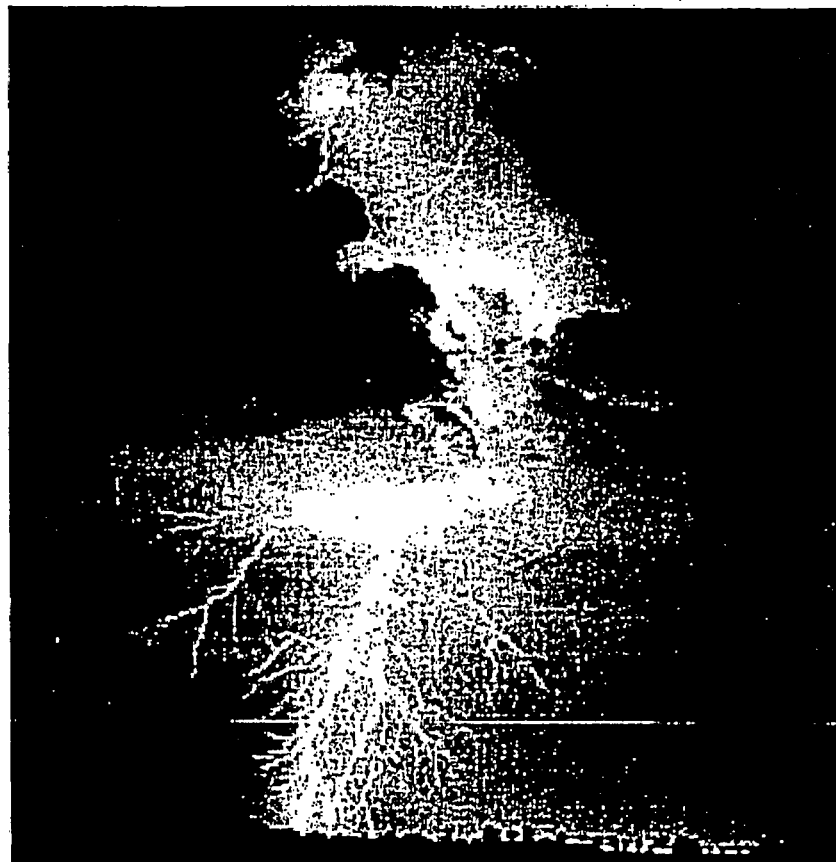


WISCONSIN ENERGY

— STATISTICS / 2000 —



— MILLENNIUM EDITION —



WISCONSIN ENERGY DIVISION DEPARTMENT OF ADMINISTRATION

Wisconsin Energy Statistics - 2000

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Wisconsin Utility Power Plant Inventory, 1999^h

Utility/Site	Nameplate Capacity (MW)	Number of Units	Primary Fuel	Utility/Site	Nameplate Capacity (MW)	Number of Units	Primary Fuel
Dairyland Power Cooperative				Wisconsin Public Service Corp. (continued)			
Alma 1-3	45.0	3	Coal	Weston 1-3	456.6	3	Coal
Alma 4,5	130.0	2	Coal	Weston 31,32	72.5	2	Gas
J.P. Madgett	387.0	1	Coal	W. Marinette 31,32,33 ^a	167.3	3	Gas
Flambeau	15.0	3	Hydro ^b	Oneida Casino	4.0	2	Oil
Genoa 3	345.6	1	Coal	Eagle River	4.0	2	Oil
				Various Hydro	57.4	38	Hydro ^b
Madison Gas and Electric Co.				Wisconsin Power and Light Co.			
Blount Street 1,3,4,5,6,7	187.5	6	Coal/RDF ^f	Blackhawk 3,4	50.0	2	Gas
Fitchburg 1,2	57.6	2	Gas	Columbia 1 ^a	512.0	1	Coal
Nine Springs	16.2	1	Gas	Columbia 2 ^a	511.0	1	Coal
Sycamore	41.6	2	Gas	Edgewater 3	60.0	1	Coal
				Edgewater 4 ^b	330.0	1	Coal
Northern States Power Co.							
Bay Front 4,5,6	68.0	3	Wood/Coal	Edgewater 5 ^d	380.0	1	Coal
Flambeau	16.0	1	Gas	Fond du Lac	344.0	4	Gas
French Island 1,2	31.3	2	Wood/RDF ^f	Nelson Dewey 1,2	200.0	2	Coal
French Island 3,4	157.6	2	Oil	Portable	0.5	1	Oil
Wheaton 1-6	322.0	6	Oil	Rock River 1,2	150.0	2	Coal
Various Hydro	236.4	62	Hydro ^b	Rock River 3-6	144.0	4	Oil
				Sheepskin	40.0	1	Oil
Wisconsin Electric Power Co.							
Concord	381.6	4	Gas	Various Hydro	37.5	13	Hydro ^b
Germanstown	244.8	4	Oil	Municipal Utilities			
Kenosha (Paris)	381.6	4	Gas	Kaukauna, City of	22.3	15	Hydro ^b
S. Oak Creek 5-8	1191.6	4	Coal		18.0	1	Gas
S. Oak Creek 9	19.6	1	Gas		6.0	3	Oil
Pleasant Prairie 1,2	1233.2	2	Coal	Manitowoc, City of	10.5	2	Gas
Pleasant Prairie 3	2.0	1	Oil		79.0	5	Coal/Coke
Point Beach 1,2	1047.6	2	Nuclear	Menasha, City of	1.0	1	Oil
Point Beach 5	25.0	1	Oil		21.2	2	Coal
Port Washington 1-4	320.0	4	Coal	Muscoda, Village of	0.1	1	Hydro ^b
Port Washington 6	19.6	1	Oil		2.0	1	Wood/RDF
Valley 1,2	272.0	2	Coal	Other Municipal Utilities and Power Cooperatives			
Valley 3	2.8	1	Oil		74.8	64	Hydro ^b
Various Hydro	6.9	8	Hydro ^b		7.0	4	Gas
					83.1	69	Oil
Wisconsin Public Service Corp.							
Kewaunee ^e	535.0	1	Nuclear				
Pulliam 3-5	110.0	3	Coal				
Pulliam 6-8	262.5	3	Coal				

^aThe Columbia 1 & 2 units are owned by Alliant Energy (46.2%), Wisconsin Public Service Corp. (31.8%) and Madison Gas and Electric Co.(22.0%).

^bThe Edgewater 4 unit is owned by Alliant Energy (68.2%) and Wisconsin Public Service Corp.(31.8%).

^cThe Kewaunee unit is owned by Wisconsin Public Service Corp.(41.2%), Alliant Energy (41.0%) and Madison Gas and Electric Co.(17.8%).

^dThe Edgewater 5 unit is owned by Alliant Energy (75%) and Wisconsin Electric Power Co.(25%).

^eHydroelectric capacity differs from sum on other tables due to different definitions of capacity in data sources.

^fRDF is Refuse Derived Fuel.

^gThe West Marinette 33 unit is jointly owned by Wisconsin Public Service Corp. (68%) and the City of Marshfield (32%).

^hDoes not include non utility generation.

Source: U.S. Department of Energy, Energy Information Administration, Inventory of Power Plants in the United States, [DOE/EIA-0095(99)] (November 1999); annual reports of various electric generating utilities (1999).

4 Renewable Energy

Renewable energy resources play a key role in Wisconsin's efforts to reduce dependence on imported fuels. Renewable resource use in Wisconsin is dominated by wood burning for space and process heat, primarily in homes and industry. About two million cords of wood are cut and burned for energy in the state each year. Wood energy use increased 5.6 percent in 1999 primarily due to more wood burned in homes for heating. Industrial wood use grew slightly due to increased economic activity. However, electric utility wood use decreased, primarily because Northern States Power decreased wood use and increased coal use in its Bay Front generating plant.

Hydroelectric power currently ranks second as a renewable energy source in Wisconsin. Hydroelectric power production comes from approximately 72 utility and about 50 privately owned sites; production is closely tied to annual rainfall. Historic data on state average rainfall is provided to help gauge the importance of rainfall in the state's overall energy patterns.

Biogas energy is produced from the state's landfills and wastewater treatment plants that have installed collection and conversion equipment. Bio-solid waste is derived from pre- and post-commercial waste used as fuel. Also, ethanol, a renewable energy source primarily made from corn, is used as the oxygenate in reformulated gasoline sold in southeastern Wisconsin and is also used as an octane booster in a portion of the conventional gasoline sold in Wisconsin.

In the absence of subsidies, and as conventional energy prices have remained low, installation of active solar systems in Wisconsin has remained slow.

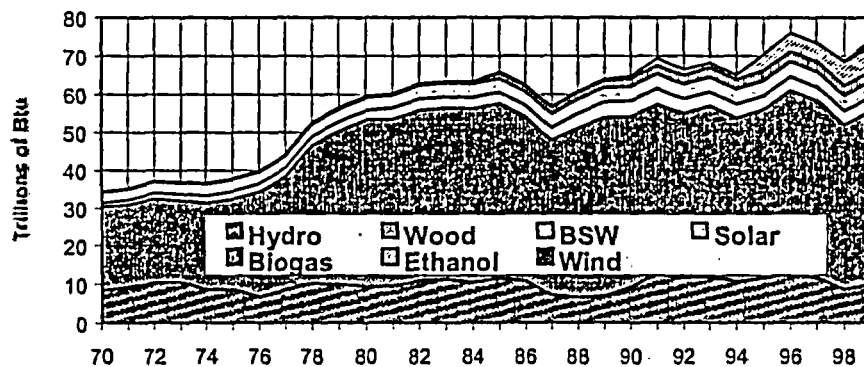
However, in 1999, a consortium of Wisconsin utilities operated thirty-five 660 kW windmills in Wisconsin. In total, these 35 windmills generated 25.7 million KWh. For perspective, the electricity generated by these 35 windmills is just 1.5 percent of the electricity generated by utilities from hydro in Wisconsin in 1999. However, while the amount of generation is small, utility electricity generated by wind is now a growing reality in Wisconsin.

Renewable Energy

Wisconsin Renewable Energy Use, by Type of Fuel, 1970-1999

(Trillions of Btu)

Renewable energy use in Wisconsin increased 6.3 percent in 1999 because the cooler winter and increased rainfall increased residential wood use and hydropower generation. Over the past ten years, various industries have been increasing their use of alternative fuels in industrial boilers, and landfill gas collection systems have also begun operation. The solar energy listing here includes both active solar collectors and estimated passive solar applications. Hydro generation includes estimates of electricity generation by Wisconsin utility and industrial dams. In 1999, ethanol use in the transportation sector increased 5.4 percent, reaching a new high of 6.4 trillion Btu (75.4 million gallons). This is the first year wind energy was significant enough to be listed.



Year	Hydro	Wood	Bio-Solid Waste ^a	Solar	Biogas	Ethanol ^b	Wind	Total
1970	8.2	22.1	1.0	2.9	0.1			34.3
1975	8.6	23.9	2.0	3.1	0.2			37.8
1980	9.3	43.9	2.4	3.3	0.5			59.5
1985	11.4	46.2	2.9	3.5	1.6	0.1		65.8
1990	9.2	44.9	4.1	3.7	2.1	0.7		64.8
1991	12.6	44.7	4.2	3.8	2.3	1.7		69.4
1992	11.4	43.6	3.8	3.8	2.5	1.4		66.4
1993	12.1	44.9	3.7	3.8	2.6	1.1		68.2
1994	10.6	43.2	3.6	3.9	2.6	1.1		65.0
1995	11.5	44.6	3.6	3.9	2.8	4.1		70.5
1996	12.8	48.2	3.6	3.9	2.7	4.8		76.0
1997	11.5	46.8	3.6	3.9	2.7	4.9		73.4
1998	8.7	43.4	3.6	4.0	2.8	6.0		68.5
1999 ^c	10.0	45.8	3.6	4.0	2.8	6.4	0.3	72.8

^aIncludes municipal and industrial solid waste.

^bEthanol is blended with a petroleum based fuel to produce reformulated gasoline or gasohol.

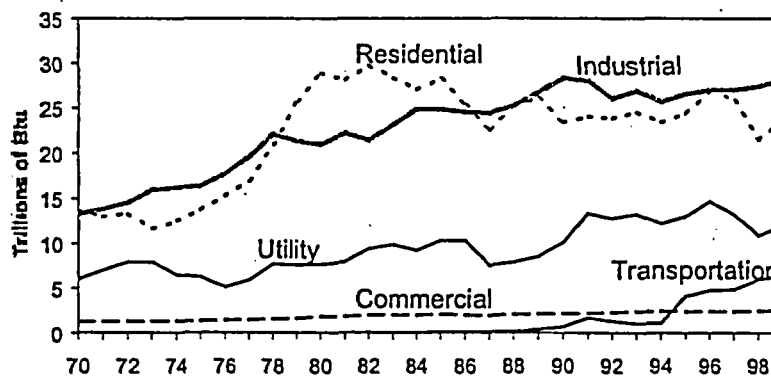
^cPreliminary estimates.

Source: Compiled from tables in this publication for Wisconsin wood and hydro and unpublished administrative data (1999).

Wisconsin Renewable Energy Use, by Economic Sector, 1970-1999

(Trillions of Btu and Percent of Total)

In Wisconsin, industry uses more renewable energy than any other sector. Wood dominates industry's renewable energy use, but hydroelectric, biogas and bio-solid waste energy are also consumed. Renewable energy use in the residential sector is divided between wood (90 percent) and solar (10 percent). Utility use of renewable energy is about two-thirds hydro and one-third wood with a small wind component. Commercial use of renewable energy includes wood, solar and bio-solid waste. Transportation use of renewable energy consist of using ethanol as an oxygenate and octane enhancer in gasoline.



Year	Residential	Commercial	Industrial	Electric		Total Resources
				Utility	Transportation	
1970	13.7	1.3	13.3	6.0		34.3
1975	13.7	1.4	16.4	6.3		37.8
1980	28.9	1.9	21.0	7.7		59.5
1985	28.3	2.1	24.9	10.4	0.1	65.8
1990	23.4	2.2	28.3	10.2	0.7	64.8
1991	24.1	2.2	28.0	13.4	1.7	69.4
1992	23.9	2.3	26.1	12.8	1.4	66.4
1993	24.6	2.4	26.9	13.2	1.1	68.2
1994	23.4	2.5	25.7	12.3	1.1	65.0
1995	24.4	2.4	26.6	13.0	4.1	70.5
1996	27.1	2.5	27.0	14.7	4.8	76.0
1997	25.9	2.5	27.0	13.2	4.9	73.4
1998	21.6	2.5	27.5	10.9	6.0	68.5
1999 ^P	23.8	2.5	28.2	12.0	6.4	72.8

^PPreliminary estimates.

Source: Compiled from tables in this publication for Wisconsin wood and hydro and unpublished administrative data (1999).

Renewable Energy

Wisconsin Wood Use, by Economic Sector, 1970-1999

(Trillions of Btu and Percent of Total)

Wood energy use in Wisconsin increased 5.6 percent in 1999, primarily because wood energy use in the residential sector increased 11.5 percent. This increased wood use was driven by a colder winter and higher residential oil, propane and natural gas prices.

Year	Residential ^a	Commercial	Industrial	Electric Utility	Total
1970	11.9 (53.8%)	0.2 (0.9%)	10.0 (45.2%)	0.0 (0.0%)	22.1
1975	11.8 (49.3)	0.2 (0.8)	11.9 (49.8)	0.0 (0.0)	23.9
1980	26.9 (61.2)	0.6 (1.4)	15.7 (35.7)	0.7 (1.7)	43.9
1985	26.1 (56.5)	0.8 (1.7)	17.6 (38.2)	1.7 (3.6)	46.2
1986	23.1 (53.4)	0.7 (1.6)	17.4 (40.2)	2.1 (4.9)	43.3
1987	20.4 (50.0)	0.6 (1.5)	17.3 (42.3)	2.6 (6.3)	40.8
1988	23.0 (51.7)	0.7 (1.6)	18.1 (40.6)	2.7 (6.2)	44.5
1989	23.8 (50.7)	0.7 (1.5)	19.5 (41.6)	2.9 (6.2)	47.0
1990	21.1 (47.0)	0.7 (1.6)	20.0 (44.6)	3.1 (6.9)	44.9
1991	21.7 (48.5)	0.7 (1.6)	19.3 (43.1)	3.1 (6.8)	44.7
1992	21.5 (49.4)	0.7 (1.6)	18.3 (41.9)	3.1 (7.2)	43.6
1993	22.2 (49.4)	0.7 (1.6)	18.6 (41.4)	3.4 (7.6)	44.9
1994	21.0 (48.6)	0.7 (1.6)	18.0 (41.7)	3.5 (8.1)	43.2
1995	21.9 (49.1)	0.7 (1.6)	18.5 (41.5)	3.5 (7.9)	44.6
1996	24.6 (51.0)	0.7 (1.5)	19.1 (39.5)	3.8 (8.0)	48.2
1997	23.4 (50.0)	0.7 (1.5)	19.4 (41.4)	3.3 (7.1)	46.8
1998	19.1 (44.0)	0.7 (1.6)	19.8 (45.5)	3.9 (8.9)	43.4
1999 ^p	21.3 (46.5)	0.7 (1.5)	20.1 (43.8)	3.8 (8.2)	45.8

^aRevised.

^pPreliminary estimates.

Source: U.S. Department of Energy, Energy Information Administration, Estimates of U.S. Wood Energy Consumption from 1949 to 1991 (August 1983); Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions, unpublished (1972-1994); USDA Forest Service, Residential Fuelwood Consumption and Production in Wisconsin (1994); Wisconsin Department of Administration, Division of Energy, "Wisconsin Residential Wood Energy Model," unpublished (1999), and Directory of Wisconsin Wood Burning Facilities (1995).

Wisconsin Manufacturing Industry Use of Wood Fuel, by Industry Group, 1972-1999

(Thousands of Tons and Trillions of Btu^a)

The use of wood and wood products as fuel by Wisconsin industries is concentrated among businesses that use or produce a wood product. Lumber mills burn sawdust, bark and scrap wood as a boiler fuel and for kiln drying boards. Furniture and paper companies use scrap wood and wood byproducts for process steam, heating and generating electricity. The slow growth in wood use by industry since 1990 is a result of the decreasing cost of fossil fuels and converting mills to use recycled paper for fiber instead of pulp wood.

Year	Lumber		Furniture		Paper & Allied		Other Manufacturing		Total	
	(Tons)	(Btu)	(Tons)	(Btu)	(Tons)	(Btu)	(Tons)	(Btu)	(Tons)	(Btu)
1972	391.2	4.43	13.2	0.15	508.5	4.88	16.1	0.18	929.0	10.50
1975	437.2	4.94	24.5	0.27	575.6	6.51	17.1	0.19	1,054.5	11.92
1980	447.5	5.06	56.9	0.64	872.8	9.86	12.0	0.13	1,389.2	15.70
1985	427.3	4.83	53.9	0.61	1,046.7	11.83	33.5	0.38	1,561.3	17.64
1986	385.5	4.36	46.3	0.52	1,081.3	12.22	24.1	0.27	1,537.7	17.38
1987	357.4	4.04	64.6	0.73	1,085.8	12.27	21.2	0.24	1,529.1	17.28
1988	409.1	4.62	65.4	0.74	1,106.7	12.51	18.7	0.21	1,599.9	18.08
1989	478.9	5.41	62.2	0.70	1,169.1	13.21	19.4	0.22	1,729.5	19.54
1990	490.9	5.55	64.0	0.72	1,186.5	13.41	30.0	0.34	1,771.4	20.02
1991	499.1	5.64	55.0	0.62	1,125.4	12.72	27.1	0.31	1,706.6	19.28
1992	435.7	4.92	61.5	0.70	1,093.1	12.35	24.9	0.28	1,615.3	18.25
1993	497.6	5.62	58.9	0.67	1,059.8	11.98	29.3	0.33	1,645.7	18.60
1994	486.7	5.50	43.4	0.49	1,015.0	11.47	44.9	0.51	1,589.9	17.97
1995	490.2	5.54	49.0	0.55	1,050.0	11.87	48.0	0.54	1,637.2	18.50
1996	495.0	5.59	52.0	0.59	1,090.0	12.32	50.0	0.56	1,687.0	19.06
1997	501.0	5.66	55.0	0.62	1,108.0	12.52	53.0	0.60	1,717.0	19.40
1998	507.0	5.73	58.0	0.66	1,127.0	12.74	55.0	0.62	1,747.0	19.75
1999 ^P	513.0	5.80	61.0	0.69	1,146.0	12.95	57.0	0.64	1,777.0	20.08

^aGross heating values of wood range from 8 MMBtu per ton to 17 MMBtu per ton, due in part to differences in moisture content. In this table, based on estimates of moisture content and type of wood used in Wisconsin, 11.3 MMBtu per ton is used.

^PPreliminary estimates.

Source: Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions, unpublished (1972-1994); Employment Research Associates, Biomass Resources: Generating Jobs and Energy, Technical Papers (January 1986); Department of Administration, Division of Energy, Directory of Wisconsin Wood Burning Facilities (1995).

Wisconsin Electric Utility Use of Wood Fuel, 1970-1999

Wood energy used for electricity in Wisconsin decreased slightly in 1999 when Northern States Power Co. shifted some of its Bay Front generation to coal. Northern States Power Co. began using wood fuel at its Bay Front electric generation facility in 1976 and at its French Island facility in 1980. These are the only electric utility generation sites in Wisconsin using significant amounts of wood.

Year	Tons	Billions of Btu
1970-1975	0	0
1980	76,282	740
1985	155,717	1,666
1986	196,620	2,104
1987	247,498	2,554
1988	262,218	2,741
1989	282,124	2,935
1990	299,464	3,112
1991	296,197	3,061
1992	297,436	3,115
1993	307,478	3,399
1994	379,106	3,536
1995	327,201	3,506
1996	339,803	3,837
1997	304,618	3,326
1998	334,231	3,871
1999 ^P	330,491	3,765

^PPreliminary estimates.

Source: Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions, unpublished (1972-1994); annual reports of various Wisconsin electric generating utilities (1995-1999).

Wisconsin Electric Utility and Non-Utility Hydroelectric Generation,^a 1970-1999

(Millions of kWh)

Total Wisconsin hydroelectric production increased almost 15 percent in 1999. While statewide average precipitation increased 4.3 percent, to 34.1 inches, precipitation in northern Wisconsin, where it is more critical for hydroelectric generation increased by 17.4 percent in 1999.

Year	Utility Plant Location		Total Utility	Wisconsin Non-Utility ^b	Total Wisconsin	Total Wisconsin Precipitation (inches per year)
	Wisconsin	Michigan				
1970	1,413.2	448.1	1,861.3	510.0	1,923.2	32.0
1975	1,482.9	450.3	1,933.2	529.4	2,012.3	32.4
1980	1,628.3	488.9	2,117.2	560.4	2,188.7	32.5
1985	2,046.3	543.6	2,589.9	635.9	2,682.2	37.0
1986	1,927.7	436.3	2,364.0	607.7	2,535.4	35.2
1987	1,176.6	354.1	1,530.7	500.4	1,677.0	28.8
1988	1,103.9	386.2	1,490.1	448.3	1,552.2	25.7
1989	1,191.4	345.8	1,537.2	429.4	1,620.8	24.5
1990	1,525.0	340.2	1,865.2	637.8	2,162.8	36.2
1991 ^{c,r}	2,270.0	436.0	2,706.0	684.7	2,954.7	38.7
1992	2,123.4	425.6	2,549.0	554.2	2,677.6	31.2
1993	2,191.0	449.1	2,640.1	636.7	2,827.7	35.6
1994	1,914.4	395.9	2,310.3	558.7	2,473.1	31.1
1995	2,097.1	440.1	2,537.2	593.3	2,690.4	32.9
1996	2,401.9	500.7	2,902.6	595.5	2,997.4	32.8
1997	2,182.2	458.5	2,640.7	521.3	2,703.5	28.6
1998	1,517.8	324.0	1,841.8	512.6	2,030.4	32.7
1999 ^p	1,734.0	416.0	2,150.0	601.7	2,335.7	34.1

^aIncluding Wisconsin power cooperatives.

^bEstimated.

^cBeginning in 1991, the U.S. DOE data source has been used.

^pPreliminary estimates.

^rRevised.

Source: Public Service Commission of Wisconsin, Accounts and Finance Division, *Generating Plants Operated by Wisconsin Electric Utilities*, Bulletin #46 (1971-1994); U.S. Department of Agriculture, Rural Electrification Administration, *Annual Statistical Report*, REA Bulletin 1-1 (1971-1994); Wisconsin Department of Administration, Division of Energy, *Wisconsin Hydroelectric Generation Model*, unpublished (1994); National Oceanic and Atmospheric Administration, *Monthly State Heating Degree Days, Historical Climatology Series 5-1* (April 1998); U.S. Department of Energy, Energy Information Administration, *Electric Power Monthly* [DOE/EIA-0226 (2000/04)] (April 2000).

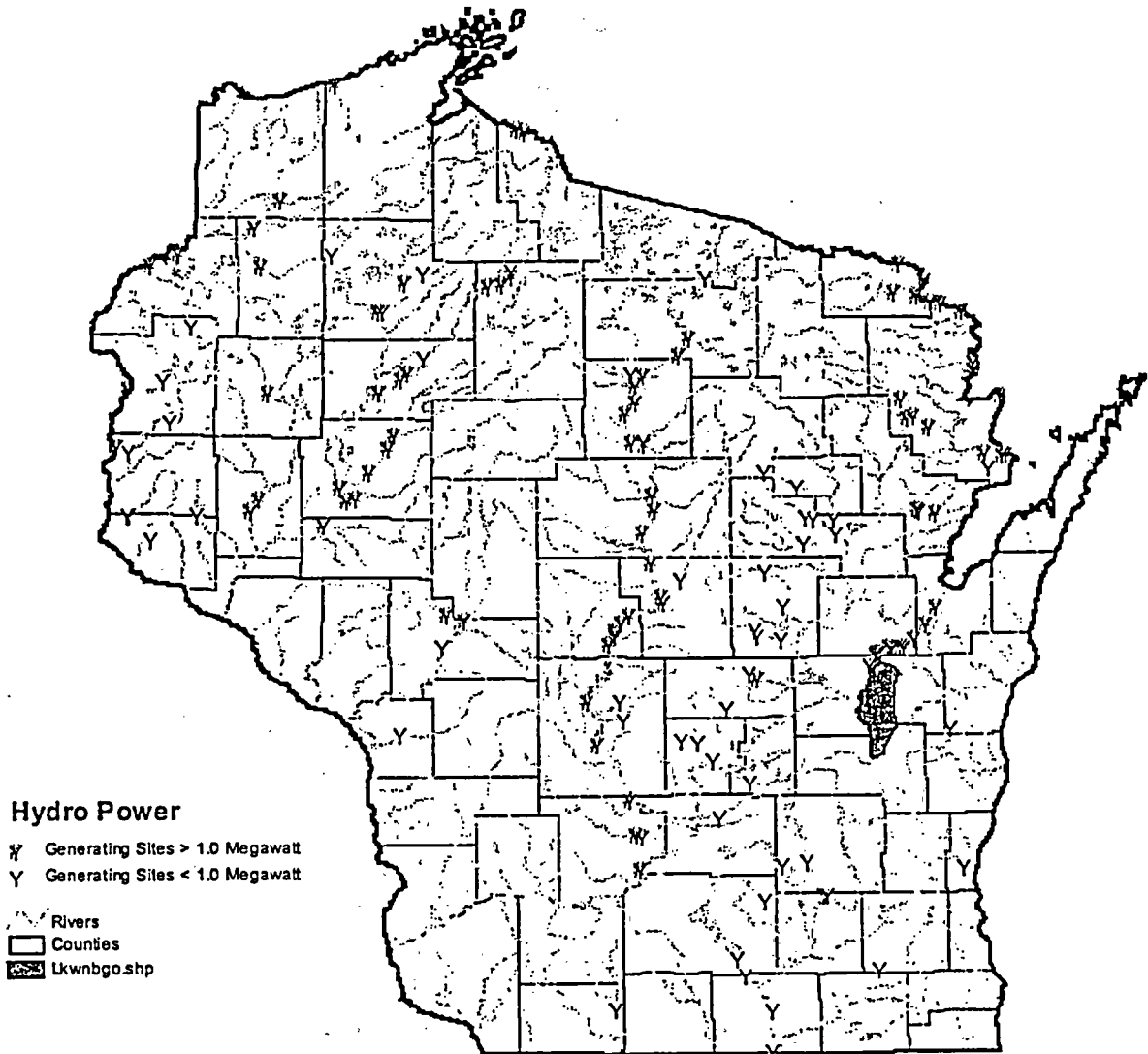
Renewable Energy

Wisconsin Electric Utility Hydroelectric Generation, by County, 1999

County	Sites (No.)	Generating Capacity (kW)	Generation (MWh)
Adams	1	15,000	88,451
Ashland	1	1,000	4,869
Barron	1	100	104
Burnett	2	2,300	7,140
Chippewa	5	172,300	460,353
Columbia	2	8,300	54,962
Douglas	1	200	0
Dunn	2	11,400	56,980
Eau Claire	1	9,500	32,338
Florence	1	3,600	13,586
Grant	1	100	0
Jackson	2	1,000	4,198
Juneau	1	20,000	86,402
LaFayette	1	100	0
Lincoln	5	26,800	129,430
Marathon	1	5,400	28,261
Marinette	6	22,700	46,652
Oconto	2	2,400	8,685
Oneida	1	1,700	6,117
Outagamie	7	24,200	154,786
Pierce	2	400	2,099
Polk	4	24,100	124,040
Portage	3	17,800	77,527
Rusk	4	29,300	99,983
St. Croix	2	3,000	16,692
Sauk	1	28,500	129,729
Sawyer	4	2,700	10,350
Shawano	3	1,700	6,520
Vilas	1	800	1,955
Washburn	2	1,700	9,421
Wood	2	12,200	72,323
Total	72	450,300	1,733,953

Source: U.S. Department of Energy, Energy Information Administration, Inventory of Power Plants in the United States [DOE/EIA-0095(99)] (November 1999), and Electric Power Monthly [DOE/EIA-0226 (2000/04)] (April 2000).

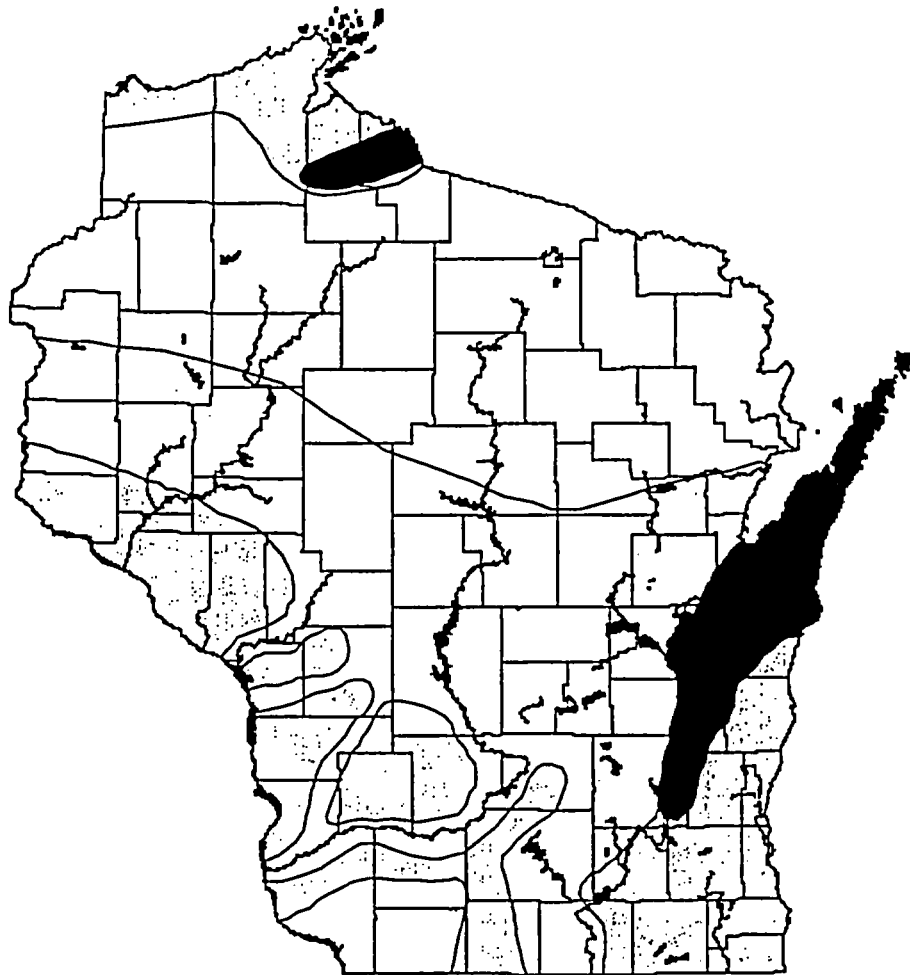
1999 Electric Utility Hydroelectric Sites in Wisconsin^a







^aTotal number of sites: 72. Generating Capacity: 450,300 kW. Generation: 1,733,953 MWh.

Source: Wisconsin Department of Administration, Division of Energy.

Wisconsin Wind Energy Potential



This map displays areas where annual average wind speeds at some sites (extrapolated to a height of 110 feet) measure:

- | | |
|---|---|
|  Best - 13 to 14 mph |  Fair - 11 to 12 mph |
|  Good - 12 to 13 mph |  Poor - Less than 11 mph |

Source: Wisconsin Department of Administration, Division of Energy.