Buildings and Energy

Buildings Sector Electricity Share

Buildings Energy Data Book: 1.1 Buildings Sector Energy Consumption *September 2006*

1.1.6 **Buildings Share of U.S. Electricity Consumption (percent)**

	Residential	Commercial	Total Buildings	Industry	Transportation	TOTAL	*Delivered Total* (quads)
1980	34%	27%	61%	39%	0%	100%	7.1
1990	34%	31%	65%	35%	0%	100%	9.3
2000	35%	34%	69%	31%	0%	100%	11.7
2004 (1)	**36%**	**34%**	**71%**	**29%**	**1%**	**100%**	**12.2**
2010	37%	36%	73%	27%	1%	100%	13.6
2015	37%	37%	74%	26%	1%	100%	14.7
2020	37%	38%	75%	25%	1%	100%	15.8
2025	38%	39%	75%	24%	1%	100%	16.9
2030	40%	40%	81%	24%	1%	100%	18.2

Note(s): 1) Buildings accounted for 79% (or $214 billion) of total U.S. electricity expenditures.

Source(s): EIA, State Energy Data 2002: Consumption, June 2006, Tables 8-12, p. 18-22 for 1980-2000; and EIA, AEO 2006, Feb. 2006, Table A2, p. 134-136 for 2004-2030 consumption, Table A3, p. 137-138 for 2004 expenditures.

Buildings Sector Energy Share

Buildings Energy Data Book: 1.1 Buildings Sector Energy Consumption *September 2006*

1.1.3 Buildings Share of U.S. Primary Energy Consumption (percent)

	Residential	Commercial	Total Buildings	Industry	Transportation	TOTAL	Total Consumption (quads)
1980 (1)	20%	14%	34%	41%	25%	100%	78.3
1990	20%	16%	36%	38%	26%	100%	84.7
2000	21%	17%	38%	35%	27%	100%	98.9
2004	21%	17%	39%	33%	28%	100%	99.7
2010	21%	18%	39%	32%	29%	100%	107.9
2015	21%	19%	40%	31%	29%	100%	114.3
2020	21%	19%	40%	31%	29%	100%	120.7
2025	20%	20%	40%	31%	30%	100%	127.1
2030	20%	20%	40%	30%	30%	100%	134.0

Note(s): 1) Renewables are not included in the 1980 data.

Source(s): EIA, State Energy Data 2002: Consumption, June 2006, Tables 8-12, p. 18-22 for 1980-2000; and EIA, AEO 2005, Feb. 2006, Table A2, p. 134-136 for 2004-2030 data and Table A17, p. 159 for non-marketed renewable energy.

Buildings Sector Contribution to US Carbon Emissions

Buildings Energy Data Book: 3.1 Carbon Emissions *September 2006*

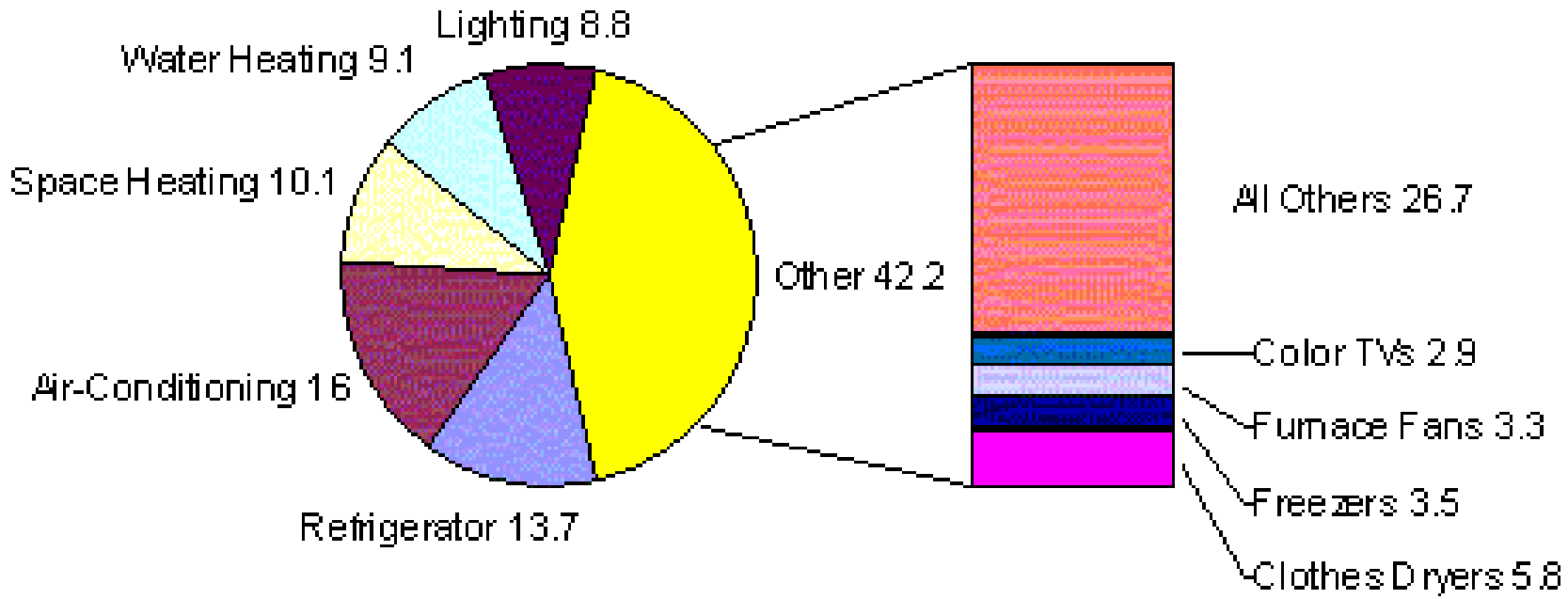
3.1.1 Carbon Dioxide Emissions for U.S. Buildings, by Year (10^6 metric tons of carbon) (1)

	Buildings				U.S.			
	Site			Growth Rate		Growth Rate	Buildings %	Buildings %
	Fossil	Electricity	Total	2004-Year	Total	2004-Year	of Total U.S.	of Total Global
1980	172.0	255.2	427.1	-	1281.7	-	33%	8.5%
1990	153.7	317.2	470.9	-	1359.7	-	35%	8.1%
2000	167.4	426.2	593.5	-	1581.3	-	38%	9.1%
2004	**164.7** (2)	**443.4** (2)	**608.1**	-	**1610.2**	-	**38%**	**9.8%** (3)
2010	168.0	502.5	670.5	1.6%	1737.1	1.3%	39%	8.6%
2015	174.8	535.3	710.1	1.4%	1833.4	1.2%	39%	7.7%
2020	179.6	577.2	756.8	1.4%	1942.9	1.2%	39%	7.5%
2025	182.5	627.0	809.5	1.4%	2070.6	1.2%	39%	7.4%
2030	186.0	686.2	872.2	1.4%	2214.6	1.2%	39%	7.3%

Note(s): 1) Excludes emissions of buildings-related energy consumption in the industrial sector. Emissions assume complete combustion from energy consumption and exclude energy production activities such as gas flaring, coal mining, and cement production. 2) Emissions differ from EIA, AEO 2006, Feb. 2006 by less than 0.1%. 3) U.S. buildings emissions approximately equal the combined carbon emissions of Japan, France, and the United Kingdom.

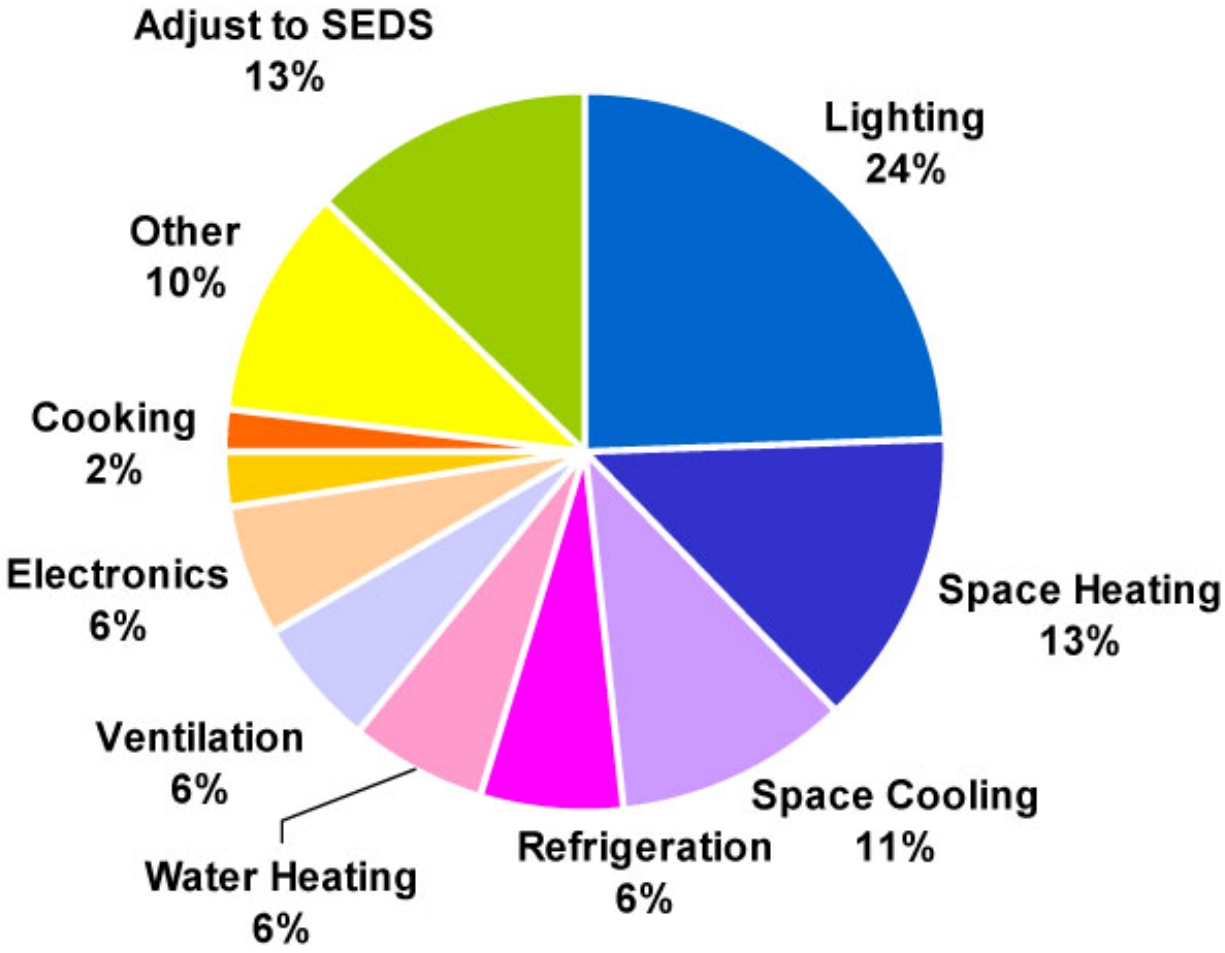
Source(s): EIA, Emissions of Greenhouse Gases in the U.S. 1985-1990, Sept. 1993, Appendix B, Tables B1-B5, p. 73-74 for 1980; EIA, Emissions of Greenhouse Gases in the U.S. 2003, Dec. 2004, Tables 7-11, p. 29-31 for 1990 and 2000; EIA, Assumptions to the AEO 2006, Mar. 2006, Table 2, p. 9 for carbon coefficients; EIA, AEO 2006, Feb. 2006, Table A2, p. 134-136 for 2004-2030 energy consumption and Table A18, p. 160 for 2004-2030 emissions; EIA, International Energy Outlook 2006, June 2006, Table A10, p. 93 for 2003-2030 global emissions; and EIA, International Energy Annual 2004, July 2006, Table H1, www.eia.doe.gov for 1980-2000 global emission.

Figure 1. Percent of Total Electricity Consumption in U.S. Housing Units, 2001



Source: Energy Information Administration, Form EIA-457A, B, C. E. and H of the 2001 Residential Energy Consumption Survey.

US Commercial Buildings Energy End Use- 2004



Total Energy Consumption: 17.40 Quadrillion Btu

* -- Excludes buildings energy consumption in the industrial sector.

Available Technologies Capable of Reducing Buildings' Carbon Intensity

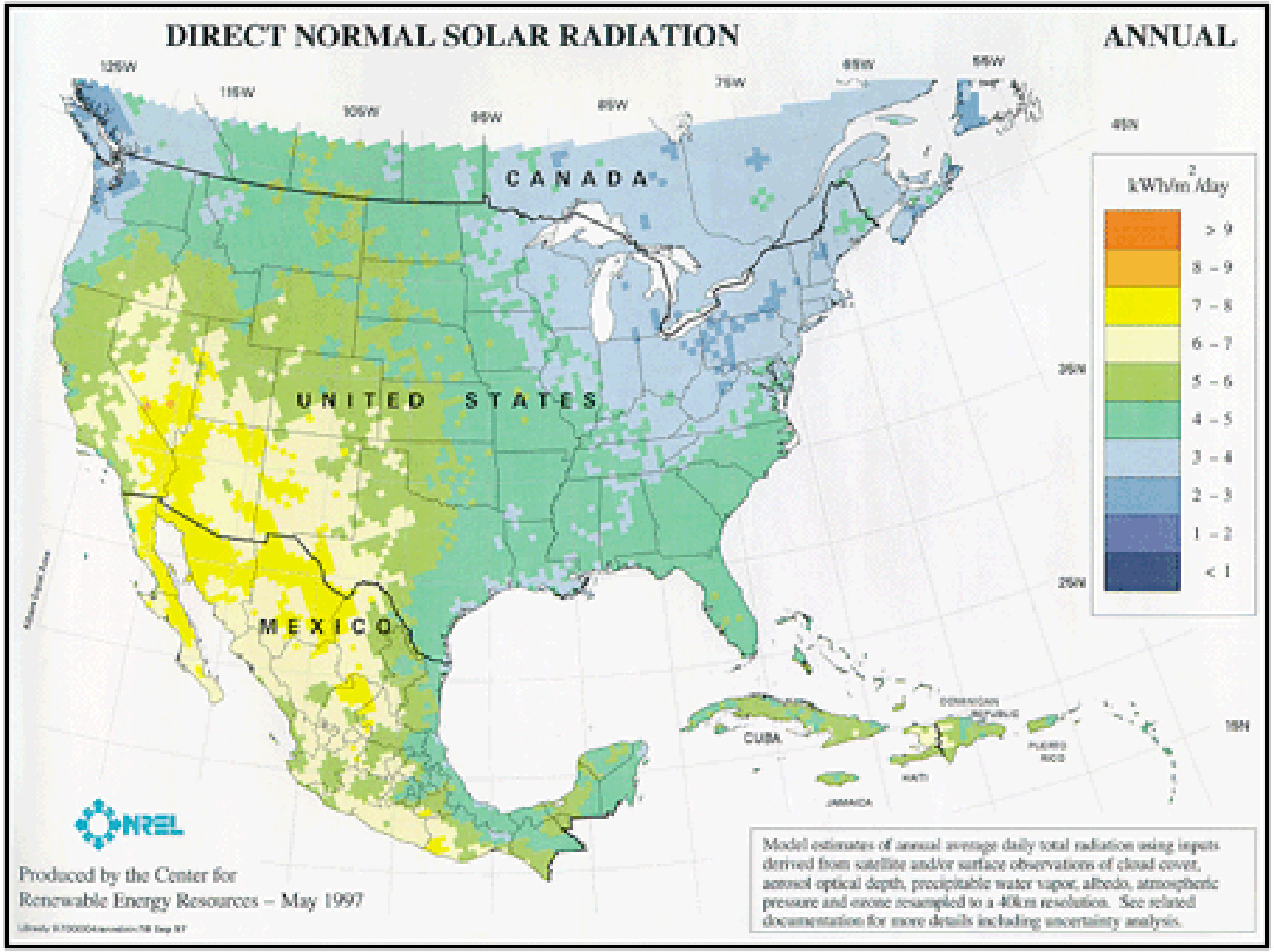
- Photovoltaics (PV)
- Solar Thermal
- Geothermal Heat Pumps (GHP)
- Improved efficiency appliances and lighting technology

Photovoltaic Potential

- PV is not yet cost-competitive with electricity from the grid
- Where government incentive programs exist, together with lower prices secured through volume purchases, installed costs as low as $3-4 watt—or some 10-12 cents per kilowatt-hour can be achieved
- Potential to off-set peak electricity demand

DIRECT NORMAL SOLAR RADIATION

ANNUAL



NREL

Produced by the Center for
Renewable Energy Resources – May 1997

Model estimates of annual average daily total radiation using inputs derived from satellite and/or surface observations of cloud cover, aerosol optical depth, precipitable water vapor, albedo, atmospheric pressure and ozone resampled to a 40km resolution. See related documentation for more details including uncertainty analysis.

Solar Thermal Potential

- Can be used for heating water or space heating
- solar water-heating system reduces the need for conventional water heating by about two-thirds
- Costs more initially, but can usually save money in long-run
  - Savings a function of:
    - The amount of hot water you use
    - Your system's performance
    - Your geographic location and solar resource
    - Available financing and incentives
    - The cost of conventional fuels
    - The cost of the fuel you use for your backup water heating system, if you have one
- Solar pool-heating provides a return on investment between 1.5 and 7 years, depending cost displaced energy

Geothermal Heat Pump Potential

- Developed more than 50 years ago and came into common use in the 1970s
- More than a million geothermal heat pumps now being used in US
- Can provide space heating, cooling, and hot water
- How it works
    - http://www.geoexchange.org/about/movie.htm

Geothermal Heat Pump Potential (cont.)

- Generally 2.5-4+ times more efficient than resistance heating and water heating alone
- Reduces energy use by 23-44% compared to advanced air-source heat pumps, and by 63-72% compared to electric resistance heating and standard air-conditioning equipment
  - [Nearly 40% of all US CO2 emissions the result of heating, cooling, and heating water for buildings]
- Higher installation cost than combustion units, time till pay-off determined by region

Sources

- http://buildingsdatabook.eere.energy.gov/?id=view_book
- http://www.eere.energy.gov/buildings/
- http://www.geoexchange.org/
- http://archive.gao.gov/t2pbat3/152033.pdf
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