

4. Energy Consumption and Expenditures

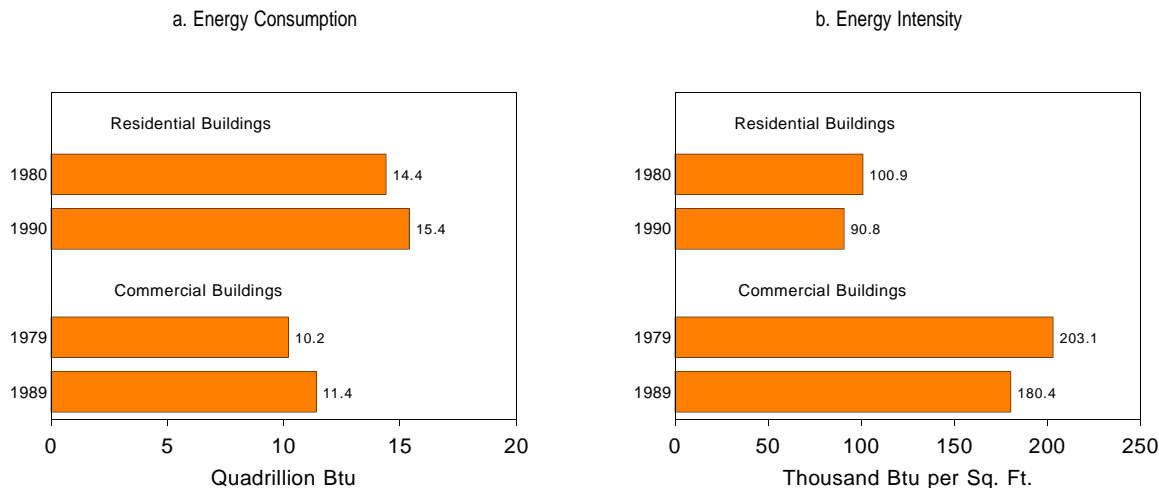
Consumption and Energy Intensities for Major Energy Sources

Throughout the 1980's, energy consumption in residential buildings was greater than in commercial buildings (Figure 4.1a). However, when difference in size between residential and commercial buildings was taken into account, the energy intensity in commercial buildings was shown to be twice that in residential buildings (Figure 1b).⁶ This difference was due to the more intensive use of energy-demanding equipment in commercial buildings, and in many cases, longer hours of operation. In residential buildings energy-consuming equipment is typically operated less intensively during the day, when the occupants are gone, or at night, when they are asleep, for fewer hours of intensive operation overall.

In the 1980's:

- Residential building consumption increased to 15.4 quadrillion Btu by 1990, while energy intensity declined from 100 thousand Btu per square foot in 1980 to just over 90 thousand in 1990 (Figures 4.1a and b).
- By 1989, commercial building consumption was 11.4 quadrillion Btu (Figure 4.1a).⁷ Energy intensity in commercial buildings declined from 203 thousand Btu per square foot in 1979 to 180 thousand in 1989 (Figure 4.1b).

Figure 4.1. Residential and Commercial Buildings Energy Consumption and Energy Intensity in the 1980's



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys; Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey, and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

⁶Energy intensity is defined as energy consumed per square foot of floorspace. Energy intensities for specific energy sources apply to only the floorspace that used the energy source.

⁷The apparent increase in commercial buildings cannot be confirmed because of the effect of the 1979 building undercount noted in Appendix C. If the reported 1979 consumption is adjusted by applying the 1979 intensity to adjusted floorspace, then the reported 1979 consumption (8.8 quadrillion Btu) rises to 10.2 quadrillion Btu, within the statistical uncertainty of the 1989 consumption estimate of 11.4 quadrillion Btu.

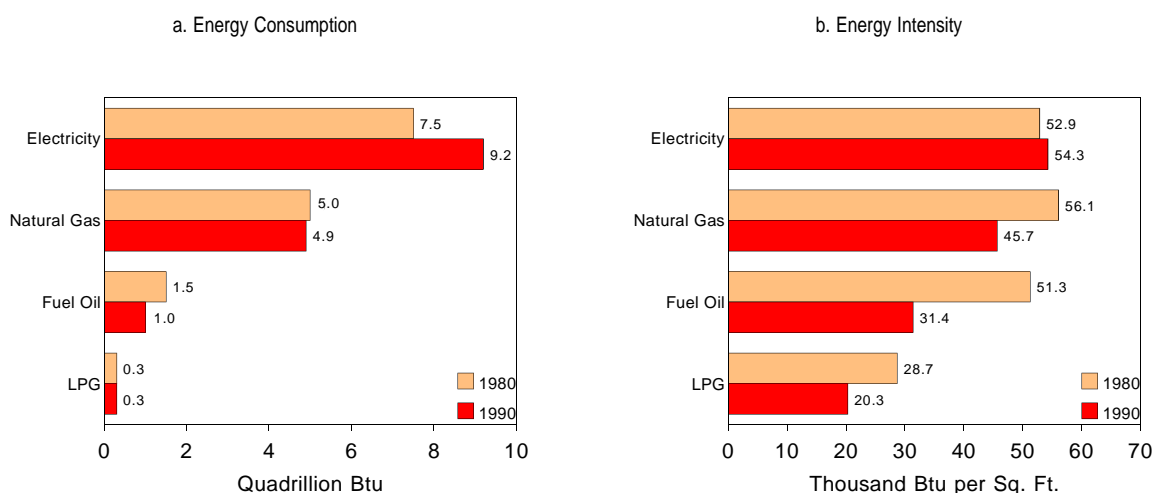
Electricity and natural gas were the two major sources of energy consumed in both residential and commercial buildings (Figures 4.2 and 4.3).⁸ Appliances and lighting were the major electricity end uses, while space heating was the major natural gas end use.⁹

- The major source of primary energy consumption in residential buildings was electricity, which accounted for more than nine quadrillion Btu by 1990, followed by natural gas at five quadrillion Btu. Fuel oil and LPG were consumed in much smaller quantities (Figure 4.2a).¹⁰
- In commercial buildings, electricity consumption accounted for 4 times as much energy as natural gas, followed by smaller levels of fuel oil and district heat consumption (Figure 4.3a).

In the 1980's:

- Electricity consumption increased and fuel oil consumption declined in residential buildings. The former was due to the demand for additional appliances and equipment. Natural gas consumption and LPG consumption were unchanged (Figure 4.2a).
- In both sectors, energy intensity declined for all sources except electricity, which showed no change (Figures 4.2b and 4.3b). The increase for district heat is explained by differences in surveys. In 1989, purchased and nonpurchased steam and hot water were included; in 1979, only purchased steam was included.
- Although electricity consumption increased due to the increased demand for services and increase in total floorspace, its intensity held steady due to the improved efficiency of its use (Figures 4.2a and b, 4.3a and b).

Figure 4.2. Residential Buildings Energy Consumption and Energy Intensity by Source, 1980 and 1990



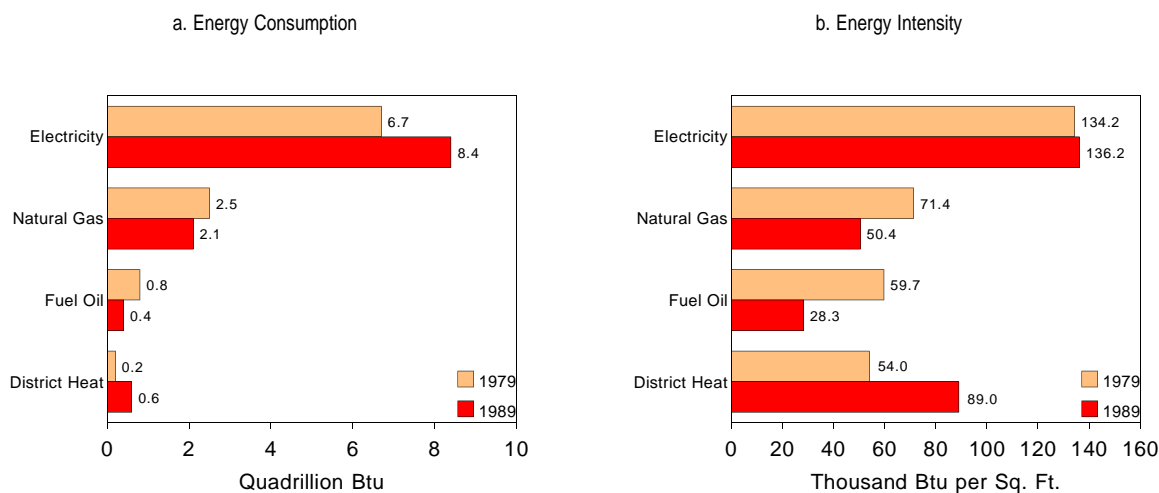
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

⁸The electricity consumption statistics in this report are for primary energy consumption and include electrical system energy losses. Primary energy consumption takes into account the fuels that are used to produce and distribute electricity. All other energy sources are reported as site consumption. See *Assessment of Energy Use in Multibuilding Facilities*, DOE/EIA-0555(93)/1 for discussion of primary district heat consumption.

⁹Space heating and air conditioning energy consumption are not adjusted for the effect of weather.

¹⁰Kerosene is combined with fuel oil. Total kerosene consumption in residential buildings was 0.1 quadrillion Btu or less.

Figure 4.3. Commercial Buildings Energy Consumption and Energy Intensity by Source, 1979 and 1989*



* 1979 includes only purchased steam, 1989 includes purchased and nonpurchased steam and purchased and nonpurchased hot water.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Consumption and Energy Intensity by End Use

Across all buildings, residential appliances and space heating were the end uses that consumed the greatest amount of energy.¹¹ In residential buildings, water heating consumed between 2.4 quadrillion Btu, while air conditioning consumed up to 1.5 quadrillion Btu (Figure 4.4a). The second largest end use in commercial buildings was space heating at 2.2 quadrillion Btu.¹²

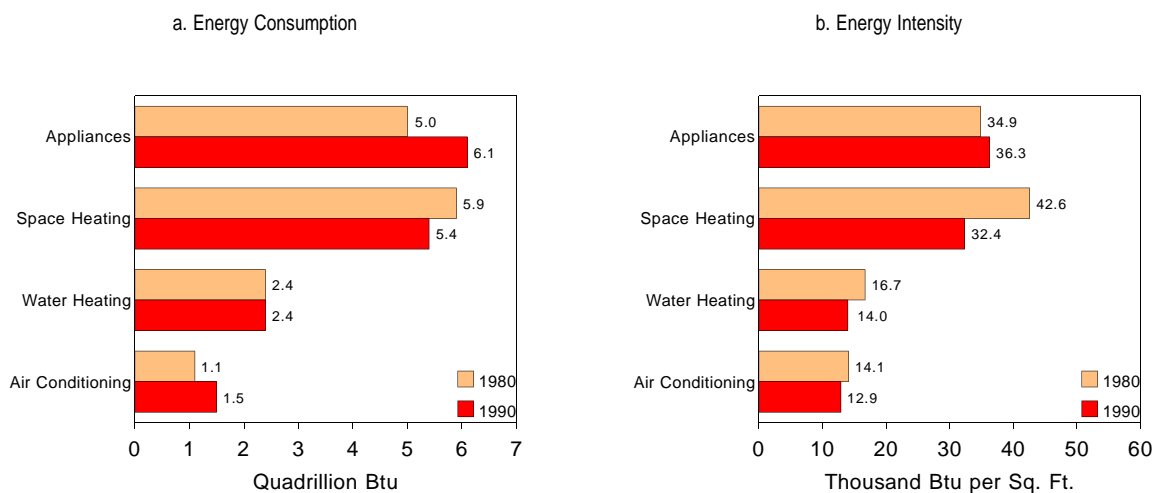
Energy intensities for residential appliances and space heating were comparable to each other and more than twice the intensities of water heating or air conditioning (Figure 4.4b). Improvements in the efficiency of new equipment and appliances attained during the 1980's did not have a large enough impact to reduce the average intensity of the entire building stock. Space heating intensity declined while changes in the other end-use intensities were minor. The decline in space heating intensity can be attributed, at least partially, to the warmer winter weather in 1990.¹³

¹¹Space heating and air conditioning energy consumption were not adjusted for the effect of weather.

¹²End-use consumption estimates for commercial buildings are only available for the 1989 survey. For additional information on these estimates, see *Energy End-Use Intensities in Commercial Buildings*, DOE/EIA-0555(94)/2 (Washington, DC, September 1994).

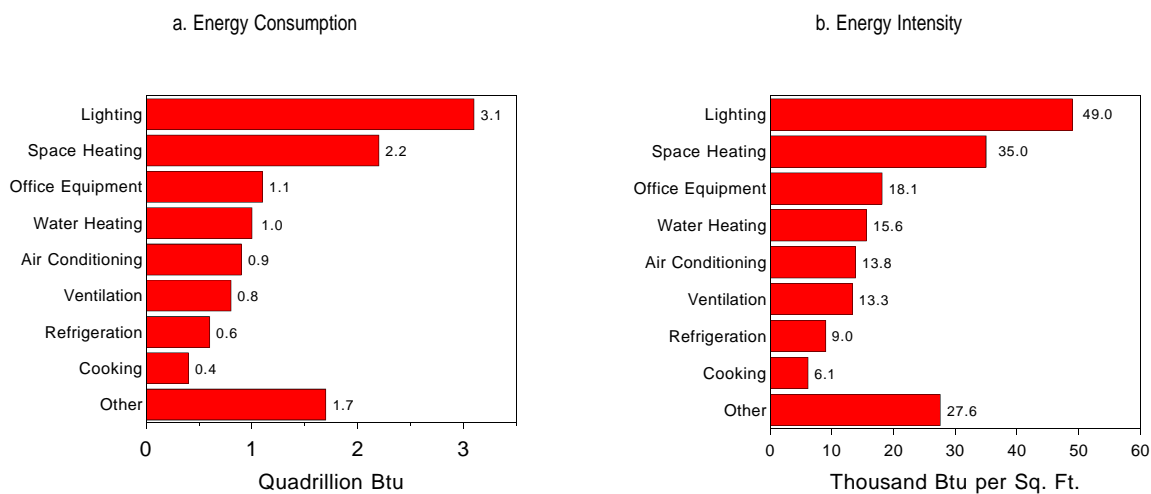
¹³See Figure 2, *Household Energy Consumption and Expenditures 1990*, DOE/EIA-0321(90) (Washington, DC, February, 1993).

Figure 4.4. Residential Buildings Energy Consumption and Energy Intensity by End Use, 1980 and 1990



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.5. Commercial Buildings Energy Consumption and Energy Intensity by End Use, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Energy Consumption by Source and End Use

Electricity dominates as an energy source because of its unique ability to provide many different kinds of desired services (e.g., lighting, household appliances), its universal availability, and its flexibility--all electric houses are common, all natural gas or fuel oil are not, since they cannot provide energy for all end uses.

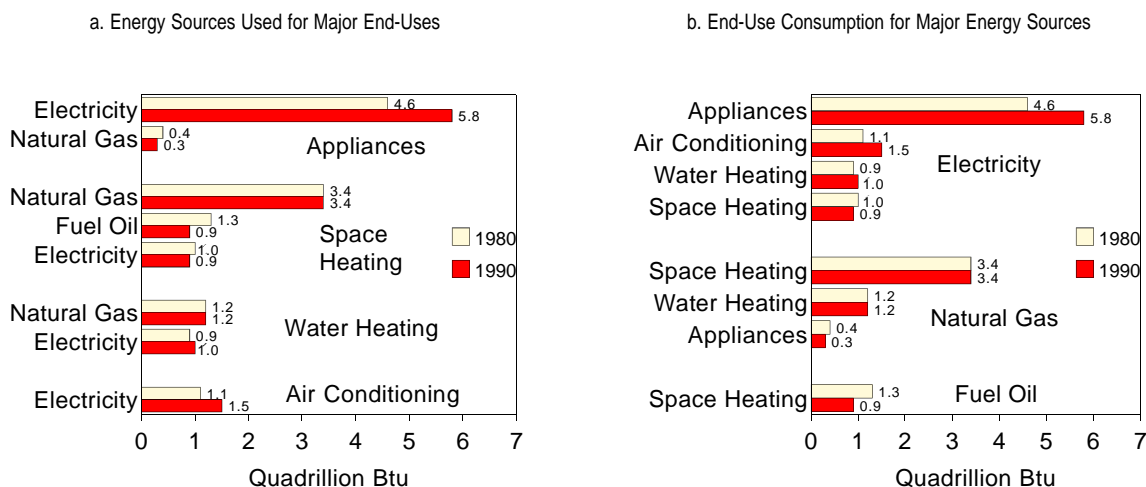
In residential buildings, energy was used primarily for appliances and space heating . Electricity consumption for appliances exceeded that of any other source (Figure 4.6a). Electricity consumption for appliances was nearly four times the consumption for any other electricity end use (Figure 4.6b).

Natural gas was the major energy source consumed for space heating, accounting for more than twice as much consumption than any other source (Figure 4.6a). Natural gas space heating consumption exceeded that of any other natural gas end use by more than two times in residential buildings and four times in commercial buildings (Figures 4.6 and 4.7).

During the 1980's, the two major changes in end-use consumption in residential buildings were an increase in electricity consumption for appliances and a decline in fuel oil consumption for space heating (Figures 4.6a and b). The former may be ascribed to the use of additional appliances (e.g., microwave ovens, water bed heaters, personal computers and printers) and the latter to the choice of other energy sources (natural gas or electricity) for space heating.

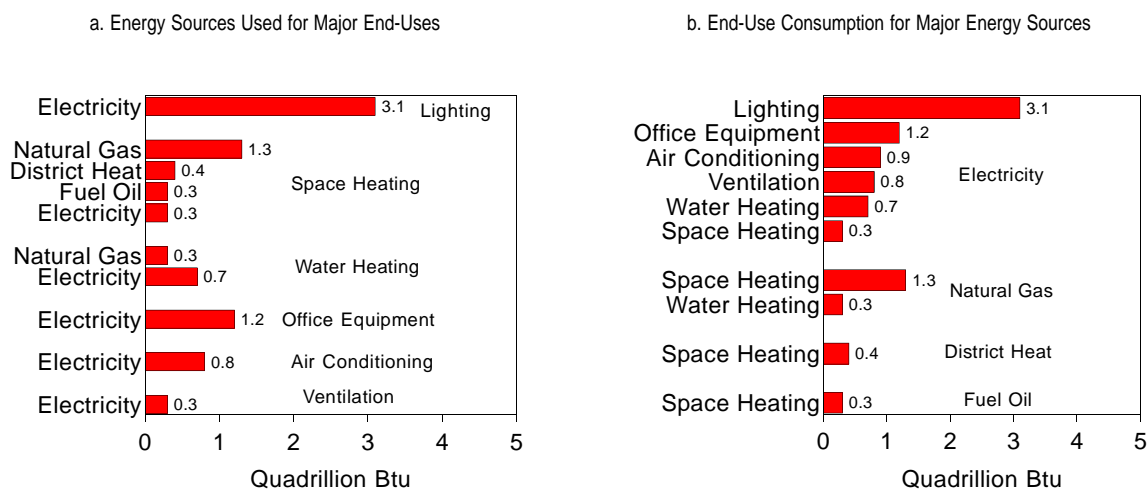
In commercial buildings, natural gas was devoted primarily to space heating; for all other end uses, electricity was the major energy source (Figure 4.7a). Lighting exceeded office equipment by more than two times as the major consumer of electricity (Figure 4.7b).

Figure 4.6. Energy Consumption by Energy Source and End Use in Residential Buildings, 1980 and 1990.



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.7. Energy Consumption by Energy Source and End Use in Commercial Buildings, 1989.*



*End-use consumption estimates are available only for the 1989 survey.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Energy Expenditures

Total energy expenditures for single-family detached homes far exceeded the total energy expenditures for all other building types, consistent with the dominance of energy consumption in these buildings (Figure 1.6). Total expenditures for energy (expressed in constant 1987 dollars) were about 50 percent greater for residential buildings than for commercial buildings (Figure 4.8).¹⁴ In residential buildings, appliances and space heating constituted the greatest expenditure among end uses, but for different reasons (Figure 4.9).¹⁵ Space heating expenditures were driven by the large quantities of energy consumed (see Figure 4.4a), while appliances expenditures were driven by the predominance of electricity as the energy source, the most expensive source on a per Btu basis. In both sectors, expenditures for electricity were greatest, more than twice those of natural gas in residential buildings and eight times those for commercial buildings (Figures 4.10a and b).

During the 1980's, total expenditures for energy in residential buildings declined (Figure 4.8). Electricity expenditures increased and fuel oil expenditures declined in residential buildings (Figure 4.10a). In residential buildings, expenditures for space heating and appliances were at nearly identical levels at the beginning of the decade, then diverged mid-decade when expenditures for space heating declined. By 1990, expenditures for appliances exceeded expenditures for space heating by 13.5 billion dollars (Figure 4.9). The divergence reflected increased consumption for appliances and rising electricity prices, along with the decline in natural gas prices from a peak in the mid-1980's.

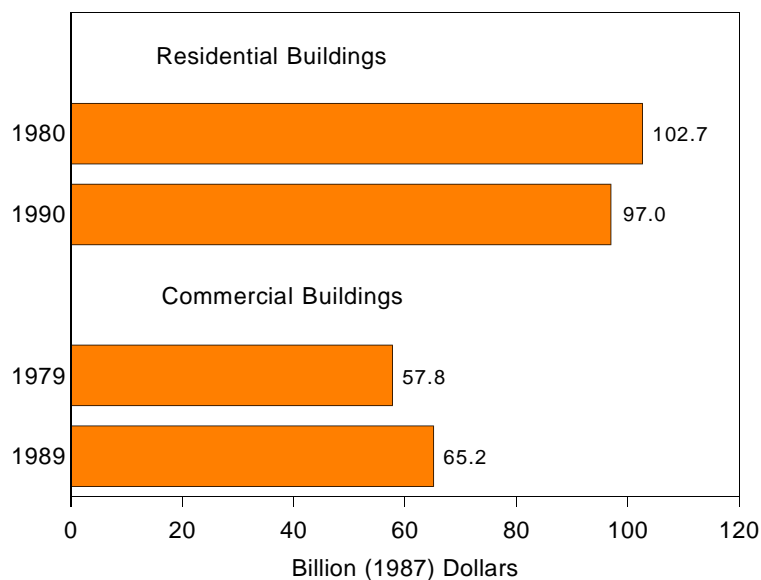
When expenditures are considered relative to consumption (expenditure intensity in dollars expended for each million Btu consumed), at the end of the decade electricity per Btu of primary consumption was 41 percent more expensive than natural gas in residential buildings and 49 percent more expensive in commercial buildings (Figures 4.11 a and b).¹⁶

¹⁴See Appendix C, "Data Quality", for adjustment of expenditures to 1987 dollars.

¹⁵There are no estimates available of expenditures by end-use for commercial buildings.

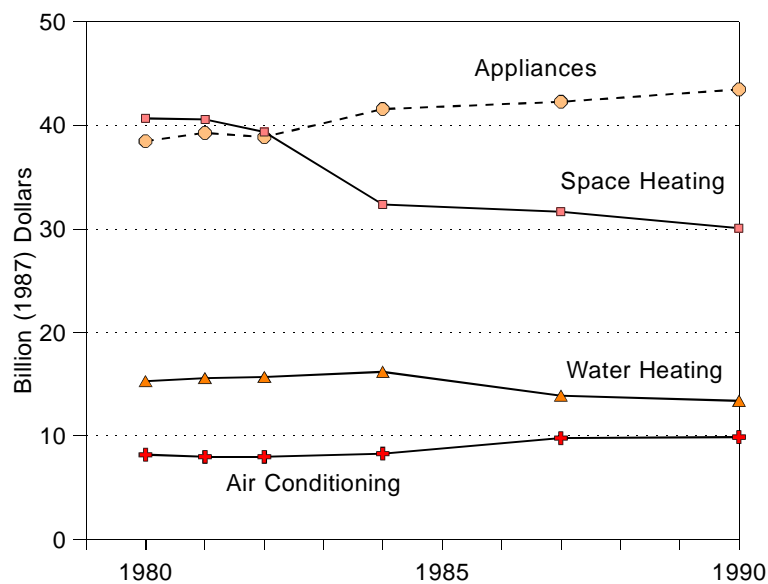
¹⁶Intensities for all major sources and electricity refer to primary electricity consumption.

Figure 4.8. Total Expenditures (1987 Dollars) for Energy in Residential and Commercial Buildings in the 1980's



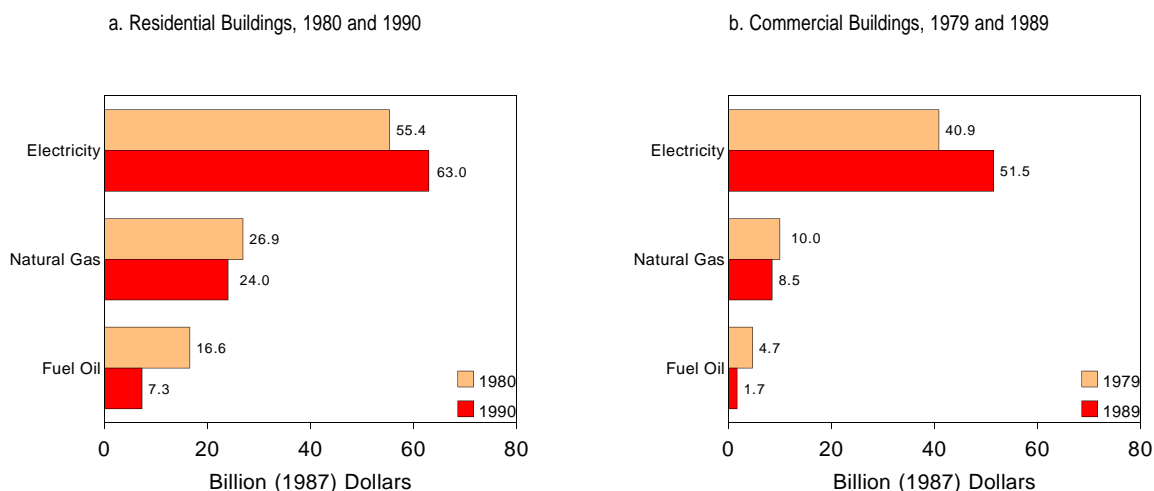
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1990 Residential Energy Consumption Surveys and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Figure 4.9. Expenditures (1987 Dollars) for End Uses in Residential Buildings in the 1980's



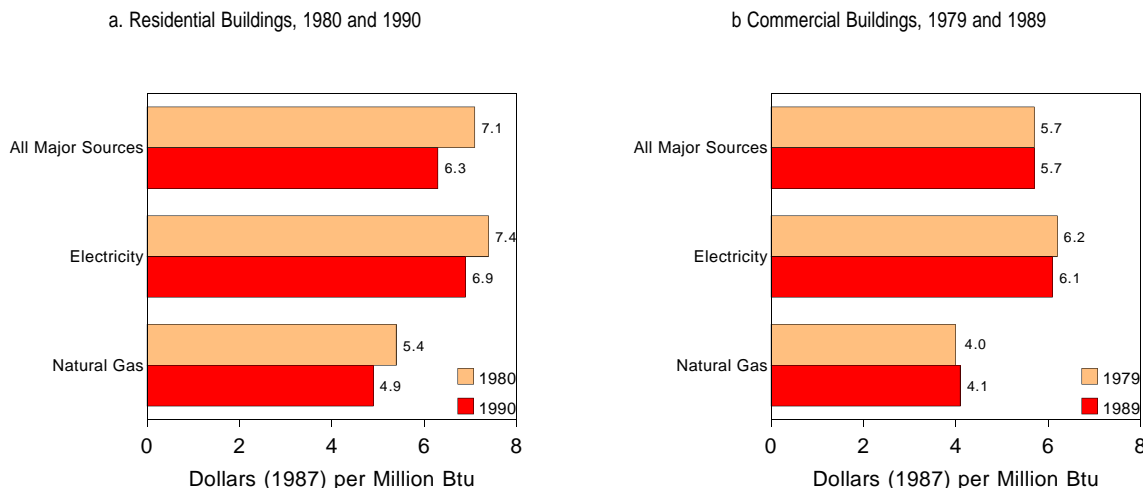
Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

Figure 4.10. Residential and Commercial Buildings Expenditures (1987 Dollars) by Energy Source



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys; Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey, and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Figure 4.11. Residential and Commercial Buildings Expenditure Intensities (1987 Dollars) by Energy Source



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys; Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey, and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

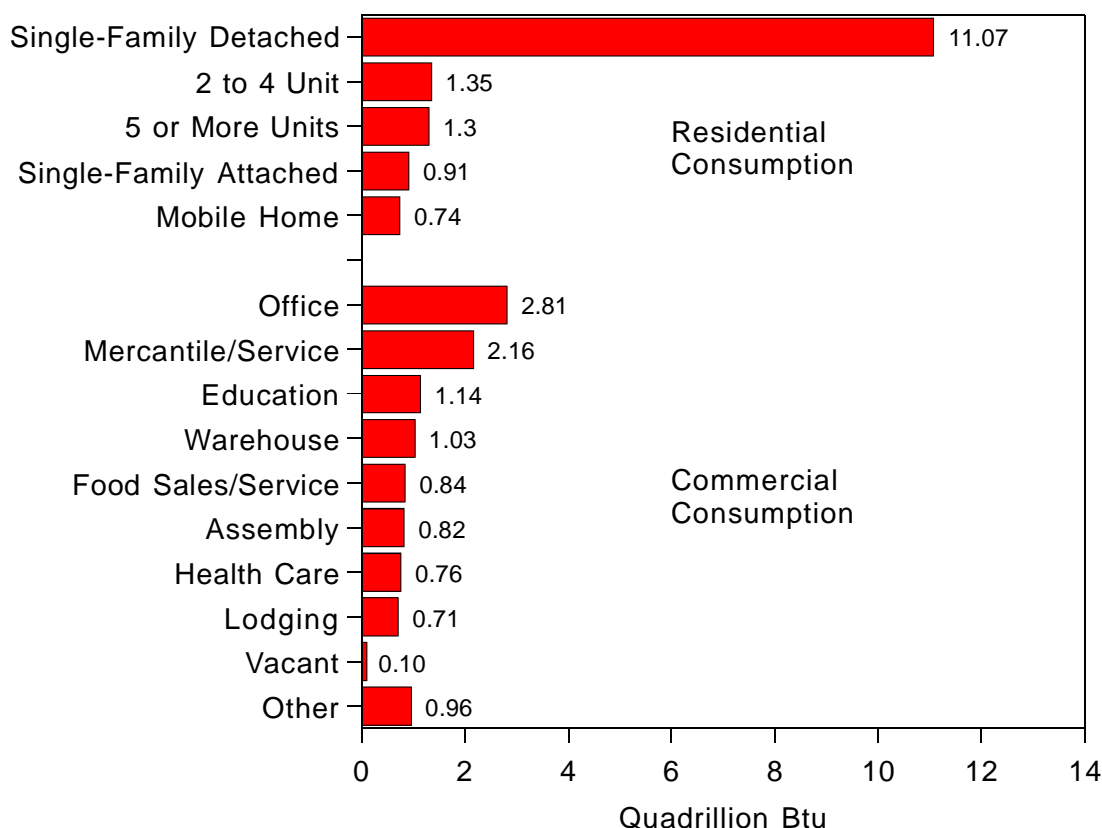
Energy Consumption and Characteristics of Residential and Commercial Buildings

In the following sections, energy consumption is broken down by major building characteristics. These differing characteristics--building type, size of building, Census region, and year of construction--can affect the amount of energy consumed, because of differing end uses and differing amounts of consumption by energy source. For each of these characteristics, comparisons are made between residential and commercial buildings, and between the beginning and end of the 1980's.

Type of Building

The single family detached home dominated all other single building types in energy consumption (Figure 4.12), as well as in number of buildings, total floorspace, and total expenditures. The total energy consumption of single-family detached homes at the end of the decade, however, was only slightly greater than the of consumption in commercial buildings, a fact that reflects the greater consumption intensity in commercial buildings. Energy consumption in other residential building types comprised about one fourth of total residential consumption.

Figure 4.12. Total Primary Energy Consumption by Building Type, 1990 RECS and 1989 CBECS



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1990 Residential Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Within the residential sector, more than 70 percent of energy consumption was in single-family detached homes. Other residential building types each accounted for only four to twelve percent of total energy consumption (Figure 4.13a). Total energy intensities were lowest for single-family detached and attached homes, and greatest for multi-unit (two to four units and five or more units) buildings and mobile homes (Figure 4.13b).

Within the commercial sector, the three largest energy-consuming commercial building types were office buildings, mercantile and service buildings, and education buildings. Combined, these three used slightly more than half of commercial consumption and had energy intensities of less than 240 thousand Btu per square foot. In contrast, energy intensities were greatest for health care buildings, and food sales and service buildings, both in excess of 320 thousand Btu per square foot, but combined, these two used less than 15 percent of total consumption (Figures 4.14a and b). The remaining commercial building types were comparable to each other in consumption levels, each consuming between six and ten percent of total commercial consumption.

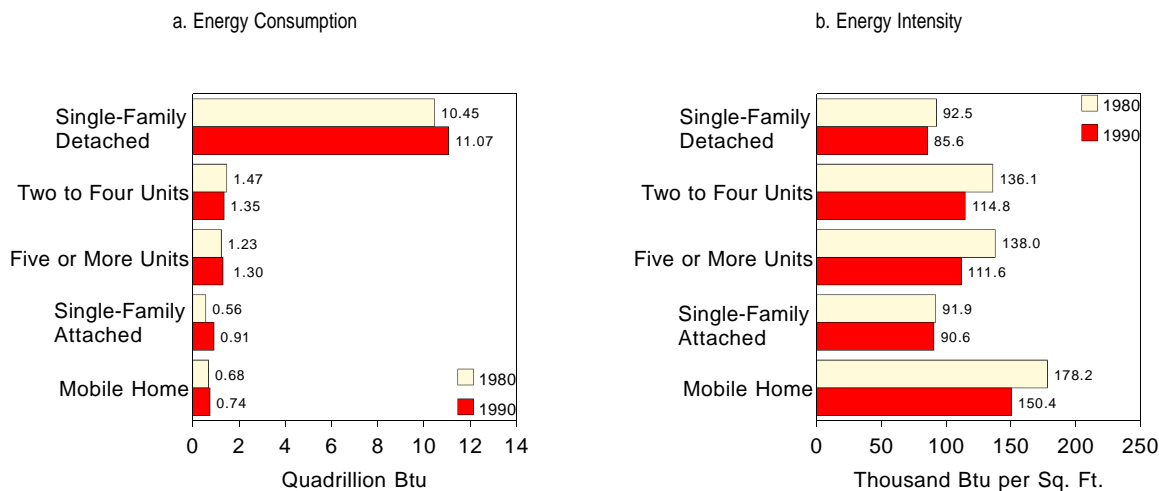
Intensity of energy use does not directly correlate with energy consumption. Natural gas energy intensities were largely comparable in both residential and commercial buildings, with the highest levels being for health care buildings, food sales and service buildings, lodging buildings, and mobile homes (Figures 4.15a and 4.16a).¹⁶ Electricity intensities in all types of residential buildings, except electricity-intensive mobile homes, were similar to each other and lower than in commercial building types. Electricity intensities in commercial buildings, on the other hand, were much more variable than in residential buildings, with the highest values in food sales and service buildings and health care buildings, where there was especially intensive use of equipment and appliances.

The following trends were observed in the 1980's:

- Energy intensities declined most in multi-unit residential buildings and mobile homes (Figure 4.13b).
- There were variable changes in consumption by type of commercial building. In offices and mercantile buildings consumption increased, in warehouses consumption decreased, and in other commercial buildings consumption was roughly constant during the decade (Figure 4.14a).
- Natural gas intensities either declined or showed no significant change in residential and commercial buildings (Figures 4.15a and 4.16a).
- Changes in electricity intensities showed no consistent trend. Electricity intensities in single-family attached homes, mercantile and service buildings, health care buildings, and food sales and service buildings increased, while in mobile homes, warehouses, and commercial lodging buildings intensities declined. All other residential and commercial types showed essentially no changes (Figures 4.15a and 4.16b).

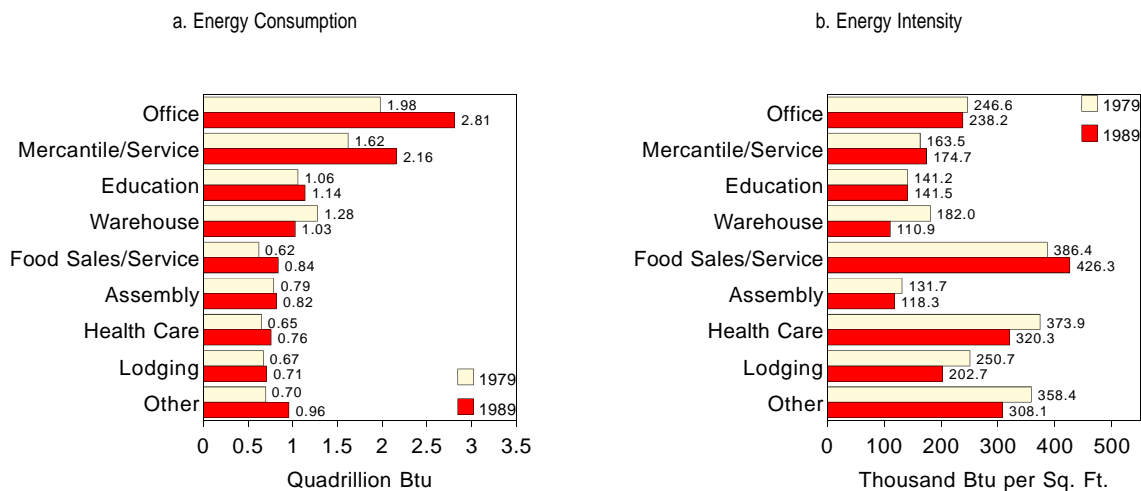
¹⁶Energy intensities for specific energy sources apply to only the floorspace that used the source.

Figure 4.13. Primary Energy Consumption and Energy Intensity by Type of Residential Building, 1980 and 1990



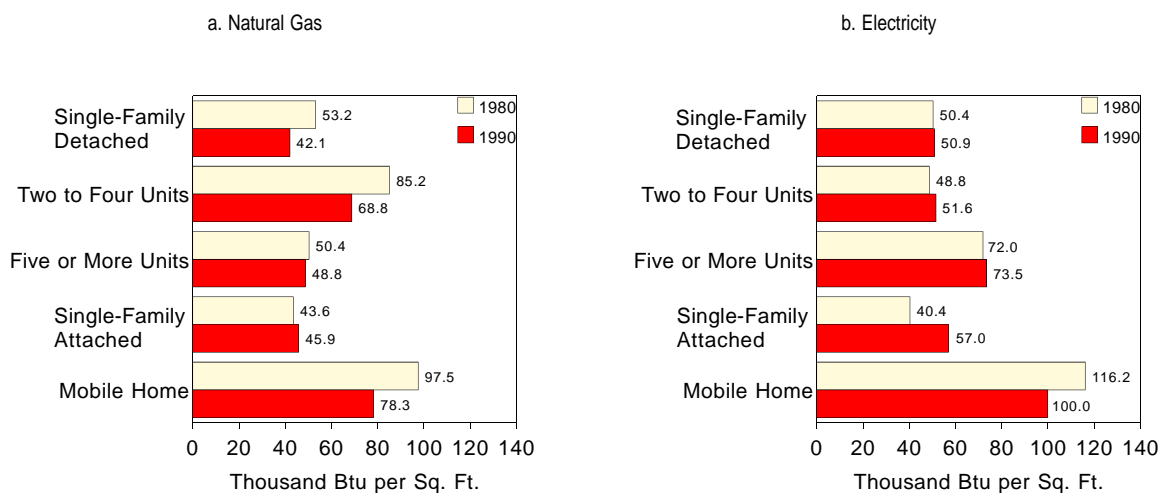
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.14. Primary Energy Consumption and Energy Intensity by Type of Commercial Building, 1979 and 1989



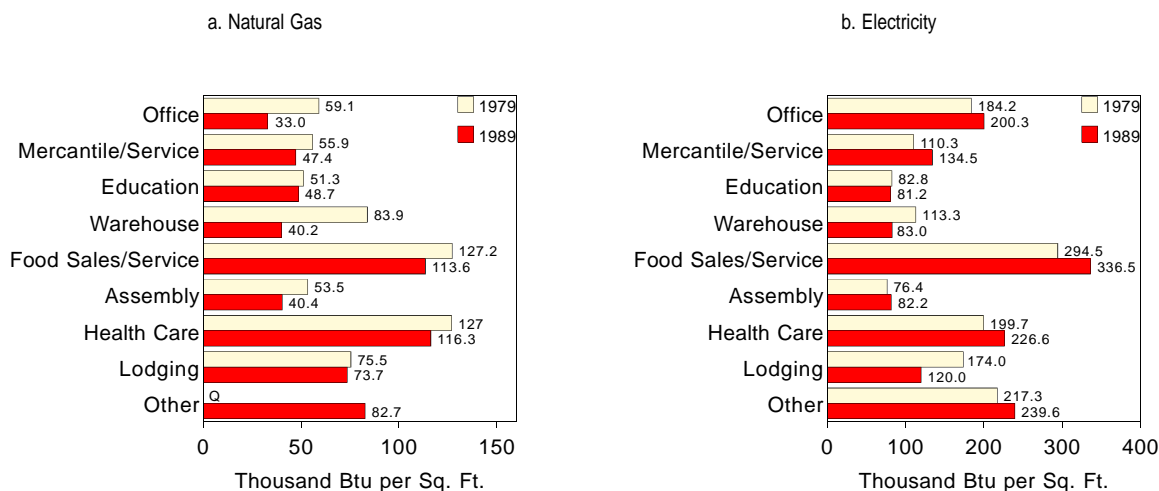
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Figure 4.15. Natural Gas and Electricity Energy Intensity by Type of Residential Building, 1980 and 1990



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.16. Natural Gas and Electricity Energy Intensity by Type of Commercial Building, 1979 and 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Size of Building

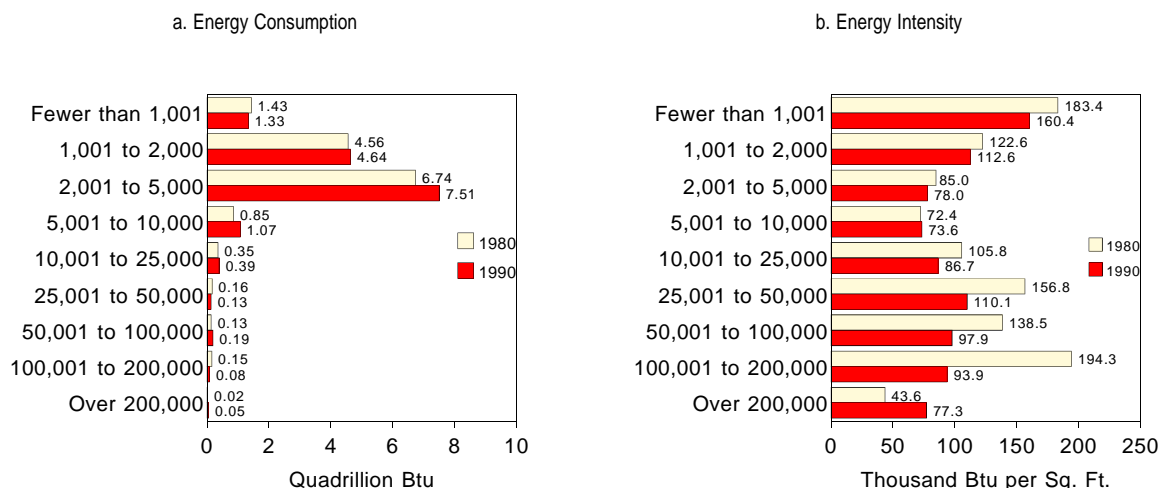
Energy consumption in residential buildings was concentrated in two size categories (encompassing buildings between 1,000 and 5,000 square feet in size), while commercial building consumption was more evenly distributed across all building sizes (Figures 4.17a and 4.18a). In the residential sector, nearly three-fourths of residential consumption occurred in the 1,001 to 5,000 square feet categories, which are the two categories that contain essentially all single-family detached homes (Figure 4.17a).

In both residential and commercial buildings, energy intensities were highest for the smallest size categories. Natural gas intensities were greatest for the smallest residential and commercial buildings and for the same size categories, residential intensities were lower (Figures 19a and 20a). Electricity intensities showed roughly similar distributions, with the highest levels in the smallest buildings. As with natural gas, electricity intensities were much lower in residential buildings than commercial buildings for the same size categories (Figures 4.19b and 4.20b). The fact that the smallest buildings had the higher intensities is explained by the type of buildings found in these size categories. In the commercial sector, the two most abundant building types were food sales and service buildings and health care buildings, the two types with the highest energy intensities. In the residential sector, the type that had the highest intensities, mobile homes, were found only in the smallest size categories.

During the 1980's:

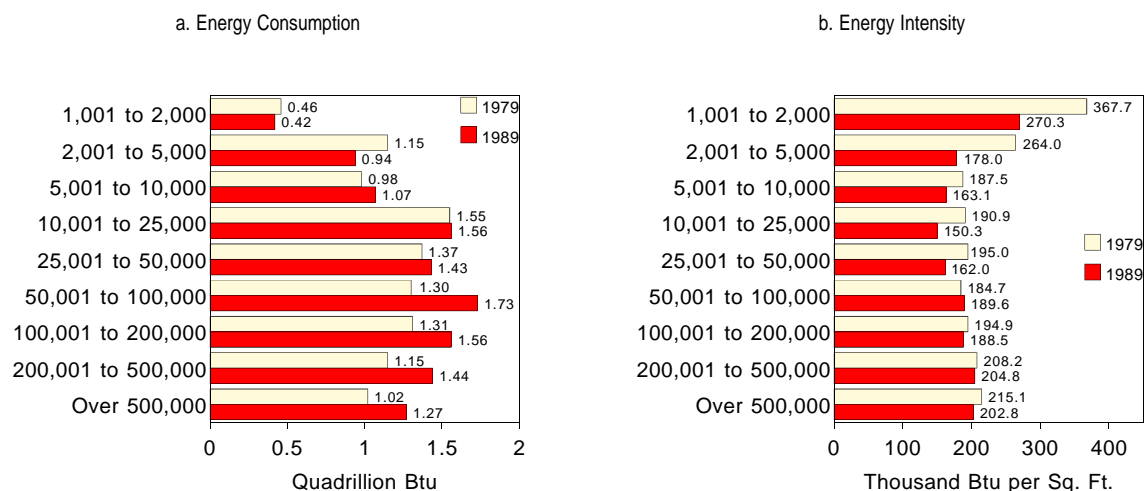
- Intensities declined or were unchanged in residential buildings (Figure 4.17b).
- Each of the categories of commercial buildings smaller than 25,000 square feet declined in energy intensity, while larger buildings showed no significant change (Figure 4.18b).
- Natural gas intensities declined, or remained unchanged, for all sizes of residential and commercial buildings. The increase for commercial buildings in the 25,001 to 50,000 category was not statistically significant (Figures 4.19a and 4.20a).

Figure 4.17. Primary Energy Consumption and Energy Intensity in Residential Buildings by Size of Building, 1980 and 1990



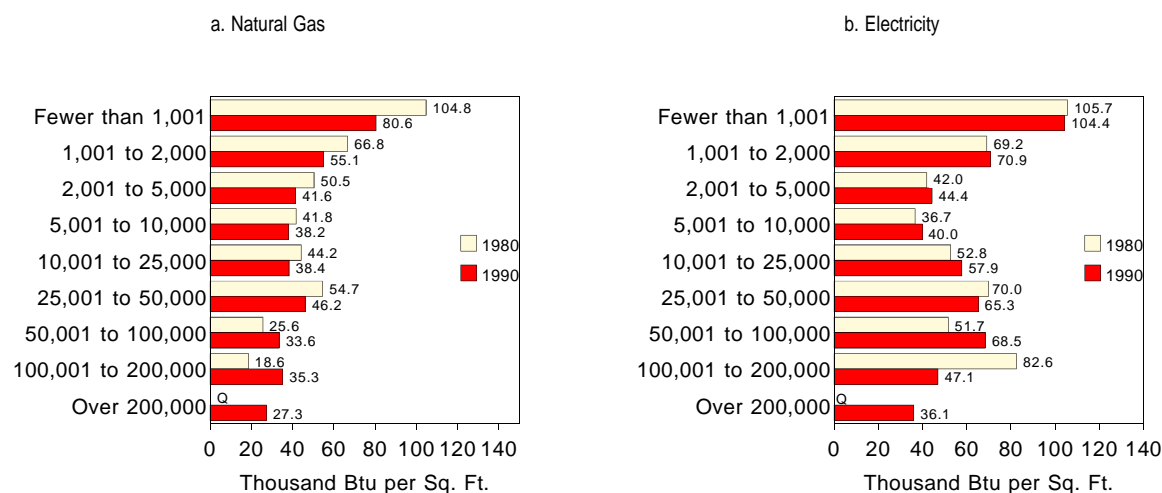
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.18. Primary Energy Consumption and Energy Intensity in Commercial Buildings by Size of Building, 1979 and 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

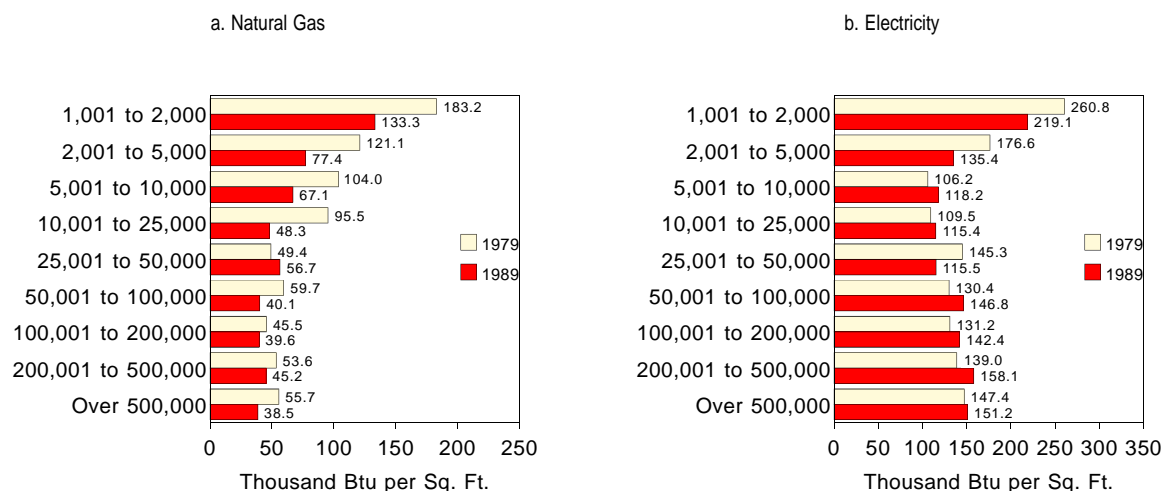
Figure 4.19. Natural Gas and Electricity Energy Intensity in Residential Buildings by Size of Building, 1980 and 1990



Q = Data withheld either because the Relative Standard Error was greater than 50 percent or fewer than 10 households were sampled.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.20. Natural Gas and Electricity Energy Intensity in Commercial Buildings by Size of Building, 1979 and 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Census Region

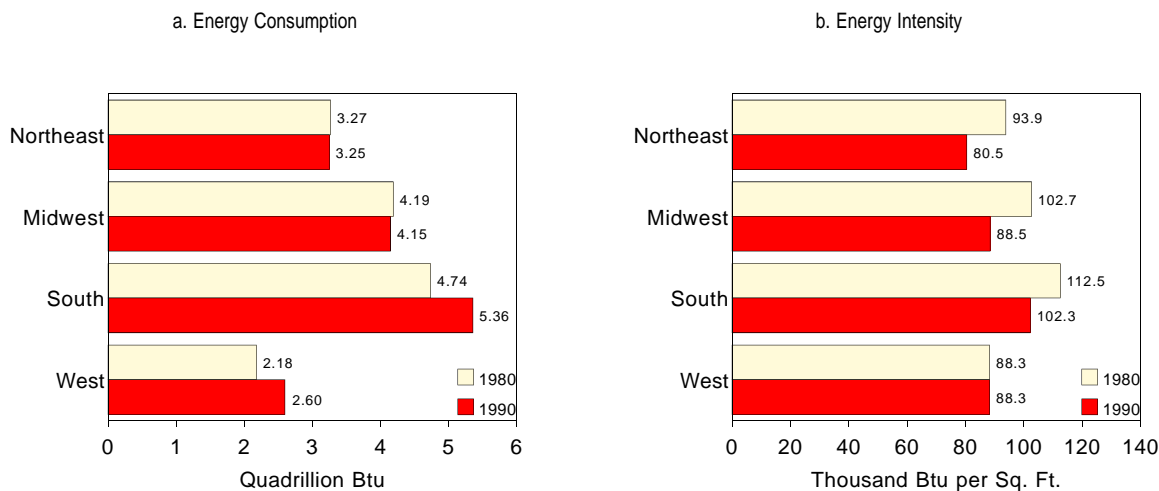
Similar patterns of regional variation occurred for both residential and commercial consumption and intensity. The share of consumption in residential and commercial buildings was greatest in the South (Figure 4.21a and 4.22a). This was due to the presence of a greater number of people (hence, number of residences and more commercial activity) in the South.

Natural gas intensities were greatest in both residential and commercial buildings in the Midwest (Figures 4.23a and 4.24a). In residential buildings, electricity intensities were highest in the South; in commercial buildings, they were highest in the West (Figures 4.23b and 4.24b).

In the 1980's:

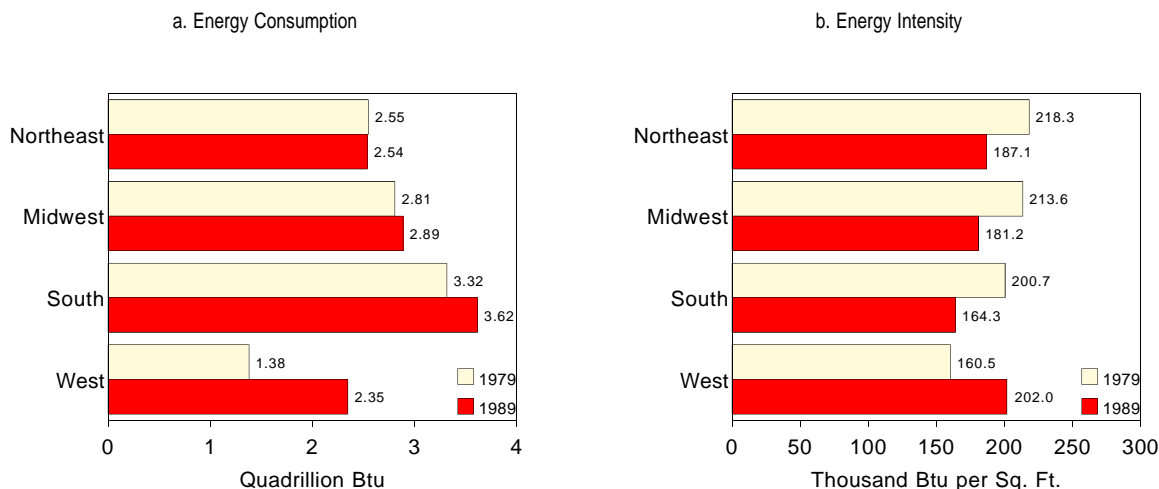
- Residential energy intensities declined in every region except in the West, where there was no change (Figure 4.21b).
- Commercial consumption showed one change, an increase in the West (Figure 4.22a).
- Commercial buildings intensities declined in the Midwest, South, and Northeast but increased in the West (Figure 4.22b).
- With the exception of residential buildings in the West, natural gas intensities declined in all regions in both sectors (Figures 4.23a and 4.24a).
- Electricity intensities increased in the West in commercial buildings; otherwise, they were unchanged in all other regions in both sectors (Figures 4.23b and 4.24b).

Figure 4.21. Primary Energy Consumption and Energy Intensity in Residential Buildings by Census Region, 1980 and 1990



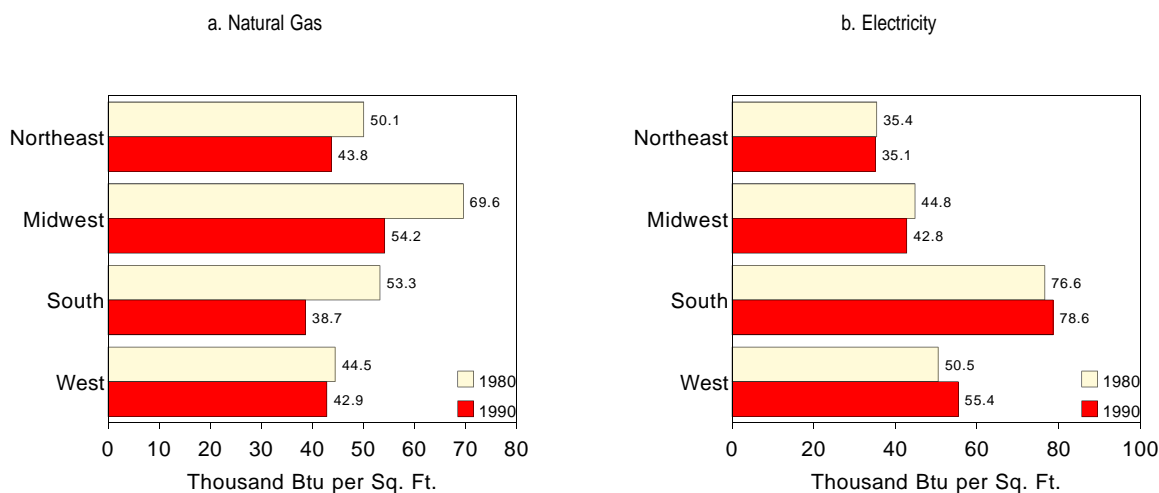
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.22. Primary Energy Consumption and Energy Intensity in Commercial Buildings by Census Region, 1979 and 1989



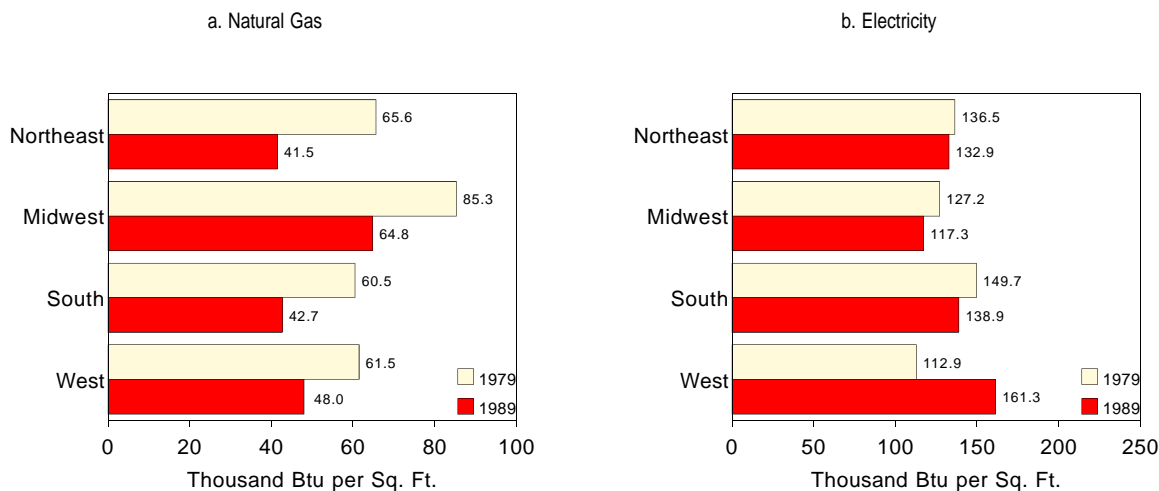
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Figure 4.23. Natural Gas and Electricity Energy Intensity in Residential Buildings by Census Region, 1980 and 1990



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.24. Natural Gas and Electricity Energy Intensity in Commercial Buildings by Census Region, 1979 and 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Year Constructed

In the 1990 survey, the energy intensities of residential buildings constructed in the 1980's were lower than those built during the preceding decades. This is a preview of the future, when buildings constructed after 1980 will constitute a larger share of the building stock and, thus, lower energy intensities can be expected.

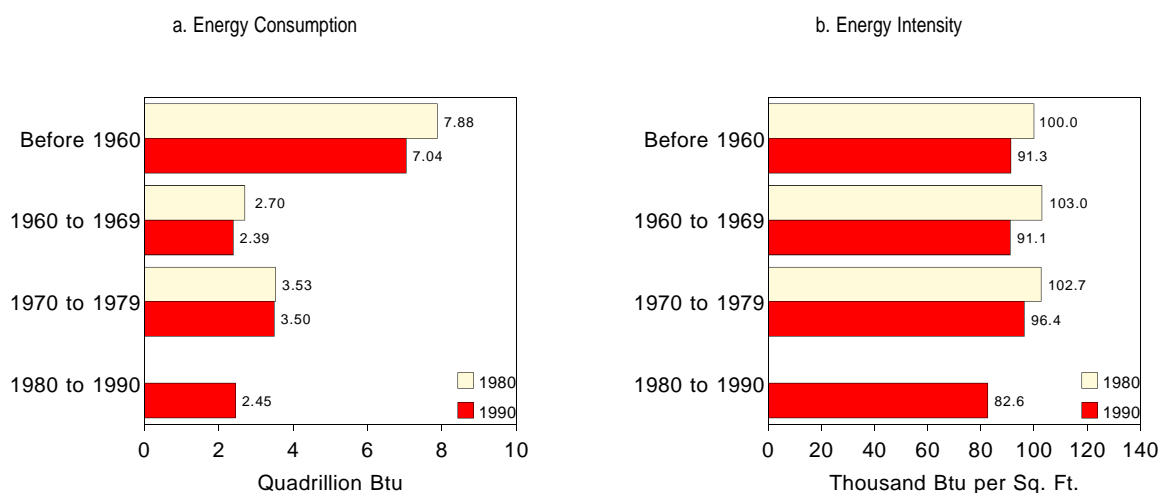
At the end of the 1980's, more than half of residential energy and more than a third of commercial energy was consumed in buildings constructed before 1960 (Figures 4.25a and 4.26a). In contrast, just under half of residential buildings and floorspace and about 40 percent of commercial buildings and floorspace were constructed before 1960.

Energy intensities were at similar levels across year-constructed categories in the residential sector for the 1980 residential survey. In the 1989 commercial buildings survey, the energy intensities of most recently constructed buildings exceeded those constructed before 1960 (Figure 4.25b). This reflected the increased demand for electricity consumption in the most recently constructed buildings.

In the 1980's:

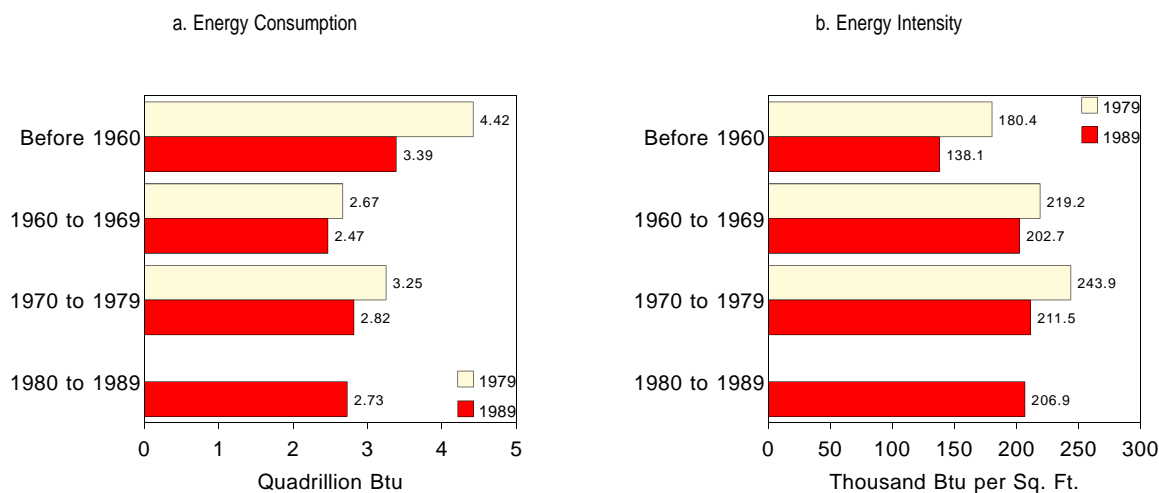
- Energy intensity in commercial buildings constructed in the 1970's, 1960's, and before 1960 all declined (Figure 4.25b).
- Natural gas intensities generally declined by 10 to 30 percent across the year-constructed categories in both sectors, while electricity intensities showed no change (Figures 4.27a and b and 4.28a and b).

Figure 4.25. Primary Energy Consumption and Energy Intensity in Residential Buildings by Year Constructed, 1980 and 1990



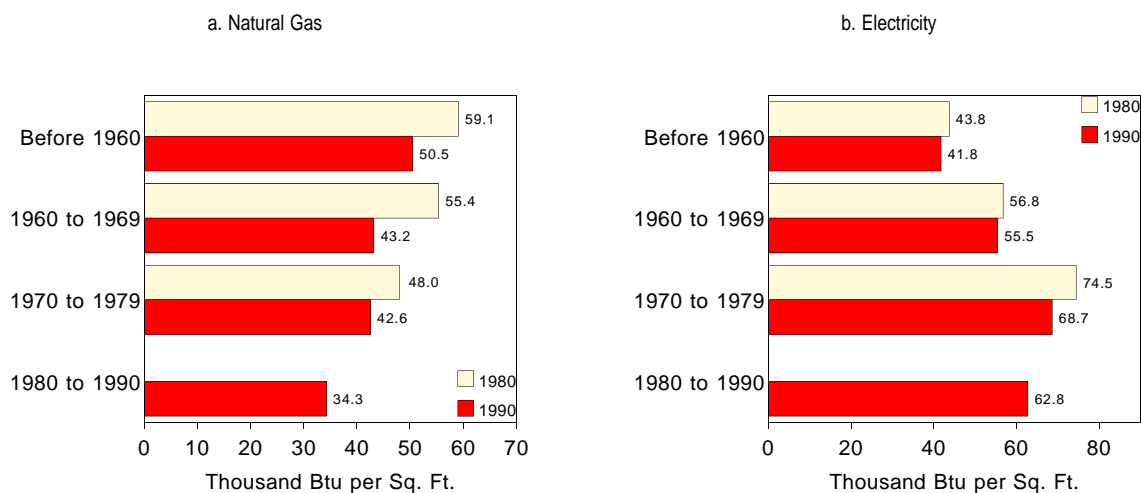
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.26. Primary Energy Consumption and Energy Intensity in Commercial Buildings by Year Constructed, 1979 and 1989



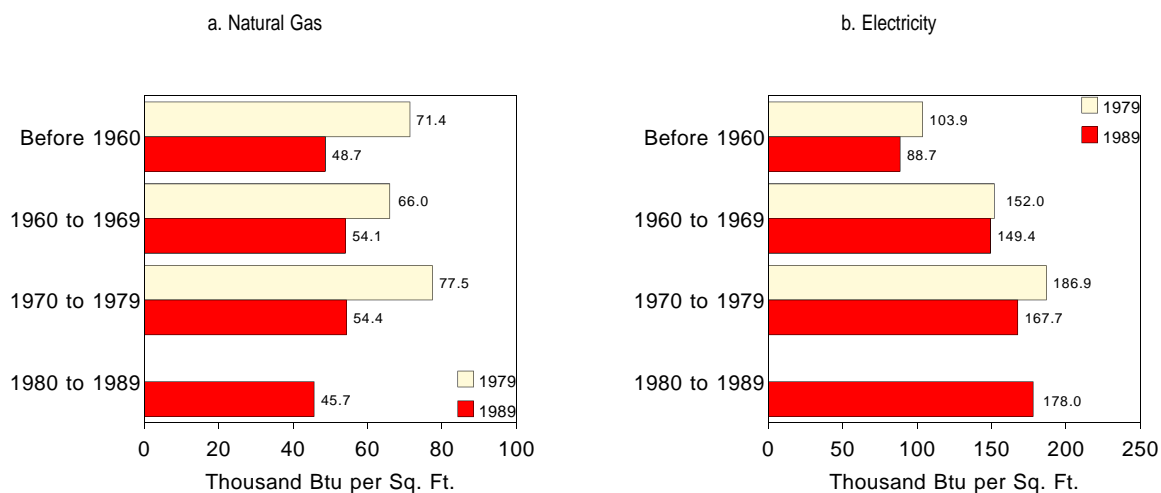
Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Figure 4.27. Natural Gas and Electricity Energy Intensity in Residential Buildings by Year Constructed, 1980 and 1990



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Surveys.

Figure 4.28. Natural Gas and Electricity Energy Intensity in Commercial Buildings by Year Constructed, 1979 and 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

**Table 4.1. Total Primary Consumption for All End Uses by Major Energy Source in Residential Buildings
(quadrillion Btu)**

Year of Survey RSE Column Factors:	Energy Sources							RSE Row Factors
	All Major Sources	Electricity	Natural Gas	Fuel Oil and Kerosene*	Fuel Oil	Kerosene	LPG	
	0.3	0.4	0.7	1.1	1.3	3.4	2.8	
1980	14.382	7.541	4.967	1.524	--	--	0.349	4.6
1981	14.283	7.414	5.273	1.281	--	--	0.314	4.7
1982	13.417	7.187	4.743	1.196	--	--	0.290	5.2
1984	14.154	7.599	4.984	1.256	1.154	0.102	0.315	4.5
1987	14.790	8.419	4.832	1.224	1.135	0.089	0.315	4.4
1990	15.368	9.182	4.863	1.041	0.976	0.065	0.281	4.6

* Fuel oil and kerosene were combined in the 1980, 1981, and 1982 surveys.

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

**Table 4.2. Energy Intensities for All End Uses by Major Energy Source in Residential Buildings
(thousand Btu per square foot)**

Year of Survey RSE Column Factors:	Energy Sources							RSE Row Factors
	All Major Sources	Electricity	Natural Gas	Fuel Oil and Kerosene*	Fuel Oil	Kerosene	LPG	
	0.4	0.6	0.5	1.0	1.0	4.3	2.1	
1980	100.93	52.93	56.12	51.31	--	--	28.77	3.2
1981	99.05	51.42	56.84	44.38	--	--	25.87	3.3
1982	94.32	50.54	51.64	39.83	--	--	24.73	3.7
1984	98.05	52.67	53.50	39.25	49.47	9.10	26.24	3.0
1987	94.31	53.70	48.63	36.76	45.81	8.14	25.67	3.3
1990	90.81	54.27	45.74	31.36	38.46	7.01	20.24	3.7

* Fuel oil and kerosene were combined in the 1980, 1981, and 1982 surveys.

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

Table 4.3. Total Primary Consumption for All End Uses by Major Energy Source in Commercial Buildings
(quadrillion Btu)

Year of Survey RSE Column Factors:	Energy Sources					RSE Row Factors
	All Major Sources	Electricity	Natural Gas	Fuel Oil ^a	District Heat	
	0.7	0.8	1.1	1.6	2.2	
1979	8.847	5.790	2.174	0.681	0.201	11.0
1979 , adjusted ^b . . .	10.159	6.649	2.497	0.782	0.231	NF
1983	9.257	6.564	2.091	0.314	0.289	10.0
1986	9.906	7.319	1.723	0.442	0.422	7.8
1989	11.401	8.386	2.073	0.357	0.585	8.6

^aIncludes kerosene.

^b1979 consumption adjusted by applying 1979 consumption intensity to adjusted floorspace. See Appendix C, "Data Quality", for further discussion.
NF = No applicable RSE row/column factor.

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-143, 788, and 871 of the 1979, 1983, and 1986 Nonresidential Buildings Energy Consumption Surveys and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Table 4.4. Energy Intensities for All End Uses by Major Energy Source in Commercial Buildings
(thousand Btu per square foot)

Year of Survey RSE Column Factors:	Energy Sources					RSE Row Factors
	All Major Sources	Electricity	Natural Gas	Fuel Oil [*]	District Heat	
	0.7	0.9	1.2	1.4	1.9	
1979	203.16	134.18	71.35	59.73	54.04	7.0
1983	187.13	135.82	61.61	33.42	64.79	9.5
1986	170.21	129.53	46.23	40.14	91.24	6.5
1989	180.44	136.21	50.39	28.32	88.96	7.0

^{*}Includes kerosene.

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-143, 788, and 871 of the 1979, 1983, and 1986 Nonresidential Buildings Energy Consumption Surveys and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Table 4.5. Total Primary Consumption by End Use in Residential Buildings
(quadrillion Btu)

Year of Survey	End Uses					RSE Row Factors
	All End Uses	Space Heating	Water Heating	Air Conditioning	Appliances	
RSE Column Factors:	1.0	NF	NF	NF	NF	
1980	14.382	5.907	2.366	1.132	4.977	1.1
1981	14.283	5.887	2.334	1.070	4.991	1.4
1982	13.417	5.294	2.220	1.049	4.854	1.4
1984	14.154	5.747	2.292	1.047	5.068	1.2
1987	14.790	5.522	2.284	1.345	5.639	1.0
1990	15.368	5.404	2.356	1.467	6.141	1.0

NF = No applicable RSE row/column factor.

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

Table 4.6. Energy Intensities by End Use in Residential Buildings
(thousand Btu per square foot)

Year of Survey	End Uses					RSE Row Factors
	All End Uses	Space Heating	Water Heating	Air Conditioning	Appliances	
RSE Column Factors:	1.0	NF	NF	NF	NF	
1980	100.94	42.64	16.71	14.08	34.93	1.2
1981	99.06	42.30	16.28	12.72	34.61	1.3
1982	94.33	38.39	15.71	12.45	34.13	1.3
1984	98.05	40.91	16.02	11.75	35.11	1.1
1987	94.31	36.04	14.64	13.59	35.96	1.2
1990	90.81	32.41	13.97	12.94	36.29	1.4

NF = No applicable RSE row/column factor.

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

Table 4.7. Total Primary Consumption by Major Energy Sources and End Uses in Residential Buildings
(quadrillion Btu)

Year of Survey	Energy Sources									
	Electricity				Natural Gas			Fuel Oil	Kerosene	Fuel Oil and Kerosene*
	Space Heating	Water Heating	Appliances	Air Conditioning	Space Heating	Water Heating	Appliances	Space Heating	Space Heating	Space Heating
1980	0.960	0.925	4.565	1.091	3.411	1.152	0.365	--	--	1.305
1981	0.922	0.928	4.515	1.049	3.692	1.133	0.427	--	--	1.063
1982	0.919	0.865	4.379	1.024	3.144	1.148	0.427	--	--	1.045
1984	0.917	0.991	4.676	1.015	3.509	1.095	0.347	1.006	0.101	--
1987	0.863	0.961	5.263	1.332	3.382	1.100	0.337	0.966	0.088	--
1990	0.918	1.027	5.782	1.457	3.367	1.160	0.326	0.866	0.065	--

* Fuel oil and kerosene were combined in the 1980, 1981, and 1982 surveys.

Notes: • See "Glossary" for definition of terms used in this report. • No applicable Relative Standard Error (RSE) row/column factors for end-use estimates.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

Table 4.8. Total Primary Consumption by Major Energy Sources and End Uses in Commercial Buildings
(quadrillion Btu)

Year of Survey	Energy Sources								
	Electricity					Natural Gas		District Heat	Fuel Oil
	Lighting	Cooling	Ventilation	Space Heating	Water Heating	Space Heating	Water Heating	Space Heating	Space Heating
1989	3.094	0.853	0.841	0.290	0.073	1.265	0.320	0.355	0.301

Notes: • See "Glossary" for definition of terms used in this report. • No applicable Relative Standard Error (RSE) row/column factors for end-use estimates.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey, and *Energy End-Use Intensities in Commercial Buildings*, DOE/EIA-0555(94)/2.

Table 4.9a. Total Expenditures for All End Uses by Major Energy Source in Residential Buildings
(billion dollars)

Year of Survey	Energy Sources								RSE Row Factors
	All Major Sources		Electricity		Natural Gas		Fuel Oil and Kerosene		
	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	
	0.5	0.5	0.7	0.7	1.3	1.3	2.2	2.2	
RSE Column Factors:	0.5	0.5	0.7	0.7	1.3	1.3	2.2	2.2	
1980	102.735	75.613	55.446	40.808	26.860	19.769	16.630	12.239	2.6
1981	103.512	83.016	55.855	44.796	29.959	24.027	14.199	11.387	2.5
1982	102.034	86.525	55.116	46.739	31.798	26.964	11.879	10.074	2.7
1984	106.795	96.970	59.999	54.479	32.793	29.776	10.571	9.598	2.4
1987	97.747	97.747	61.580	61.580	26.149	26.149	7.208	7.208	2.4
1990	96.994	110.185	62.972	71.537	23.998	27.261	7.260	8.247	2.4

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

Table 4.9b. Total Expenditures for All End Uses by Major Energy Source in Commercial Buildings
(billion dollars)

Year of Survey	Energy Sources								RSE Row Factors
	All Major Sources		Electricity		Natural Gas		Fuel Oil		
	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	
	RSE Column Factors:	0.8	0.8	0.9	0.9	1.0	1.0	1.4	
1979	50.444	33.596	35.662	23.751	8.730	5.814	4.152	2.765	8.7
1979, adjusted*	57.812	38.503	40.922	27.254	9.984	6.649	4.716	3.141	NF
1983	63.156	55.451	44.737	39.279	13.033	11.443	2.394	2.102	8.4
1986	62.339	60.219	48.847	47.186	8.649	8.355	2.132	2.059	5.4
1989	65.217	70.826	51.513	55.943	8.475	9.204	1.678	1.822	6.2

* 1979 expenditures adjusted by applying 1979 expenditure intensity to adjusted 1979 floorspace. See Appendix C, "Data Quality", for further discussion.
NF = No applicable RSE row/column factor.

Notes: • To obtain the Relative Standard Error (RSE) percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-143,788, and 871 of the 1979, 1983, and 1986 Nonresidential Buildings Energy Consumption Surveys and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.

Table 4.10. Total Expenditures by End Use in Residential Buildings
(billion dollars)

Year of Survey	End Uses							
	Space Heating		Water Heating		Air Conditioning		Appliances	
	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars	1987 Dollars	Current Dollars
1980	40.709	29.962	15.323	11.278	8.182	6.022	38.520	28.351
1981	40.605	32.565	15.604	12.514	8.024	6.435	39.281	31.503
1982	39.408	33.418	15.715	13.326	8.044	6.821	38.868	32.960
1984	32.380	36.881	16.229	14.736	8.307	7.543	41.642	37.811
1987	31.682	31.682	13.910	13.910	9.829	9.829	42.326	42.326
1990	30.079	34.170	13.445	15.274	9.932	11.283	43.537	49.458

Notes: • See "Glossary" for definition of terms used in this report. • No applicable Relative Standard Error (RSE) row/column factors for end-use estimates.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980, 1981, 1982, 1984, 1987, and 1990 Residential Energy Consumption Surveys.

Table 4.11 Total Primary Consumption and Energy Intensities in Residential Buildings, 1980 and 1990

Building Characteristics	Total Consumption (quadrillion Btu)		Energy Intensities (thousand Btu per sq. ft.)						RSE Row Fac- tors
			All Major Sources		Electricity		Natural Gas		
	1980	1990	1980	1990	1980	1990	1980	1990	
	RSE Column Factors:	1.1	1.2	0.7	0.7	1.1	1.1	1.1	
All Buildings	14.382	15.368	100.93	90.81	52.93	54.27	56.12	45.74	1.5
Census Region									
Northeast	3.273	3.246	93.91	80.45	35.44	35.07	50.12	43.81	2.8
Midwest	4.190	4.153	102.70	88.48	44.81	42.82	69.63	54.22	2.6
South	4.741	5.364	112.39	102.30	76.65	78.63	53.27	38.70	3.1
West	2.178	2.605	88.30	88.28	50.49	55.42	44.48	42.91	3.0
Census Division									
New England	0.777	0.728	87.68	78.38	33.98	33.87	47.11	44.95	5.0
Middle Atlantic	2.496	2.517	96.03	81.07	35.93	35.43	50.71	43.61	3.6
East North Central	2.945	2.997	105.96	88.77	44.59	42.08	74.67	56.13	3.6
West North Central	1.245	1.157	95.73	87.75	45.29	44.71	58.89	49.48	4.1
South Atlantic	2.342	2.560	105.09	96.20	71.52	76.61	51.48	37.65	4.5
East South Central	0.971	1.090	113.43	101.19	86.08	77.90	55.34	37.64	7.9
West South Central	1.428	1.714	125.96	113.85	79.63	82.72	54.06	40.15	5.0
Mountain	0.649	0.781	102.43	99.88	51.44	54.93	60.61	55.62	5.6
Pacific	1.529	1.824	83.42	84.10	50.18	55.60	39.12	37.96	3.6
Type of Home									
Mobile Home	0.678	0.735	178.30	150.07	116.20	99.98	97.49	78.33	5.6
Single-Family Detached	10.448	11.071	92.51	85.60	50.36	50.86	53.22	42.14	1.9
Single-Family Attached	0.559	0.906	92.00	90.52	40.34	57.04	43.60	45.88	7.4
2 to 4 Units	1.468	1.352	136.08	114.77	48.77	51.65	85.21	68.75	4.5
5 or More Units	1.228	1.304	138.04	111.63	72.04	73.50	50.43	48.83	5.0
Building Floorspace (square feet)									
Fewer than 1,001	1.426	1.331	183.06	160.36	105.70	106.42	104.83	80.56	3.7
1,001 to 2,000	4.562	4.636	122.60	112.55	69.14	70.93	66.82	55.07	2.4
2,001 to 5,000	6.736	7.508	85.00	77.97	41.97	44.40	50.49	41.59	2.0
5,001 to 10,000	0.854	1.065	72.48	73.60	36.71	40.03	41.79	38.22	6.4
10,001 to 25,000	0.348	0.385	105.69	86.66	52.82	57.84	44.23	38.37	13.3
25,001 to 50,000	0.164	0.126	156.83	110.87	69.98	65.32	54.65	46.24	13.3
50,001 to 100,000	0.127	0.188	139.39	97.61	51.69	68.44	25.61	33.59	15.6
100,001 to 200,000	0.106	0.077	138.39	94.38	82.65	47.11	18.58	35.29	22.9
Over 200,000	0.058	0.053	130.50	78.22	66.71	36.09	Q	27.34	27.7
Year Constructed									
1939 or Before	4.136	3.607	95.55	88.49	35.38	38.01	59.01	53.07	2.8
1940 to 1949	1.280	1.129	107.89	97.36	48.73	50.09	60.94	50.95	4.2
1950 to 1959	2.465	2.297	104.00	93.03	49.83	50.32	58.41	46.05	3.5
1960 to 1969	2.700	2.386	103.01	91.12	56.82	55.51	55.40	43.19	3.6
1970 to 1979	3.525	3.495	102.71	96.34	74.47	68.71	48.00	42.55	3.4
1980 to 1990	0.276	2.454	88.61	82.60	66.14	62.75	37.80	34.30	7.0

Q = Data withheld either because the Relative Standard Error (RSE) was greater than 50 percent or fewer than 10 households were sampled.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • Because of rounding, data may not sum to totals. • See "Glossary" for definition of terms used in this report.

Source: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-457 of the 1980 and 1990 Residential Energy Consumption Survey.

Table 4.12. Total Primary Consumption and Energy Intensities in Commercial Buildings, 1979 and 1989

Building Characteristics	Total Consumption (quadrillion Btu)			Energy Intensities (thousand Btu per square foot)						RSE Row Fac- tors
				All Major Sources		Electricity		Natural Gas		
	1979	1979 (adjusted)*	1989	1979	1989	1979	1989	1979	1979	
	0.9	NF	1.0	0.9	0.8	1.2	0.9	1.2	1.1	
RSE Column Factors:	0.9	NF	1.0	0.9	0.8	1.2	0.9	1.2	1.1	
All Buildings	8.847	10.159	11.401	203.16	180.44	134.18	136.21	71.35	50.39	5.7
Census Region										
Northeast	2.082	2.553	2.540	218.46	187.18	136.49	132.89	65.64	41.46	11.9
Midwest	3.033	2.808	2.892	213.66	181.25	127.14	117.26	85.25	64.84	8.6
South	2.742	3.322	3.621	200.74	164.31	149.68	138.94	60.46	42.68	9.3
West	0.989	1.385	2.348	160.61	202.04	112.89	161.31	61.47	48.01	12.1
Principal Building Activity										
Assembly	0.702	.791	0.818	131.67	118.32	76.42	82.20	53.50	40.37	13.1
Education	0.842	1.056	1.143	141.11	141.51	82.80	81.22	51.29	48.72	10.5
Food Sales and Service	0.685	0.623	0.835	387.03	426.32	294.48	336.51	127.16	113.62	10.1
Health Care	0.730	0.651	0.761	373.42	370.31	199.68	226.56	127.03	116.34	10.4
Lodging	0.520	0.667	0.705	250.88	202.73	174.00	120.01	75.52	73.73	13.6
Mercantile and Service	1.627	1.614	2.161	163.37	174.75	110.26	134.48	55.85	47.40	10.1
Office	1.723	1.977	2.811	246.56	238.20	184.17	200.33	59.05	32.97	7.1
Warehouse	1.093	1.280	1.027	181.90	110.98	113.30	82.95	83.90	40.20	16.4
Other	0.764	0.695	0.964	358.38	308.14	217.30	239.60	166.55	82.74	24.7
Vacant	0.161	0.427	0.177	117.75	42.58	95.75	39.16	47.39	Q	24.3
Building Floorspace (square feet)										
1,001 to 2,000	0.288	0.459	0.415	366.97	270.38	260.78	219.06	183.21	133.25	8.5
2,001 to 5,000	0.888	1.153	0.936	264.50	178.07	176.61	135.36	121.09	77.38	7.3
5,001 to 10,000	0.950	0.979	1.065	187.35	163.12	106.22	118.23	104.03	67.09	10.9
10,001 to 25,000	1.463	1.547	1.562	190.86	150.31	109.52	115.37	95.52	48.31	9.6
25,001 to 50,000	1.322	1.370	1.426	195.00	162.07	145.26	115.49	49.40	56.69	10.2
50,001 to 100,000	1.191	1.301	1.731	184.75	189.64	130.37	146.83	59.74	40.06	12.9
100,001 to 200,000	1.083	1.312	1.561	194.82	188.57	131.20	142.41	45.45	39.57	13.5
200,001 to 500,000	1.077	1.150	1.438	208.38	204.82	139.02	158.12	53.63	45.17	14.3
Over 500,000	0.584	1.021	1.266	215.40	202.84	147.41	151.20	55.74	38.50	16.8
Year Constructed										
1899 or Before	0.362	0.299	0.178	181.07	107.67	115.01	48.03	59.74	52.31	15.4
1900 to 1919	0.623	0.568	0.391	133.74	92.20	72.27	58.97	50.21	40.22	16.9
1920 to 1945	1.684	1.574	1.062	194.42	131.18	104.85	80.88	93.31	42.46	14.8
1946 to 1959	1.569	1.966	1.754	187.00	166.91	117.62	112.41	64.01	56.77	10.9
1960 to 1969	2.053	2.668	2.467	219.31	202.76	152.00	149.38	65.97	54.05	9.5
1970 to 1979	2.556	3.252	2.820	243.97	211.57	186.91	167.66	77.47	54.41	7.4
1980 to 1989	--	--	2.728	--	206.97	--	178.02	--	45.73	8.7

* 1979 consumption adjusted by applying 1979 consumption intensity to adjusted 1979 floorspace. See Appendix C, "Data Quality", for further discussion.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent or fewer than 20 buildings were sampled.

Notes: To obtain the RSE percentage for any table cell, multiply the corresponding RSE column factor by the corresponding RSE row factor for the cell. • See "Glossary" for definition of terms used in this report.

Source: Energy Information Administration, Office of Energy Markets and End Use, Form EIA-143 of the 1979 Nonresidential Buildings Energy Consumption Survey and Form EIA-871 of the 1989 Commercial Buildings Energy Consumption Survey.