3.31%	10.30%	20.78%	9.47%
Estimated Exposed Pop.		1,657,124	914,947	230,455	697,312	759,797	125,786	642,291
U.S. Total	80,389,673	3,990,045	1,858,910	468,529	1,390,381	2,131,135	424,221	1,706,914
% of Group		4.96%	3.07%	1.85%	3.95%	10.71%	23.30%	9.45%
Estimated Exposed Pop.		10,975,043	5,081,684	1,206,696	3,958,197	5,941,838	1,304,803	4,704,255

Derived From:

1) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary HC80-1-B1, Issued December 1983.

2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part 1 United States Summary HC80-1-A1 Issued May 1983.

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Table 10.

Distribution of Occupied Housing Units Utilizing LP
For Cooking by Region and Population Density Group.

	Total Occupied Units	Total Utilizing LP	Inside SMSA's		Outside SMSA's			
			Total	Central City	Non-Central City	Total	Rural Farm	Non- Farm
North East Region	17,470,616	1,242,836	747,329	115,772	631,557	495,507	24,282	471,225
% of Group		8.59%*	5.02%	1.95%	7.06%	19.18%	23.91%	18.99%
Estimated Exposed Pop.		3,405,371	2,049,208	294,061	1,812,569	1,367,599	85,473	1,286,444
North Central Region	20,859,206	1,392,251	449,732	51,724	398,008	942,519	251,584	690,930
% of Group		6.67%	3.02%	0.85%	4.60%	15.48%	27.49%	13.35%
Estimated Exposed Pop.		3,828,690	1,241,260	133,448	1,150,243	2,573,077	792,490	1,830,965
South Region	26,486,217	2,427,874	1,020,398	169,773	850,625	1,407,476	151,287	1,256,189
% of Group		9.17%	5.70%	2.18%	8.43%	16.39%	24.81%	15.75%
Estimated Exposed Pop.		6,725,211	2,795,891	444,805	2,407,269	3,997,232	440,245	3,555,015
West Region	15,573,634	506,385	223,698	41,719	181,979	282,687	30,177	252,510
% of Group		3.25%	1.73%	0.77%	2.42%	10.73%	15.55%	10.35%
Estimated Exposed Pop.		1,372,303	601,748	105,550	509,541	791,524	94,152	701,978
U.S. Total	80,389,873	5,569,346	2,441,157	378,988	2,062,169	3,128,189	457,335	2,670,854
% of Group		6.93%	4.04%	1.50%	5.85%	15.73%	25.12%	14.78%
Estimated Exposed Pop.		15,331,575	6,679,107	977,864	5,879,622	8,729,432	1,412,360	7,374,402

* $\frac{\text{Total Utilizing LP}}{\text{Total Units in Group}} \times 100$

Derived From:

1) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter B Detailed Housing Characteristics, Part 1 United States Summary HC80-1B1, Issued December 1983.

2) 1980 Census of Housing, Vol. 1 Characteristics of Housing Units, Chapter A General Housing Characteristics, Part 1 United States Summary HC80-1-A1 Issued May 1983.

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Table 11
Distribution of Occupied Housing Units and Occupied Units Utilizing LP For House Heating Fuel By Type of Housing Unit.

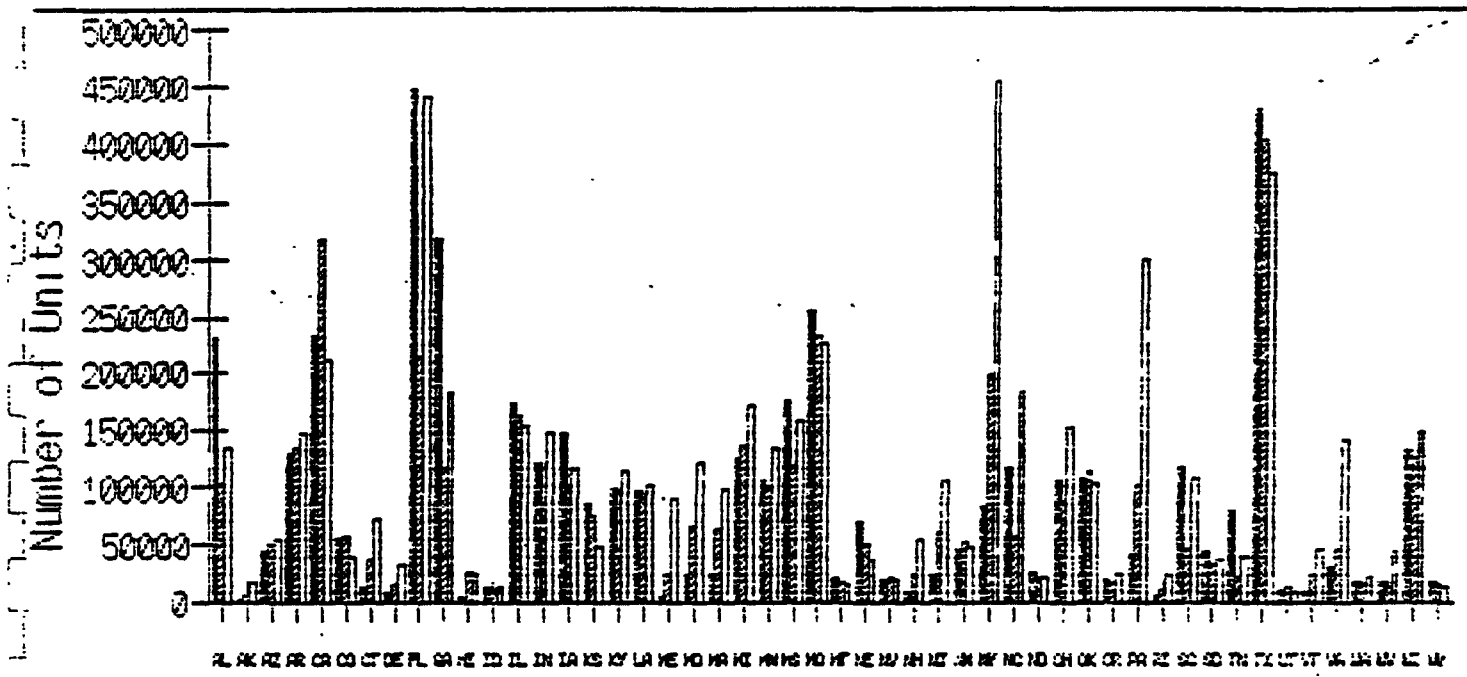
	Occupied Housing Units		LP House Heating Fuel Use			Cumulative %
	Owner	Rental	Total	Rental	Total	
One Unit Detached	43,253,057	7,285,635	50,538,692	672,080	3,122,055	68.85
				9.22%*	6.18%*	
One Unit Attached	1,868,095	1,439,690	3,307,785	26,341	52,450	70.01
				1.81%*	1.59%*	
Mobile Homes or Trailers	3,103,849	785,305	3,889,154	187,833	934,651	90.62
				23.92%*	24.03%*	
Two Unit Structures	1,510,899	3,375,819	4,886,718	77,043	117,658	93.21
				2.28%*	2.41%*	
3 & 4 Unit Structures	656,497	3,292,024	3,948,521	66,744	93,122	95.26
				2.03%*	2.36%*	
5 to 9 Unit Structures	406,143	3,036,221	3,442,167	54,321	75,978	96.94
				1.79%*	2.20%*	
10 to 19 Unit Structures	312,927	3,231,111	3,544,038	45,560	60,192	98.27
				1.41%*	1.70%*	
20 to 49 Unit Structures	273,122	2,446,337	2,719,459	30,283	37,740	99.10
				1.24%*	1.39%*	
Over 50 Unit Structures	411,806	3,701,136	4,112,942	33,779	40,978	100.00
				0.91%*	1.00%*	
Total 3 & 4 Units and Smaller	50,392,397	16,178,473	66,570,870	3,290,128	4,319,936	95.26
			82.81% of U.S. Units			

* LP Using Units By type of Unit X 100
Total Units By Type

Derived From: 1980 Census of Housing, Vol. 3
Subject Reports Chapter 4 Structural Characteristics Of The Housing Inventory, HCSO-3-4 Issued Aug. 1984.

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LP Fuel Users by State

Househeating Gas
 Waterheating Gas
 Cooking Gas

Fig. 10

Source: 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary HC80-1-31, Issued
 December 1983.

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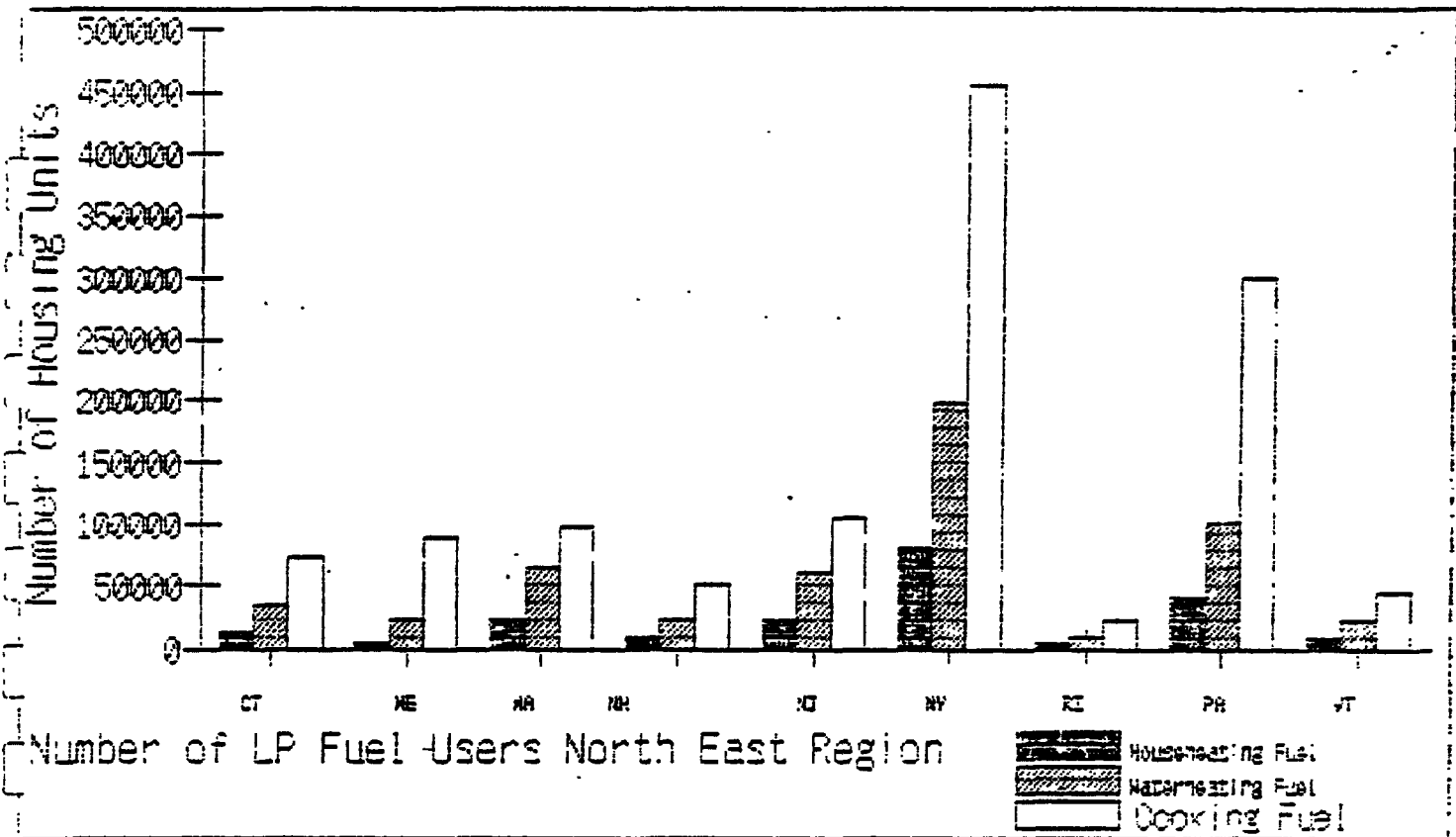


Fig.11

Source: 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary HC80-1-B1. Issued
 December 1983.

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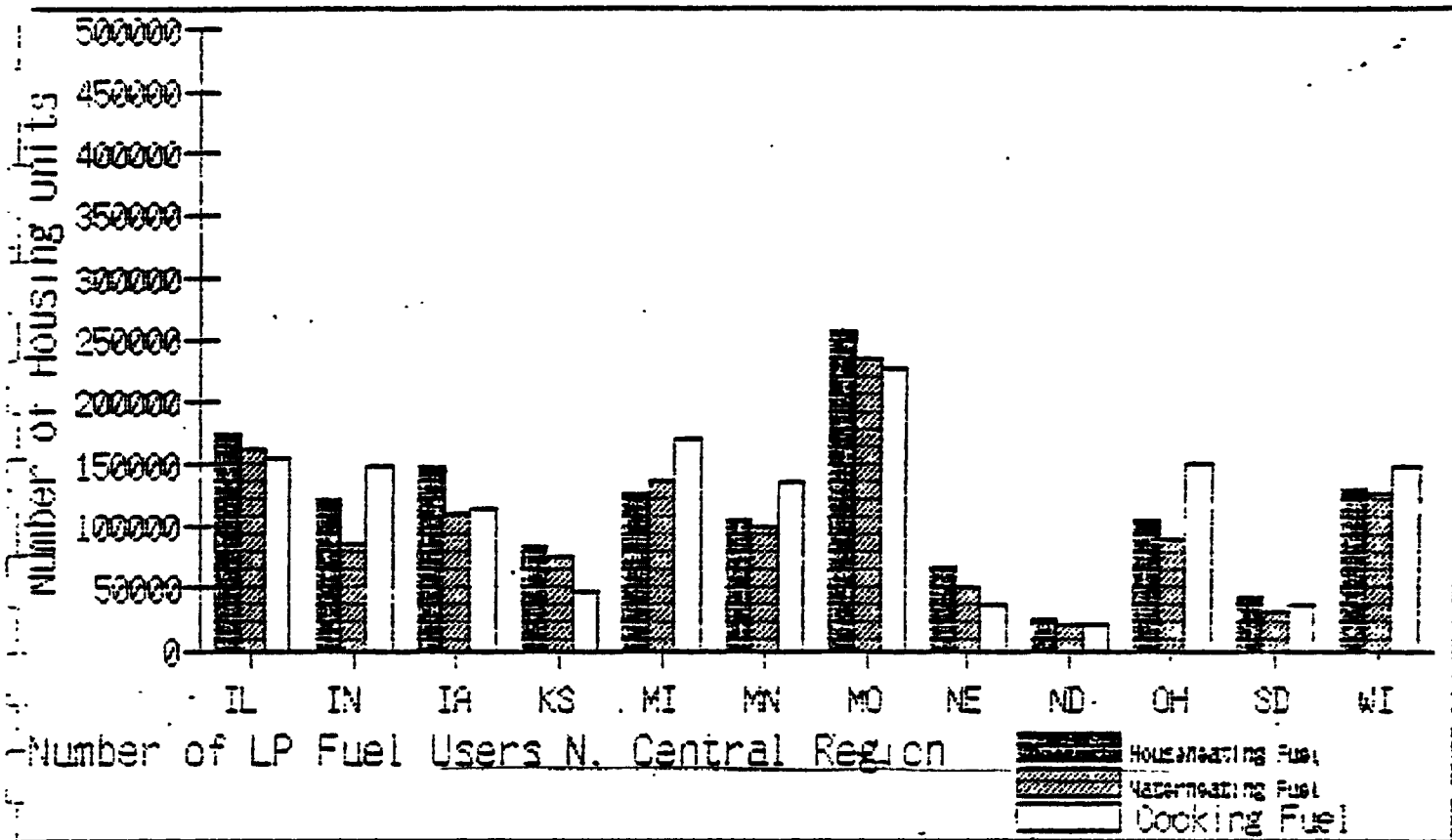


Fig. 12

Source: 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary HC80-1-81, Issued
 December 1983.

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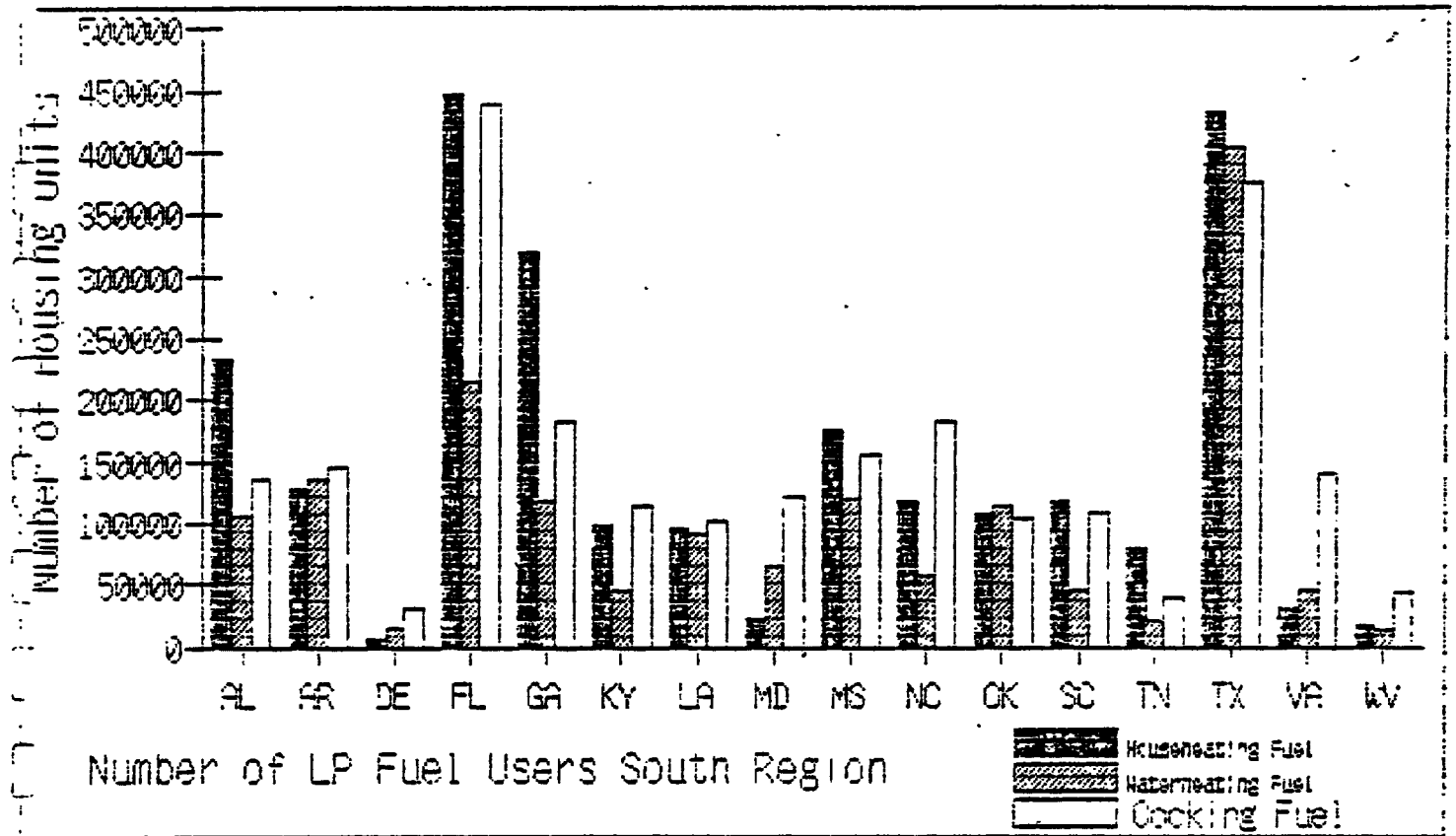


Fig. 13

Sources 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary HC80-1-31, Issued
 December 1983.

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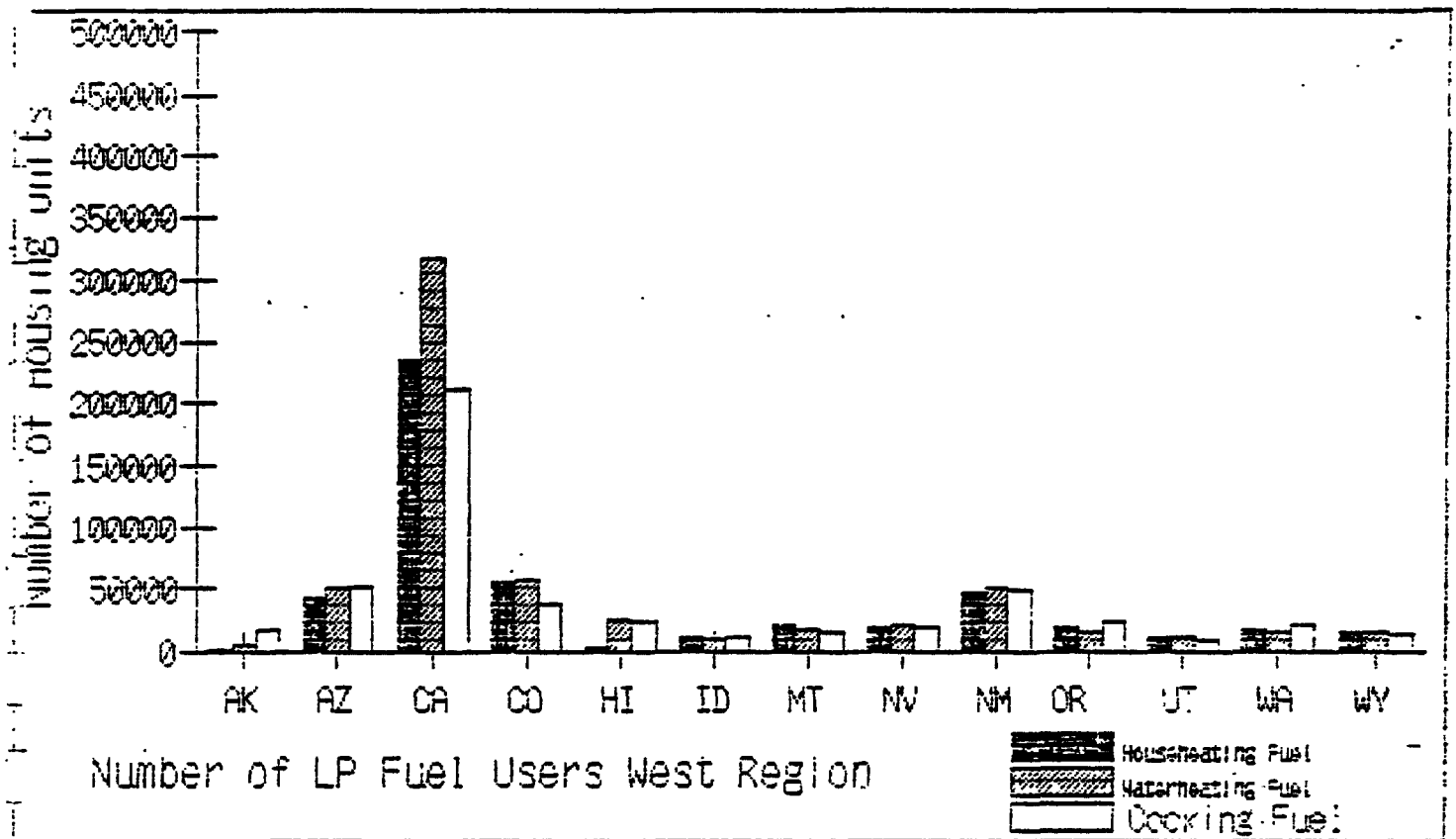


Fig. 14

Source: 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary HC80-1-B1, Issued
 December 1983.

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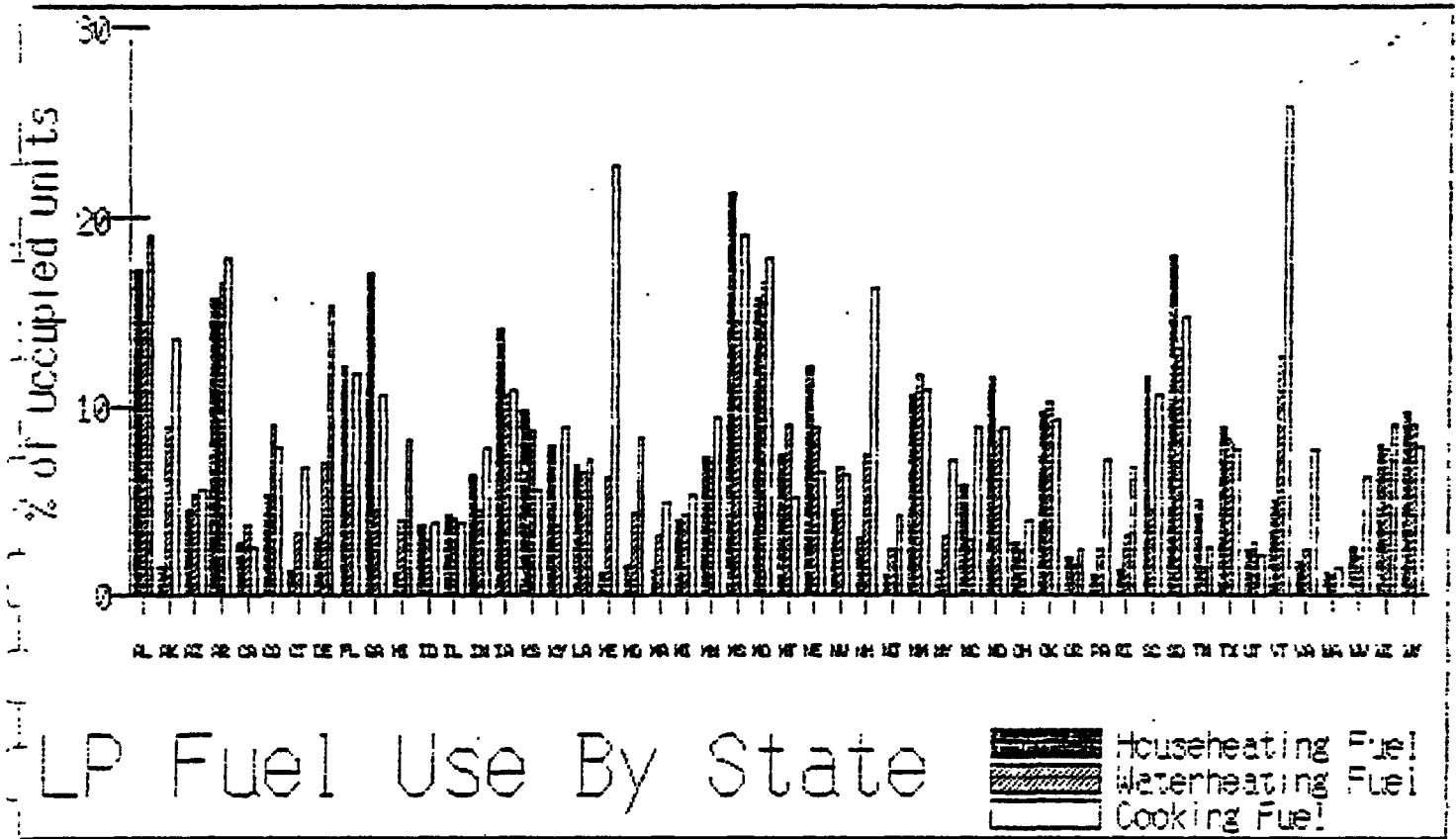


Fig. 15

Source: 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary HC80-1-B1, Issued
 December 1983.

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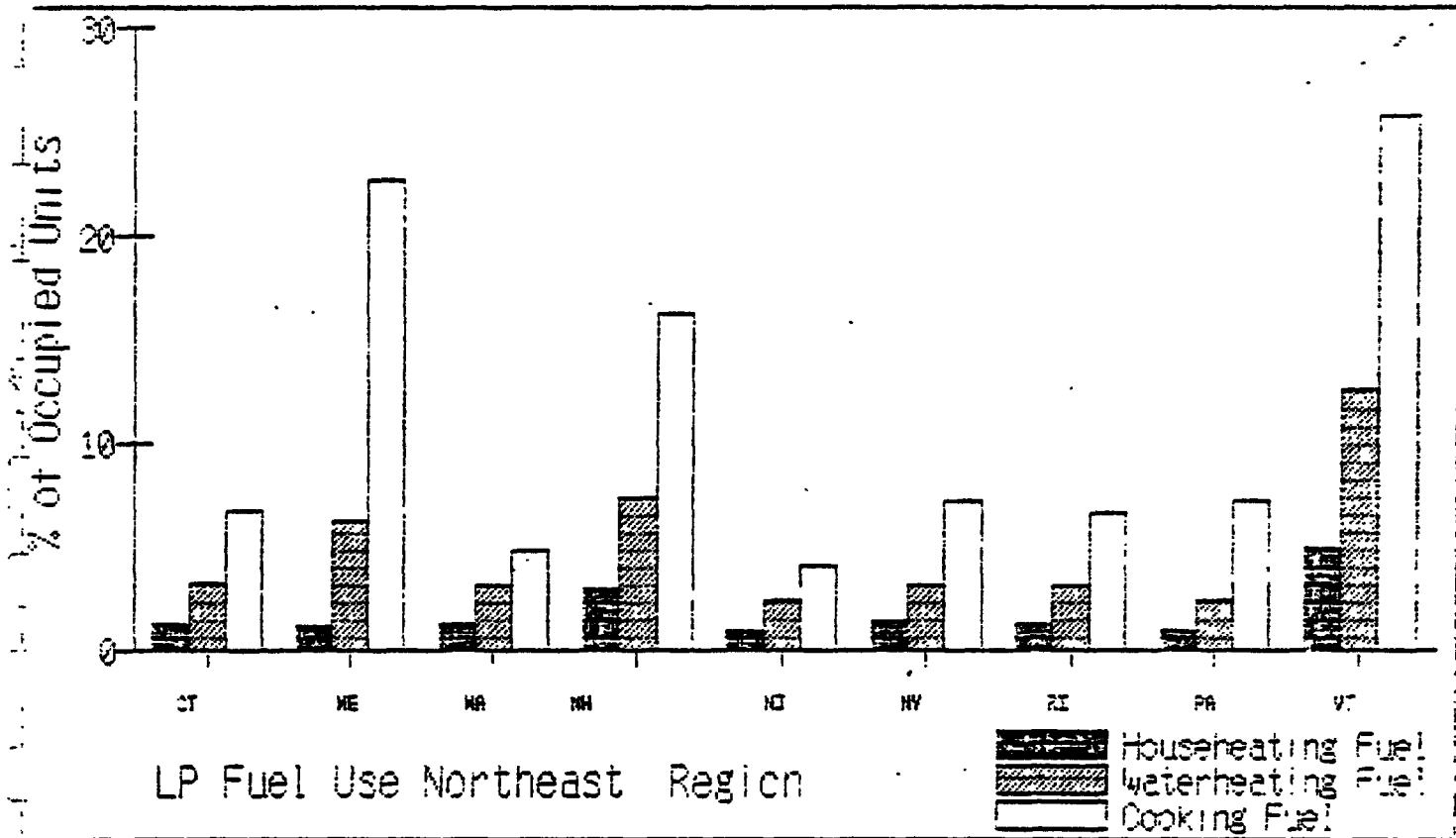


Fig. 16

Source: 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary HC80-1-B1, Issued
 December 1983.

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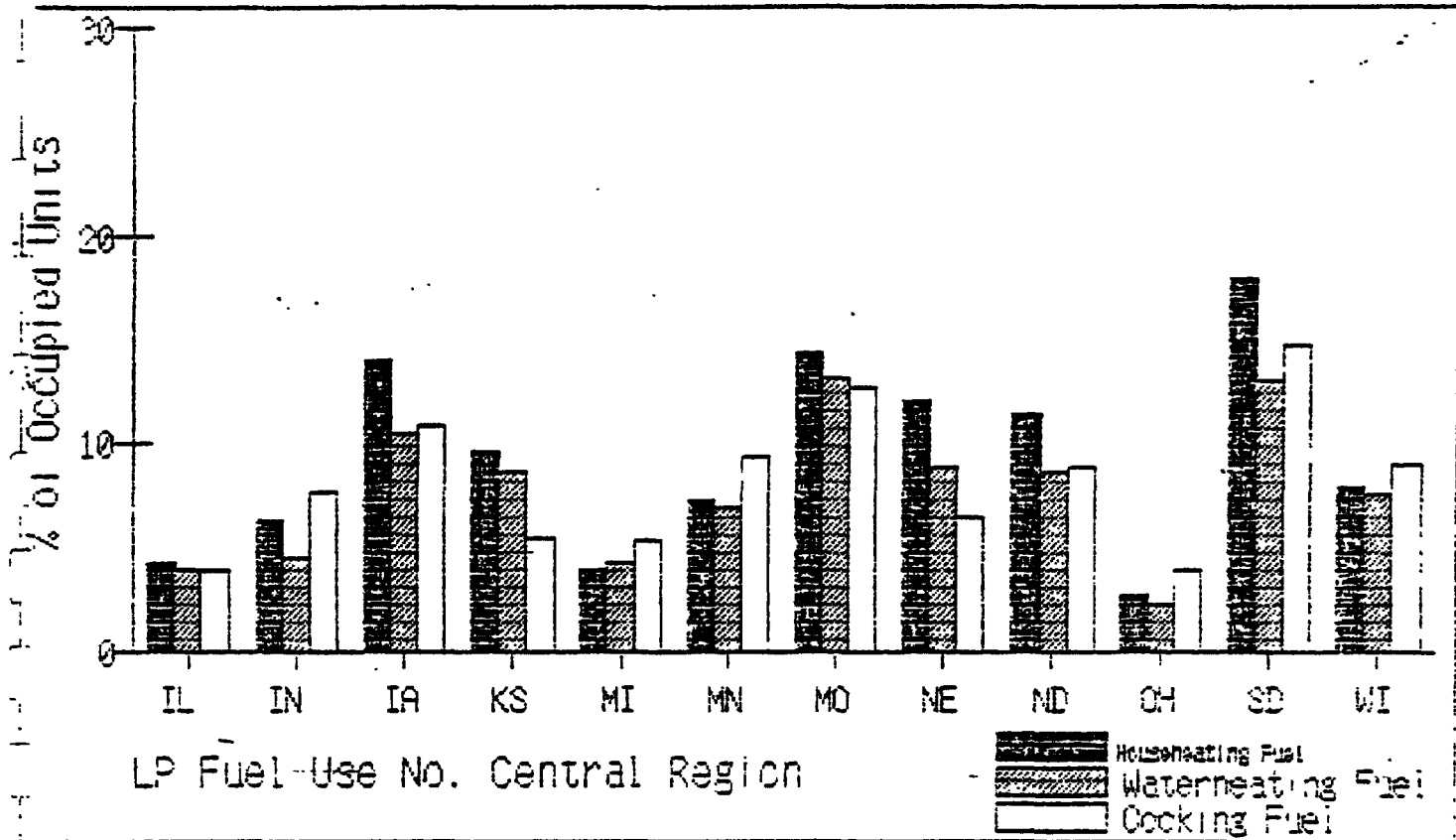


Fig. 17

Source: 1980 Census Of Housing, Vol. 1
 Characteristics Of Housing Units, Chapter B
 Detailed Housing Characteristics, Part 1
 United States Summary EC80-1-31, Issued
 December 1983.

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