

The Growth in Electricity Demand in U.S. Households, 1981-2001: Implications for Carbon Emissions

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Energy Information Administration

25th Annual IAEE International Conference

Denver

September 18-21, 2005



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- **“The opinions and conclusions expressed herein are solely those of the authors and should not be construed as representing the opinions or policy of the Energy Information Administration, the U.S. Department of Energy, or any agency of the United States Government.”**



Overview

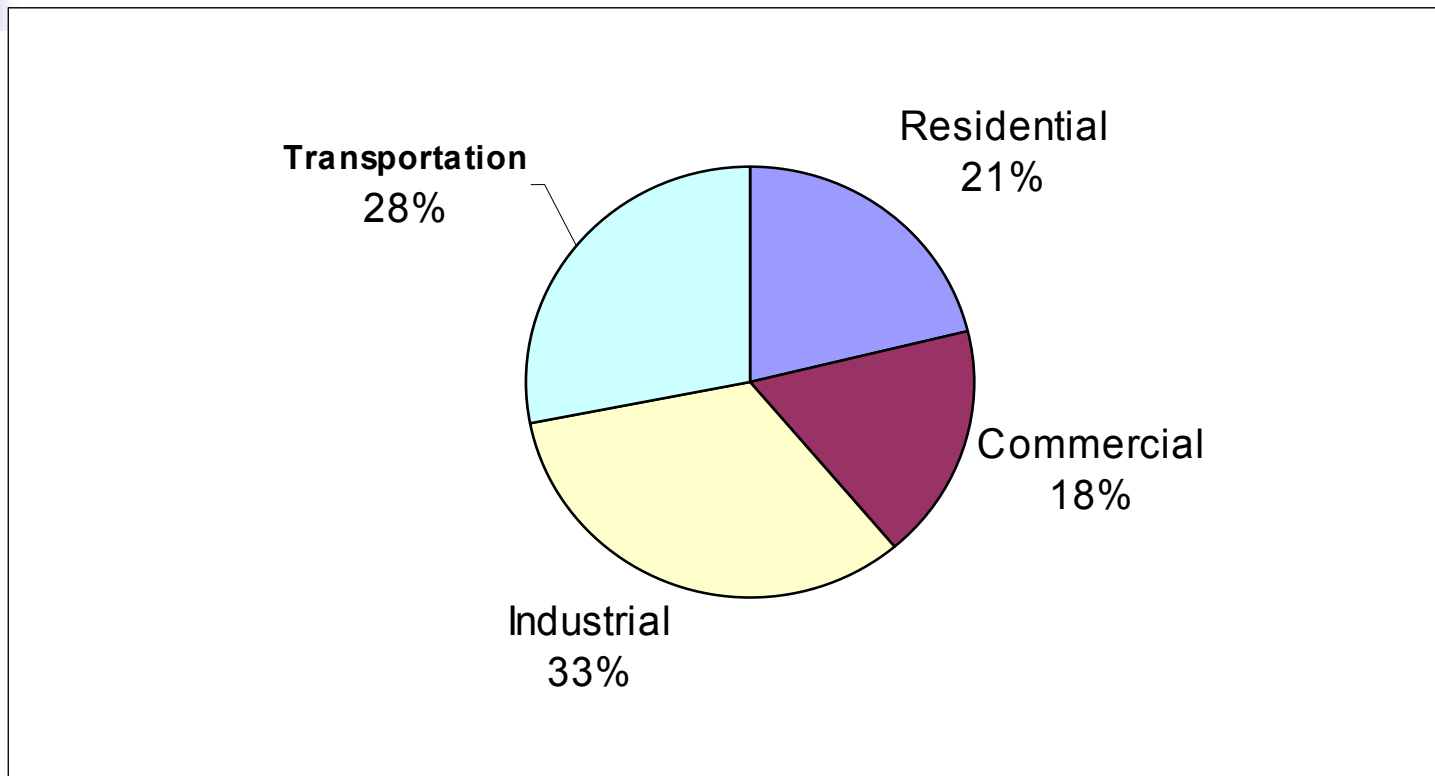
- Introduction
- Trends in Electricity Consumption, 1981 – 2001
 - Growth in Appliances and Electrical Equipment
 - Growth in Consumption by End Use
 - Factors Affecting Electricity Consumption
- Implications for Carbon Emissions
 - Growth in Carbon Emissions, 1981-2001
 - Absolute Numbers
 - Carbon-Intensity Indicators
- Conclusions



Data Used: Residential Energy Consumption Survey

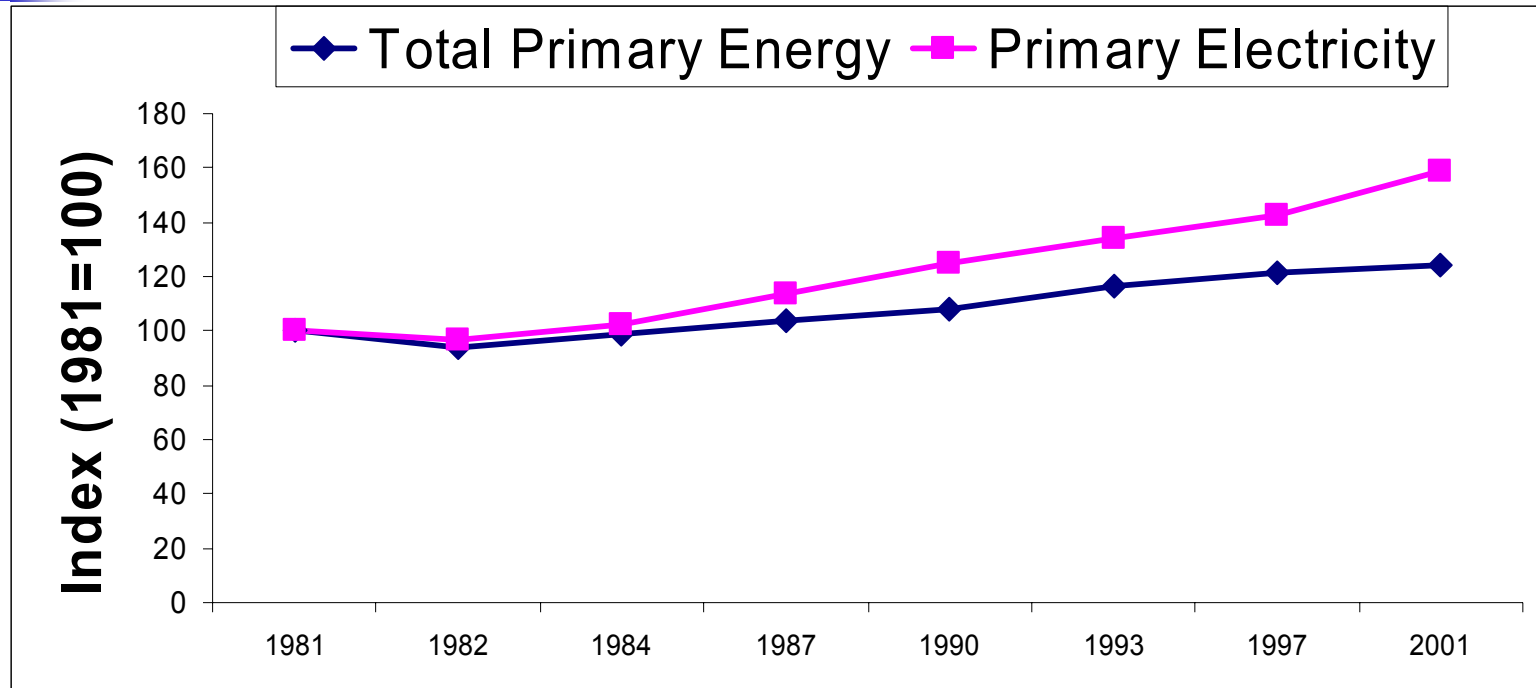
- National Survey – 1981 - 2001
- Approximately 5, 000 Household Personal Interviews - Household and Housing Unit Data
- Rental Survey
- Suppliers Survey
- End Use Estimation

Sector Shares of Total Energy Consumption, 2004



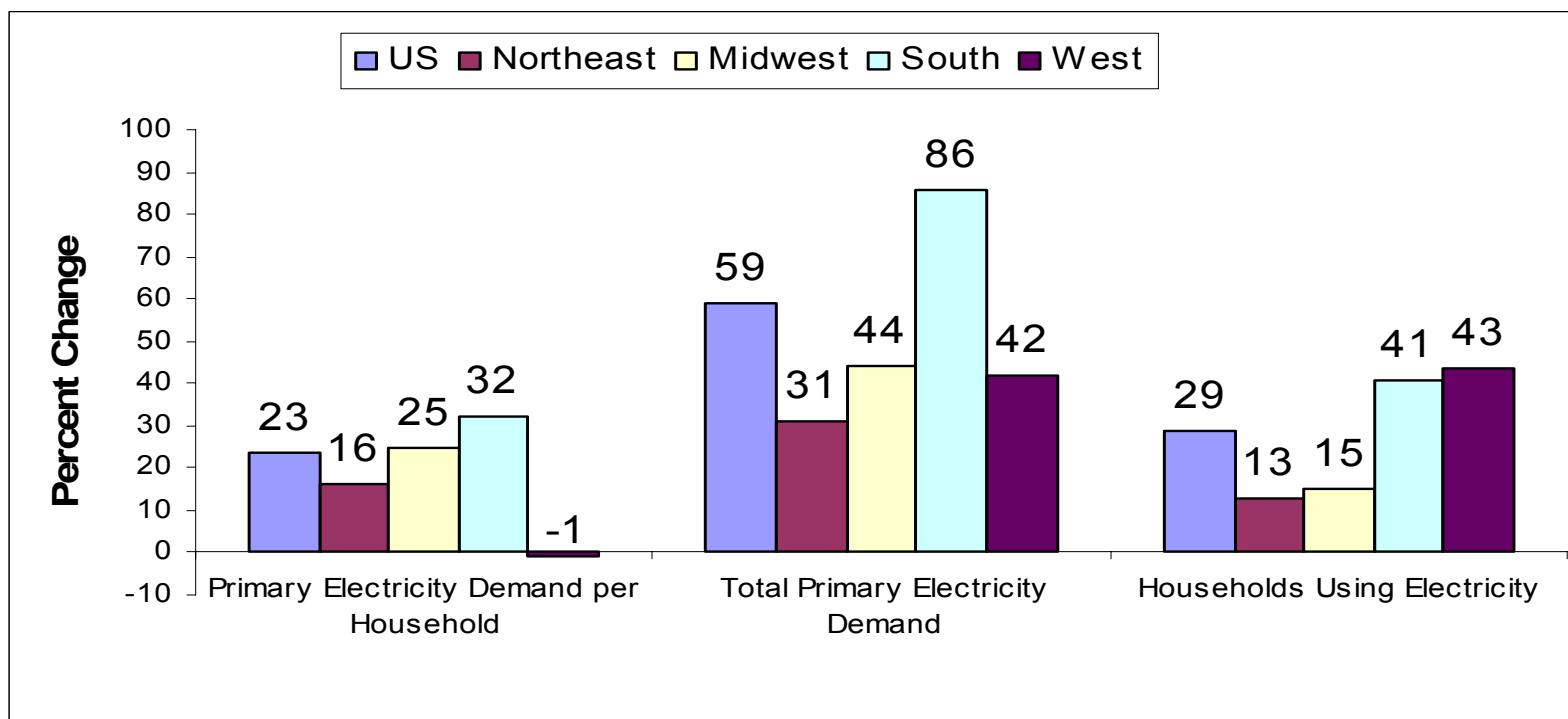
Source: Energy Information Administration, 2004 Annual Energy Review.

Energy Consumption, 1981-2001



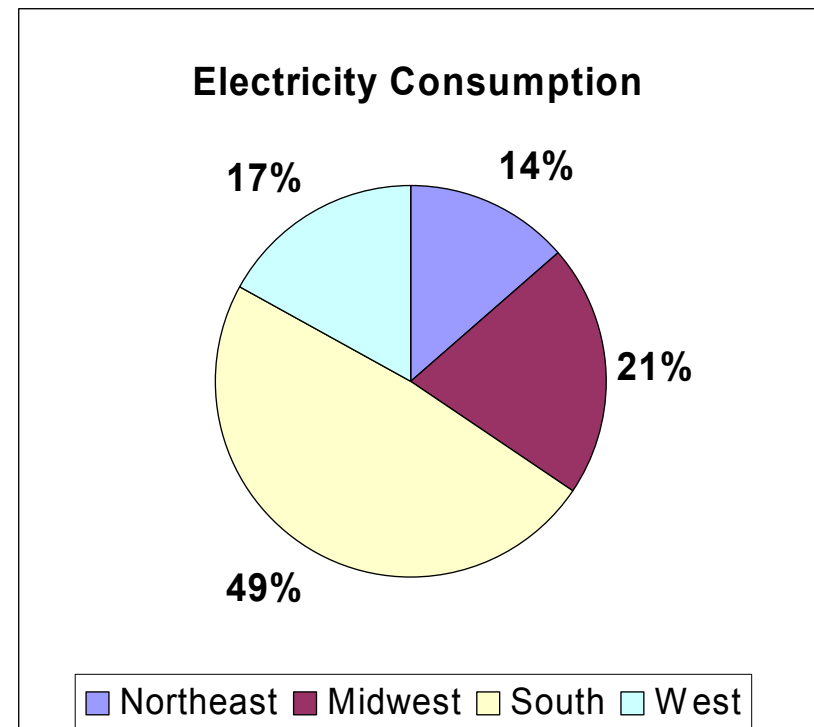
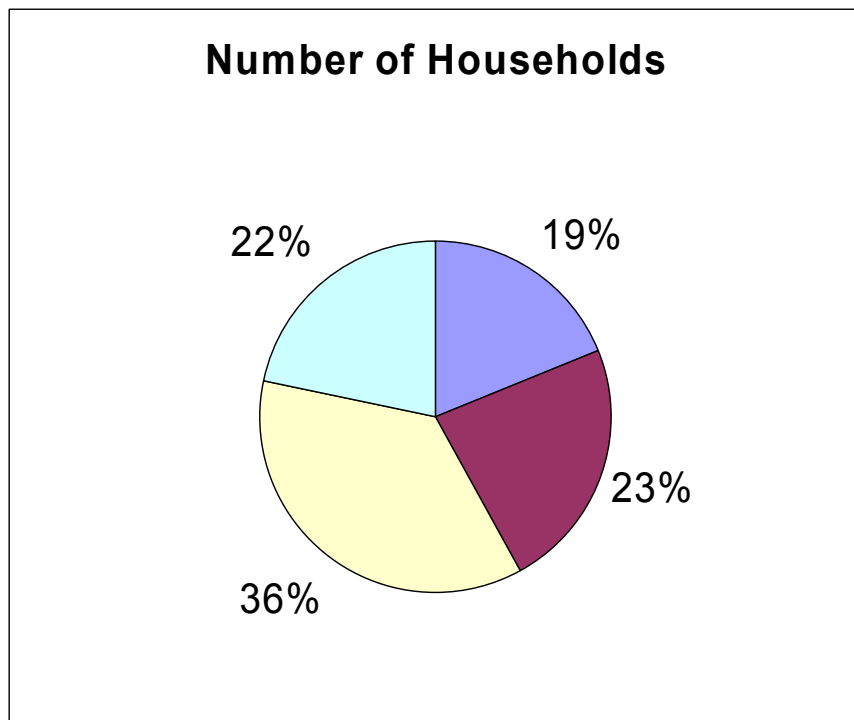
Source: Energy Information Administration, Residential Energy Consumption Surveys.

Percent Change in Primary Electricity Demand in the U.S. 1981-2001



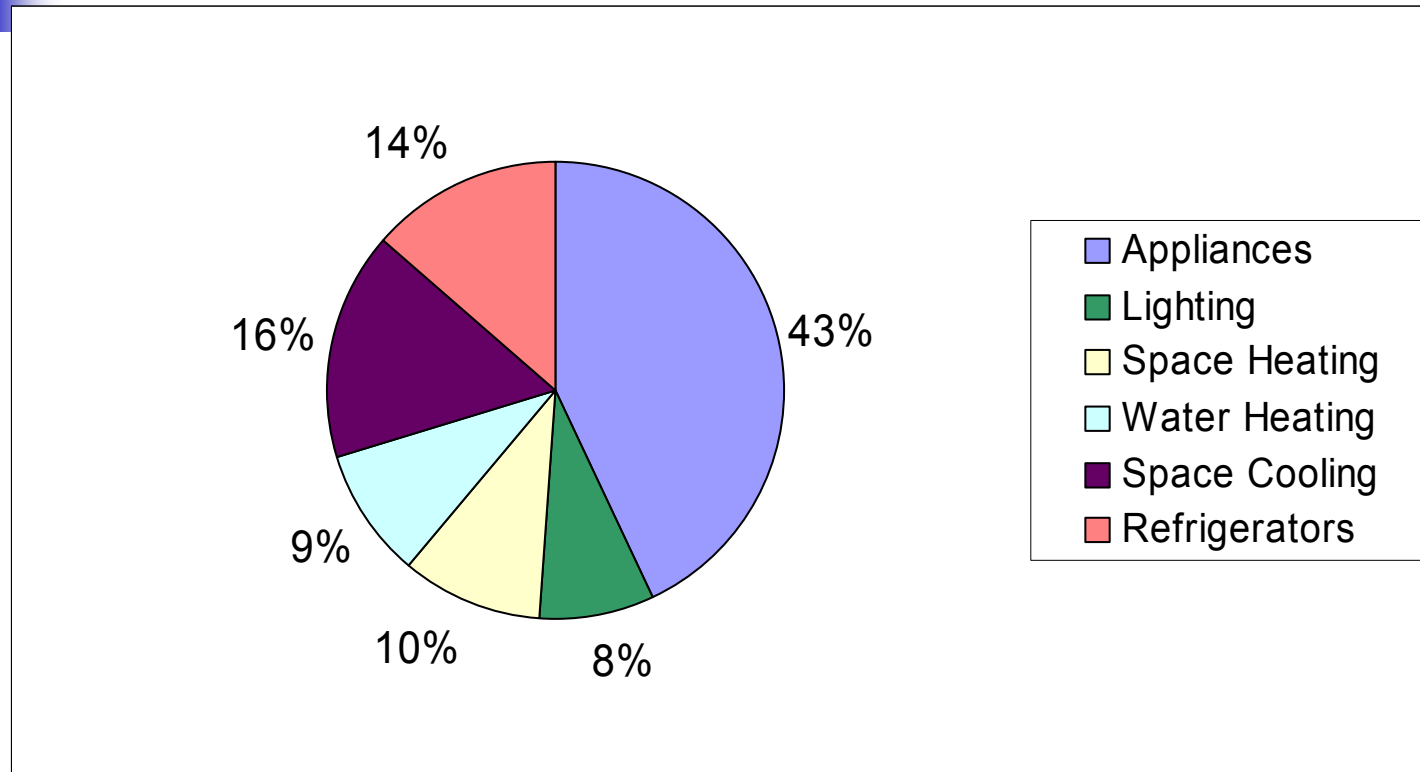
Source: Energy Information Administration, Residential Energy Consumption Surveys.

Distribution of Number of Households and Residential Electricity Consumption, by Census Regions, 2001



Source: Energy Information Administration, Residential Energy Consumption Survey.

Percent of Total Electricity Consumption in U.S. Housing Units, 2001



Sources: Energy Information Administration, Residential Energy Consumption Surveys.

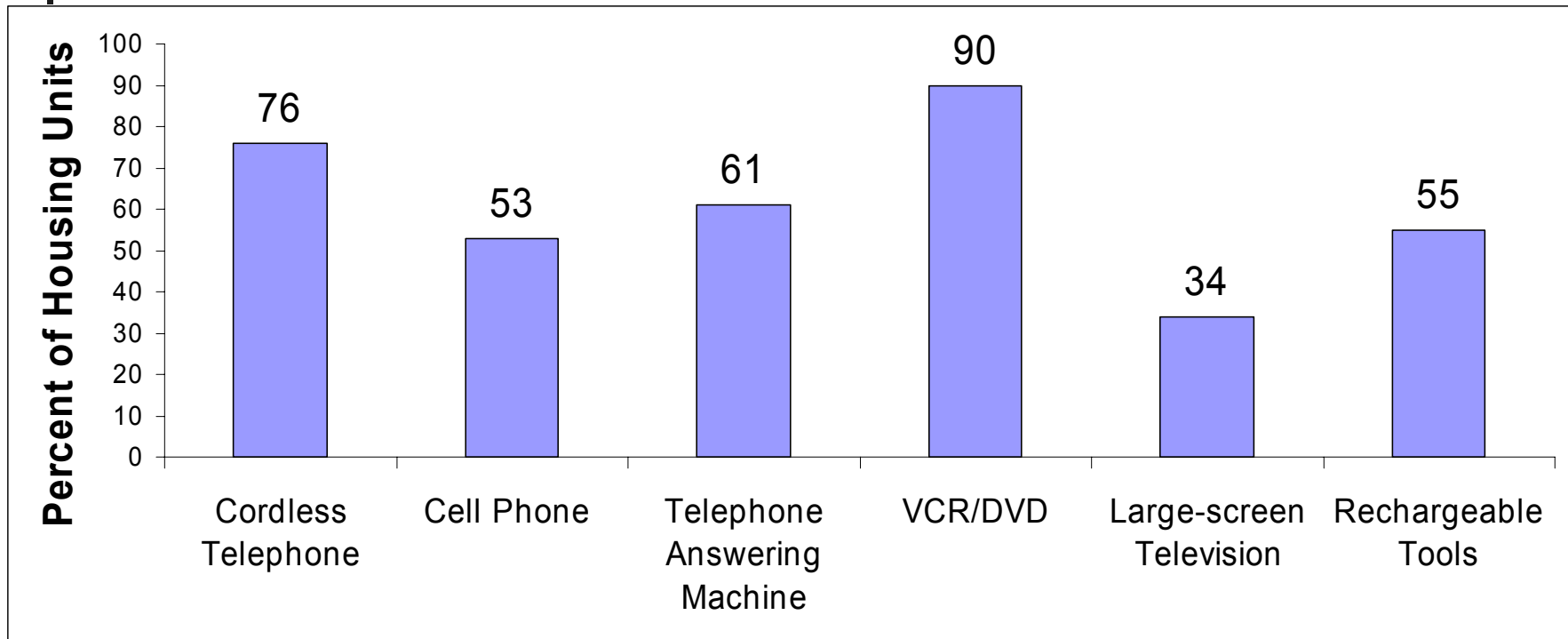
Growth of Electrical Equipment and Appliances, 1981-2001

(Percent of Households)

	1981	1982	1984	1987	1990	1993	1997	2001
Refrigerator (One)	87	86	88	86	84	85	85	83
Refrigerator (two or More)	13	13	12	14	15	15	15	17
Central air Conditioning	27	28	30	36	29	44	47	54
Room Air Conditioning	31	30	30	30	29	27	25	22
Water Heating	32	32	34	35	37	38	40	38
Main Space Heating	17	16	17	19	23	26	29	29
Color Television	82	88	88	93	96	98	99	99
Black and White Television	48	47	43	36	31	20	NA	NA
Clothes Dryer	45	45	46	51	53	57	77	57
Freezer	38	37	37	34	35	35	33	32
Microwave Oven	17	21	34	61	79	84	83	86
Dishwasher	37	36	38	43	45	45	50	53
Personal Computer	NA	NA	NA	NA	16	23	35	56

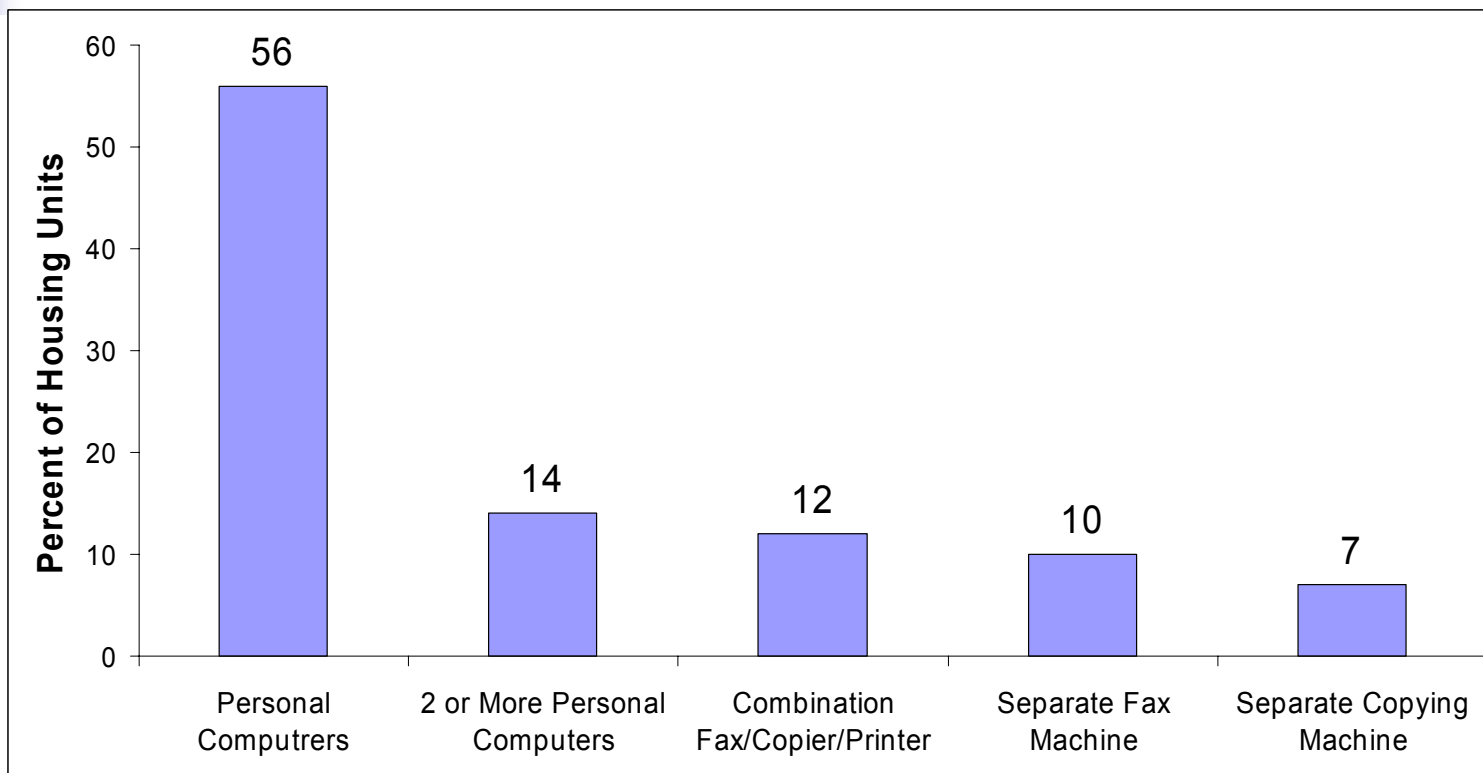
Source: Energy Information Administration, Residential Energy Consumption Surveys.

Household Appliances Used in U.S. Housing Units in 2001 that were Rare or Non-Existent in 1981



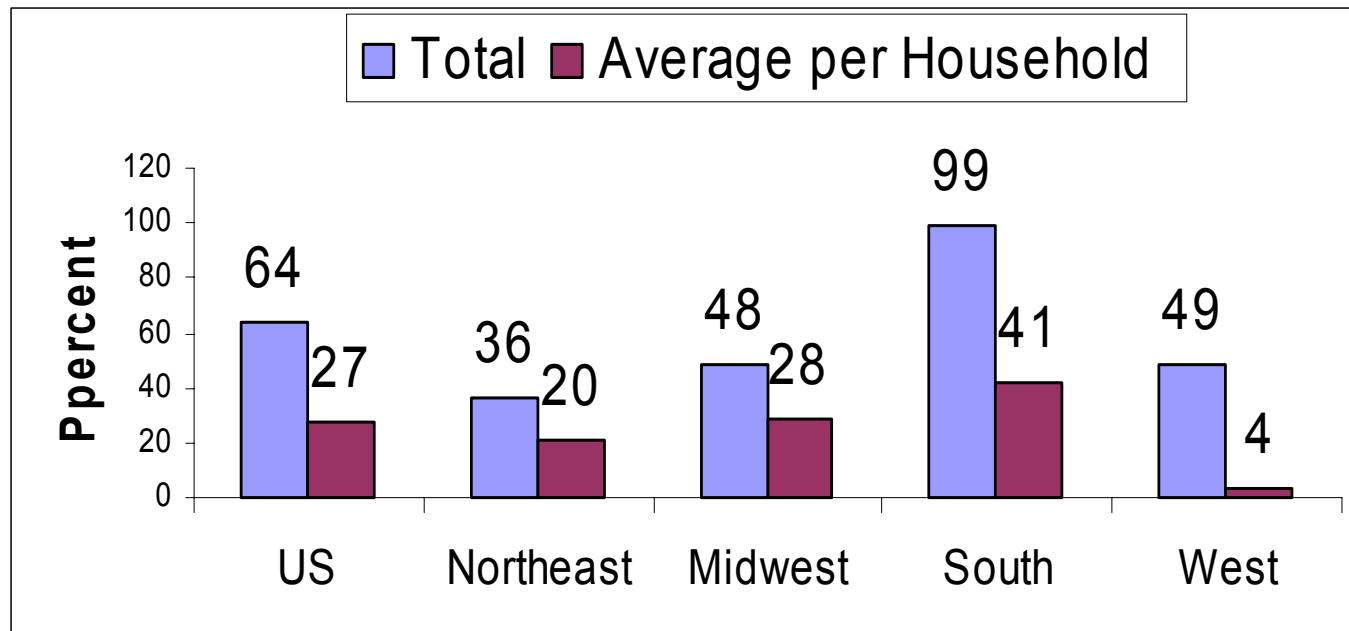
Sources: Energy Information Administration, Residential Energy Consumption Surveys.

More Household Appliances Used in U.S. Housing Units in 2001 that were Rare or Non-Existent in 1981



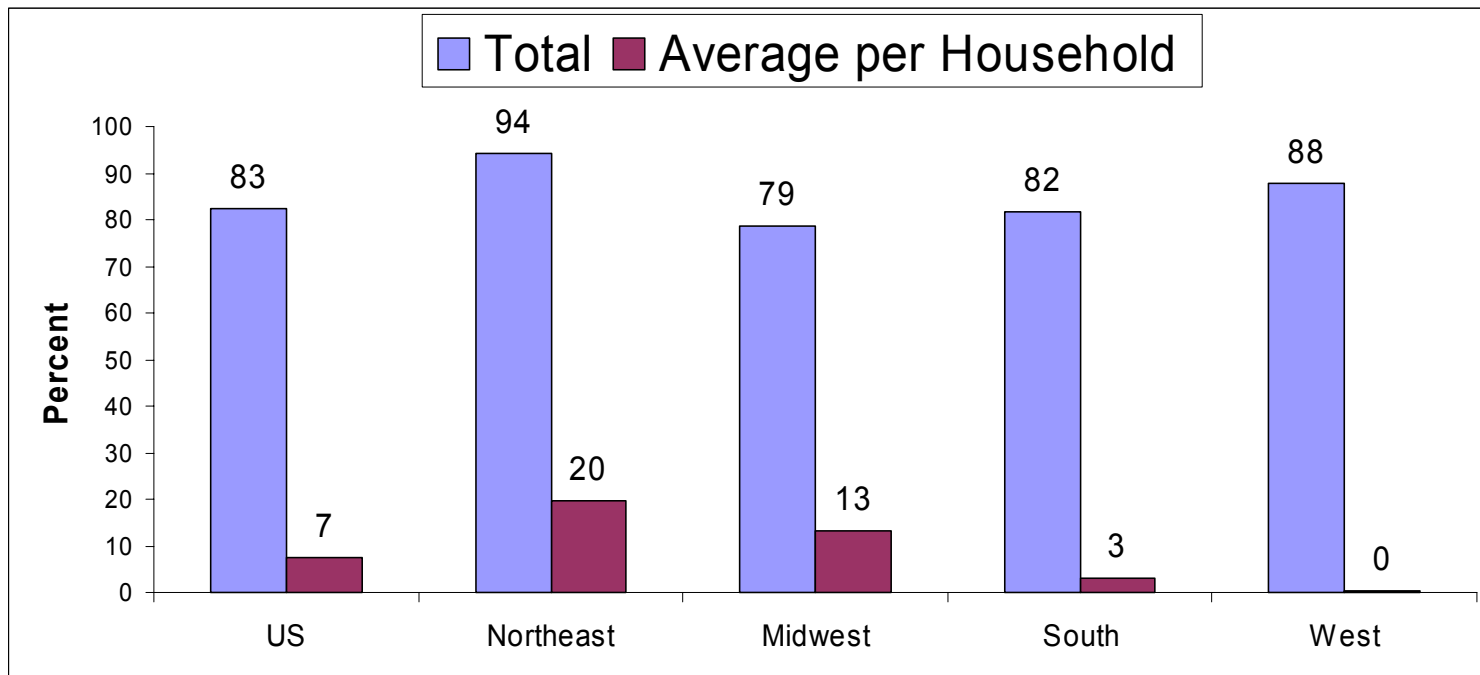
Sources: Energy Information Administration, Residential Energy Consumption Surveys.

Percent Change in Electricity Consumption by Appliances, Refrigerators, and Lighting, 1981-2001



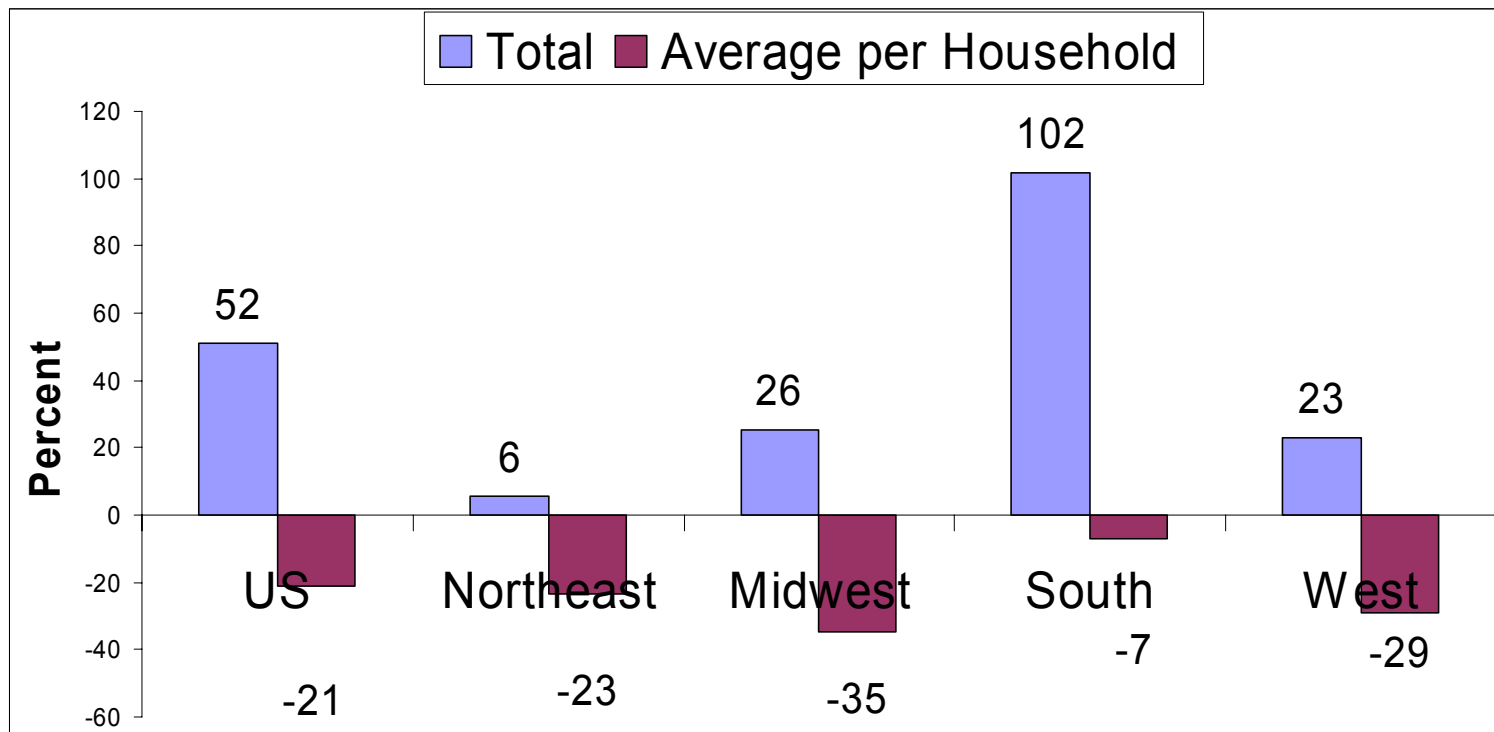
Source: Energy Information Administration, Residential Energy Consumption Survey

Percent Change in Electricity Consumption for Space Cooling, 1981-2001



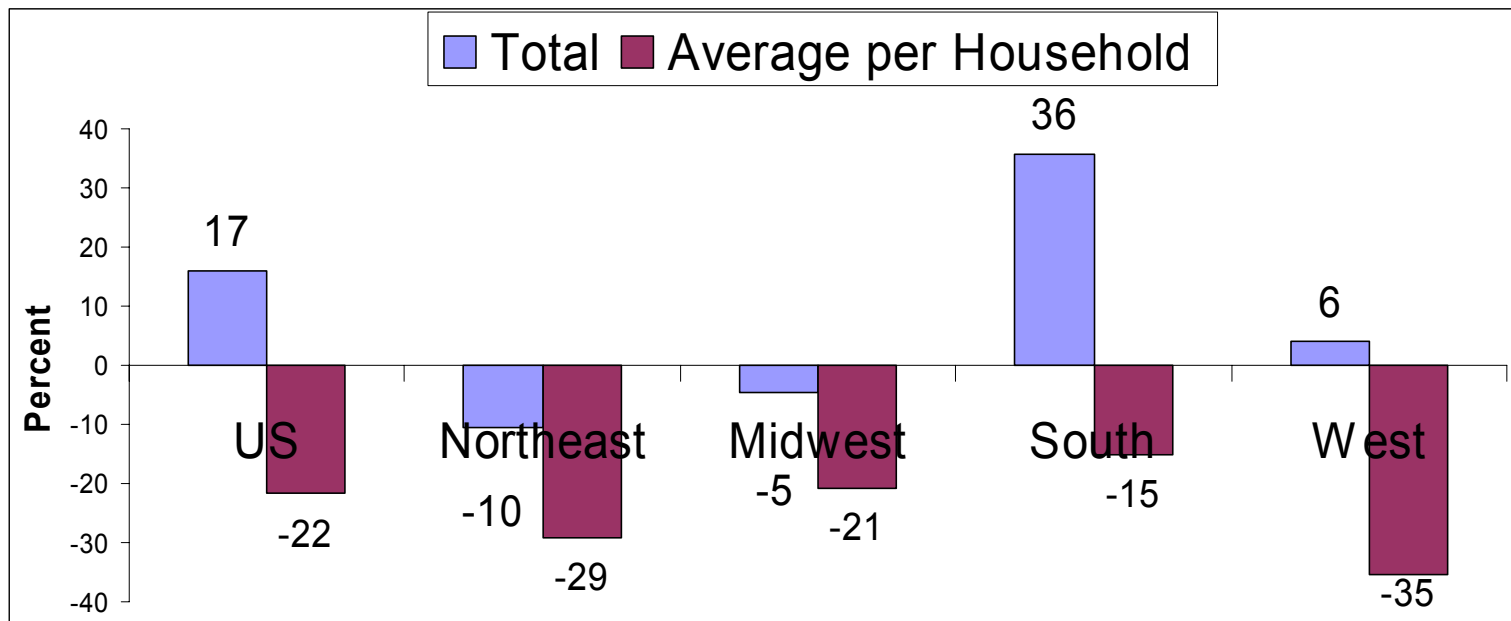
Sources: Energy Information Administration, Residential Energy Consumption Surveys.

Percent Change in Electricity Consumption for Space Heating, 1981-2001



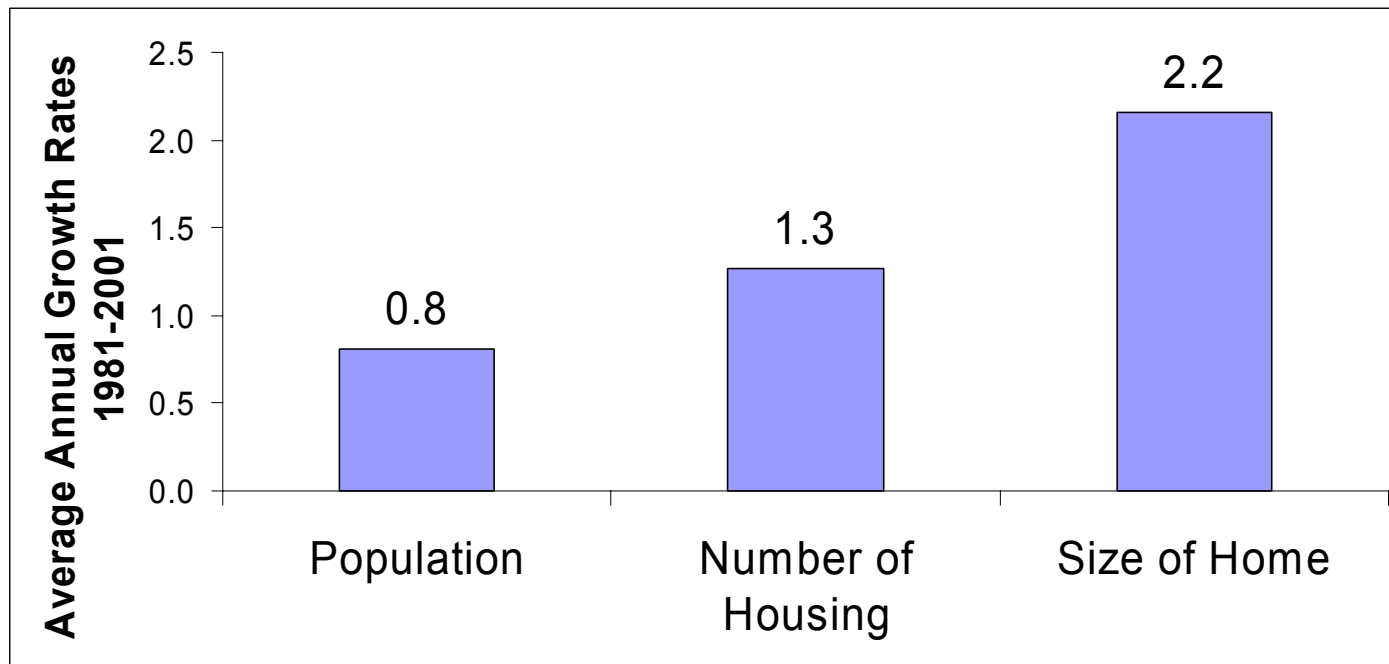
Source: Energy Information Administration, Residential Energy Consumption Survey

Percent Change in Electricity Consumption for Water Heating, 1981-2001



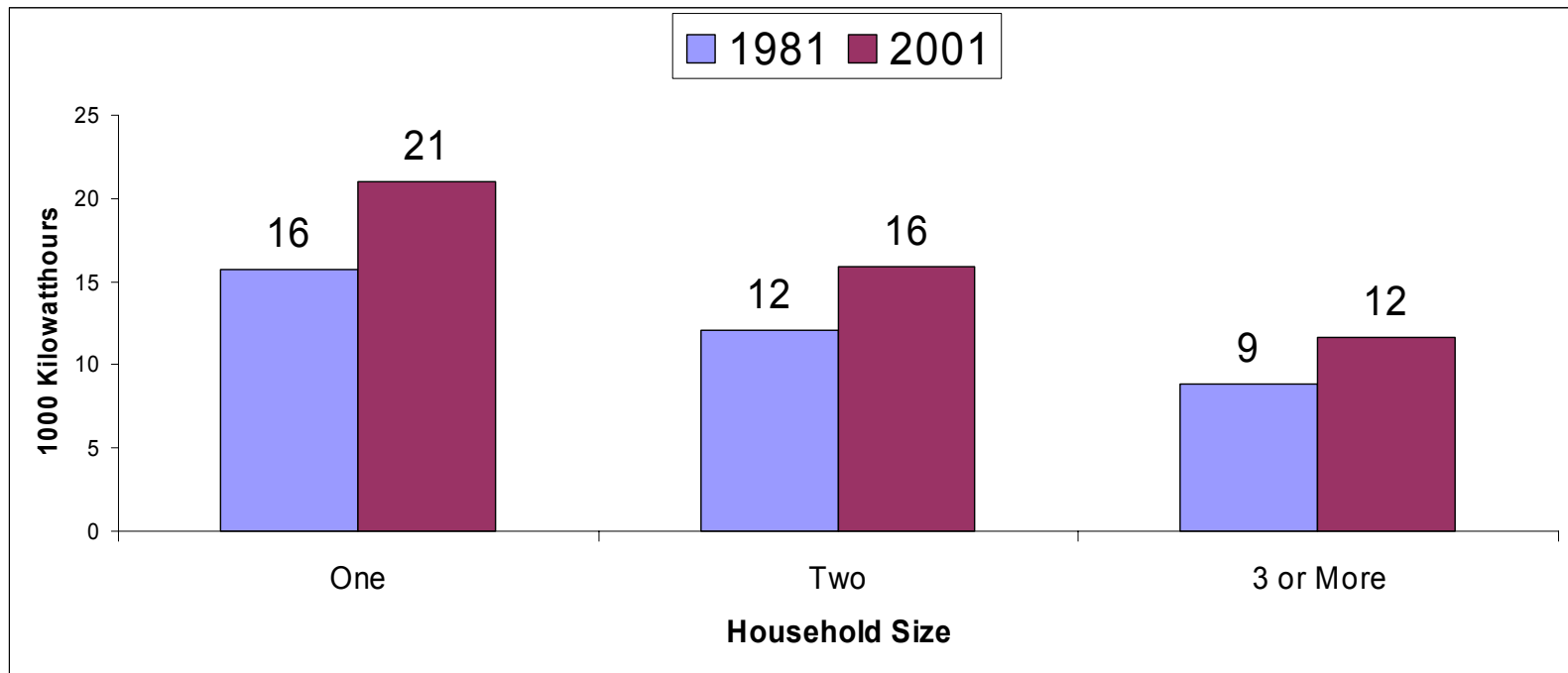
Source: Energy Information Administration, Residential Energy Consumption Survey

Factors Affecting the Growth of Electricity Consumption



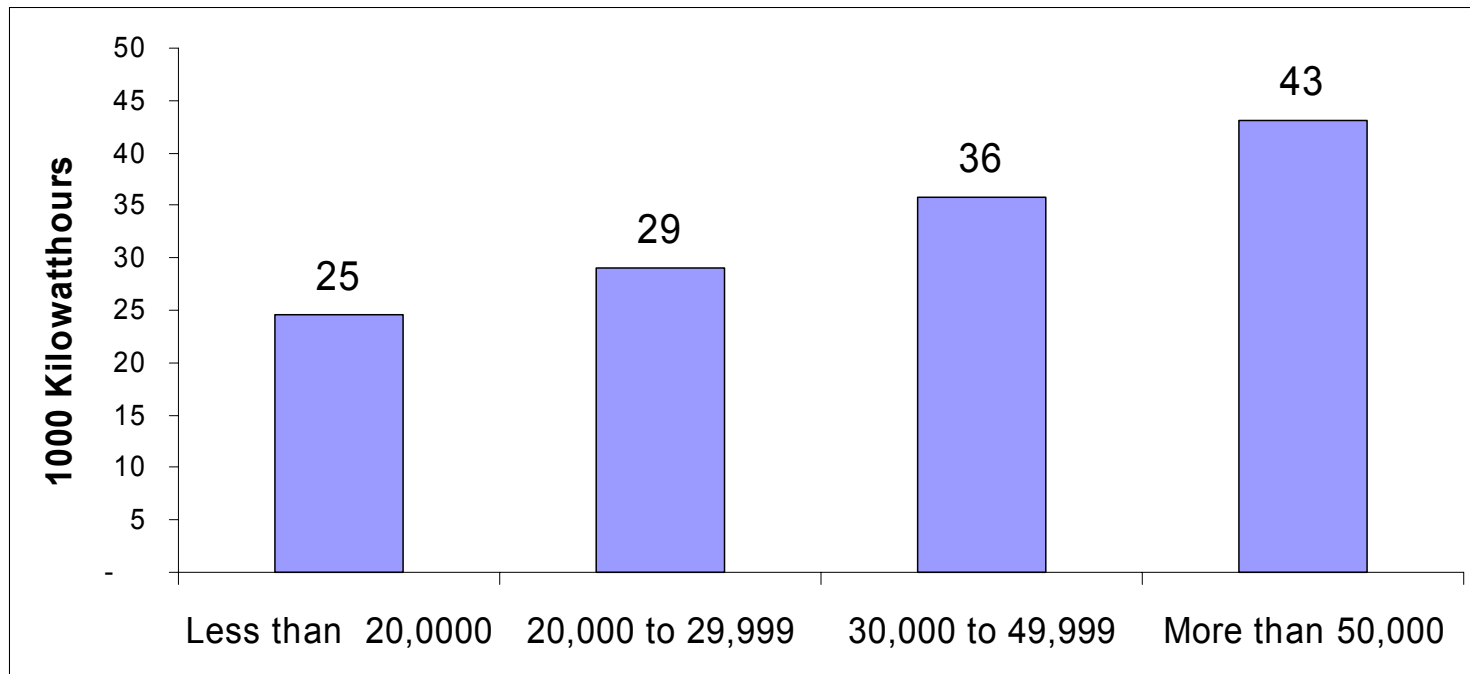
Source: Energy Information Administration, Residential Energy Consumption Survey

Per Capita Electricity Consumption by Household Size, 2001



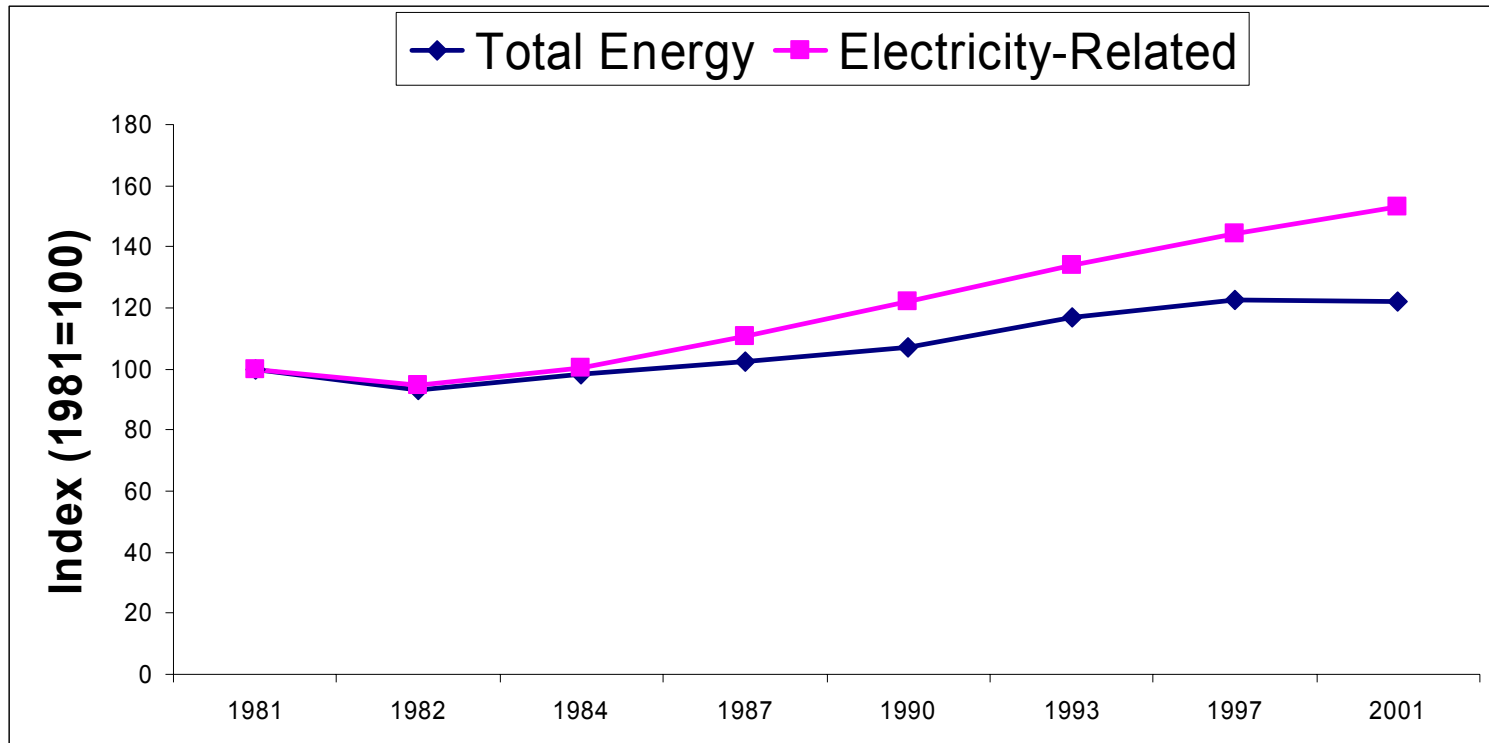
Source: Energy Information Administration, Residential Energy Consumption Survey

Average Primary Electricity Consumption per Household by Income Groups, 2001



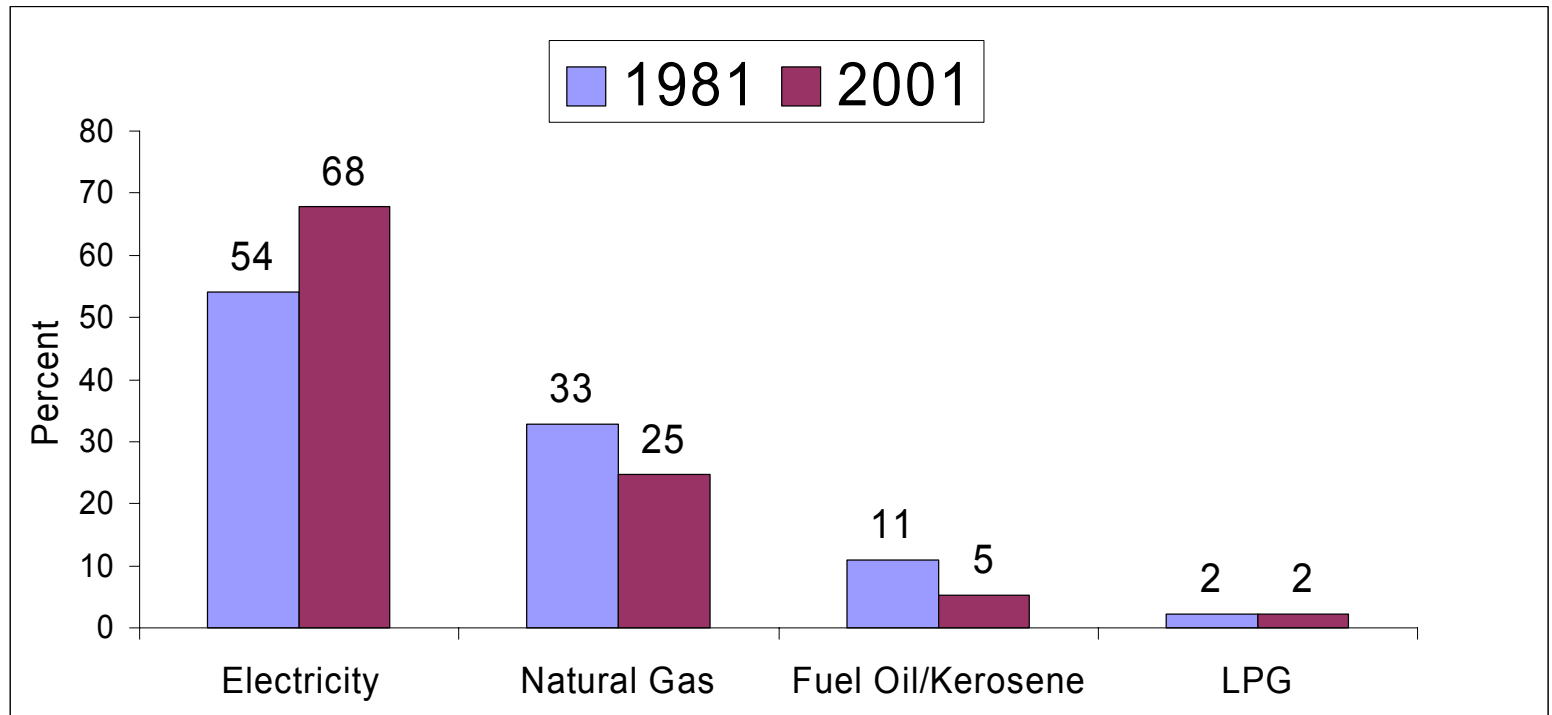
Source: Energy Information Administration, Residential Energy Consumption Survey

Residential Carbon Dioxide Emissions, 1981-2001



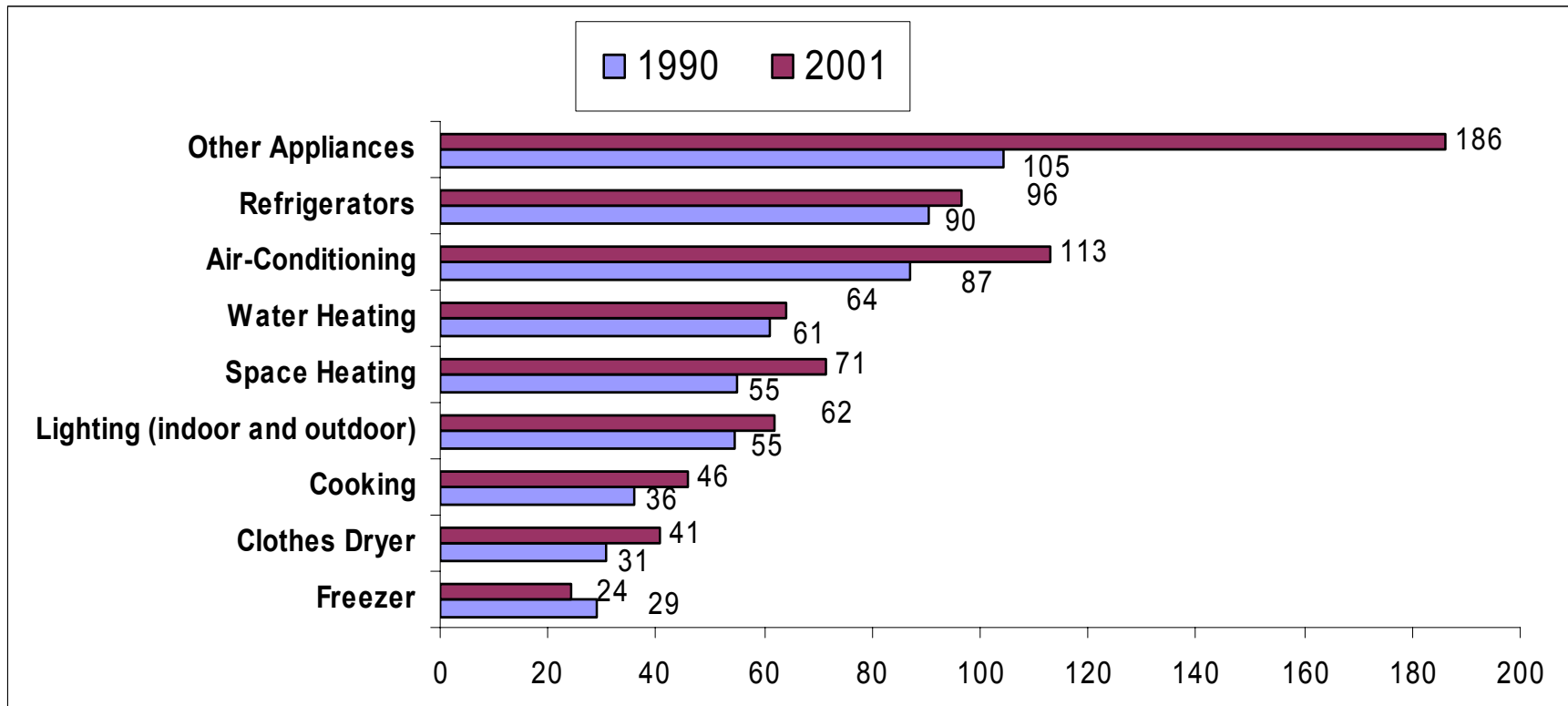
Source: Energy Information Administration, Residential Energy Consumption Surveys.

Distribution of Carbon Dioxide by Fuel Source, 1981-2001



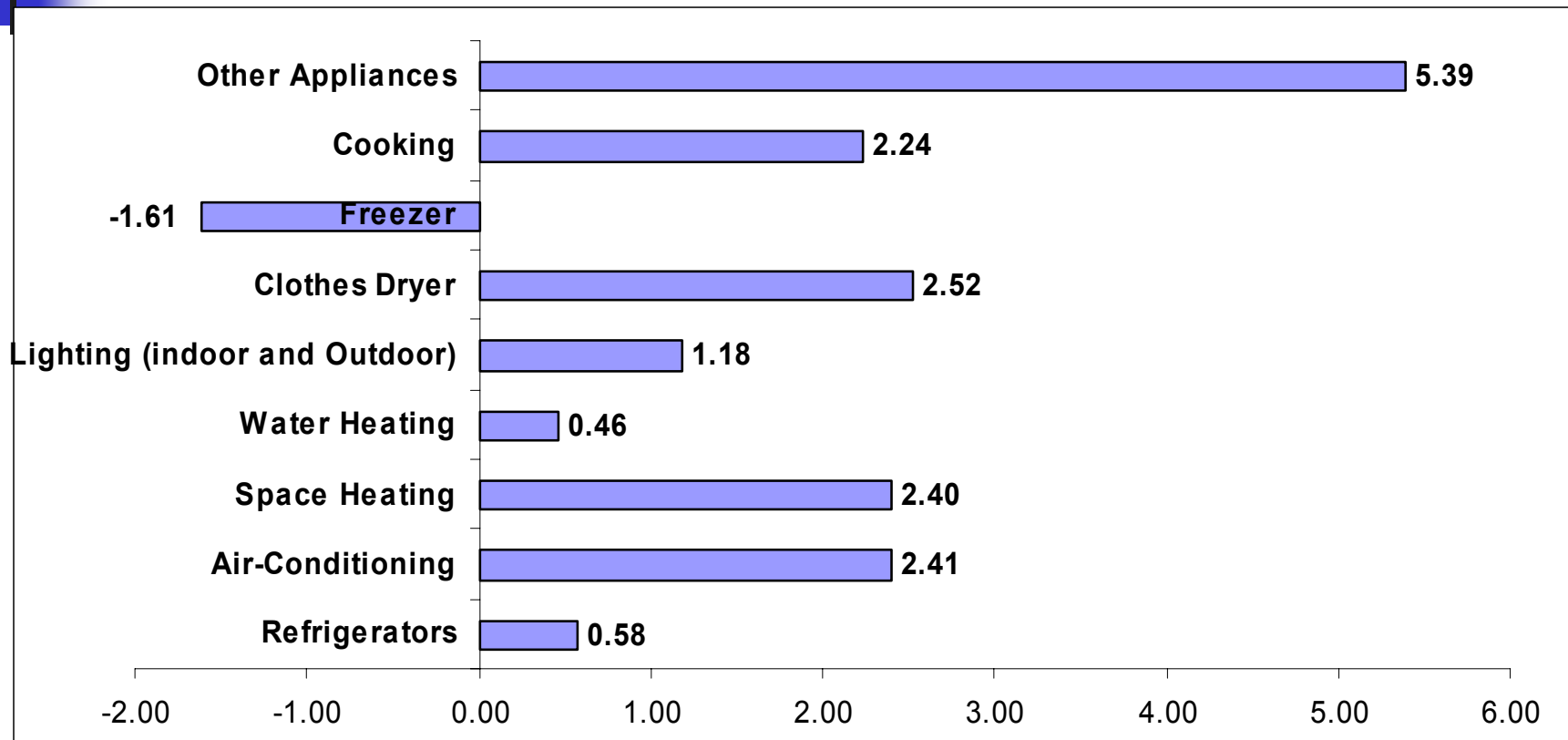
Source: Energy Information Administration, Residential Energy Consumption Surveys and Emissions of Greenhouse Gases.

Emissions of Carbon Dioxide by End Use, 1990-2001



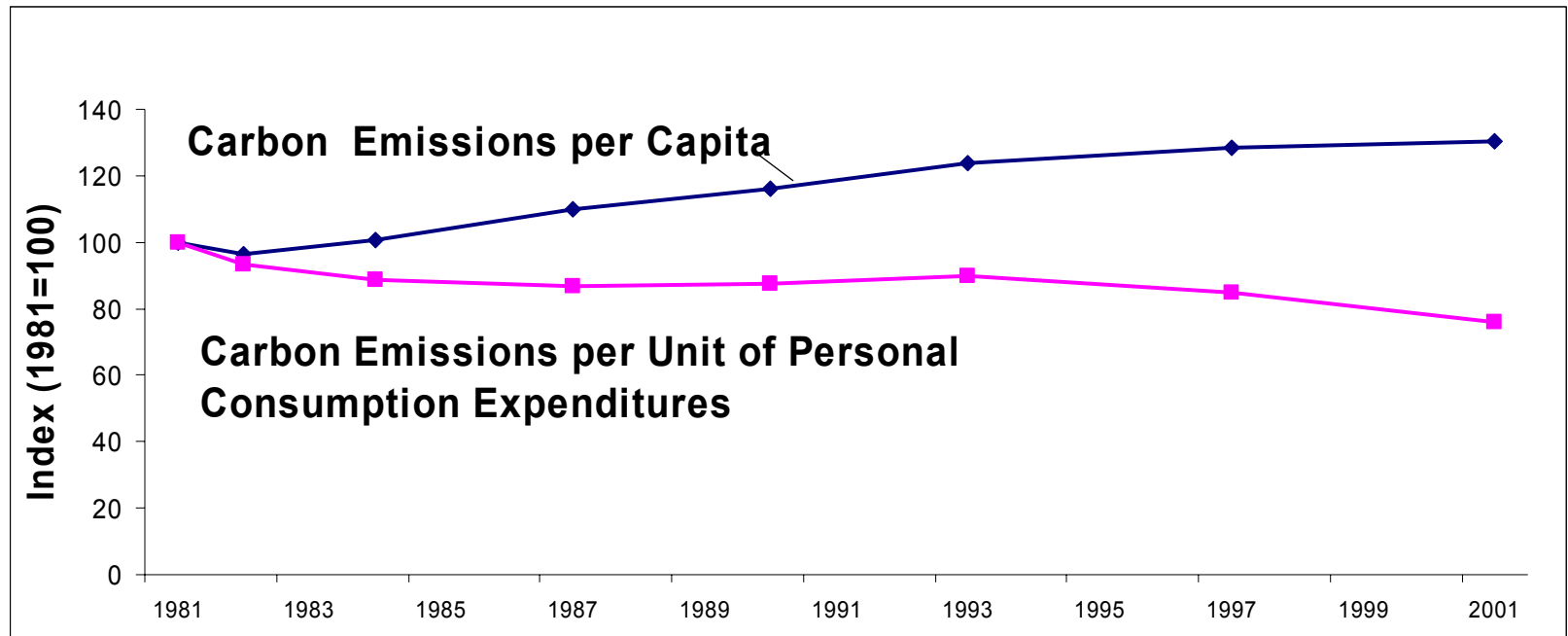
Source: Source: Energy Information Administration, Residential Energy Consumption Survey and Emissions of Greenhouse Gases in the United States.

Average Annual Growth Rate of Carbon Dioxide by End Use, 1990-2001



Source: Source: Energy Information Administration, Residential Energy Consumption Survey and Emissions of Greenhouse Gases in the United States.

Carbon Dioxide Emissions Intensity of Population, and Personal Consumption Expenditures, 1981-2001



Source: Source: Energy Information Administration, Residential Energy Consumption Survey and Emissions of Greenhouse Gases in the United States.



Electricity Demand and Carbon Dioxide Emissions in the Future

- Between 2002 and 2025, EIA projects household primary energy consumption to increase by 25 percent.
- Electricity demand is projected to account for about 76 percent of the growth in household energy use.
- Between 2002 and 2025, household carbon dioxide emissions are projected to increase at an average of 1.2 percent per Year.



Conclusions

- Household sector is responsible for a significant amount of carbon dioxide emissions.
- To avoid increasing carbon emissions, household electricity intensity must decline and /or less carbon intensive fuel should be used for electricity generation
- Examination of carbon dioxide emissions by end use indicates that the major source of residential carbon emissions are the “other appliances” that are not under appliance standards.