CHAPTER 8

Miscellaneous

A Quick Guide to Future Trends in Energy

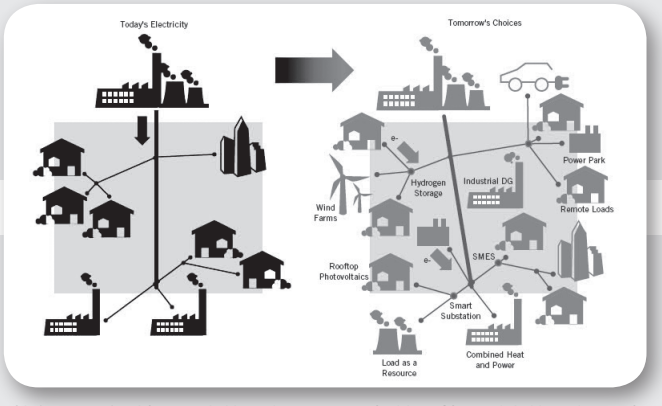
The world of energy is always in flux, the following are some new approaches to energy consumption, generation and distribution that are happening on a small scale now, but may burgeon into more significant changes in the future.

A NET-ZERO RESIDENTIAL HOME IN STOUGHTON, WI.

Net Zero Energy Building

A Net Zero Energy Building is any building that generates as much electricity as it uses, having a net energy consumption of zero. To achieve this, the building must generate a significant amount of energy, usually from renewables. Not only do people in buildings use energy, but the building itself is an energy consumer. By using design advances and energy efficient technologies, the overall energy consumption of the building is decreased, which increases the likelihood that the building can generate the same amount of energy that it 'spends'. Some energy efficient technologies include: solar space heating, solar thermal water heating, ground source heat pumps, and natural lighting and ventilation.

Distributed Generation Historically, electricity is generated at centralized locations owned by utilities or independent power producers (e.g., coal-fired power plants), and then distributed to utility customers through the grid. Distributed generation—also referred to as decentralized generation—describes a scenario where electricity is generated by privately owned sources (e.g., photovoltaic solar cells) at a non-centralized location, such as a businesses or residential homes. This electricity is sold to the utility for distribution on the grid. Distributed generation increases the number of generators on the grid, which, in theory, also increases the security of the grid, but also can raise other technical challenges such as grid stability.



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Smart Grid A Smart Grid is a modernized electric grid that can gather, use and communicate information collected about the workings of the grid itself. It uses sensing equipment, smart meters, and integrated communications to make the grid more flexible, reliable, and efficient. A smart grid can send the data it gathers from devices on the grid to the utility network, reducing the need for utility workers to manually check the usage on the meters. In addition, since this data is in real-time, it can be used to help customers shift their electricity usage away from peak times, which lowers the demand for utilities, allowing for efficient use of the grid. Smart grids also allow for better integration of distributed generation by providing the ability to reduce demand when needed, and to store energy when the demand isn't as high.

United States Energy Use and Gross Domestic Product

ENERGY USE PER DOLLAR OF GDP
45.4%
SINCE 1980

Until the early 1970s, energy use kept pace with the growth in the nation's economy. Economic growth during the 1970s and early 1980s was accompanied by slower growth in energy use due to increases in efficiency and a shift away from energy intensive industries.

Efficiency, in terms of decreasing energy required to produce a dollar of Gross Domestic Product, continues to increase slowly.

The ratio between electric sales and Gross Domestic Product has fallen 2.4 percent since 2010, and 22.1 percent since 1980. Energy use per dollar of Gross Domestic Product declined 2.2 percent since 2010 and 45.4 percent since 1980.

The federal Bureau of Economic Analysis (BEA) periodically adjusts the base year for economic data. These data represent the most recent revision of BEA data to 2005 as the base year.

1970-2011

Year	Resident Population (Thousands)[a,r]	Gross Domestic Product (Bil. of 2005$)	Resource Energy Consumption (Quad. Btu)[c]	Electric Sales to Ultimate Customers (Bil. of kWh)[d]	Resource Energy Per GDP (Thous. Btu/2005$)	Electric Sales Per GDP (kWh/2005$)
1970	205,052	4,266.3	67.84	1,392.0	15.90	0.3263
1975	215,973	4,875.4	71.96	1,747.1	14.76	0.3584
1980	227,225	5,834.0	78.07	2,094.4	13.38	0.3590
1985	237,924	6,843.4	76.39	2,324.0	11.16	0.3396
1990	249,623	8,027.1	84.49	2,712.6	10.52	0.3379
1995[r]	266,278	9,086.0	91.03	3,013.3	10.02	0.3316
1996[r]	269,394	9,425.8	94.02	3,101.1	9.97	0.3290
1997[r]	272,647	9,845.9	94.60	3,145.6	9.61	0.3195
1998[r]	275,854	10,274.7	95.02	3,264.2	9.25	0.3177
1999[r]	279,040	10,770.7	96.65	3,312.1	8.97	0.3075
2000[r]	282,162	11,216.4	98.81	3,421.4	8.81	0.3050
2001[r]	284,969	11,337.5	96.17	3,394.5	8.48	0.2994
2002[r]	287,625	11,543.1	97.65	3,465.5	8.46	0.3002
2003[r]	290,108	11,836.4	97.94	3,493.7	8.28	0.2952
2004[r]	292,805	12,246.9	100.16	3,547.5	8.18	0.2897
2005[r]	295,517	12,623.0	100.28	3,661.0	7.94	0.2900
2006[r]	298,380	12,958.5	99.63	3,669.9	7.69	0.2832
2007[r]	301,231	13,206.4	101.31	3,764.6	7.67	0.2851
2008[r]	304,094	13,161.9	99.29	3,733.0	7.54	0.2836
2009[r]	306,772	12,703.1	94.60	3,596.9	7.44	0.2831
2010[r]	309,330	13,088.0	97.97	3,754.5	7.49	0.2869
2011[p]	**311,592**	**13,315.1**	**97.47**	**3,726.2**	**7.32**	**0.2798**

a As of July 1.
c Quadrillions of Btu.
d Beginning in 1975, the DOE data source has been used.
p Preliminary.
r Revised.

Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review* (April 2011), http://www.eia.doe.gov/mer/; Tables 1.3 and 7.1 (1970-2011); Wisconsin Department of Administration Demographic Services resident, national population estimates as of July 1 (1970-2011). Bureau of Economic Analysis, Regional Economic Accounts, http://www.bea.gov/bea/regional/ (1970-2011).

Wisconsin Population, Households, Gross State Product and Personal Income

Data in this table are provided as a reference point for making per capita comparisons. To explain recent increases in residential energy use, personal income per capita and per household are shown in current and constant 2011 dollars.

1970-2011

Year	GDP Deflator	Population[c,r] (Thousands)	No. of Households[a,c,r] (Thousands)	Gross State Product (Million 2011 Dollars)	Personal Income[b,r] (Current Dollars)			Personal Income[b,r] (2011 Dollars)		
					Total (Million Dollars)	Dollars Per Capita	Dollars Per Household	Total (Million Dollars)	Dollars Per Capita	Dollars Per Household
1970	24.34	4,417.8	1,328.8	94,057	17,621	3,989	13,261	82,079	18,579	61,769
1975	33.59	4,565.8	1,486.8	109,324	27,830	6,095	18,718	93,917	20,570	63,167
1980	47.79	4,705.6	1,652.3	125,477	47,519	10,098	28,760	112,716	23,954	68,219
1985	61.63	4,744.7	1,720.4	135,785	65,132	13,727	37,860	119,805	25,250	69,639
1990	72.26	4,891.8	1,822.1	157,245	88,213	18,033	48,412	138,383	28,289	75,946
1995	81.61	5,134.1	1,946.3	187,963	116,074	22,608	59,639	161,241	31,406	82,845
1996	83.16	5,182.0	1,971.6	195,536	122,953	23,727	62,362	167,604	32,344	85,010
1997	84.63	5,233.9	1,998.4	203,018	130,478	24,929	65,292	174,777	33,393	87,459
1998	85.58	5,280.0	2,024.5	212,737	141,019	26,708	69,658	186,787	35,376	92,265
1999	86.84	5,323.7	2,053.9	221,930	147,462	27,699	71,795	192,490	36,157	93,718
2000	88.72	5,363.7	2,084.6	226,966	156,603	29,197	75,125	200,090	37,304	95,987
2001	90.73	5,412.7	2,115.7	229,268	162,773	30,072	76,935	203,378	37,574	96,127
2002	92.20	5,460.9	2,147.3	233,904	167,708	30,711	78,103	206,205	37,760	96,031
2003	94.14	5,498.0	2,170.9	238,515	173,248	31,511	79,804	208,630	37,947	96,103
2004	96.79	5,540.5	2,197.4	244,677	180,303	32,543	82,055	211,179	38,115	96,106
2005	100.00	5,584.5	2,223.5	247,906	186,545	33,404	83,897	211,468	37,867	95,105
2006	103.23	5,618.8	2,242.5	251,130	198,556	35,338	88,543	218,038	38,805	97,231
2007	106.23	5,647.2	2,254.8	252,405	206,648	36,593	91,647	220,525	39,050	97,801
2008	108.58	5,669.6	2,265.7	246,482	215,330	37,980	95,041	224,805	39,651	99,223
2009	109.73	5,680.2	2,275.5	243,480	209,595	36,900	92,110	216,531	38,121	95,158
2010	110.99	5,687.0	2,279.8	250,965	217,562	38,256	95,432	222,206	39,073	97,469
2011[p]	**113.36**	**5,697.0**	**2,287.8**	**254,818**	**228,888**	**40,177**	**100,047**	**228,888**	**40,177**	**100,047**

a Household numbers for intercensal years estimated on basis of Public Service Commission of Wisconsin reports of electric utility residential customers. Starting in 2000, estimates are from the Department of Administration, Wisconsin Demographic Services Center.

b Personal Income data are revised back to 1970 based on federal BEA adjustments (2011).

c Population and Households revised for 2000-2011.

p Preliminary estimates.

r Revised.

Source: U.S. Department of Commerce, Bureau of Census, Population Division, *2000 Census of Population and Housing*, CPH-1-51 (August 2001) and Preliminary Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2010 (NST-PEST2010-01) (February 2011); Final Official Population Estimates and Census Counts for Wisconsin Counties: 1970 – 2008; Department of Administration, Wisconsin Demographic Services Center (1970-2011) and Intercensally Revised Annual Estimates of Residents,Housing Units and Households in Wisconsin, 1990-2011 (May 2011); U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts, http://www.bea.gov/bea/regional/ (1970-2011).

HOUSEHOLD INCOME
IN 2011 DOLLARS
1.3%
ANNUALLY
SINCE 1990

Wisconsin's population and number of households continue to grow since 2006. The number of households has grown slower than the population, as the number of persons per household has declined more slowly.

After growing at an annual rate of 2.4 percent over the 10-year period from 1990 to 2000, the 2011 per household income (in constant 2011 dollars) increased to its highest level since 1970.

Household income growth, in constant 2011 dollars, has been averaging about 1.3 percent annually over the 21-year period since 1990. Gross State Product in 2011 dollars increased by 1.5 percent in 2011 compared to 2010.

Wisconsin Employment, by Type

WISCONSIN LABOR FORCE **0.8%**

WISCONSIN EMPLOYMENT **0.4%**

In 2011, Wisconsin's working age labor force increased 0.8 percent. Employment in the state increased 0.4 percent (11,600 jobs). Employment in all sectors increased. In the goods producing sector, by 1.6 percent, in the services-producing sector by 0.2 percent, and by 0.4 percent in the nonfarm sector. Most Wisconsin jobs are classified as services producing.

1970-2011 THOUSANDS

Year	Working Age 18-64	Total Employment[a]	Percent Working Age Employed	Total NonFarm[b,e]	Goods Producing[b,c]	Services Producing[b,d]
1970[r]	2,362.6			1,530.5	565.7	964.8
1975[r]	2,572.5			1,677.0	570.5	1,106.5
1980	2,783.7			1,938.1	630.6	1,307.5
1985[r]	2,858.3			1,983.1	580.4	1,402.7
1990	2,949.3	2,486.1	84.3%	2,291.5	614.8	1,676.7
1995	3,122.9	2,773.6	88.8%	2,558.6	672.5	1,886.1
1996[r]	3,157.5	2,815.6	89.2%	2,600.6	679.2	1,921.4
1997[r]	3,194.8	2,855.8	89.4%	2,655.8	694.9	1,960.9
1998[r]	3,228.6	2,870.0	88.9%	2,718.0	713.5	2,004.6
1999[r]	3,261.0	2,879.0	88.3%	2,784.0	720.5	2,063.5
2000	3,292.4	2,894.9	87.9%	2,833.8	723.0	2,110.8
2001	3,332.7	2,897.9	87.0%	2,813.9	689.5	2,124.3
2002[r]	3,372.3	2,860.9	84.8%	2,782.4	656.2	2,125.8
2003[r]	3,406.3	2,862.6	84.0%	2,773.8	631.9	2,142.0
2004[r]	3,443.8	2,868.4	83.3%	2,804.5	633.3	2,171.2
2005[r]	3,487.5	2,890.1	82.9%	2,838.3	636.4	2,201.9
2006[r]	3,516.8	2,932.5	83.4%	2,861.5	637.2	2,224.4
2007[r]	3,538.8	2,948.7	83.3%	2,878.3	630.9	2,247.5
2008[r]	3,554.9	2,939.8	82.7%	2,871.0	614.7	2,256.3
2009[r]	3,631.5	2,842.9	78.3%	2,744.1	541.1	2,203.0
2010[r]	3,668.0	2,821.8	76.9%	2,728.7	528.0	2,200.7
2011[p]	**3,697.6**	**2,833.4**	**76.6%**	**2,740.7**	**536.2**	**2,204.5**

a Nonfarm wage and salary employment.

b These data categories represent numbers of jobs, not numbers of individuals.

c Goods Producing is a compilation of the Mining, Natural Resources, and Construction industries.

d Services Producing is a compilation of all non-farm jobs that do not produce goods.

e Total Non-Farm job is a compilation of many non-farm job categories, which includes Goods Producing and Services Producing.

p Preliminary.

r Revised.

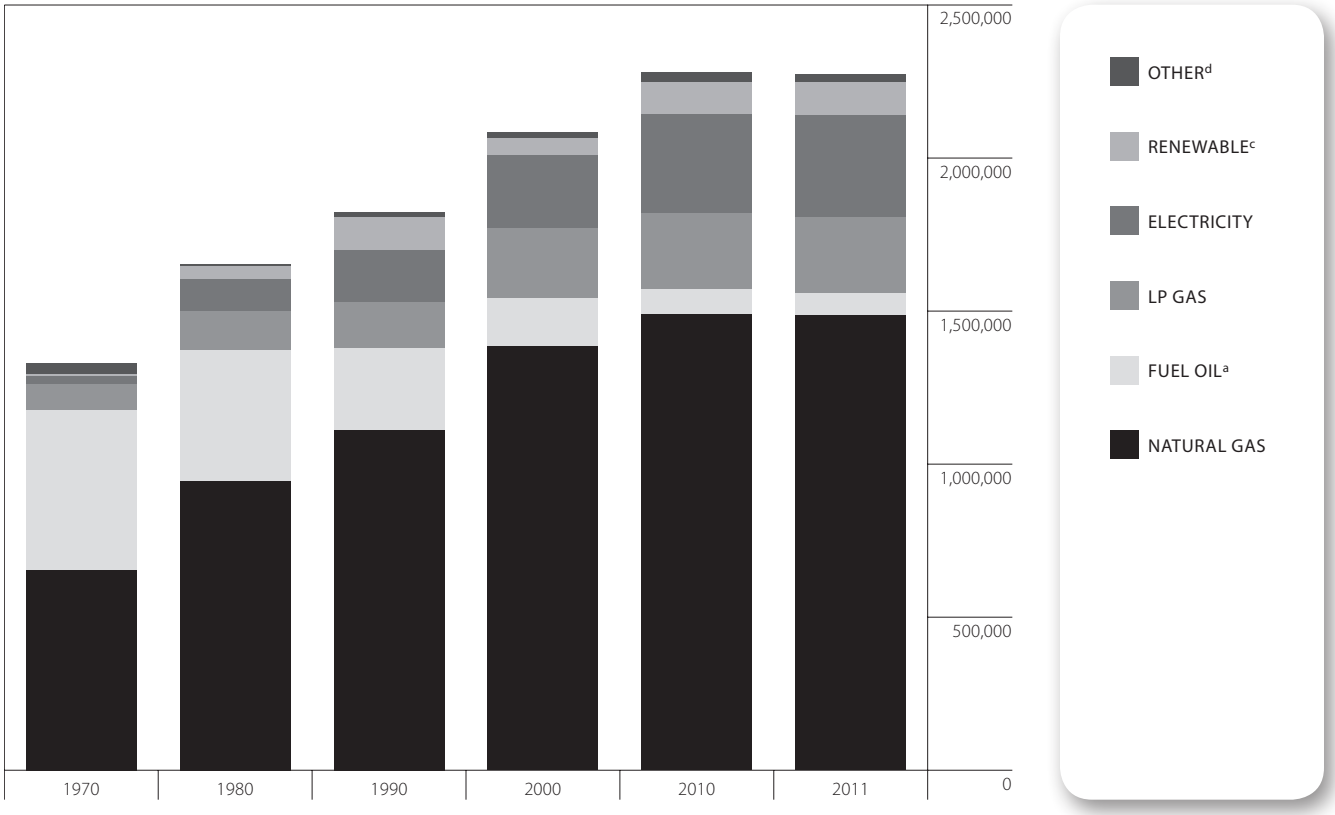
Source: Wisconsin Department of Administration, Demographic Services Center, *Single Year of Age Projections, 2000-2011, Broad Age Groups, Intercensal Revision Controlled to State Estimates (May 2011)*; Wisconsin Department of Workforce Development, Labor Market information Section, Current Employment Statistics (CES) http://worknet.wisconsin.gov/worknet/daces.aspx?menuselection=da (1990-2010) and Local Area Unemployment Statistics (LAUS) http://worknet.wisconsin.gov/worknet/dalaus.aspx?menuselection=da (1980-2011).

Wisconsin Occupied Dwelling Units, by Type of Fuel for Space Heating

1970, 1980, 1990, 2000, 2010 AND 2011 NUMBER OF UNITS AND PERCENT OF TOTAL

Fuel	1970		1980		1990		2000		2010		2011	
Natural Gas	654,851	*49.3%*	945,092	*57.2%*	1,111,733	*61.0%*	1,384,230	*66.4%*	1,488,259	*65.3%*	1,484,849	*65.3%*
Fuel Oil[a]	521,256	*39.2%*	425,622	*25.8%*	265,600	*14.6%*	158,499	*7.6%*	81,908	*3.6%*	74,110	*3.3%*
LP Gas	85,549	*6.4%*	130,476	*7.9%*	152,823	*8.4%*	228,408	*11.0%*	250,022	*11.0%*	246,414	*10.8%*
Electricity	24,763	*1.9%*	101,489	*6.1%*	168,615	*9.3%*	236,755	*11.4%*	320,964	*14.1%*	333,466	*14.7%*
Wood	6,795	*0.5%*	42,783	*2.6%*	107,239	*5.9%*	56,862	*2.7%*	106,608	*4.7%*	107,814	*4.7%*
Coal or Coke	29,708	*2.2%*	2,591	*0.2%*	787	*0.0%*	330	*0.0%*	308	*0.0%*	326	*0.0%*
Solar Energy	NA		NA		NA		NA		345	*0.0%*	765	*0.0%*
Other	5,334	*0.4%*	3,578	*0.2%*	11,294	*0.6%*	13,839	*0.7%*	22,028	*1.0%*	20,056	*0.9%*
None	548	*0.0%*	630	*0.0%*	4,027	*0.2%*	5,621	*0.3%*	9,090	*0.4%*	7,552	*0.3%*
Total[b]	**1,328,804**		**1,652,261**		**1,822,118**		**2,084,544**		**2,279,532**		**2,275,352**	

1970-2011 NUMBER OF UNITS



a Includes kerosene.

b Number of households data may not match due to different data sources.

c Includes wood and solar energy.

d Includes Coal/coke, no fuel or other fuel as defined by the American Community Survey.

Source: U.S. Department of Commerce, Bureau of the Census, *Census of Housing* (1970, 1980, 1990 and 2000) and American Community Survey (2005-2011).

Wisconsin Motor Vehicle Registrations, by Type of Vehicle

TOTAL VEHICLE REGISTRATIONS
0.22%

In 2011, total vehicle registrations decreased by 0.22 percent; auto registrations decreased by 2.2 percent. The truck category includes vans, sports utility vehicles and light trucks.

These data are provided as a factor to help compare the use of motor vehicle fuels across the years.

1970-2011

Year	Autos	Trucks	Buses	Motorcycles	Trailers	Total[a,b]
1970	1,762,681	317,096	8,178	53,642	64,065	2,210,492
1975	2,023,427	426,756	11,422	96,629	81,378	2,644,681
1980	2,248,951	665,012	13,375	169,329	93,288	3,215,302
1985	2,310,024	771,264	10,325	176,037	101,030	3,406,196
1990	2,456,175	1,053,280	14,518	149,281	152,712	3,825,966
1995	2,419,389	1,399,236	14,940	161,773	240,841	4,281,803
1996	2,398,351	1,464,366	15,413	136,794	205,177	4,260,959
1997	2,370,453	1,537,241	12,497	161,509	213,415	4,339,088
1998	2,402,019	1,668,241	17,061	151,391	231,934	4,513,250
1999	2,396,072	1,735,326	14,546	171,839	242,849	4,605,088
2000	2,405,408	1,822,078	15,587	160,927	256,890	4,703,294
2001	2,413,001	1,922,916	16,259	192,312	269,931	4,860,457
2002	2,404,081	2,012,847	17,061	183,890	285,471	4,948,282
2003	2,401,816	2,103,643	17,555	215,231	303,852	5,091,716
2004	2,387,459	2,176,903	14,099	207,592	334,898	5,170,728
2005	2,384,717	2,280,170	12,418	278,055	365,435	5,320,795
2006	2,427,905	2,354,954	13,222	266,195	396,374	5,458,650
2007	2,427,882	2,404,895	14,110	324,833	419,816	5,591,536
2008	2,391,300	2,400,680	10,736	307,808	411,871	5,522,395
2009	2,340,991	2,429,194	12,738	345,737	417,031	5,545,691
2010	2,333,029	2,449,286	13,410	317,387	426,092	5,539,204
2011	**2,282,310**	**2,451,634**	**14,411**	**361,893**	**416,550**	**5,526,798**

a As of June 30.

b Total includes motor homes, mopeds and municipal vehicles; it does not equal sum of registration types shown before 2005. From 2005 on, motor homes, mopeds and municipal vehicles are included in trucks, motorcycles and autos, respectively.

Source: Wisconsin Department of Transportation (January 2012).

Wisconsin New Single and Two Family Building Permits

1990-2011[a]

	1990		2000		2005		2010		2011	
Type										
Single Family	10,663	94.9%	17,548	93.5%	20,380	94.0%	6,375	96.7%	5,253	96.0%
Two Family	578	5.1%	1,219	6.5%	1,306	6.0%	218	3.3%	218	4.0%
Heating Equipment										
Forced Air	10,299	91.6%	16,972	95.6%	19,256	88.1%	5,615	68.3%	4,553	66.8%
Radiant Electric	225	2.0%	343	1.9%	515	2.4%	186	2.3%	177	2.6%
Heat Pump	15	0.1%	50	0.3%	199	0.9%	174	2.1%	155	2.3%
Boiler	113	1.0%	385	2.2%	1,017	4.7%	410	5.0%	390	5.7%
Not Specified	589	5.2%	10	0.1%	871	4.0%	1,841	22.4%	1,538	22.6%
AC Equipped										
Yes	2,699	24.0%	10,820	57.7%	14,208	65.5%	4,009	60.6%	3,514	64.2%
No	8,542	76.0%	7,947	42.3%	7,499	34.5%	2,604	39.4%	1,962	35.8%
Space Heating Source										
Natural Gas	8,518	75.8%	11,640	61.9%	13,061	60.2%	3,696	55.9%	3,118	56.9%
LP Gas	1,395	12.4%	3,733	19.8%	4,703	21.7%	1,539	23.3%	1,265	23.1%
Oil	109	1.0%	49	0.3%	33	0.2%	3	0.0%	8	0.1%
Electric	240	2.1%	175	0.9%	265	1.2%	219	3.3%	208	3.8%
Solid	51	0.5%	51	0.3%	83	0.4%	142	2.1%	106	1.9%
Solar	0	0.0%	51	0.3%	83	0.4%	12	0.2%	13	0.2%
Not Specified	928	8.3%	3,117	16.6%	3,477	16.0%	1,002	15.2%	757	13.8%
Water Heating Source										
Natural Gas	8,326	74.1%	11,690	62.3%	12,348	56.9%	3,455	52.2%	2,862	52.3%
LP Gas	1,082	9.6%	2,746	14.6%	3,484	16.1%	1,037	15.7%	852	15.6%
Oil	22	0.2%	12	0.1%	12	0.1%	1	0.0%	1	0.0%
Electric	667	5.9%	1,495	8.0%	2,058	9.5%	1,163	17.6%	1,055	19.3%
Solid	12	0.1%	27	0.1%	58	0.3%	36	0.5%	27	0.5%
Solar	0	0.0%	1	0.0%	36	0.2%	11	0.2%	13	0.2%
Not Specified	1,132	10.1%	2,796	14.9%	3,709	17.1%	910	13.8%	665	12.1%
Living Area (Sq. Ft)										
1-1,000	394	3.6%	654	3.7%	591	2.8%	363	5.7%	294	5.6%
1,001-1,800	4,784	44.0%	7,681	43.4%	7,764	37.2%	2,671	42.2%	2,041	38.7%
1,801-2,400	3,153	29.0%	4,874	27.5%	6,091	29.2%	1,543	24.4%	1,324	25.1%
2,401-Greater	2,550	23.4%	4,496	25.4%	6,444	30.8%	1,758	27.8%	1,618	30.7%
Total	10,881		17,705		20,890		6,335		5,277	
Average (Sq. Ft)	1,980		1,945		2,148		2,025		2,107	

a These statistics are incomplete before January 1, 2005, as not all municipalities who issue building permits reported this information.

Source: Wisconsin Department of Commerce, Division of Safety and Buildings http://www.dsps.wi.gov/sb/SB_statsUDCStatisticslist.html; Amerifax Data Corporation, http://www.home2000.com/adc/welcome.htm (1970-2012).

SINGLE FAMILY PERMITS **7.7%** FROM 2010 TO 2011

From 2010 to 2011, there was a 17.6 percent decrease in construction for single family building permits,

TWO-FAMILY PERMITS **STAYED LEVEL** FROM 2010 TO 2011

while two-family building permits stayed level.

There was a 8.3 percent increase for solar space heating, and a 18.2 percent increase in solar for water heating. Natural gas and propane remain the most commonly used fuels for space heating.The most common fuels for water heating are natural gas and electricity.

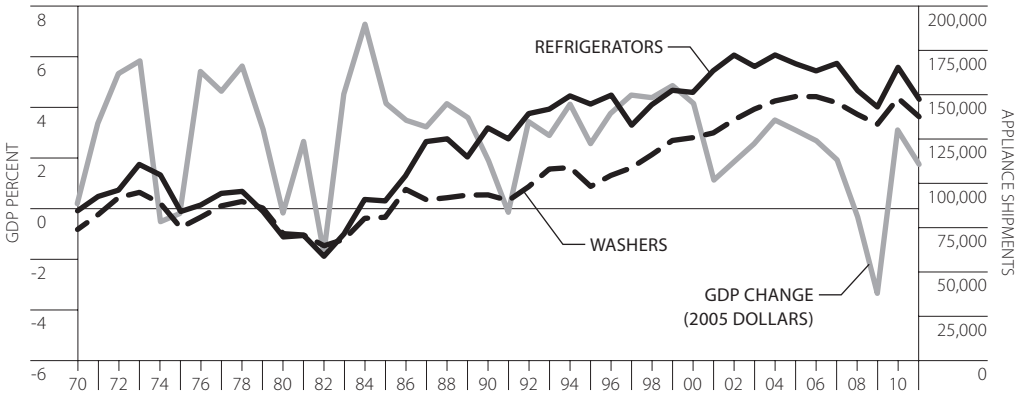
Wisconsin Appliance Shipments, by Type, Cooling Degree Days and Gross National Product

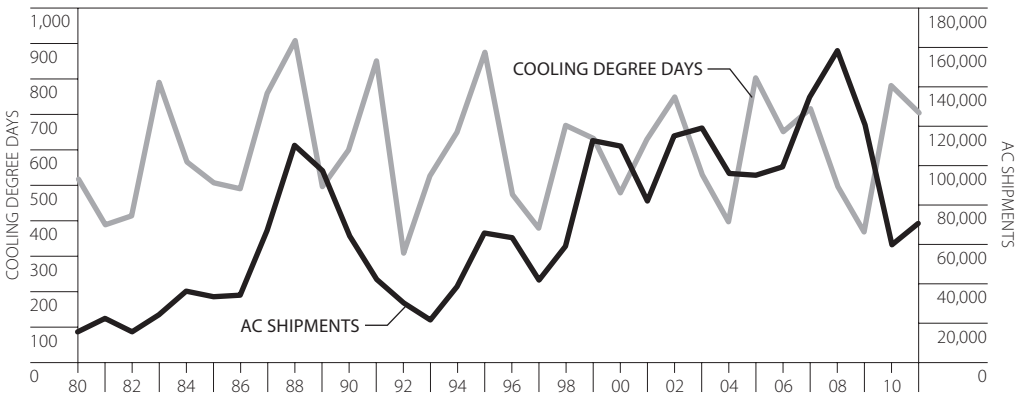
The first graph plots shipments of refrigerators and washing machines against the annual percent change in the U.S. Gross Domestic Product (GDP) in constant 2005 U.S. dollars. This graph illustrates the relationship between large appliance purchases, the national economy and energy consumption.

The second graph plots appliance shipments of room air conditioners (RACs) against Wisconsin's Cooling Degree Days (CDDs)[a] to demonstrate the relationship between appliance purchases, energy consumption and the weather.

1970-2011

Year	Cooling Degree Days	Percent Change in GDP	Refrigerators	Room Air Conditioners	Washers
1970		0.19%	84,180	62,715	73,666
1975		-0.21%	83,658	31,297	74,547
1980	516	-0.28%	69,380	15,290	71,230
1985	505	4.14%	89,700	33,100	80,500
1990	599	1.88%	130,800	64,100	93,100
1995	868	2.51%	144,300	65,400	97,800
2000	474	4.14%	150,900	109,600	125,400
2005	797	3.07%	167,062	94,773	148,563
2006	648	2.66%	163,019	99,097	148,519
2007	713	1.91%	167,234	134,569	145,139
2008	495	-0.34%	152,087	157,601	138,575
2009	363	-3.49%	142,502	120,597	132,900
2010	778	3.03%	164,700	59,200	147,500
2011	**703**	**1.74%**	**147,200**	**70,400**	**137,300**

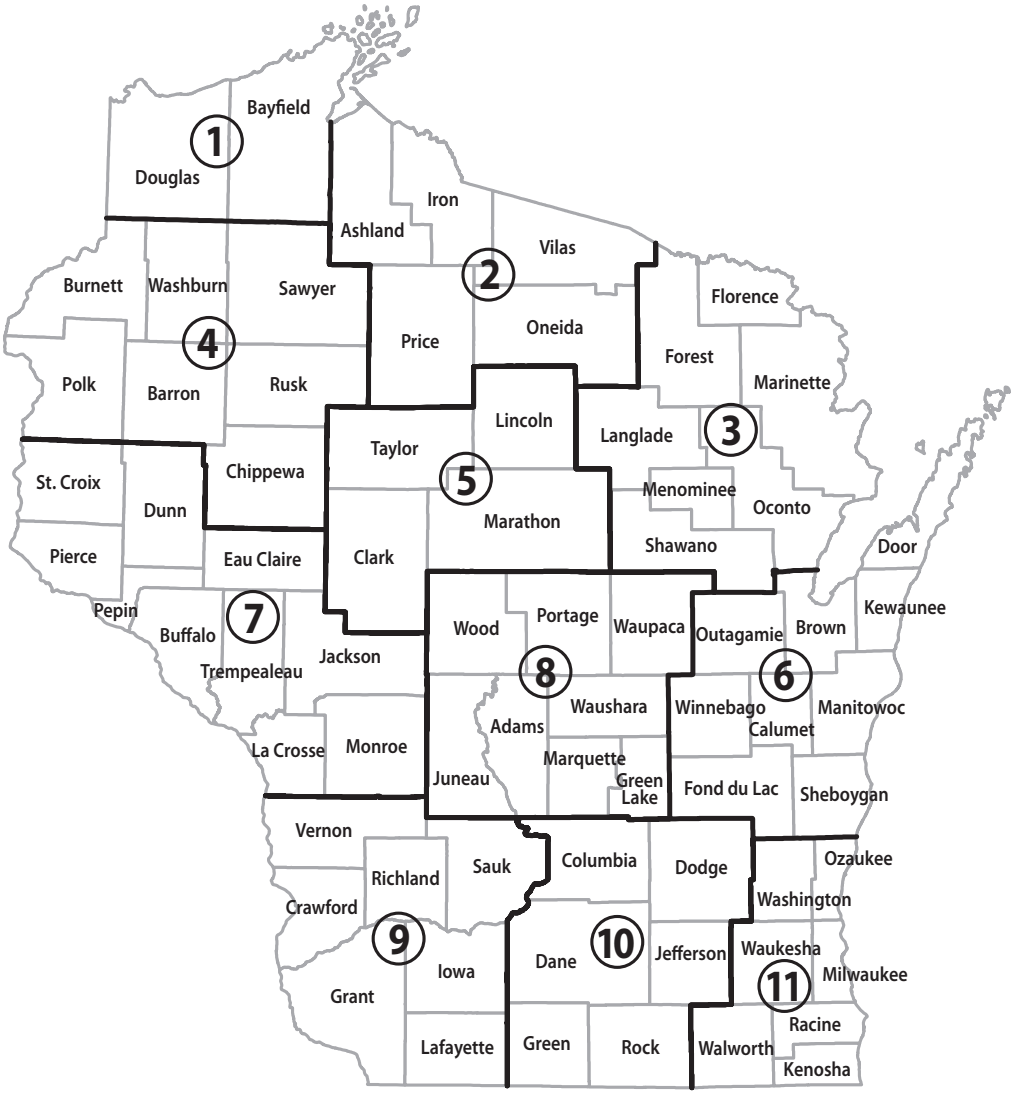




a Additional information about degree days can be found at the end of this chapter.

Source: Association of Home Appliance Manufacturers, *Distributor Sales by State–2011*. Association of Home Appliance Manufacturers, *Trends in Energy Efficiency–2011*. Compiled from tables in this chapter on Cooling Degree Days and the Gross Domestic Product.

Wisconsin Degree Day Zones



The energy needed to heat and cool homes and other buildings strongly depends on the outdoor temperature. The next few pages provide a set of tables listing typical and historic degree day figures throughout Wisconsin in eleven degree day zones—shown in the map.

Heating and cooling degree days are relative measures of outdoor air temperature, and are defined as deviations of the mean daily temperature below or above a base temperature of 65 degrees Fahrenheit. Data for this section are collected through a partnership with the Wisconsin State Climatology Office.

Heating and cooling degree days are provided as population-weighted averages for the state, to provide a point of reference for comparing the severity of winters and summers to statewide energy use.

Source: Wisconsin State Energy Office.

Wisconsin Normal Heating Degree Days, by Zone and Month

Heating degree days are relative measurements of outdoor air temperature and are defined as deviations of the mean daily temperature below a base temperature (65 degrees Fahrenheit, by convention). For example, a weather station recording a mean daily temperature of 40 degrees Fahrenheit would report 25 heating degree days. The normal heating degree days for each zone and month are the 30-year averages, from 1981 through 2010.

Month	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	State[a]
January	1,647	1,635	1,567	1,682	1,562	1,499	1,568	1,547	1,506	1,434	1,325	**1,451**
February	1,365	1,372	1,312	1,361	1,289	1,251	1,277	1,263	1,219	1,173	1,095	**1,195**
March	1,186	1,173	1,117	1,108	1,072	1,060	1,043	1,043	981	963	929	**1,000**
April	762	697	667	632	604	637	576	586	557	558	588	**597**
May	435	343	335	306	295	326	257	278	262	266	313	**300**
June	157	112	102	86	73	92	62	69	57	60	84	**79**
July	47	36	30	24	15	23	11	18	13	10	11	**15**
August	66	56	48	47	34	40	28	36	28	27	15	**28**
September	253	256	232	232	210	207	194	194	175	171	126	**172**
October	627	631	594	588	556	556	551	534	513	505	433	**505**
November	1,002	1,031	973	1,028	963	914	962	942	899	866	780	**875**
December	1,486	1,486	1,418	1,534	1,433	1,350	1,430	1,407	1,364	1,300	1,195	**1,313**
Total	**9,033**	**8,828**	**8,392**	**8,628**	**8,106**	**7,955**	**7,959**	**7,917**	**7,574**	**7,333**	**6,894**	**7,531**

a Population-weighted statewide average, based on 2010 census.

Source: National Climatic Data Center, 1981-2010 U.S. Climate Normals, http://ggweather.com/normals

Wisconsin Normal Cooling Degree Days, by Zone and Month

Cooling degree days are relative measurements of outdoor air temperature and are defined as deviations of the mean daily temperature above a base temperature (65 degrees Fahrenheit, by convention). For example, a weather station recording a mean daily temperature of 90 degrees Fahrenheit would report 25 cooling degree days. The normal cooling degree days for each zone and month are the 30-year averages, from 1981 through 2010.

Month	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	State[a]
April	1	1	2	2	1	2	4	4	3	4	5	**4**
May	9	14	15	17	18	16	28	26	22	26	25	**23**
June	48	67	75	85	97	83	120	112	113	120	120	**108**
July	118	127	139	157	172	150	214	184	193	206	222	**194**
August	89	96	104	116	130	111	161	136	152	157	193	**155**
September	22	25	29	31	35	33	48	44	48	51	69	**51**
October	1	1	2	2	3	3	4	4	5	4	7	**5**
Total	**288**	**331**	**365**	**410**	**456**	**398**	**579**	**510**	**536**	**568**	**641**	**538**

a Population-weighted statewide average, based on 2010 census.

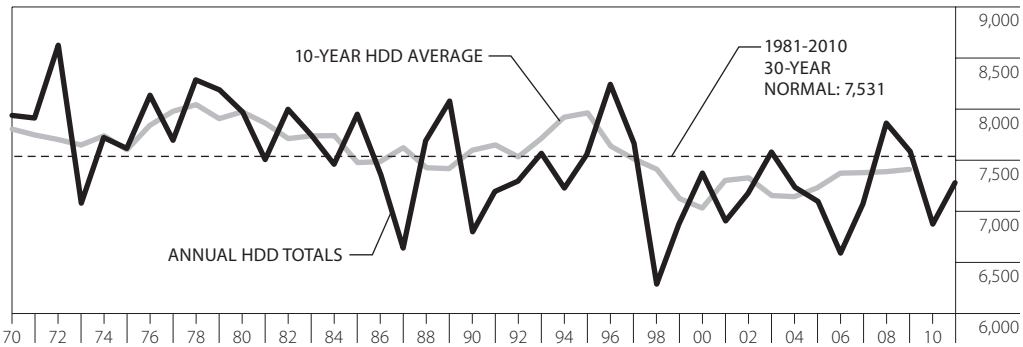
Source: National Climatic Data Center, 1981-2010 U.S. Climate Normals, http://ggweather.com/normals

Wisconsin Population-Weighted Heating Degree Days

1970-2011

What significance does the number of HDDs have on energy use? Increased HDDs means that space heating is used more because the temperature is cooler. Fewer HDDs means that space heating is used less because the temperature is warmer. Fluctuations in HDDs can also influence such variables as price and volume of winter heating fuels (e.g., propane, heating oil, natural gas).

The 10-year average and 30-year normal[b] are presented here as a point of reference for the variation in HDDs. The 10-year average is plotted in the middle of an 11-year period, averaging the five years previous to, and five years after, the plotted year. For example, the number plotted on the graph at 2003 is the average of 1998 through 2008. The 10-year average is not plotted for 2007 through 2011 because these averages cannot yet be calculated.



Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Normal	**1,451**	**1,195**	**999**	**597**	**300**	**79**	**15**	**28**	**172**	**505**	**874**	**1,313**	**7,528**
1970	1,716	1,292	1,116	564	294	81	15	15	179	430	888	1,343	7,933
1975	1,375	1,247	1,212	789	220	74	23	17	257	412	714	1,268	7,608
1980	1,465	1,378	1,141	582	240	116	8	14	177	634	867	1,345	7,967
1985	1,614	1,296	883	473	188	107	7	31	194	486	994	1,660	7,933
1990	1,141	1,119	880	532	361	52	18	18	131	497	708	1,321	6,778
1995	1,344	1,197	890	682	254	38	8	1	213	455	1,097	1,376	7,555
2000	1,428	1,057	758	625	244	86	26	15	189	384	909	1,637	7,358
2005	1,435	1,043	1,073	490	330	19	9	12	75	425	810	1,370	7,091
2006	1,043	1,203	949	441	265	46	3	7	191	598	762	1,068	6,576
2007	1,282	1,398	852	615	200	35	11	13	130	319	879	1,338	7,072
2008	1,451	1,378	1,110	578	349	41	7	11	106	478	861	1,477	7,847
2009	1,689	1,160	976	606	263	105	34	50	96	608	671	1,323	7,581
2010	1,447	1,161	811	421	232	37	1	5	176	396	795	1,375	6,857
2011	**1,516**	**1,211**	**1,059**	**636**	**330**	**70**	**1**	**4**	**211**	**404**	**748**	**1,088**	**7,278**

a Population-weighted heating degree days are derived by multiplying the number of heating degree days in each degree day zone by the population in that degree day zone, adding the products, then dividing by the total state population (based on 2010 census data).

b The 30-year normal runs from 1981 to 2010 and is developed by the National Oceanographic and Atmospheric Agency (NOAA).

Source: Wisconsin State Energy Office, degree day data based on daily data from the University of Wisconsin-Madison, Wisconsin State Climatology Office (http://www.aos.wisc.edu/~sco/) (1970-2011).

2011 HDD
3.4%
BELOW THE 30-YEAR NORMAL

Using population-weighted[a] heating degree days (HDDs) as an index, the winter for 2011 was colder than the winter of 2010, with 6.1 percent more HDDs. In 2011, the number of HDDs (7,278) was 3.4 percent below the 30-year normal (7,531).

The 10-year average is plotted using area-weighted HDDs. The state climatologist uses area to weight these data, where the rest of the HDD data in this publication is weighted by population to better illustrate the connection between degree days and energy consumption.

2010 Wisconsin Heating Degree Days, by Zone and Month

Month	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	State[a]
January	1,557	1,515	1,487	1,717	1,514	1,444	1,600	1,557	1,622	1,486	1,313	**1,447**
February	1,319	1,276	1,237	1,403	1,204	1,180	1,280	1,262	1,298	1,167	1,044	**1,161**
March	917	891	869	866	816	835	783	848	817	802	787	**811**
April	576	535	496	448	415	441	372	422	333	382	432	**421**
May	346	305	277	277	261	241	256	251	203	215	212	**232**
June	133	104	82	84	56	49	41	29	5	15	27	**37**
July	4	3	3	0	0	2	0	1	0	0	1	**1**
August	31	18	14	19	12	7	7	9	6	4	0	**5**
September	335	310	268	310	243	212	220	221	148	147	117	**176**
October	531	509	488	512	436	451	462	466	372	393	313	**396**
November	960	953	891	980	894	819	915	859	814	787	696	**795**
December	1,478	1,466	1,433	1,580	1,461	1,386	1,531	1,514	1,515	1,401	1,241	**1,375**
Total	**8,187**	**7,885**	**7,545**	**8,196**	**7,312**	**7,067**	**7,467**	**7,439**	**7,133**	**6,799**	**6,183**	**6,858**

a Population-weighted statewide average, based on 2010 census.

Source: Wisconsin State Energy Office, degree day data based on daily data from the University of Wisconsin-Madison, State Climatology Office (http://www.aos.wisc.edu/~sco/)

2011 Wisconsin Heating Degree Days, by Zone and Month

Month	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	State[a]
January	1,688	1,689	1,642	1,780	1,635	1,578	1,689	1,649	1,559	1,485	1,369	**1,516**
February	1,335	1,349	1,306	1,392	1,316	1,253	1,323	1,298	1,230	1,193	1,108	**1,211**
March	1,228	1,241	1,192	1,224	1,157	1,126	1,156	1,171	996	998	967	**1,059**
April	746	797	747	671	703	679	636	693	565	572	613	**636**
May	524	383	365	346	323	335	284	311	271	300	350	**330**
June	194	106	94	77	77	73	72	87	44	40	74	**70**
July	16	5	3	2	1	0	1	2	0	0	0	**1**
August	19	49	29	12	3	3	3	6	1	0	0	**4**
September	275	335	298	247	262	246	240	235	222	215	156	**211**
October	497	571	501	458	462	419	450	432	390	396	356	**404**
November	908	956	869	878	860	766	814	795	772	740	666	**748**
December	1,263	1,362	1,237	1,299	1,266	1,106	1,245	1,161	1,083	1,052	974	**1,088**
Total	**8,693**	**8,843**	**8,283**	**8,386**	**8,065**	**7,584**	**7,913**	**7,840**	**7,133**	**6,991**	**6,633**	**7,277**

a Population-weighted statewide average, based on 2010 census.

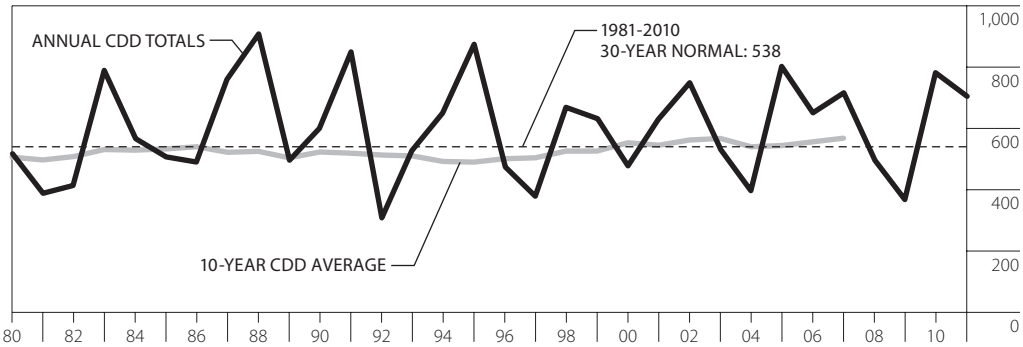
Source: Wisconsin State Energy Office, degree day data based on daily data from the University of Wisconsin-Madison, State Climatology Office (http://www.aos.wisc.edu/~sco/)

Wisconsin Population-Weighted Cooling Degree Days

1980-2011

What significance does the number of CDDs have on energy use? Increased CDDs means that air conditioning may be used more because the temperature is warmer. Fewer CDDs means that air conditioning may be used less because the temperature is cooler. Fluctuations in CDDs can also influence such variables as peak electric demand and the wholesale price of electricity.

The 10-year average and 30-year normal[c] are presented here as a point of reference for the variation in CDDs. The 10-year average is plotted in the middle of an 11-year period, averaging the five years previous to, and five years after, the plotted year. For example, the number plotted on the graph at 2003 is the average of 1998 through 2008. The 10-year average is not plotted for 2007 through 2011 because these averages cannot yet be calculated.



Month	April[b]	May	June	July	August	September	October[b]	Total
Normal	**4**	**23**	**108**	**194**	**155**	**51**	**5**	**540**
1980	9	34	71	219	156	27	0	516
1985	31	28	60	185	98	103	0	505
1990	32	3	120	177	164	99	4	599
1995	0	8	224	273	311	47	5	868
2000	0	37	88	137	154	54	5	474
2005	3	4	211	228	200	119	32	797
2006	1	53	95	302	169	25	4	648
2007	8	48	132	202	196	90	37	713
2008	0	1	93	195	150	52	4	495
2009	0	14	114	80	123	32	0	363
2010	8	59	110	285	278	36	2	778
2011	**1**	**27**	**94**	**336**	**188**	**48**	**9**	**703**

a Population-weighted cooling degree days are derived by multiplying the number of cooling degree days in each degree day zone by the population in that degree day zone, adding the products, then dividing by the total state population (based on 2010 census data).

b Includes March for the years 2001 and 2007. For 1990, the October column also includes November.

c The 30-year normal runs from 1981 to 2010 and is developed by the National Oceanographic and Atmospheric Agency (NOAA).

Source: Wisconsin State Energy Office, degree day data based on daily data from the University of Wisconsin-Madison, State Climatology Office (http://www.aos.wisc.edu/~sco/) (1970-2011).

2011 CDD
30.6%
ABOVE THE 30-YEAR NORMAL

Using population-weighted[a] cooling degree days (CDD) as an index, the summer of 2011 was cooler than the summer of 2010, with 9.6 percent fewer cooling degree days. In 2011, the number of cooling degree days (703) was 30.6 percent above the 30-year normal (538).

The 10-year average is plotted on the graph using area-weighted CDDs. The state climatologist uses area to weight these data, where the rest of the CDD data in this publication is weighted by population to better illustrate the connection between degree days and energy consumption.

In 2011, the number of CDDs decreased because the summer was cooler than last year. 2008 and 2009 represented a slight departure from a trend since 2005 of hotter summers with more CDDs.

2010 Wisconsin Cooling Degree Days, by Zone and Month

Month	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	State[a]
January	0	0	0	0	0	0	0	0	0	0	0	**0**
February	0	0	0	0	0	0	0	0	0	0	0	**0**
March	0	0	0	0	0	0	0	0	0	0	0	**0**
April	0	0	5	0	0	9	0	0	5	5	16	**8**
May	21	58	59	57	63	55	66	81	71	69	50	**59**
June	53	53	66	63	79	67	88	96	143	128	142	**110**
July	169	173	214	195	220	243	256	234	293	307	339	**285**
August	159	174	217	196	209	248	267	245	265	280	331	**278**
September	9	4	13	5	16	20	7	15	38	36	63	**36**
October	0	0	0	1	0	0	1	0	10	4	3	**2**
November	0	0	0	0	0	0	0	0	0	0	0	**0**
December	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**411**	**462**	**574**	**517**	**587**	**642**	**685**	**671**	**825**	**829**	**944**	**778**

a Population-weighted statewide average, based on 2010 census.

Source: Wisconsin State Energy Office, degree day data based on daily data from the University of Wisconsin-Madison, State Climatology Office (http://www.aos.wisc.edu/~sco/)

2011 Wisconsin Cooling Degree Days, by Zone and Month

Month	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	Zone 11	State[a]
January	0	0	0	0	0	0	0	0	0	0	0	**0**
February	0	0	0	0	0	0	0	0	0	0	0	**0**
March	0	0	0	0	0	0	0	0	0	0	0	**0**
April	0	0	0	0	0	0	0	0	0	1	1	**1**
May	0	6	15	9	14	22	16	18	51	46	28	**27**
June	16	55	69	63	87	71	115	89	139	145	84	**94**
July	221	256	297	271	277	320	306	301	355	368	364	**336**
August	112	46	98	112	151	139	150	159	199	200	247	**188**
September	20	16	25	40	42	33	50	44	46	44	62	**48**
October	16	4	7	21	6	6	18	15	13	10	7	**9**
November	0	0	0	0	0	0	0	0	0	0	0	**0**
December	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**385**	**383**	**511**	**516**	**577**	**591**	**655**	**626**	**803**	**814**	**793**	**703**

a Population-weighted statewide average, based on 2010 census.

Source: Wisconsin State Energy Office, degree day data based on daily data from the University of Wisconsin-Madison, State Climatology Office (http://www.aos.wisc.edu/~sco/)