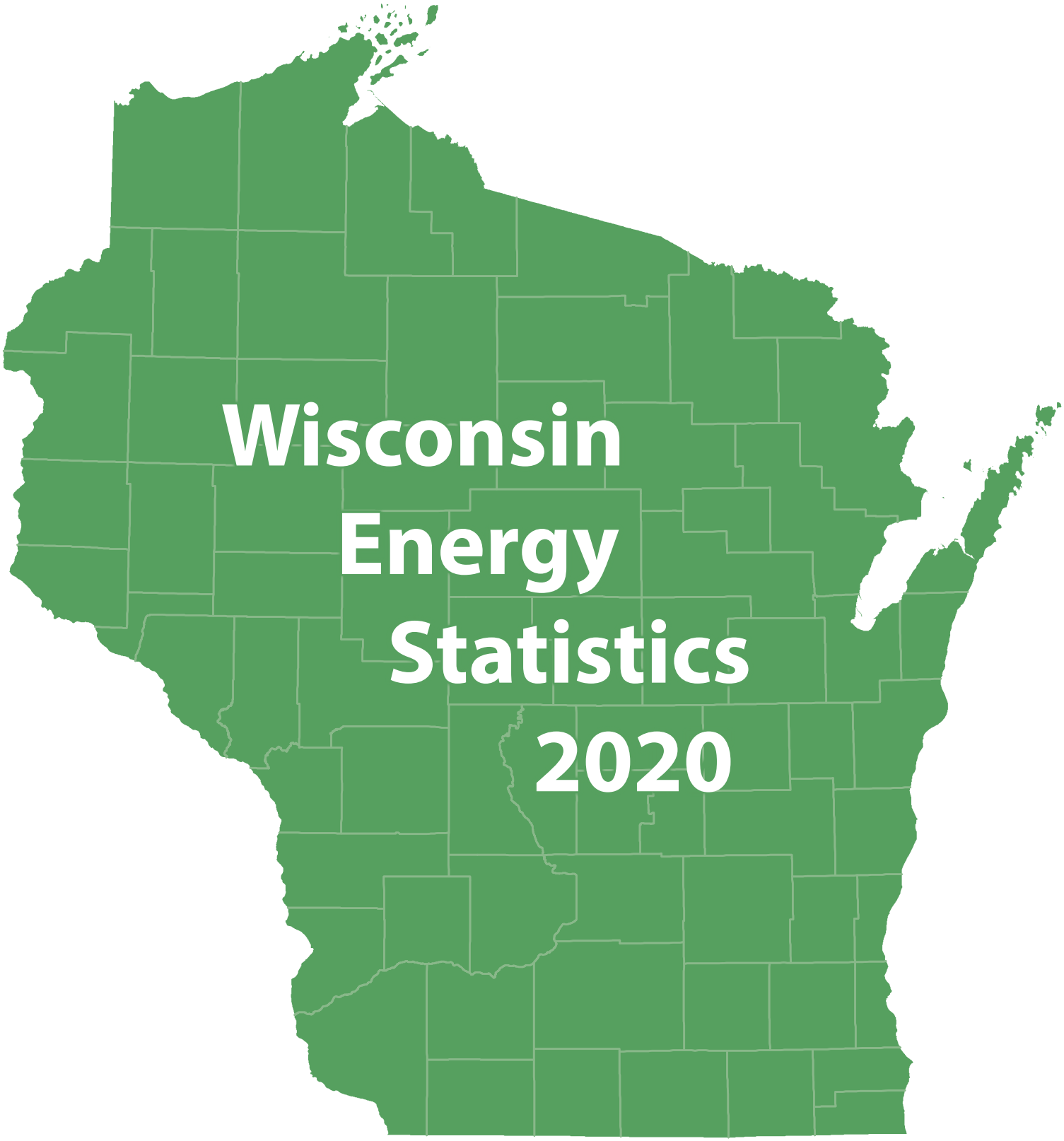
PSC of WISCONSIN

OEI
Wisconsin Office of Energy Innovation



Wisconsin Energy Statistics 2020

Wisconsin Energy Statistics

2020 edition:

Covering 2017 data

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Madison, WI 53707-7854

Acknowledgments:
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Co-authored by: Olivia Shanahan, Maria Redmond, Megan Levy and Tom Nowakowski
Editing and Formatting: University of Wisconsin Printing and Publishing

Foreword

Following a Wisconsin tradition begun by the self-taught naturalist and scientist, Increase Lapham,[1] in the 1830's, the Public Service Commission of Wisconsin-Office of Energy Innovation has been diligently tracking energy statistics since 1976. The volume that follows, is a collection of data that provides a snapshot of energy use, intensity, economic, and environmental impacts for the years 2015 through 2017. As our state considers the task of transitioning to carbon free electricity by the year 2050, as set forth by Governor Tony Evers' Executive Order 38, this data will be a resource for decision makers and provide a foundation for advocates, researchers, and innovators.

To ensure equitable access to this information, we've made several key components of this data available on the Public Service Commission's website.[2] As we work to make more datasets available online, we ask that you contact us at OEI@wisconsin.gov with your feedback and suggestions.

The data within the Wisconsin Energy Statistics book depicts all energy used, from petroleum for transportation to renewables and natural gas for electricity generation. Since its first printing, we've implemented many changes. Notably, there are now two distinct chapters highlighting the state economic profile and the environmental impact of all energy use in the state. We are more aware now than ever of the environmental impact of our energy choices, and the economic benefits of moving to clean energy cannot be ignored.

It is the mission of the Public Service Commission to oversee and facilitate the efficient and fair provision of quality utility services in Wisconsin. The commissioners consider and balance diverse perspectives while endeavoring to protect the environment, public interest, and public health and welfare; the Wisconsin Energy Statistics are integral to this mission.

Rebecca Cameron Valcq, Chairperson
Public Service Commission of Wisconsin

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[1] According to the Wisconsin State Historical Society, "Increase Lapham was Wisconsin's first scientist and one of its foremost citizens. He wrote the first book published in Wisconsin, made the first accurate maps of the state, investigated Wisconsin's effigy mounds, native trees and grasses, climatic patterns and geology, and helped found many of the schools, colleges and other cultural institutions that still enrich the state today." Read more here: https://www.wisconsinhistory.org/Records/Article/CS527

[2] https://psc.wi.gov/Pages/Programs/OEI.aspx

CONTENTS

HIGHLIGHTS

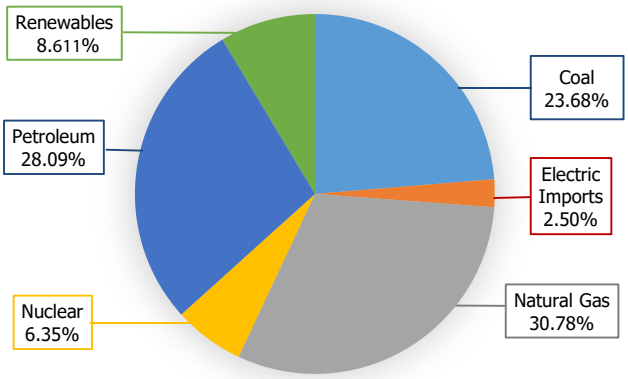
Wisconsin Resource Energy Use

Primary energy use is the energy harvested directly from the resource. This accounts for the basic energy content of coal, petroleum, nuclear and renewable fuels.

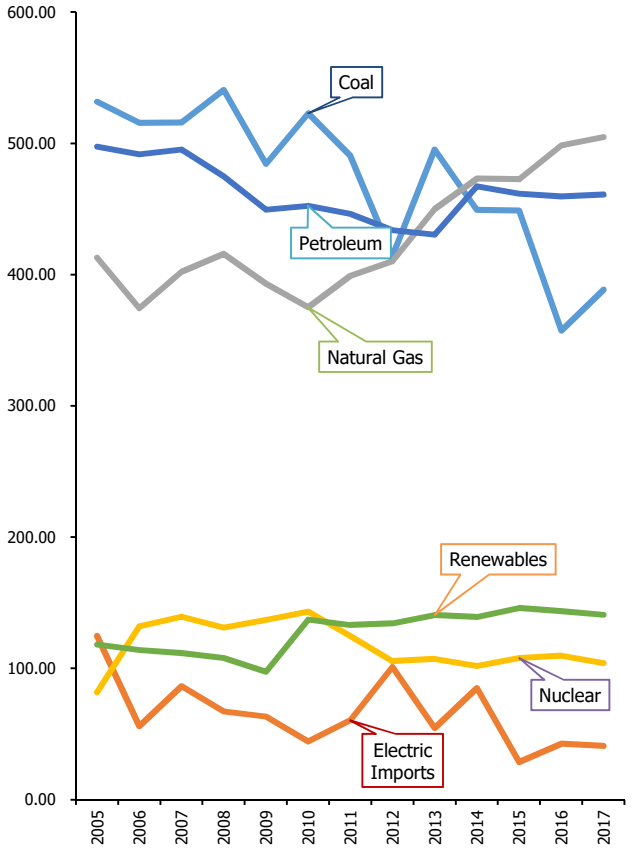
WISCONSIN RESOURCE ENERGY USE 2017: 1,641 TRILLION BTU

By Source

2017 Percent of total

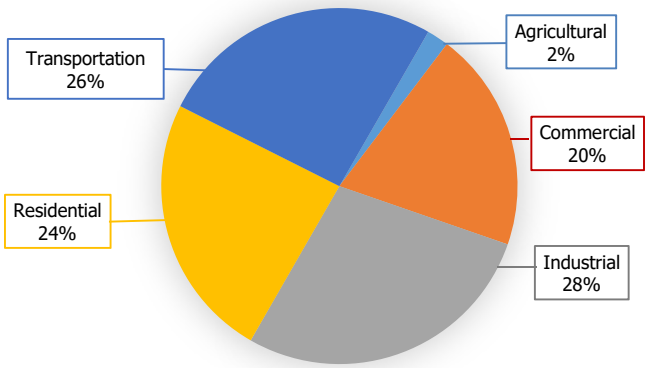


2005-2017 (Trillions of Btu)

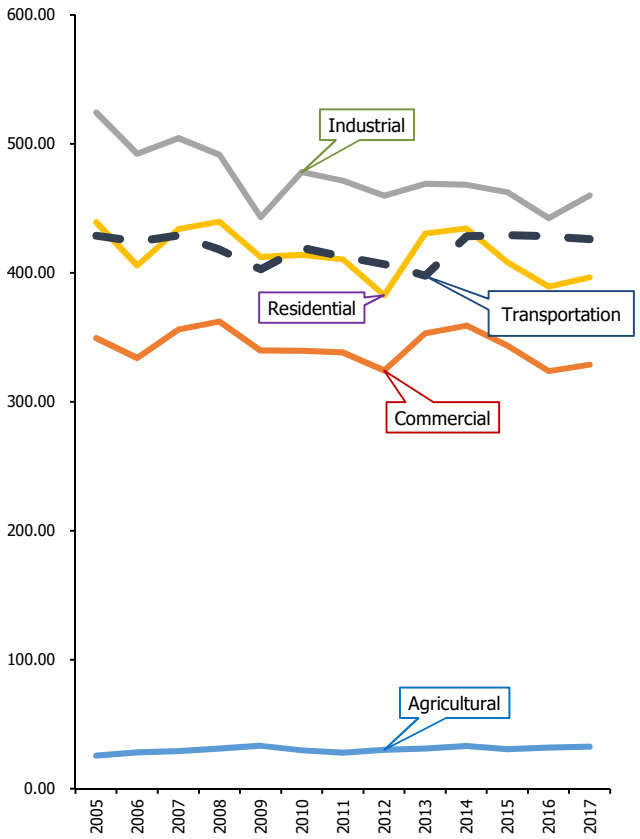


By Economic Sector

2017 Percent of total



2005-2017 (Trillions of Btu)



Source: See Wisconsin Resource Energy Use, Page 94

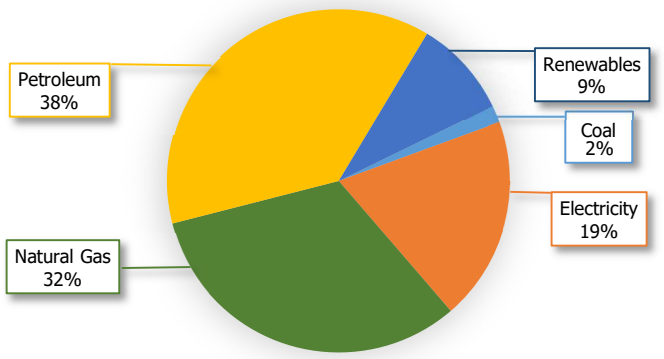
Wisconsin End Use Energy Consumption

End-use refers to the energy content of electricity and other fuels at the point of use by customers in the economic sectors: agricultural, commercial, industrial, residential, and transportation.

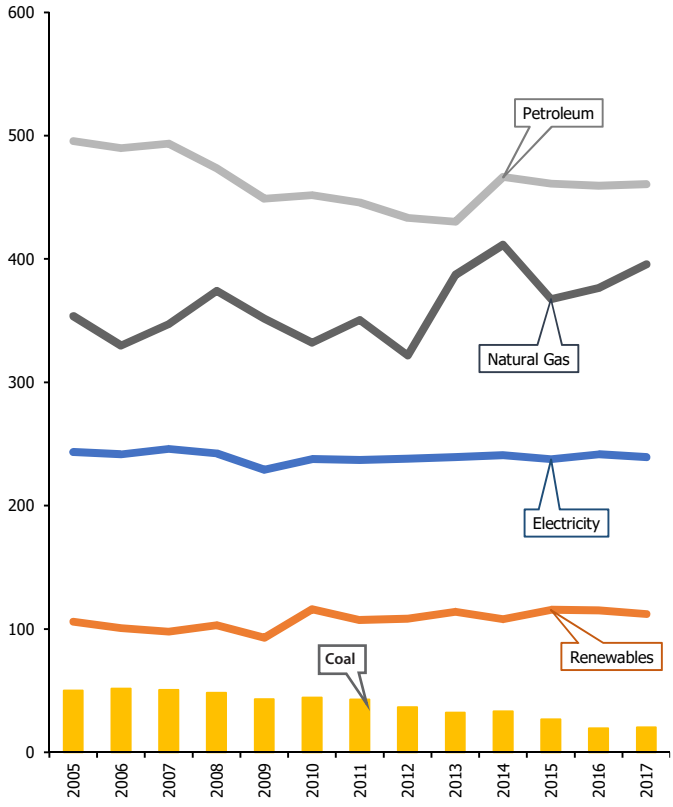
WISCONSIN END USE ENERGY CONSUMPTION 2017: 1,224 TBTU

By Source

2017 Percent of Total

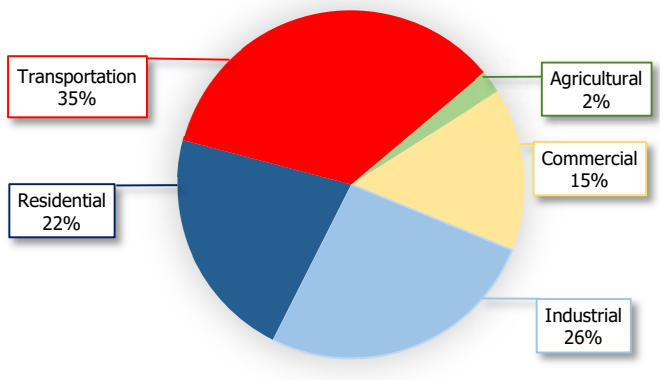


2005-2017 (Trillions of Btu)

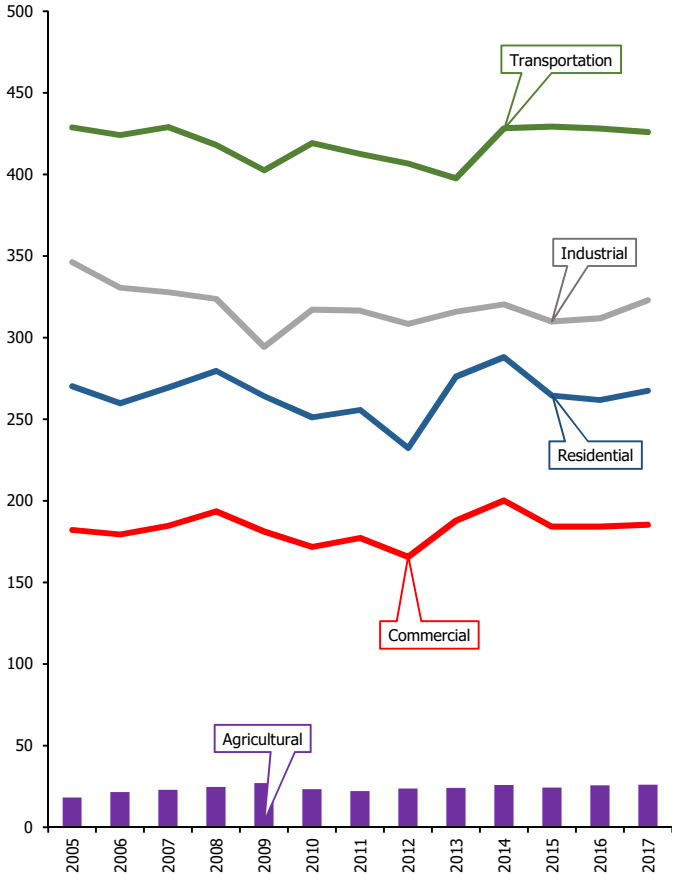


By Economic Sector

2017 Percent of Total



2005-2017 (Trillions of Btu)



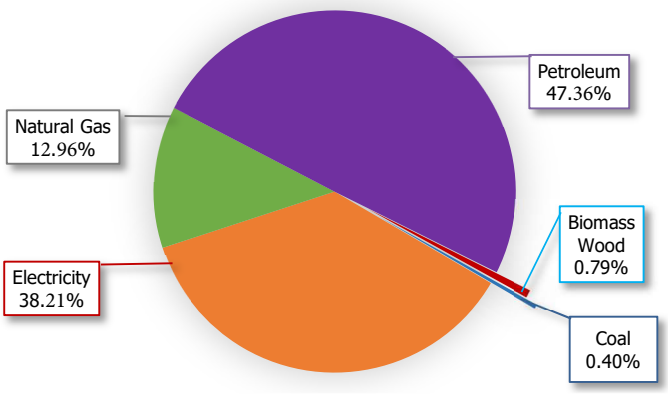
See Wisconsin End-Use Energy Consumption, Page 99

Wisconsin End Use Energy Expenditure

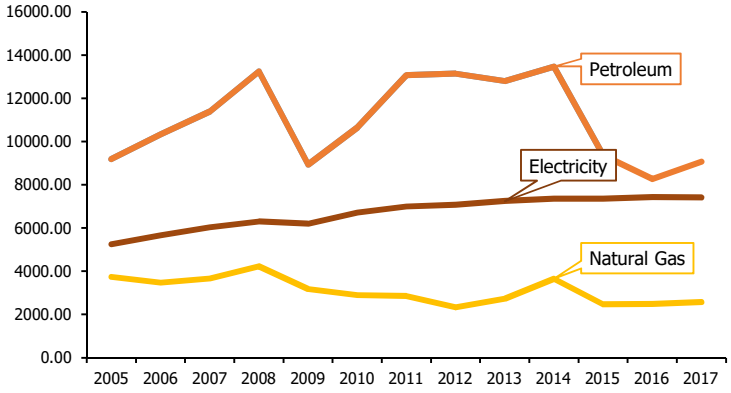
End Use expenditure increased by almost 1 billion (6%) from 2016 to 2017. Expenditure increased for all the sectors and fuels from 2016 to 2017. Only expenditure for electricity shows a decline by 0.19%. Wisconsin End Use Expenditure in 2017 was 19,419 Million Dollars.

By Source

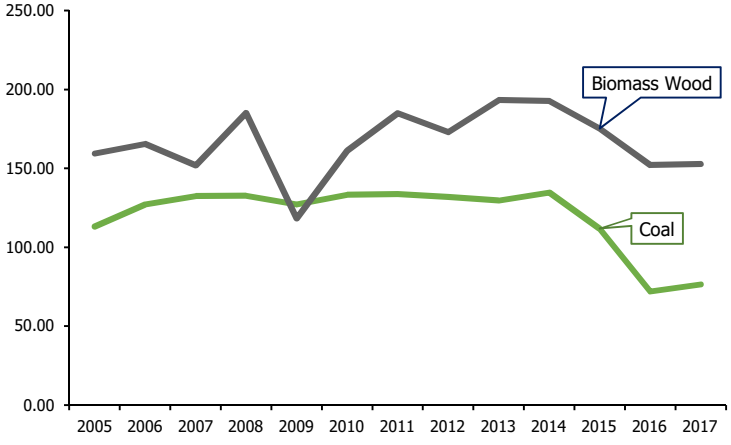
2017 Percent of Total



2005-2017 (Millions of Dollars) (a)

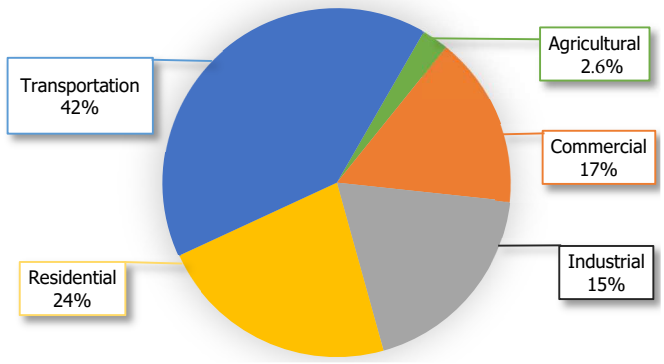


Wisconsin End Use Energy Expenditure, by source 2005-2017
(Million Dollars) (b)

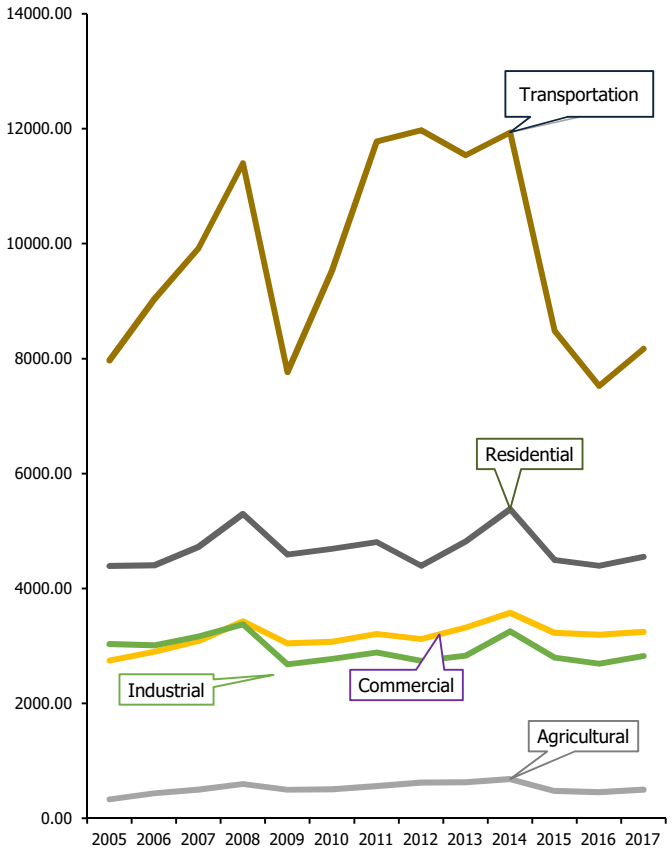


By Economic Sector

2017 Percent of Total



2005-2017 (Millions of Dollars)



Source: Wisconsin End Use Energy Expenditure, Page 104

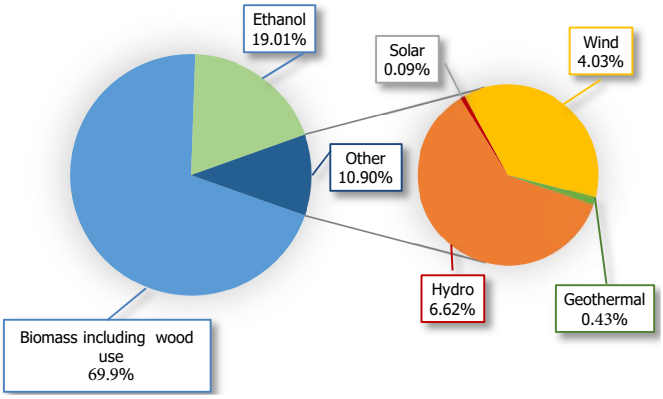
Source: Wisconsin End Use Energy Expenditure, Page 104

Wisconsin Renewable Energy Production and Use

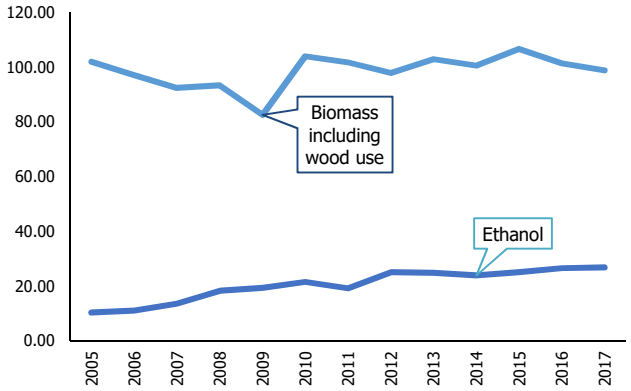
Renewable energy production includes all renewable energy used for generating electricity and other applications that displace fossil fuels (e.g., space heating, transportation fuel). Overall renewable energy resource use in Wisconsin decreased by 2% from 2016 to 2017. Renewable Energy resource use for the year 2017 was 141 Trillion Btu.

By Source

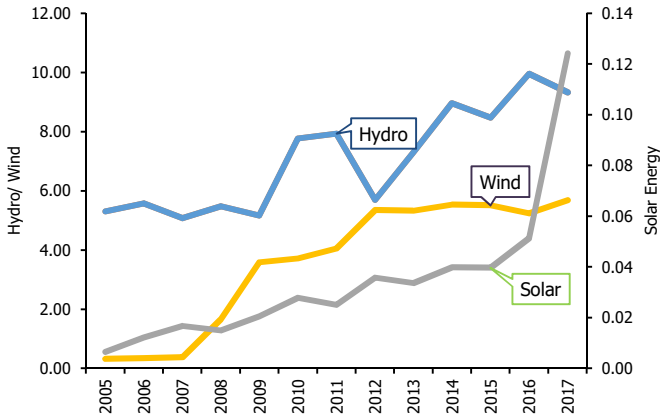
2017 Percent of Total



2005-2017 (Trillion of Btu) (a)

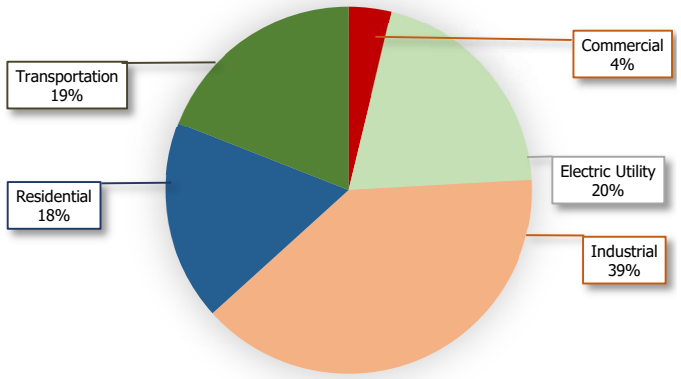


2005-2017 (Trillion of Btu) (b)

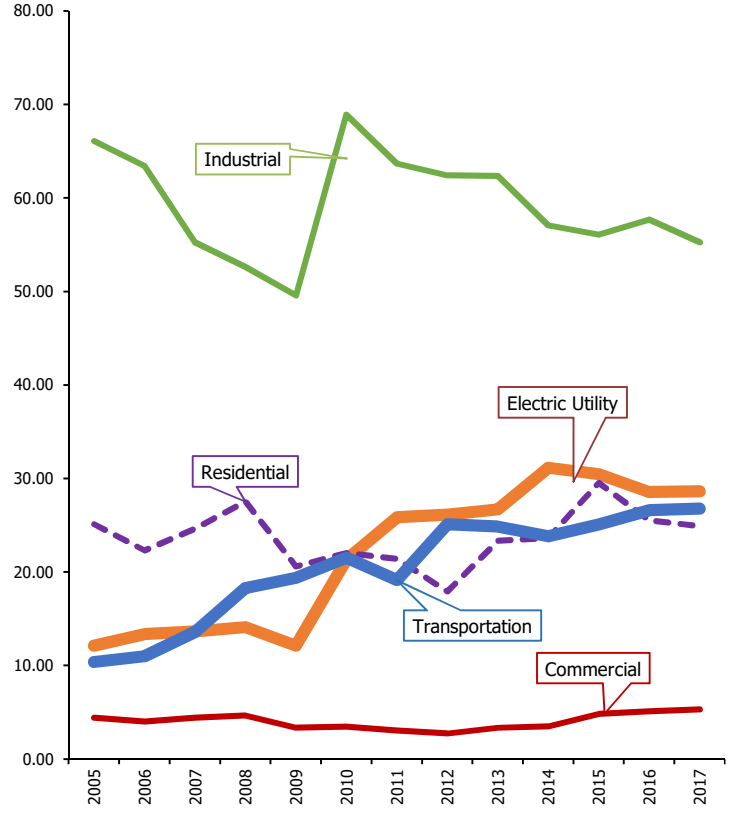


By Economic Sector

2017 Percent of Total



2005-2017 (Trillions of Btu)



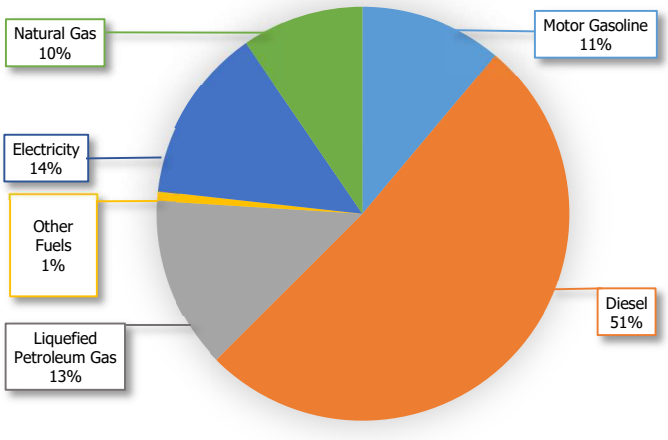
Source: See Wisconsin Renewable Energy Production and Use, Page 130

Wisconsin Energy Use by Agricultural and Transportation Sector

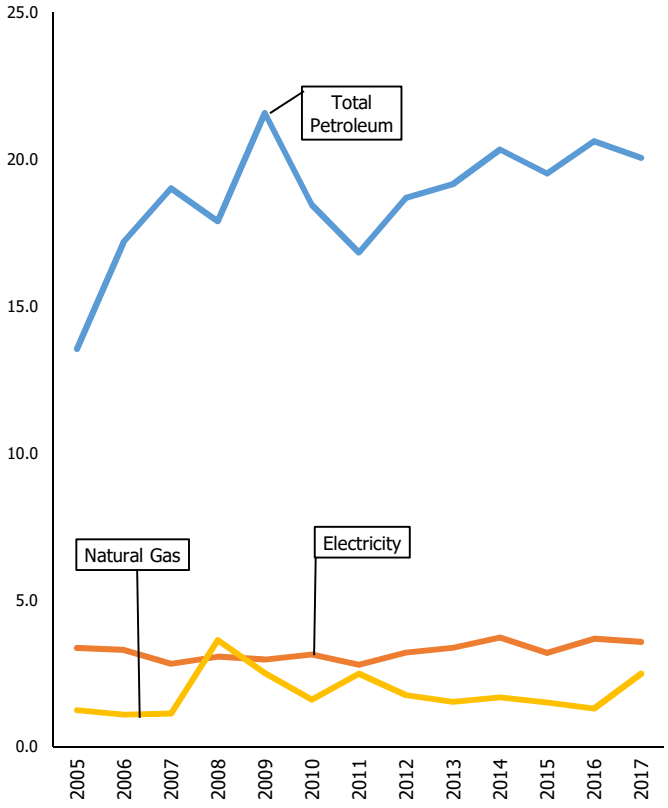
Agricultural petroleum consumption decreased marginally by almost 2.0 percent in 2017 from 2016 and electricity use decreased by 2.7% percent. However natural gas use doubled in 2017. Total energy end-use increased by 2 percent. Total motor gasoline use by the transportation sector decreased by 0.7 percent with overall petroleum use decreasing by 0.6 percent.

Agricultural Sector

End Use Energy Consumption 2017: 26 tBtu

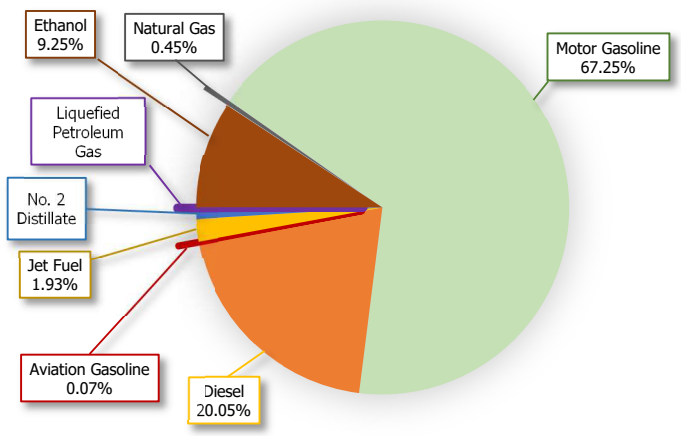


Energy Use by Agricultural Sector 2005-2017 (tBTUs)

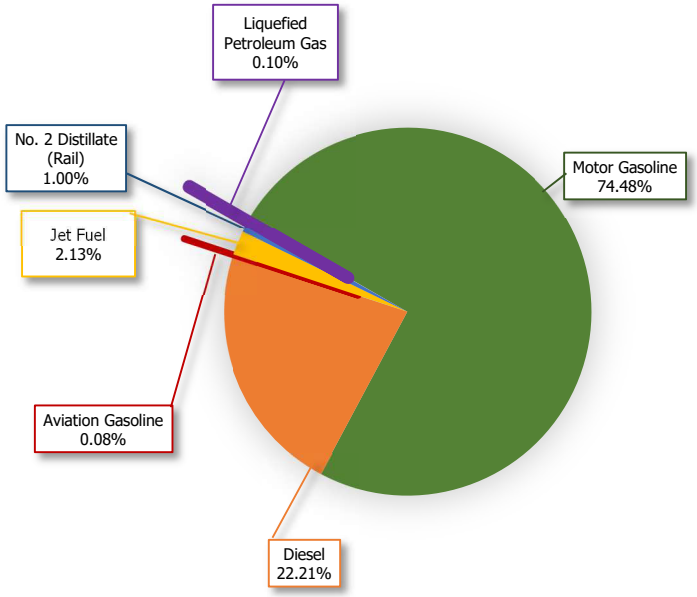


Transportation Sector

End Use Energy Consumption 2017: 426 tBtu



Petroleum Use byTransportation Sector : 3098 Million Gallons



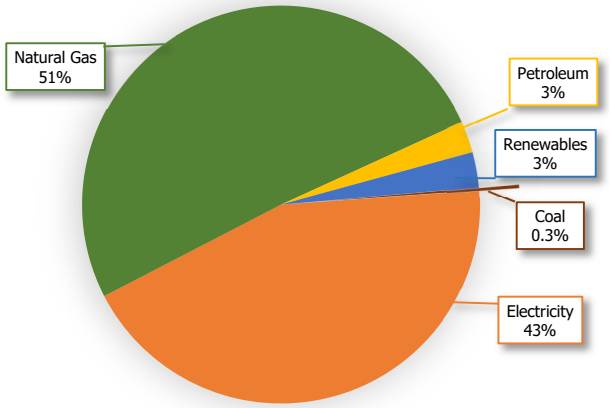
Source: See Energy Use by Transportation Sector Page 73, Agriculture Sector Page 57

Wisconsin Energy Use by Commercial and Industrial Sector

Commercial and industrial sector end-use energy consumption increased 0.6 percent and 3.5 percent, respectively in 2017 from 2016. Natural Gas use by the Commercial sector was 94.1 tBtu and Industrial sector was 161 tBtu in 2017. Both the sector's primary fuel is natural gas, comprising more than 50% percent of the End-Use Energy Consumption by both the sectors.

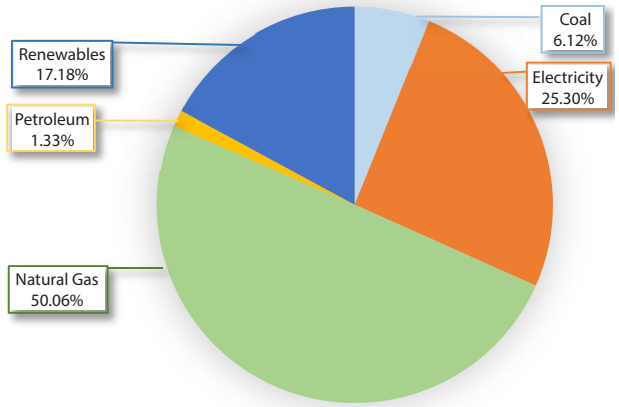
Commercial Sector

End Use Energy Consumption 2017: 185.4 tBtu



Industrial Sector

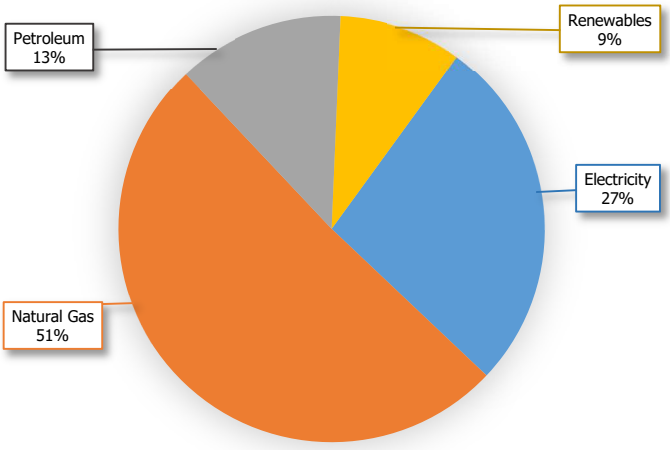
End Use Energy Consumption 2017: 321.8 tBtu



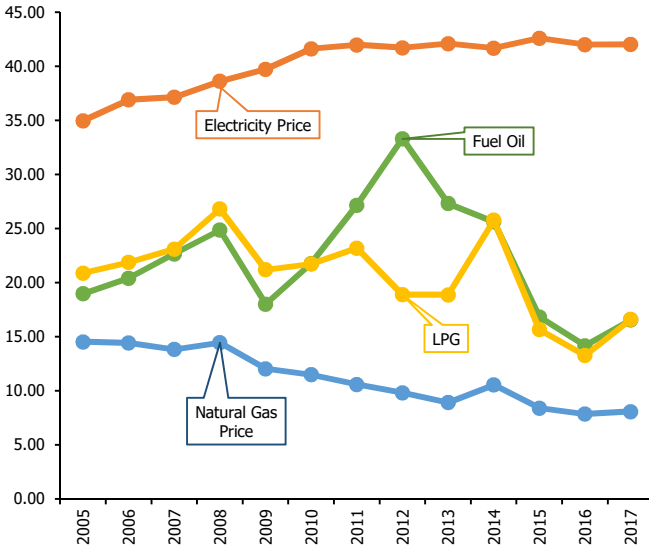
Wisconsin Energy Use by Residential Sector

Residential use of petroleum has declined from 37.91 tBtu in 2005 to just 33.97 tBtu in 2017. Similarly, electricity use has declined from 74.4 tBtu in 2005 to 70.1 tBtu in 2017. Natural gas is the dominant fuel used in residential sector and makes up 52 percent of total energy end-use in 2017.

End Use Energy Consumption 2017: 265.5 tBtu



Energy Prices (2005-2017)



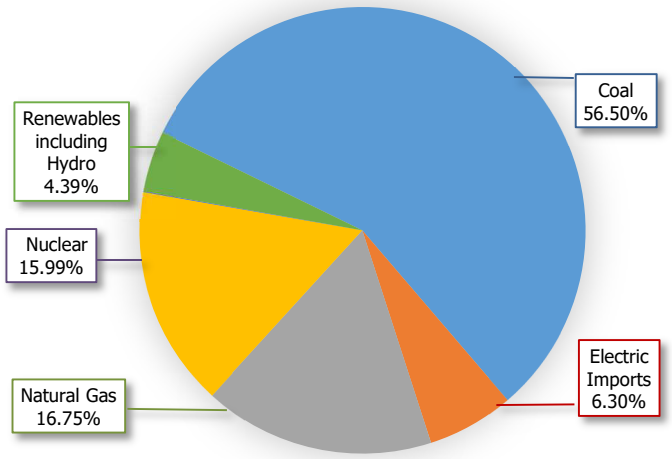
Source: See Energy Use by Residential Sector, Page 68

Wisconsin Energy Use for Electricity Generation

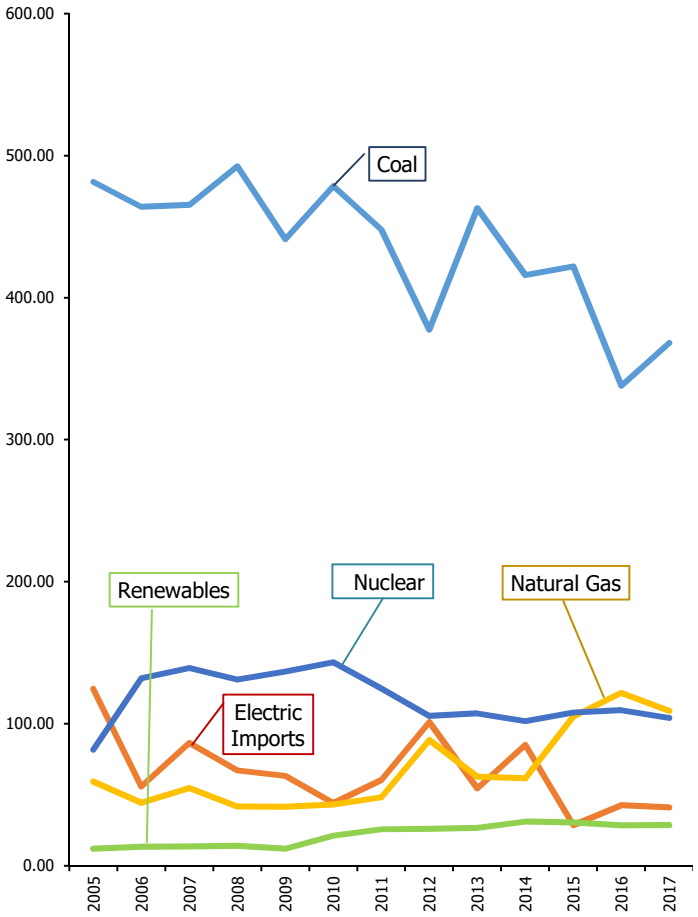
Electric power generation declined from 65,536.56 Million kWh in 2016 to 65,154 million kWh in 2017. Coal represents more than 55 percent of the electric power generation in Wisconsin. Natural gas fired power plants make up almost 17 percent of total net generation, while nuclear power supplies have contributed almost 16 percent.

By Source

Energy Use for Electricity Generation, 2017: 651.83 tBtu

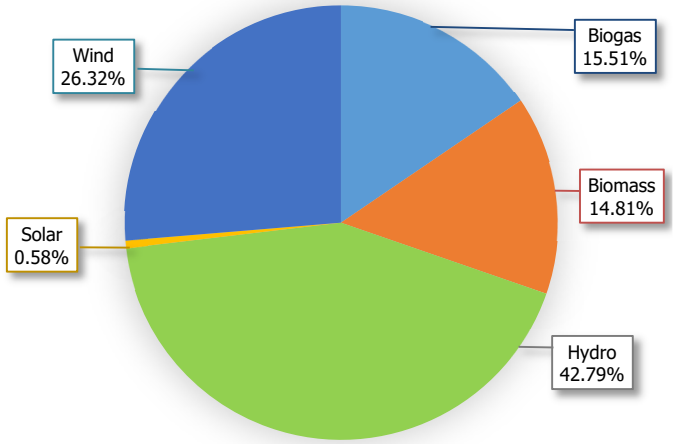


2005-2017 (Trillion of Btu)

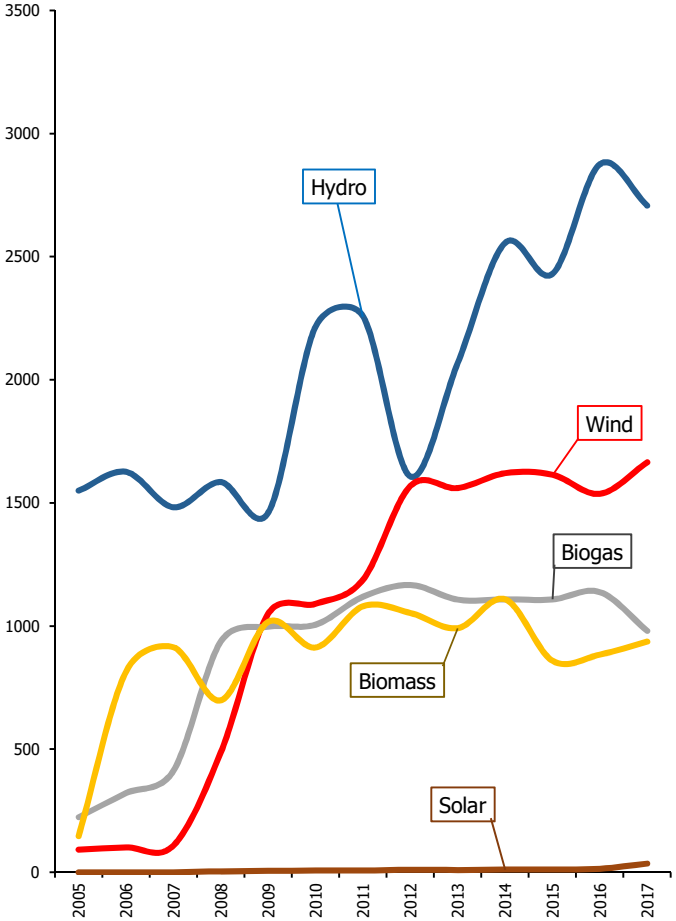


By Source

Electrity Generation from Renewable Energy, 2017: 6334.25 Million kWh



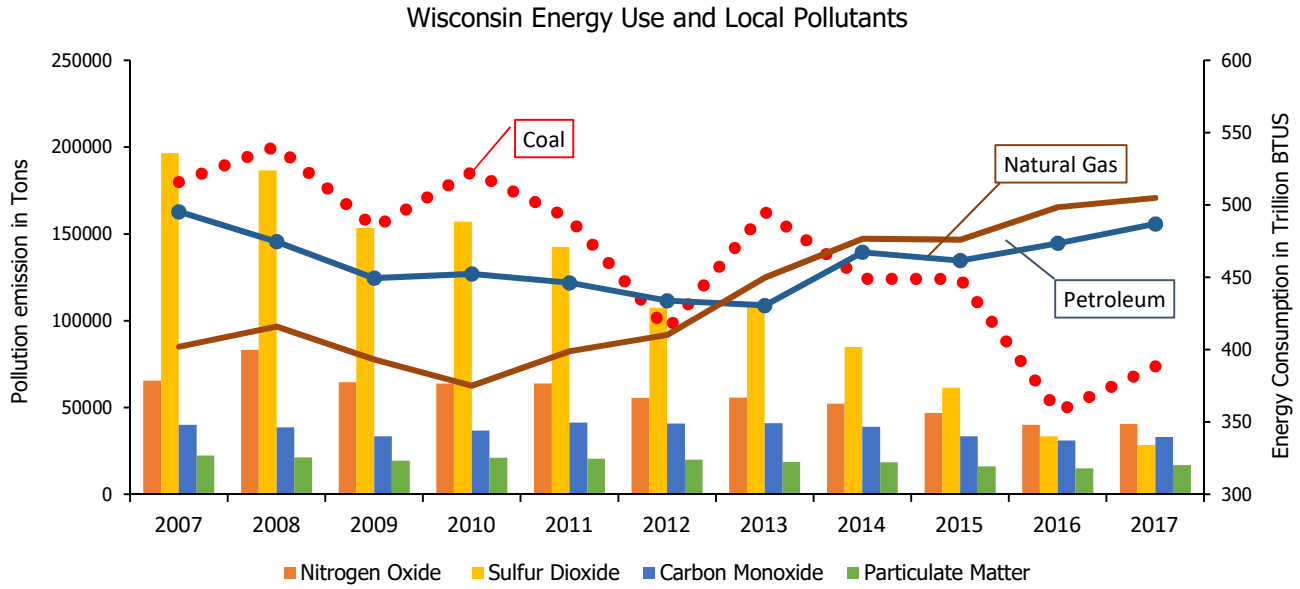
2005-2017 (Trillion of Btu)



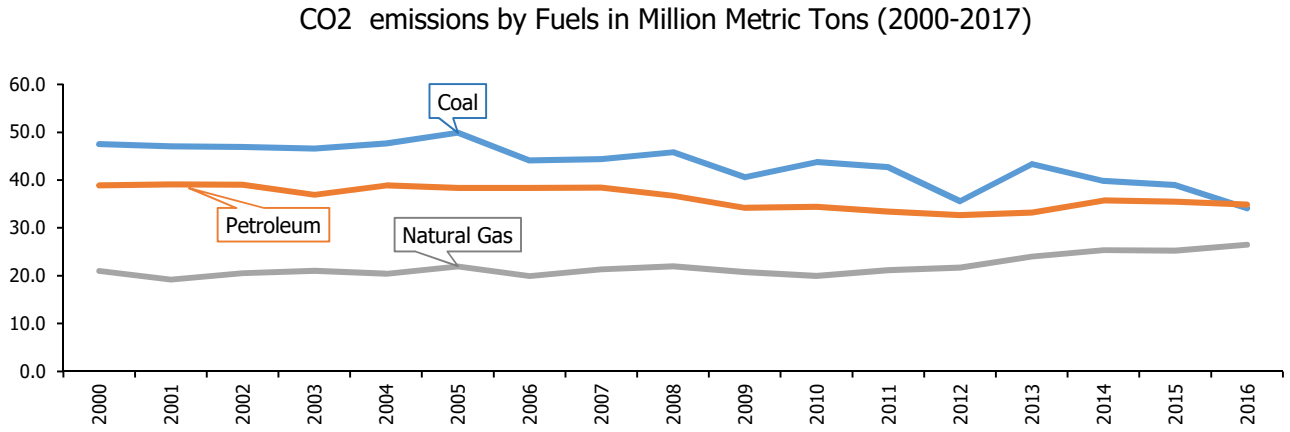
Source: See Total Energy Use Page 97,Wisconsin Renewable Energy Production and Use, Page 130

Wisconsin Energy Use and Environment

In 2017, major utilities emitted 38% less nitrogen oxide, 17.5 % less carbon monoxide and 24 % less particulate matter as compared to 2007. In 2007, SO2 emissions by the major utilities were 196,554 tons which reduced to 28,400 tons in 2017.



Carbon dioxide (CO2) emissions from fossil fuel consumption declined from 107.8 million metric tons in 2000 to 95.6 million metric tons in 2017. Since 2000, carbon emissions in the Industrial Sector declined by 27% and in the Electric Power Sector by 32%. The CO2 emissions from coal use in 2000 totaled 47.1 million metric tons which was reduced to 33.7 million metric tons in 2017.



Source: Wisconsin Energy Use and the Environment Page 129

Wisconsin State Economic and Demographic Profile

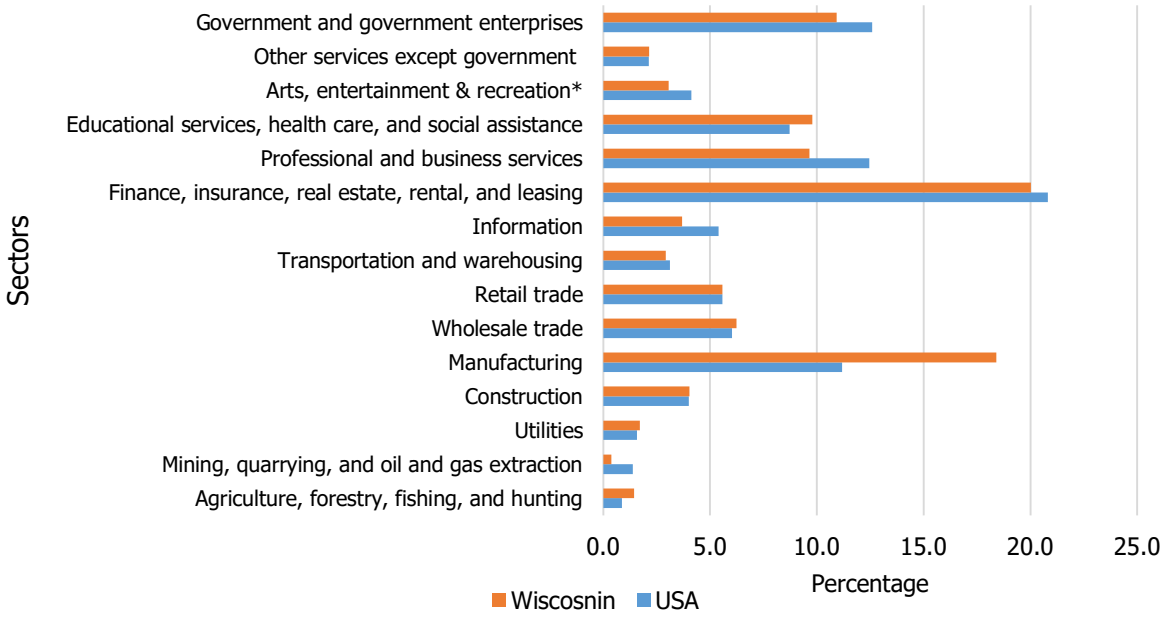
The Gross Domestic Product (GDP) of Wisconsin was $ 321,584 million and $ 55,522 per capita in 2017. After the economic recession of 2008-09, Wisconsin has maintained a steady growth of GDP per capita at around 1 to 1.5 % every year. The aggregate contribution to GDP from the finance, insurance, real estate, and leasing industries is approximately 20%. Almost 10 % of the GDP comes from the educational services, health care and social assistance sector. The sectoral share of the GDP in the state is similar to the sectoral share of the GDP in the U.S, except for that of the manufacturing sector. While, more than 18% of the GDP comes from the manufacturing sector in Wisconsin, the sectoral share of the GDP at the national level is 11%. The higher share of the manufacturing sector in the state GDP has implications for employment structure, energy consumption and environmental quality.

This section also discusses the employment in the energy sector. Energy markets have been evolving around the globe and in the U.S. As per 2017 data, traditional energy workers in Wisconsin were 1.2% of the total traditional energy workers in the U.S. and accounted for 1.4% of the state total employment. Energy efficiency jobs in Wisconsin are 2.9% of the total energy efficiency jobs in the U.S and 2% of the total state employment. Motor vehicle sector jobs in Wisconsin were 2% of all motor vehicle jobs nationwide and 1.6% of the total state employment in 2017[a].

Finally, we discuss the State demographic and housing profile in brief. While 65% of housing units use utility gas as heating fuel, only 16 % of the occupied units use electricity. The residential sector's high dependency on utility gas for heating is mostly because of lower natural gas prices and higher residential electricity prices. Fuel use by residential sector is discussed in detail in subsequent chapters.

[a] 2017 U.S. Energy and Employment Report (USEER): https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Sectoral share as percentage of GDP (2017)



Wisconsin Economic Profile
(2000-2017)

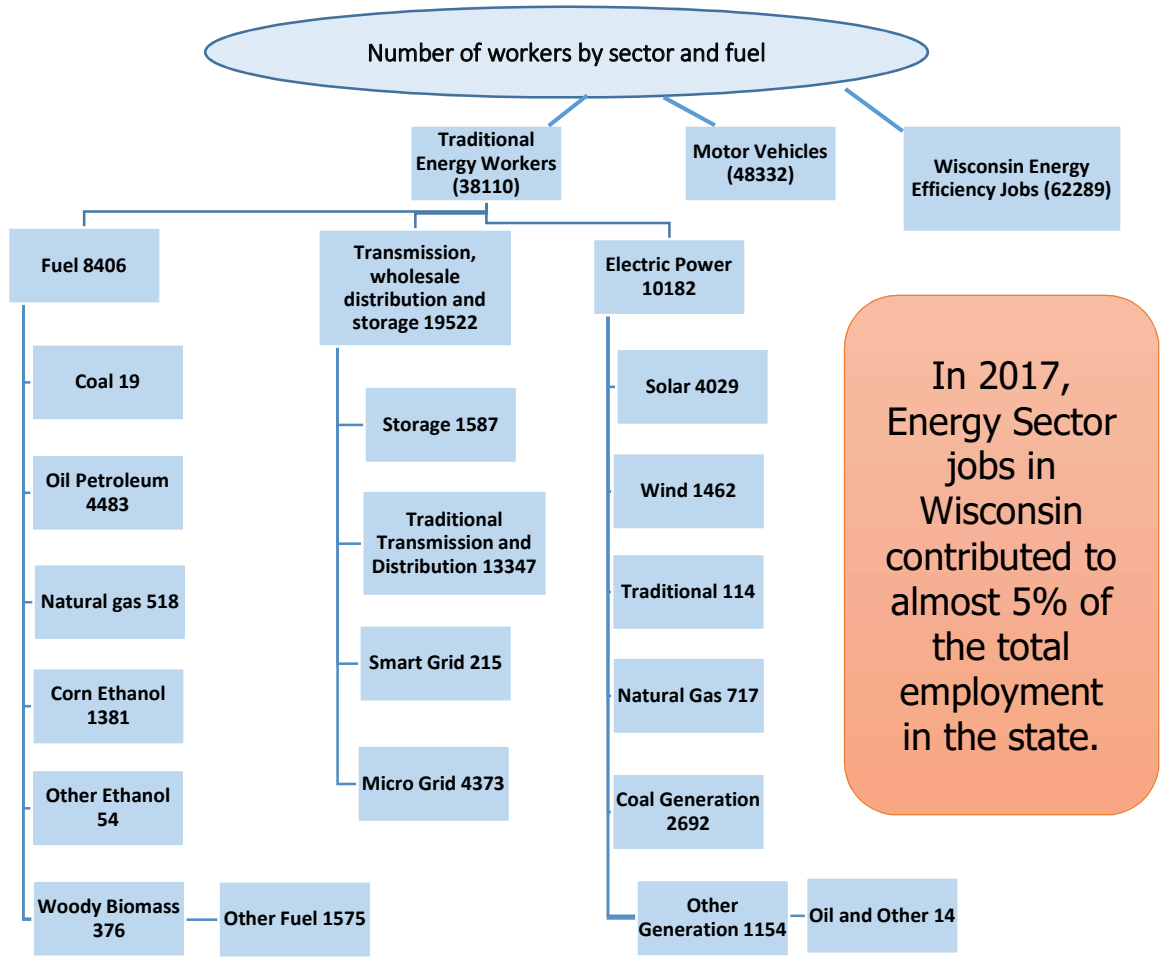
	Per Capita Disposable Personal Income		GDP in current dollars (millions)		GDP per capita in current dollars		GDP Per Capita chained to 2012	
Year	**Wisconsin**	**USA**	**Wisconsin**	**USA**	**Wisconsin**	**USA**	**Wisconsin**	**USA**
2000	25502	33596	180539	10252347	33595	36335	43373	46537
2001	26752	34180	187939	10581822	34760	37133	43669	46539
2002	27852	34887	194813	10936418	35777	38023	44259	46912
2003	28673	35509	203135	11458246	37074	39496	45238	47841
2004	29897	36358	215139	12213730	39017	41713	46428	49201
2005	30555	36585	225698	13036637	40694	44115	47269	50463
2006	32098	37677	235709	13814609	42259	46299	47775	51405
2007	33348	38177	243767	14451860	43446	47976	47754	51874
2008	34337	38182	244760	14712845	43389	48383	46912	51315
2009	34433	37786	245539	14448932	43311	47100	45357	49577
2010	35231	38219	254354	14992052	44698	48467	46541	50428
2011	36759	38834	263882	15542582	46256	49883	47394	50840
2012	38469	39829	274344	16197007	47963	51603	47963	51603
2013	38185	39041	282385	16784851	49222	53107	48142	52191
2014	39801	40323	293519	17521747	51029	55033	48893	53080
2015	41124	41674	304852	18219297	52913	56803	49514	54208
2016	41795	42081	312141	18707189	54069	57904	49960	54660
2017	43169	42901	321584	19485394	55522	59928	50496	55515

*Includes accommodation and food services
Source: Bureau of Economic Analysis, U.S Department of Commerce, Regional Data (2000-2017): https://apps.bea.gov/iTable/iTable.cfm?acrdn=6&isuri=1&reqid=70&step=1#reqid=70&step=1&isuri=1, World Development Indicators (2000-2017): https://databank.worldbank.org/reports.aspx?source=world-development-indicators#.

Wisconsin Employment
(2000 - 2017)

Year	Wisconsin	USA	Year	Wisconsin	USA
2000	2868880	136900667	2009	2834968	139893917
2001	2874919	136939333	2010	2814739	139077167
2002	2861916	136480917	2011	2840486	139885167
2003	2879342	137729250	2012	2857571	142474583
2004	2881701	139239750	2013	2873047	143940667
2005	2878254	141710083	2014	2914939	146318667
2006	2913831	144417583	2015	2952135	148847167
2007	2936823	146050167	2016	3000302	151442583
2008	2939967	145373250	2017	3037722	153337667

Wisconsin Energy and Employment
2017



Source: United States Department of Labor, Employment, Wisconsin https://beta.bls.gov/dataViewer/view/timeseries/LASST550000000000005, 2017 U.S. Energy and Employment Report (USEER): https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Energy and Employment in Midwest Region as of 2017

Number of Energy Workers by Major Technology

	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Total Midwest
Fuel	8406	32727	13180	10755	20467	9376	27090	**122001**
Transmission, wholesale distribution, and storage	19522	49657	27358	13591	37702	23282	42424	**213536**
Electric power generation	10182	28434	17222	7636	27751	11041	30184	**132450**
Traditional Energy workers	***38110***	***110819***	***57760***	***31983***	***85920***	***43698***	***99698***	***467988***
Energy Efficiency Jobs	62289	83987	52578	18845	87013	43808	78764	**427284**
Motor vehicles	48332	101310	155953	37268	233842	33041	170010	**779756**
Total	**148731**	**296116**	**266291**	**88096**	**406775**	**120547**	**348472**	**1675028**

Number of Workers as the Percentage of U.S Employment in Specific field

	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio
Traditional Energy Workers	1.2%	3.4%	1.8%	1.0%	2.6%	1.3%	3.1%
Energy Efficiency Jobs	2.9%	3.8%	2.4%	1.0%	4.0%	2.0%	3.6%
Motor vehicles	2.0%	4.2%	6.5%	1.5%	9.7%	1.38%	7.08%

Number of workers as the Percentage of Total State Employment

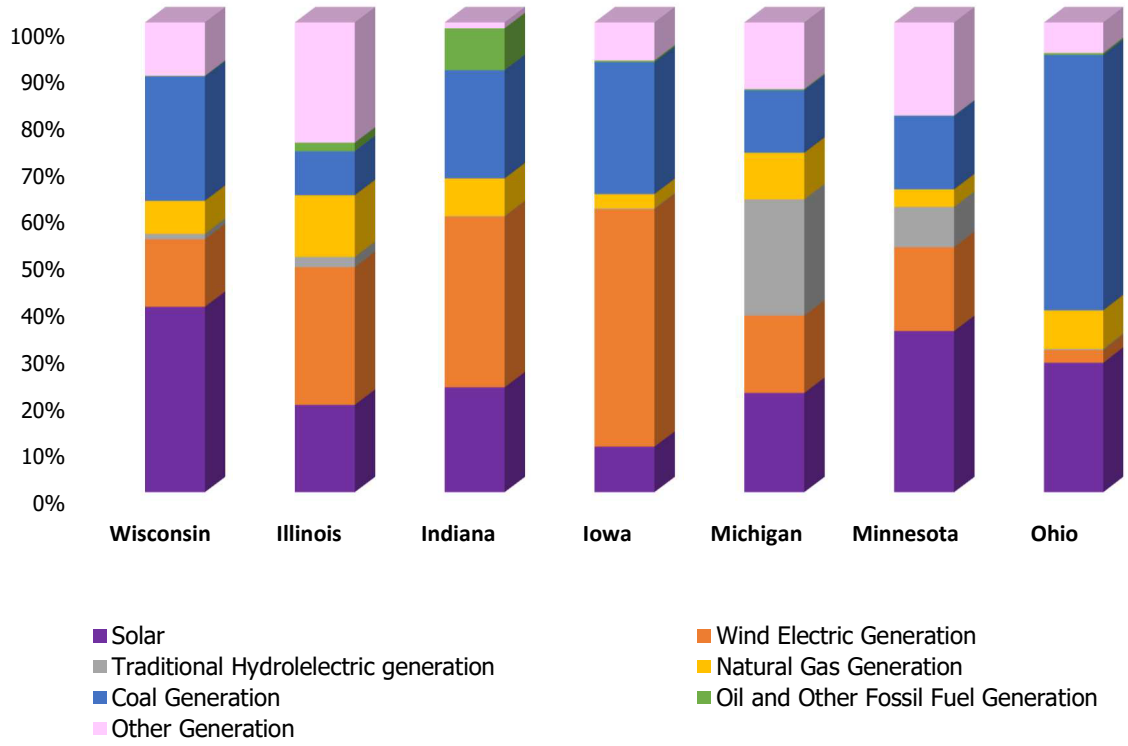
	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio
Traditional Energy Workers	1.4%	1.9%	2.0%	2.1%	2.1%	1.6%	1.9%
Energy Efficiency Jobs	2.0%	1.4%	1.8%	1.2%	2.1%	1.6%	1.5%
Motor Vehicles	1.6%	1.7%	5.4%	2.4%	5.7%	1.2%	3.2%

Source: 2017 U.S. Energy and Employment Report (USEER) https://www.bls.gov/regions/economic-summaries.htm#WI, https://www.usenergyjobs.org/previous-reports, https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Technology Break down

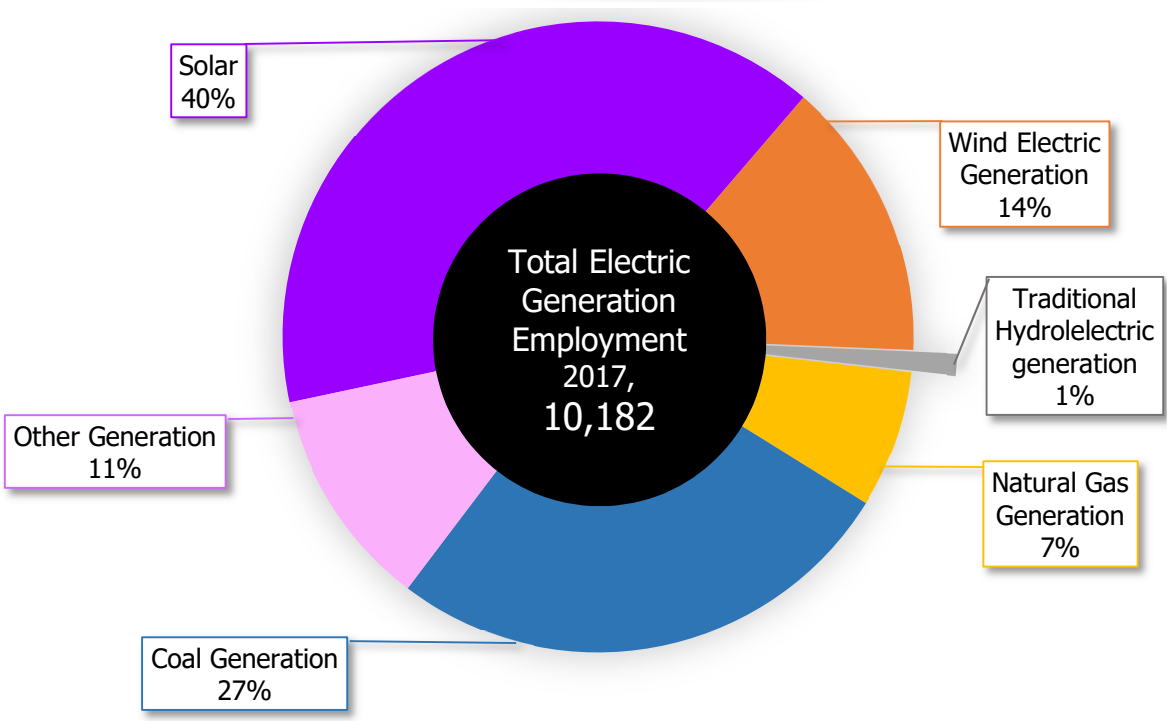
Electric Power Generation Employment by Sub-Technology	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Total Midwest
Solar	4029	5325	3866	745	5898	3800	8350	**32013**
Wind Electric Generation	1462	8321	6250	3859	4559	1966	819	**27236**
Traditional Hydroelectric generation	114	617	17	13	6856	946	70	**8633**
Natural Gas Generation	717	3727	1378	233	2746	412	2477	**11690**
Coal Generation	2692	2660	3964	2140	3694	1722	16376	**33248**
Oil and Other Fossil Fuel Generation	14	518	1531	27	67	9	125	**2291**
Other Generation	1154	7266	216	619	3930	2186	1967	**17338**
Total	**10182**	**28434**	**17222**	**7636**	**27750**	**11041**	**30184**	**132449**

Electric Power Generation Employment in Mid West by Sub-Technology (2017)



Source: 2017 U.S. Energy and Employment Report (USEER)
https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Electric Power Generation Employment by Sub-technology in Wisconsin 2017



Electricity Generation Labor Productivity in Midwest (MGWH)[b], 2017

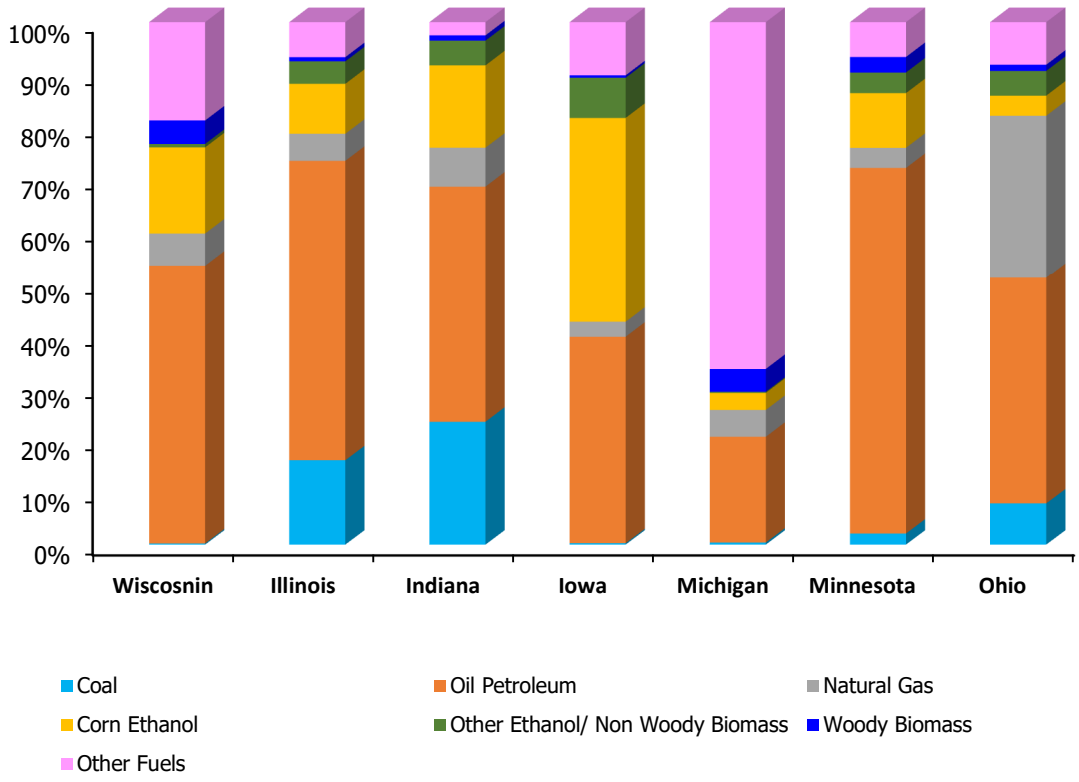
	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio
Solar	19.11	20.85	80.96	126.17	21.87	172.37	28.02
Wind Electric Generation	1122.44	1474.34	814.24	5538.48	1138.63	5664.80	1940.17
Traditional Hydroelectric generation	23307.02	202.59	18000.00	79538.46	244.89	1329.81	3957.14
Natural Gas Generation	19044.63	4028.98	13044.99	19600.86	9516.02	16281.55	11626.56
Coal Generation	13317.98	21796.99	18260.60	11849.53	11375.47	13229.97	4173.42

[b] Labor Productivity is total electricity generated by the technology divided by number of people working in that technology.
Source: U.S Energy Information Administration, Electricity Net Generation (2017) https://www.eia.gov/electricity/annual/, 2017 U.S. Energy and Employment Report (USEER) https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Fuel Employment in Midwest by Sub-Technology (2017)

	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Total Midwest
Coal	19	5336	3119	28	82	201	2157	**10942**
Oil Petroleum	4483	18739	5930	4260	4175	6570	11707	**55864**
Natural Gas	518	1688	977	307	1047	360	8393	**13290**
Corn Ethanol	1381	3116	2068	4197	665	977	1039	**13443**
Other Ethanol/ Non Woody Biomass	55	1401	621	823	44	369	1275	**4588**
Woody Biomass	376	262	133	50	891	277	321	**2310**
Other Fuels	1575	2185	332	1090	13564	623	2198	**21567**
Total	**8407**	**32727**	**13180**	**10755**	**20468**	**9377**	**27090**	**122004**

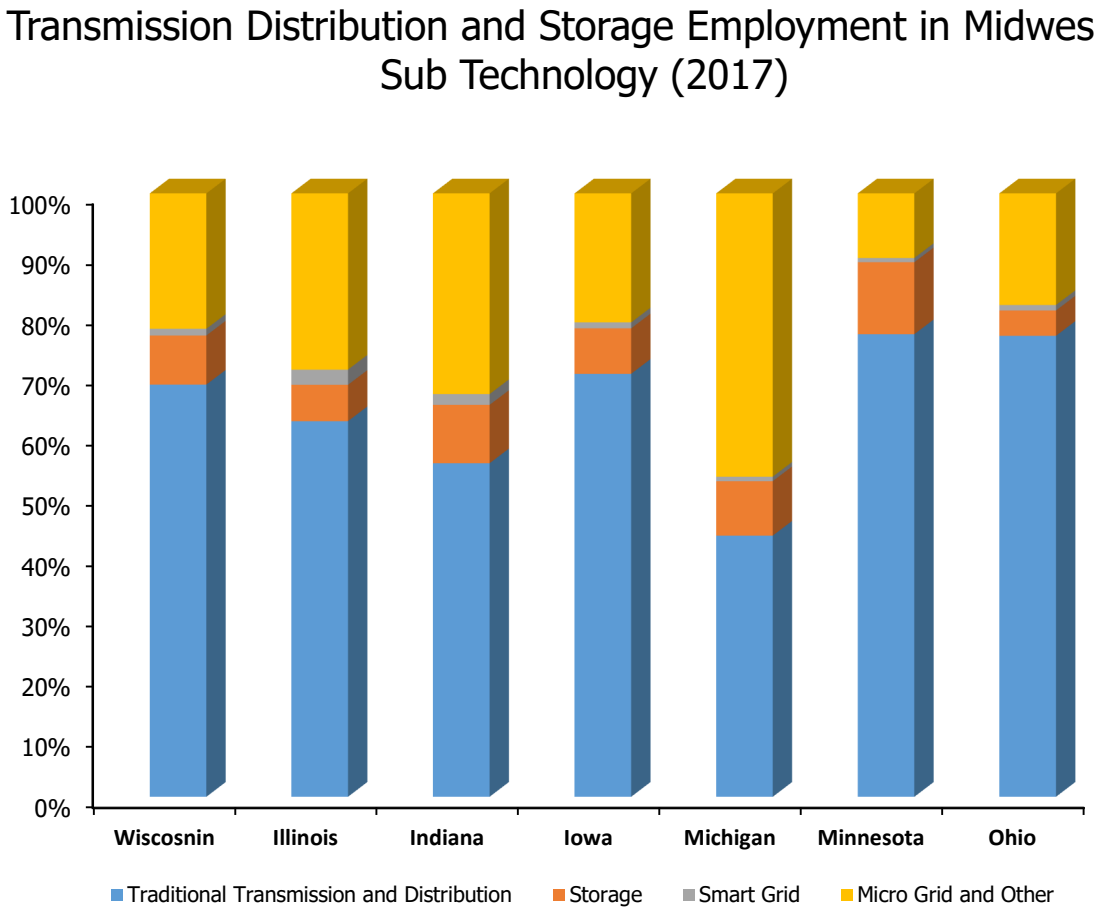
Fuel Employment in Midwest by Sub Technology (2017)



Source: 2017 U.S. Energy and Employment Report (USEER)
https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Transmission Distribution and Storage Employment in Midwest by Sub Technology (2017)

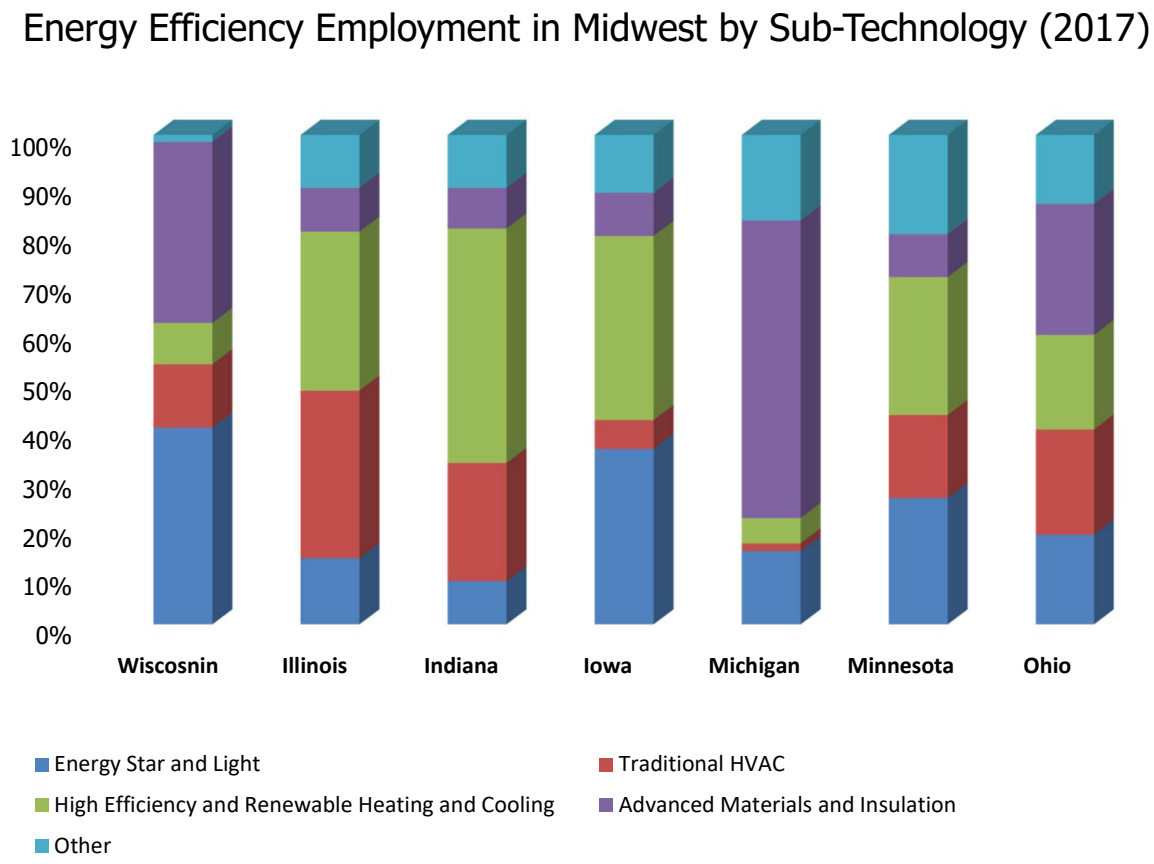
	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Total Midwest
Traditional Transmission and Distribution	13347	30946	15144	9536	16239	17860	32428	**135500**
Storage	1587	2986	2642	1022	3517	2772	1778	**16304**
Smart Grid	215	1250	489	133	279	165	384	**2915**
Micro Grid and Other	4373	14476	9083	2901	17666	2485	7835	**58819**
Total	**19522**	**49658**	**27358**	**13592**	**37701**	**23282**	**42425**	**213538**



Source: 2017 U.S. Energy and Employment Report (USEER)
https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Energy Efficiency Employment in Midwest by Sub-Technology

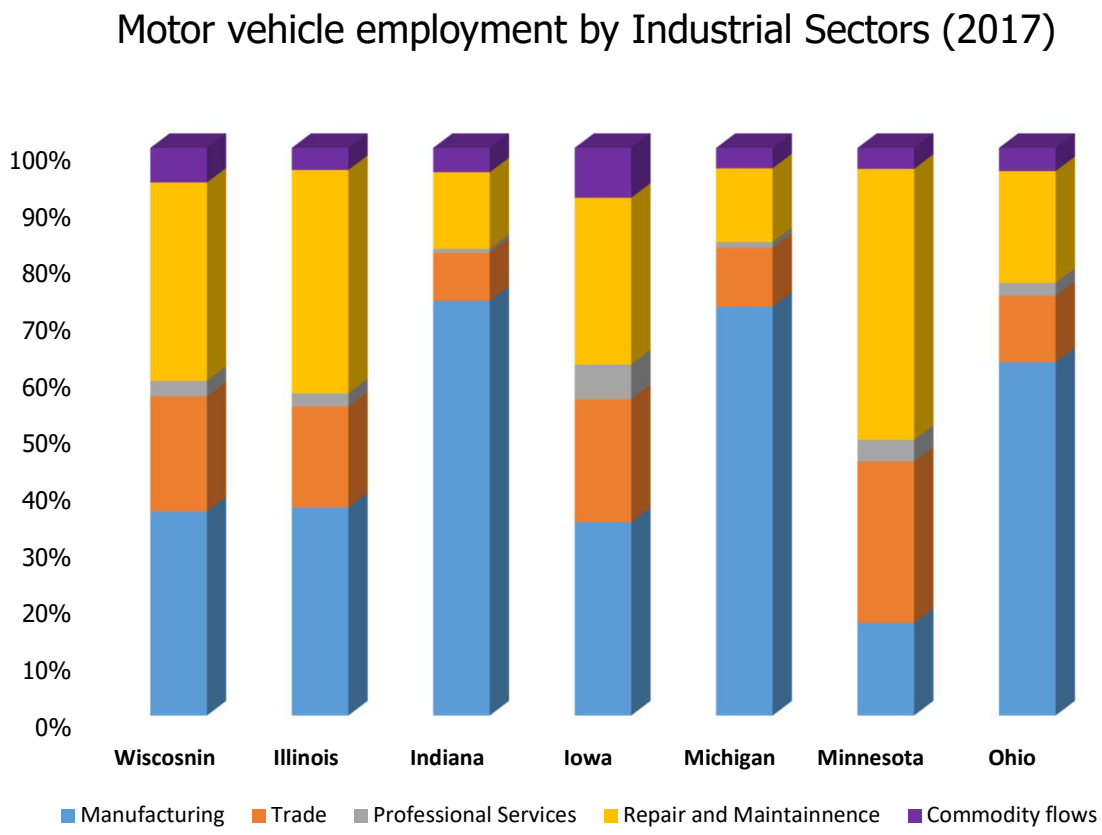
	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Total Midwest
Energy Star and Light	25101	11409	4678	6770	13111	11361	14539	**86969**
Traditional HVAC	8045	28774	12716	1116	1403	7421	16908	**76383**
High Efficiency and Renewable Heating and Cooling	5261	27236	25143	7074	4501	12327	15182	**96724**
Advanced Materials and Insulation	22994	7525	4369	1662	52847	3832	21067	**114296**
Other	888	9043	5672	2224	15151	8867	11068	**52913**
Total	62289	83987	52578	18846	87013	43808	78764	427285



Source: 2017 U.S. Energy and Employment Report (USEER)
https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Motor vehicle jobs by industrial sectors in Midwest Region 2017

	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Total Midwest
Manufacturing	17351	37079	113845	12671	168366	5352	105746	**460412**
Trade	9811	18033	13256	8087	24319	9416	19891	**102815**
Professional Services	1304	2330	1091	2273	2338	1255	3910	**14504**
Repair and Maintenance	16916	39916	21053	10957	30399	15793	33492	**168527**
Commodity flows	2948	3951	6705	3279	8418	1222	6970	**33496**
Total	**48332**	**101310**	**155953**	**37268**	**233842**	**33041**	**170010**	**779756**



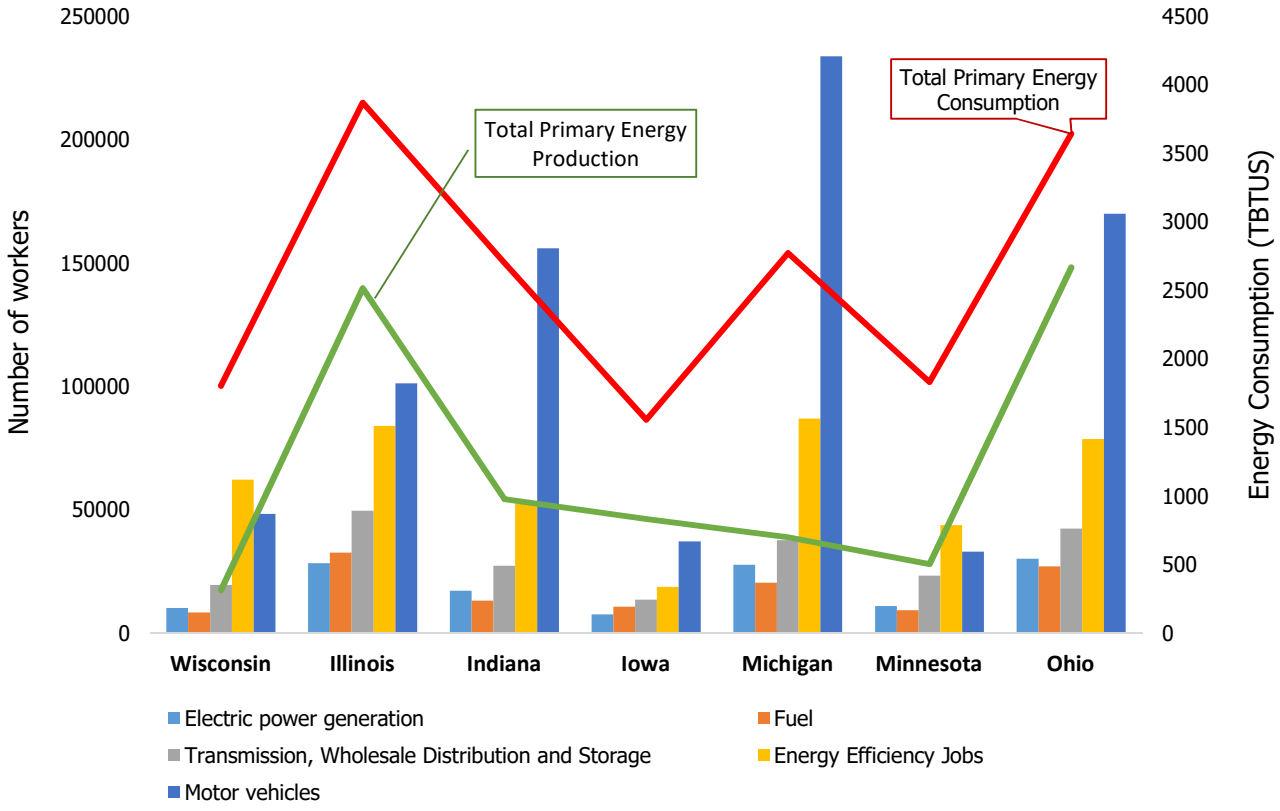
Source: 2017 U.S. Energy and Employment Report (USEER)
https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf

Generation and the Fuels Employment by Sub technology in USA (as of January 2017)

Technology	Electric Power Generation	Fuels	Total
Solar	373807		373807
Wind	101738		101738
Geothermal	5768		5768
Bioenergy	26014	104663	130677
Corn Ethanol		28613	28613
Other Ethanol/ Non Woody Biomass, including Biodiesel		23088	23088
Woody Biomass Fuel for energy and cellulose biofuels		30458	30458
Other Biofuels		22504	22504
Low Impact Hydroelectric generation	9295		9295
Traditional hydropower	56259		56259
Nuclear	68176	8595	76771
Coal	86035	74084	160119
Natural gas	52125	309993	362118
Oil/ Petroleum	12840	502678	515518
Advanced gas	36117		36117
Other generation/ Other fuels	32695	82736	115431
	860869	1187412	2048281

Source: 2017 U.S. Energy and Employment Report (USEER) https://www.usenergyjobs.org/previous-reports

Energy Employment by Major Technology in Mid West



This chart shows the number of workers employed in the Energy sector alongside the amount of energy produced and consumed in the state. It is evident from the chart that the states employing more workers are able to produce and consume more energy. A closer look at the chart reveals two other major points. First, all of the Midwestern states are producing less energy than what they consume. Second, energy efficiency jobs have the largest share in the total energy employment in the State. This could have direct implications for the overall amount of energy use, and subsequently its prices and environmental impact. The following chapters have a detailed discussion on Wisconsin's energy prices, consumption and generation.

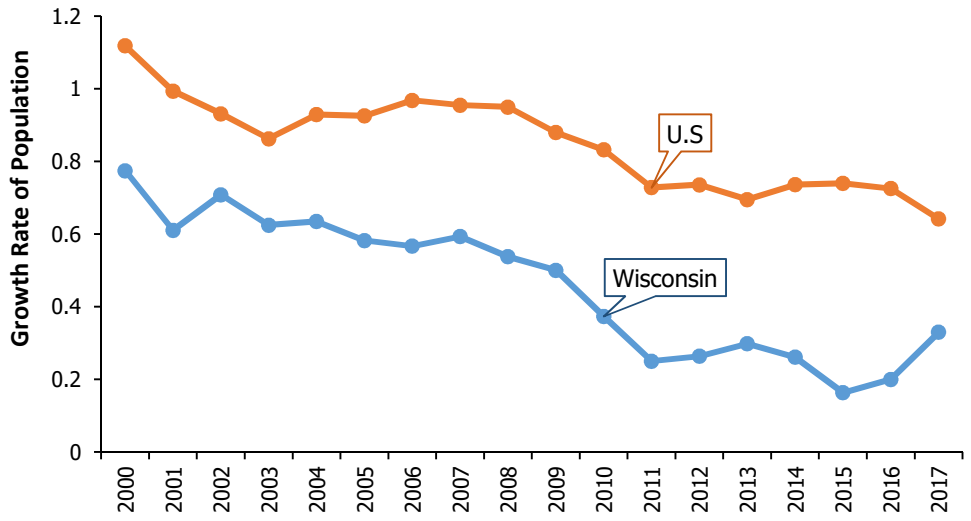
Source: 2017 U.S. Energy and Employment Report (USEER) https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report%20State%20Charts%202_0.pdf, U.S Energy Information Administration, State Energy Data System (2017) https://www.eia.gov/state/seds/seds-data-complete.php?sid=WI

Wisconsin State Demographic Profile

Year	Population (in millions)	
	Wisconsin	**USA**
2000	5.37	282.2
2001	5.41	285.0
2002	5.45	287.6
2003	5.48	290.1
2004	5.51	292.8
2005	5.55	295.5
2006	5.58	298.4
2007	5.61	301.2
2008	5.64	304.1
2009	5.67	306.8
2010	5.69	309.3
2011	5.70	311.6
2012	5.72	313.9
2013	5.74	316.1
2014	5.75	318.4
2015	5.76	320.7
2016	5.77	323.1
2017	5.79	325.1

The population growth rate shows a declining trend both at the state and national level. It implies that at both state and national level the population is growing but at a declining rate. However, Wisconsin shows an upsurge in the population growth rate for the years 2015, 2016 and 2017. Population growth rate has major implications for energy demand in any economy.

Population Growth Rates (2000 -2017)



Source: Bureau of Economic Analysis, U.S Department of Commerce, Regional Data (2000-2017)
https://apps.bea.gov/iTable/iTable.cfm?acrdn=6&isuri=1&reqid=70&step=1#reqid=70&step=1&isuri=1

Population Demographics by Age and Gender as of 2017

	Male	Female	Total
Population 65 years and above	402,955	493,769	896,724
Population below 65 years	2,461,160	2,405,333	4,866,493
	2,864,115	**2,899,102**	**5,763,217**

Population in households in Wisconsin as of 2017

	Male	Female	Total
Population 65 years and above	327,144	415,532	742,676
Population below 65 years	2,411,021	2,383,075	4,794,096
	2,738,165	**2,798,607**	**5,536,772**

Household Type and Age of Householder as of 2017

Total housing units	**2,668,692**
Occupied housing units	**2,328,754**

	Householders below 65 years	Householders 65 years and above	Total
Family households	1,184,779	296,747	**1,481,526**
Non-family households	574,110	273,118	**847,228**
Total	**1,758,889**	**569,865**	**2,328,754**

Population Demographics by Race as of 2017

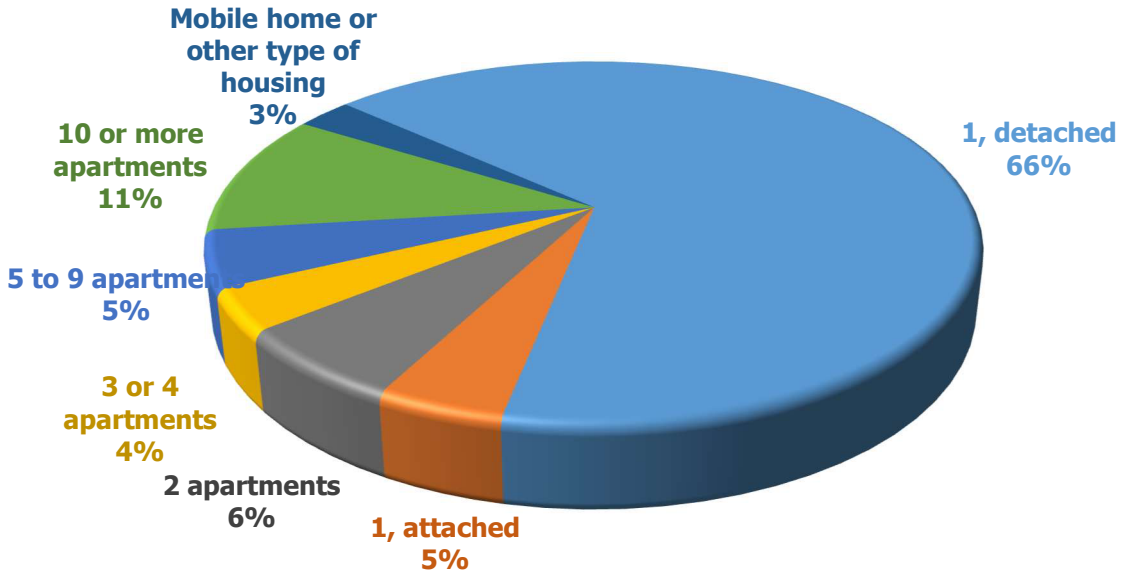
Total population	**5763217**
Hispanic or Latino (of any race)	380,590
White alone	4,715,129
Black or African American alone	359,094
American Indian and Alaska Native alone	45,947
Asian alone	151,358
Native Hawaiian and Other Pacific Islander alone	1,520
Some other race alone	4,483
Two or more races	105,096

Source: United States Census Bureau, American Fact Finder, 2010 Census https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml, 2017 American Community Survey https://suburbanstats.org/population/how-many-people-live-in-wisconsin

Occupied housing Units in Wisconsin 2017

Occupied housing units	**2,328,754**
UNITS IN STRUCTURE	
1, detached	1,549,158
1, attached	106,162
2 apartments	150,790
3 or 4 apartments	87,295
5 to 9 apartments	117,444
10 or more apartments	252,914
Mobile home or other type of housing	64,991
	2,328,754
HOUSEHOLD SIZE	
1-person household	675580
2-person household	862900
3-person household	325889
4-or-more-person household	464385
	2,328,754

OCCUPIED HOUSING UNITS IN STRUCTURE 2017

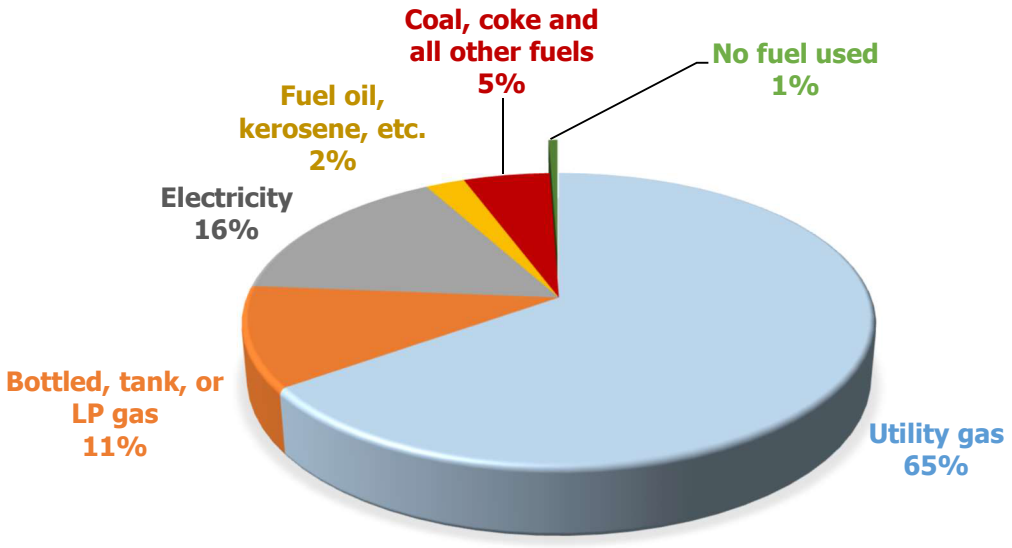


Source: United States Census Bureau, American Fact Finder, 2010 Census https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml, 2017 American Community Survey https://suburbanstats.org/population/how-many-people-live-in-wisconsin

Heating Fuel Used by Occupied Households as of 2017

Utility gas	1,516,546
Bottled, tank, or LP gas	260,306
Electricity	365,586
Heating oil, kerosene, etc.	54,323
Coal, Coke and all other fuels	119390
No fuel used	12,603
Total	**2,328,754**

HOUSE HEATING FUEL USED BY OCCUPIED HOUSING UNITS (2017)



Source: United States Census Bureau, American Fact Finder, 2017 American Community Survey https://suburbanstats.org/population/how-many-people-live-in-wisconsin

Consumers & the Economy

Energy consumption is determined by three major factors: economic activity, population changes, and technology changes. Everyday activities like flipping a light switch, turning up the thermostat, or starting a load of laundry relies on energy sources like electricity or natural gas. A large part of rural Wisconsin depends on electric heat, propane, wood, or other thermal energy sources for space heating or cooking because they have no access to natural gas. Energy consumed for space heating and cooling is highly dependent on weather and is measured with heating and cooling degree-days (HDD and CDD)[a]. HDDs occur when indoor space heating is used to warm homes as outdoor temperatures drop below 65ºF. As a cold weather state, HDDs and CDDs are important to track in Wisconsin. In 2017, total HDDs were 10 % below the 30 year normal, indicating a reduced need for natural gas for space heating due to warmer temperatures. CDDs increased, so more schools, businesses, and residences used additional electric energy for cooling. Degree days are weighted according to the population of a region (degree day zone) to illustrate the connection between changes in outdoor air temperature and indoor energy use.

The following five major appliances are typically used in Wisconsin households: room air conditioning (AC) units, freezers, washing machines, dishwashers, and refrigerators. Except for the refrigerator, energy use by these appliances has decreased since 2005 as follows: room AC units by 12 %, freezers 17 %, washing machines 54 %, and dishwashers 30%. This trend is evident on the national level.

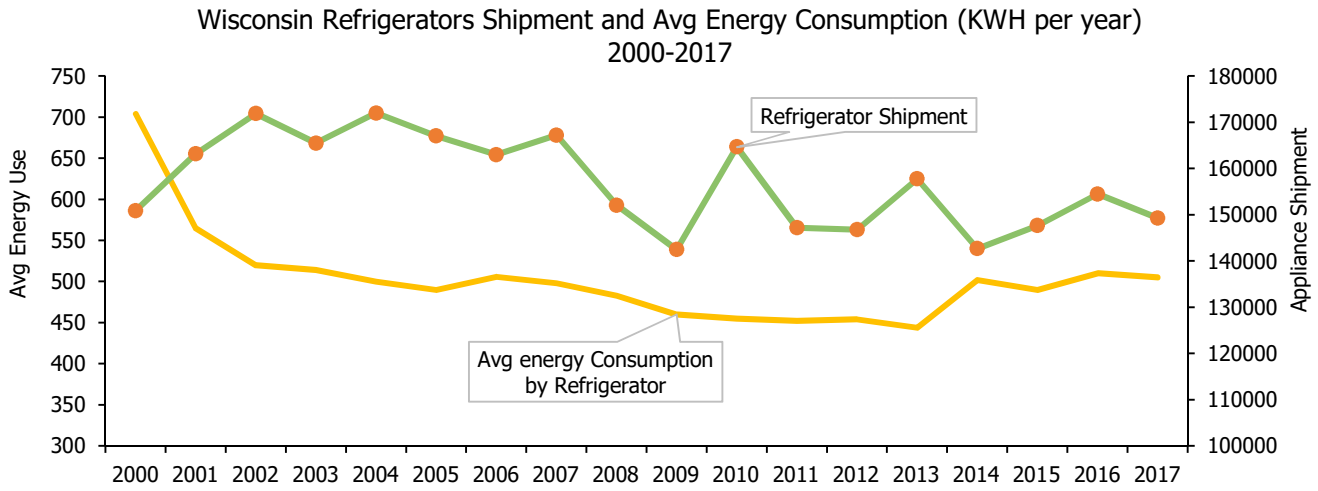
Programs like Focus on Energy[b] have a positive impact on the state's economy by incentivizing in-state purchases of these increasingly energy efficient technologies and renewable energy as well. Wisconsin residents and businesses that are eligible for Focus on Energy receive information, technical support, and financial incentives to help manage rising energy costs, protect the environment, and promote in-state economic development. Sixty% of trade allies (contractors, vendors, and national rebate administrators) reported growth in their business since becoming involved with Focus on Energy. There was a significant decline from 44% to 12%, in the number of households purchasing CFLs over the three year period 2015, 2016 and 2017. Meanwhile, households purchasing LEDs have increased from 21% in 2015 to 29% in 2016 to 48% in 2017.

[a] Degree days are defined as the number of degrees by which the average daily temperature is higher than 65°F (cooling degree days) or lower than 65°F (heating degree days). Degree days reflect changes in climate and are used as a proxy for the energy demand for heating or cooling buildings.
[b] Focus on Energy Quadrennial Achievement Report https://focusonenergy.com/sites/default/files/FOE_Volume_zero_053119.pdf

Appliance Shipments to Wisconsin and Average Energy Consumption by Major Household Appliances

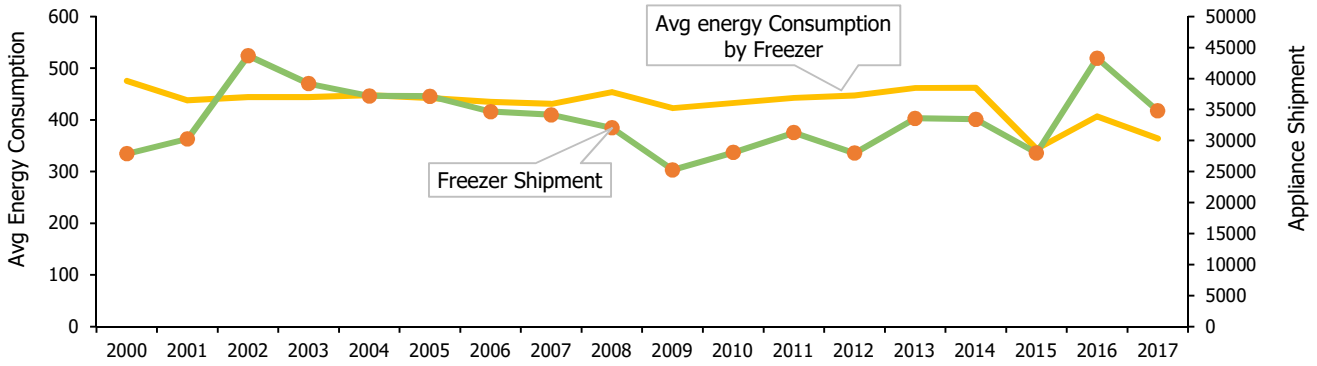
2000-2017

Year	Refrigerators		Freezer		Room Air Conditioners	
	Shipment	Avg energy Consumption[c] (kWh/Year)	Shipment	Avg energy Consumption (kWh/Year)	Shipment	Avg energy Consumption[d] (kWh/Year)
2000	150900	704	27900	476	109600	629
2001	163200	565	30300	438	81200	615
2002	171900	520	43700	444	114800	603
2003	165500	514	39200	444	118700	566
2004	172000	500	37200	448	95700	602
2005	167062	490	37148	442	94773	478
2006	163019	506	34673	435	99097	550
2007	167234	498	34151	431	134569	521
2008	152087	483	32072	454	157601	530
2009	142502	460	25283	423	120597	554
2010	164700	455	28100	433	59200	515
2011	147200	452	31300	443	70400	516
2012	146800	454	28000	447	59800	493
2013	157800	444	33600	462	68200	482
2014	142696	502	33424	462	34148	485
2015	147700	490	28006	344	75600	479
2016	154503	510	43291	407	73793	418
2017	149300	505	34800	364	106800	421
Energy Star		314		300		307

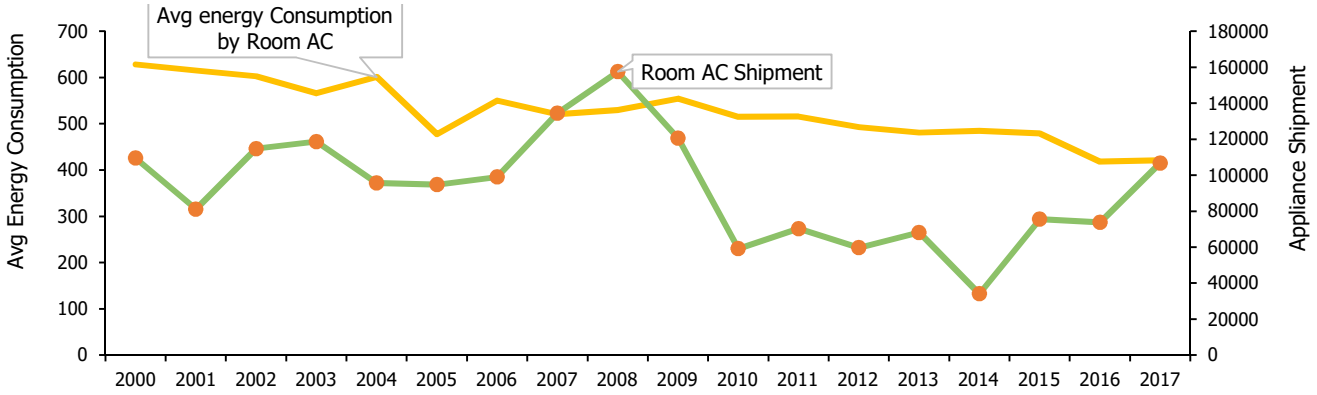


[c]Standards increased July 1, 2001
[d] At 600 hours per year
Data Source: Association of Home Appliance Manufacturers, Energy Efficiency and Consumption Trends, (2000-2017) https://www.aham.org/consumer; ENERGY START Most Efficient 2015

Wisconsin Freezer Shipment and Avg Energy Consumption
(KWH per year) 2000-2017



Wisconsin Room Air Conditioning Shipment and Avg Energy Consumption
(KWH per year) 2000-2017



The average energy consumption graphs show a declining trend over the years for most of the appliances. This shows a rise in efficiency. Shipment of room AC and washing machines show an increase in 2017 from 2016. The fall in the shipment of refrigerators (- 3.37%), freezers (-19.61%) and dish washers (-2.59%) could be due to both expansion of the secondary market and rise in efficiency.

Appliance Shipments to Wisconsin and Average Energy Consumption by Major Household Appliances 2000-2017 (Contd.)

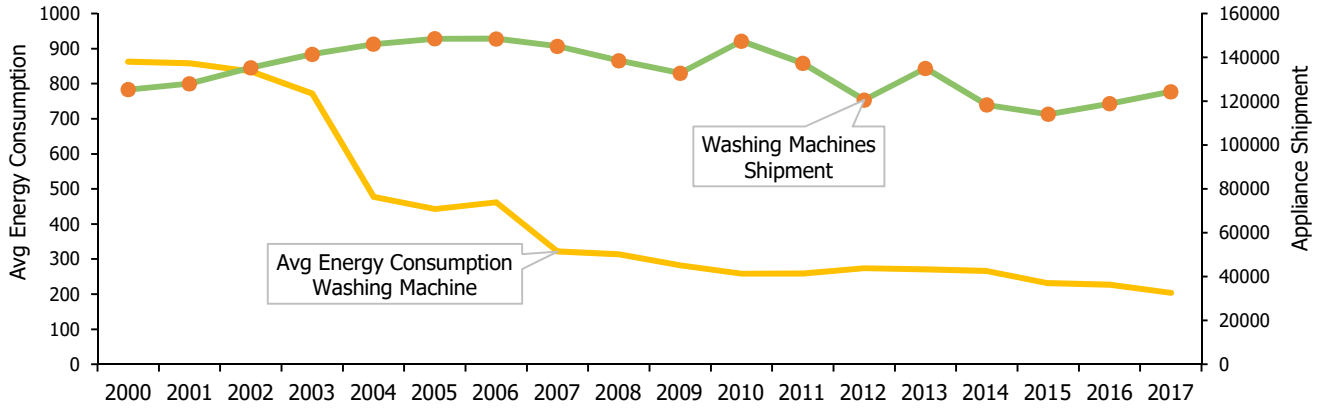
Year	Washing Machines		Dish Washer (Built-in and Portable)	
	Shipment	Avg Energy Consumption[a](kWh/Year)	Shipment	Avg Energy Consumption[b](kWh/Year)
2000	125400	862	100700	430
2001	128100	859	103700	413
2002	135400	835	110900	396
2003	141500	772	115900	394
2004	146100	478	119600	361
2005	148563	443	114171	359
2006	148519	463	105955	350
2007	145139	321	108880	329
2008	138575	314	100272	327
2009	132900	282	85127	312
2010	147500	259	86100	295
2011	137300	259	80800	282
2012	120600	274	86100	280
2013	135100	275	93100	273
2014	118369	267	86102	269
2015	114100	231	86103	258
2016	118933	227	104127	252
2017	124400	209	101500	252
Energy Star		75		190

Change in Average Energy Consumption from the preceding period

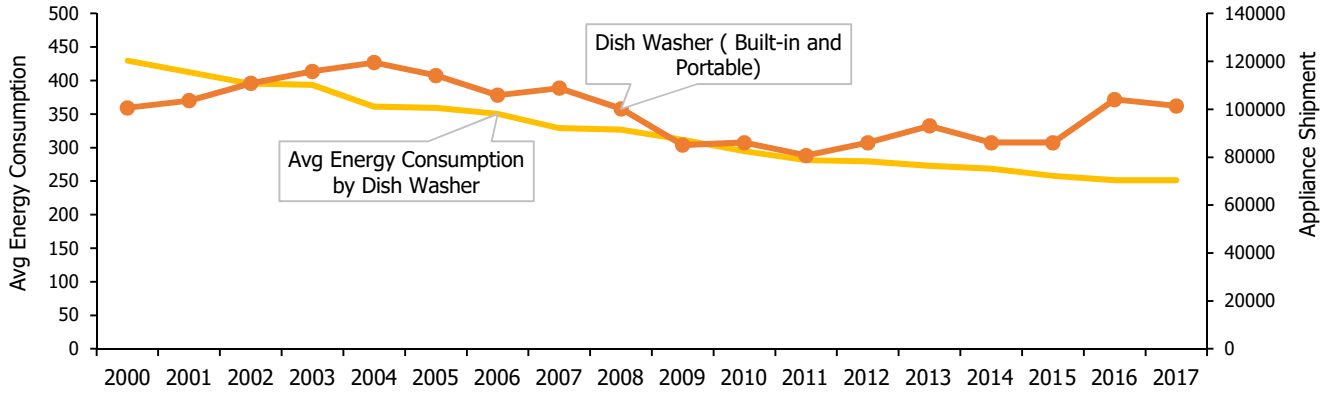
Year	Refrigerator	Freezer	Room Air Condition	Washing Machine	Dish Washer
2015 to 2016	4.08	18.31	-12.68	-1.69	-2.5
2016 to 2017	-0.98	-10.56	0.57	-10.34	0

[a] Loads per year: 392. Based on electric water heater. Standards increased January 1, 2004 and January 1, 2007.
[b] Loads per year: 215. Based on electric water heater. Standards increased May 14, 1994 and January 1, 2010.

Wisconsin Washing Machine Shipment and Avg Energy Consumption (KWH per year) 2000-2017



Wisconsin Dishwasher Shipment and Avg Energy Consumption (KWH per year) 2000-2017

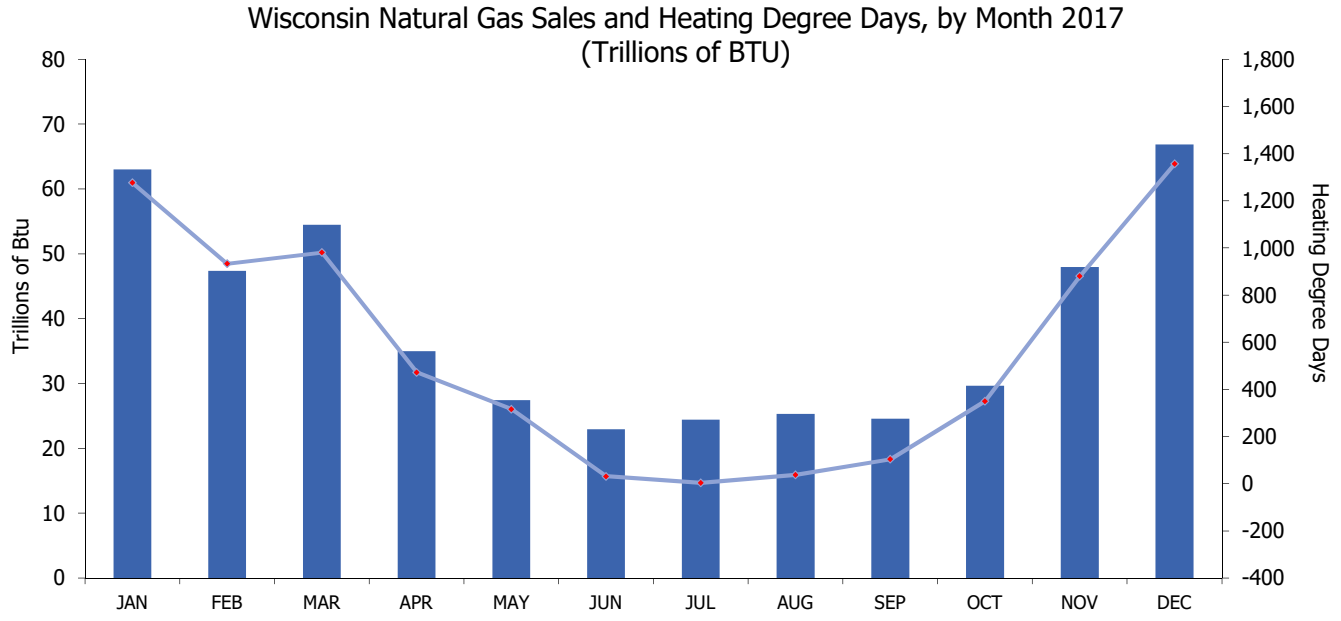


Data Source: Association of Home Appliance Manufacturers, Energy Efficiency and Consumption Trends, (2000-2017) https://www.aham.org/consumer; ENERGY START Most Efficient 2015

Wisconsin Natural Gas Sales, by Month

2000-2017 (Trillions of Btu)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2000	60.1	47.1	37.7	32.0	21.6	15.9	15.6	18.0	17.6	24.2	40.6	63.7	**394.1**
2001	53.0	51.8	45.8	26.4	18.4	16.1	15.7	16.7	17.7	27.4	28.9	44.6	**362.5**
2002	50.2	44.1	49.2	31.8	24.2	16.0	16.7	16.3	17.5	29.8	40.7	50.5	**387.0**
2003	63.5	56.0	45.3	32.2	20.7	15.6	15.5	17.3	16.7	25.4	38.0	48.6	**394.8**
2004	65.4	48.9	41.2	27.6	21.3	14.8	15.1	14.8	15.5	23.1	33.4	56.6	**377.7**
2005	60.2	45.7	48.3	28.8	22.8	21.2	20.2	21.0	18.4	24.0	35.8	55.1	**401.5**
2006	44.9	49.3	42.2	23.6	19.8	18.5	17.7	18.4	17.6	31.2	35.6	45.0	**363.8**
2007	54.3	61.5	41.1	32.4	19.1	16.0	17.7	20.3	17.3	25.1	37.4	54.6	**396.8**
2008	62.2	58.8	49.0	30.3	20.5	15.6	17.1	16.9	16.7	26.4	37.8	59.1	**410.4**
2009	67.5	49.1	43.1	30.4	18.3	17.4	14.7	16.0	17.5	28.4	32.4	54.5	**389.5**
2010	61.4	48.7	36.4	22.3	19.6	17.8	18.6	19.9	16.7	22.0	34.7	55.1	**373.1**
2011	61.3	49.9	45.4	31.3	23.0	16.2	19.3	17.6	16.7	24.6	35.3	45.9	**386.7**
2012	54.4	48.9	33.1	29.0	23.5	21.6	25.4	20.2	19.0	27.9	38.3	47.6	**388.9**
2013	*60.8*	53.2	52.6	37.0	22.1	18.4	19.7	20.5	19.1	28.0	43.5	63.1	**438.1**
2014	*73.9*	63.4	53.1	35.2	24.5	19.1	18.3	19.7	20.5	30.8	51.2	53.2	**463.0**
2015	66.9	69.0	49.4	32.1	24.3	21.9	23.2	21.9	22.8	27.7	39.0	49.2	**447.4**
2016	67.1	57.9	49.1	40.9	28.4	26.1	25.5	27.0	21.7	26.8	35.8	61.6	**467.7**
2017	63.0	47.4	54.5	35.0	27.5	23.0	24.4	25.3	24.6	29.6	48.0	66.9	**469.1**



Source: Public Service Commission of Wisconsin, Form PSC-AF2 Monthly Financial and Statistical Reports (2000-2017)
http://apps.psc.wi.gov/vs2015/ERF/ERFhome.aspx

Wisconsin Energy Consumption per capita by Source

2000-2017 (Millions of BTU)

Year	Coal	Electric Imports	Natural Gas	Nuclear	Petroleum	Renewable	Total
2000	96.65	19.22	73.21	23.03	92.42	19.91	324.45
2001	96.53	20.90	66.67	22.98	92.32	21.00	320.41
2002	93.38	18.44	70.55	24.69	93.18	16.29	316.53
2003	96.19	15.86	71.97	24.09	93.34	18.21	319.65
2004	97.43	17.40	69.40	23.28	94.08	15.99	317.58
2005	95.87	22.61	74.48	14.75	89.70	21.30	318.71
2006	92.45	10.15	67.14	23.69	88.15	20.47	302.05
2007	91.95	15.75	71.67	24.85	88.30	19.90	312.42
2008	95.88	12.81	73.75	23.27	84.17	19.13	309.00
2009	85.45	12.03	69.37	24.16	79.29	17.22	287.53
2010	91.91	8.55	65.94	25.21	79.51	24.13	295.24
2011	86.04	11.50	69.96	21.88	78.25	23.35	290.98
2012	72.36	18.61	71.75	18.47	75.87	23.48	280.54
2013	86.34	10.20	78.43	18.72	75.06	24.52	293.27
2014	78.10	15.61	82.28	17.74	81.26	24.20	299.20
2015	77.92	5.76	82.05	18.76	82.33	25.35	292.17
2016	61.91	8.22	86.35	18.72	82.04	24.86	282.10
2017	67.09	7.66	87.18	18.93	84.08	24.33	289.28

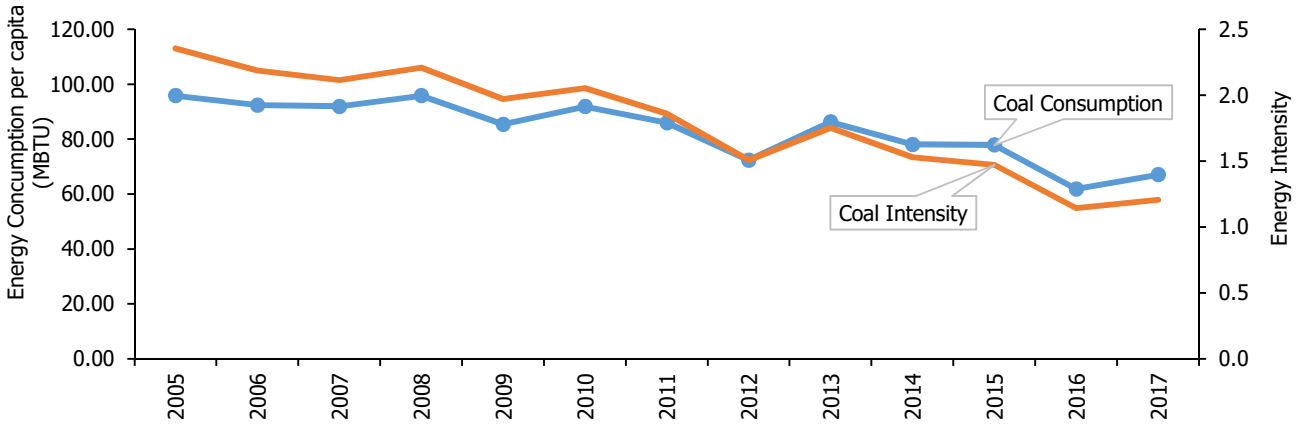
Wisconsin Energy Intensity by Source

2000-2017 (BTU/$GDP)

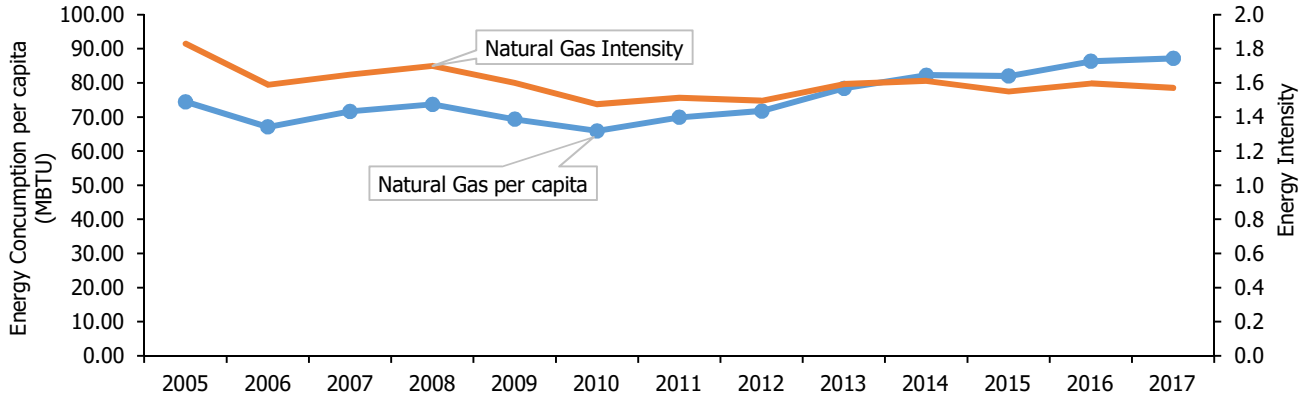
Year	Coal	Electric Imports	Natural Gas	Nuclear	Petroleum	Renewable	Total
2000	2.9	0.6	2.2	0.7	2.8	0.6	9.7
2001	2.8	0.6	1.9	0.7	2.7	0.6	9.2
2002	2.6	0.5	2.0	0.7	2.6	0.5	8.8
2003	2.6	0.4	1.9	0.6	2.5	0.5	8.6
2004	2.5	0.4	1.8	0.6	2.4	0.4	8.1
2005	2.4	0.6	1.8	0.4	2.2	0.5	7.8
2006	2.2	0.2	1.6	0.6	2.1	0.5	7.1
2007	2.1	0.4	1.6	0.6	2.0	0.5	7.2
2008	2.2	0.3	1.7	0.5	1.9	0.4	7.1
2009	2.0	0.3	1.6	0.6	1.8	0.4	6.6
2010	2.1	0.2	1.5	0.6	1.8	0.5	6.6
2011	1.9	0.2	1.5	0.5	1.7	0.5	6.3
2012	1.5	0.4	1.5	0.4	1.6	0.5	5.8
2013	1.8	0.2	1.6	0.4	1.5	0.5	6.0
2014	1.5	0.3	1.6	0.3	1.6	0.5	5.9
2015	1.5	0.1	1.6	0.4	1.6	0.5	5.5
2016	1.1	0.2	1.6	0.3	1.5	0.5	5.2
2017	1.2	0.1	1.6	0.3	1.5	0.4	5.2

Source: See Wisconsin Resource Energy, Wisconsin State Demographic Profile, Population, Wisconsin Economic Profile, GDP in current Dollars

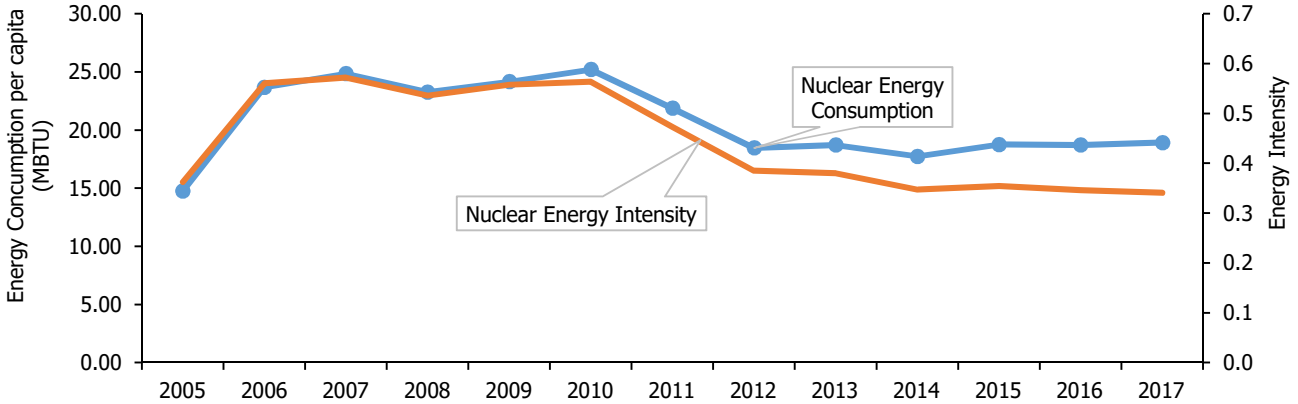
Coal Consumption per capita and Intensity (2000-2017)



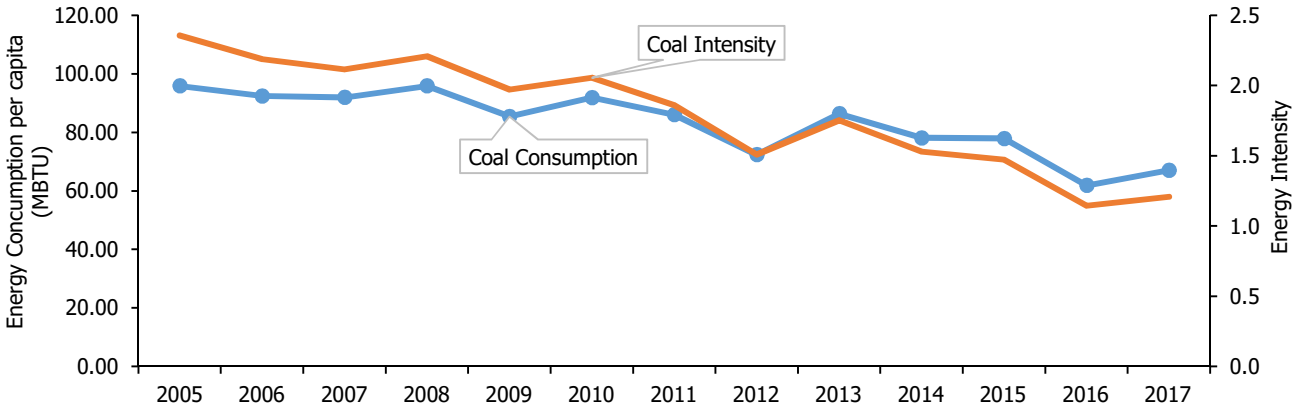
Natural Gas Consumption per capita and Intensity (2000-2017)



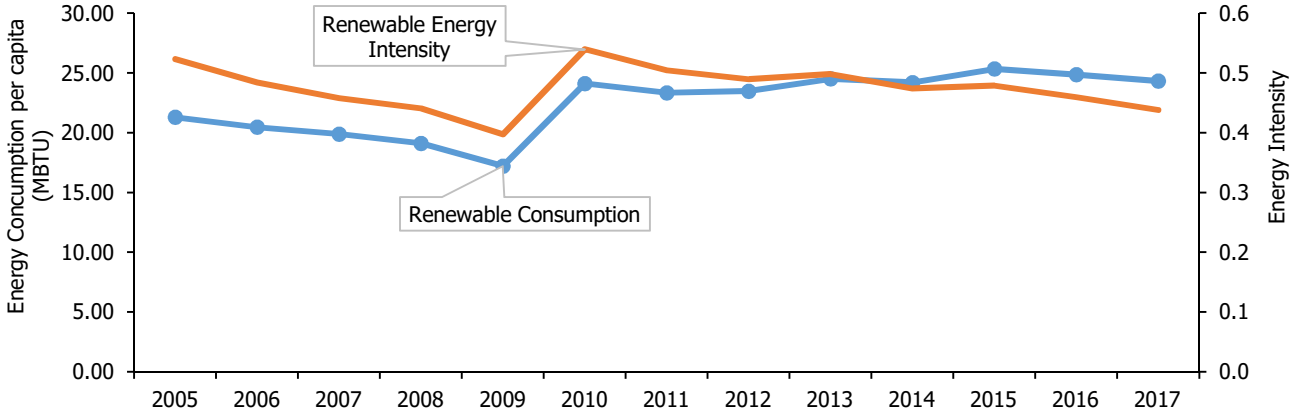
Nuclear Energy Consumption per capita and Intensity (2005-2017)



Petroleum Consumption per capita and Intensity (2000-2017)



Renewable Consumption per capita and Intensity (2005-17)



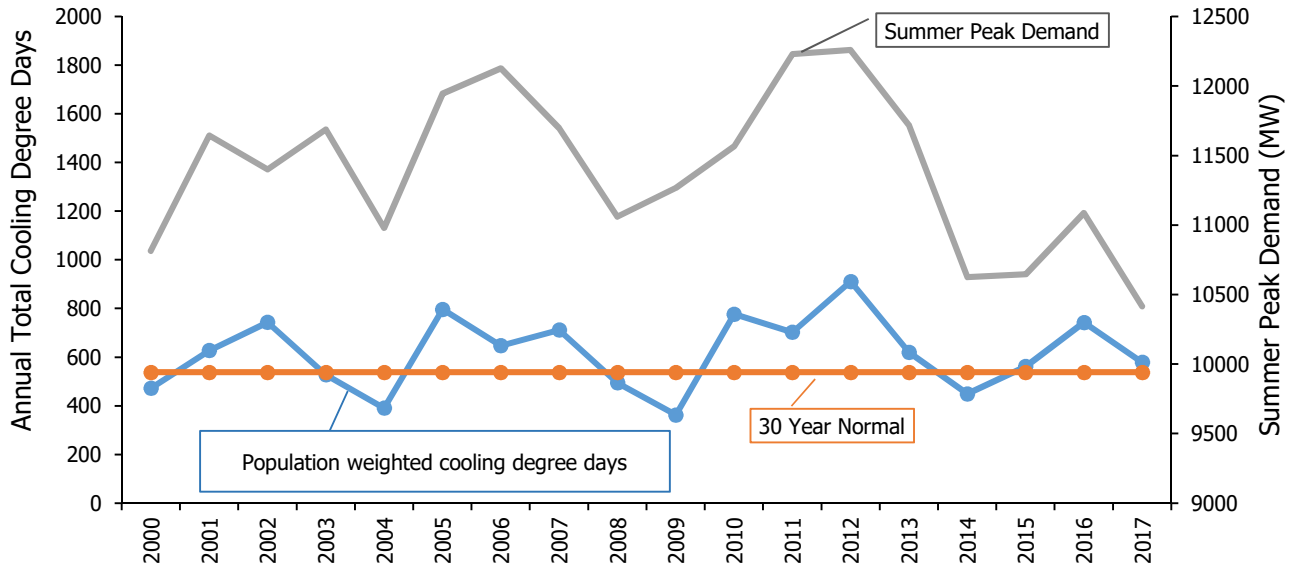
While energy consumption per capita reflects how much energy is consumed by an individual in the economy on an average, the energy intensity shows how much energy is required to produce a unit of GDP. Consumption per capita of almost all the energy sources other than the natural gas, show a declining trend. However, the energy intensity show a declining trend for all the sources. This implies lower energy is required to produce a unit of GDP indicating rising energy efficiency in the state.

Wisconsin Population-Weighted Cooling Degree Days, by Month and 30-year Normal

(2000-2017)

MONTH	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL
2000	0	0	37	88	136	154	53	5	473
2001	0	5	20	126	234	213	29	1	628
2002	0	20	20	162	297	152	87	6	744
2003	0	2	1	69	163	223	66	4	528
2004	0	3	11	66	140	83	87	1	391
2005	0	3	4	211	228	200	119	32	797
2006	0	1	52	94	302	169	26	4	648
2007	0	8	48	132	201	196	90	37	712
2008	0	0	1	93	195	150	52	4	495
2009	0	0	14	114	80	123	32	0	363
2010	0	8	59	110	285	278	36	2	778
2011	0	1	27	94	336	188	48	9	703
2012	14	1	59	200	393	185	59	1	912
2013	0	4	35	101	220	174	82	5	621
2014	0	0	26	116	117	152	38	1	450
2015	0	0	28	74	187	149	122	2	562
2016	0	0	40	127	243	245	82	6	743
2017	0	1	12	141	196	104	108	17	579
30 year population weighted Normal									
	0	3.6	22.6	107.8	193.7	155	50.8	4.7	538.2

Wisconsin Population Weighted Cooling Degree Annual total, Summer Peak Demand and 30 year Normal

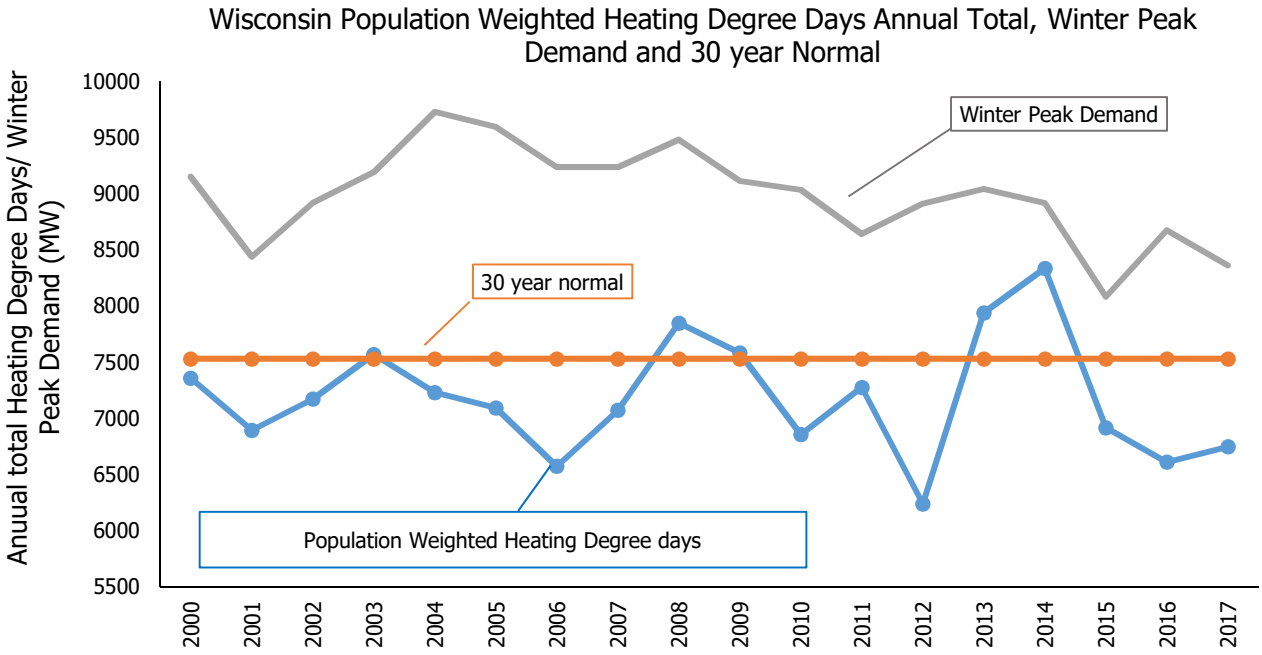


Source: National Oceanographic and Atmospheric Administration, National Weather Service (2000-2017) https://w2.weather.gov/climate/;Wisconsin Office of Energy Innovation, Heating, Cooling and Growing Degree Days (2000-2017) http://degreedays.wi.gov/index.asp, See Summer Peak Demand pp.76

Wisconsin Population-Weighted Heating Degree Days, by Month, and 30-year Normal

(2000-2017)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2000	1428	1057	759	626	245	86	26	15	189	384	909	1636	7360
2001	1335	1287	1069	491	251	96	19	7	192	495	581	1072	6895
2002	1160	1000	1129	604	416	68	1	8	106	615	903	1163	7173
2003	1477	1333	1025	644	345	97	10	5	167	484	841	1142	7570
2004	1570	1199	876	555	324	98	22	78	79	429	749	1253	7232
2005	1436	1043	1073	491	331	20	9	12	75	425	811	1369	7095
2006	1044	1203	949	441	265	46	3	7	190	599	761	1068	6576
2007	1282	1398	853	615	201	35	11	13	130	319	879	1337	7073
2008	1451	1378	1111	579	350	42	7	11	107	478	861	1477	7850
2009	1689	1160	977	607	264	106	34	50	96	607	671	1323	7584
2010	1447	1161	811	421	232	37	1	5	176	396	795	1375	6858
2011	1516	1211	1059	636	330	70	1	4	211	404	748	1088	7277
2012	1242	1036	541	550	166	36	0	17	194	530	826	1103	6241
2013	1375	1244	1176	706	289	79	22	17	137	477	918	1501	7941
2014	1694	1502	1223	666	271	44	24	10	178	496	1073	1155	8336
2015	1420	1509	970	554	240	69	24	31	68	420	682	932	6919
2016	1406	1144	813	629	264	32	6	5	58	355	608	1293	6613
2017	1277	934	981	473	317	32	4	38	105	351	881	1357	6749
30 year Population weighted Normal													
	1451	1195	1000	597	300	79	15	28	172	505.1	874.5	1313	7531



Looking at the above charts, most of the years show higher total cooling degree days than 30 year population weighted- normal implying hotter summers in the state. This has an obvious impact on peak electricity demand during summers. Whereas, most of the years show lower total heating degree days implying warmer winters, lesser dependency on natural gas and electricity for heating.

Source: Wisconsin Office of Energy Innovation, Heating, Cooling and Growing Degree Days (2000-2017) http://degreedays.wi.gov/index.asp, See winter peak demand

Energy Use & Prices

Energy consumption and fuel costs can vary widely by not only the type of fuel, but also by economic sector. The type and amount of fuel consumed by an economic sector depends largely on its economic activity, but is also influenced by the price of energy which can change in response to market prices and policies.

An economic sector is defined by the major economic activities of a particular group: Agricultural, Commercial, Electric Utility, Industrial, Residential, and Transportation. Economic sectors may overlap in the type of fuel they consume, but end use often varies. For instance, the residential sector uses natural gas primarily for space heating whereas the electric utility sector uses natural gas as fuel for generating electricity; the transportation sector uses petroleum as motor gasoline while the agricultural sector uses petroleum primarily in the form of diesel to power farm equipment; and the industrial and commercial sectors are the largest consumers of electricity, using electricity primarily for manufacturing and production of goods or to power and light offices and buildings.

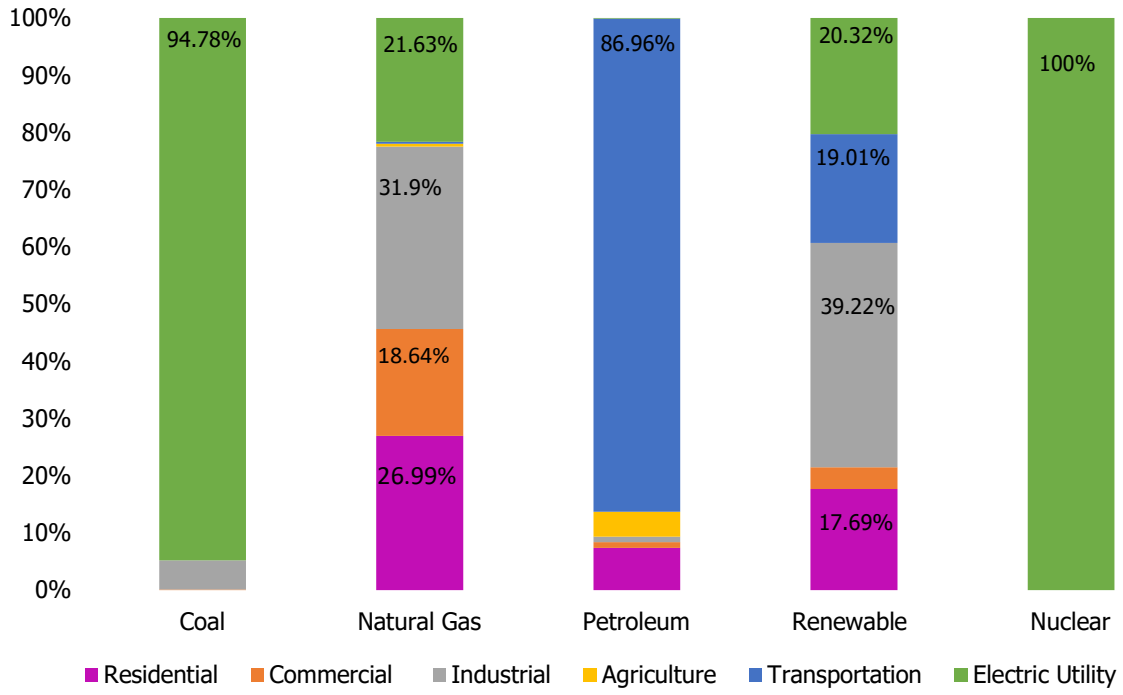
From 2009 to 2017, natural gas consumption by the Utilities has increased by approximately 100 percent, attributable to technological advances in drilling that allowed previously 'trapped' natural gas reserves to be extracted, leading to greater supply and lower prices. Low natural gas prices over this period led to an increase in the number of natural gas powered vehicles operating within the Transportation sector. Because of this, natural gas consumption by the Transportation sector increased from 0.02 trillion British thermal units (tBtu) in 2005 to 1.76 tBtu in 2017.

Renewable energy use by commercial and industrial sectors increased as prices for renewable resources decreased. This was due in part to federal and state incentives designed to help bring renewable energy into price parity with conventional energy resources (e.g. coal, natural gas). In 2005, the state of Wisconsin passed Legislative Act 141 which established the Focus on Energy program, Wisconsin's statewide energy efficiency and renewable energy program. Focus on Energy provided financial incentives to commercial customers and large energy users (typically industrial customers) to help spur greater adoption and development of renewable energy technologies and systems.

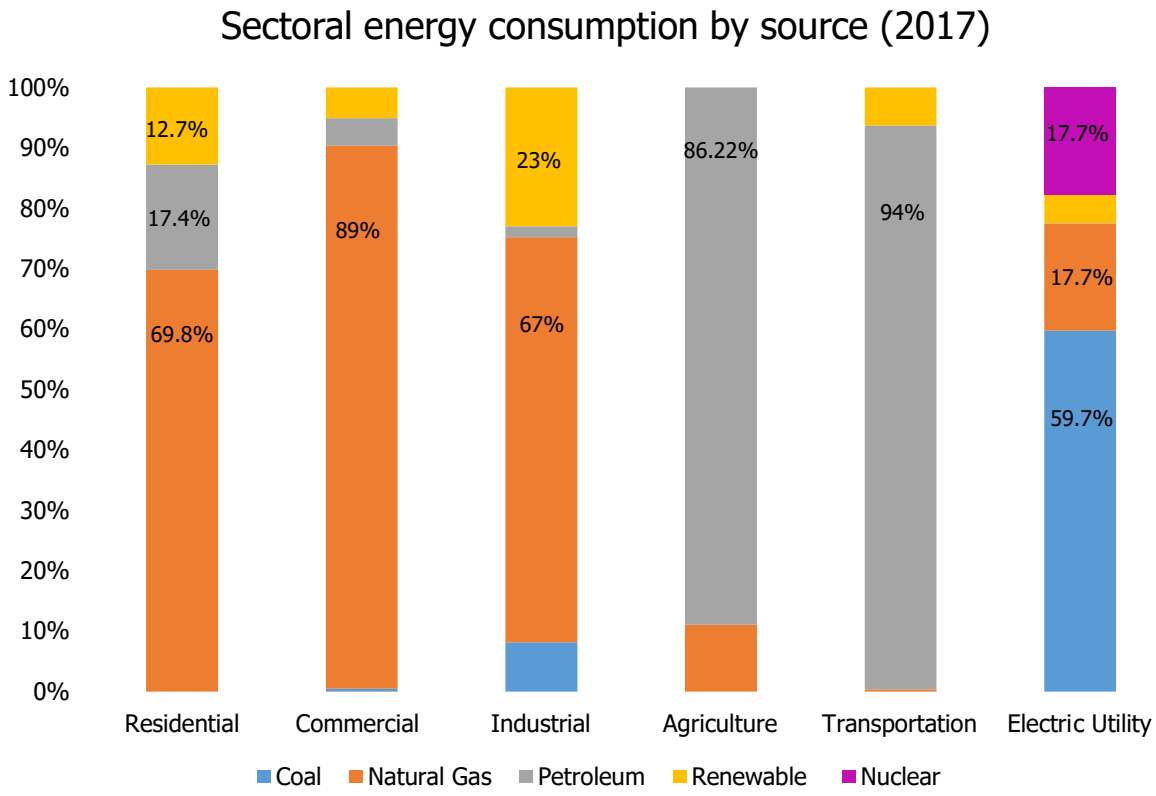
ENERGY USE BY SOURCE AND SECTOR (2017)

Energy Use for all Resources (*Trillions of BTU*)	Coal	Natural Gas	Petroleum	Renewable	Nuclear	TOTAL	% of total energy use by each sector
Residential	0.00	136.30	33.97	24.934	0	**195.20**	*12.0%*
Commercial	0.50	94.10	4.76	5.315	0	**104.68**	*6.4%*
Industrial	19.70	161.10	4.30	55.275	0	**240.38**	*14.7%*
Agriculture	0.00	2.50	20.05	0.000	0	**22.55**	*1.4%*
Transportation	0.00	1.76	397.46	26.790	0	**426.01**	*27.7%*
Electric Utility	368.30	109.20	0.43	28.636	104	**610.56**	*37.8%*
TOTAL	**388.60**	**504.96**	**460.97**	**140.95**	**104**	**1600**	
% of total energy use per fuel type	*23%*	*30.96%*	*29.86%*	*9%*	*7%*		*100.0%*

Fuel consumption by each sector (2017)



Source: See Wisconsin Resource Energy Use


Sectoral energy consumption by source (2017)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
12.7%
17.4%
69.8%
89%
23%
67%
86.22%
94%
17.7%
17.7%
59.7%
Residential
Commercial
Industrial
Agriculture
Transportation
Electric Utility
Coal
Natural Gas
Petroleum
Renewable
Nuclear

Average Utility Electricity and Natural Gas Prices by Economic Sector for Selected Midwestern States
(2016 - 2017)

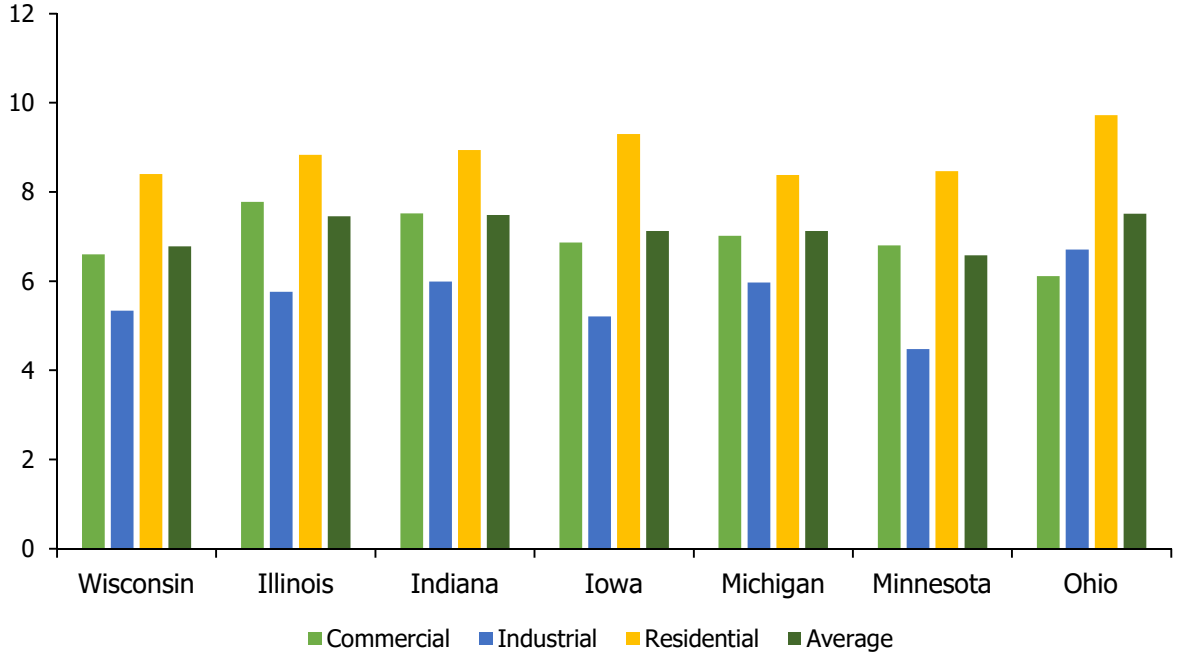
		Electricity (Cents Per kWh)				Natural Gas (Dollars Per Million Btu)			
		Commercial	Industrial	Residential	Average	Commercial	Industrial	Residential	Average
2016	Wisconsin	10.76	7.48	14.10	10.78	6.29	5.05	8.07	6.47
	Illinois	9.02	6.51	12.62	9.38	7.14	5.03	7.88	6.68
	Indiana	10.01	6.98	11.86	9.62	6.55	4.99	7.92	6.49
	Iowa	9.13	6.02	11.94	9.03	5.99	4.70	8.13	6.27
	Michigan	10.63	6.91	15.21	10.92	6.9	5.75	8.21	6.95
	Minnesota	9.85	7.60	12.71	10.05	6.44	4.19	8.01	6.21
	Ohio	9.98	6.98	12.51	9.82	5.74	4.81	9.03	6.53
	United States	10.43	6.75	12.55	10.27	7.28	3.51	10.05	6.95
2017	Wisconsin	10.87	7.49	14.38	10.91	6.6	5.34	8.4	6.78
	Illinois	9.09	6.47	13.04	9.53	7.78	5.76	8.83	7.46
	Indiana	10.05	7.54	12.35	9.98	7.52	5.99	8.94	7.48
	Iowa	9.43	6.17	12.35	9.32	6.87	5.21	9.30	7.13
	Michigan	11.01	7.20	15.40	11.20	7.02	5.97	8.38	7.12
	Minnesota	10.47	7.37	13.08	10.31	6.8	4.48	8.47	6.58
	Ohio	10.06	6.92	12.65	9.88	6.11	6.71	9.72	7.51
	United States	10.66	6.88	12.89	10.48	7.88	4.10	10.91	7.63

On an average Wisconsin's electricity prices are higher than the nationwide average in 2017. While in the commercial sector the electricity Price is almost 2% higher than the National Average, in the industrial sector the prices are higher by 8% and in the residential sector the prices are higher by 10%.

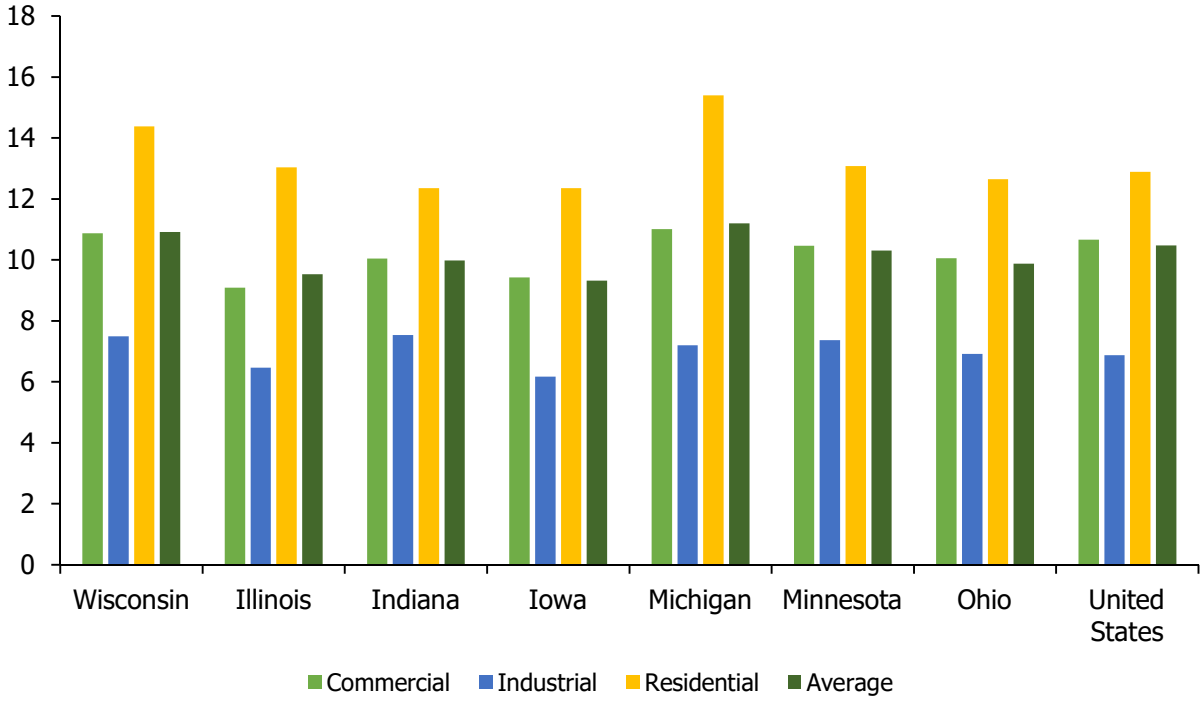
In the case of natural gas, Wisconsin prices are lower than the national prices: in the commercial sector by 19% and in the residential sector by 11%. However, natural gas price in the industrial sector is higher in Wisconsin than the national price by more than a dollar.

Source: U.S Energy Information Administration, Electricity, Average Price by State by Provider (EIA-861) (2016-17) https://www.eia.gov/electricity/data/state/, U.S Energy Information Administration, Natural Gas (2016-17) https://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PIN_DMcf_a.htm

Average Utility Natural Gas Prices, by Economic Sector, for Selected Midwestern States, Dollar per Million Btu (2017)



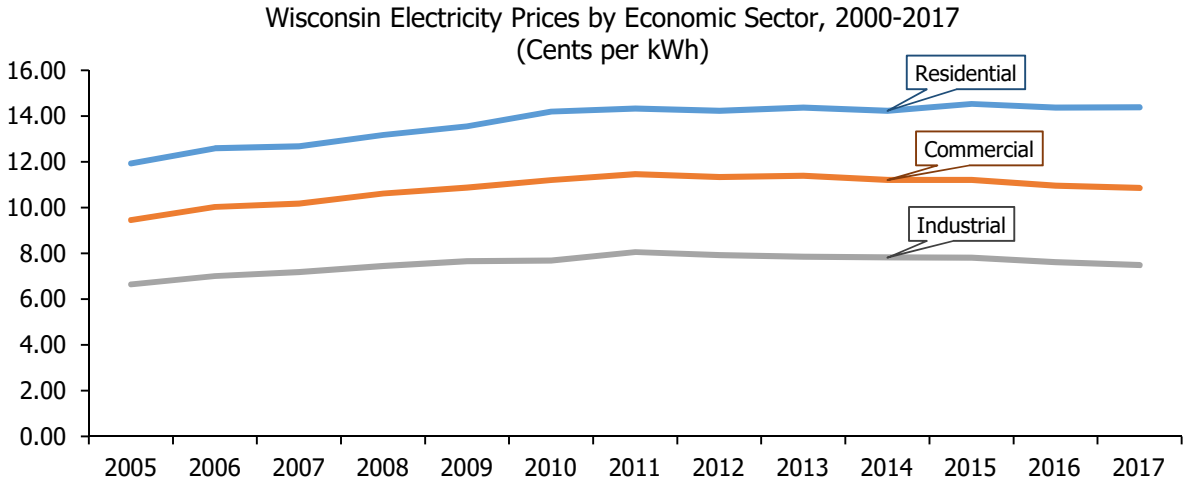
Average Utility Electricity Prices, by Economic Sector, for Selected Midwestern States, Cents per kWh (2017)



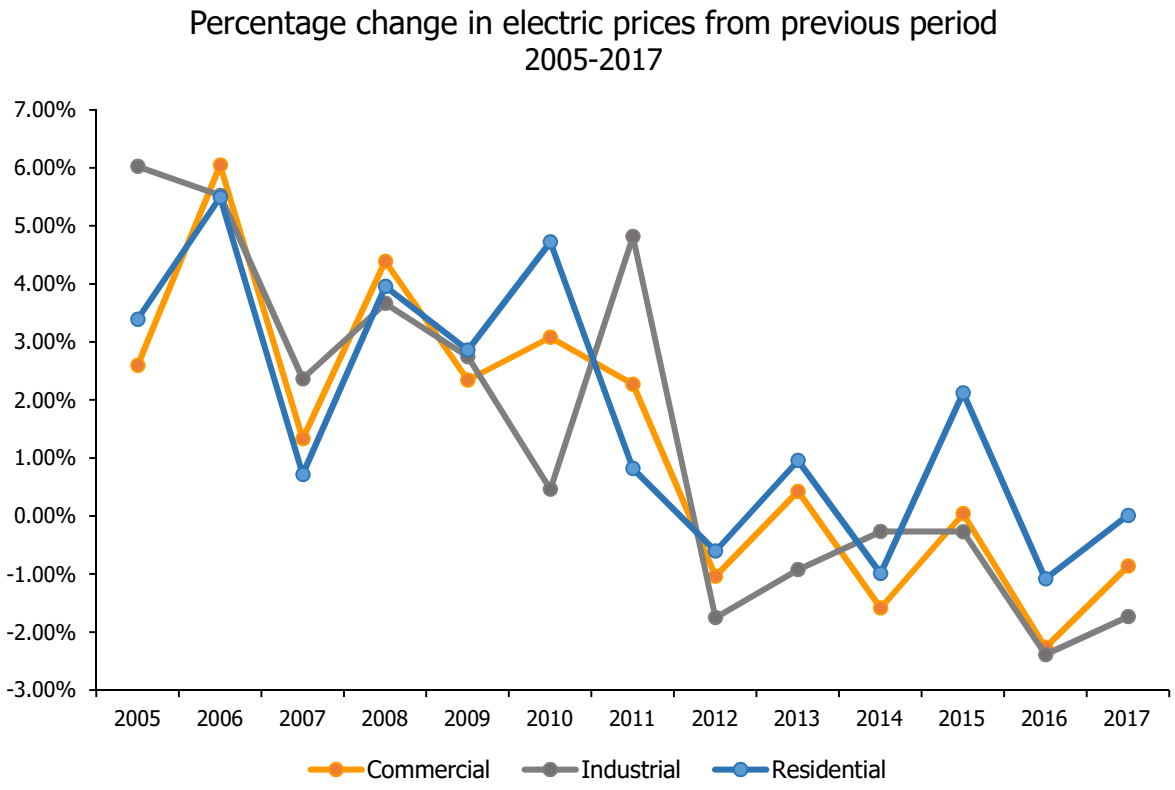
Wisconsin Electricity Prices by Economic Sector

2005-2017 (Cents per kWh)

Year	Nominal Dollars				2017 Dollars			
	Commercial	Industrial	Residential	Average	Commercial	Industrial	Residential	Average
2005	7.67	5.39	9.67	7.58	9.47	6.66	11.94	9.36
2006	8.38	5.86	10.51	8.25	10.04	7.02	12.60	9.89
2007	8.72	6.16	10.87	8.58	10.18	7.19	12.69	10.02
2008	9.28	6.51	11.52	9.10	10.62	7.45	13.19	10.42
2009	9.57	6.74	11.94	9.42	10.87	7.66	13.57	10.70
2010	9.98	6.85	12.65	9.83	11.21	7.69	14.21	11.04
2011	10.42	7.33	13.02	10.26	11.46	8.06	14.32	11.28
2012	10.51	7.34	13.19	10.35	11.35	7.92	14.24	11.17
2013	10.74	7.40	13.55	10.56	11.39	7.85	14.37	11.21
2014	10.77	7.52	13.67	10.65	11.21	7.83	14.23	11.09
2015	10.89	7.58	14.11	10.86	11.22	7.81	14.54	11.19
2016	10.76	7.48	14.11	10.78	10.96	7.62	14.38	10.99
2017	10.87	7.49	14.38	10.91	10.87	7.49	14.38	10.91



Source: U.S. Energy Information Administration, Electricity (2005-2017) https://www.eia.gov/electricity/data/state/ (average price by state



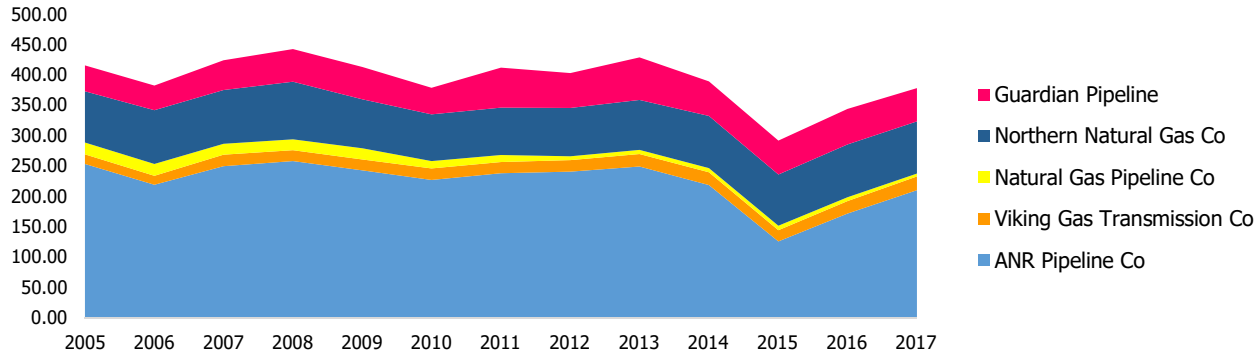
Electricity prices seem flat after 2011 across sectors. But if we look at the percentage change in the prices from the previous period in all the sectors, we observe that after 2013 there is a fall in prices in commercial and industrial sector. Percentage change in prices with negative values for the years 2012, 2014 and 2016 show that the prices have fallen in those years. The commercial and industrial sectors have seen greater fall in price than the residential sector.

Wisconsin Natural Gas Deliveries by Pipeline Company

2005-2017 (Trillions of Btu)

Year	ANR Pipeline Co.[a]	Viking Gas Transmission Co.[b]	Natural Gas Pipeline Co.[c]	Northern Natural Gas Co.	Guardian Pipeline[d]	Total[e]
2005	253.20	16.06	19.57	84.00	42.89	415.72
2006	219.00	14.60	19.90	88.60	40.60	382.70
2007	249.90	18.78	17.96	88.40	48.87	423.91
2008	258.30	17.94	17.46	94.90	53.91	442.51
2009	243.00	17.62	18.51	80.60	53.48	413.21
2010	226.90	18.80	12.20	77.10	43.90	378.90
2011	237.90	18.80	11.40	77.96	66.10	412.16
2012	240.75	18.73	6.59	79.55	57.23	402.85
2013	249.04	20.75	6.57	82.22	70.51	429.09
2014	218.49	20.92	6.87	86.29	57.02	389.59
2015	125.58	18.58	7.44	84.58	55.75	291.93
2016	171.50	20.50	6.50	87.10	58.70	344.20
2017	210.00	22.90	4.59	86.00	55.00	378.49

Wisconsin Natural Gas Deliveries by Pipeline Company, 2000-17 (Trillions of BTU)



The dip in 2015 is mainly due to the reduced usage by the mining operation and warmer winter. The total delivery in the state reduced by almost 25% in 2015.

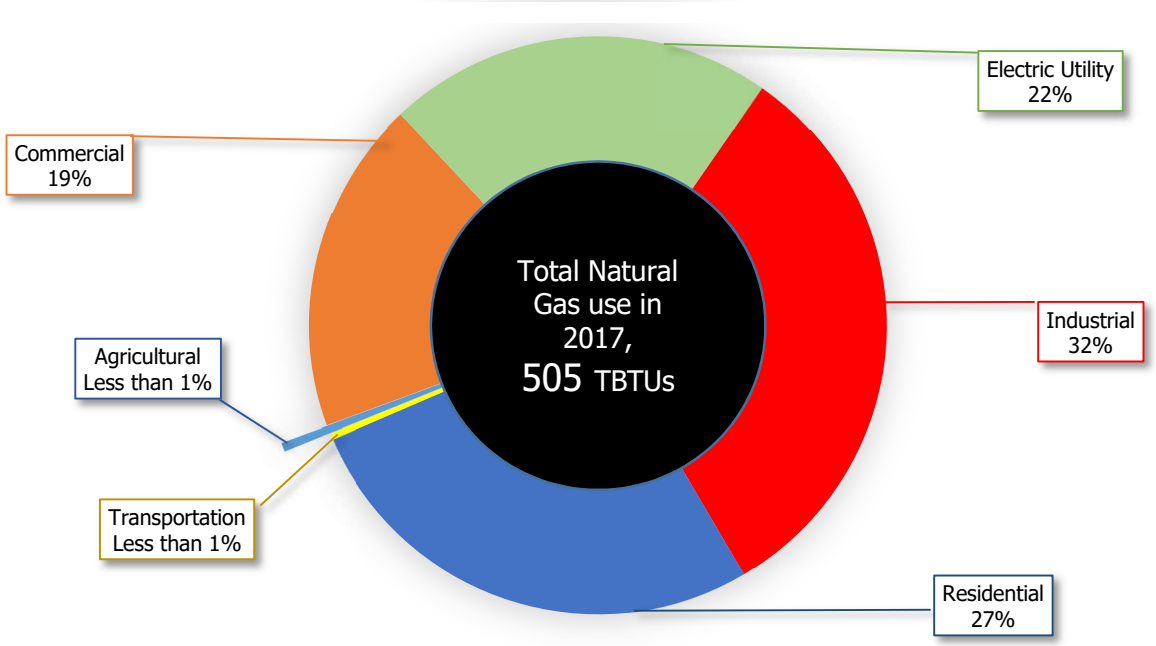
[a] Formerly American Natural Resources Pipeline Co.
[b] Formerly Midwest Gas Transmission Co.
[c] In 1994, Midcon Corporation became part of the Natural Gas Pipeline Co.
[d] Guardian Pipeline became operational on December 7, 2002.
[e] Total purchases differ from the total sold and used by gas utilities due to inventory changes, utility production from liquefied petroleum gas, and some unaccounted gas.
Source: Personal communication, ANR Pipeline Company, Viking Gas Transmission Company, Natural Gas Pipeline Company, Northern Natural Gas Company, Guardian Pipeline (2000-17).

Wisconsin Natural Gas Use by Economic Sector

2005-2017 (Trillions of Btu)

Year	Agricultural	Commercial[f]	Electric Utility[g]	Industrial	Residential	Transportation[h]	Total Resource Use	Total End Use
2005	1.26	87.21	59.38	132.27	132.92	0.02	413.06	353.68
2006	1.11	87.29	44.46	119.70	121.89	0.02	374.47	330.01
2007	1.14	90.26	54.92	122.81	133.00	0.02	402.15	347.23
2008	3.64	98.50	41.71	129.61	142.54	0.02	416.02	374.31
2009	2.52	92.74	41.58	121.39	135.04	0.02	393.29	351.71
2010	1.62	83.03	43.07	122.62	124.85	0.03	375.22	332.16
2011	2.49	88.26	48.40	128.63	131.26	0.06	399.10	350.71
2012	1.77	78.41	88.63	126.70	114.69	0.17	410.37	321.74
2013	1.54	99.30	62.70	139.40	146.60	0.44	449.98	387.28
2014	1.70	111.00	61.70	146.20	155.20	0.98	476.78	415.08
2015	1.52	94.40	103.00	143.10	132.80	1.31	476.13	373.13
2016	1.31	92.80	121.80	149.80	131.20	1.58	498.49	376.69
2017	2.50	94.10	109.20	161.10	136.30	1.76	504.96	395.76

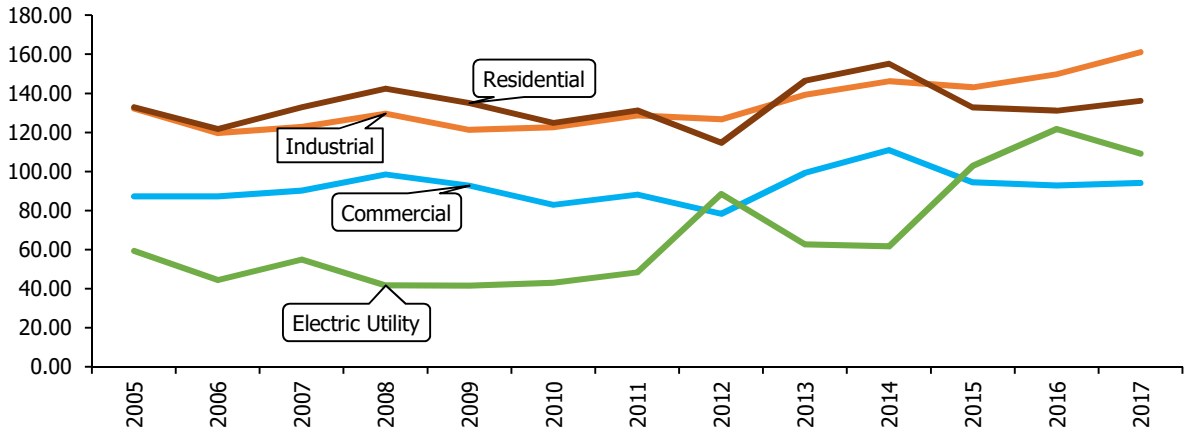
Wisconsin Natural Gas Use by Economic Sector, 2017 (Trillions of Btu)



[f] Includes sales to government agencies and other public authorities for general or institutional purposes and vehicle fuel, classified as "other" sales by the American Gas Association. 2005 - 2012 revised, change in methodology.
[g] Includes gas used in electric power generation by utilities and independent power producers.
[h] Includes compressed (CNG) and liquefied (LNG) natural gas used for vehicle fuel.
Source: Personal Communication with U.S. Department of Agriculture, U.S.Energy Information Administration, State Energy Data System, Consumption 2005-2017 https://www.eia.gov/state/seds/seds-data-complete.php?sid=WI

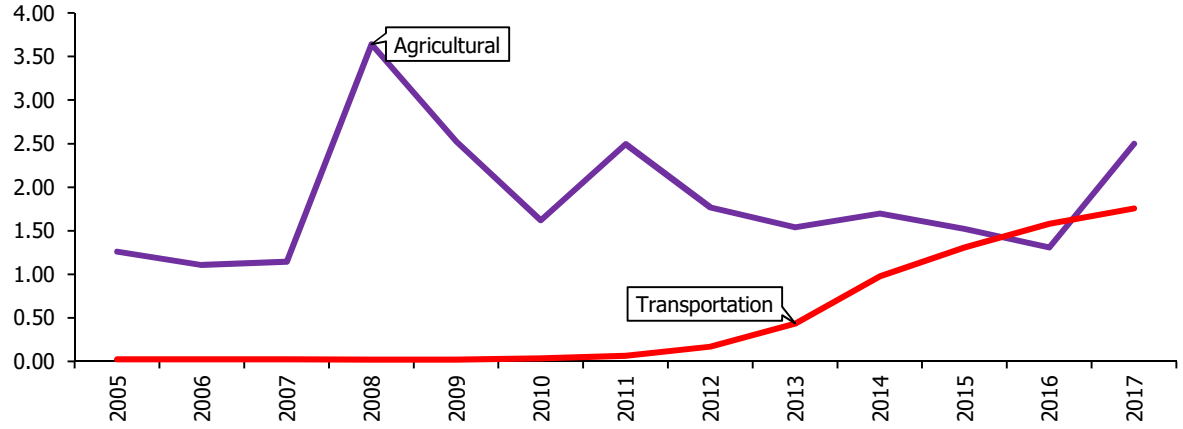
In the commercial sector, there was a dip in the natural gas use during the period 2008-2012, but after 2012 the consumption of natural gas has gone up. The rise in consumption of natural gas by both the commercial and industrial sector is in response to the fall in price after 2012. Natural Gas use by electric utility shows fluctuations but there is an overall rise in consumption of natural gas by electric utilities for producing electricity. The rise in natural gas use by utilities is due to the closing of coal plants in the state. Natural Gas use by the residential sector is mostly affected by the weather. The number of heating degree days were lower in the years 2006, 2012 and 2015 which is well reflected in the graph of natural gas use by the residential sector.

Natural Gas Use by Economic Sectors (TBTU)



Even though, the Transportation sector and the agricultural sector use a small percentage of natural gas, the consumption by these sectors show an increasing trend.

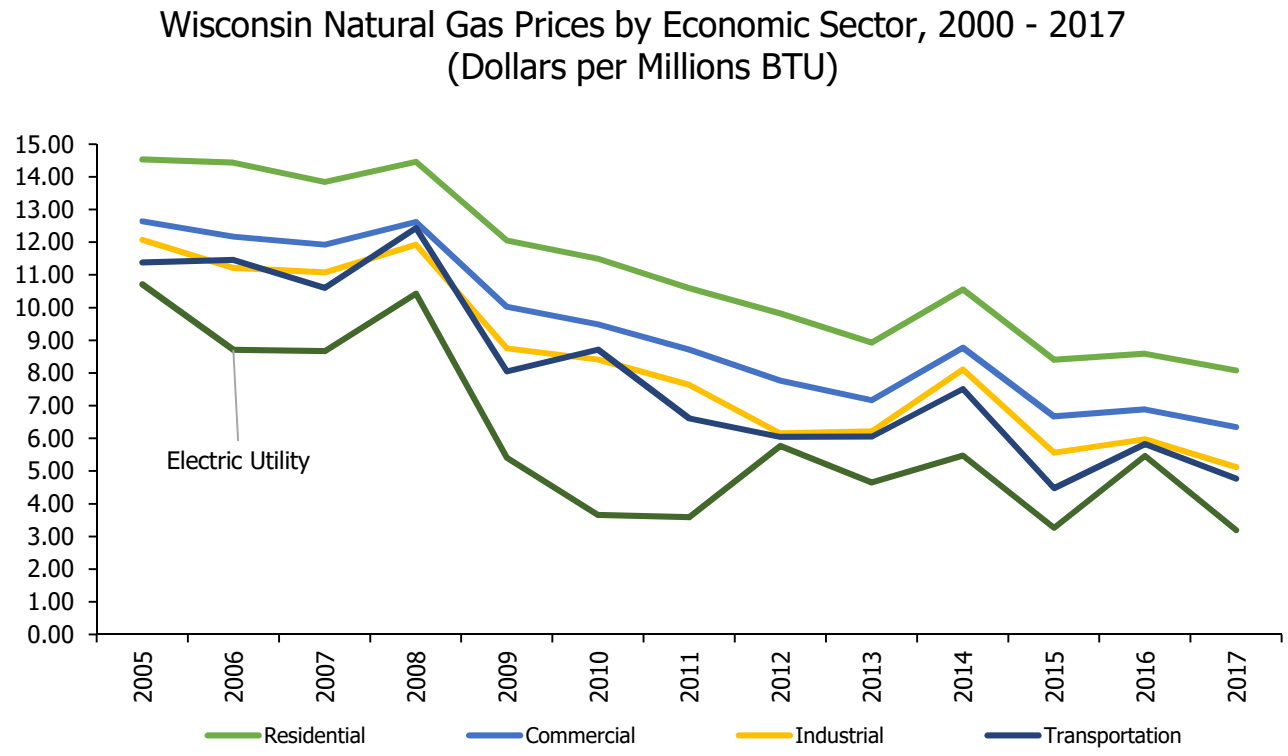
Natural Gas Use by Agricultural and Transportation Sector (TBTU)



Wisconsin Natural Gas Prices by Economic Sector

2005-2017 (2017 Dollars per Millions BTU)

Year	Commercial	Electric Utility	Industrial	Residential	Transportation	Average
2005	12.64	10.72	12.08	14.53	11.38	**12.80**
2006	12.18	8.71	11.22	14.43	11.46	**12.21**
2007	11.93	8.67	11.08	13.84	10.61	**11.87**
2008	12.63	10.43	11.93	14.46	12.43	**12.85**
2009	10.03	5.41	8.76	12.06	8.06	**9.87**
2010	9.49	3.66	8.41	11.50	8.72	**9.43**
2011	8.71	3.59	7.65	10.59	6.61	**8.60**
2012	7.77	5.78	6.15	9.82	6.05	**6.93**
2013	7.17	4.66	6.22	8.93	6.06	**7.13**
2014	8.78	5.48	8.11	10.56	7.52	**8.15**
2015	6.68	3.27	5.56	8.41	4.48	**5.77**
2016	6.89	5.47	5.98	8.59	5.83	**6.55**
2017	6.35	3.20	5.13	8.08	4.77	**5.51**



Note: The prices are different than the source because the prices in the source are current year prices and the prices above are chained to 2017.

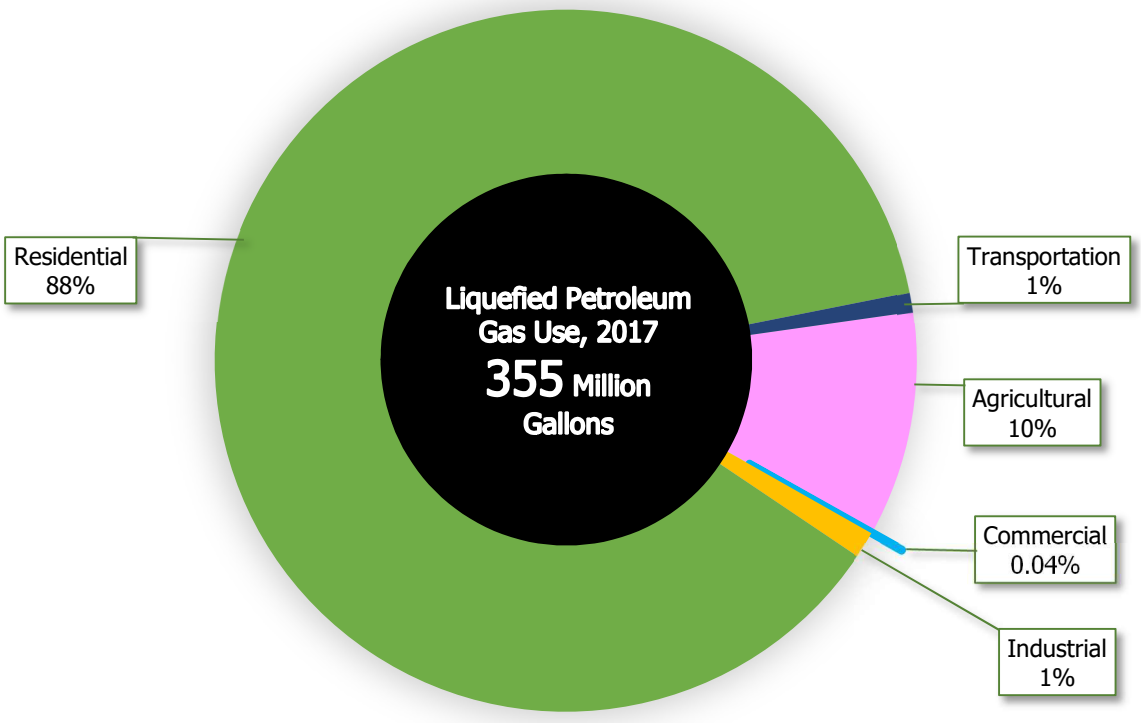
Source: U.S. Energy Information Administration, State Energy Data System Prices and Expenditures (2000-2017) http://www.eia.gov/state/seds/seds-data-complete.cfm#PricesExpenditures

Wisconsin Liquefied Petroleum Gas Use by Economic Sector

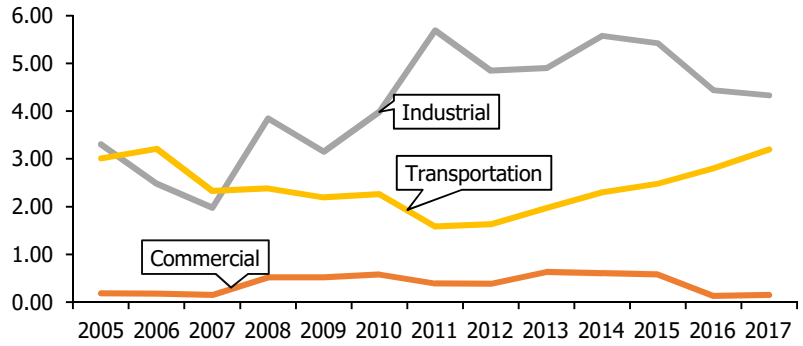
2005-2017 (Millions of Gallons)

Year	Agricultural	Commercial	Industrial	Residential	Transportation	Total
2005	22.61	0.19	3.31	234.80	3.01	263.91
2006	27.07	0.18	2.48	270.61	3.22	303.56
2007	28.35	0.15	1.98	265.73	2.33	298.55
2008	31.80	0.52	3.85	253.74	2.39	292.30
2009	37.83	0.52	3.15	264.42	2.20	308.13
2010	28.74	0.58	3.99	230.67	2.26	266.24
2011	22.53	0.40	5.69	231.08	1.58	261.27
2012	23.97	0.39	4.85	213.45	1.63	244.28
2013	35.87	0.64	4.91	274.65	1.97	318.03
2014	30.72	0.61	5.58	304.72	2.30	343.93
2015	32.90	0.58	5.42	278.53	2.49	319.93
2016	33.70	0.13	4.44	276.70	2.81	317.78
2017	36.80	0.15	4.33	310.77	3.20	355.25

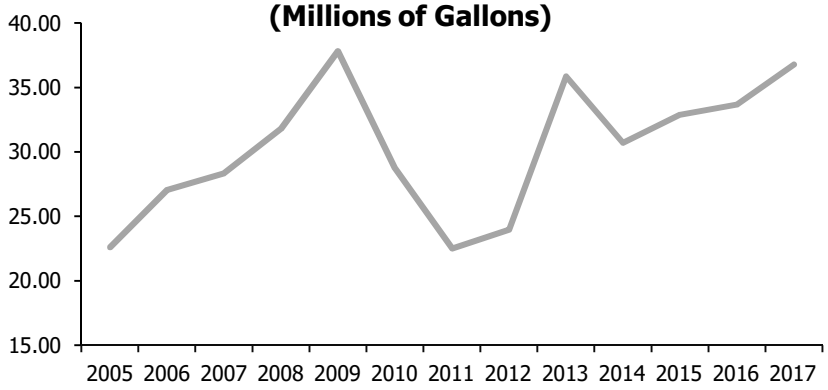
Wisconsin Liquefied Petroleum Gas Use by Economic Sector
2017



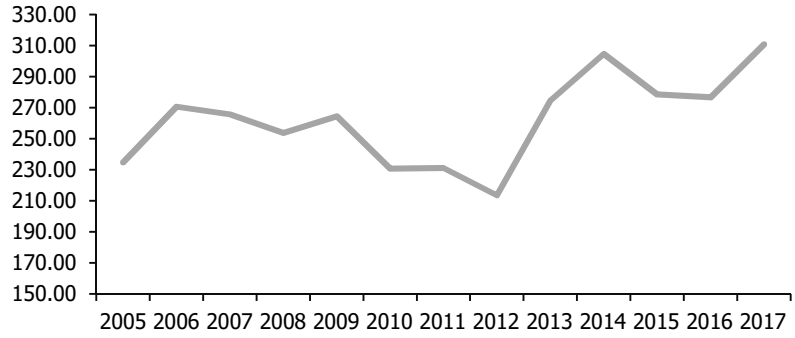
LPG use by Economic Sectors 2000-2017 (Millions of Gallons)



LPG use by Agricultural Sector 2000-2017 (Millions of Gallons)



LPG use by Residential Sector 2000-2017 (Millions of Gallons)



Both industrial and commercial sectors are increasingly shifting their preference to natural gas. The transportation sector uses more Motor gasoline and Diesel. The LPG use by these three sectors is considerably lower than the consumption by agricultural and residential use.

The fluctuations in LPG demand by industrial and commercial sectors are mainly responsive to price changes. The decline in LPG consumption by agricultural and residential sectors in 2011 and 2012 was largely due to the two of the warmest North American winters on record, which significantly reduced propane demand for grain drying and space heating. The increase in demand in 2013 and 2014 was primarily due to colder-than-normal weather in the eastern half of the country during the winter heating season, and higher-than-average grain drying demand for propane in the Midwest amid two record corn harvests.

Source:
https://afdc.energy.gov/files/u/publication/2016_propane_market_outlook.pdf

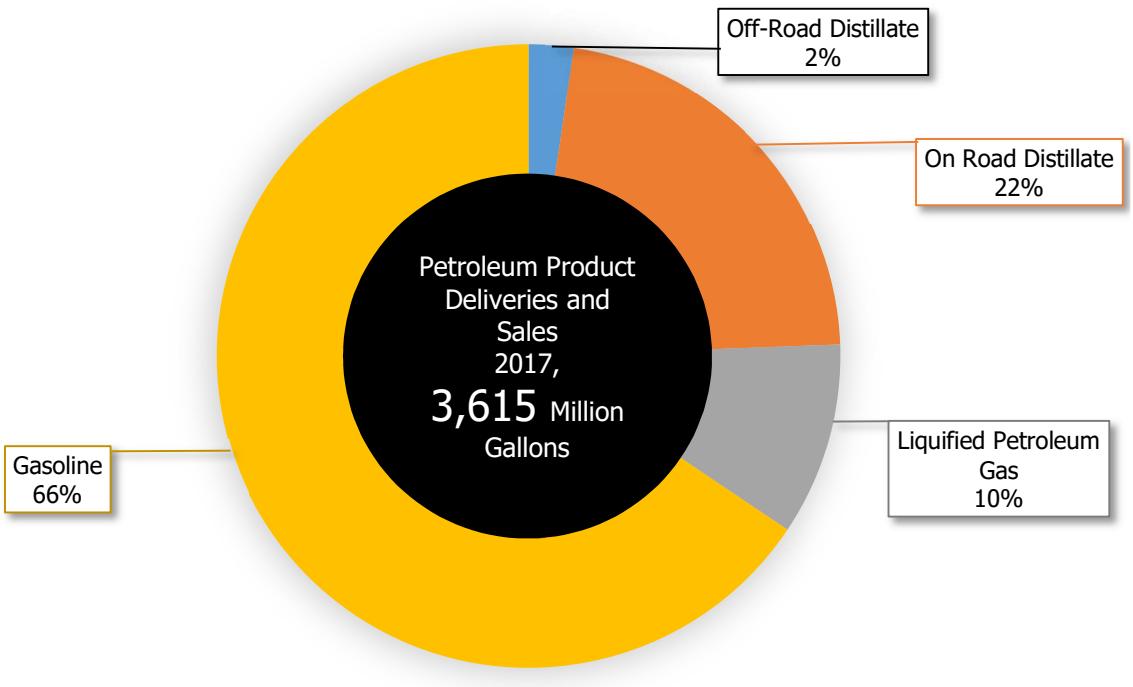
Source: U.S. Department of Agriculture: personal communication, U.S. Department of Energy, Form EIA-25 Prime Supplier's Monthly Report (1974-2012), Form EIA-782C Monthly Report of Petroleum Products Sold into States for Consumption (2000 – 2017) http://www.eia.gov/petroleum/marketing/prime/; Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions (2000-2017) Unpublished data; Wisconsin Department of Revenue, Federal Highway Report (2008 – 2017) https://www.revenue.wi.gov/Pages/ISE/Excise_Fuel-Home.aspx#fuelstat

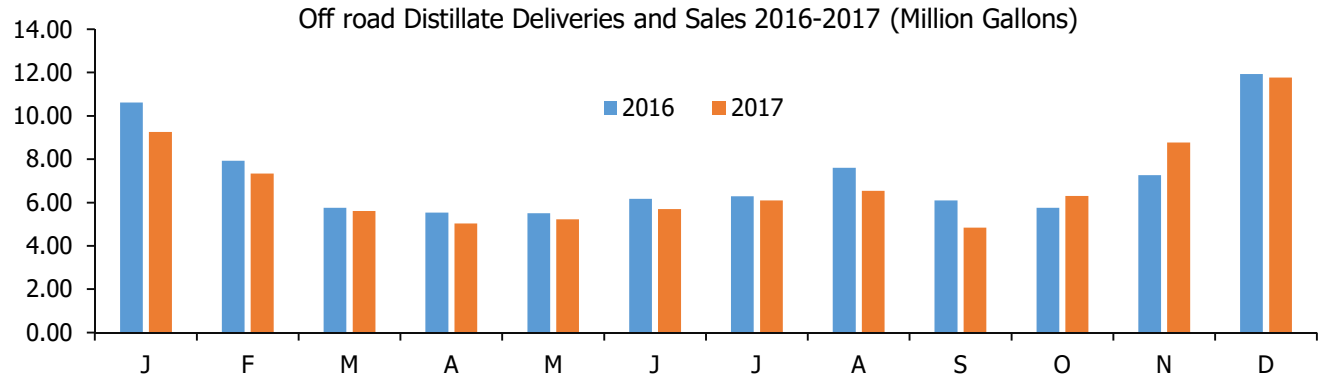
Monthly Petroleum Product Deliveries and Sales in Wisconsin

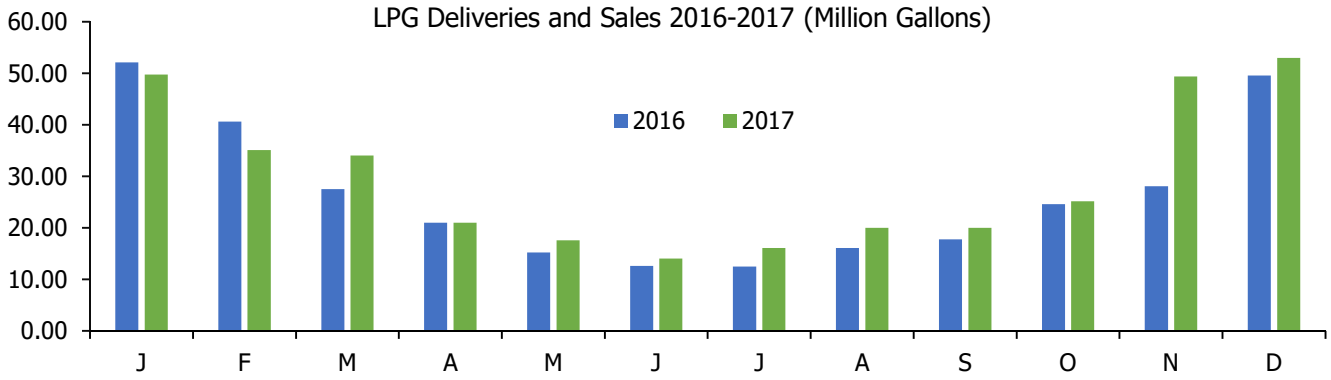
2016-2017 (Millions of Gallons)

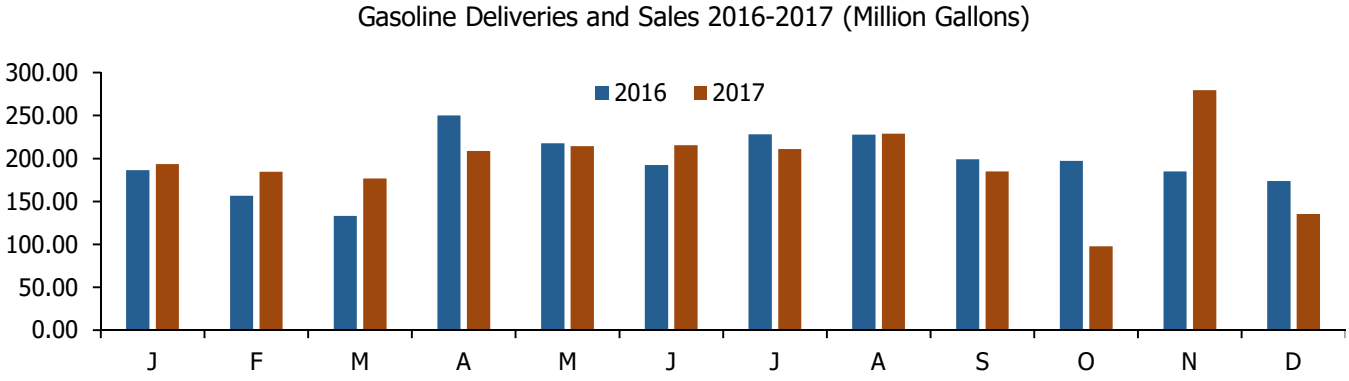
	Off-Road Distillate		On-Road Distillate		Liquefied Petroleum Gas		Gasoline		Total Monthly Fuel Deliveries	
Months	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
January	10.61	9.26	62.68	56.12	52.11	49.78	186.42	193.61	**311.83**	**308.78**
February	7.93	7.33	55.61	69.48	40.63	35.11	156.45	184.76	**260.62**	**296.68**
March	5.76	5.61	29.78	62.46	27.53	34.08	133.21	176.69	**196.27**	**278.84**
April	5.54	5.03	96.66	70.98	21.01	21.03	250.12	208.87	**373.32**	**305.91**
May	5.51	5.23	72.92	71.48	15.21	17.61	217.81	214.41	**311.45**	**308.72**
June	6.17	5.70	58.13	72.40	12.64	14.02	192.45	215.63	**269.38**	**307.75**
July	6.30	6.10	69.75	61.57	12.50	16.08	228.26	211.00	**316.81**	**294.75**
August	7.60	6.54	71.14	81.23	16.11	20.03	227.68	261.61	**322.53**	**369.41**
September	6.09	4.85	71.25	67.40	17.79	20.00	199.11	213.91	**294.23**	**306.16**
October	5.75	6.31	73.02	21.29	24.64	25.16	197.42	97.86	**300.84**	**150.62**
November	7.27	8.76	57.73	113.58	28.08	49.40	184.90	279.49	**277.97**	**451.22**
December	11.94	11.76	56.45	36.90	49.56	53.00	173.61	135.33	**291.55**	**237.00**
Annual Total	86.45	82.48	775.11	784.89	317.80	355.31	2347.43	2393.16	**3526.79**	**3615.83**

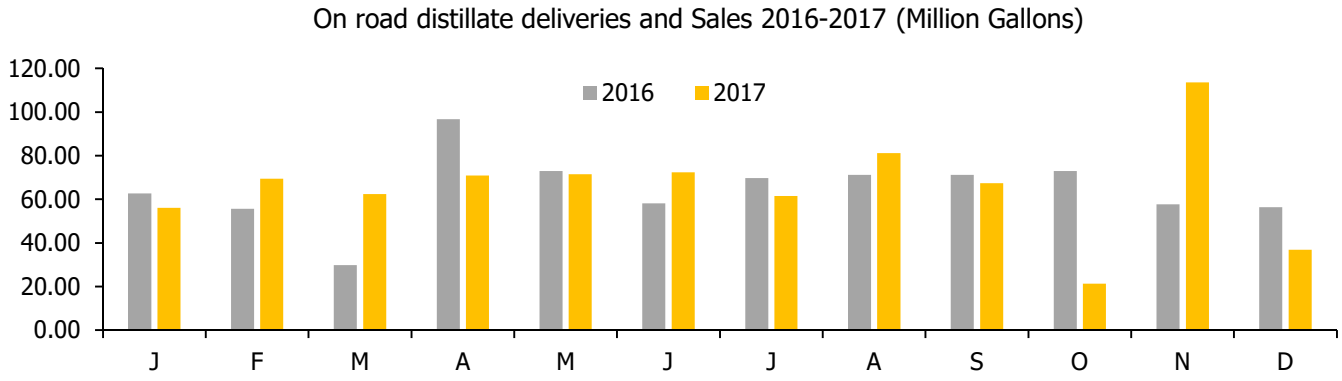
Petroleum Product Deliveries and Sales 2017











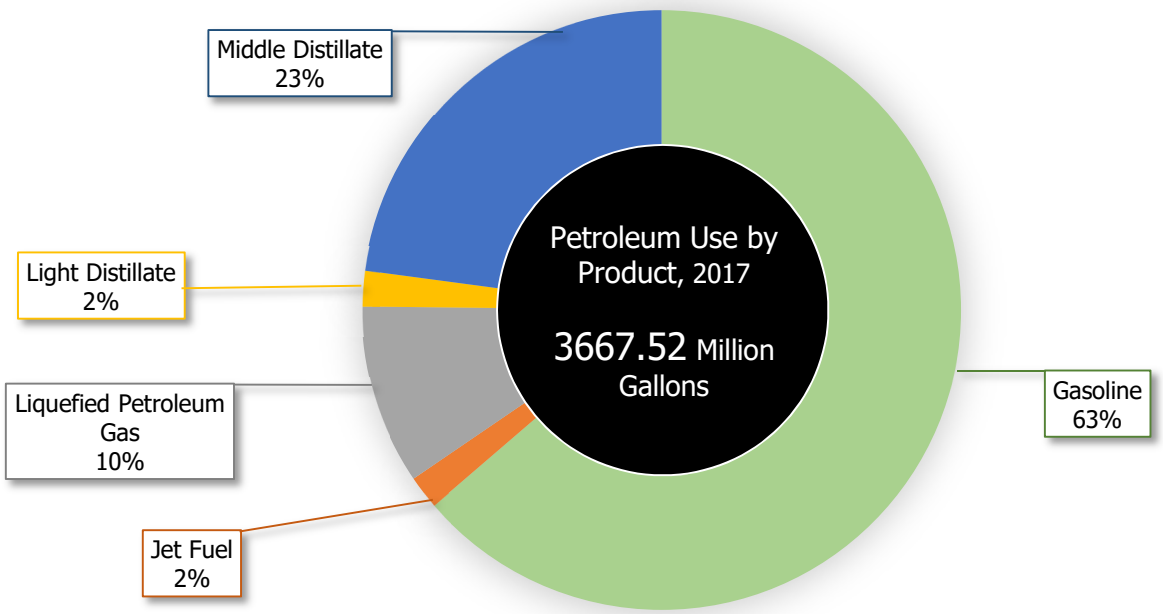
Source: U.S. Energy Information Administration, Petroleum and Other Liquids, Prime Supplier Report Archives (2016-2017): https://www.eia.gov/petroleum/marketing/prime/archive/#2019-2020, State of Wisconsin Department of Revenue, Federal Highway Report (2016-2017) https://www.revenue.wi.gov/Pages/ISE/excise-fuel.aspx

Wisconsin Petroleum Use by Fuel Type

2005-2017 (Millions of Gallons)

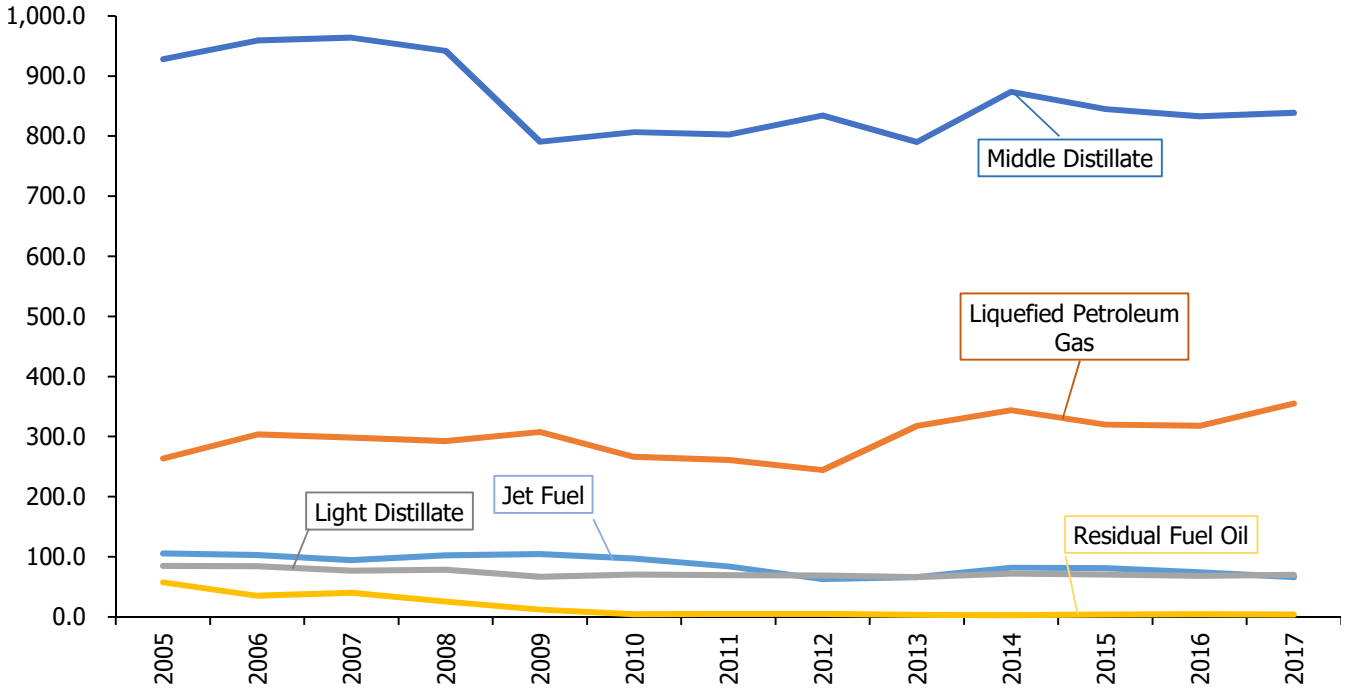
Year	Gasoline	Jet Fuel	Liquefied Petroleum Gas	Light Distillate	Middle Distillate	Residual Fuel Oil	Total
2005	2474.6	105.7	263.9	84.6	928.1	57.5	3914.3
2006	2393.6	102.9	303.6	84.1	959.0	35.0	3878.1
2007	2434.2	94.5	298.5	76.5	963.9	40.1	3907.7
2008	2303.5	102.4	292.3	78.5	942.0	25.8	3744.6
2009	2283.7	104.7	308.1	66.7	791.0	12.2	3566.4
2010	2334.7	96.9	266.2	70.5	807.0	4.4	3579.7
2011	2309.9	84.0	261.3	69.2	802.4	4.8	3531.6
2012	2211.8	62.8	244.3	68.5	834.6	4.7	3426.7
2013	2178.9	65.9	318.0	65.9	790.3	3.1	3422.2
2014	2337.1	82.2	343.9	72.2	873.9	2.7	3712.1
2015	2343.1	80.8	319.9	70.6	845.4	3.7	3663.5
2016	2347.4	74.3	317.8	68.5	833.0	4.2	3647.5
2017	2393.2	66.1	355.3	70.1	838.6	4.1	3667.5

Wisconsin Petroleum Use by Fuel Type, 2017

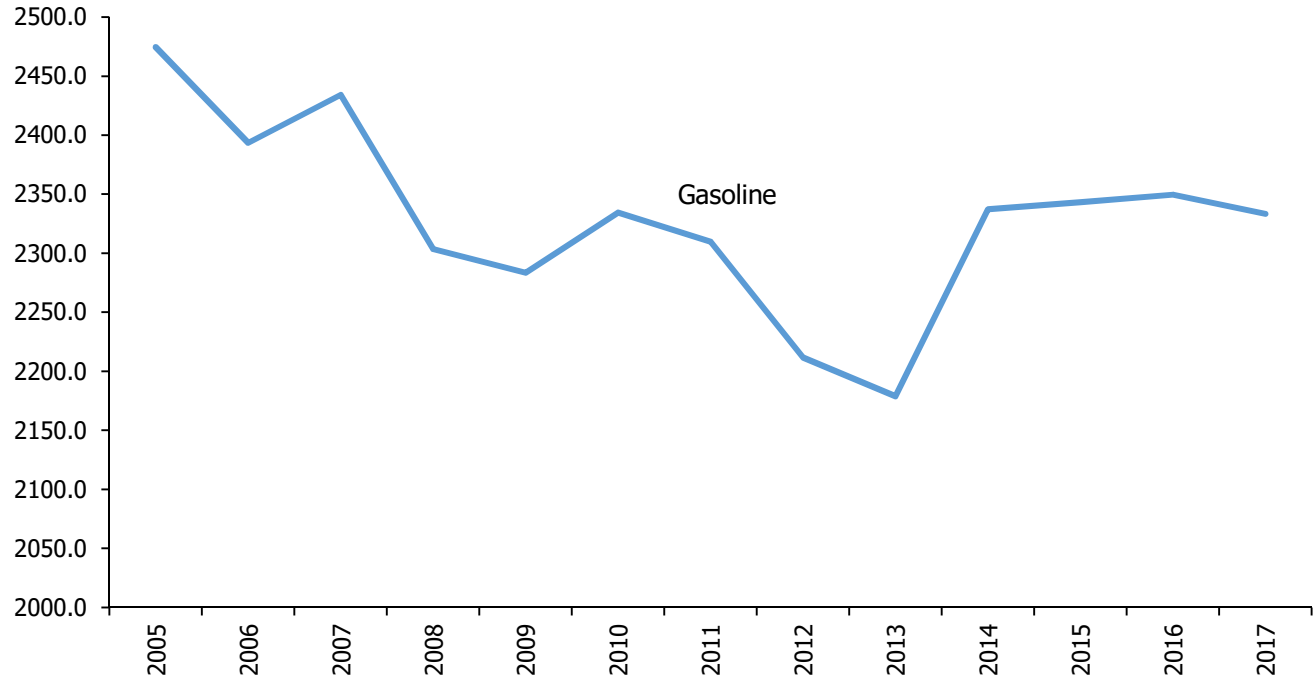


Source: U.S. Department of Agriculture, Personal Communication, National Agriculture Statistics Service, (2005-2017) Unpublished data, Value added by US agriculture (includes net farm income) (2013-2017) http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/value-added-years-by-state.aspx; U.S. Energy Information Administration Distillate Fuel Oil and Kerosene Sales by End Use: https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_SWI_a.htm, Wisconsin Department of Revenue, Fuel Tax Statistical Report (2005-2017), Federal Highway Report (2005-2017) https://www.revenue.wi.gov/Pages/ISE/Excise_Fuel-Home.aspx.

Wisconsin Petroleum Use by fuel type (Millions of Gallons) 2000-2017 (a)



Wisconsin Petroleum Use (Millions of Gallons) 2000-2017 (b)



Wisconsin Petroleum Use by Economic Sector

2005-2017

(Millions of Gallons)

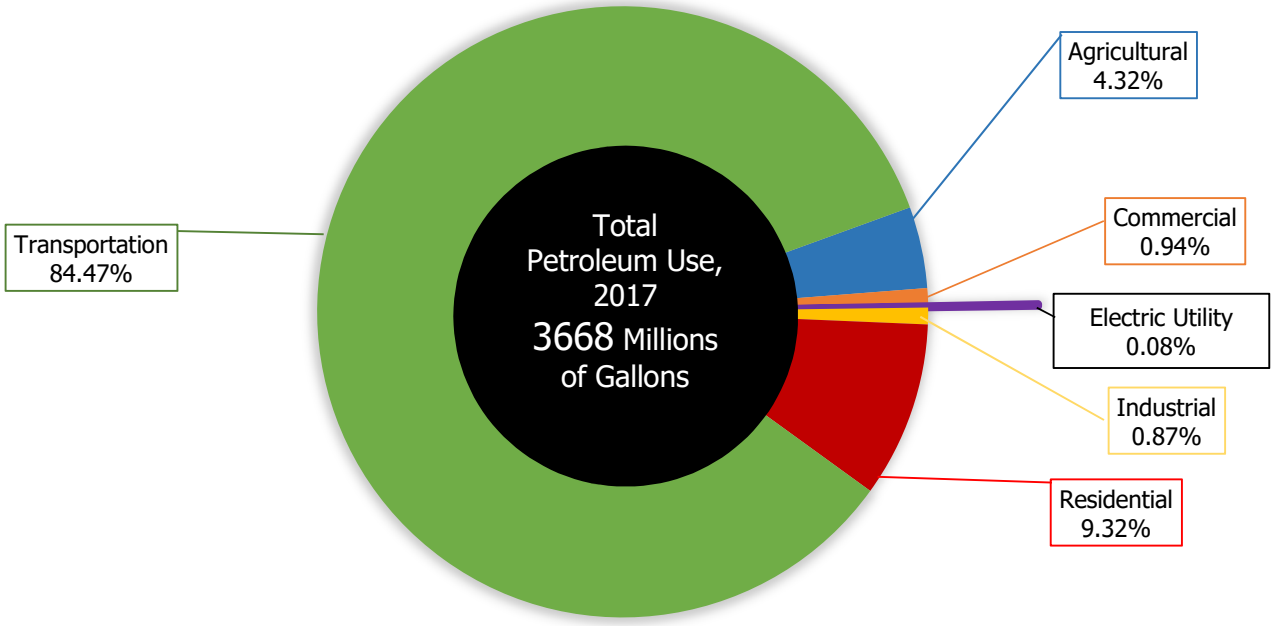
Year	Agricultural	Commercial	Electric Utility	Industrial	Residential	Transportation	TOTAL
2005	107.9	65.0	13.6	117.2	346.8	3263.8	3914.3
2006	135.2	41.0	11.1	103.9	368.2	3218.8	3878.1
2007	148.9	43.2	13.6	116.6	348.0	3237.5	3907.7
2008	141.3	55.1	7.7	84.5	342.5	3113.5	3744.6
2009	170.3	40.9	4.1	43.4	316.2	2991.6	3566.4
2010	144.5	27.5	3.7	26.7	276.2	3101.1	3579.7
2011	130.5	33.9	3.6	25.9	270.4	3067.3	3531.6
2012	144.5	32.4	4.2	31.1	243.6	2970.8	3426.7
2013	151.4	26.5	3.0	30.6	308.2	2902.5	3422.2
2014	158.7	29.8	5.3	32.5	343.5	3142.2	3712.0
2015	153.2	30.7	2.8	26.1	311.4	3139.4	3663.5
2016	161.5	30.9	2.9	27.1	307.9	3118.5	3648.7
2017	158.4	34.4	3.1	32.1	341.8	3098.4	3668.1

(Trillions of BTUs)

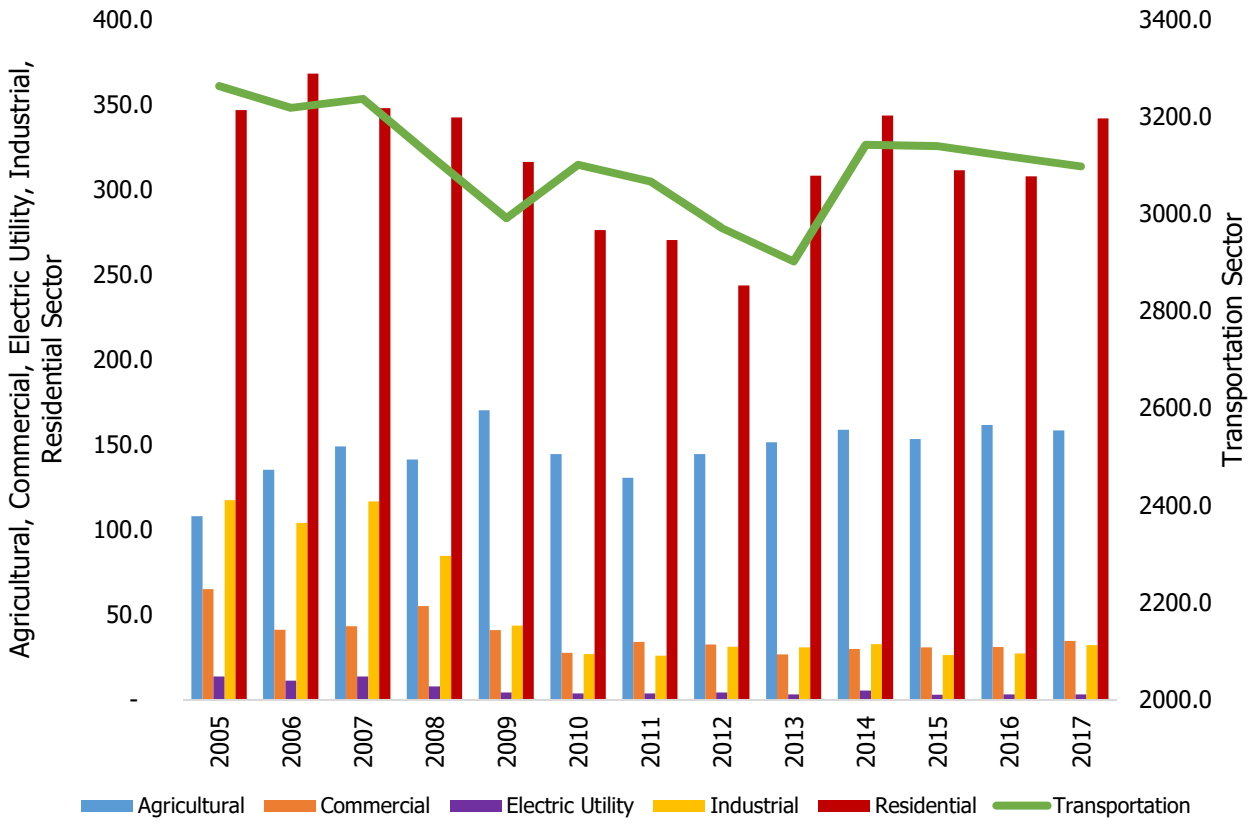
Year	Agricultural	Commercial	Electric Utility	Industrial	Residential	Transportation	Total Resource Use	Total End Use
2005	13.55	9.12	1.89	16.56	37.91	418.49	497.51	495.63
2006	17.21	5.69	1.54	14.57	39.34	413.28	491.64	490.10
2007	19.02	5.99	1.88	16.41	36.76	415.40	495.46	493.58
2008	17.89	7.60	1.07	11.83	36.52	399.87	474.79	473.72
2009	21.57	5.64	0.57	5.98	32.42	383.34	449.52	448.95
2010	18.46	3.79	0.51	3.57	28.33	397.78	452.43	451.92
2011	16.83	4.69	0.50	3.39	27.50	393.47	446.38	445.88
2012	18.69	4.48	0.58	4.16	24.56	381.51	433.97	433.39
2013	19.16	3.65	0.41	4.07	30.87	372.45	430.60	430.19
2014	20.34	4.10	0.73	4.30	34.47	403.49	467.43	466.69
2015	19.52	4.22	0.39	3.43	31.14	402.97	461.68	461.29
2016	20.62	4.27	0.41	3.61	30.73	400.01	459.65	459.24
2017	20.05	4.76	0.43	4.30	33.97	397.46	460.97	460.54

Source: U.S. Department of Agriculture, National Agriculture Statistics Service, (2005-2012) Unpublished data, Value added by US agriculture (includes net farm income) (2013-2017) http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/value-added-years-by-state.aspx; U.S. Department of Energy, Form EIA-782C Monthly Report of Petroleum Products Sold into States for Consumption (2005-2017) http://www.eia.gov/petroleum/marketing/prime/; Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions (2000-2017) Unpublished data; Federal Highway Report (2005-2017) https://www.revenue.wi.gov/Pages/ISE/Excise_Fuel-Home.aspx.

Wisconsin Petroleum Use By Economic Sectors, 2017



Wisconsin Petroleum Use by Economic Sector, 2005-2017 (Millions of Gallons)



Energy Use by Wisconsin Agricultural Sector

Agriculture plays a vital role in Wisconsin's economy. Popularly known as America's Dairyland, more than just milk and cheese are produced and processed in the state. Wisconsin ranks first in the nation in: snap beans for processing, cheese, cranberries, ginseng, mink pelts, dry whey for humans, milk goats and corn for silage[a]. The agricultural sector is a large energy consumer predominately using petroleum fuels, electricity, and natural gas to power on-farm operations and residences.

In 2017, the agricultural sector consumed 158.4 million gallons of fuel. Diesel fuel consumption accounts for 62 percent of all agricultural fuel used for a total of 96.87 million gallons. Most of the fuel is used for growing and harvesting crops. Together with motor gasoline, these two fuels accounted for 120.8 million gallons, more than 77 percent of all agricultural fuel used in 2017.

There continues to be opportunities to explore and expand energy efficiency as well as the potential for energy production in the sector. The Office of Energy Innovation and Focus on Energy promote the efficient use of electricity and natural gas in agricultural facilities and processes. Improved ventilation strategies can save money and natural resources while increasing milk production and reproduction in dairy facilities.

After excessive heat in the summer of 2012 led to a drop in milk production, a dairy farm in eastern Wisconsin built a tunnel ventilated barn to keep the barn's 2,100 cows comfortable. The project was successful, and other natural ventilated barns were also retrofitted to tunnel ventilation with the help of a Focus on Energy Trade Ally and incentives from Focus on Energy[b].

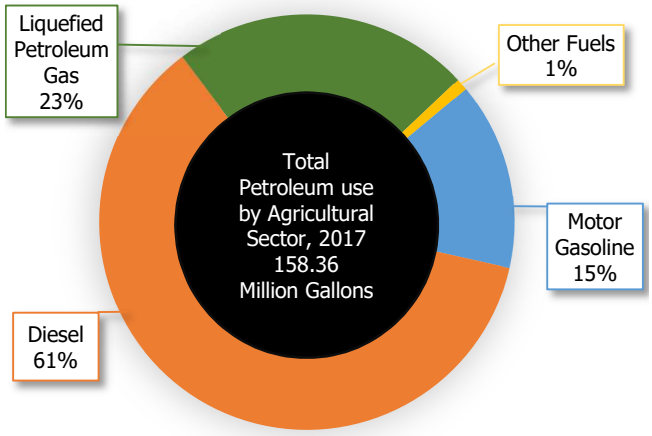
[a]Wisconsin Agricultural Statistics, Department of Agriculture, Trade and Consumer Protection https://datcp.wi.gov/Pages/Publications/WIAgStatistics.aspx.
[b]Focus on Energy Case Studies: Ventilation Retrofits, Wisconsin Focus on Energy, 2017.

Agricultural Sector Petroleum Use

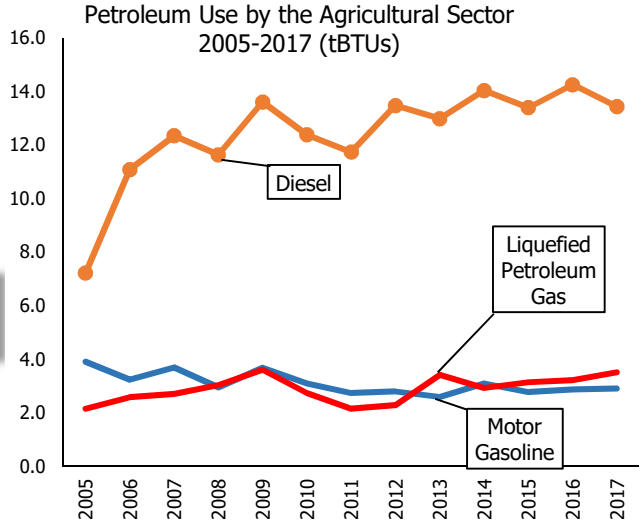
2005-2017

Year	Motor Gasoline		Diesel		Liquefied Petroleum Gas		Other Fuels[c]		Total Petroleum	
	Millions of Gallons	Trillions of Btu	Millions of Gallons	Trillions of Btu	Millions of Gallons	Trillions of Btu	Millions of Gallons	Trillions of Btu	Millions of Gallons	Trillions of Btu
2005	31.25	3.9	52.12	7.2	22.61	2.2	1.89	0.3	**107.87**	**13.55**
2006	25.92	3.2	79.98	11.1	27.07	2.6	2.21	0.3	**135.17**	**17.21**
2007	29.61	3.7	89.08	12.3	28.35	2.7	1.93	0.3	**148.97**	**19.02**
2008	23.62	3.0	83.89	11.6	31.80	3.0	1.96	0.3	**141.26**	**17.89**
2009	29.51	3.7	98.10	13.6	37.83	3.6	4.81	0.7	**170.25**	**21.57**
2010	24.83	3.1	89.27	12.4	28.74	2.7	1.66	0.2	**144.50**	**18.46**
2011	21.89	2.7	84.65	11.7	22.53	2.2	1.48	0.2	**130.55**	**16.83**
2012	22.44	2.8	97.17	13.5	23.97	2.3	0.91	0.1	**144.49**	**18.69**
2013	20.73	2.6	93.63	13.0	35.87	3.4	1.18	0.2	**151.40**	**19.16**
2014	24.77	3.1	101.23	14.0	30.72	2.9	1.98	0.3	**158.69**	**20.34**
2015	22.23	2.8	96.61	13.4	32.90	3.1	1.45	0.2	**153.19**	**19.52**
2016	22.95	2.9	102.78	14.3	33.72	3.2	2.02	0.3	**161.47**	**20.62**
2017	23.21	2.9	96.87	13.4	36.85	3.5	1.42	0.2	**158.36**	**20.05**

Petroleum Use by Wisconsin Agricultural Sector 2017



Petroleum Use by the Agricultural Sector 2005-2017 (tBTUs)



[c] Primarily distillate and kerosene, may include small amounts of coal and wood.

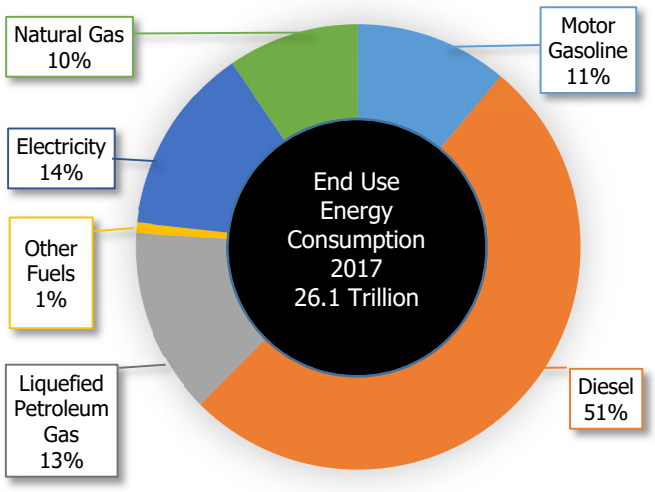
Source: U.S. Department of Agriculture, National Agriculture Statistics Service, (2005-2017) Unpublished data Personal Communication, Value added by US agriculture (includes net farm income) (2013-2017) http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/value-added-years-by-state.aspx. U.S. Energy Information Administration, Distillate Fuel Oil and Kerosene Sales by End Use (Farm 2005-2017) https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_SWI_a.htm

Agricultural Sector Energy Use

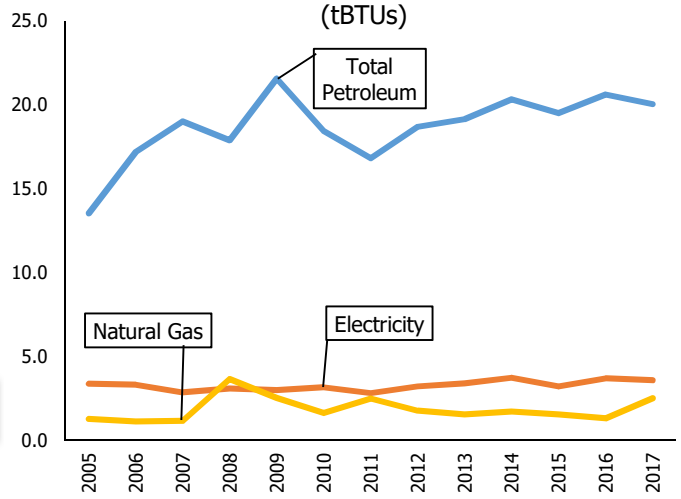
2005-2017 (Trillions of Btu)

Year	Electricity (Millions of kWh)	Electricity	Total Petroleum	Natural Gas	Total End Use	Total Resource Use
2005	987.84	3.37	13.55	1.26	**18.18**	**25.52**
2006	969.67	3.31	17.21	1.11	**21.63**	**28.21**
2007	832.55	2.84	19.02	1.14	**23.01**	**29.08**
2008	900.10	3.07	17.89	3.64	**24.61**	**31.08**
2009	871.54	2.97	21.57	2.52	**27.07**	**33.21**
2010	923.36	3.15	18.46	1.62	**23.23**	**29.96**
2011	821.91	2.81	16.83	2.49	**22.13**	**27.87**
2012	941.90	3.21	18.69	1.77	**23.68**	**30.11**
2013	990.21	3.38	19.16	1.54	**24.08**	**31.00**
2014	1094.33	3.73	20.34	1.70	**25.78**	**33.09**
2015	940.10	3.21	19.52	1.52	**24.25**	**30.61**
2016	1078.74	3.68	20.62	1.31	**25.61**	**31.92**
2017	1047.96	3.58	20.05	2.50	**26.13**	**32.49**

Energy Use by the Agricultural Sector 2017



Energy Use by Agricultural Sector 2005-2017 (tBTUs)



Source: U.S. Department of Agriculture, National Agriculture Statistics Service, (2005-2017) Unpublished data Personal Communication, Value added by US agriculture (includes net farm income) (2013-2017) http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/value-added-years-by-state.aspx. U.S. Energy Information Administration, Distillate Fuel Oil and Kerosene Sales by End Use (Farm 2005-2017) https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_SWI_a.htm

Energy Use by Wisconsin Commercial Sector

The commercial sector consists of non-industrial, business consumers of energy for example service-sector businesses and even some manufacturers with low energy demands may be classified as commercial. Federal, State, and local governments; financial institutions; municipal libraries; wastewater treatment facilities; churches, non-manufacturing business establishments, including hotels, motels, and restaurants; wholesalers and retail stores; health, social, and educational institutions are examples of commercial customers. The Commercial sector uses energy for space heating, water heating, air conditioning, lighting, refrigeration, and cooking. In addition to these basic needs for energy, the commercial sector also uses energy to power a wide variety of equipment including back-up power generators, computer and communication equipment, and pool filtration among many other energy needs.

While this sector is largely an energy consumer, some individual facilities within the sector have the ability to capture and use energy to produce electricity and/or generate useful thermal energy. Specifically, wastewater treatment plants can capture and use biogas created as a by-product of the wastewater treatment process. The captured biogas is then used to generate thermal energy (for space-or process-heating) and/or to power generators to produce electricity. A variety of fuel types power the commercial sector; including petroleum, natural gas, coal, and electricity. In 2017, the commercial sector used 185 trillion Btu of energy.

In an effort to reduce fuel consumption and increase energy conservation for a segment of the commercial sector, the Wisconsin Office of Energy Innovation launched the Municipal Energy Efficiency Technical Assistance Program (MEETAP). The program was developed to help municipalities and schools realize the benefits available from working with Energy Service Companies (ESCOs) such as identifying and implementing energy conservation measures, replacing aging and inefficient mechanical and lighting systems, or performing deferred maintenance.

The data in this chapter shows the trends of the commercial sector's use of various energy sources and the trends in their prices. Below is summary of these trends.

- Electricity: Electricity consumption reached its lowest in 2009 (during the economic recession), then started to rise until the year 2013. Since 2014, the level of electricity consumption has been almost constant. The electricity price reached its peak in 2011, and has since been showing a downward trend.

- Petroleum: The use of petroleum is highly dependent on its price. As the price of petroleum increases, the use decreases and vice versa.

- Coal: Coal use has seen a considerable decline after the closing of major coal plants. The price of the coal has been almost constant for the commercial sector.

- Natural Gas: Natural Gas use is influenced by many economic factors like its own price, price of electricity and petroleum, infrastructural demands, technical changes and weather conditions[d]. The price of natural gas has been going down at a steady rate. The price is generally affected by production, storage and imports.

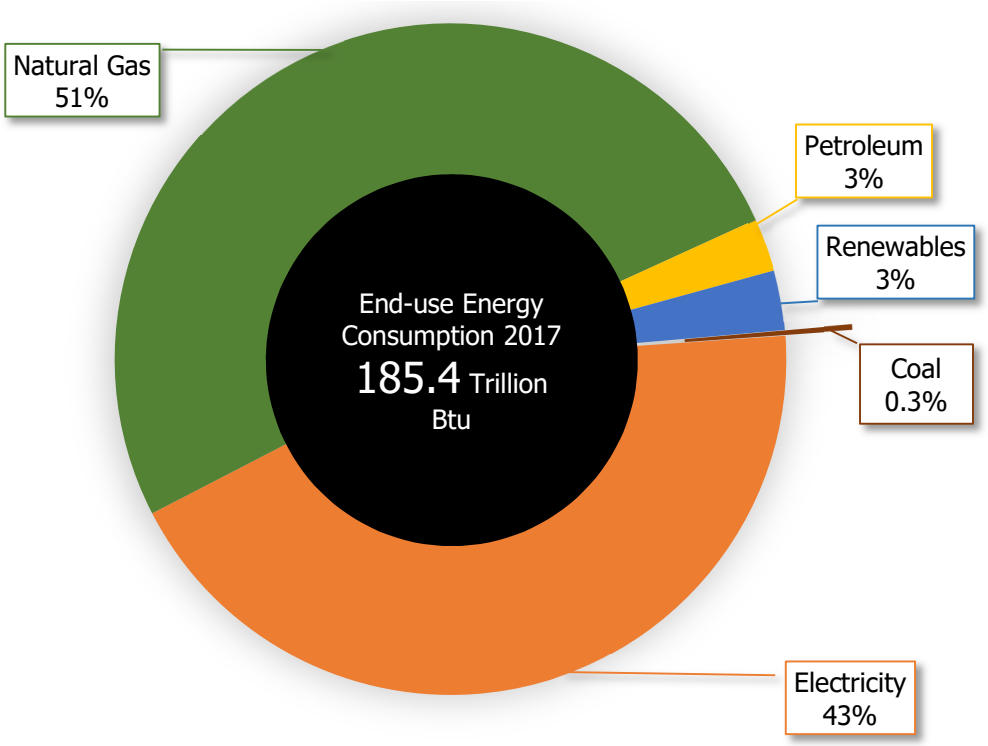
[d] https://www.eia.gov/energyexplained/natural-gas/factors-affecting-natural-gas-prices.php

Commercial Sector Energy Use by Source

2005-2017 (Trillions of Btu)

Year	Coal	Electricity	Natural Gas	Petroleum	Renewables	Total End Use	Total Resource Use
2005	4.8	76.8	87.2	9.1	4.4	182.3	349.2
2006	4.8	77.7	87.3	5.7	4.0	179.5	333.8
2007	3.9	80.2	90.3	6.0	4.4	184.7	355.6
2008	2.7	80.1	98.5	7.6	4.7	193.6	363.9
2009	2.9	76.7	92.7	5.6	3.4	181.4	340.7
2010	3.0	78.5	83.0	3.8	3.5	171.8	337.9
2011	2.7	78.7	88.3	4.7	3.1	177.4	336.7
2012	0.8	79.3	78.4	4.5	2.7	165.7	322.6
2013	0.9	80.7	99.3	3.6	3.4	188.0	351.9
2014	0.7	81.1	111.0	4.1	3.5	200.4	357.5
2015	0.5	80.3	94.4	4.2	4.8	184.2	341.8
2016	0.6	81.5	92.8	4.3	5.1	184.3	322.3
2017	0.5	80.7	94.1	4.8	5.3	185.4	327.8

Energy Use by Commercial Sector by Source, 2017



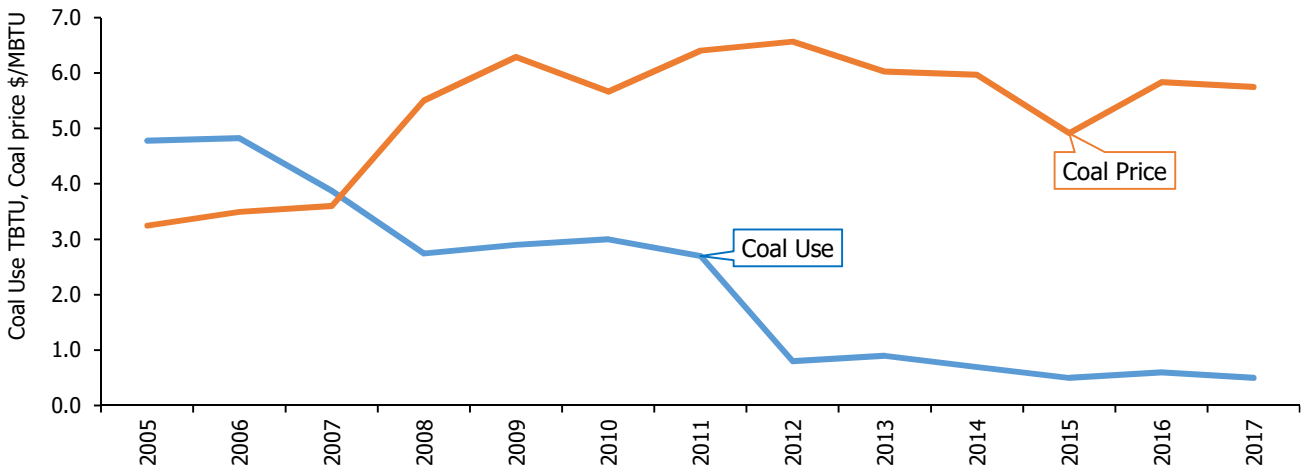
Source: U.S. Energy Information Administration, Petroleum and Other Liquids (2005-2017) https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_SWI_a.htm, Natural Gas (2005-2017) https://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_SWI_a.htm, Prime Supplier Report Archives https://www.eia.gov/petroleum/marketing/prime/archive/#2019-2020, Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions (2005-2017) Unpublished data and Personal Communication. Public Service Commission of Wisconsin, Annual Reports, Investor Owned Utilities (2005-2017) Unpublished data, Strategic Energy Assessment 2024 (Personal Communication),

Commercial Sector Energy Prices by Source

2005-2017 (2017 Dollars per Million Btu)[e,b]

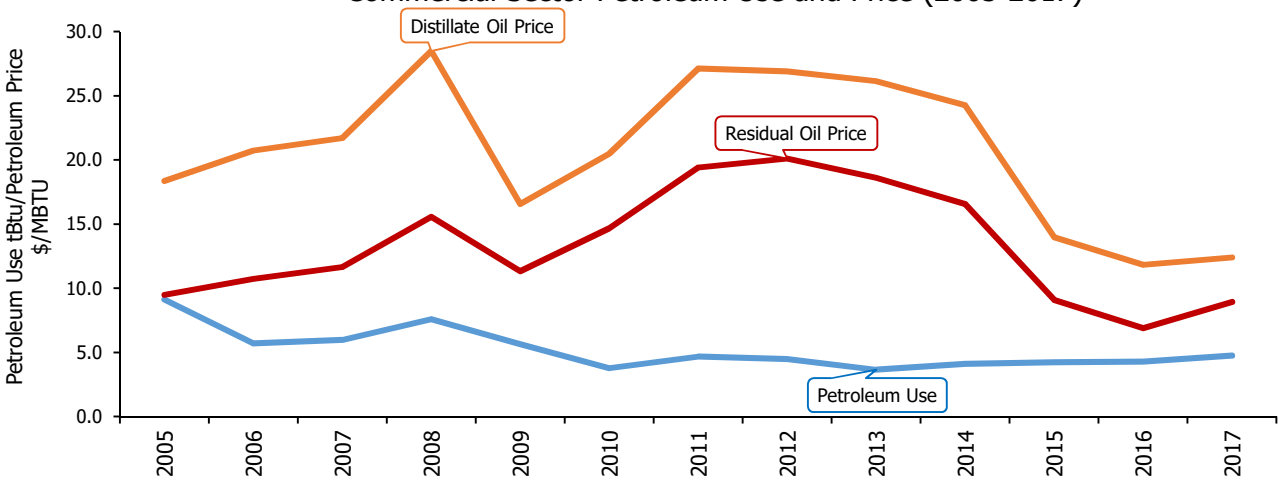
Year	Coal	Distillate Oil [c]	Residual Oil [c]	Natural Gas	Electricity
2005	3.25	18.38	9.49	13.00	27.81
2006	3.50	20.73	10.74	12.55	30.32
2007	3.60	21.72	11.66	12.28	30.68
2008	5.51	28.50	15.57	13.03	32.11
2009	6.29	16.57	11.33	10.11	32.09
2010	5.67	20.49	14.68	9.61	33.29
2011	6.40	27.13	19.41	8.87	33.33
2012	6.57	26.90	20.11	7.87	33.66
2013	6.03	26.15	18.61	7.22	33.66
2014	5.97	24.27	16.56	8.84	33.10
2015	4.92	13.99	9.09	6.65	32.76
2016	5.84	11.83	6.89	6.09	31.99
2017	5.75	12.42	8.94	6.35	31.87

Commercial Sector Coal Use and Price (2005-2017)

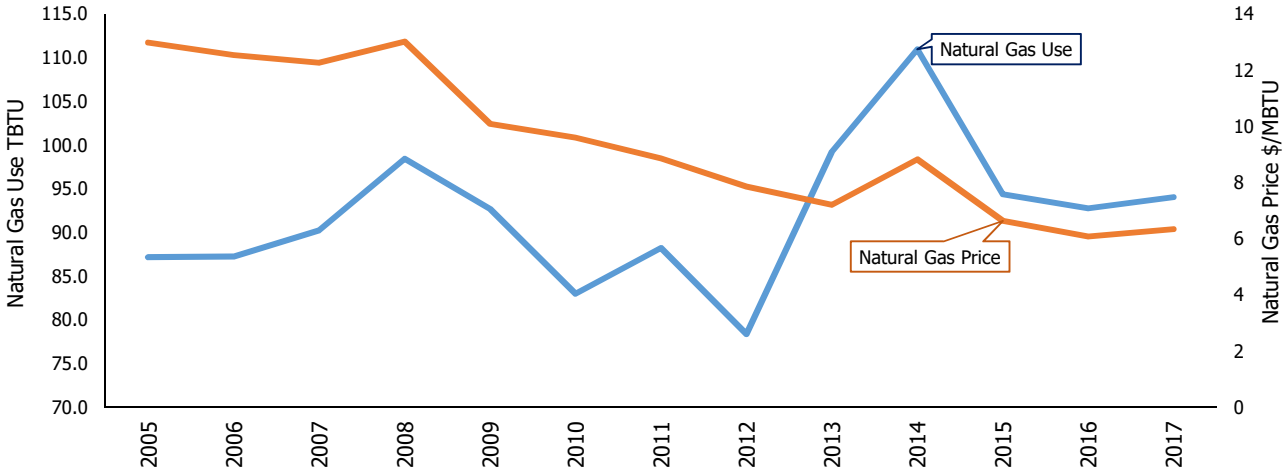


e The prices are adjusted to inflation.
b The prices are revised using Wisconsin GDP deflator, the previous reports used U.S GDP deflator.
c Revised , Residual fuel oil price not available for Wisconsin beginning in 2009 due to publishing policies of the U.S Energy Information Administration. U.S prices are thus used as a proxy.
Source: U.S. Energy Information Administration, Commercial sector Energy Consumption, Prices and Expenditure estimates, https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_prices/com/pr_com_WI.html&sid=WI

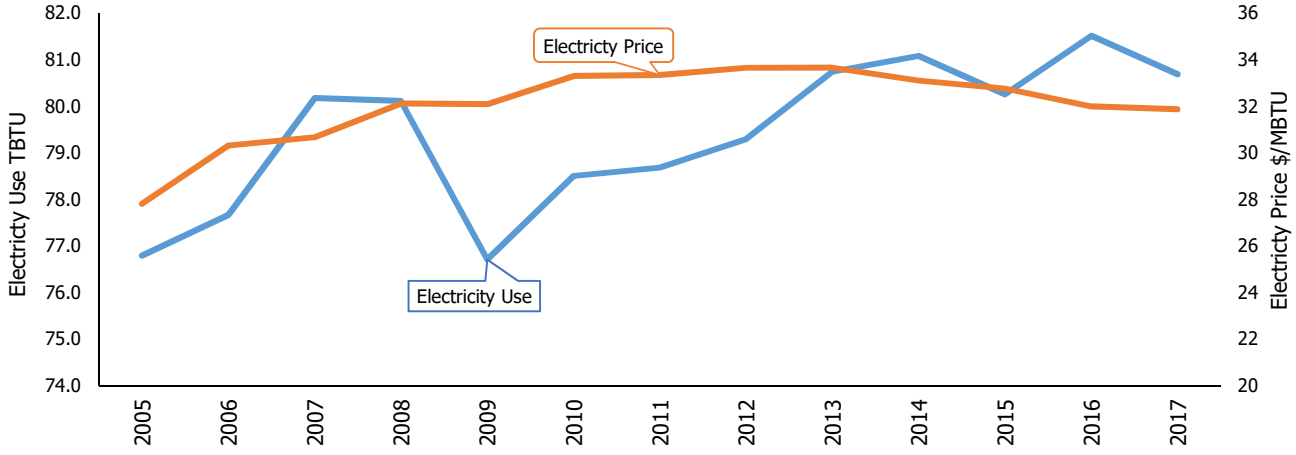
Commercial Sector Petroleum Use and Price (2005-2017)



Commercial Sector Natural Gas Use and Price (2005-2017)



Commercial Sector Electricy Use and Price (2005-2017)



Energy Use by Wisconsin Industrial Sector

The industrial sector is typically associated with the manufacturing, production, and transportation of goods Wisconsinites use every day. The industrial sector also produces heavy equipment, machines, facilities, and tools used by many of Wisconsin's businesses and workers. Energy in the industrial sector is used for a variety of purposes including process heating and cooling and powering machinery.

Industrial energy use also includes energy used for facility heating, air conditioning, and lighting. In 2017, 322 trillion Btu of energy were consumed to produce goods and extract raw materials, accounting for 26 percent of all energy consumed in Wisconsin. The economic downturn that began in 2008 resulted in an overall decrease in energy use in the industrial sector. Changes in drilling technology (which resulted in dramatically lower natural gas prices) are illustrated in the industrial sector where natural gas use increased from 2012 to 2013 and continues to increase while coal use has been in decline.

The Wisconsin Office of Energy Innovation's Focus on Energy Program offers several programs to address the industrial sector's energy consumption, energy efficiency, and use of renewable energy sources including:

Renewable Rewards Program — providing business customers with prescriptive and custom financial incentives for solar electric (PV) and geothermal heat pump systems;

Emerging Technologies Program — identifying new energy efficiency and renewable energy technologies within the industrial, commercial, and agricultural sectors; and,

Strategic Energy Management Program — available to large industrial customers interested in the business advantages of a more sustained, strategic commitment to energy efficiency.

Industrial Sector Energy Use by Source

2005-2017 (Trillions of Btu)

Year	Coal	Electricity	Natural Gas	Petroleum	Renewables	Total End Use	Total Resource Use
2005	45.1	85.5	132.3	16.6	66.1	345.5	531.3
2006	46.7	85.2	119.7	14.6	63.4	329.5	498.8
2007	46.6	85.8	122.8	16.4	55.3	326.8	509.7
2008	45.5	83.2	129.6	11.8	52.6	322.8	499.6
2009	41.1	75.4	121.4	6.0	49.6	293.5	450.2
2010	42.1	79.0	122.6	3.6	68.9	316.2	483.4
2011	41.0	79.0	128.6	3.4	63.7	315.7	475.5
2012	34.9	79.3	126.7	4.2	62.4	307.5	464.4
2013	30.5	78.6	139.4	4.1	62.4	315.0	474.6
2014	31.7	80.0	146.2	4.3	57.1	319.3	474.3
2015	25.5	80.7	143.1	3.4	56.1	308.9	467.5
2016	18.8	80.8	149.8	3.6	57.7	310.7	447.6
2017	19.7	81.4	161.1	4.3	55.3	321.8	465.5

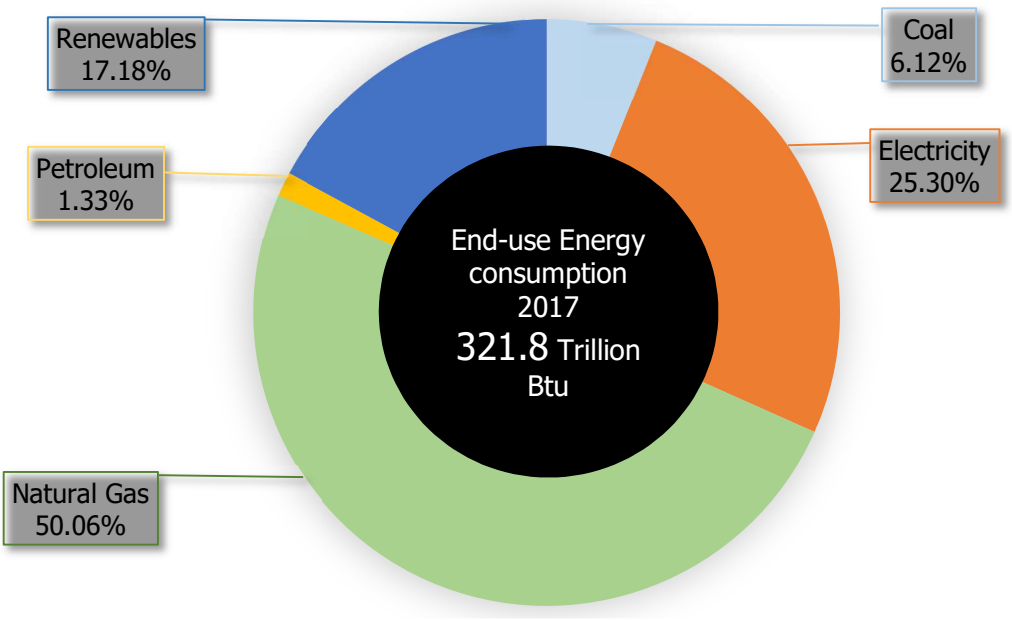
Industrial Sector Energy Prices by Source

2005-2017 (2017 Dollars per Million BTU)[f]

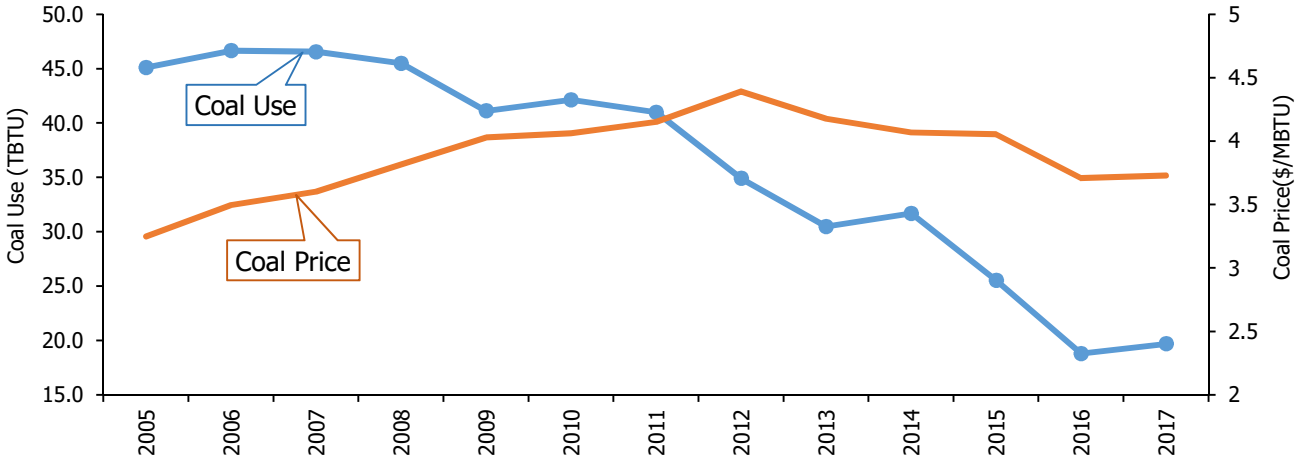
Year	Coal	Electricity	Natural Gas	Distillate Oil [b]	Residual Oil [b]
2005	3.25	20.05	12.41	18.58	8.52
2006	3.50	21.20	11.56	21.01	9.54
2007	3.60	21.69	11.40	22.02	10.22
2008	3.82	22.54	12.31	28.86	14.52
2009	4.03	22.59	8.82	16.74	9.05
2010	4.06	22.84	8.52	20.73	13.14
2011	4.15	24.04	7.78	28.28	17.33
2012	4.39	23.53	6.23	27.82	18.30
2013	4.18	23.18	6.26	26.57	17.67
2014	4.07	23.50	8.17	24.33	16.57
2015	4.05	22.79	5.54	15.28	10.45
2016	3.71	22.26	4.89	12.15	7.35
2017	3.73	21.96	5.13	14.49	9.71

f The prices are revised using Wisconsin GDP deflator, the previous reports used U.S GDP deflator.
b revised
Source: U.S Energy Information Administration, Industrial Sector Energy Price and Expenditure Estimates, (2005-2017) https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_prices/ind/pr_ind_WI.html&sid=WI, Industrial Sector Energy Use https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/ind/use_ind_WI.html&sid=WI, Prime Supplier Report Archives https://www.eia.gov/petroleum/marketing/prime/archive/#2005-2017, Public Service Commission of Wisconsin, Annual Reports, Investor Owned Utilities (2005-2017), Personal Communication with Public Service Commission Unpublished data, Strategic Energy Assessment 2024 (Personal Communication), Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions (2005-2017) Unpublished data and Personal Communication, U.S. Department of Agriculture, National Agriculture Statistics Service, (2005-2017) Unpublished data Personal Communication, Value added by US agriculture (includes net farm income) (2013-2017) http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/value-added-years-by-state.aspx.

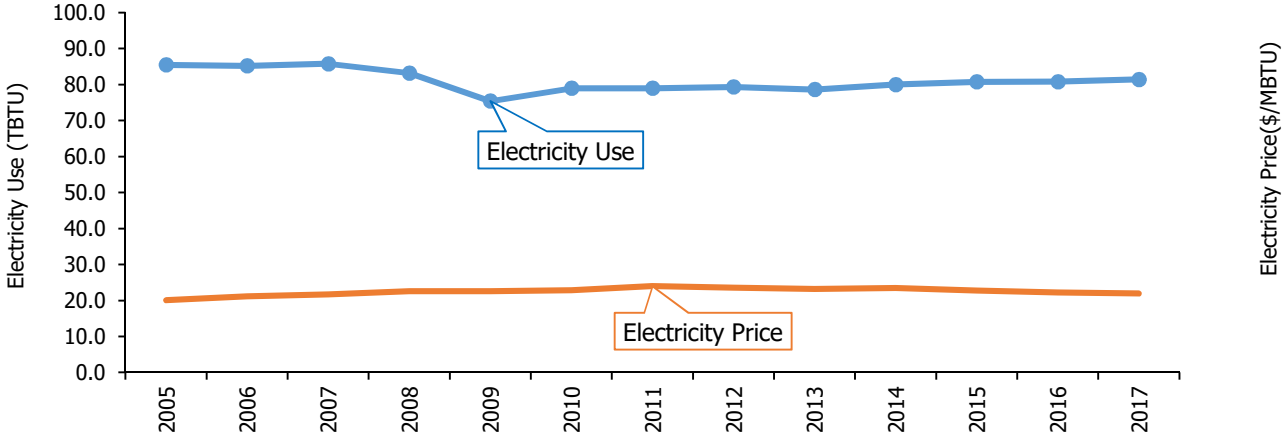
Energy Use by Industrial Sector 2017



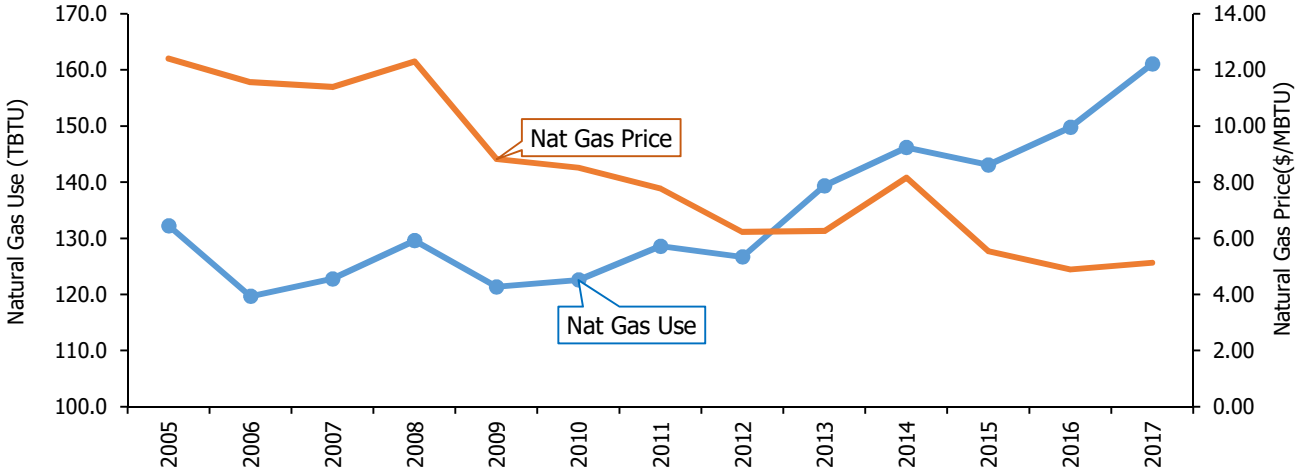
Industrial Sector Coal Use and Price (2000-2017)



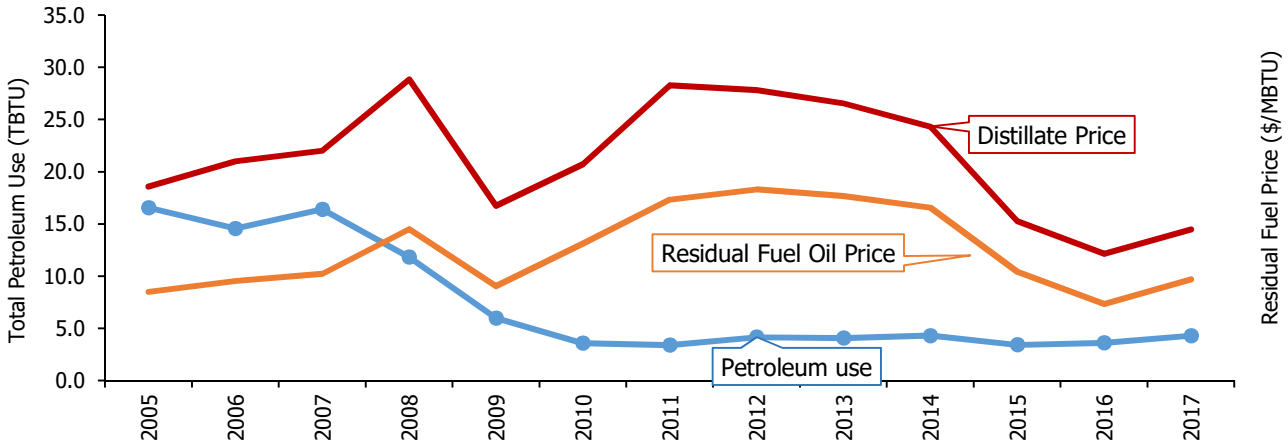
Industrial Sector Electricty Use and Price (2000-2017)



Industrial Sector Natural Gas Use and Price (2000-2017)



Industrial Sector Petroleum Use and Price (2000-2017)



Energy Use by Wisconsin Residential Sector

The residential sector of Wisconsin includes many different housing types: single family, multi-family housing, apartments, condominiums, and mobile homes. Residents of Wisconsin use energy at home every day for space heating and cooling, water heating, lighting, and powering electronic devices and appliances.

Residential use of petroleum has declined from 37.91 tBtu in 2005 to just 33.97 tBtu in 2017. Similarly, electricity use has declined from 74 tBtu in 2005 to 71 tBtu in 2017. The electricity use decline can be attributed to greater overall household energy efficiency achieved through programs like Focus on Energy, and the trends in appliance purchases and efficiencies as discussed in Chapter 2, Consumers and the Economy. Another factor contributing to declining electricity use could be shifting of consumption from Electricity to Natural Gas.

Coal use for in-home heating has remained at zero since 2008. Natural gas is the dominant fuel used in Wisconsin homes, primarily for space heating, and makes up 52 percent of total residential energy use in 2017. From 2014 to 2017, natural gas consumption in the residential sector decreased by 12.17 percent, the first decrease in natural gas consumption since 2012. This is consistent with a broader trend of a decrease of fuel consumption for home heating in that same timeframe. In total, the residential sector of Wisconsin uses 22 percent of all energy used in Wisconsin, or 265.7 tBtus.

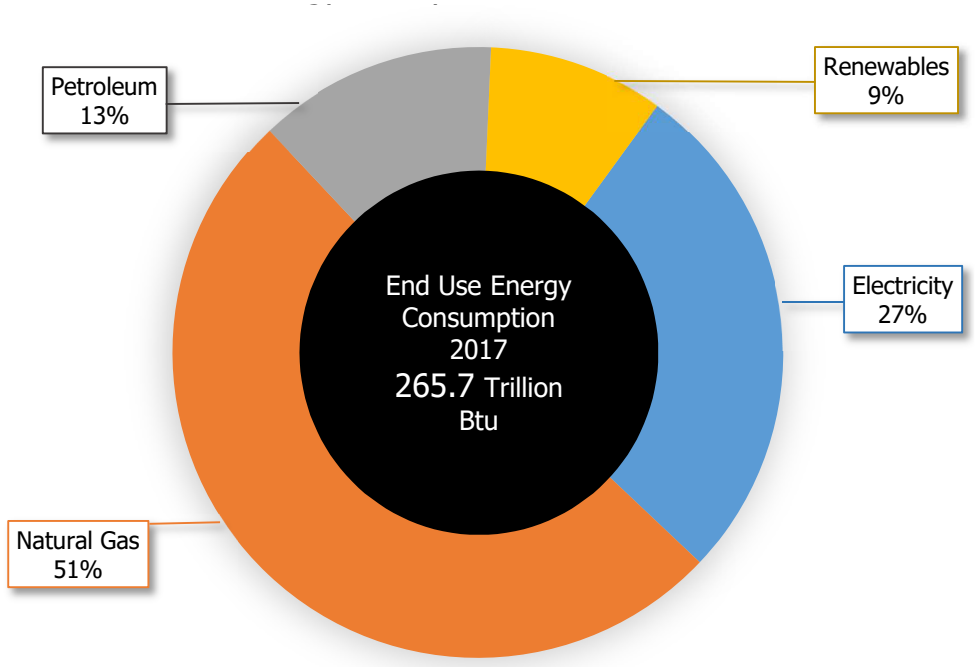
As part of the State Heating Oil and Propane Pricing Program (SHOPP), a joint effort between the U.S. Energy Information Administration and State Energy Offices to monitor local pricing for winter heating fuels, the Office of Energy Innovation collects prices of heating oil and liquefied petroleum gas (LPG, commonly known as propane) from heating fuel retailers. This information is made available to the public and is used by policymakers, industry analysts, and consumers. Tracking the price of heating fuels, especially in winter, is critical to the state of Wisconsin as approximately 250,000 residents rely on these heating fuels to stay warm.

Residential Sector Energy Use by Source

2005-2017 (Trillions of BTU)

Year	Coal	Electricity	Natural Gas	Petroleum	Renewables	Total End Use	Total Resource
2005	0.1	74.4	132.9	37.9	25.3	270.7	432.2
2006	0.1	72.1	121.9	39.3	22.5	256.0	399.1
2007	0.1	74.6	133.0	36.8	24.9	269.3	428.1
2008	0.0	73.0	142.5	36.5	27.8	279.8	434.9
2009	0.0	71.1	135.0	32.4	20.9	259.5	407.2
2010	0.0	74.0	124.9	28.3	22.4	249.6	406.2
2011	0.0	73.7	131.3	27.5	21.8	254.3	403.5
2012	0.0	73.0	114.7	24.6	18.3	230.6	375.1
2013	0.0	73.2	146.6	30.9	23.7	274.3	422.9
2014	0.0	72.3	155.2	34.5	24.0	286.0	426.1
2015	0.0	70.3	131.6	31.1	29.9	262.9	400.9
2016	0.0	72.0	131.2	30.7	25.9	259.8	381.8
2017	0.0	70.1	136.3	33.9	25.3	265.7	389.3

Energy Use By Residential Sector 2017



Source: Public Service Commission of Wisconsin, Annual Reports, Investor Owned Utilities (2005-2017), Public Service Commission of Wisconsin, Strategic Energy Assessment 2024, Unpublished data and Personal Communication, U.S. Energy Information Administration, Residential Sector Energy Consumption Estimates (2005-2017)https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/res/use_res_WI.html&sid=WI, Distillate Fuel Oil and Kerosene sales by End Use https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_SWI_a.htm, Prime Supplier Report Archives https://www.eia.gov/petroleum/marketing/prime/archive/#2005-2017, Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions (2005-2017) Unpublished data and Personal Communication, U.S. Department of Agriculture, National Agriculture Statistics Service, (2005-2017) Unpublished data Personal Communication, Value added by US agriculture (includes net farm income) (2013-2017) http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/value-added-years-by-state.aspx.

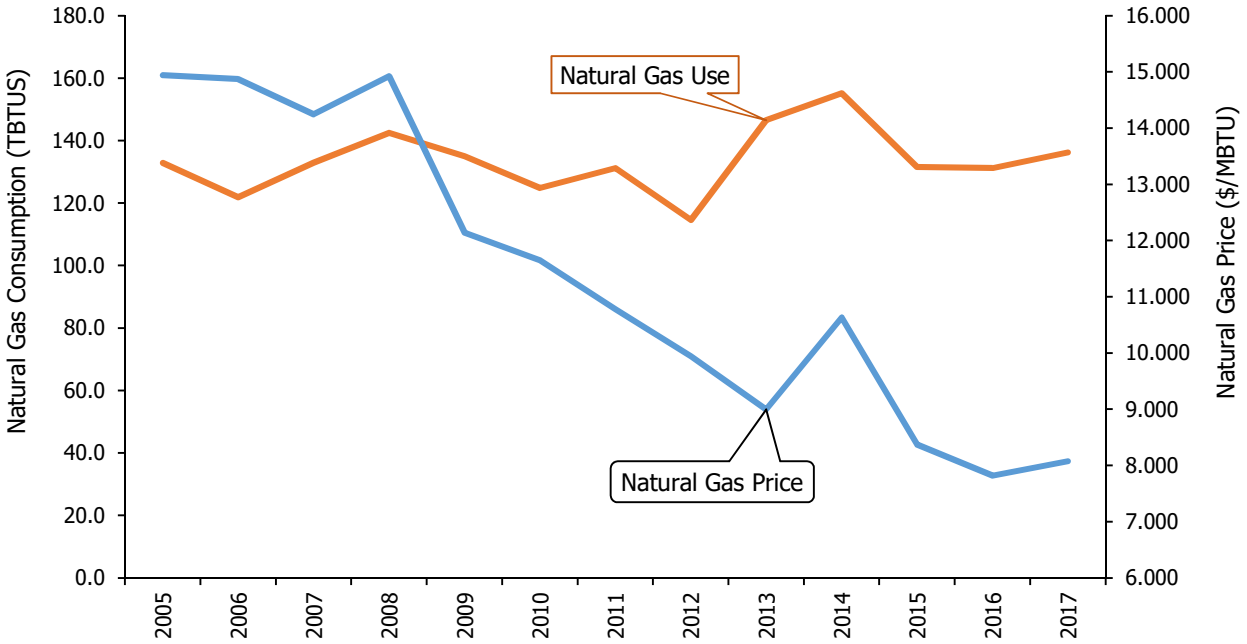
Residential Sector Energy Prices by Source

2005-2017 (2017 Dollars per Million Btu)

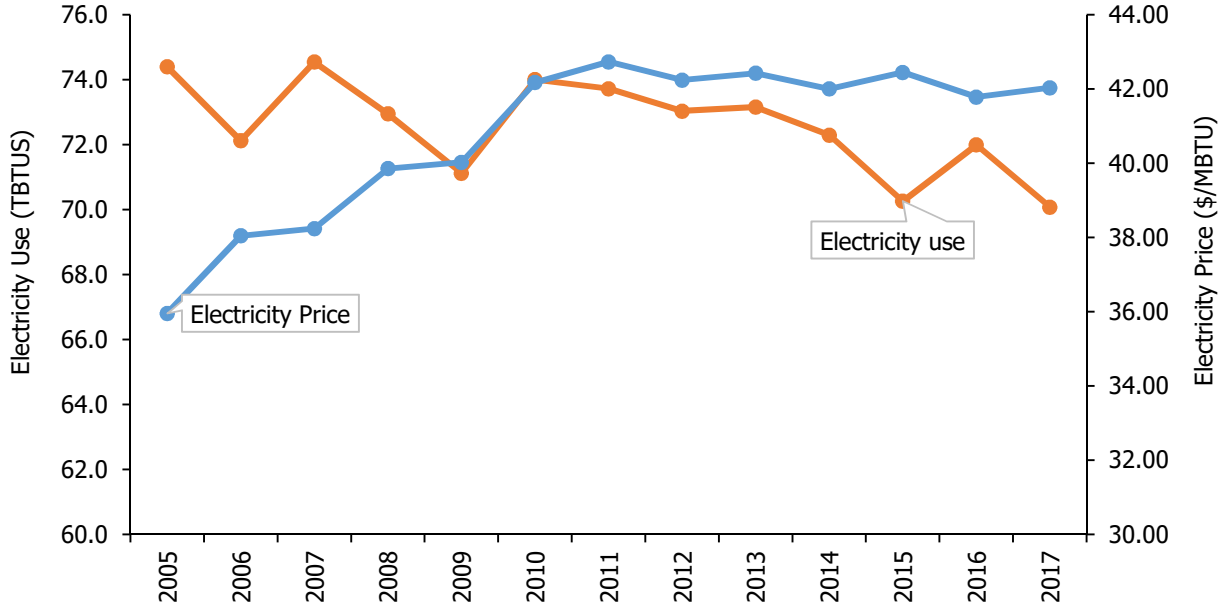
Year	Heating Oil	LPG	Natural Gas	Electricity
2005	19.51	21.48	14.94	35.96
2006	21.06	22.56	14.87	38.05
2007	23.34	23.78	14.25	38.24
2008	25.67	27.68	14.92	39.86
2009	18.16	21.37	12.14	40.03
2010	22.07	22.03	11.65	42.18
2011	27.64	23.61	10.78	42.74
2012	33.73	19.14	9.94	42.25
2013	27.54	19.02	9.00	42.43
2014	25.84	25.99	10.64	42.01
2015	16.78	15.62	8.37	42.45
2016	14.10	13.20	7.82	41.79
2017	16.57	16.62	8.08	42.04

Source: U.S. Energy Information Administration, Residential sector energy prices (2005-2017) https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_prices/res/pr_res_WI.html&sid=WI, Weekly Propane residential prices (2005-2017) https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPLLPA_PRS_SWI_DPG&f=W, AAA Gas prices https://gasprices.aaa.com/?state=WI aggregated by Office of Energy Innovation (2005-2017) https://psc.wi.gov/Pages/Programs/OEI/SHOPP.aspx, Wisconsin Public Service Commission Electricity and Natural Gas distribution reports, Electronic Records Filing System Docket #5-GF-159: http://apps.psc.wi.gov/vs2015/ERF_search/content/searchResult.aspx?UTIL=5&CASE=GF&SEQ=159&START=none&END=none&TYPE=none&SERVICE=none&KEY=none&NON=N

Natural Gas Use and Price by Residential Sector (2005-2017)



Electricity Use and Price by Residential sector (2005-2017)

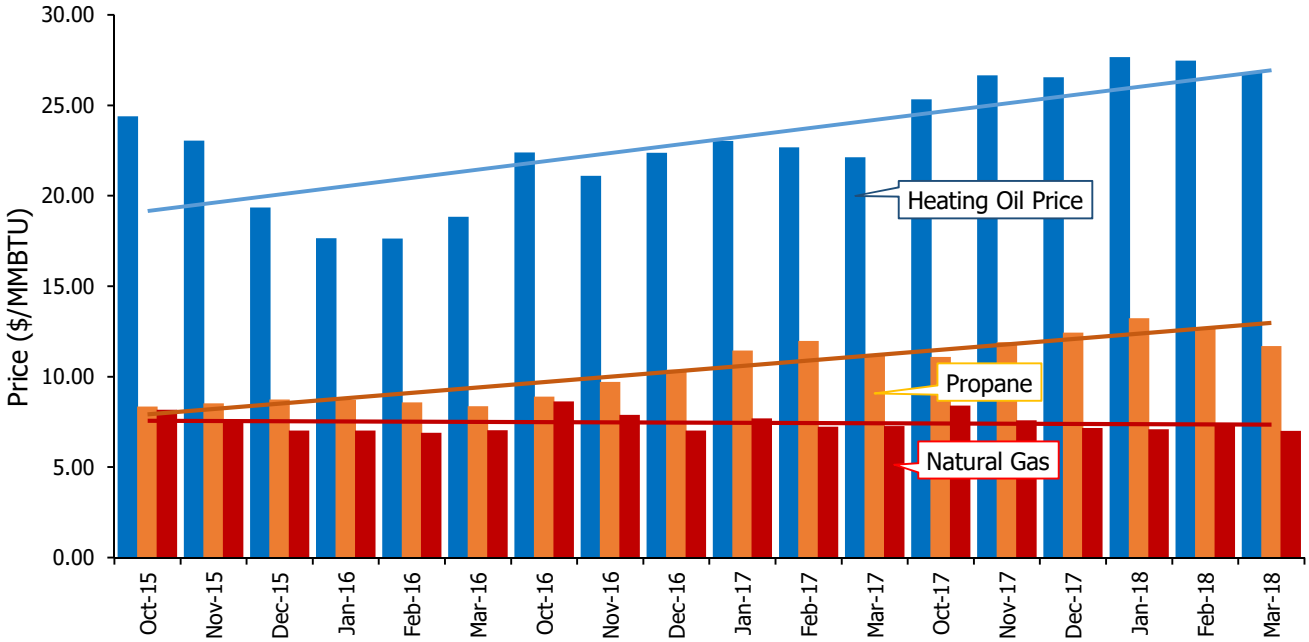


Residential Sector Energy Prices for the Winter Heating Season

Oct 2015 - Mar 2018 (Current Prices)

Date	$/Gallon		$/MMBTU		
	Heating Oil	Propane	Heating Oil	Propane	Natural Gas
Oct-15	2.33	1.16	24.39	8.35	8.18
Nov-15	2.20	1.18	23.04	8.52	7.58
Dec-15	1.85	1.21	19.35	8.75	7.02
Jan-16	1.69	1.21	17.65	8.73	7.03
Feb-16	1.68	1.19	17.63	8.58	6.90
Mar-16	1.80	1.16	18.83	8.37	7.04
Oct-16	2.14	1.23	22.39	8.90	8.63
Nov-16	2.02	1.35	21.10	9.72	7.89
Dec-16	2.14	1.44	22.37	10.38	7.03
Jan-17	2.20	1.59	23.04	11.44	7.70
Feb-17	2.16	1.66	22.67	11.97	7.24
Mar-17	2.11	1.55	22.13	11.21	7.27
Oct-17	2.42	1.54	25.33	11.09	8.41
Nov-17	2.54	1.65	26.65	11.90	7.59
Dec-17	2.54	1.73	26.56	12.44	7.17
Jan-18	2.64	1.84	27.67	13.24	7.10
Feb-18	2.62	1.77	27.47	12.75	7.42
Mar-18	2.56	1.62	26.81	11.70	7.00

Residential Sector Winter Prices by Source, for the Heating Season 2016-2017



Source: Public Service Commission of Wisconsin, Form PSC-AF2 Monthly Financial and Statistical Reports (2005-2018), http://apps.psc.wi.gov/vs2015/ERF_search/content/searchResult.aspx?UTIL=5&CASE=GF&SEQ=159&START=none&END=none&TYPE=none&SERVICE=none&KEY=none&NON=N, U.S. Energy Information Administration, State Heating Oil Propane Program (2005-2018); Public Service Commission of Wisconsin, Form PSC-AF2 Monthly Financial and Statistical Reports (2005-2018), Weekly Price Summaries: https://psc.wi.gov/Pages/Programs/OEI/SHOPP.aspx, Wisconsin Public Service Commission Electricity and Natural Gas distribution reports, Electronic Records Filing System Docket #5-GF-159: http://apps.psc.wi.gov/vs2015/ERF_search/content/searchResult.aspx?UTIL=5&CASE=GF&SEQ=159&START=none&END=none&TYPE=none&SERVICE=none&KEY=none&NON=N

Energy Use by Wisconsin Transportation sector

Transportation energy use includes use of motor gasoline, ethanol, diesel, jet fuel, No. 2 oil distillate, residual fuel oil, liquefied petroleum gas (LPG, commonly known as propane), and natural gas. The sum of all these fuel types support commercial, industrial and individual transportation needs. In 2017, 3.4 billion gallons of fuel were consumed by Wisconsin for: manufacture and distribution of goods, farming and distribution of produce, commercial air travel, commuting to work, leisure travel, marine sports, and many other applications.

Motor gasoline consumption accounts for 68 percent of all transportation fuel used for a total of 2.36 billion gallons, much of which is used by Wisconsin citizens commuting to and from work. When combined with diesel fuel, a fuel used for truck transportation and distribution of goods, motor gasoline and diesel fuel accounted for 3.06 billion gallons, more than 87.5 percent of all transportation fuel used in 2017.

Citizens and businesses can take advantage of a number of transportation initiatives led by groups like Wisconsin Clean Cities, a stand-alone, non-profit organization that is a designated U.S. Department of Energy's (DOE) Clean Cities coalition serving the state of Wisconsin. A partnership between the Wisconsin Office of Energy Innovation and Wisconsin Clean Cities provided Wisconsin with innovative transportation fuel programs: Forwarding Wisconsin's Fuel Choice and Wisconsin Smart Fleet. These programs focused on training and education to reduce Wisconsin's petroleum consumption and carbon footprint in an effort to conserve resources, decrease pollution, reduce barriers to expanding alternative fuels markets statewide, and increase overall sustainability in fleets.

It is important to note that there has been an upsurge in sales of plug-in electric vehicles (PEVs), including battery electric vehicles and plug-in hybrid electric vehicles both nationwide and statewide. In 2015, there were 316 electric and 32,832 hybrid vehicles in Wisconsin. By 2018, the number of electric vehicles increased to 1,279 and hybrid vehicles increased to 44,279. Despite PEVs and hybrid vehicles accounting for less than 1% of total vehicles in the State, future development of the electric vehicle market and electricity consumption by such vehicles have important policy implications.

Transportation Sector Energy Use

2005-2017 (Millions of Gallons)

Year	Motor Gasoline[a]	Diesel	Aviation Gasoline	Jet Fuel	No. 2 Distillate (Rail)	Residual (Vessel)	Liquefied Petroleum Gas	Total Petroleum	Ethanol	Natural Gas[b]	Total
2005	2439.19	672.69	4.15	105.68	35.14	0.00	3.01	3259.87	122.96	0.21	3383.03
2006	2364.13	702.56	3.52	102.94	37.16	0.00	3.22	3213.52	130.41	0.22	3344.15
2007	2401.74	691.34	2.85	94.55	43.22	0.00	2.33	3236.04	161.24	0.21	3397.48
2008	2277.30	693.90	2.61	102.41	34.68	0.00	2.38	3113.28	217.00	0.17	3330.45
2009	2252.30	600.38	1.85	104.71	30.13	0.00	2.20	2991.56	229.69	0.18	3221.43
2010	2307.56	658.81	2.27	96.89	33.31	0.00	2.26	3101.11	255.36	0.30	3356.77
2011	2285.50	657.95	2.48	84.04	35.79	0.00	1.58	3067.34	227.08	0.55	3294.97
2012	2186.93	666.88	2.39	62.79	50.18	0.00	1.63	2970.81	297.49	1.51	3269.81
2013	2156.01	632.74	2.18	65.90	43.70	0.00	1.97	2902.50	294.68	3.88	3201.06
2014	2309.86	693.35	2.52	82.15	52.06	0.00	2.30	3142.25	282.55	8.62	3433.42
2015	2317.95	685.98	2.94	80.81	49.23	0.00	2.49	3139.39	297.52	11.47	3448.37
2016	2324.50	672.30	2.40	74.30	42.20	0.00	2.80	3118.46	315.60	13.9	3447.97
2017	2307.60	688.02	2.56	66.07	30.99	0.00	3.20	3098.40	317.41	15.48	3431.30

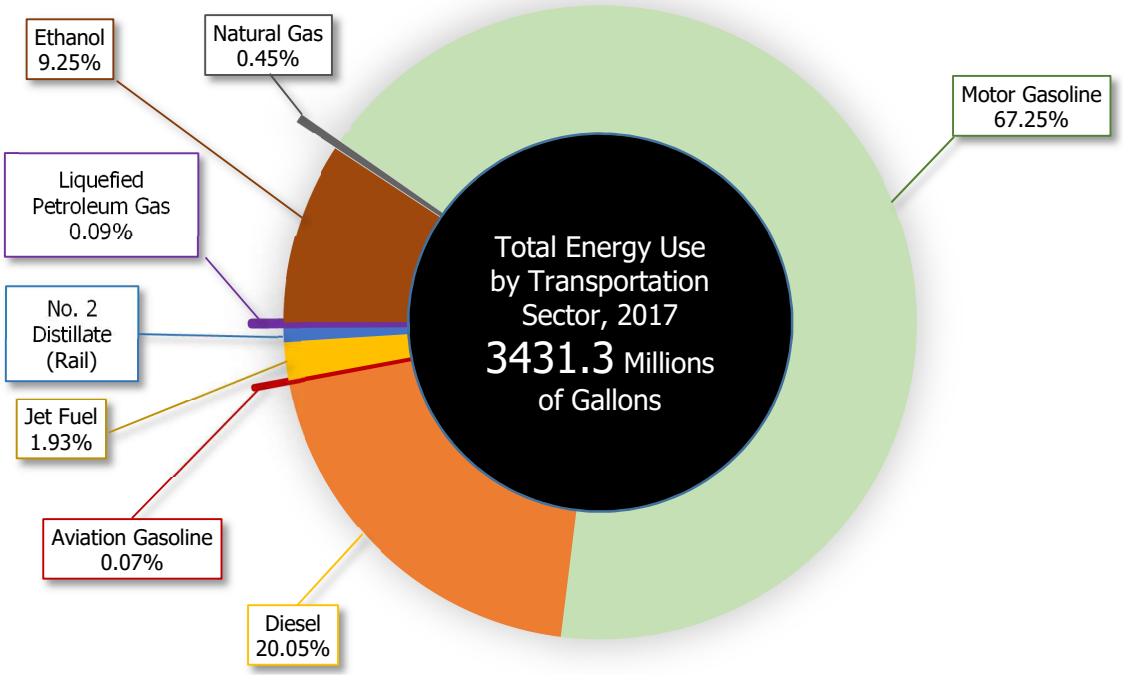
Transportation Sector Energy Use

2005-2017 (Trillions of Btu)

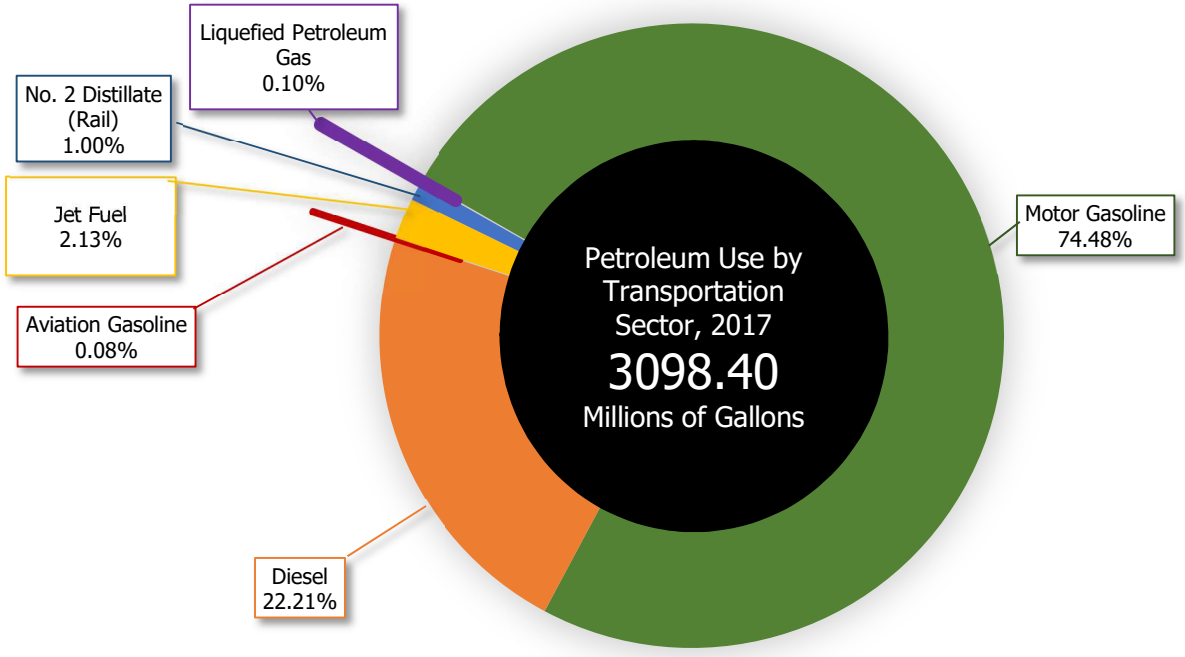
Year	Motor Gasoline	Diesel	Aviation Gasoline	Jet Fuel	No. 2 Distillate (Rail)	Residual (Vessel)	Liquefied Petroleum Gas	Total Petroleum	Ethanol	Natural Gas	Total
2005	304.90	93.05	0.52	14.27	4.87	0.59	0.29	418.49	10.38	0.02	428.89
2006	295.52	97.18	0.44	13.90	5.15	0.78	0.31	413.28	11.01	0.02	424.31
2007	300.22	95.63	0.36	12.76	5.99	0.21	0.22	415.40	13.61	0.02	429.03
2008	284.66	95.99	0.33	13.82	4.81	0.03	0.23	399.87	18.31	0.02	418.21
2009	281.54	83.05	0.23	14.14	4.18	0.00	0.21	383.34	19.39	0.02	402.75
2010	288.44	91.13	0.28	13.08	4.62	0.00	0.22	397.78	21.55	0.03	419.36
2011	285.69	91.01	0.31	11.35	4.96	0.00	0.15	393.47	19.17	0.06	412.70
2012	273.37	92.25	0.30	8.48	6.96	0.00	0.16	381.51	25.11	0.17	406.78
2013	269.50	87.53	0.27	8.90	6.06	0.00	0.19	372.45	24.87	0.44	397.75
2014	288.73	95.91	0.32	11.09	7.22	0.00	0.22	403.49	23.85	0.98	428.31
2015	289.74	94.89	0.37	10.91	6.83	0.00	0.24	402.97	25.11	1.31	429.39
2016	290.56	93.00	0.30	10.03	5.85	0.00	0.27	400.01	26.64	1.58	428.22
2017	288.45	95.17	0.32	8.92	4.30	0.00	0.31	397.46	26.79	1.76	426.01

[a] Does not include ethanol
[b] Compressed natural Gas shown in gasoline gallon equivalents
Source: Wisconsin Department of Revenue, Motor Vehicle Fuel Tax Statistics Federal Highway Report (2005-2017) https://www.revenue.wi.gov/Pages/ISE/Excise-Fuel-Home.aspx, Personal Communication with Department of Revenue, Personal communication with U.S Department of Agriculture, U.S Energy Information Administration, Transportation Sector Energy Consumption Estimates (2005-2017): https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/tra/use_tra_WI.html&sid=WI, Personal Communication Rail Road Companies (2005-2017)

Total Energy Use by Transportation Sector, 2017

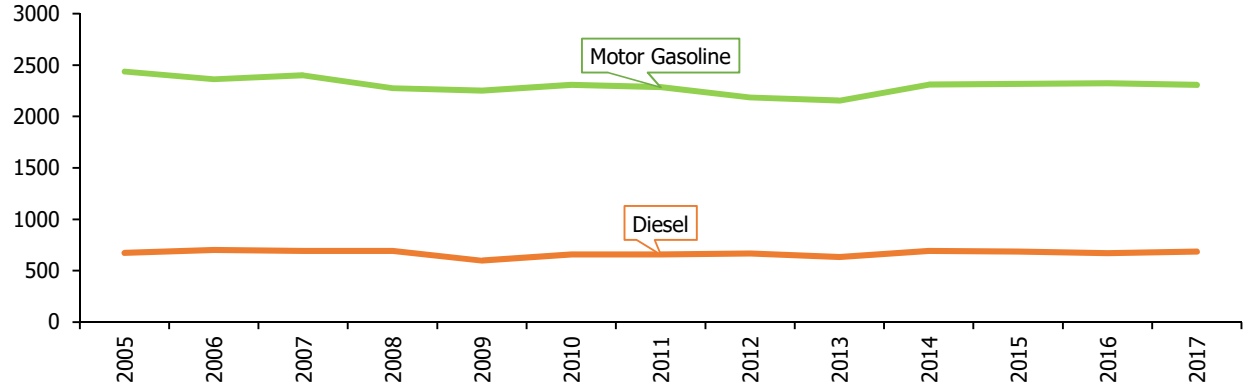


Petroleum Use byTransportation Sector, 2017



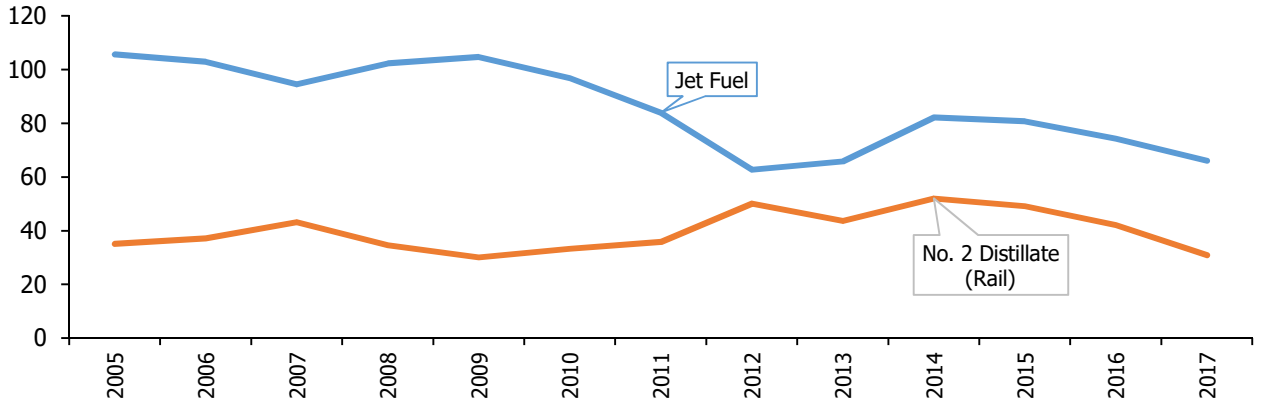
Motor Gasoline and Diesel Use by Transportation Sector (2005-2017)

Millions of Gallons



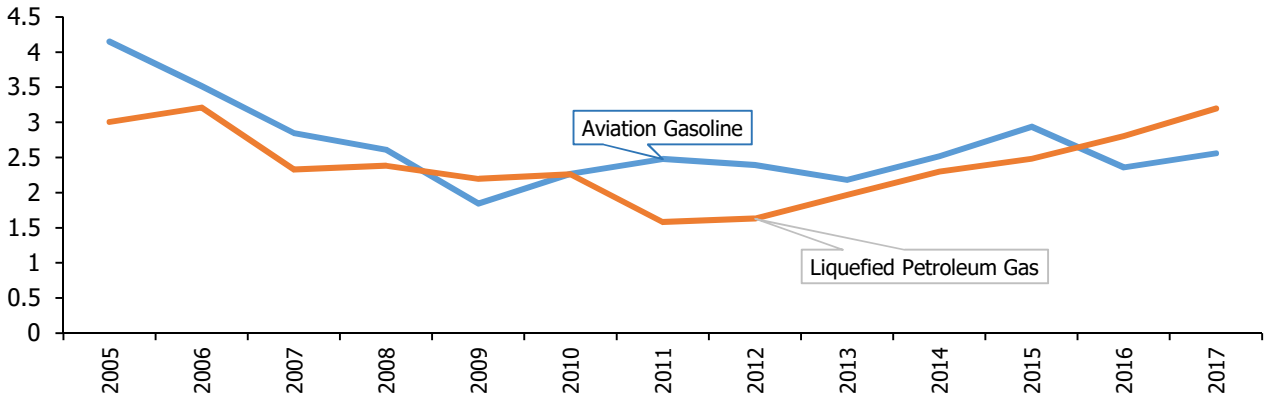
Jet Fuel and No. 2 Use by Transportation Sector (2005-2017)

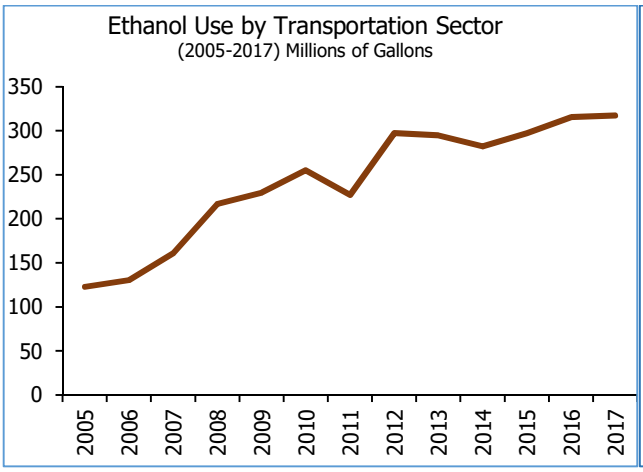
Millions of Gallons

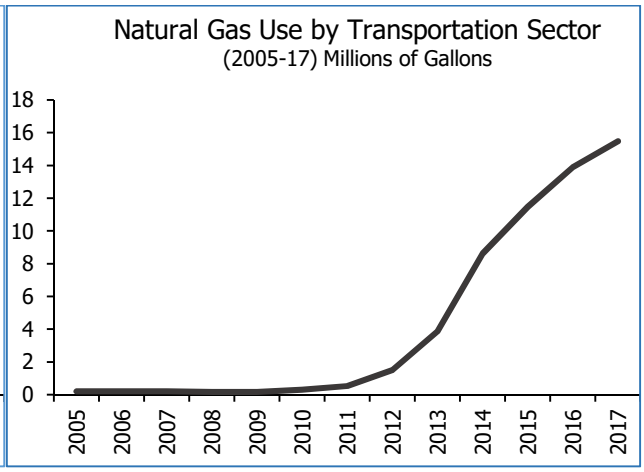


Aviation Gasoline and LPG Use by Transportation Sector (2005-2017)

Millions of Gallons





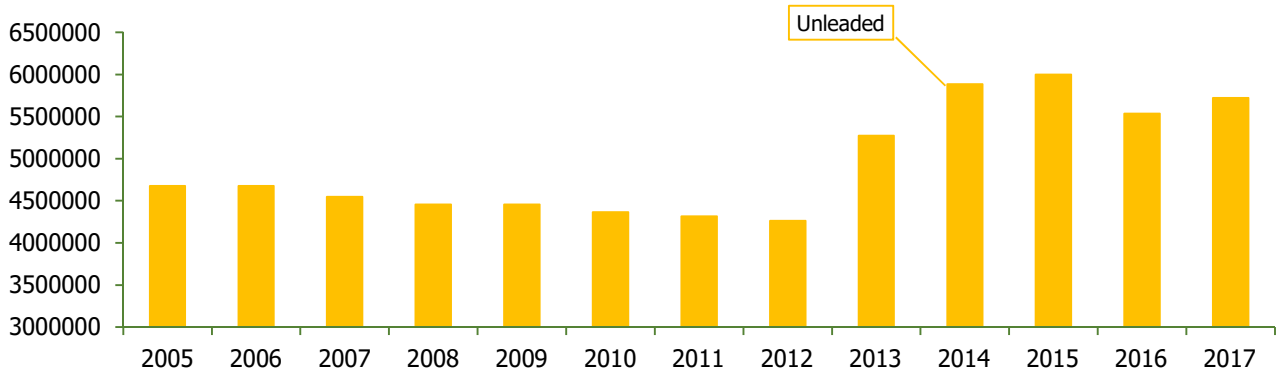


Wisconsin Motor Vehicle Registrations, by Type of Fuel
2005 - 2017

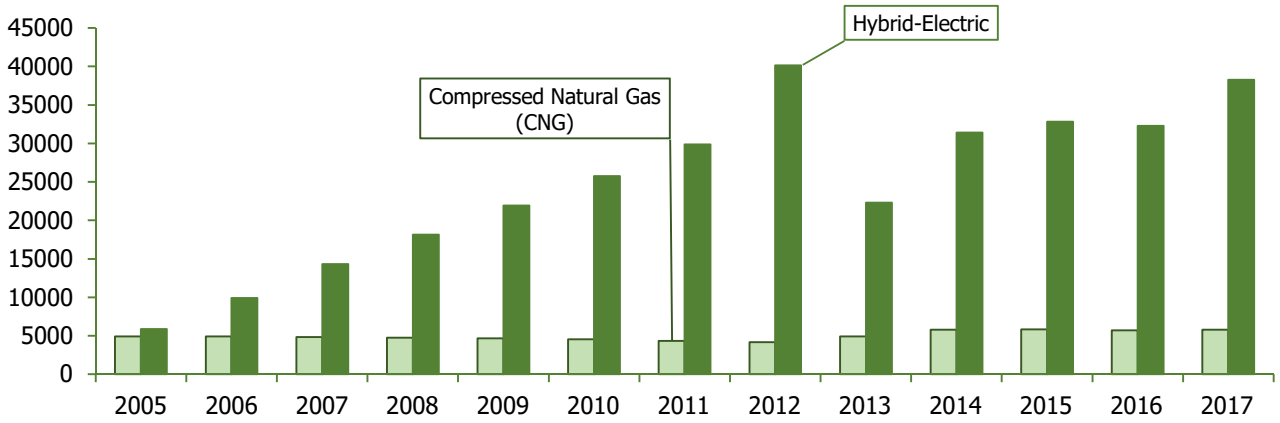
Year	Unleaded	Diesel	Ethanol (E85) Flex Fuel	Hybrid-Electric	Propane	Compressed Natural Gas (CNG)	Electric	Methanol	Liquefied Natural Gas (LNG)	Other[a]	Total
2005	4678223	146406	109848	5862	115	4899	8	1	0	426438	5371800
2006	4676626	159327	128563	9891	95	4922	7	1	0	504622	5484054
2007	4546665	164568	148619	14329	83	4852	12	0	0	576857	5455985
2008	4456969	149054	169073	18145	71	4762	27	0	0	604464	5402565
2009	4455171	173831	190198	21938	81	4664	32	0	0	693190	5539105
2010	4365757	166473	223564	25758	60	4526	33	0	0	696347	5482518
2011	4316926	172191	271732	29871	53	4348	51	1	0	731625	5526798
2012	4263037	203773	372660	40143	47	4156	234	2	0	685045	5569097
2013	5274566	350580	277096	22306	177	4915	203	0	0	254268	6184111
2014	5883765	419550	378210	31401	184	5770	269	0	2	300536	7019687
2015	5997946	431255	400018	32832	174	5835	316	0	2	311144	7179522
2016	5534264	438332	383660	32262	325	5722	375	0	2	303752	6698694
2017	5719696	468862	425770	38280	403	5806	771	2	2	316619	6976211

[a] Fuel type coded as exempt or as a miscellaneous fuel type.
Source: Personal communication, Wisconsin Department of Transportation, Unpublished data (2005-2017)

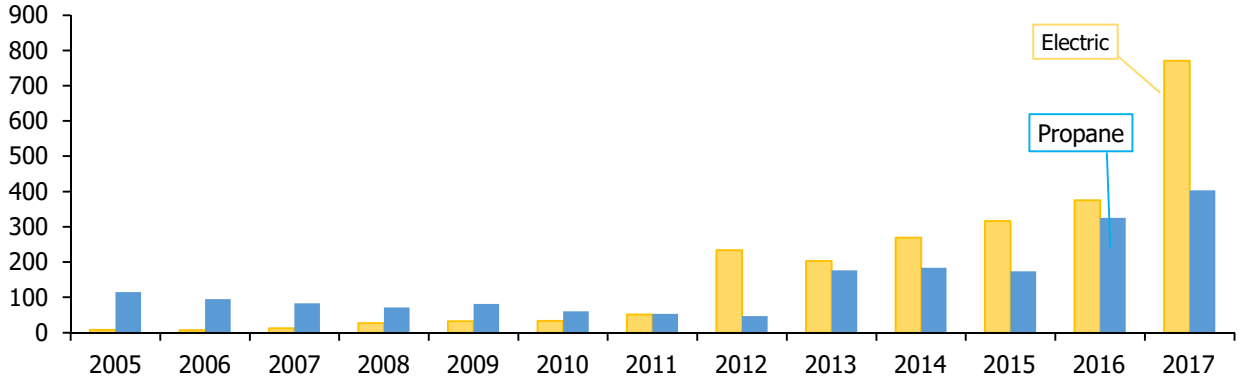
Wisconsin Motor Vehicles Registrations, by Fuel Type 2005-2017



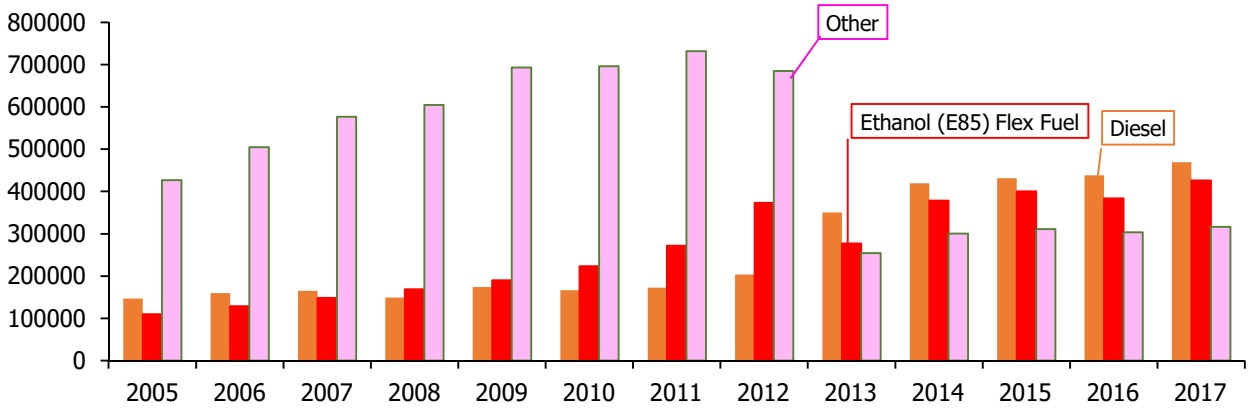
Wisconsin Motor Vehicles Registrations, by Fuel Type 2005-2017



Wisconsin Motor Vehicles Registrations, by Fuel Type 2005-2017



Wisconsin Motor Vehicles Registrations, by Fuel Type 2005-2017



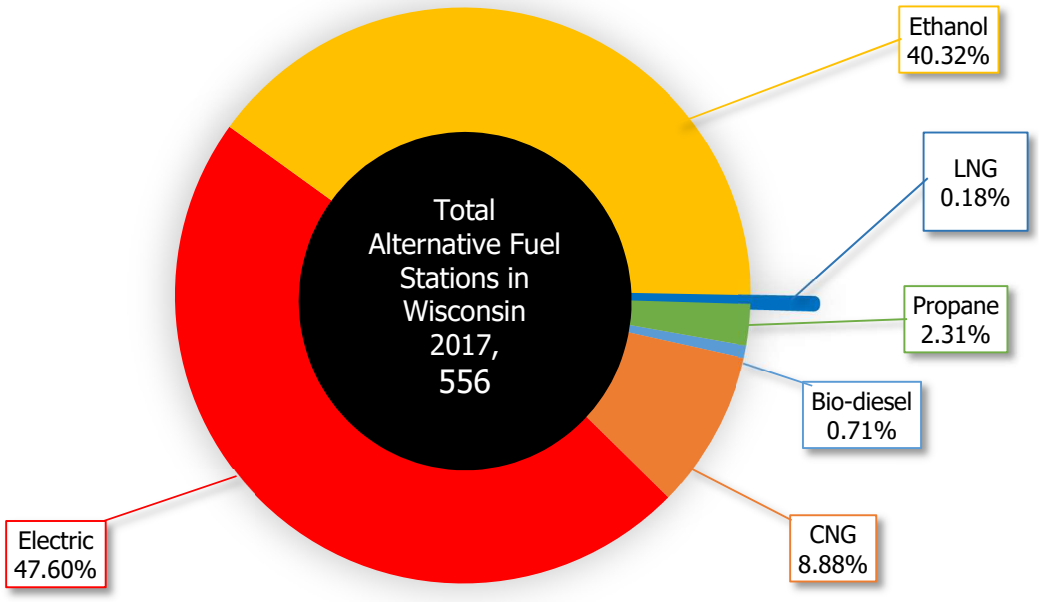
Wisconsin Alternative Fuel Stations Profile 2019[a]

	Public	Private	Total
Bio-diesel	4	0	4
CNG	38	12	50
Electric[b]	237	31	268
Ethanol	226	1	227
LNG	1	0	1
Propane	13	0	13
All Fuels	508	48	556

Electric Fuel Stations and Charging Outlets in Wisconsin 2019

	Stations	Charging Outlets
Level1	77	78
Level2	232	460
DC Fast	43	140
Total	**342**	**678**

Alternative Fuel Stations in Wisconsin, 2019

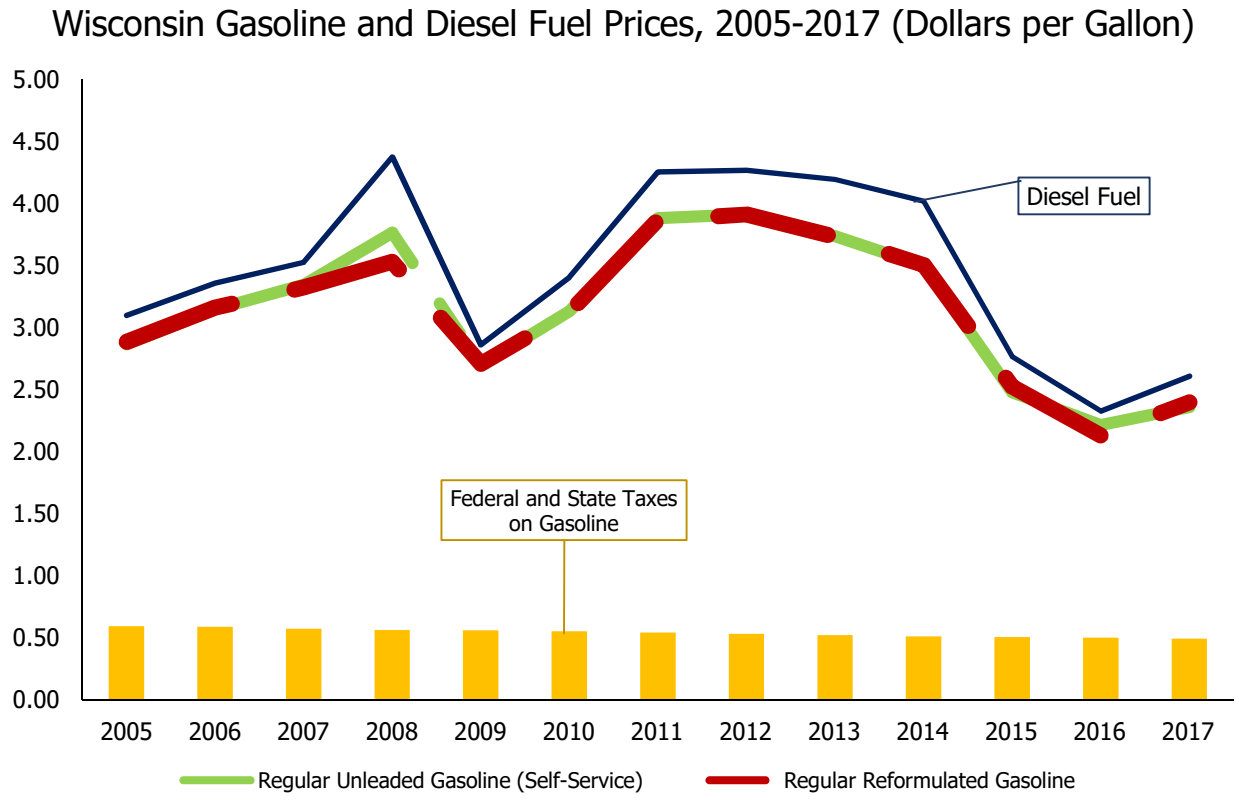


[a] The data prior 2019 December is unavailable.
[b] includes only Level 2 and DC Fast Charging Stations
Source: https://www.energy.gov/public-services/vehicles/alternative-fuel-vehicles#/analyze?country=US&region=US-WI&fuel=ELEC&access=public&access=private

Wisconsin Gasoline and Diesel Fuel Prices

2005-2017 (Dollars per Gallon)

	Actual Year Dollars				2017 Dollars			
Year	**Regular Unleaded Gasoline (Self-Service)**	**Regular Reformulated Gasoline**	**Diesel Fuel**	**Federal and State Taxes on Gasoline[a]**	**Regular Unleaded Gasoline (Self-Service)**	**Regular Reformulated Gasoline**	**Diesel Fuel**	**Federal and State Taxes on Gasoline**
2005	2.32	2.34	2.51	0.48	2.87	2.89	3.10	0.59
2006	2.63	2.64	2.80	0.49	3.15	3.16	3.36	0.59
2007	2.87	2.85	3.02	0.49	3.35	3.33	3.53	0.58
2008	3.29	3.09	3.82	0.49	3.77	3.53	4.37	0.56
2009	2.37	2.38	2.52	0.49	2.70	2.71	2.86	0.56
2010	2.79	2.78	3.03	0.49	3.13	3.13	3.41	0.55
2011	3.53	3.52	3.87	0.49	3.88	3.87	4.25	0.54
2012	3.62	3.62	3.95	0.49	3.91	3.91	4.27	0.53
2013	3.52	3.52	3.95	0.49	3.74	3.73	4.19	0.52
2014	3.36	3.37	3.86	0.49	3.50	3.51	4.02	0.51
2015	2.41	2.45	2.69	0.49	2.48	2.53	2.77	0.51
2016	2.18	2.09	2.29	0.49	2.22	2.13	2.33	0.50
2017	2.36	2.40	2.61	0.49	2.36	2.40	2.61	0.49



[a] State petroleum inspection fee s. 168.12(1), Wis. Stats.: $0.02, Federal retail gasoline tax: $0.184, Wisconsin state retail gasoline tax: $0.309

Source: Daily State Gasoline price: https://gasprices.aaa.com/?state=WI aggregated by the Wisconsin Office of Energy Innovation in https://psc.wi.gov/Pages/Programs/OEI/SHOPP.aspx, U.S. Energy Information Administration, Midwest Regular Reformulated Retail Gasoline Prices (2005-2017) https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPMRR_PTE_R20_DPG&f=M, Federal and State Motor Fuels Taxes https://www.eia.gov/petroleum/marketing/monthly/pdf/mgt.pdf.

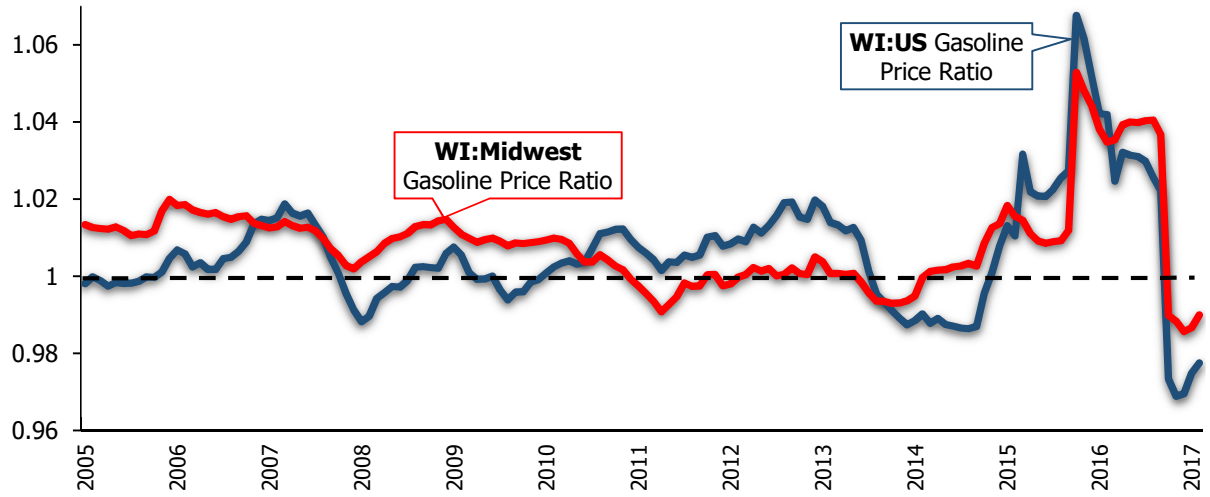
Retail Sales Price of Conventional Gasoline in Wisconsin, Midwest and U.S.

2005-2017 (Dollars per Gallon)

YEAR	WISCONSIN	MIDWEST[a]	U.S.
2005	1.80	1.78	1.80
2006	2.10	2.06	2.08
2007	2.35	2.32	2.31
2008	2.72	2.71	2.75
2009	1.87	1.85	1.86
2010	2.29	2.27	2.29
2011	3.04	3.05	3.02
2012	3.13	3.13	3.10
2013	3.03	3.03	2.99
2014	2.87	2.87	2.89
2015	1.92	1.89	1.89
2016	1.68	1.62	1.62
2017	1.86	1.88	1.91

Wisconsin Gasoline Prices Relative to the U.S. and Midwest

2005-2015 (Dollars Per Gallon)



Data are present in a 12-point moving average. Index of 1 used to comapare Wisconsin prices against Midwest and U.S. prices; Value ±1 indicate higher or lower price relative to U.S. or Midwest average, respectively.

[a] IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, OK, SD, TN, WI

U.S. Energy Information Administration, U.S. Regular Conventional Retail Gasoline Prices (2005-2015) https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epmru_pte_nus_dpg&f=m, Midwest Regular Conventional Retail Gasoline Prices (2005-2017) https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epmru_pte_r20_dpg&f=m, AAA Daily Gas prices aggregated by Wisconsin Office of Energy Innovation https://psc.wi.gov/Pages/Programs/OEI/SHOPP.aspx (2005-2017) https://gasprices.aaa.com/?state=WI, Federal and state motor fuel taxes: https://www.eia.gov/petroleum/marketing/monthly/

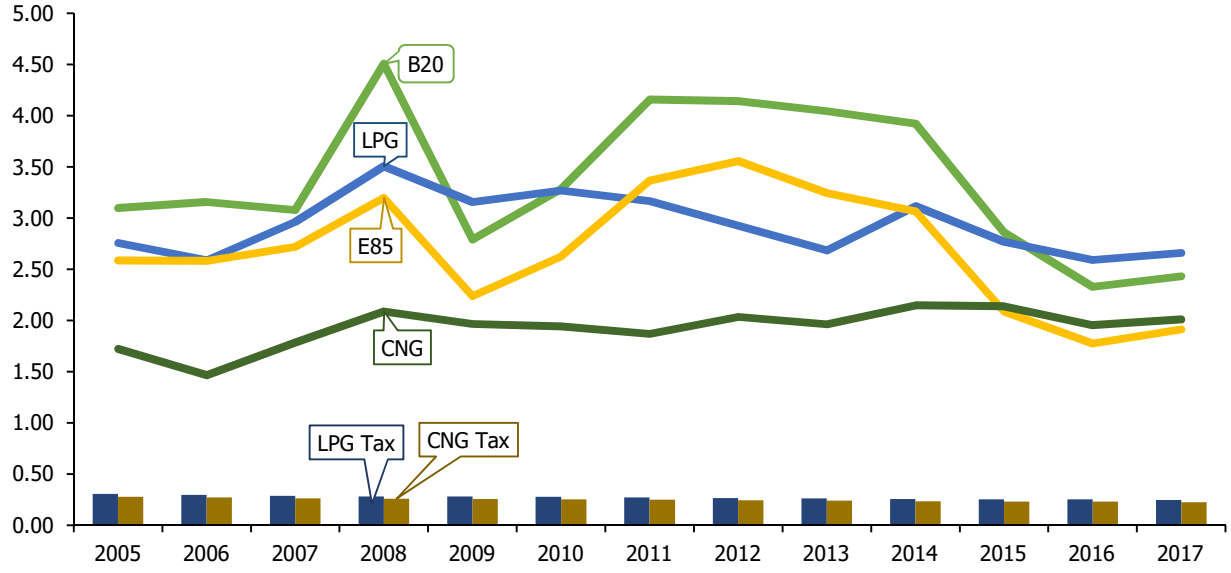
Wisconsin Alternative Vehicle Fuels Retail Prices

2005-2017 (Dollars per Gallon and Gasoline Gallon Equivalents)

Year	Nominal Values						2017 Dollars					
	B20	LPG	E85	CNG	LPG[a] Tax	CNG[b] Tax	B20	LPG	E85	CNG	LPG Tax	CNG Tax
2005	2.51	2.24	2.10	1.40	0.23	0.25	3.10	2.76	2.59	1.72	0.30	0.28
2006	2.64	2.16	2.16	1.23	0.23	0.25	3.16	2.59	2.58	1.47	0.30	0.27
2007	2.64	2.54	2.33	1.53	0.23	0.25	3.08	2.96	2.72	1.79	0.29	0.26
2008	3.94	3.07	2.80	1.83	0.23	0.25	4.51	3.51	3.20	2.09	0.28	0.26
2009	2.46	2.78	1.97	1.73	0.23	0.25	2.79	3.16	2.24	1.97	0.28	0.26
2010	2.93	2.91	2.34	1.73	0.23	0.25	3.29	3.27	2.63	1.94	0.28	0.25
2011	3.78	2.88	3.06	1.70	0.23	0.25	4.16	3.17	3.37	1.87	0.27	0.25
2012	3.84	2.71	3.30	1.89	0.23	0.25	4.14	2.93	3.56	2.03	0.27	0.24
2013	3.81	2.53	3.06	1.85	0.23	0.25	4.04	2.69	3.25	1.97	0.26	0.24
2014	3.77	3.00	2.95	2.07	0.23	0.25	3.92	3.12	3.07	2.15	0.26	0.24
2015	2.78	2.69	2.03	2.08	0.23	0.25	2.86	2.77	2.09	2.14	0.25	0.23
2016	2.28	2.54	1.74	1.91	0.22	0.24	2.33	2.59	1.78	1.95	0.25	0.23
2017	2.43	2.66	1.92	2.01	0.22	0.24	2.43	2.66	1.92	2.01	0.25	0.23

Wisconsin Alternative Vehicle Fuels Retail Prices, 2000-2017

(Dollars per Gallon and Gasoline Gallon Equivalents)



The price of alternative vehicle fuel other than CNG show a declining trend in terms of 2017 prices. The tax rates on LPG and CNG prices too are declining in terms of 2017 prices. It is important to note the difference in nominal prices and 2017 prices. In nominal terms the price may have increased, but shows a decline when adjusted to inflation (2017 constant prices).

[a] LPG state tax: $0.226
[b] CNG state tax: $0.247
U.S. Department of Energy, Alternative Fuels Data Center, Clean Cities Alternative Fuel Price Report (2005-2017) https://afdc.energy.gov/publications/search/keyword/?q=alternative%20fuel%20price%20report, Wisconsin Department of Revenue, Motor Vehicle Fuel Tax Statistics Federal Highway Report (2005-2017) https://www.revenue.wi.gov/Pages/ISE/Excise-Fuel-Home.aspx.

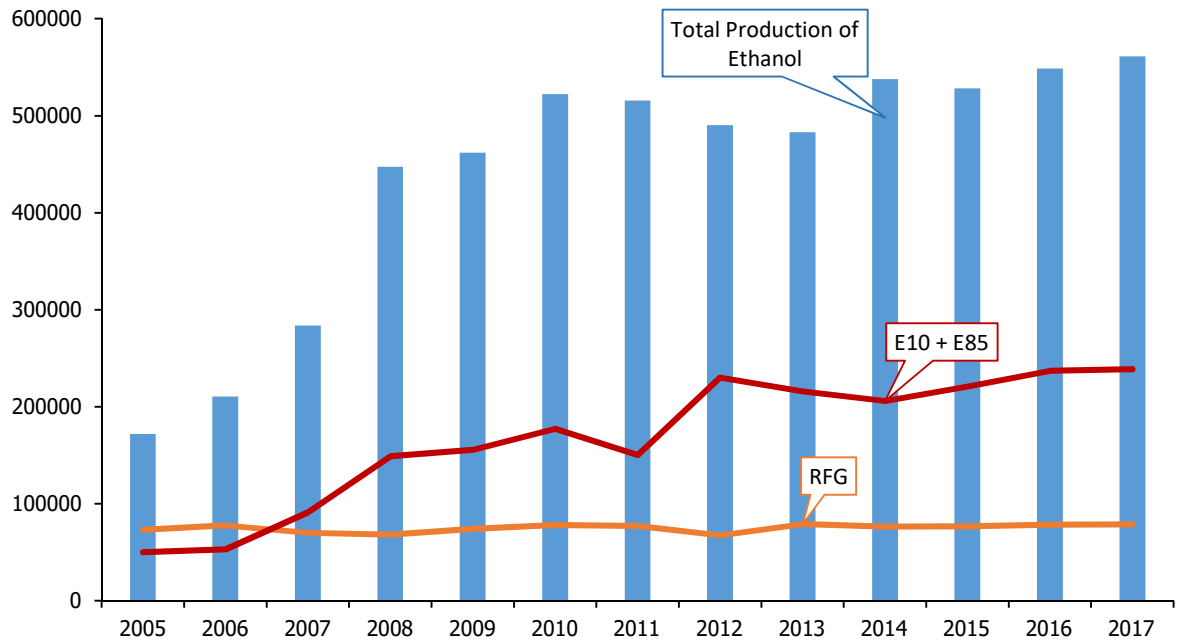
Wisconsin Ethanol Use for Producing RFG, E10 and E85

(Thousands of Gallons) 2005 - 2017

Year	Total Production of Ethanol[a]	Percent change from previous year	Ethanol used for blending with:		Total Consumption	Percent change from previous year
			RFG[b]	E10 + E85[c]		
2005	171780		73046	49914	122960	
2006	210378	22.5%	77614	52800	130414	6.1%
2007	283878	34.9%	69963	91272	161235	23.6%
2008	447384	57.6%	68047	148949	216996	34.6%
2009	462000	3.3%	74142	155547	229689	5.8%
2010	522270	13.0%	77968	177394	255362	11.2%
2011	515676	-1.3%	76927	150150	227078	-11.1%
2012	490224	-4.9%	67286	230203	297489	31.0%
2013	483042	-1.5%	78914	215770	294684	-0.9%
2014	537726	11.3%	76395	206154	282549	-4.1%
2015	528234	-1.8%	76775	220741	297516	5.3%
2016	548562	3.8%	78465	237147	315612	6.1%
2017	561288	2.3%	78712	238703	317415	0.6%

Ethanol Production and Ethanol Use for producing RFG, E10 and E85

(Thousands of Gallons) 2005-2017



[a] Revised from EIA (source mentioned below; 1 barrel= 42 gallons)
[b] RFG is reformulated gasoline. Starting January 1, 1995, the federal government mandated its sale in six southeastern Wisconsin counties to comply with the Clean Air Act. Ethanol is used to provide the oxygenate required in RFG.
[c]E10 is a motor fuel blend consisting of 10 percent ethanol and 90 percent conventional gasoline (non RFG) and E85 is a motor fuel consisting of 85 percent ethanol and 15 percent conventional gasoline (non RFG).

Source: U.S. Energy Information Administration, State Energy Data System (2005-2017), Primary energy production: https://www.eia.gov/state/seds/seds-data-complete.php?sid=WI#Production, Personal Communication with Department of Revenue (2005-2017), Department of Revenue Federal Highway Report (2005-2017) https://www.revenue.wi.gov/Pages/ISE/Excise-Fuel-Home.aspx#fhway, U.S. Energy Information Administration, Prime Supplier Report Archives (Form EIA-782C Monthly Report of Petroleum Products Sold into States for Consumption 2005-2017): https://www.eia.gov/petroleum/marketing/prime/archive/

Electric Power Generation

Electric power generation produces the end-use energy that powers Wisconsin, from homes to schools to libraries, museums, and restaurants. Electricity is generated at power plants (also called generating facilities) through the combustion of a variety of fuels including: coal, biomass, natural gas, nuclear, and renewables.

Electric power generation declined from 65,536.56 Million kWh in 2016 to 65,153 million kWh in 2017. Despite declines in coal usage since 2013, coal still represents more than 55 percent of the electric power generation in Wisconsin.

Over the years, natural gas consumption has fluctuated as a heavily used fuel for electricity generation. In 2017, natural gas was the second-largest source of electric power generation, overtaking nuclear power. Nuclear power generation, by contrast, has remained relatively constant, decreasing from 10008 million kWh in 2015 to 9648.98 million kWh in 2017. Natural gas fired power plants make up almost 19 percent of total net generation, while nuclear power supplies have contributed almost 14 percent. Nuclear power in Wisconsin is no longer owned by utilities, but by independent power producers who sell the power to customers in Wisconsin and other states.

Peak load is simply the highest amount of electricity drawn from the utility during a given timeframe. Both Summer and Winter Peak Demand have been declining since 2011. The electric utility power load, the amount of electricity on the grid at a given time, was at its highest in 2005, declined during the recession years, and after which its second highest peak of 70,352 million kWh was in 2015.

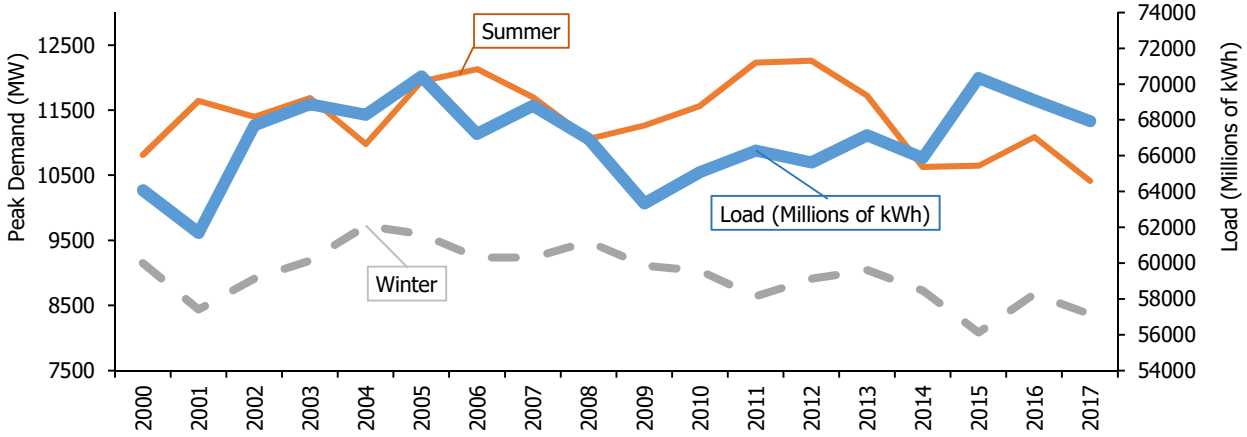
Eastern Wisconsin[a] Non-Coincident Peak[b] Demand and Electric Utility Power Load

2000 - 2017 (MW and Millions of kWh)

Year	Peak Demand (MW) Summer	%change	Winter	%change	Load (Millions of kWh)
2000	10814		9152		64084
2001	11645	+7.7%	8440	-7.8%	61701
2002	11401	- 2.1%	8917	+5.7%	67698
2003	11688	+2.5%	9192	+3.1%	68886
2004	10981	-6.0%	9729	+5.8%	68296
2005	11946	+8.8%	9595	-1.4%	**70441**
2006	12129	+1.5%	9238	-3.7%	67216
2007	11698	-3.6%	9237	0.0%	68796
2008	11060	-5.5%	9482	2.7%	66931
2009	11267	+1.9%	9114	-3.9%	63349
2010	11568	+2.7%	9036	-0.9%	65092
2011	12230	+5.7%	8642	-4.4%	66300
2012	12259	+0.2%	8913	3.1%	65623
2013	11722	-4.4%	9042	1.4%	67142
2014	10626	-9.3%	8919	-1.4%	65887
2015	10646	+0.2%	8084	-9.4%	**70352**
2016	11088	+4.2%	8677	7.3%	69120
2017	10415	-6.1%	8364	-3.6%	67929

Wisconsin's 2017 summer peak electricity demand for the eastern Wisconsin utilities decreased by 6.1% due to cooler summers. Winter peak demand also decreased by 3.6% due to warmer winter.

Eastern Wisconsin Utility Power Non-Coincident Peak Demand, Summer and Winter, 2000-2017(MW)



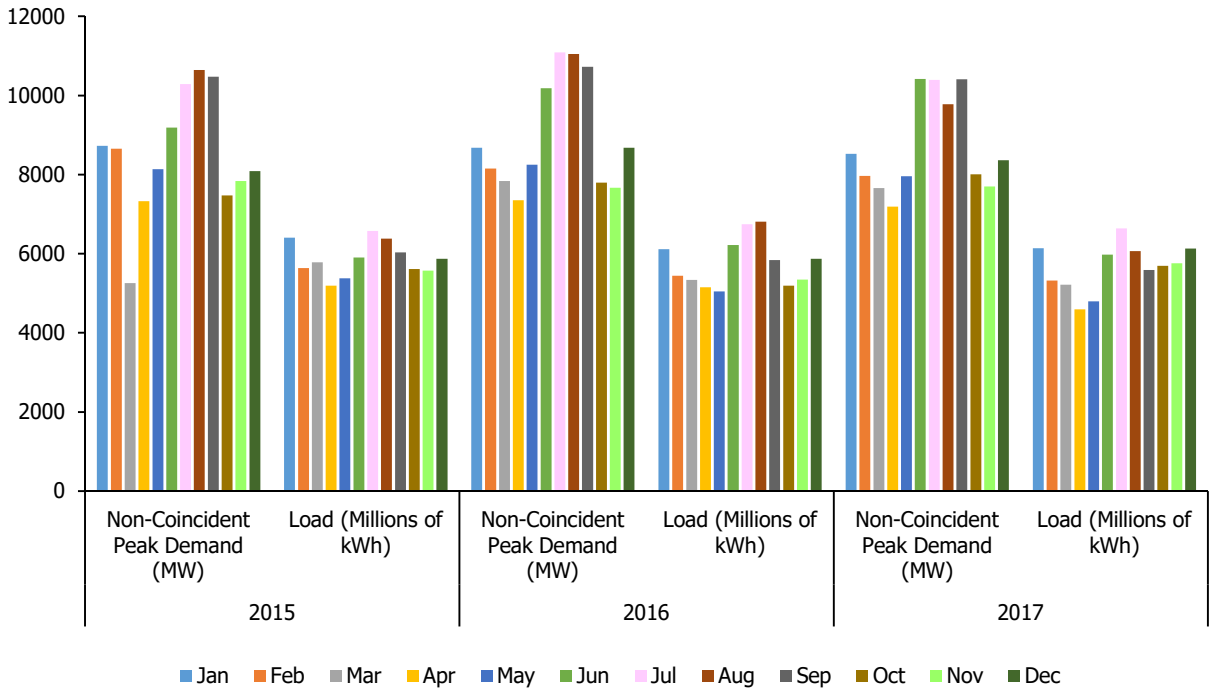
[a] Eastern Wisconsin Utilities: Wisconsin Electric Power Co., Wisconsin Power and Light Co., Wisconsin Public Services Corp., and Madison Gas and Electric Co.
[b] Non-Coincident peak demand is the sum of the individual monthly peak electric demands from Wisconsin's eastern utilities.
Source: Wisconsin electric utility annual reports submitted to the Public Service Commission of Wisconsin (2000-2017)
http://apps.psc.wi.gov/vs2015/annualReports/content/listingIOU.aspx

Eastern Wisconsin Non-Coincident Peak Demand and Electric Utility Power Load by Month

2015 - 2017 (MW and Millions of kWh)

	2015		2016		2017	
	Non-Coincident Peak Demand (MW)	Load (Millions of kWh)	Non-Coincident Peak Demand (MW)	Load (Millions of kWh)	Non-Coincident Peak Demand (MW)	Load (Millions of kWh)
Jan	8730	6409	8679	6115	8526	6140
Feb	8653	5635	8153	5446	7966	5321
Mar	5255	5785	7837	5337	7660	5217
Apr	7329	5196	7351	5154	7190	4597
May	8139	5375	8252	5043	7962	4795
Jun	9191	5906	10186	6218	***10415***	5980
Jul	10290	6575	***11088***	6743	10391	6643
Aug	**10646**	6379	11051	6806	9781	6066
Sep	10474	6032	10721	5841	10406	5586
Oct	7472	5615	7797	5193	8004	5694
Nov	7838	5575	7666	5349	7701	5756
Dec	8084	5870	8677	5875	8364	6134
Total		**70352**		**69120**		**67929**

Eastern Wisconsin Non-Coincident Peak Demand and Electric Utility Power Load by Month (2015-2017)



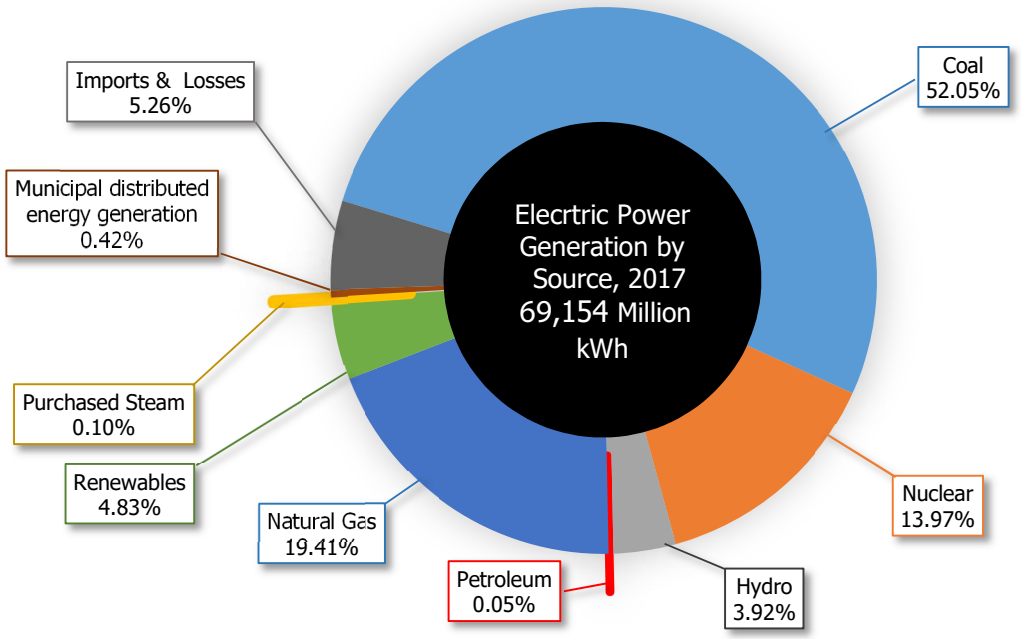
Source: Wisconsin electric utility annual reports submitted to the Public Service Commission of Wisconsin (2015-2017) http://apps.psc.wi.gov/vs2015/annualReports/content/listingIOU.aspx

Wisconsin Energy Use for Electric Generation and Total Sales

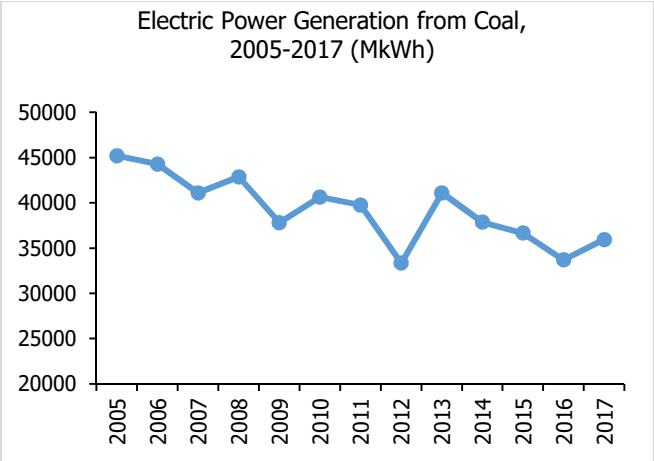
2005-2017 (Millions of kWh)

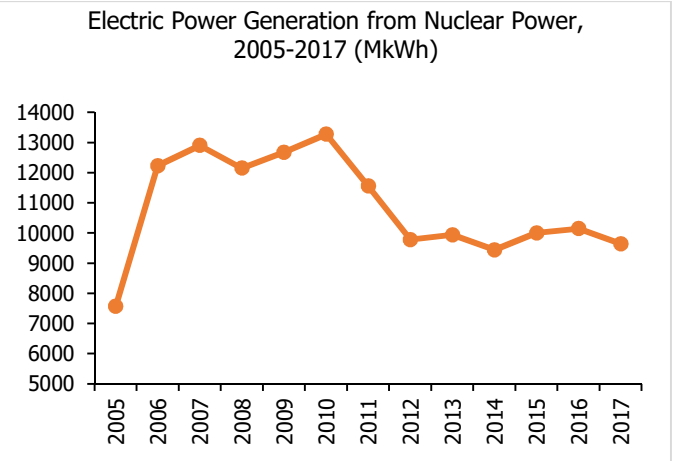
Year	Coal[a]	Nuclear	Hydro	Petroleum[b]	Natural Gas	Renewables[c]	Purchased Steam	Total Generation by Utilities	Distributed Energy Generation[d]	Imports & Losses[e]	Total Sales
2005	45219	7574	1551	75	4406	413		59238	52	11046	**70336**
2006	44298	12234	1718	263	5112	1184		64809	56	4956	**69821**
2007	41111	12910	1534	161	6479	1287		63483	149	7670	**71301**
2008	42887	12155	1684	100	5219	1682		63727	446	5949	**70122**
2009	37824	12683	1562	44	5452	2658	30	60253	415	5619	**66286**
2010	40646	13281	2339	45	5474	2631	33	64449	388	3916	**68752**
2011	39763	11560	2259	45	6211	2949	19	62806	448	5358	**68612**
2012	33342	9784	1608	9	11290	3337	32	59402	465	8954	**68820**
2013	41117	9942	2069	6	7451	3329	33	63947	342	4835	**69124**
2014	37869	9447	2557	63	8137	3442	32	61547	410	7538	**69495**
2015	36681	10008	2431	33	13378	3201	32	65764	394	2541	**68699**
2016	33709	10151	2876	36	15573	3161	30	65537	415	3785	**69736**
2017	35955	9649	2708	32	13409	3335	66	65154	**291**	3634	**69079**

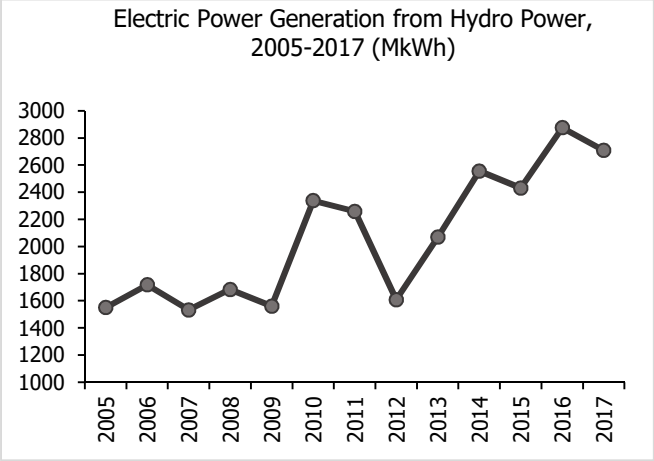
Wisconsin Energy Use for Electric Generation by Source 2017

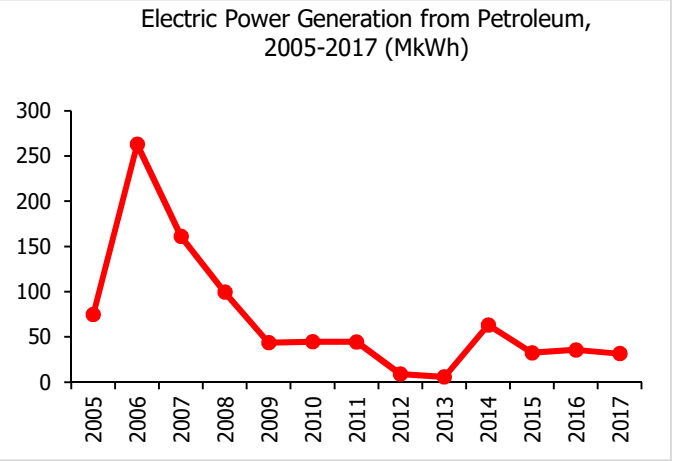


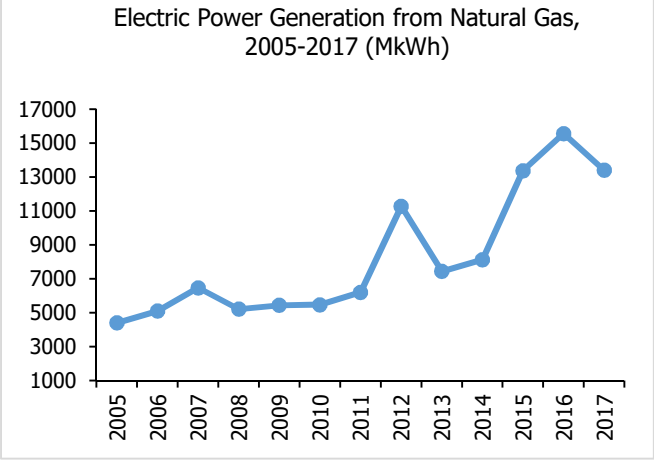
[a] May include small amounts of refuse derived fuel (RDF).
[b] Includes propane used for electricity production.
[c] Includes biomass, methane from landfills and digesters, solar and wind.
[d] The strategic placement of small-scale power generation units at or near the site where the electric power will be consumed is referred to as distributed generation. The reported figures are incomplete and will be published next year.
[e] Imports and losses reflect the difference between total sales reported by the U.S. Energy Information Administration and total generation in Wisconsin. Negative values may indicate out-of-state exports and/or line losses.
Source: Public Service Commission of Wisconsin, Personal Communication and Annual Reports, Investor Owned Utilities, (2005-2017) Unpublished data, U.S. Energy Information Administration, Form EIA-923 detailed data with previous form data (EIA-906/920) https://www.eia.gov/electricity/data/eia923/, Distributed Energy Resources, Biennial Strategic Energy Assessment 2024, PSCW http://apps.psc.wi.gov/vs2015/ERF_view/viewdoc.aspx?docid=341817, U.S. Energy Information Administration, State Electricity Profile: Wisconsin https://www.eia.gov/state/search/#?1=102&2=229

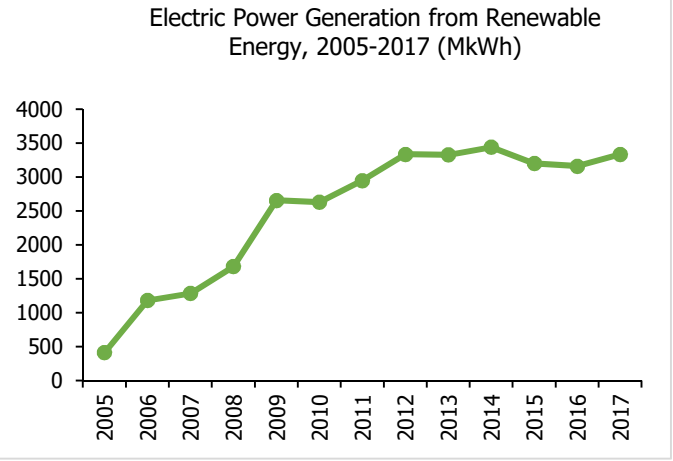

Electric Power Generation from Coal, 2005-2017 (MkWh)
50000
45000
40000
35000
30000
25000
20000
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

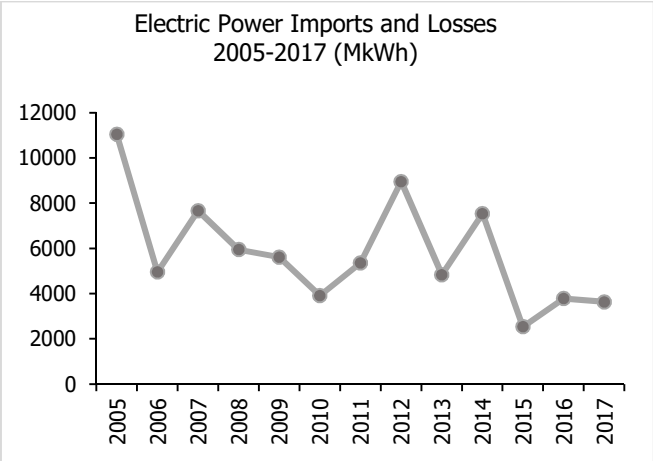

Electric Power Generation from Nuclear Power, 2005-2017 (MkWh)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

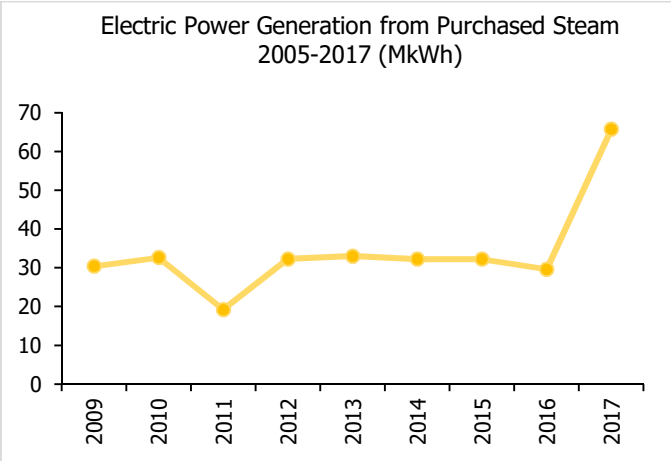

Electric Power Generation from Hydro Power, 2005-2017 (MkWh)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


Electric Power Generation from Petroleum, 2005-2017 (MkWh)
300
250
200
150
100
50
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


Electric Power Generation from Natural Gas, 2005-2017 (MkWh)
17000
15000
13000
11000
9000
7000
5000
3000
1000
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


Electric Power Generation from Renewable Energy, 2005-2017 (MkWh)
4000
3500
3000
2500
2000
1500
1000
500
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017





Percentage Contribution By Each Fuel In Total Electric Generation 2005-2017

Year	Coal	Nuclear	Hydro	Petroleum	Natural Gas	Renewables	Purchased Steam	Total Generation by Utilities (MkWh)
2005	76.33%	12.79%	2.62%	0.13%	7.44%	0.70%		59238.4
2006	68.35%	18.88%	2.65%	0.41%	7.89%	1.83%		64809.2
2007	64.76%	20.34%	2.42%	0.25%	10.21%	2.03%		63482.5
2008	67.30%	19.07%	2.64%	0.16%	8.19%	2.64%		63726.5
2009	62.78%	21.05%	2.59%	0.07%	9.05%	4.41%	0.05%	60252.7
2010	63.07%	20.61%	3.63%	0.07%	8.49%	4.08%	0.05%	64448.7
2011	63.31%	18.41%	3.60%	0.07%	9.89%	4.70%	0.03%	62806.1
2012	56.13%	16.47%	2.71%	0.02%	19.01%	5.62%	0.05%	59401.6
2013	64.30%	15.55%	3.24%	0.01%	11.65%	5.21%	0.05%	63946.6
2014	61.53%	15.35%	4.15%	0.10%	13.22%	5.59%	0.05%	61547.0
2015	55.78%	15.22%	3.70%	0.05%	20.34%	4.87%	0.05%	65764.2
2016	51.44%	15.49%	4.39%	0.05%	23.76%	4.82%	0.05%	65536.6
2017	55.19%	14.81%	4.16%	0.05%	20.58%	5.12%	0.10%	65153.8

While the contribution of coal in total electricity generation is decreasing over the years, contribution of other sources like Natural Gas and Renewables is increasing.

Wisconsin Power Plant Inventory 2017

Utility/Site	Nameplate Capacity (MW)	Number of Units	Primary Fuel
Dairyland Power Cooperative			
Elk Mound	71.0	2	Natural Gas
Flambeau	22.0	3	Hydro
Genoa 3	345.6	1	Coal
J.P. Madgett	387.0	1	Coal
Washington Island	5	7	Fuel Oil
Various Biogas Methane	0.8	2	Biogas
Madison Gas and Electric Co.			
Blount Street 6,7	100.0	2	Natural Gas
Nine Springs	16.2	1	Natural Gas
Rosiere	11.2	17	Wind
Sycamore	41.6	2	Natural Gas
West Campus	169.3	3	Natural Gas
W. Marinette 3,4	83.0	1	Natural Gas
Various Solar	0.10	Multiple	Solar
Northern States Power Co.			
Bay Front 4,5,6	67.2	3	Biomass Wood
Flambeau	16.0	1	Natural Gas
French Island 1,2	30.4	2	Biomass Wood
French Island 3,4	157.6	2	Fuel Oil
French Island Total	188		Coal
Various Hydro	240.9	58	Hydro
Wheaton 1-4	216.0	4	Natural Gas
Wheaton 5-6	106.2	2	Fuel Oil
Wisconsin Electric Power Co.			
Blue Sky Green Field	145.2	88	Wind
Byron	1.32	2	Wind
Concord	381.2	4	Natural Gas
Germantown 1,2,3,4	244.8	4	Fuel Oil
Germantown 5	106.9	1	Natural Gas
Glacier Hills	162	90	Wind
Milwaukee	11.0	1	Coal
Montfort	30	20	Wind
Paris	381.2	4	Natural Gas
Port Washington 1-3	1,150.0	6	Natural Gas
Domtar Rothschild	50.0	1	Biomass Wood
S. Oak Creek 5-8	1,191.6	4	Coal
Valley 1,2	272.0	2	Coal
Valley 3	2.7	1	Fuel Oil
Various Hydro	13.6	8	Hydro
Various Solar	0.003	3	Solar

Utility/Site	Nameplate Capacity (MW)	Number of Units	Primary Fuel
Wisconsin Public Service Corp.			
Lincoln	9.24	14	Wind
Pulliam 31	91	1	Natural Gas
Pulliam 7,8[d]	231.2	2	Coal
Various Hydro	92.2	47	Hydro
Weston 2,3[e]	432.1	2	Coal
Weston 31,32	76.3	2	Natural Gas
W. Marinette 31,32	83.6	3	Natural Gas
W. Marinette 33	83.5	1	Natural Gas
Various Solar	0.0495	8	Solar
DePere	187.2	1	Natural Gas
Fox Energy Center	620	3	Natural Gas
Wisconsin Power and Light Co.			
Cedar Ridge	67.65	41	Wind
Edgewater 4,5	743.7	2	Coal
Neenah	371.0	2	Natural Gas
Riverside	695.7	3	Natural Gas
Rock River 3-6	144.0	4	Natural Gas
Sheboygan Energy Center	380	2	Natural Gas
Sheepskin	40.0	1	Natural Gas
South Fond Du Lac	172.0	2	Natural Gas
Various Landfill Gas	2.3	13	Biomass LFG
Various Hydro	36.6	12	Hydro
Various Solar	0.01	5	Solar
Various Biogas Methane	0.3	10	Biogas
Shared Ownership			
Columbia 1	512.0	1	Coal
Columbia 2	511.0	1	Coal
Edgewater 4	330.0	1	Coal
Weston 4	595	1	Coal
Elm Road Generating Station Total	1402.55	2	Coal
Forward Wind	129.0	86	Wind
Municipal Utilities			
Manitowoc, City of	5.5	1	Natural Gas
Menasha, City of	28.0	3	Coal
Merchant/IPP			
Point Beach	1,098.6	2	Nuclear
Rockgen	187	3	Natural Gas
Statewide Utilities			
	6908.75	22	Coal
	6141.20	62	Natural Gas
	405.3	128	Hydro
	151.13	59	Renewables
	516.30	17	Petroleum
	555.6	358	Wind
	1098.6	2	Nuclear
Statewide Total	15776	647	All

Utility Annual Variable Costs of Power Generation, by Type of Plant
(2000-2017)

This table shows the annual variable cost of generating one kWh of electricity by various technologies in Wisconsin's electric utility plants. The costs in the table below reflect costs incurred by Wisconsin's five largest investor-owned utilities. Wisconsin utilities no longer own nuclear generation; all nuclear reactors located in Wisconsin are owned by independent power producers. The data for 2005, 2006, and 2007 show an increase in the per kWh cost of nuclear generation because these are the years in which sales of the plants were completed. Cost per kWh continues remain high for nuclear generation.

2000-2017 cents per kWh

Year	Fossil Fuel Steam (Coal)	Nuclear Steam[a]	Internal Combustion[b]	Hydro	All Plants	Purchased Power	Average cost
2000	1.75	2.16	7.73	0.86	1.91	3.36	2.24
2001	1.76	2.37	7.63	0.90	1.95	3.90	2.41
2002	1.87	2.18	6.09	0.75	1.97	3.64	2.40
2003	1.91	2.40	8.02	1.12	2.10	4.05	2.61
2004	1.97	2.46	14.63	1.06	2.19	4.26	2.72
2005	2.11	2.64	16.02	1.21	2.74	5.25	3.48
2006	2.68	2.83	14.81	1.40	3.11	5.83	3.88
2007	2.94	3.05	11.76	1.65	3.42	6.29	4.22
2008	3.49	4.03	13.29	1.53	4.00	6.76	4.74
2009	3.77	4.25	9.84	1.81	4.22	5.78	4.65
2010	3.86	4.15	8.19	1.28	4.16	6.06	4.59
2011	4.25	4.01	7.49	1.37	4.33	5.69	4.65
2012	4.57	4.29	4.60	1.90	4.44	5.12	4.64
2013	4.28	4.34	5.27	1.34	4.35	5.71	4.60
2014	4.40	4.62	5.50	1.25	4.50	5.13	4.67
2015	4.51	4.63	3.50	1.36	4.20	5.05	4.40
2016	4.56	4.67	3.30	1.11	4.90	6.23	5.20
2017	4.26	4.70	3.82	1.27	4.89	6.56	5.32

[a] Nuclear Reactors in Wisconsin are owned by independent power producers.
[b] Internal combustion includes both gas powered turbines and diesel powered engines.
Source: Public Service Commission of Wisconsin, Annual Reports: Investor Owned Utilities (2000- 2017) http://apps.psc.wi.gov/vs2015/annualReports/content/listingIOU.aspx

Total Energy Use and Expenditure

There are two common ways to account for energy use: primary or resource energy use, and energy end-use. Primary energy use is the energy harvested directly from the resource. This accounts for the basic energy content of coal, petroleum, nuclear and renewable fuels. End-use refers to the energy content of electricity and other fuels at the point of use by customers in the economic sectors: agricultural, commercial, industrial, residential, and transportation.

About 70 percent of the energy used to generate and distribute electricity is lost as waste heat, making primary energy use greater than end-use. As primary energy use of coal decreases, natural gas use increases. Natural gas makes up almost 30 percent of primary energy use in Wisconsin, with coal close at almost 23 percent.

The transportation sector is the largest energy user in Wisconsin, consuming nearly 35 percent of total end-use energy in the state, most of which is petroleum. Since 2015, energy use has increased in all sectors except for the transportation sector. Renewable energy use has steadily grown, except for in2017 when there was a decline of 2 percent from 2016.

As a net energy importer, Wisconsin receives nearly all of its fuel from sources outside state borders. As energy consumption rises in the state, the amount of money sent out of state to meet energy demand increases.

From 2016 to 2017, Wisconsin's overall end-use energy expenditure increased from $18,262 million to $19,299 million. Every sector spends varying amounts on each fuel type, depending on its needs. The agricultural and transportation sectors spend a small amount on natural gas ($15.88 and $31 million respectively) in comparison to the residential sector's $1,101.3 million, as natural gas is the primary fuel for home heating in Wisconsin.

The transportation sector consistently spends the most on petroleum as compared to other fuels. Of the overall cost to Wisconsinites for energy, more than 40 percent is the cost to fuel our transportation needs. Motor gasoline accounts for roughly 78 percent of all petroleum products used by the transportation sector, with expenditure falling from $8,402.13 in 2014 to $6,000 million in 2017.

The agricultural sector saw a slight increase in total energy expenditures in 2017, from $455.14 million to $499.27 million. However there were decreases in petroleum and natural gas expenditures that may be attributable in part to recent technological advances in drilling. These advances have lowered the cost of petroleum and natural gas considerably, increasing their abundance on the market and in reserves.

Renewable energy expenditures are not included in this section directly except woody biomass use and imported electricity which is generated by renewable sources.

Resource Energy

	Percent Change from Previous Year	Percent of Wisconsin's Resource Energy Expenditure
2015		
Overall	-2.9%	
By Fuel		
Coal	-0.1%	26.9%
Electricity Imports	-66.3%	1.7%
Natural Gas	-0.1%	28.4%
Nuclear	5.9%	6.5%
Petroleum	-1.2%	27.7%
Renewables	4.9%	8.8%
By Economic Sector		
Agriculture	-7.5%	2%
Commercial	-4.4%	20%
Industrial	-1.4%	28%
Residential	-5.9%	24%
Transportation	0.3%	26%
2016		
Overall	-3.3%	
By Fuel		
Coal	-20.4%	22.2%
Electricity Imports	49.0%	2.7%
Natural Gas	5.4%	30.9%
Nuclear	1.4%	6.8%
Petroleum	-0.4%	28.5%
Renewables	-1.7%	8.9%
By Economic Sector		
Agriculture	4.2%	2%
Commercial	-5.7%	20%
Industrial	-4.3%	28%
Residential	-4.8%	24%
Transportation	-0.3%	26%
2017		
Overall	1.8%	
By Fuel		
Coal	8.7%	23.7%
Electricity Imports	-4.0%	2.5%
Natural Gas	1.3%	30.8%
Nuclear	-4.9%	6.3%
Petroleum	0.3%	28.1%
Renewables	-1.8%	8.6%
By Economic Sector		
Agriculture	1.9%	2%
Commercial	1.7%	20%
Industrial	4.0%	28%
Residential	2.0%	24%
Transportation	-0.5%	26%

End Use Energy

	Percent Change from Previous Year	Percent of Wisconsin's End Use Energy Expenditure
2015		
Overall	-4.1%	
By Fuel		
Coal	-19.1%	2%
Electricity Imports	-1.1%	19%
Natural Gas	-10.7%	31%
Petroleum	-1.2%	38%
Renewable	7.0%	10%
By Economic Sector		
Agriculture	-5.91%	2%
Commercial	-8.06%	15%
Industrial	-3.24%	26%
Residential	-8.08%	22%
Transportation	0.25%	35%
2016		
Overall	0.22%	
By Fuel		
Coal	-27.7%	2%
Electricity Imports	1.5%	20%
Natural Gas	2.5%	31%
Petroleum	-0.4%	38%
Renewable	-0.6%	9%
By Economic Sector		
Agriculture	5.60%	2%
Commercial	0.03%	15%
Industrial	0.59%	26%
Residential	-1.17%	22%
Transportation	-0.27%	35%
2017		
Overall	1.35%	
By Fuel		
Coal	4.12%	2%
Electricity Imports	-0.94%	19%
Natural Gas	5.06%	32%
Petroleum	0.28%	38%
Renewable	-2.29%	9%
By Economic Sector		
Agriculture	2.04%	2%
Commercial	0.59%	15%
Industrial	3.57%	26%
Residential	2.24%	22%
Transportation	-0.52%	35%

Wisconsin Resource Energy Use (Trillions of Btu)

By Source (2005-2017)

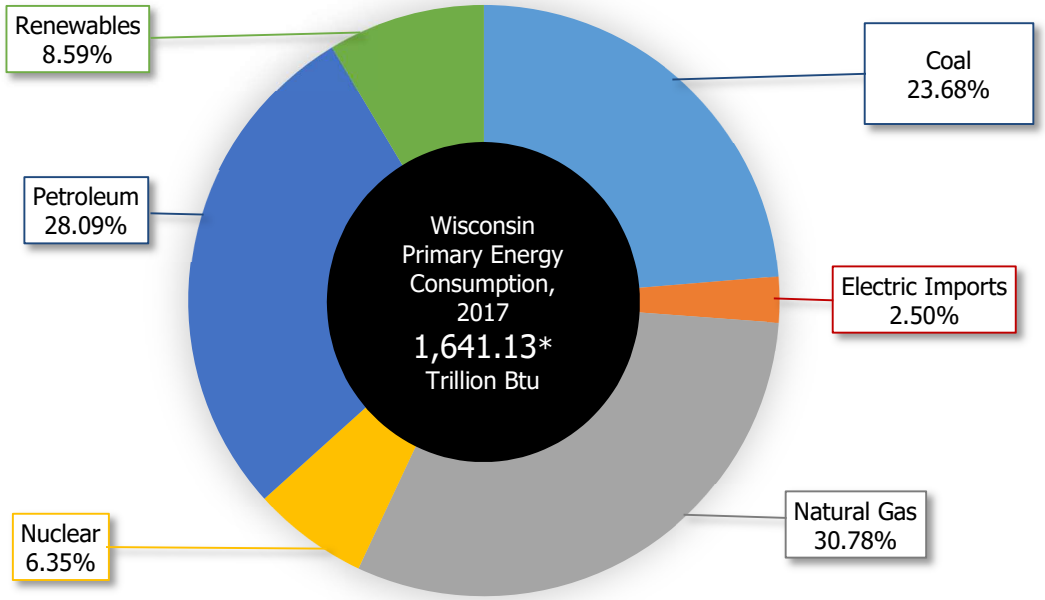
Year	Coal[a]	Electric Imports[b]	Natural Gas	Nuclear[c]	Petroleum	Renewables[d]	Total
2005	531.72	124.81	413.06	81.80	497.51	118.32	1767.22
2006	515.67	56.00	374.47	132.13	491.64	114.34	1684.26
2007	515.91	86.67	402.15	139.43	495.46	111.89	1751.50
2008	540.83	67.23	416.02	131.27	474.79	119.17	1749.31
2009	484.45	63.50	393.29	136.98	449.52	111.26	1638.99
2010	523.03	44.25	375.22	143.43	452.43	137.68	1676.05
2011	490.82	60.55	399.10	124.85	446.38	133.59	1655.28
2012	413.90	101.18	410.37	105.66	433.97	134.70	1599.79
2013	495.35	54.64	449.98	107.37	430.60	141.04	1678.99
2014	449.24	85.18	476.28	102.03	467.43	139.59	1720.24
2015	448.91	28.1	476.13	108.09	461.68	146.44	1669.96
2016	357.40	42.77	498.49	109.60	459.65	143.89	1611.79
2017	388.60	41.06	504.96	104.21	460.97	141.33	1641.13

By Economic Sector (2005-2017)

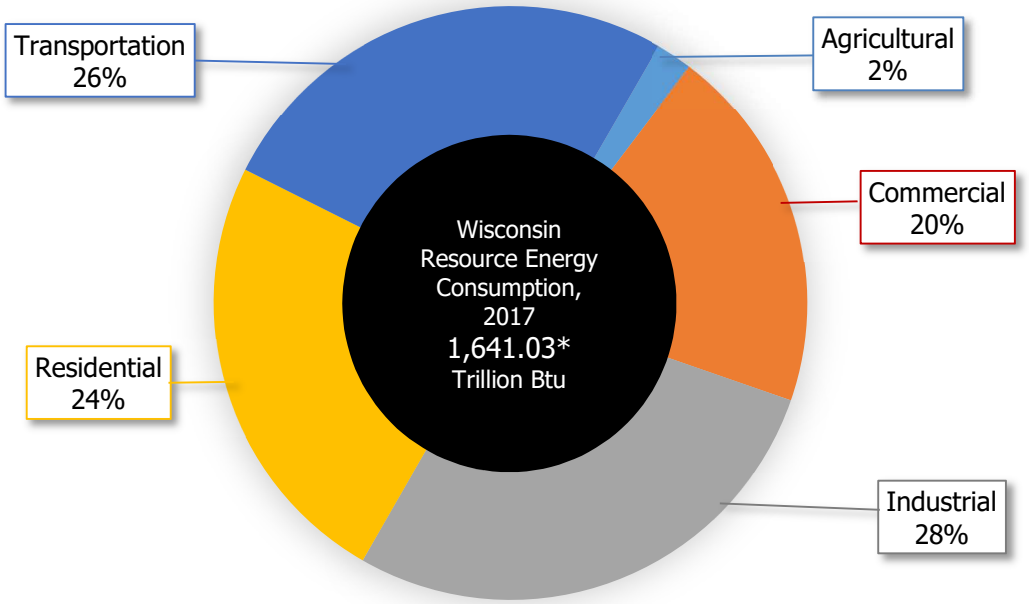
Year	Agricultural	Commercial	Industrial[d]	Residential[d]	Transportation	Total
2005	25.51	349.21	531.27	432.23	428.89	1767.11
2006	28.20	333.76	498.77	399.13	424.31	1684.18
2007	29.06	355.59	509.65	428.10	429.03	1751.43
2008	31.14	363.91	499.55	434.90	418.21	1747.70
2009	33.25	340.67	450.17	414.11	402.75	1640.94
2010	29.90	337.92	483.43	406.24	419.36	1676.85
2011	27.81	336.66	475.46	403.53	412.70	1656.16
2012	30.04	322.61	464.52	375.13	406.78	1599.08
2013	30.95	351.90	474.62	422.89	397.75	1678.10
2014	33.01	357.51	474.32	426.12	428.31	1719.29
2015	30.55	341.83	467.48	400.92	429.39	1670.18
2016	31.85	322.34	447.60	381.79	428.22	1611.79
2017	32.44	327.75	465.48	389.34	426.01	1641.03

[a] Includes petroleum coke.
[b] Reflects the resource energy assumed to be used in other states or Canada to produce electricity imported into Wisconsin, Negative values may indicate out-of-state exports and/or line losses.
[c] Data from power plants now owned by independent power producers, formerly owned by Wisconsin utilities.
[d] Revised
Source: Wisconsin Renewable Energy Production and Use (2005-2017),Wisconsin Energy Use by Agricultural Sector, Transportation Sector, Commercial sector, Industrial Sector, Residential Sector (2005-2017),Wisconsin Energy Use for Electricity Generation (2005-2017)

Wisconsin Resource Energy Use, by Source 2017

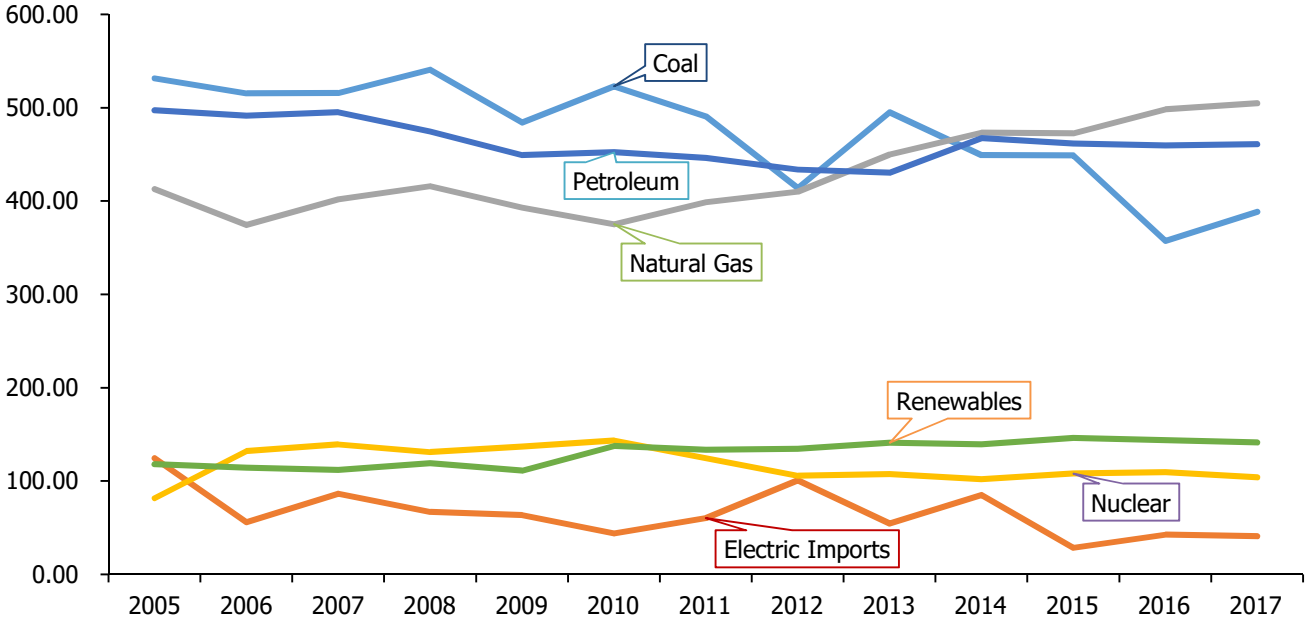


Wisconsin Resource Energy Use, by Economic Sector 2017

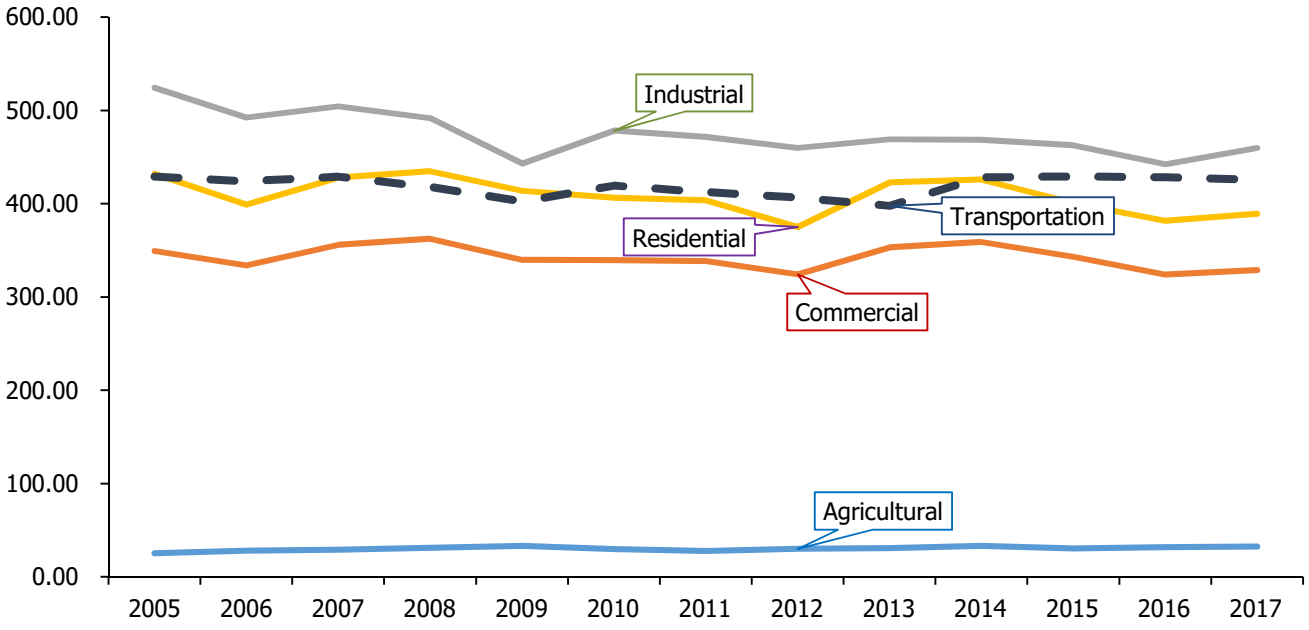


*Difference is due to difference in data sources

Wisconsin Resource Energy Use, by Source 2005-2017 (Trillions of Btu)



Wisconsin Resource Energy Use, by Economic Sector 2005-2017
(Trillions of Btu)

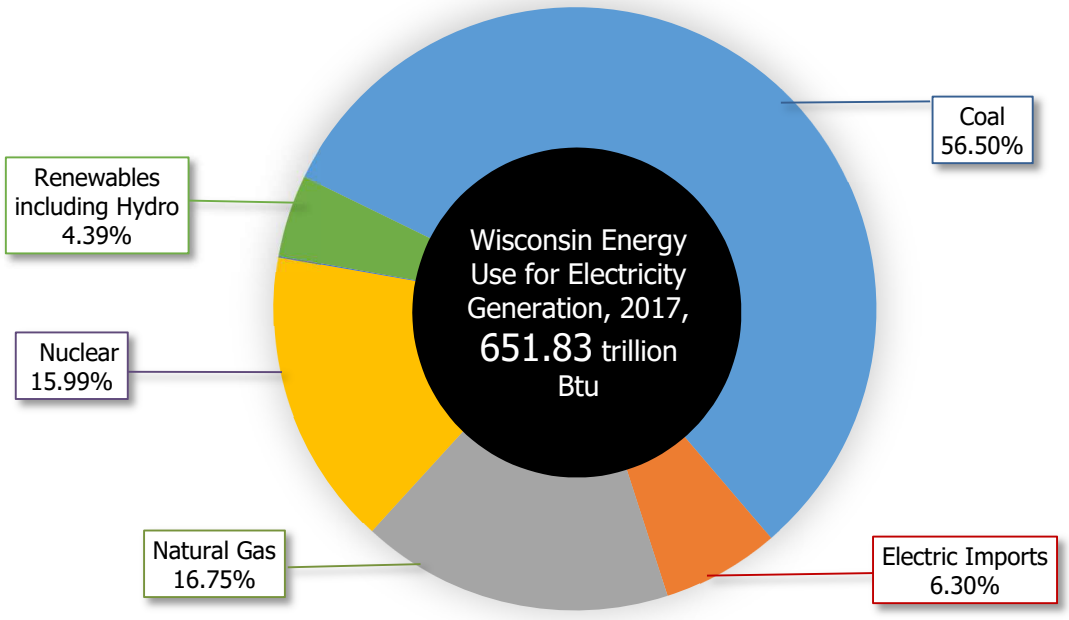


Wisconsin Energy Use for Electricity Generation

2005-2017 (Trillions of Btu)

Year	Coal	Electric Imports[a]	*Hydro*	Natural Gas	Nuclear	Petroleum	Renewables including HYDRO	Total
2005	481.71	124.81	*5.12*	59.38	81.80	1.89	12.13	761.72
2006	464.11	56.00	*4.94*	44.46	132.13	1.54	13.38	711.62
2007	465.40	86.67	*4.48*	54.92	139.43	1.88	13.66	761.96
2008	492.59	67.23	*4.87*	41.71	131.27	1.07	15.74	749.60
2009	441.35	63.50	*4.62*	41.58	136.98	0.57	18.01	701.98
2010	478.69	44.25	*6.92*	43.07	143.43	0.51	21.34	731.29
2011	448.01	60.55	*6.99*	48.40	124.85	0.50	25.85	708.14
2012	377.44	101.18	*4.97*	88.63	105.66	0.58	26.12	699.62
2013	463.09	54.64	*6.39*	62.70	107.37	0.41	26.71	714.92
2014	416.08	85.18	*8.03*	61.70	102.03	0.73	31.16	696.89
2015	422.09	28.71	*7.57*	105.20	108.09	0.39	30.47	694.96
2016	338.00	42.77	*9.01*	121.80	109.60	0.41	28.56	641.13
2017	368.30	41.06	*8.45*	109.20	104.21	0.43	28.64	651.83

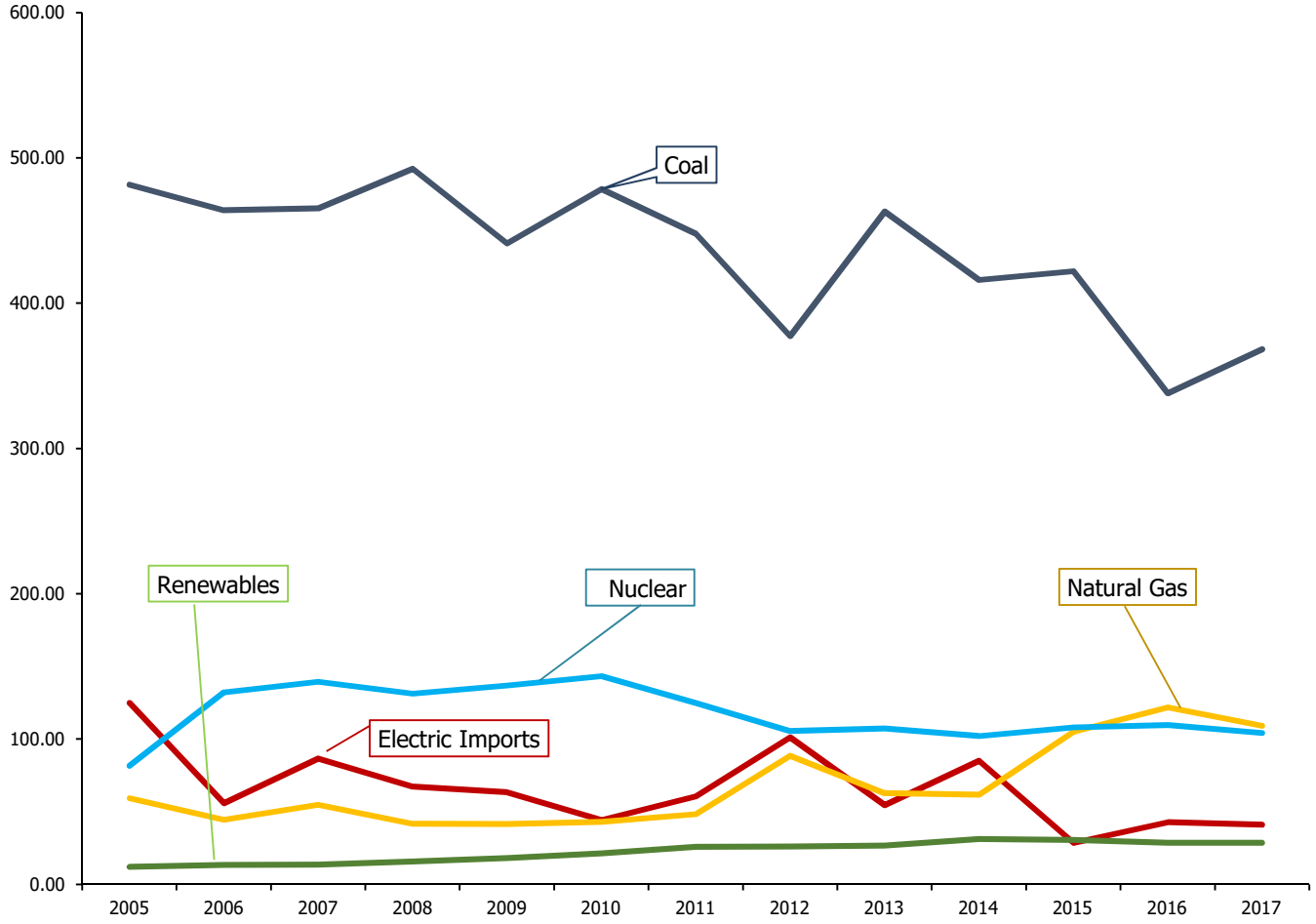
Wisconsin Energy Use for Electricity Generation, 2017



[a] Reflects the resource energy assumed to be used in other states or Canada to produce electricity imported into Wisconsin, Negative values indicate out-of-state exports and/or line losses.

Source: See Energy Use & Prices 2005- 2017, Wisconsin Electric Power Generation; Wisconsin Renewable Energy.

Energy Use for Electricity Generation 2005-2017 (tBtu)



Wisconsin End-Use Energy Consumption, by Source

2005-2017 (Trillions of Btu)

Year	Coal	Electricity	Natural Gas	Petroleum	Renewables[a]	Total
2005	50.01	240.06	353.68	495.63	106.19	1245.56
2006	51.57	238.30	330.01	490.10	100.96	1210.94
2007	50.50	243.35	347.23	493.58	98.23	1232.89
2008	48.24	239.33	374.31	473.72	103.44	1239.04
2009	43.10	226.24	351.71	448.95	93.25	1163.25
2010	44.34	234.65	332.16	451.92	116.34	1179.41
2011	42.81	234.17	350.71	445.88	107.74	1181.31
2012	36.46	234.88	321.74	433.39	108.58	1135.06
2013	32.27	235.92	387.28	430.19	114.33	1199.98
2014	33.16	237.19	415.08	466.69	108.42	1260.54
2015	26.82	234.47	373.13	461.29	115.97	1211.67
2016	19.40	238.01	376.69	459.24	115.33	1208.67
2017	20.20	235.77	395.76	460.54	112.69	1224.96

Wisconsin Energy End Use, by Economic Sector

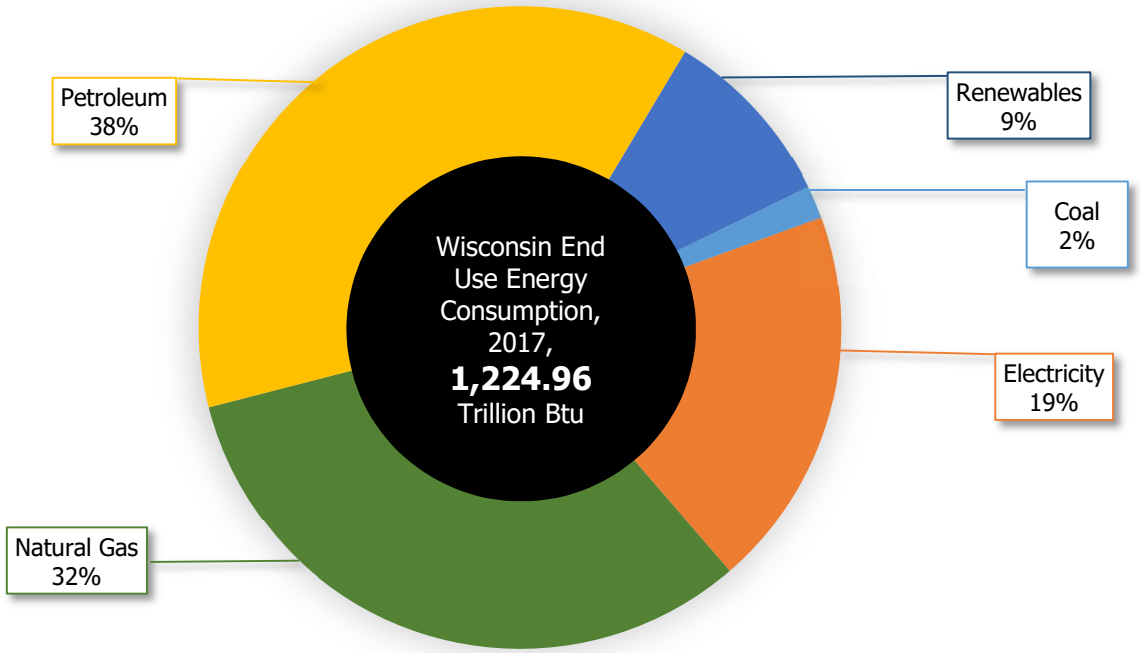
2005-2017 (Trillions of Btu)

Year	Agricultural	Commercial	Industrial	Residential	Transportation	Total
2005	18.18	182.32	345.51	270.65	428.89	1245.56
2006	21.63	179.50	329.54	255.96	424.31	1210.94
2007	23.01	184.73	326.84	269.29	429.03	1232.89
2008	24.61	193.63	322.76	279.83	418.21	1239.04
2009	27.07	181.35	293.51	259.50	402.75	1164.18
2010	23.23	171.77	316.24	249.61	419.36	1180.22
2011	22.13	177.40	315.66	254.30	412.70	1182.19
2012	23.68	165.72	307.53	230.61	406.78	1134.32
2013	24.08	187.96	314.96	274.35	397.75	1199.10
2014	25.78	200.36	319.26	285.99	428.31	1259.70
2015	24.25	184.22	308.90	262.92	429.39	1209.69
2016	25.61	184.28	310.72	259.84	428.22	1208.67
2017	26.13	185.36	321.80	265.67	426.01	1224.97

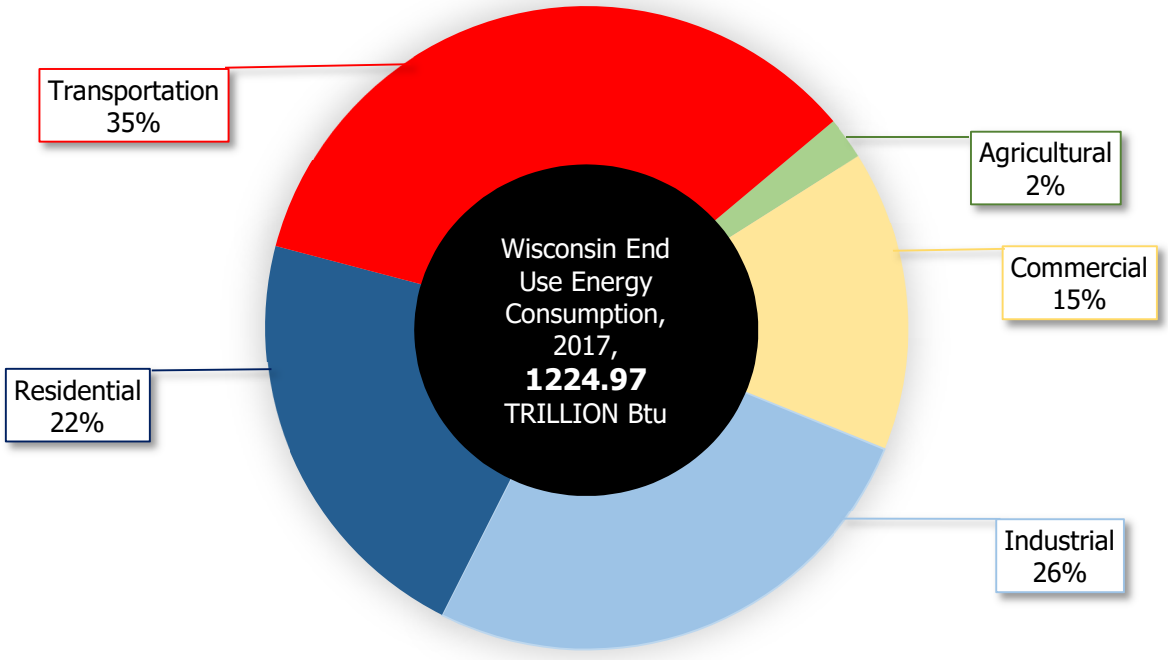
[a] Revised

Source: See Energy Use and Prices, Renewable Energy and Electric Power Generation.

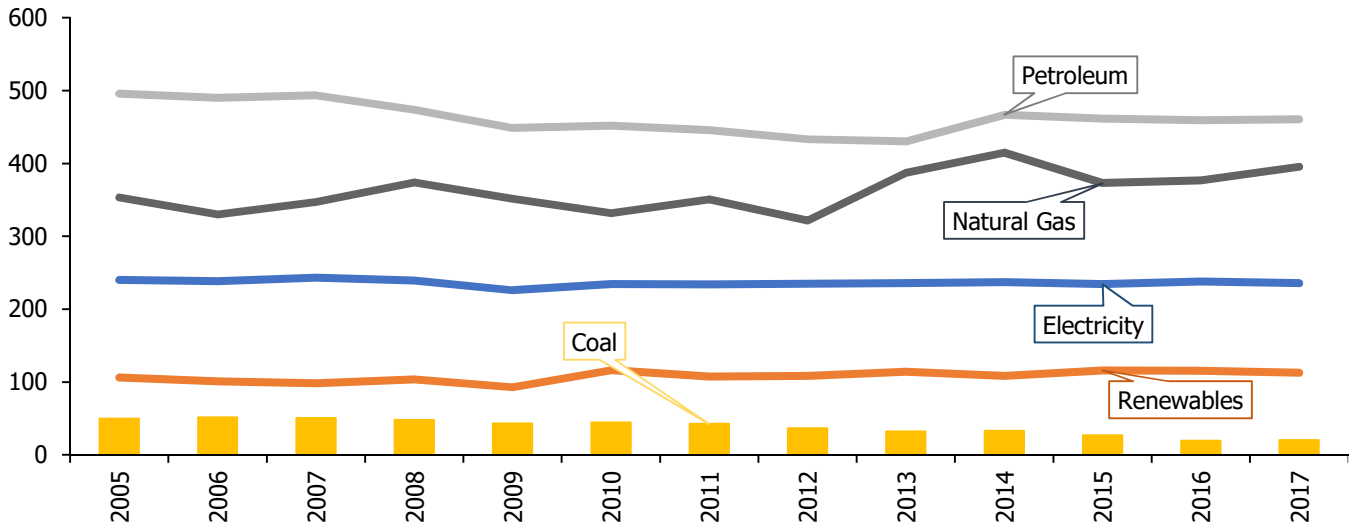
Wisconsin End Use Energy Consumption, by Source, 2017 (Trillions of Btu)



Wisconsin End Use Energy Consumption, by Economic Sector, 2017 (Trillions of Btu)

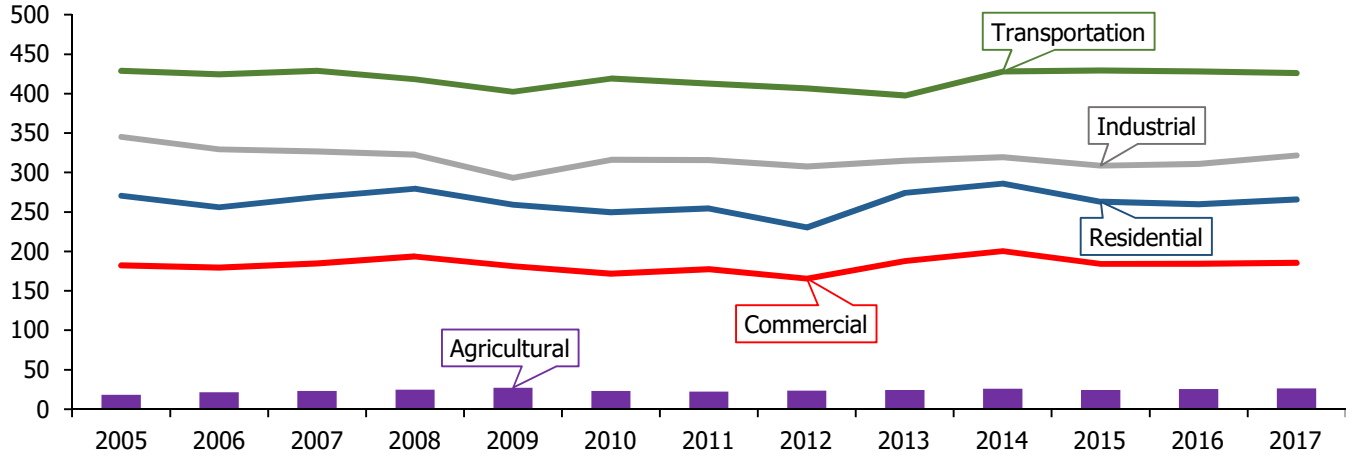


Wisconsin End Use Energy Consumption, by Source, 2005-2017 (Trillions of BTU)



The flat curve of electricity use shows increasing energy efficiency and shift from electricity to natural gas use. The dip in the natural gas curve around 2015 is due to the warmer winter that year.

Wisconsin End Use Energy Consumption, by Economic sector 2005-17 (Trillions of Btu)



The flat curve of industrial sector energy use shows energy efficiency achieved by industrial sector. The fluctuations in residential sector are specific to weather and price changes.

Summary Table of Energy Use 2017 (Trillions of Btu)

	Agricultural sector (1)	Commercial sector (2)	Industrial sector (3)	Residential sector (4)	Transportation sector (5)	End-Use Consumption (1+2+3+4+5=6)	Fuel Used for Electric Generation (7)	Total Resource Energy Use (6+7)
Natural Gas (a)	2.5	94.1	161.1	136.3	1.8	396	109	505
Nuclear (b)							104	104
Petroleum (c)	20.1	4.8	4.3	34	397.5	460.5	0.4	460.9
Renewable (d)	0	5.3	55.3	25	26.8	112	29	141.9
Coal (e)	0	0.5	19.7	0	0	20	368	388
Electricity (f)	3.6	80.7	81.4	70.1		235.7		
Electricity Imports							41.1	41.1
End-Use Consumption (a+b+c+d+e+f)	26.1	185.4	321.8	265.3	426	1224.2		
Fuel used for electric generation[a] (g)	9.9	223	225.1	193.8	0		651.5	
Total Resource Energy Use (a+b+c+d+e+g)	32.4	327.8	465.5	388.8	426			1640.9
Approximate Conversion loss (Resource Use minus End-Use)	6.3	142.4	143.7	123.7	0			

[a] This is an approximation of fuel used for electric generation by that sector. It is estimated by taking the ratio of electric used by that specific sector to total electricity used by the state times total fuel used by the electric sector.

Note that fuel used for electric generation minus the conversion loss is electricity used by each sector.

End Use Energy Expenditure

		Percent Change from Previous Year	Percent of Wisconsin's End Use Energy Expenditure
2015	Overall	-21.8%	
By Fuel	Coal	-16.95%	0.57%
	Electricity	0.00%	37.79%
	Natural Gas	-32.59%	12.67%
	Petroleum	-30.53%	48.06%
	Biomass	-9.08%	0.9%
By Economic Sector	Agriculture	-30.50%	3%
	Commercial	-9.80%	16%
	Industrial	-14.00%	19%
	Residential	-16.40%	22%
	Transportation	-28.92%	40%
2016	Overall	-6.40%	
By Fuel	Coal	-35.65%	0.4%
	Electricity	0.94%	40.71%
	Natural Gas	-5.74%	12.75%
	Petroleum	-11.65%	45.31%
	Biomass	-13.18%	0.8%
By Economic Sector	Agriculture	-4.44%	2%
	Commercial	-1.11%	17%
	Industrial	-3.8%	19%
	Residential	-2.30%	23%
	Transportation	-11.32%	39%
2017	Overall	5.13%	
By Fuel	Coal	6.39%	0.4%
	Electricity	-0.19%	38.45%
	Natural Gas	10.46%	13.33%
	Petroleum	9.70%	47.04%
	Biomass	0.39%	0.8%
By Economic Sector	Agriculture	9.70%	3%
	Commercial	1.59%	16%
	Industrial	3.6%	19%
	Residential	3.65%	22%
	Transportation	8.64%	40%

Wisconsin End Use Energy Expenditure, by Source

2005-2017 (Millions of Dollars)

Year	Coal	Electricity	Natural Gas	Petroleum[a]	Biomass Wood	Total[b]
2005	113.21	5260.68	3751.32	9149.29	159.40	18433.89
2006	127.15	5670.62	3475.12	10382.79	165.60	19821.27
2007	132.54	6043.22	3665.56	11420.19	152.00	21413.52
2008	132.67	6309.73	4237.57	13140.32	185.20	24005.49
2009	127.24	6211.26	3187.86	8910.66	118.20	18555.22
2010	133.27	6718.01	2899.03	10605.04	161.20	20516.55
2011	133.66	6998.87	2857.94	13025.26	185.00	23200.74
2012	131.81	7073.29	2333.24	13176.05	173.10	22887.50
2013	129.58	7259.20	2742.83	12813.59	193.30	23138.49
2014	134.72	7365.27	3664.65	13520.44	192.80	24877.87
2015	111.88	7365.21	2470.23	9411.49	175.30	19534.11
2016	72.00	7434.49	2328.38	8324.39	152.20	18311.46
2017	76.60	7420.21	2571.95	9197.67	152.80	19419.24

Wisconsin End Use Energy Expenditure, by Economic Sector

2005-2017 (Millions of Dollars)

Year	Agricultural	Commercial	Industrial	Residential	Transportation	Total
2005	332.53	2747.99	3033.59	4344.89	7974.90	18433.89
2006	436.75	2896.63	3008.07	4447.24	9032.58	19821.27
2007	496.93	3088.89	3164.80	4743.04	9919.85	21413.52
2008	598.70	3430.92	3380.04	5190.49	11405.35	24005.49
2009	500.79	3044.27	2682.80	4558.18	7769.18	18555.22
2010	503.19	3070.27	2776.55	4636.81	9529.74	20516.55
2011	560.44	3213.61	2890.33	4754.97	11781.38	23200.74
2012	621.06	3120.30	2743.53	4425.09	11977.52	22887.50
2013	625.12	3321.38	2830.37	4818.42	11543.21	23138.49
2014	685.29	3580.96	3253.04	5419.35	11939.23	24877.87
2015	476.30	3230.17	2798.41	4543.39	8485.85	19534.11
2016	455.14	3194.98	2692.45	4443.96	7524.93	18311.46
2017	499.27	3243.45	2826.24	4675.12	8175.16	19419.24

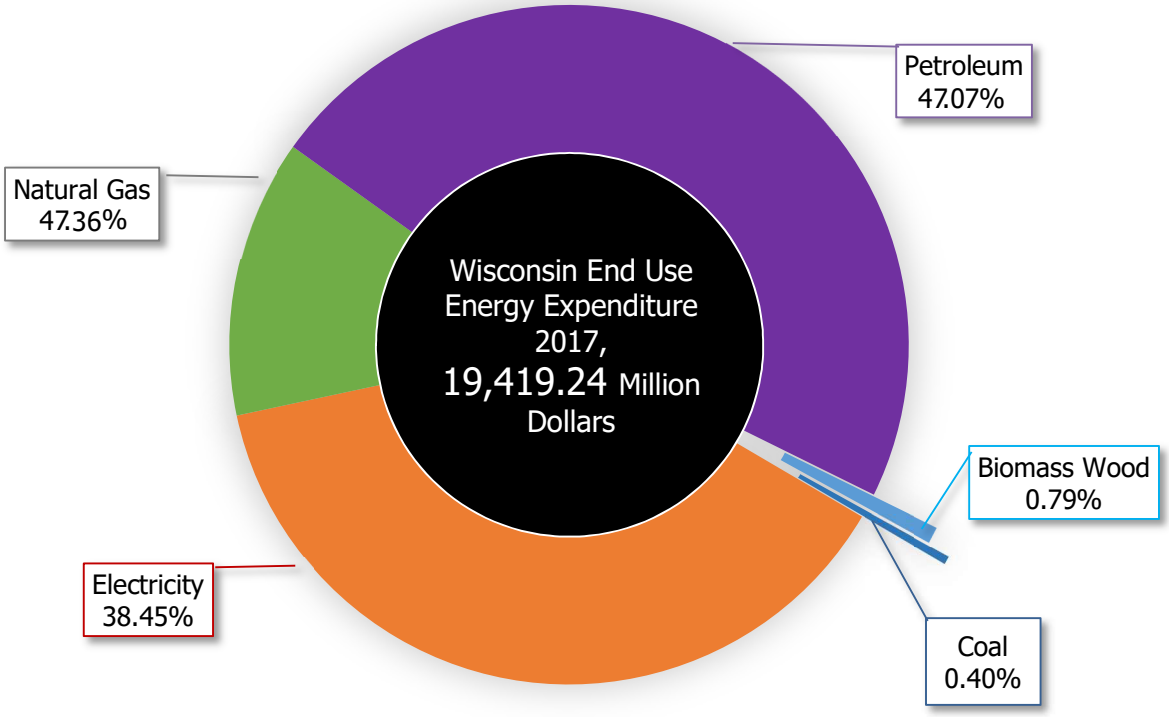
Note: The prices used to estimate the expenditure is in terms of dollars per million Btu and at current year prices i.e not adjusted to inflation. The expenditure does not include expenditure on renewables other than Biomass Wood. The estimates above include the energy imports.

[a] Distillate oil and residual fuel oil price for Wisconsin not available beginning in 2009 and 2011, respectively, due to reports being suspended as part of U.S. budget sequester and publishing policies of the U.S. Energy Information Administration. Gasoline and Diesel fuel expenditures for Transportation historically revised.

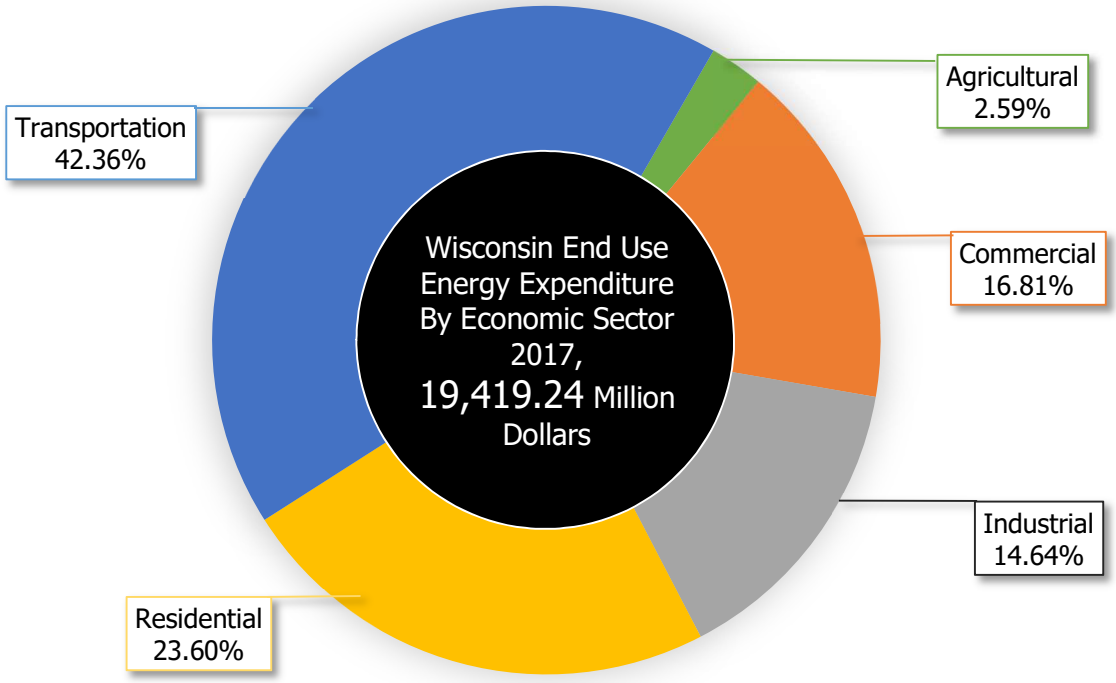
[b] Does not include renewable energy, except biomass wood and renewable fuels used in electricity production.

Source: U.S Energy Information Administration, Wisconsin Energy Prices and Expenditure (2005-2017) https://www.eia.gov/state/seds/seds-data-complete.php?sid=WI; See Wisconsin Expenditure on Energy by Agricultural Sector, Commercial Energy, Industrial Energy, Residential Energy, Transportation Energy.

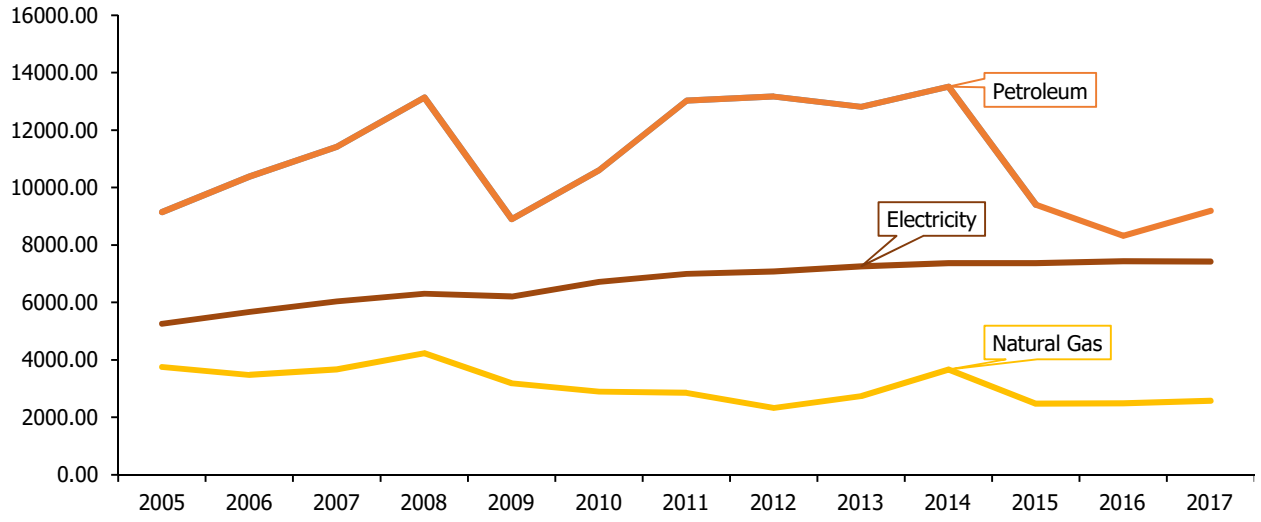
Wisconsin End Use Energy Expenditure, by Source 2017
(Millions of Dollars)



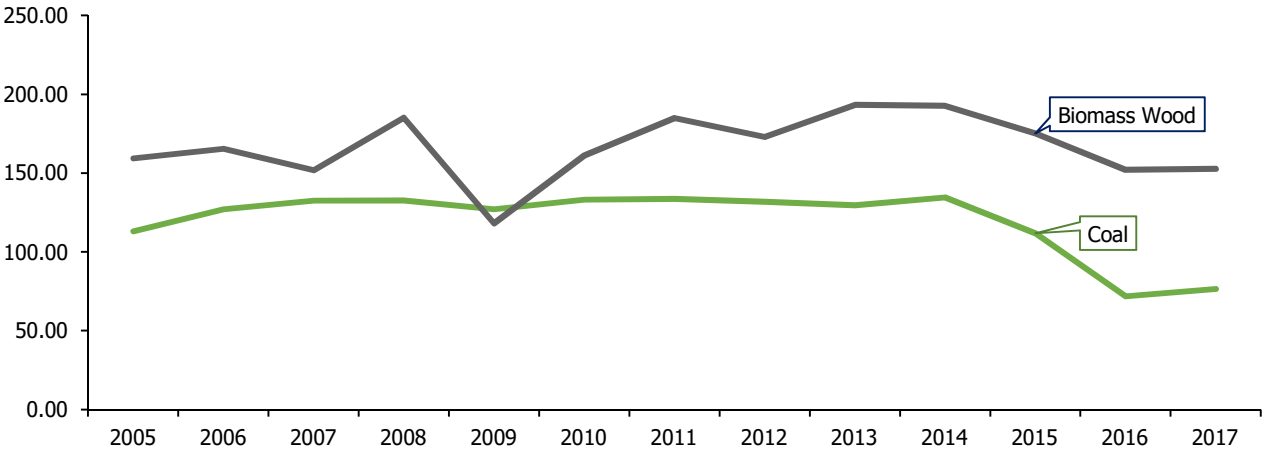
Wisconsin End Use Energy Expenditure, by Economic Sector 2017
(Millions of Dollars)



Wisconsin End Use Energy Expenditure, by source 2005-2017 (Millions of Dollars). A

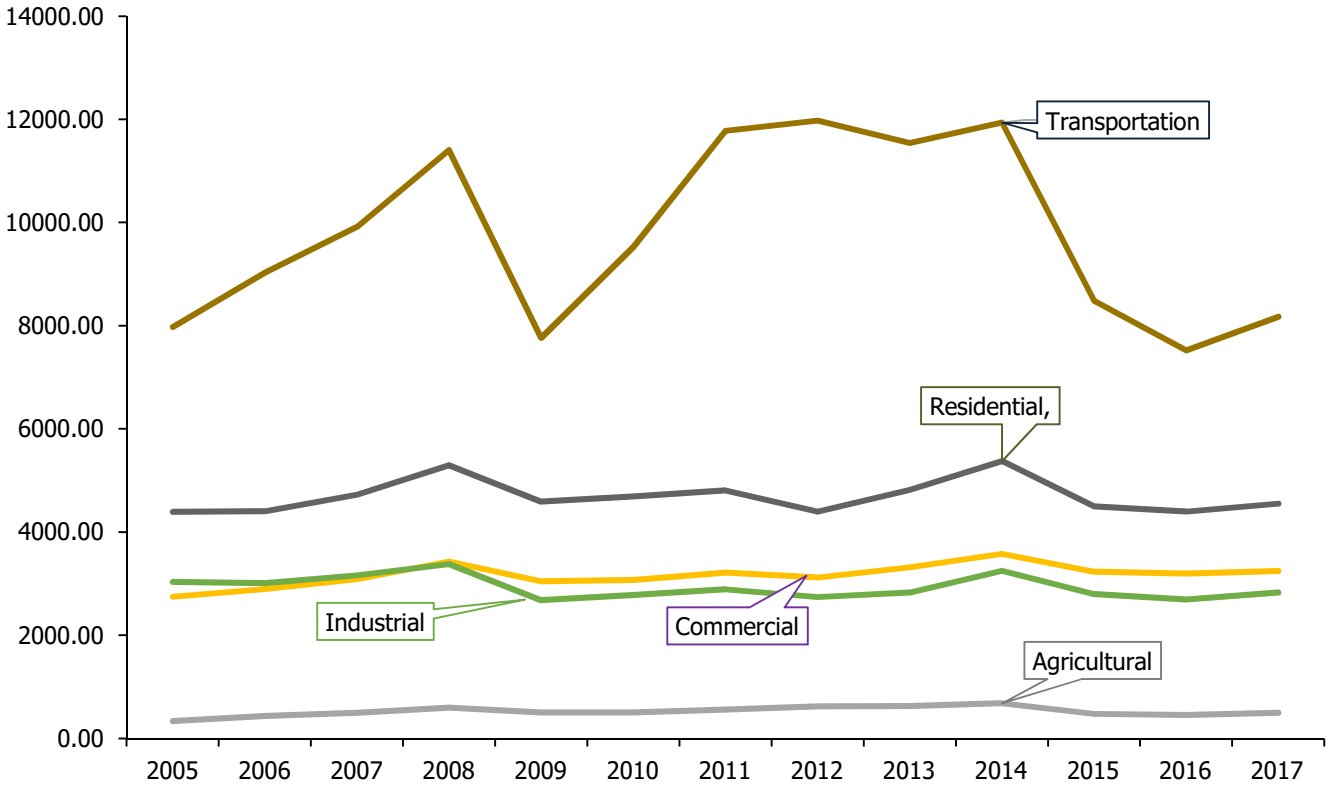


Wisconsin End Use Energy Expenditure, by source 2005-2017 (Millions of Dollars). B



While expenditure on Coal has come down due to closing down of coal plants in the State, expenditure on natural gas has declined due to lower prices. The expenditure on Electricity use shows almost a flat curve due to the cumulative impact of slower growth of both prices and the use.

Wisconsin End Use Energy Expenditures, by Economic Sector 2005-2017
(Millions of Dollars)

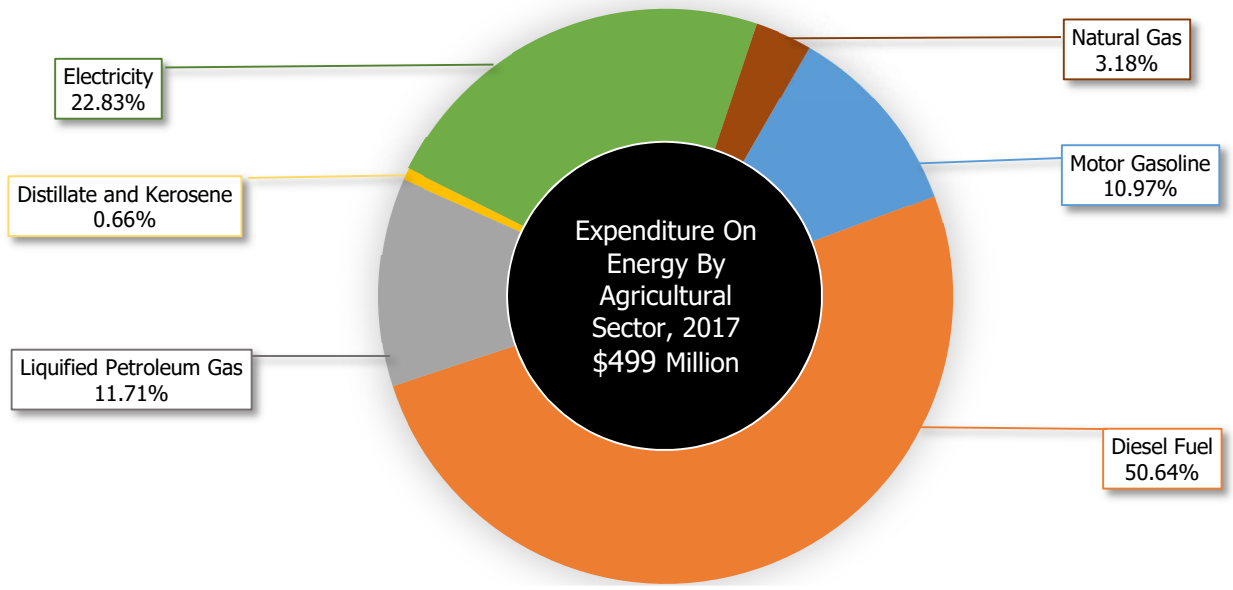


Expenditure on Energy by Wisconsin Agricultural Sector

2005 – 2017 (Millions of Dollars)

Year	Motor Gasoline	Diesel Fuel[a]	Liquefied Petroleum Gas	Distillate and Kerosene[b]	Electricity[r]	Natural Gas[c]	Total Petroleum	Total
2005	72.60	130.67	36.55	4.00	75.79	12.92	243.81	332.53
2006	68.07	224.01	47.11	5.11	81.22	11.23	344.30	436.75
2007	84.86	269.01	53.66	5.14	72.57	11.68	412.67	496.93
2008	77.62	320.41	71.23	5.75	83.50	40.19	475.02	598.70
2009	70.08	247.10	67.40	10.51	83.41	22.29	395.09	500.79
2010	69.22	270.65	53.05	4.35	92.21	13.72	397.26	503.19
2011	77.36	327.34	45.34	4.95	85.70	19.76	454.99	560.44
2012	81.31	384.11	40.08	3.81	99.01	12.74	509.31	621.06
2013	73.03	370.21	60.94	4.09	106.44	10.41	508.27	625.12
2014	83.23	390.74	72.66	6.58	117.72	14.37	553.21	685.29
2015	53.53	259.39	47.82	3.19	102.50	9.88	363.92	476.30
2016	49.93	235.36	41.94	3.83	116.21	7.87	331.06	455.14
2017	54.78	252.83	58.48	3.31	113.99	15.88	369.41	499.27

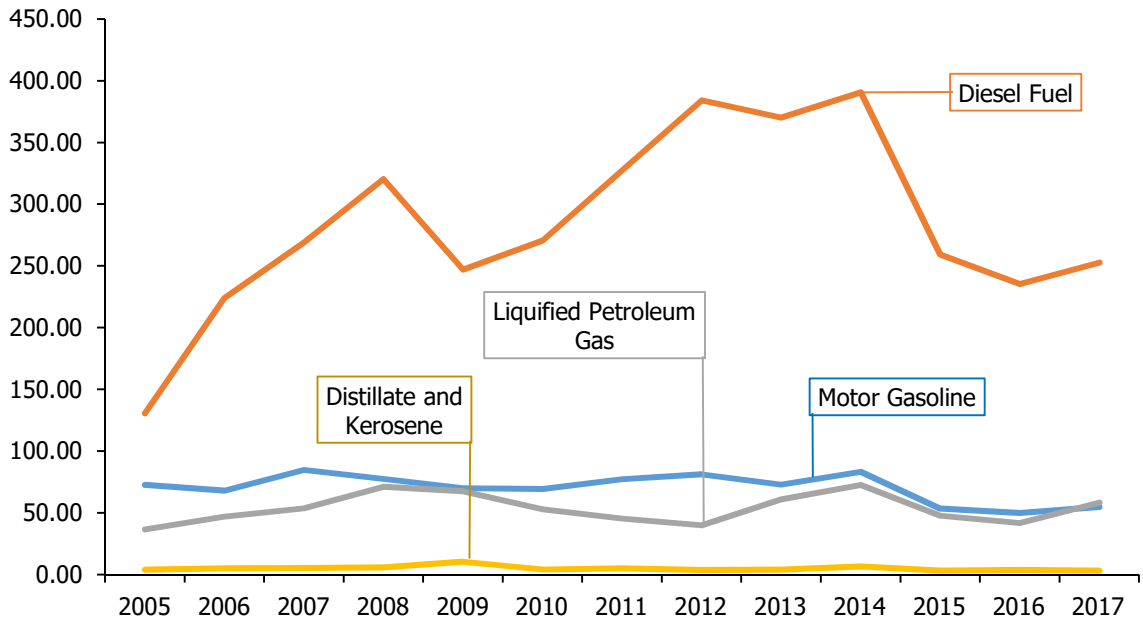
Expenditure on Energy by Agricultural Sector 2017



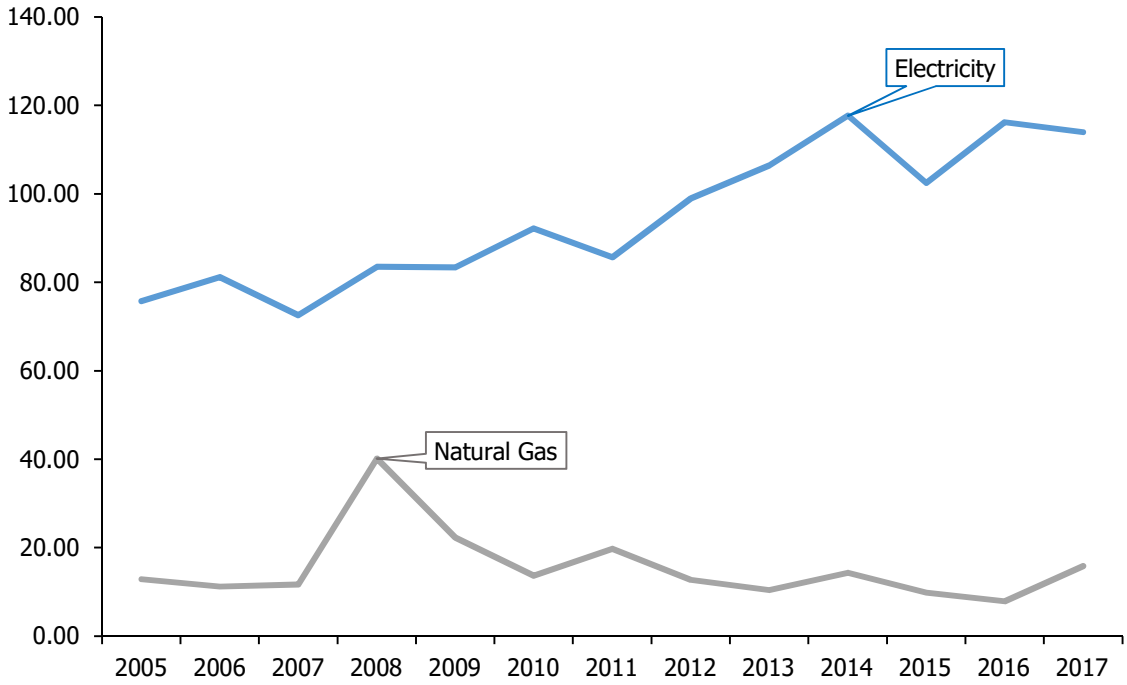
[a] Includes fuel oil and kerosene.
[b]Primarily distillate and kerosene, may include small amounts of coal and wood.
[c] Increase in expenditures in 2008 reflects the relatively high price of natural gas and inclusion of nurseries and greenhouses in the sample.
[R] Revised

Source: Personal communication, U.S. Department of Agriculture, National Agriculture Statistics Service (2005-2017), Value added by US agriculture (includes net farm income) (2013-2017) http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/value-added-years-by-state.aspx; U.S. Energy Information Administration, State Energy Data System Prices and Expenditures (2005-2017) http://www.eia.gov/state/seds/seds-data-complete.cfm#PricesExpenditures; Wisconsin Division of the American Automobile Association, Wisconsin Average Gas Prices (2007-2015) http://gasprices.aaa.com/?state=WI; Wisconsin Department of Revenue, Fuel Tax Statistical Report (2005-2017) https://www.revenue.wi.gov/Pages/ISE/Excise_Fuel-Home.aspx.

Expenditure on Petroleum Products by Agricultural Sector (Million $)



Expenditure on Natural Gas and Electricity by Agricultural Sector (Million $)

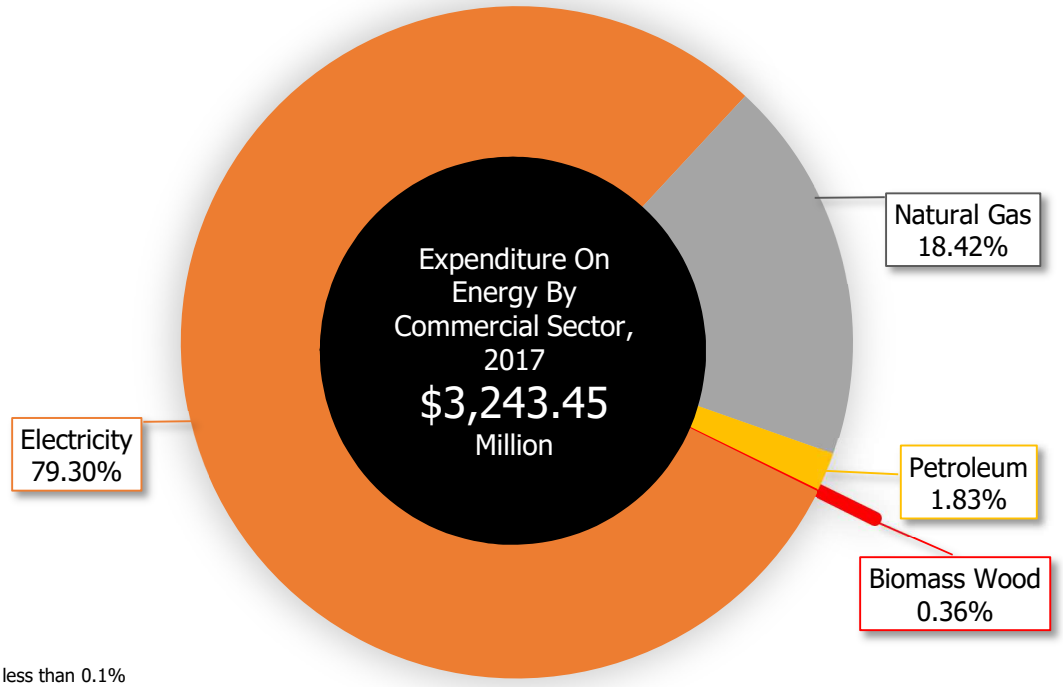


Expenditure on Energy by Wisconsin Commercial Sector

2005-2017 (Millions of Dollars)

Year	Coal	Electricity	Natural Gas	Petroleum	Biomass Wood	Total
2005	12.24	1726.39	880.06	119.90	9.40	2747.99
2006	13.65	1905.90	875.65	91.62	9.80	2896.63
2007	11.64	2047.67	910.80	106.99	11.80	3088.89
2008	8.87	2177.52	1046.24	183.30	15.00	3430.92
2009	6.94	2150.95	796.59	81.89	7.90	3044.27
2010	7.87	2296.99	687.85	68.26	9.30	3070.27
2011	6.76	2403.88	679.25	113.42	10.30	3213.61
2012	6.21	2442.24	551.82	110.03	10.00	3120.30
2013	6.98	2542.69	671.27	88.83	11.60	3321.38
2014	5.72	2559.02	909.45	94.87	11.90	3580.96
2015	5.08	2562.52	592.92	57.65	12.00	3230.17
2016	3.30	2573.59	557.73	49.86	10.50	3194.98
2017	3.00	2571.91	597.54	59.20	11.80	3243.45

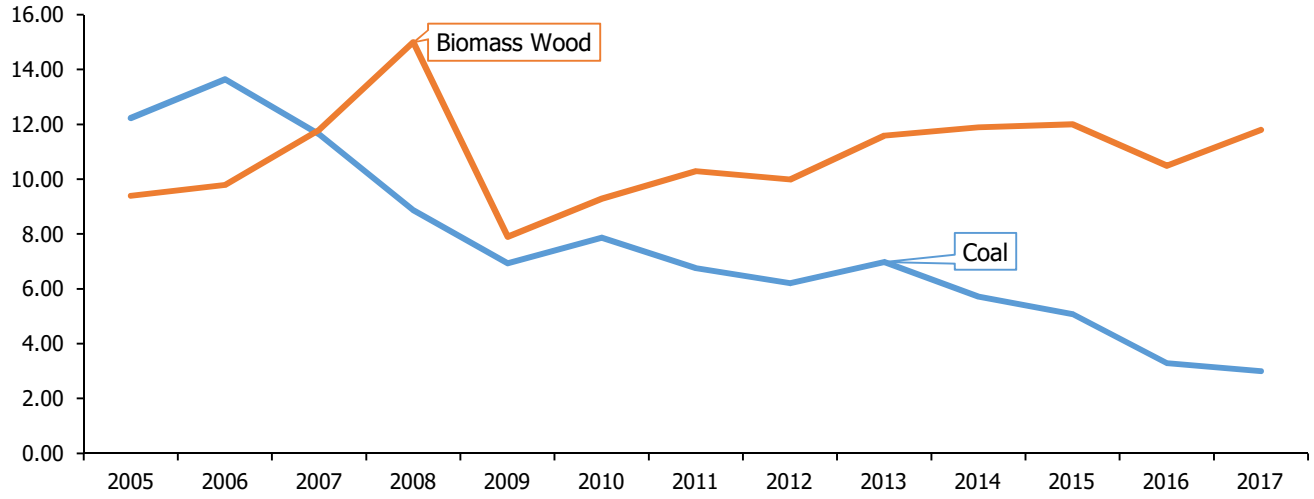
Expenditure on Energy by Commercial Sector 2017 (Million $)



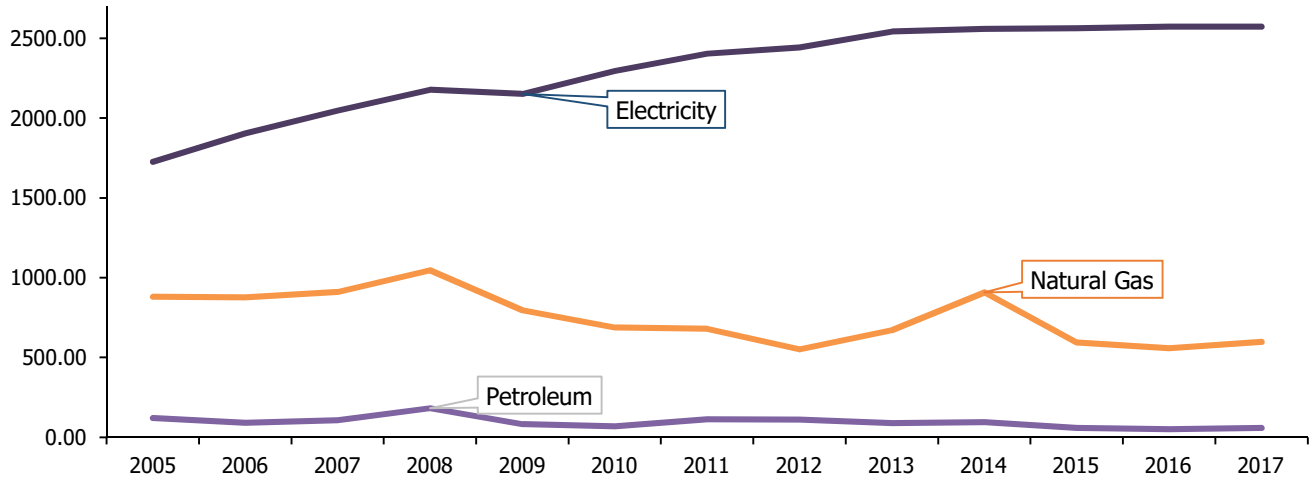
Note: Coal less than 0.1%

Source: See Energy Use by Commercial Sector and Energy Prices for the Commercial Sector, Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions (2005-2017) Unpublished data, U.S Energy Information and Administration, State Energy Data System (SEDS) Prices and Expenditures https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_prices/com/pr_com_WI.html&sid=WI, Public Service Commission of Wisconsin, Annual Reports, Investor Owned Utilities (2005-2017) http://apps.psc.wi.gov/vs2015/annualReports/content/listingIOU.aspx, U.S Energy Information and Administration, Weekly Wisconsin Propane Residential Prices (2005-2017) https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPLLPA_PRS_SWI_DPG&f=W

Expenditure on Coal and Biomass Wood by Commercial Sector (Million $)



Expenditure on Electricity, Natural Gas and Petroleum by Commercial sector (Million $)

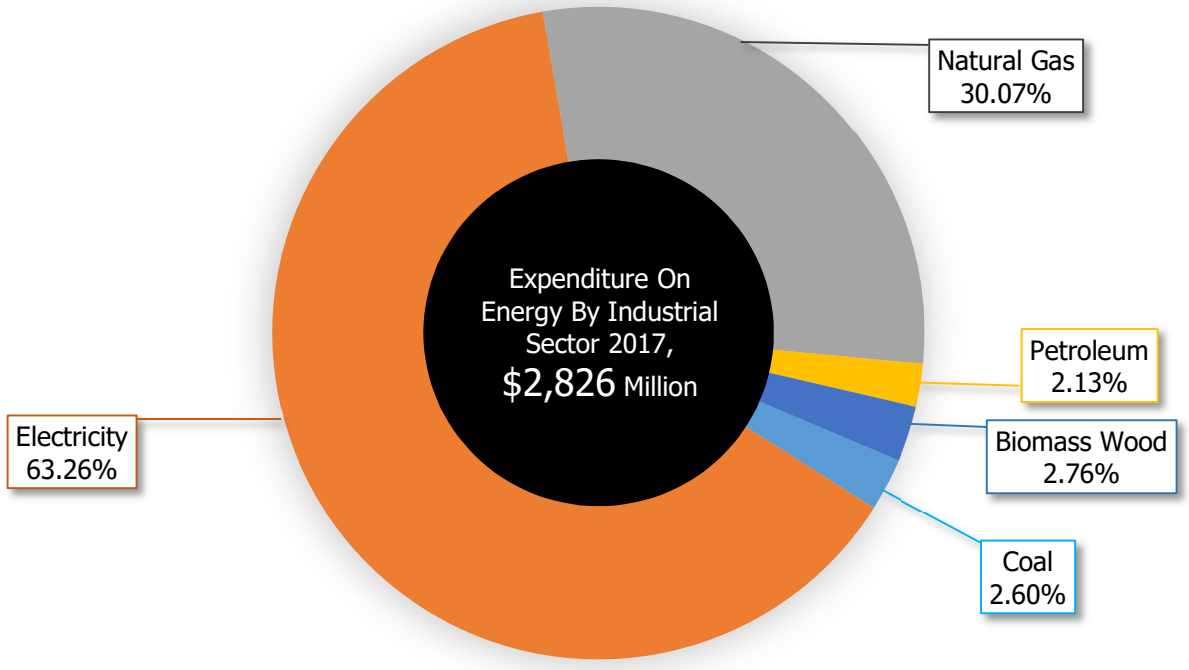


Expenditure on Energy by Wisconsin Industrial Sector

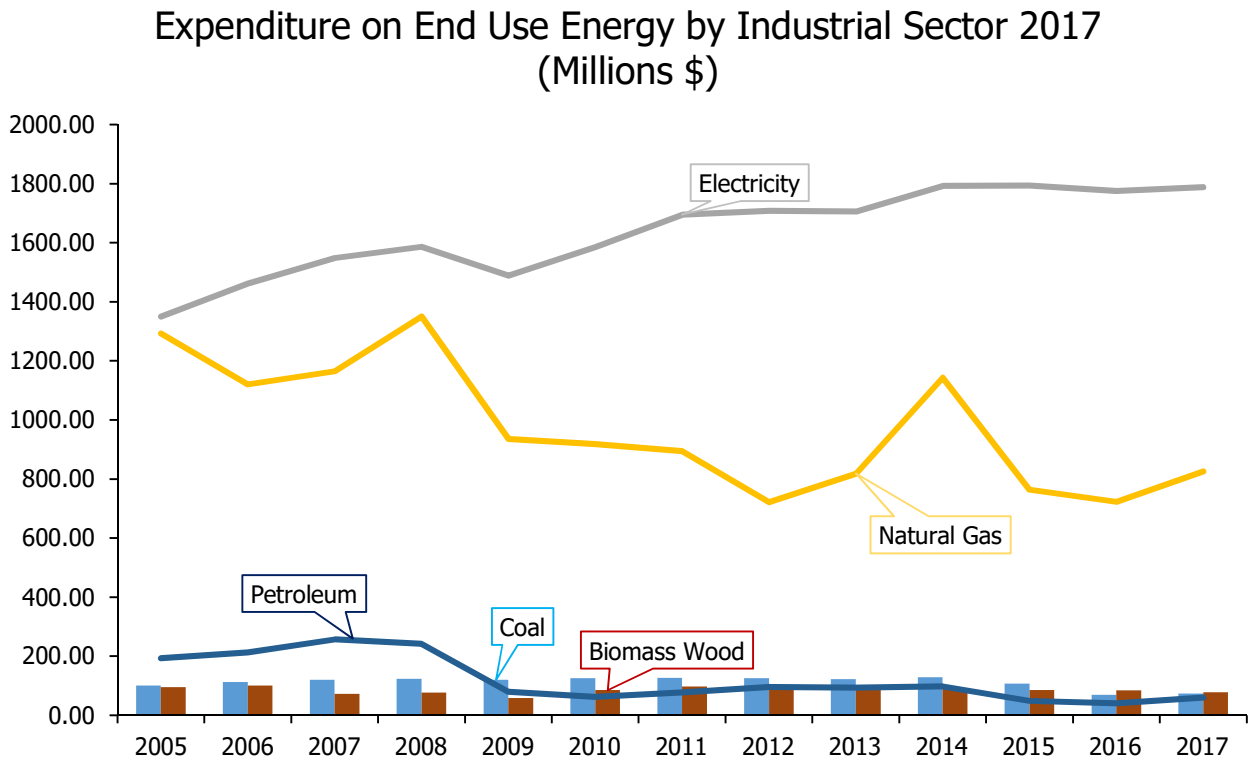
2005-2017 (Millions of Dollars)

Year	Coal	Electricity	Natural Gas	Petroleum	Biomass Wood	Total
2005	100.4	1350.66	1293.6	193.46	95.5	3033.59
2006	113.0	1462.01	1120.4	212.59	100.1	3008.07
2007	120.5	1549.28	1165.4	257.39	72.2	3164.80
2008	123.8	1587.13	1350.5	242.20	76.4	3380.04
2009	120.3	1488.91	935.9	79.70	58.0	2682.80
2010	125.4	1585.37	918.4	61.64	85.7	2776.55
2011	126.9	1695.13	894.0	76.80	97.5	2890.33
2012	125.6	1708.33	722.2	96.21	91.2	2743.53
2013	122.6	1705.62	818.3	93.97	89.9	2830.37
2014	129.0	1792.92	1143.3	97.54	90.3	3253.04
2015	106.8	1793.26	764.6	48.61	85.1	2798.41
2016	68.7	1775.52	723.5	40.70	84.0	2692.45
2017	73.6	1787.99	826.4	60.30	77.9	2826.24

Expenditure on Energy by Industrial Sector, 2017



Source: See Energy Use by Industrial Sector and Energy Prices for the Industrial Sector, Wisconsin Department of Natural Resources, Annual Survey of Point Source Emissions (2005-2017) Unpublished data, U.S Energy Information and Administration, State Energy Data System (SEDS) Prices and Expenditures https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_prices/com/pr_com_WI.html&sid=WI, Public Service Commission of Wisconsin, Annual Reports, Investor Owned Utilities (2005-2017) http://apps.psc.wi.gov/vs2015/annualReports/content/listingIOU.aspx, U.S Energy Information and Administration, Weekly Wisconsin Propane Residential Prices (2005-2017) https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPLLPA_PRS_SWI_DPG&f=W

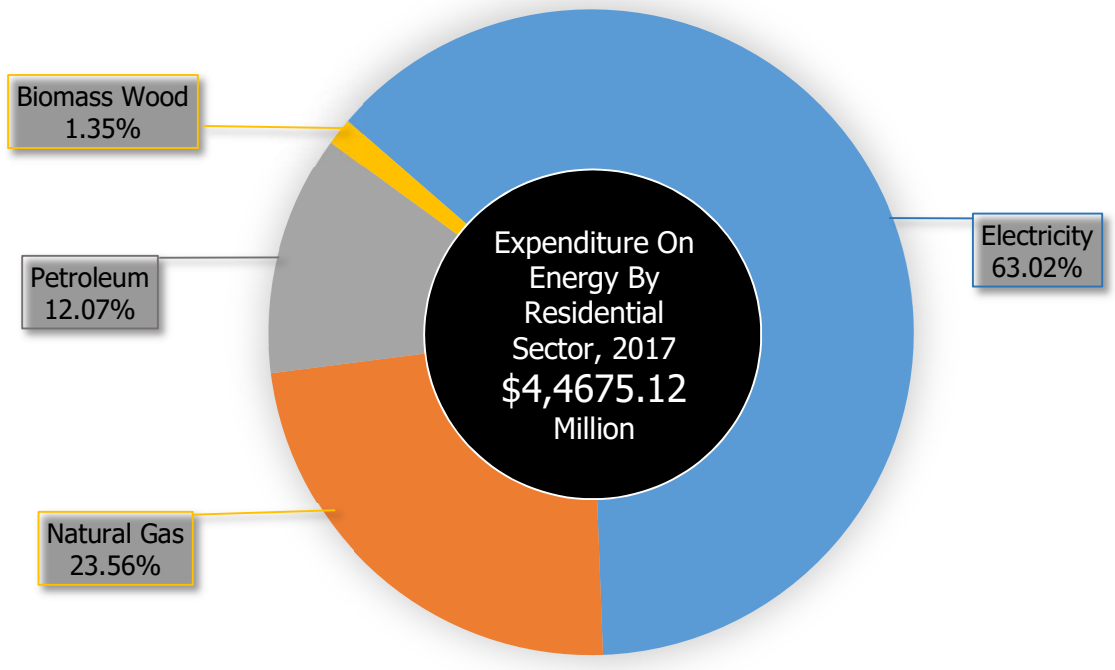

Expenditure on End Use Energy by Industrial Sector 2017
(Millions $)
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Electricity
Natural Gas
Petroleum
Coal
Biomass Wood

Expenditure on Energy by Wisconsin Residential Sector

2005-2017 (Millions of Dollars)

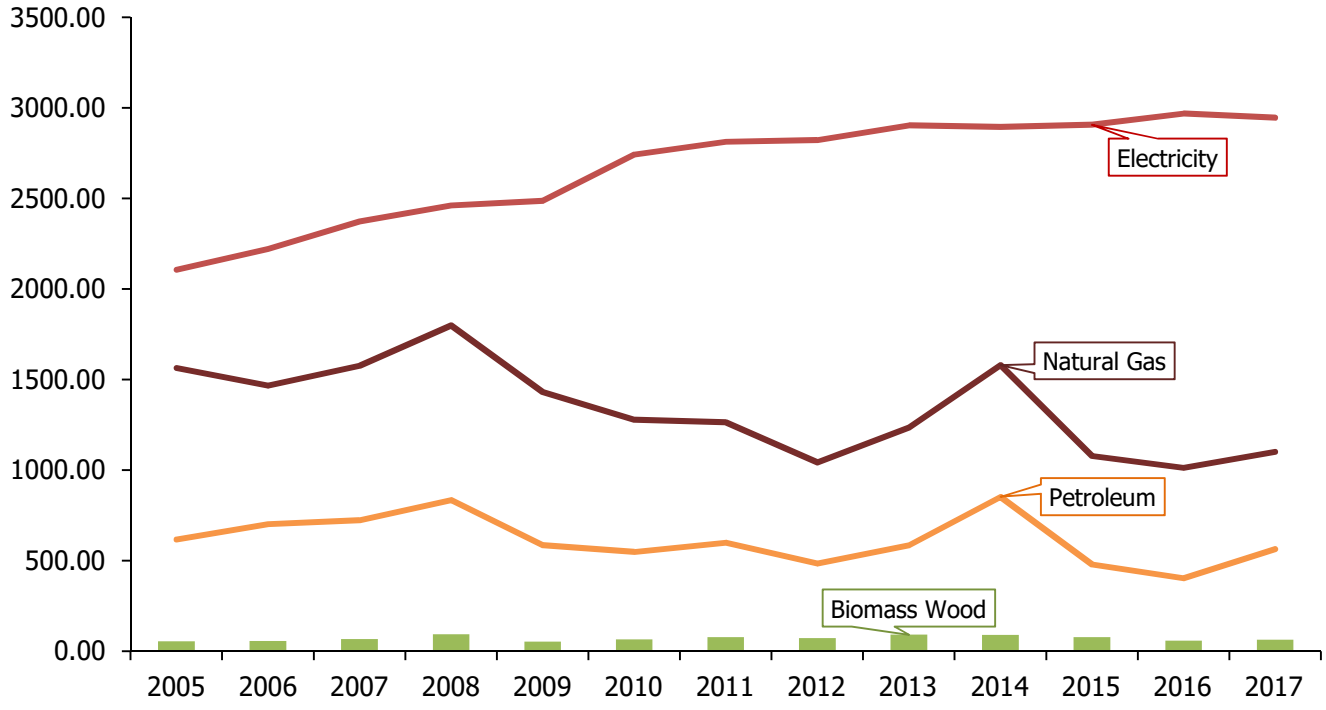
Year	Coal	Electricity	Natural Gas	Petroleum	Biomass Wood	Total
2005	0.57	2107.84	1564.48	617.51	54.50	4344.89
2006	0.50	2221.49	1467.59	701.95	55.70	4447.24
2007	0.40	2373.70	1577.33	723.61	68.00	4743.04
2008	0.00	2461.58	1800.33	834.78	93.80	5190.49
2009	0.00	2487.99	1432.77	585.11	52.30	4558.18
2010	0.00	2743.44	1278.50	548.66	66.20	4636.81
2011	0.00	2814.17	1264.00	599.60	77.20	4754.97
2012	0.00	2823.71	1043.71	485.77	71.90	4425.09
2013	0.00	2904.45	1235.84	586.33	91.80	4818.42
2014	0.00	2895.61	1579.94	853.20	90.60	5419.35
2015	0.00	2906.94	1079.12	479.13	78.20	4543.39
2016	0.00	2969.17	1012.86	404.22	57.70	4443.96
2017	0.00	2946.32	1101.30	564.39	63.10	4675.12

Expenditure on Energy by Residential Sector 2017 (Millions of Dollars)



Source: See Energy Use and Prices by Residential Sector, U.S Energy Information and Administration, State Energy Data System (SEDS) https://www.eia.gov/state/seds/seds-data-complete.php?sid=WI, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPLLPA_PRS_SWI_DPG&f=W,

Expenditure on End Use Energy Consumption by Residential Sector 2005-17
(Millions of Dollars)

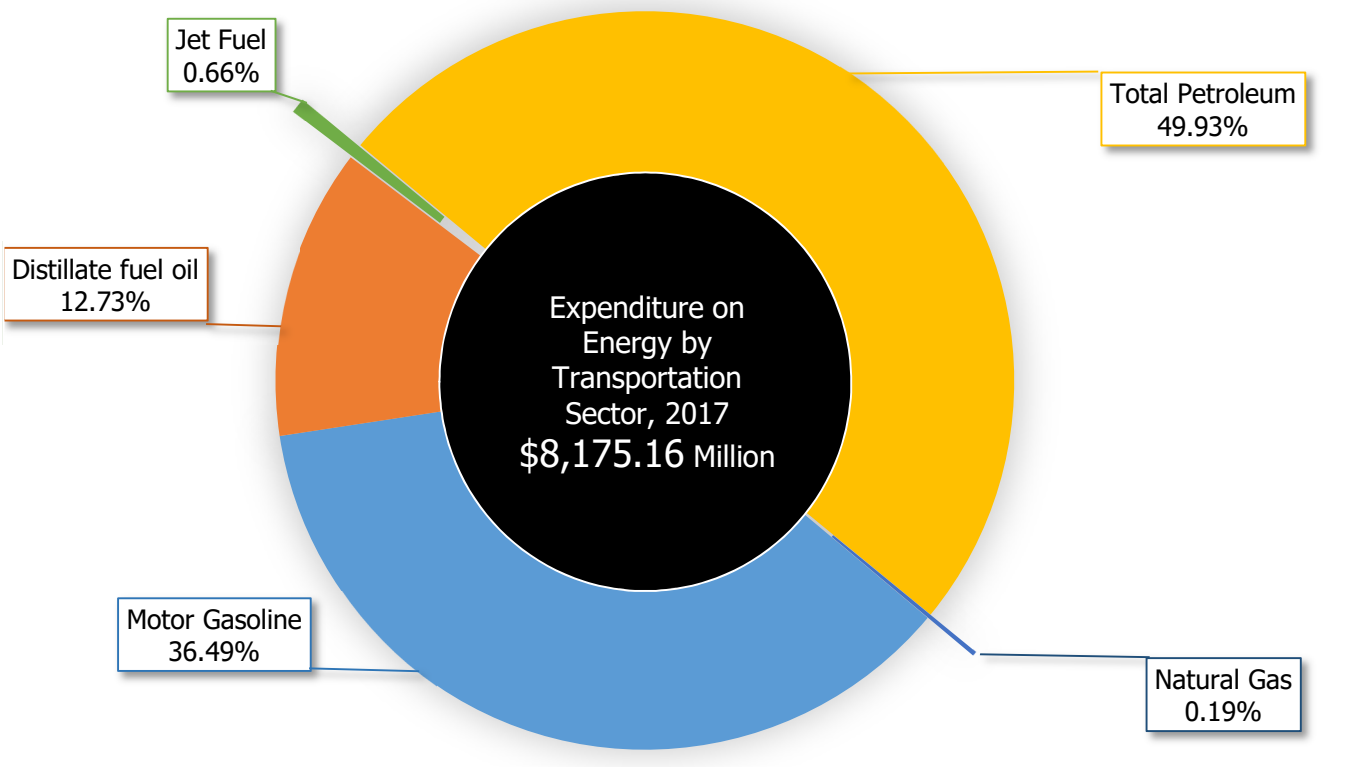


Expenditure on End Use Energy Consumption by Transportation Sector

2005-2017 (Millions of Dollars)

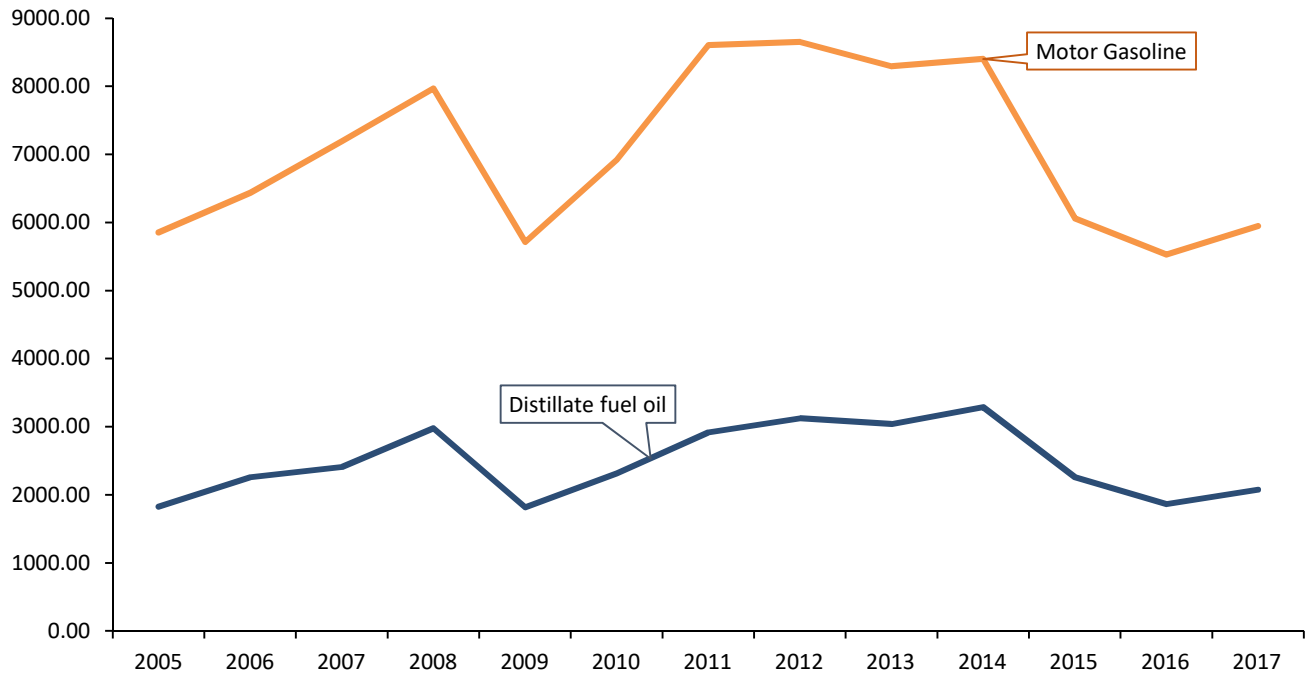
Year	Motor Gasoline	Distillate fuel oil	Aviation Gasoline	Jet Fuel	Total Petroleum	Natural Gas	Total
2005	5854.06	1826.80	1.02	216.70	7974.61	0.29	7974.90
2006	6439.44	2262.00	1.03	234.20	9032.32	0.26	9032.58
2007	7197.91	2411.40	0.96	201.80	9919.54	0.32	9919.85
2008	7971.90	2979.70	1.07	340.60	11405.03	0.32	11405.35
2009	5715.15	1817.10	0.55	178.30	7768.87	0.31	7769.18
2010	6921.64	2314.50	0.80	212.80	9529.22	0.52	9529.74
2011	8606.58	2916.60	1.17	256.10	11780.45	0.93	11781.38
2012	8653.36	3125.50	1.17	194.70	11974.73	2.79	11977.52
2013	8296.60	3042.20	1.08	196.30	11536.18	7.03	11543.21
2014	8402.13	3290.00	1.20	228.30	11921.63	17.61	11939.23
2015	6065.34	2258.10	9.14	129.60	8462.17	23.67	8485.85
2016	5531.97	1862.70	6.38	97.50	7498.55	26.38	7524.93
2017	5951.73	2077.00	7.73	107.91	8144.37	30.80	8175.16

Expenditure on Energy by Transportation Sector 2017 (Millions $)

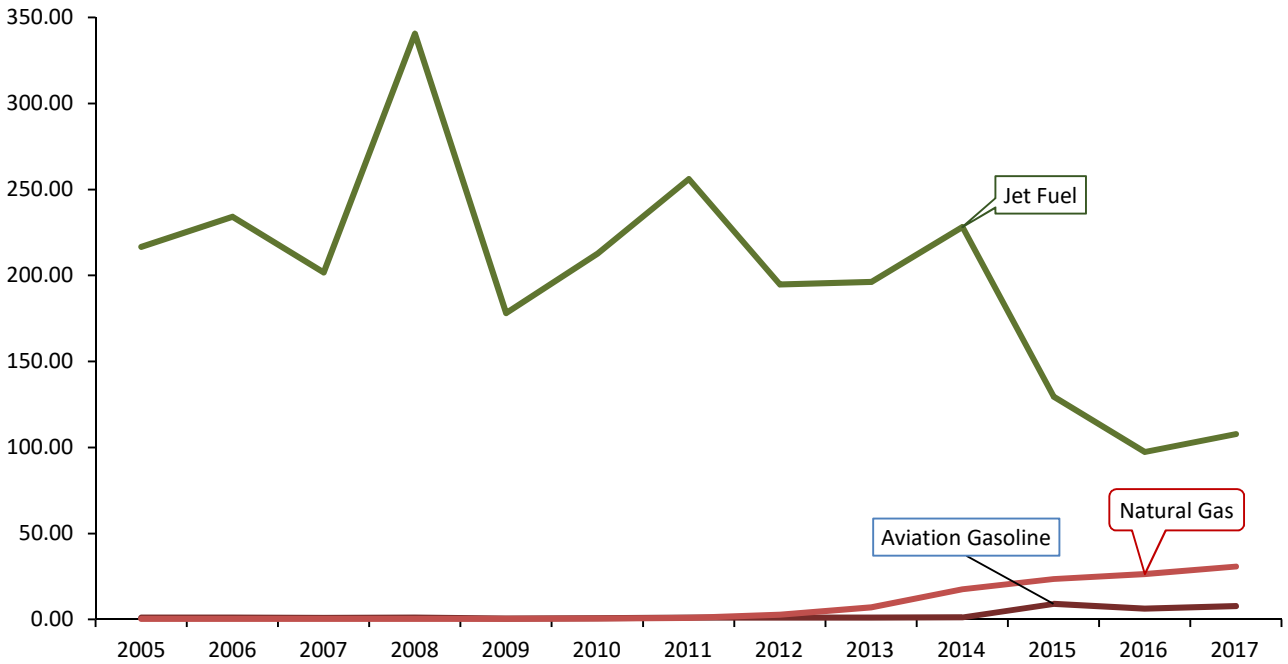


Source: See Energy Use and Prices, Energy Use by Transportation Sector

Expenditure on End Use Energy Consumption by Transportation Sector 2005-17
(Millions $)



Expenditure on End Use Energy Consumption by Transportation Sector 2005-17
(Millions $)



Other Macro Economic Variables - Wisconsin 2005-2017

Year	Resource Energy Intensity[a]	End Use Energy Intensity[b]	Resource Energy Use Per Capita[c]	End Use Energy Per Capita[d]	End Use Energy Expenditure Per Capita (In Millions)[e]
2005	7829.2	5517.8	318.6	224.5	3526.5
2006	7144.7	5136.6	301.9	217.1	3776.1
2007	7184.1	5056.6	312.1	219.7	4049.2
2008	7100.9	5061.2	308.1	219.6	4511.4
2009	6619.6	4736.2	286.7	205.1	3440.2
2010	6587.9	4635.4	294.5	207.2	3820.1
2011	6271.4	4475.2	290.1	207.0	4332.0
2012	5830.0	4136.0	279.6	198.4	4241.1
2013	5944.4	4248.1	292.6	209.1	4310.9
2014	5847.5	4281.3	298.4	218.5	4598.2
2015	5465.5	3955.0	289.2	209.3	3586.2
2016	5162.4	3871.0	279.1	209.3	3349.9
2017	5102.1	3808.0	283.3	211.4	3510.1

A falling energy intensity signifies lower energy required for generating 1 dollar of income in Wisconsin.
A falling energy use per capita signifies lower energy consumption by an individual in Wisconsin. Energy Expenditure also shows a declining trend for the last few years, signifying lower expenditure on energy by an individual over the years.

[a] Resource Energy Intensity is the ratio of Resource Energy Use to Gross Domestic Product. The Gross Domestic product is in current dollars terms.
[b] End Use Energy Intensity is the ratio of End Use Energy to Gross Domestic Product. The Gross Domestic product is in current dollars terms.
[c] Resource Energy Use Per Capita is the ratio of Resource Energy Use to Population
[d] End Use Energy Per Capita is the ratio of End Use Energy to Population
[e] End Use Energy Expenditure Per capita is the ratio of End Use Energy Expenditure to Population

Gross Domestic Product and the Population of the State of Wisconsin are used for the Estimation.

Energy Use and the Environment

The State of Wisconsin shows major improvement in environmental quality in terms of local pollutants[f] like Sulfur Dioxide (SO_2) and Nitrogen Oxides (NO_X). In 2017, major utilities emitted 38% less nitrogen oxide, 17.5 % less carbon monoxide and 24 % less particulate matter as compared to 2007. SO_2 emissions have significantly declined primarily because of the closing of coal plants. In 2007, SO2 emissions by the major utilities were 196,554 tons which reduced to 28,400 tons in 2017.

There has been a decline in carbon dioxide (CO_2) emissions from fossil fuel consumption from 107.8 million metric tons in 2000 to 95.6 million metric tons in 2017. This decline in total carbon emissions is due to the decline in emissions by major contributors like the Industrial Sector and the Electric Power Sector. The emissions by the Transportation Sector have been almost constant. Since 2000, carbon emissions in the Industrial Sector declined by 27% and in the Electric Power Sector by 32%. The CO2 emissions from coal use in 2000 totaled 47.1 million metric tons which was reduced to 33.7 million metric tons in 2017. However, the carbon emissions from natural gas has increased from 21.1 million metric tons to 26.5 million metric tons and that may be a concern for policymakers.

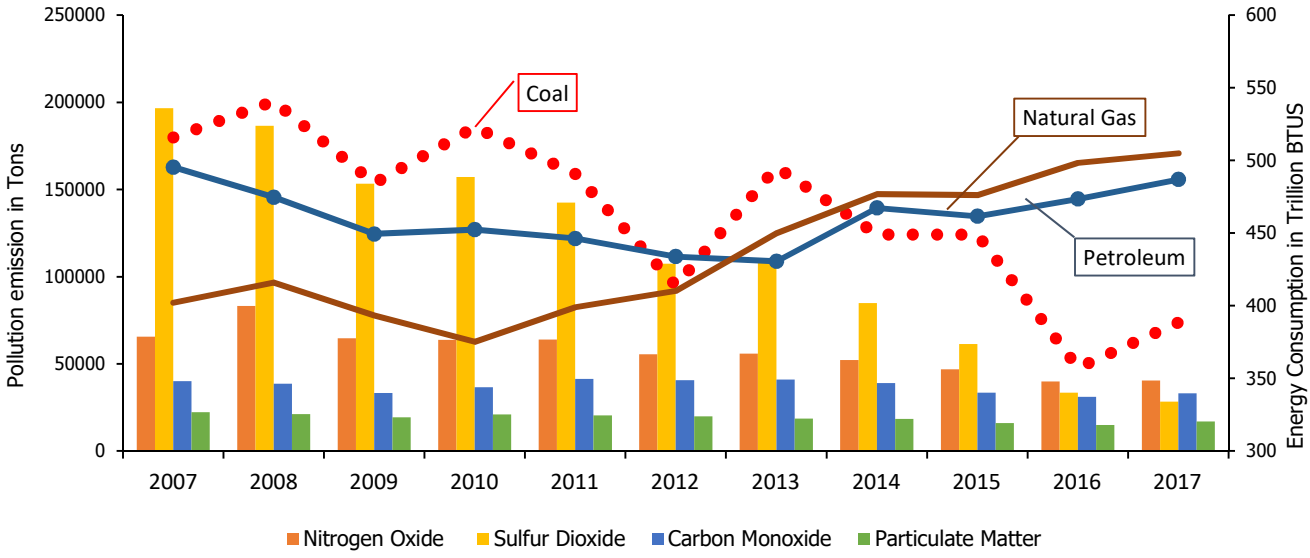
[f] Local Pollutants are those pollutants which affect the lives directly unlike a global pollutant CO_2.

Local Pollution Emission by Major Facilities

Stationary and Portable Source (Tons) 2007-2017

Year	Nitrogen Oxide	Percent of Total	Sulfur Dioxide	Percent of Total	Particulate Matter	Percent of Total	Carbon Monoxide	Percent of Total	Total
2007	65557	20.2%	196554	60.6%	22300	6.9%	40100	12.4%	**324511**
2008	83219	25.2%	186585	56.6%	21269	6.5%	38590	11.7%	**329663**
2009	64606	23.9%	153381	56.7%	19331	7.1%	33323	12.3%	**270640**
2010	63732	22.9%	157172	56.4%	20987	7.5%	36691	13.2%	**278582**
2011	63897	23.8%	142566	53.1%	20502	7.6%	41343	15.4%	**268308**
2012	55432	24.8%	107497	48.1%	19996	8.9%	40706	18.2%	**223631**
2013	55797	24.9%	108981	48.6%	18571	8.3%	41024	18.3%	**224373**
2014	52163	26.8%	84864	43.7%	18394	9.5%	38978	20.1%	**194399**
2015	46902	29.7%	61345	38.9%	15980	10.1%	33452	21.2%	**157679**
2016	39988	33.5%	33400	28.0%	14938	12.5%	31054	26.0%	**119381**
2017	40542	34.1%	28400	23.9%	16884	14.2%	33045	27.8%	**118872**

Wisconsin Energy Use and Local Pollutants



- *Sulfur dioxide shows the largest reduction.*
- *Carbon Monoxide has declined in absolute terms but has increased its share in total emission over the years.*
- *Increasing Petroleum Use explains rising Carbon Monoxide.*
- *The reduction in total emissions is explained by the reduction in coal use.*

Source: Department of Natural Resource, Historical Air Emissions Information (2007-2017) https://dnr.wi.gov/topic/AirEmissions/Historical.html

Wisconsin Electric Utility Nitrogen Oxide (NOx)[a] Emissions
2008-2017(Tons)

Utility	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Dairyland Power Cooperative										
Alma	3671	1100	763	367	171	134	126	0	0	0
J.P. Madgett	3962	3636	2898	2933	2841	825	2031	2072	1239	692
Genoa	2697	1574	1669	769	651	825	854	776	595	901
Madison Gas and Electric Co. - Blount Street	568	78	88	47	65	22	9	79	161	31
Northern States Power Co. - Bay Front	1562	915	665	535	255	333	312	318	321	355
Wisconsin Electric Power Co.										
Oak Creek	4,979	5530	4982	5657	2547	2836	3632	3945	3676	3988
Port Washington	129	129	131	115	195	155	135	193	229	229
Valley	3106	1817	1446	1250	1003	1042	1385	557	309	254
Pleasant Prairie	2862	2623	2711	2498	2110	2998	2430	2523	2227	2128
'Wisconsin Power and Light Co.										
Columbia 1	2715	2438	2899	2781	2943	2638	1975	1905	3483	4518
Columbia 2	2549	2329	2447	2703	2655	2244	1390	1444		
Edgewater 1-4	2805	1409	1503	1563	1164	1212	1278	999	1307	1571
Edgewater 5	1698	1552	1791	1735	1442	602	361	454		
Nelson Dewey	2589	2382	3082	3237	2626	2142	1725	1740	*Retired*	*Retired*
Rock River	93	33	5	6	39	29	60	43	56	134
Wisconsin Public Service Corp.										
Pulliam	6591	3391	2705	1348	854	1238	1186	500	413	650
Weston 1,2	2699	971	1212	810	511	492	175	15		
Weston 3	2593	2034	1493	1165	785	1013	889	712	1087	1141
Weston 4	281	794	922	914	822	998	777	746		
Municipal Utilities										
Manitowoc	593	246	234	145	77	58	75	58	76	74
Oak Creek	60	65	27	419	426	421	392	280	*Closed*	*Closed*
Major Utilities' NOx Emissions	**48742**	**34981**	**33647**	**30578**	**23753**	**22253**	**20804**	**19080**	**15179**	**16668**
Major Facilities NOx Emissions	**83219**	**64606**	**63732**	**63897**	**55432**	**55797**	**52163**	**46902**	**39988**	**40542**

[a] Nitrogen oxides (NOx) is the sum of NO and NO2

Source: Wisconsin Department of Natural Resource, Historical Air Emissions Information (2007-2017) https://dnr.wi.gov/topic/AirEmissions/Historical.html

Wisconsin Electric Utility Sulfur Dioxide (SO_2) Emissions

2008-2017 (Tons)

Utility	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Dairyland Power Cooperative										
Alma	9558	4809	4189	1196	878	622	474	0	*Retired*	
J.P. Madgett	9114	10041	8874	3296	2379	5769	3163	704	920	772
Genoa	11970	6479	4976	4827	4276	361	419	401	253	397
Stoneman	0	0	0	0	0	0	0	0	*Sold in 1993*	
Madison Gas and Electric Co. - Blount Street	2958	397	278	1	1	0	0	0	*Stopped burning Coal after 2010*	
Northern States Power Co. - Bay Front	1041	735	347	286	68	117	64	89	97	82
Wisconsin Electric Power Co.										
Oak Creek	14472	14823	13032	13624	2200	510	505	713	706	668
Port Washington	4	6	6	1	739	7	6	10	12	11
Valley	6887	5376	4890	4226	11	3468	3396	1067	0	0
Pleasant Prairie	1092	988	1195	928	3519	1174	1310	1335	1600	931
Wisconsin Power and Light Co.										
Columbia 1	13561	11833	14527	12340	12678	11400	5518	709	1393	2145
Columbia 2	13303	12396	13192	12429	11921	10794	2339	573		
Edgewater 1-4	7205	5666	5758	5785	4547	5015	4667	3921	*3,4 Retired*	
Edgewater 5	7858	7782	8779	8340	6640	8745	5998	6698	5981	4511
Nelson Dewey	13531	12646	13454	11505	3304	4353	3513	3585	*Retired*	
Rock River	2	4	0	0	3	2	1	1	*Converted to gas*	
Wisconsin Public Service Corp.										
Pulliam	8446	4386	5517	3508	1846	2503	2476	959	748	1063
Weston 1,2	2852	2060	2601	1679	1133	1143	394	36	*Retired*	
Weston 3	7338	5912	7216	5593	4236	5215	4539	3499	1337	615
Weston 4	333	972	1120	904	687	762	588	563		
Municipal Utilities										
Manitowoc	1706	794	593	111	91	174	276	245	263	320
Marshfield	0	0	0	0	0	0	0	0	*Retired*	
Menasha	0	0	0	0	0	0	0	0	*Retired*	
Major Utility SO2 Emissions	**133231**	**108105**	**110544**	**90579**	**61157**	**62134**	**39646**	**25108**	**13310**	**11515**
Major Facilities SO2 Emissions[a]	**186585**	**153381**	**157172**	**142566**	**107497**	**108981**	**84864**	**61345**	**33400**	**28400**

[a] Only those Utilities are shown that reported emissions above a threshold level (5 tons for SO2 and NO2) – Table 1 of NR 438.03, Wis. Adm Code Threshold Amounts https://dnr.wi.gov/cias/am/amexternal/pollutantsnr438.aspx

Wisconsin Carbon Dioxide Emissions from Fossil Fuel Consumption by Sectors

(2000-2017) Million Metric tons of CO_2

Year	Residential Sector	Commercial Sector	Industrial Sector	Transportation Sector	Electric Power Sector	Total	Emissions reported by Major facilities[a]
2000	10.2	5.6	17.3	29.6	44.7	**107.4**	**47.1**
2001	9.8	5.4	16.4	29.5	44.4	**105.3**	**45.7**
2002	10.5	5.8	16.6	29.6	44.1	**106.5**	**44.2**
2003	10.6	6.1	14.6	29.2	44.0	**104.5**	**46.1**
2004	10.2	5.7	15.4	30.5	45.2	**107.2**	**46.6**
2005	9.9	6.2	14.9	30.0	49.2	**110.3**	**47.5**
2006	8.9	5.3	14.2	30.5	43.5	**102.5**	**44.9**
2007	9.4	5.5	14.4	30.6	44.3	**104.2**	**45.1**
2008	10.1	6.5	13.8	29.5	44.8	**104.7**	**45.5**
2009	9.3	5.8	12.0	28.8	40.0	**95.6**	**41.3**
2010	8.6	5.2	12.0	29.3	43.1	**97.9**	**45.5**
2011	8.9	5.5	12.4	28.3	42.3	**96.9**	**44.6**
2012	7.6	4.7	12.1	28.2	37.4	**90.2**	**39.6**
2013	9.7	6.0	13.2	28.0	43.8	**100.6**	**45.9**
2014	10.4	6.5	13.8	30.2	40.1	**101.9**	**42.6**
2015	8.9	6.0	13.2	29.8	42.0	**99.7**	**44.7**
2016	8.7	5.9	12.6	29.5	38.9	**95.5**	**41.2**
2017	8.9	6.0	13.3	28.8	41.1	**98.2**	**43.8**

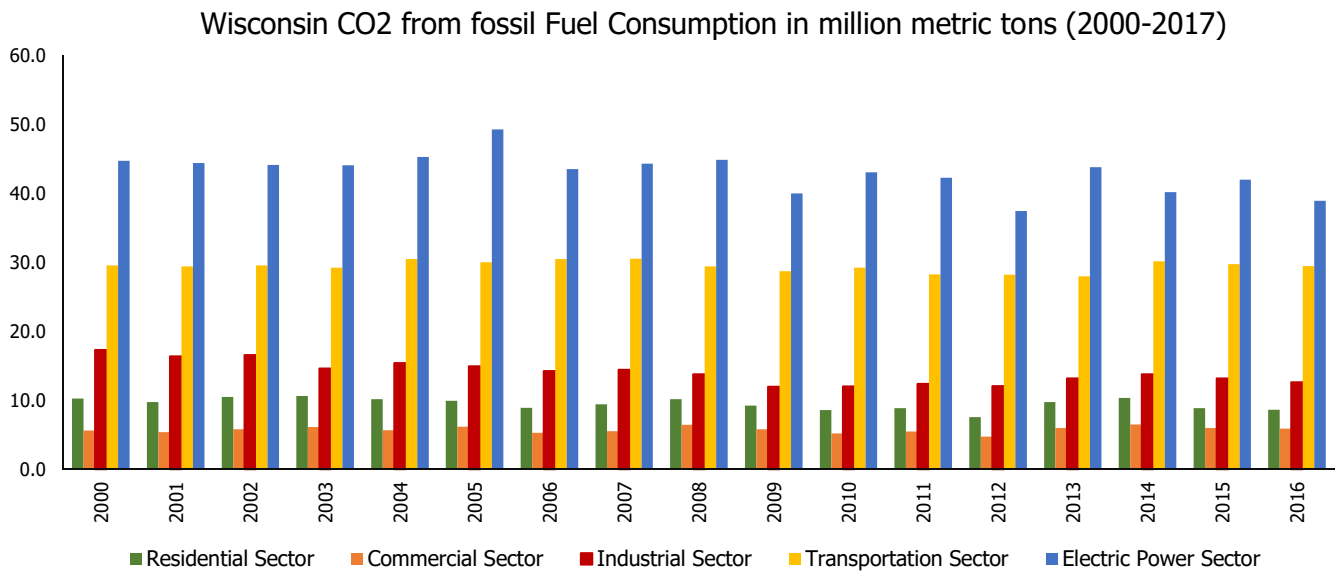
Sectoral Contribution to the Total Emission

Year	Residential Sector	Commercial Sector	Industrial Sector	Transportation Sector	Electric Power Sector
2000	9.53%	5.23%	16.12%	27.50%	41.62%
2005	8.99%	5.61%	13.55%	27.21%	44.65%
2010	8.75%	5.30%	12.27%	29.79%	43.89%
2015	8.88%	6.00%	13.21%	29.83%	42.08%
2016	9.06%	6.17%	13.21%	30.82%	40.73%
2017	9.07%	6.15%	13.52%	29.37%	41.89%

The sectoral contribution to the total emission has almost remained the same for last decade. There is a slight reduction in emission by the industrial sector which is compensated by the transportation sector. Electric sector remains the highest contributor in total emissions.

[a] Facilities which have reported emissions above a threshold level – 100000 tons for CO2, NR438 Pollutants https://dnr.wi.gov/cias/am/amexternal/pollutantsnr438.aspx

Sources: U.S. Energy Information Administration, Environment (2000-2017) https://www.eia.gov/environment/emissions/state/



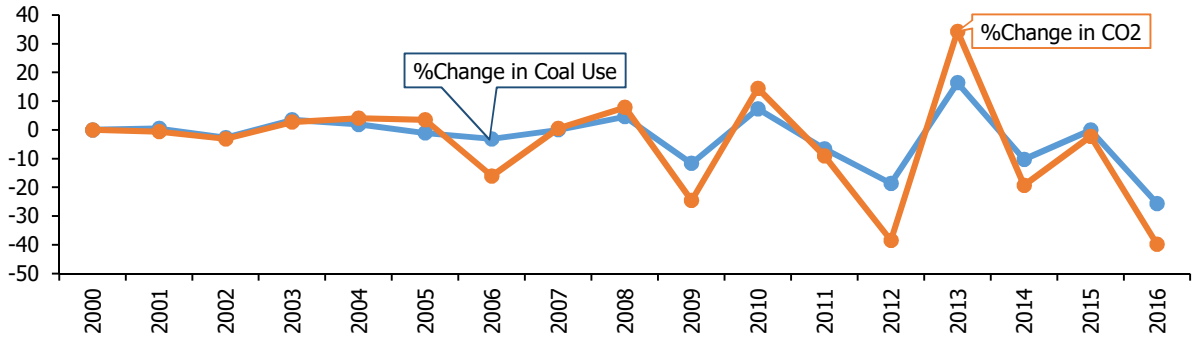
CO_2 Emissions by Fuels

(2000-2017) Million Metric tons

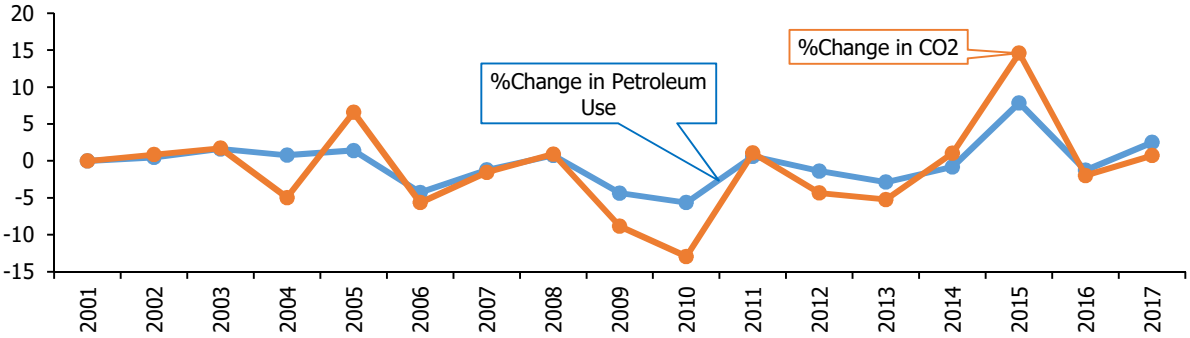
Year	Coal	*Percent of Total*	Petroleum	*Percent of Total*	Natural Gas	*Percent of Total*	Total	U.S Total
2000	47.5	*44.3%*	38.9	*36.2%*	21.0	*19.6%*	**107.4**	5867.2
2001	47.0	*44.7%*	39.1	*37.1%*	19.2	*18.2%*	**105.3**	5765.3
2002	46.9	*44.1%*	39.1	*36.7%*	20.5	*19.3%*	**106.5**	5809.9
2003	46.6	*44.6%*	36.9	*35.3%*	21.1	*20.1%*	**104.6**	5860.5
2004	47.7	*44.6%*	38.9	*36.3%*	20.4	*19.1%*	**107.0**	5979.5
2005	49.9	*45.3%*	38.4	*34.8%*	22.0	*19.9%*	**110.3**	5999.8
2006	44.2	*43.1%*	38.3	*37.4%*	19.9	*19.5%*	**102.4**	5914.5
2007	44.4	*42.6%*	38.4	*36.9%*	21.4	*20.5%*	**104.2**	6003.9
2008	45.9	*43.8%*	36.8	*35.1%*	22.0	*21.0%*	**104.6**	5817.3
2009	40.7	*42.5%*	34.2	*35.8%*	20.8	*21.7%*	**95.7**	5392.7
2010	43.8	*44.6%*	34.4	*35.1%*	19.9	*20.3%*	**98.1**	5585.6
2011	42.7	*43.9%*	33.4	*34.3%*	21.1	*21.7%*	**97.2**	5446.8
2012	35.6	*39.6%*	32.7	*36.3%*	21.7	*24.1%*	**90.0**	5230.1
2013	43.4	*43.1%*	33.2	*33.0%*	24.0	*23.9%*	**100.6**	5357.1
2014	39.8	*39.4%*	35.7	*35.4%*	25.4	*25.2%*	**100.9**	5414.4
2015	39.0	*39.1%*	35.5	*35.6%*	25.3	*25.3%*	**99.7**	5264.0
2016	34.1	*35.7%*	34.9	*36.5%*	26.5	*27.8%*	**95.5**	5171.6
2017	37.1	*37.8%*	34.4	*35.0%*	26.7	*27.2%*	**98.2**	5130.9

Sources: U.S. Energy Information Administration, Environment (2000-2017) https://www.eia.gov/environment/emissions/state/

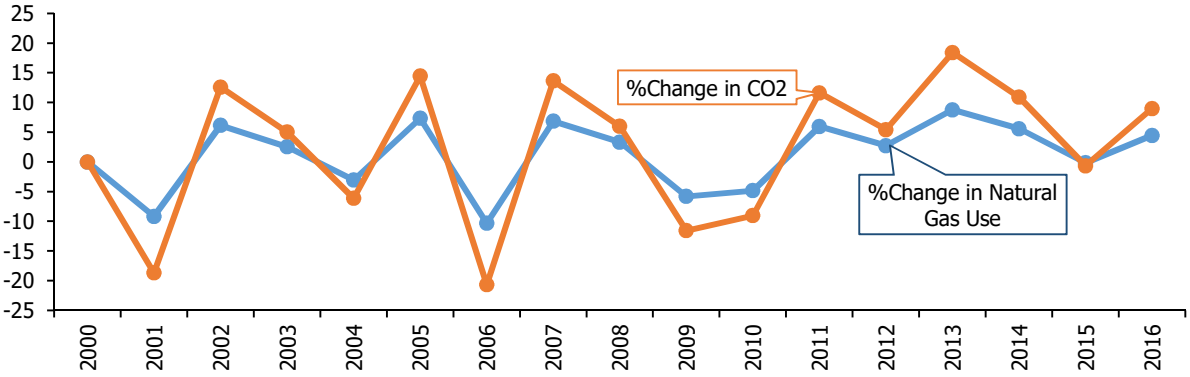
Percentage change in CO2 emission from Coal use and Percentage change in Coal Use (2000 - 2017)



Percentage Change in CO2 emission from petroleum use and Percentage change in Petroleum Use (2000 - 2017)

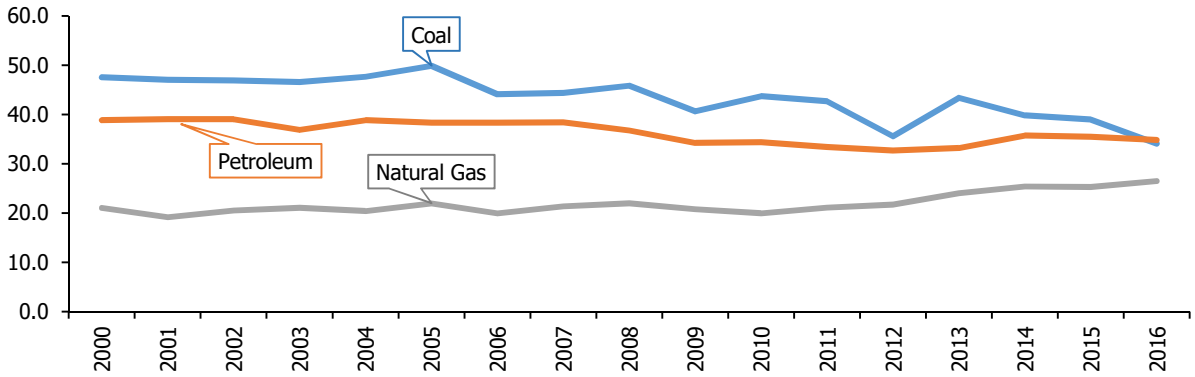


Percentage change in CO2 emission from Natural Gas Use and Percentage change in Natural Gas use (2000 - 2017)



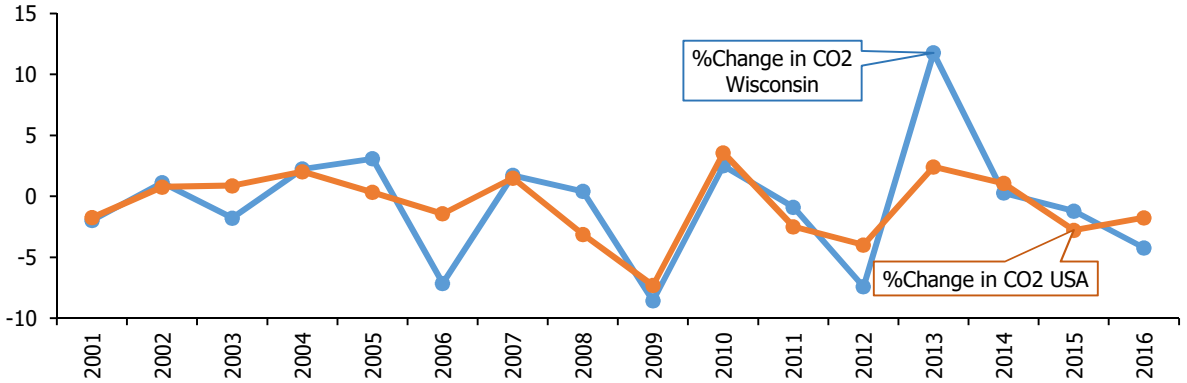
Note: Percentage change implies percentage change from the previous period. Negative values mean fall in values from previous period and positive values mean increase in value from previous period.

CO2 emissions by Fuels in Million Metric Tons (2000 -2017)



CO2 emissions from coal use is decreasing whereas CO2 emissions from natural gas use is increasing since 2010.

Percentage Change in CO2 emissions (2000- 2017)



Since 2014, emission levels have declined both at the State and National level. The decline in the State level CO2 in 2016 was proportionately more than the decline in National Level CO2. This was similar in years 2006, 2009, 2012.

Other Wisconsin Environmental-Economic Indicators

2000-2017

Year	CO2 tons per capita by major facilities[a]	CO2 tons per capita Wisconsin	Major facilities CO2 (Tons)/ GDP current Dollars	Wisconsin CO2 (Tons)/ GDP current Dollars
2000	8.76	19.99	260.69	595.13
2001	8.45	19.48	243.03	560.43
2002	8.11	19.56	226.66	546.74
2003	8.42	19.09	227.08	515.02
2004	8.44	19.40	216.40	497.26
2005	8.56	19.89	210.28	488.64
2006	8.05	18.36	190.43	434.55
2007	8.04	18.57	185.03	427.46
2008	8.06	18.55	185.86	427.53
2009	7.28	16.88	168.07	389.68
2010	8.00	17.24	179.03	385.64
2011	7.82	17.04	169.08	368.43
2012	6.92	15.74	144.35	328.14
2013	8.00	17.54	162.57	356.35
2014	7.40	17.54	145.07	343.82
2015	7.75	17.31	146.48	327.06
2016	7.15	16.54	132.15	305.96
2017	7.56	16.96	136.18	305.42

[a] Facilities which have reported emissions above a threshold level - 100000 tons for CO2, NR438 Pollutants https://dnr.wi.gov/cias/am/amexternal/pollutantsnr438.aspx

Source: Personal Communication with Wisconsin Department of Natural Resource (2000-2017), See State Economic and Demographic Profile

Wisconsin Electric Utility[b] Carbon Dioxide Emissions
2008-2017 (Tons)

Utility	2010	2011	2012	2013	2014	2015	2016	2017
Alliant Energy-Wisconsin Power And Light								
Columbia	8290634	7948137	8637911	8385161	5986969	5957788	5997985	7676119
Edgewater	4794440	4829239	3990739	4734853	4253245	4273611	4063294	4404356
Nelson Dewey	1544197	1461540	1198413	1494221	1487224	1451505		
Neenah								241433.5
Riverside	324795.5	364800	527351.9	589432.7	744747.7	1115513	973945.1	540664.7
Sheboygan								212830.5
Dairyland Power Cooperative								
Alma	2862787	2516177	2405041	2964601	1756102	1867828	2359289	1997416
Genoa	1770789	1856340	1048101	1579209	1642147	1539478	1056843	1666388
E J Stoneman Station	118206.2	432847.1	465030.8	468024.5	434656.8	301718.2		
LSP - Whitewater Limited Partnership	329424	296115.9	476738.9	357915.4	355847.1	314827	429885.7	448852.5
Manitowoc Public Utilities	422775.5	315665.9	146726.5	168018.9	236812.8	205290.8	224563.9	274163
Rockgen Energy Center	107833		167964.7	114693.9			131376.5	155034.2
Madison Gas And Electric Co.- West Campus Cogeneration Facility		101904.8	162530.7	128650.5		137836.3	323855	209103.4
Wisconsin Electric Power Co.								
Rothschild				103500	437200	419101	408093.2	421912.2
Oak Creek	8862431	11542258	7100666	9278438	11075571	13790274	12685332	13861853
Paris			100982.7			102778.4	134714.4	
Pleasant Prairie	8899530	7887620	6895992	9637350	7807222	8299525	7576933	6668435
Port Washington	1215718	1004786	2108959	1440817	1258324	1955399	2404738	2229480
Valley	1423342	1136373	931999.8	959504.5	1996479	684280	524789.2	460923.1
Wisconsin Public Service Corp.								
Fox Energy	260523.1	678446.8	1095061	677330.3	607850.9	1348260	1345339	1165672
Pulliam	2024785	1136361	727870.2	1120997	1114580	538724.1	423310.9	667579.2
Weston	7092136	6124852	4927443	6083463	4962774	4327415	3756513	4257362
West Marinette							111172.8	
Northern States Power Co.								
Bay Front	451017	1842237	358551.7	371575.4	298837.2	332828	293613.4	331853.4
French Island			158898.5	147882.3	126991.5	130774.9	139866.2	150514
Total[c]	50795363	51475701	43632974	50805639	46583580	49094755	45365453	48041945

[b] Utilities which have reported emissions above a threshold level – 100000 tons for CO2, NR438 Pollutants https://dnr.wi.gov/cias/am/amexternal/pollutantsnr438.aspx
Source: Department of Natural Resources, Historical air emission Information (2010- 2017) https://dnr.wi.gov/topic/AirEmissions/Historical.html and Personal Communication.

[c] The total estimates of CO2 may differ due to difference in sources

Renewable Energy

Renewable energy is energy derived from a renewable resource such as: fuel cells, sunlight (solar), geothermal heat, wind, tides, water (hydro), and various forms of biomass, as defined in Wisconsin Statute 196.378 (1)(h). Wisconsin met its Renewable Portfolio Standard (RPS) goal of 10 percent of retail sales of electricity from renewable resources in 2015. Approximately 11.64 percent of 2017 total retail sales of electricity came from renewable resources. If generation for green pricing programs is added to the total, for which some retail customers voluntarily pay a premium, 12.15 percent of retail sales came from renewable resources in 2017[d]. Out of the total electricity produced by the renewable resources within the state, hydro and wind contributes to almost 43 percent and 26.8 percent, respectively; biomass accounts for 15 percent, biogas 15 percent, and solar 1 percent.

Biomass accounts for almost 70% of the total renewable energy used in the State. Biomass includes wood and wood processing waste, agricultural crops and waste materials, food waste, animal manure and human sewage. Biogas is harvested by processing biomass in a way that helps micro-organisms digest the organic material and produce gas. This process is what's known as anaerobic digestion. Biogas is produced from the state landfills and agricultural manure digesters. Biogas contributes to 15% of the electricity generated by renewable source in the State.

Renewable energy is also used by the transportation sector. Approximately 6 percent of auto fuel is supplied by ethanol processing plants within the state, where ethanol is blended with conventional gasoline for use in vehicles. Renewable energy purchases by electric utilities in Wisconsin have increased over the years. This increase in renewable imports can be attributed in part to Wisconsin's geographic location. Wisconsin shares borders with 3 of the top 10 wind producing states: Iowa (#2), Minnesota (#6), and Illinois (#7). A rise is observed in the case of solar energy generation. The nameplate capacity[e] increased 3 times since 2015 and as a result, the solar energy generated in 2017 was 25.16 million kWh as compared to 1.89 million kWh in 2015. As a cold weather state, Wisconsin uses a large amount of energy to heat water. Focus on Energy provided rewards and incentives through 2013 to help encourage residential renewable energy adoption, particularly adoption of solar water heaters.

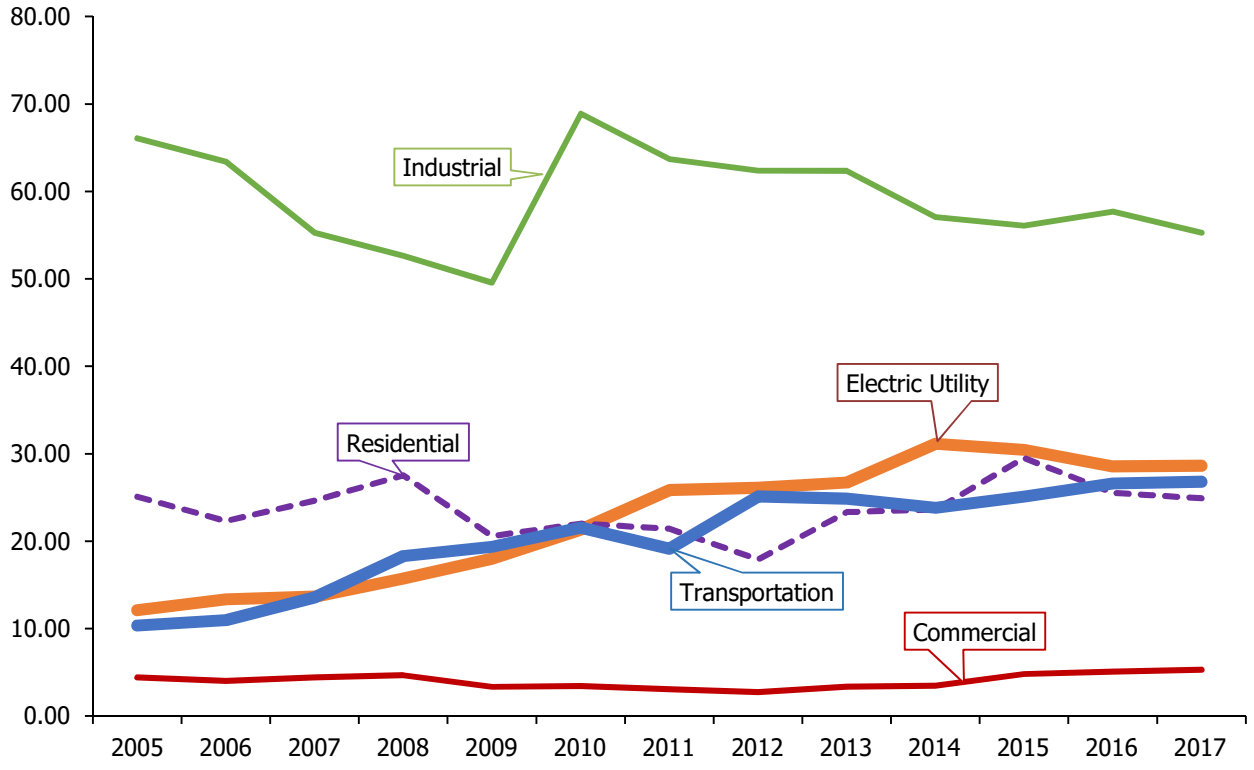
[d] Public Service Commission, The Wisconsin Renewable Portfolio Standards (RPS) Compliance: http://apps.psc.wi.gov/vs2015/ERF_view/viewdoc.aspx?docid=344905. These figures include renewable energy estimates produced in other states.
[e] Nameplate capacity, also known as the rated capacity, nominal capacity, installed capacity, or maximum effect, is the intended full-load sustained output of a facility such as a power plant, electric generator, a chemical plant, fuel plant, metal refinery, mine, and many others

Wisconsin Renewable Energy Production and Use, by Economic Sector

2005-2017 (Trillions of Btu)

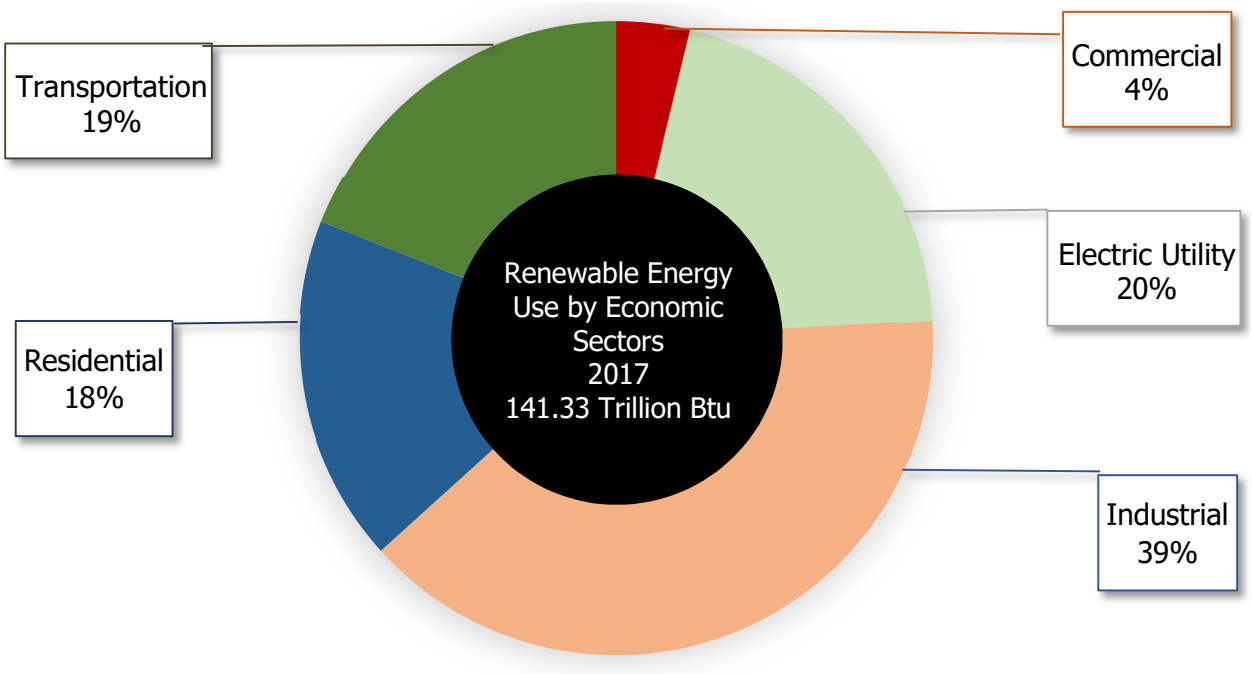
Year	Commercial	Industrial	Residential	Transportation	Total End User	Electric Utility	Total Resource Use
2005	4.42	66.08	25.31	10.38	106.19	12.13	118.32
2006	4.03	63.42	22.51	11.01	100.96	13.38	114.34
2007	4.43	55.28	24.92	13.61	98.23	13.66	111.89
2008	4.67	52.64	27.81	18.31	103.44	15.74	119.17
2009	3.36	49.59	20.91	19.39	93.25	18.01	111.26
2010	3.45	68.91	22.42	21.55	116.34	21.34	137.68
2011	3.07	63.69	21.82	19.17	107.74	25.85	133.59
2012	2.74	62.41	18.32	25.11	108.58	26.12	134.70
2013	3.36	62.37	23.72	24.87	114.33	26.71	141.04
2014	3.48	57.07	24.02	23.85	108.42	31.16	139.59
2015	4.84	56.10	29.91	25.11	115.97	30.47	146.44
2016	5.09	57.69	25.91	26.63	115.33	28.56	143.89
2017	5.31	55.27	25.31	26.79	112.69	28.64	141.33

Wisconsin Renewable Energy Production and Use, by Economic Sectors
2005-2017 (Trillions of Btu)



Source: Public Service Commission of Wisconsin, Personal Communication and Annual Reports, Investor Owned Utilities, (2005-2017) Unpublished data, U.S. Energy Information Administration, State Energy Data System (SEDS): 1960-2017, Energy Consumption https://www.eia.gov/state/seds/seds-data-complete.php?sid=WI, Distributed Energy Resources, Biennial Strategic Energy Assessment 2024: http://apps.psc.wi.gov/vs2015/ERF_view/viewdoc.aspx?docid=341817, Personal Communication with Department of Revenue (2005-2017)

Wisconsin Renewable Energy Production and Use, by Economic Sector 2017 (Trillions of BTU and Percent of Total)

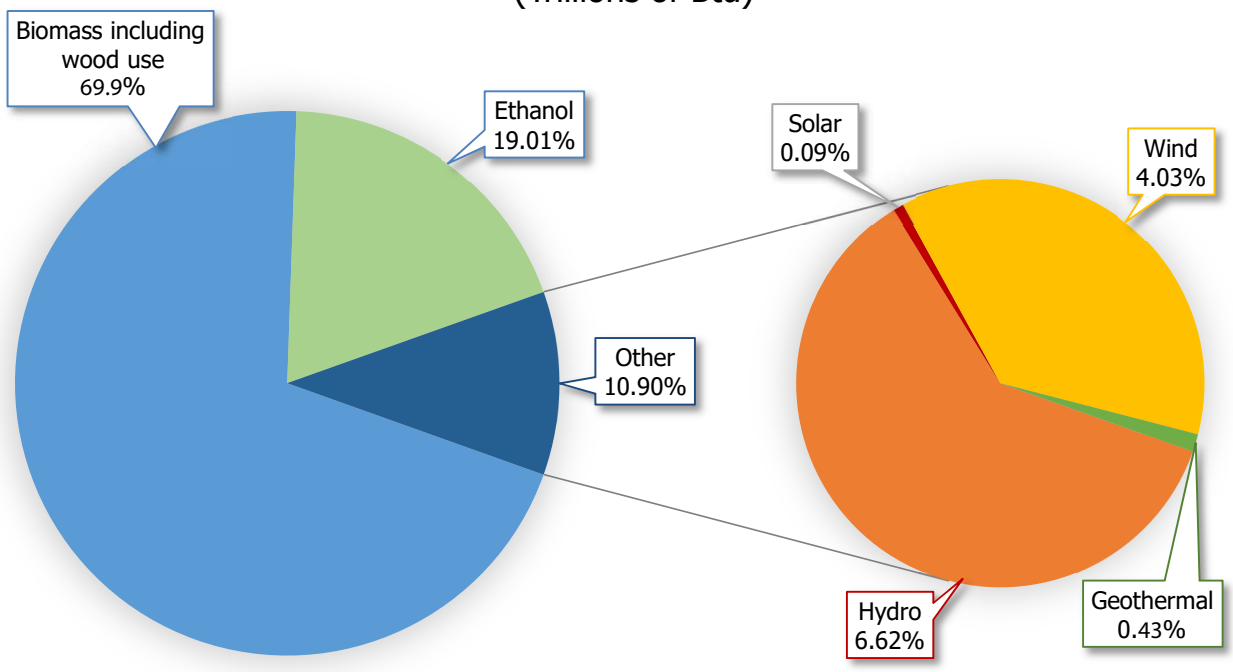


Wisconsin Renewable Energy Production & Use, by Source

2005-2017 (Trillions of Btu)

Year	Biomass Including Wood Use[a,b]	Hydro	Solar	Wind	Ethanol[c]	Geothermal	Total
2005	102.00	5.31	0.01	0.32	10.38	0.30	118.32
2006	97.10	5.57	0.01	0.35	11.01	0.30	114.34
2007	92.40	5.08	0.02	0.38	13.61	0.40	111.89
2008	93.30	5.48	0.02	1.66	18.31	0.40	119.17
2009	82.60	5.16	0.02	3.59	19.39	0.50	111.26
2010	104.00	7.78	0.03	3.72	21.55	0.60	137.68
2011	101.80	7.94	0.03	4.06	19.17	0.60	133.59
2012	97.90	5.70	0.04	5.36	25.11	0.60	134.70
2013	102.90	7.31	0.03	5.33	24.87	0.60	141.04
2014	100.60	8.97	0.04	5.53	23.85	0.60	139.59
2015	106.70	8.48	0.04	5.51	25.11	0.60	146.44
2016	101.40	9.96	0.05	5.25	26.63	0.60	143.89
2017	98.80	9.33	0.12	5.69	26.79	0.60	141.33

Wisconsin Renewable Energy Use, by Source 2005-2017 (Trillions of Btu)



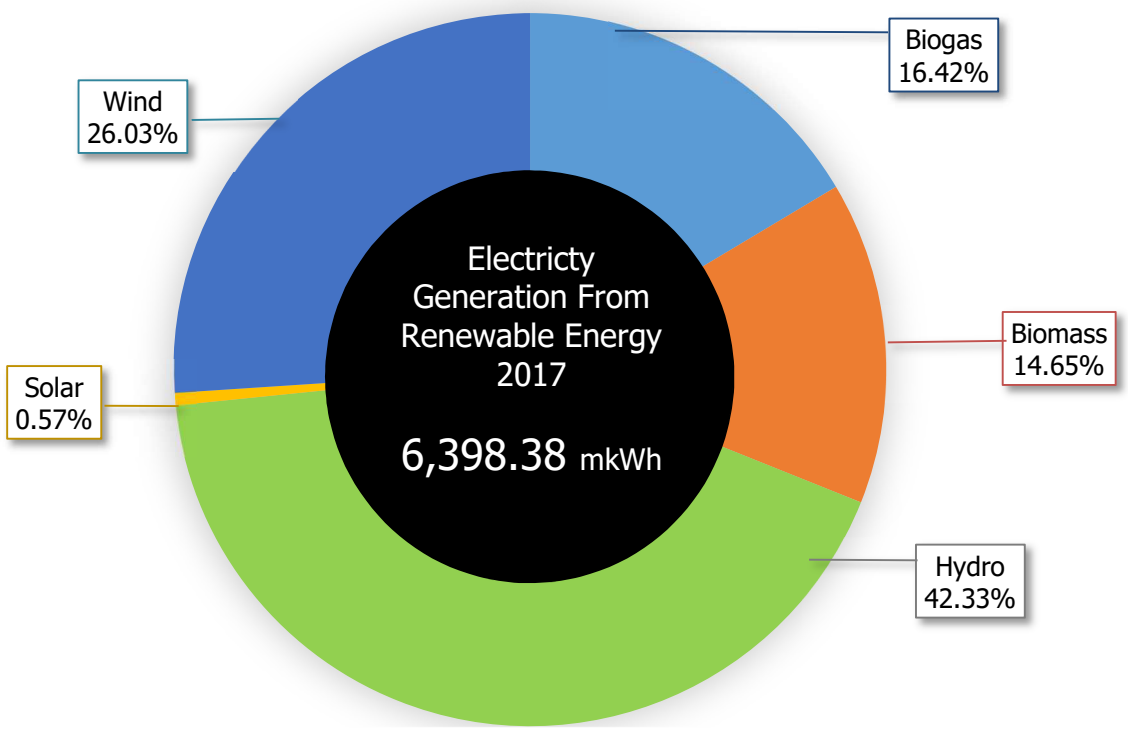
[a]Biogas is produced from the State's landfills and agricultural manure digesters. Wisconsin's statutes and U.S. Energy Information Administration includes biogas in the definition of biomass.
[b]Wood, wood-derived fuels, and biomass waste.
Source: Public Service Commission of Wisconsin, Personal Communication and Annual Reports, Investor Owned Utilities, (2005-2017) Unpublished data, U.S. Energy Information Administration, State Energy Data System (SEDS): 1960-2017, Energy Consumption https://www.eia.gov/state/seds/seds-data-complete.php?sid=WI, Distributed Energy Resources, Biennial Strategic Energy Assessment 2024: http://apps.psc.wi.gov/vs2015/ERF_view/viewdoc.aspx?docid=341817, Personal Communication with Department of Revenue (2005-2017)

Wisconsin Electricity Generation from Renewable Energy

2005-2017 Millions of kWh

Year	Biogas	Biomass[d]	Hydro	Solar	Wind	Total
2005	224.31	148.20	1550.70	0.03	92.60	2015.83
2006	322.18	815.83	1626.94	0.02	101.81	2866.78
2007	412.61	914.42	1483.22	0.03	109.30	2919.59
2008	954.76	698.58	1585.59	4.40	487.35	3730.69
2009	1028.25	1017.23	1460.93	6.04	1050.58	4563.03
2010	1056.41	912.98	2216.93	8.15	1090.96	5285.43
2011	1191.60	1080.33	2258.88	7.37	1188.81	5726.99
2012	1257.96	1053.25	1608.19	10.50	1569.83	5499.72
2013	1213.61	991.70	2069.10	9.88	1561.12	5845.42
2014	1212.38	1108.83	2556.90	11.68	1621.63	6511.43
2015	1198.81	859.24	2431.23	11.64	1615.29	6116.21
2016	1234.46	884.56	2876.34	15.03	1537.76	6548.15
2017	1050.86	937.09	2708.24	36.41	1665.77	6398.38

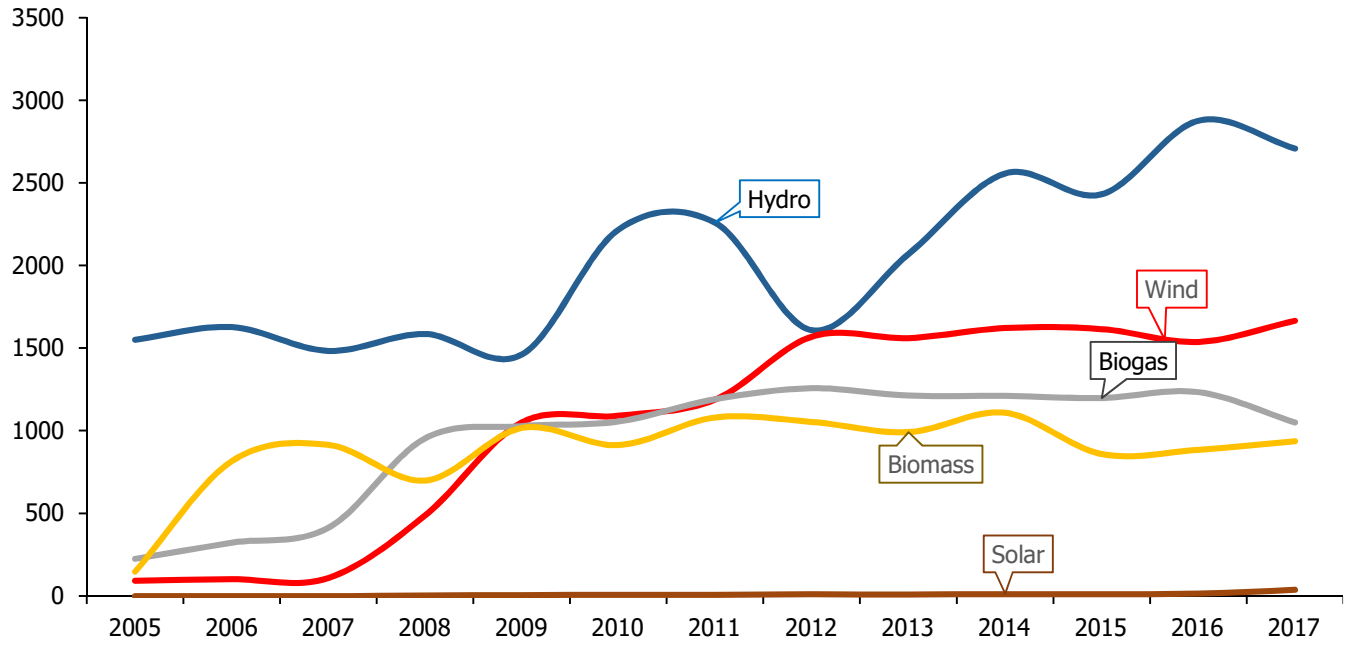
Electrity Generation from Renewable Energy- 2017



[d] Revised

Source: Public Service Commission of Wisconsin, Personal Communication and Annual Reports, Investor Owned Utilities, (2005-2017) Unpublished data, U.S. Energy Information Administration, Form EIA-923 detailed data with previous form data (EIA-906/920) https://www.eia.gov/electricity/data/eia923/, Distributed Energy Resources, Biennial Strategic Energy Assessment 2024, PSCW http://apps.psc.wi.gov/vs2015/ERF_view/viewdoc.aspx?docid=341817, Personal Communication with Facilities (2011-2017), U.S Energy Information Administration, State Profile and Energy Estimates (2005-2017) https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/total/use_tot_WIcb.html&sid=WI

Wisconsin Renewable Energy Electricity Generation, by Type of Fuel, 2005-2017
Millions of kWh



Biomass Wood and Waste Use[e] (Trillions of Btu)

Year	Commercial	Electric Utility	Industrial	Residential	Total	% of Total Renewable Energy
2005	4.4	6.7	65.9	25	102	86.35%
2006	4	8.1	62.8	22.2	97.1	85.06%
2007	4.4	8.8	54.7	24.5	92.4	82.77%
2008	4.6	9.2	52.1	27.4	93.3	78.46%
2009	3.3	9.8	49.1	20.4	82.6	74.46%
2010	3.3	10.7	68.2	21.8	104	75.75%
2011	2.9	14.8	62.9	21.2	101.8	76.42%
2012	2.6	15.8	61.8	17.7	97.9	72.89%
2013	3.2	15	61.6	23.1	102.9	73.15%
2014	3.3	17.6	56.3	23.4	100.6	72.27%
2015	4.7	17.4	55.3	29.3	106.7	73.05%
2016	4.9	14.3	56.9	25.3	101.4	70.66%
2017	5.1	14.5	54.5	24.7	98.8	70.10%

[e] Wood, wood-derived fuels, and biomass waste. Includes Biogas Source.
Source: State Profile and Energy Estimates (2005-2017) https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/total/use_tot_WIcb.html&sid=WI

Electricity Generation from Biogas Use

(Millions of kWh)

Biogas is produced from the state landfills and agricultural manure digesters. In Wisconsin statutes and in data from U.S. Energy Information Administration, biogas is included in the definition of biomass. Here, we break out biogas from biomass to provide further detail about these resources in the state.

YEAR	INDUSTRIAL		ELECTRIC UTILITY		COMMERCIAL		TOTAL	% of Total Electricity Generated from Renewables	% of Total Electricity Generated
	MKWH	Percent of Total	MKWH	Percent of Total	MKWH	Percent of Total	**MKWH**		
2005	181.42	*80.88%*	37.89	*16.89%*	5.00	*2%*	**224.31**	11%	0%
2006	263.37	*81.75%*	46.09	*14.31%*	12.72	*4%*	**322.18**	11%	0%
2007	364.87	*88.43%*	24.78	*6.01%*	22.96	*6%*	**412.61**	14%	1%
2008	498.49	*52.21%*	41.08	*4.30%*	415.19	*43%*	**954.76**	26%	1%
2009	546.71	*53.17%*	49.88	*4.85%*	431.66	*42%*	**1028.25**	23%	2%
2010	533.15	*50.47%*	45.13	*4.27%*	478.13	*45%*	**1056.41**	20%	2%
2011	596.87	*50.09%*	46.65	*3.91%*	548.08	*46%*	**1191.60**	21%	2%
2012	623.26	*49.55%*	28.45	*2.26%*	606.24	*48%*	**1257.96**	23%	2%
2013	584.55	*48.17%*	24.83	*2.05%*	604.23	*50%*	**1213.61**	21%	2%
2014	613.50	*50.60%*	20.53	*1.69%*	578.35	*48%*	**1212.38**	19%	2%
2015	578.72	*48.27%*	28.06	*2.34%*	592.03	*49%*	**1198.81**	20%	2%
2016	592.68	*48.01%*	25.57	*2.07%*	616.21	*50%*	**1234.46**	19%	2%
2017	580.35	*55.23%*	21.71	*2.07%*	448.81	*43%*	**1050.86**	16%	2%

Wisconsin Utility and Non-Utility Hydroelectric Generation

2010-2017 (Millions of kWh)

Year	Wisconsin	Michigan*	Total Wisconsin-Owned Generation	Wisconsin Non-Utility Generation	Total Wisconsin Hydroelectric Generation
2010	2026.67	330.25	2356.92	190.26	2216.93
2011	2048.11	339.63	2387.74	210.77	2258.88
2012	1455.01	257.43	1712.44	153.18	1608.19
2013	1871.97	346.26	2218.23	197.11	2069.08
2014	2353.62	415.21	2768.83	203.28	2556.90
2015	2216.65	406.14	2622.79	214.58	2431.23
2016	2639.79	415.30	3055.09	236.50	2876.29
2017	2476.59	489.37	2965.96	231.66	2708.24

Wisconsin Utility and Non-Utility Electric Generation from Solar Energy

2010-2017 (Millions of kWh)

Year	Wisconsin	Minnesota*	Total Wisconsin-Owned Generation	Wisconsin Non-Utility Generation	Total Wisconsin Solar Generation
2010	0.12	0.20	0.32	0.00	0.12
2011	0.23	1.70	1.93	0.05	0.28
2012	0.57	2.60	3.17	0.06	0.63
2013	0.53	2.30	2.83	0.05	0.58
2014	1.86	4.90	6.76	0.05	1.91
2015	1.83	5.33	7.16	0.06	1.89
2016	2.94	24.71	27.65	0.05	2.99
2017	25.08	306.33	**331.41**	0.09	**25.17**

Wisconsin Utility and Non-Utility Electric Generation from Wind Energy,

2010-2017 (Millions of kWh)

Year	Wisconsin	Other States*	Total Wisconsin-Owned Generation	Wisconsin Non-Utility Generation	Total Wisconsin Wind Generation
2010	1087.90	6274.60	7362.5	0.16	1088.06
2011	1186.17	6632.40	7818.57	0.34	1186.51
2012	1567.50	9263.52	10831.02	0.39	1567.89
2013	1558.90	9215.54	10774.44	0.34	1559.24
2014	1612.30	11416.95	13029.25	25.14	1637.44
2015	1582.00	10816.51	12398.50	31.06	1613.06
2016	1508.08	13532.2	15040.28	27.57	1535.65
2017	1634.08	13546.14	15180.22	30.35	1664.49

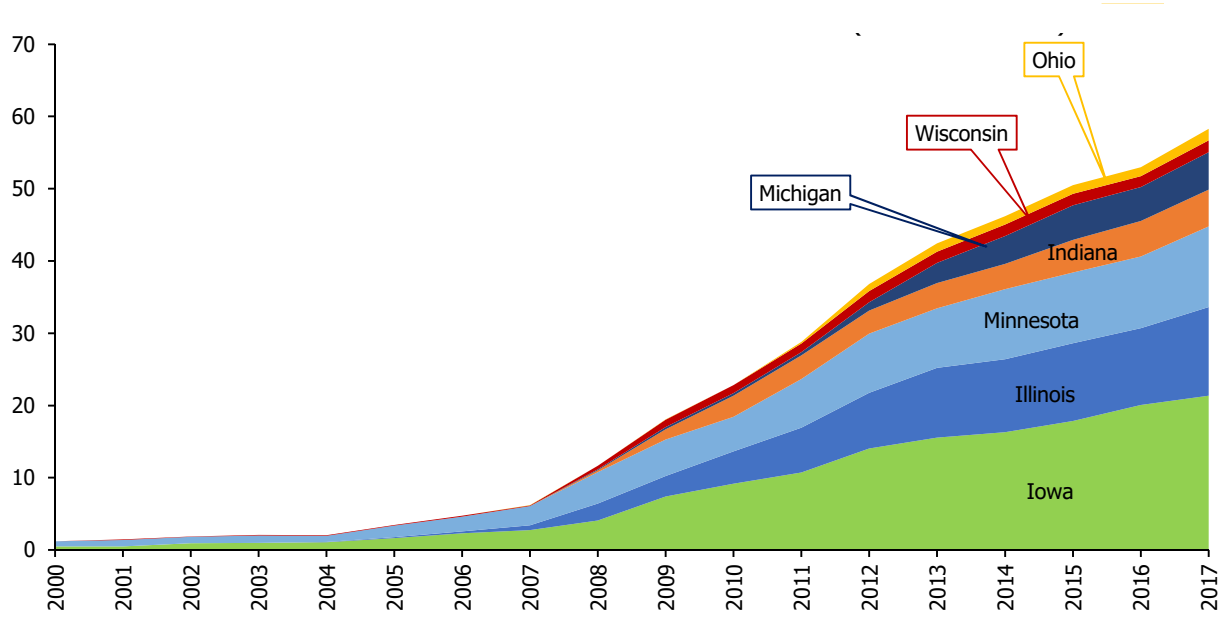
*These numbers represent electricity generated outside the State of Wisconsin but owned by Wisconsin Utilities.
Source: Public Service Commission of Wisconsin, Personal Communication and Annual Reports, Investor Owned Utilities, (2005-2017) Unpublished data

Wisconsin, Midwest and U.S. Wind Generation

2000-2017 (MWh in Millions)

Year	Wisconsin[a]	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Midwest Total*	United States
2000	0.00	0.00	0.00	0.49	0.00	0.72	0.00	**1.22**	5.59
2001	0.07	0.00	0.00	0.49	0.00	0.90	0.00	**1.46**	6.74
2002	0.05	0.00	0.00	0.92	0.00	0.91	0.00	**1.87**	10.35
2003	0.10	0.02	0.00	0.98	0.00	0.98	0.00	**2.08**	11.19
2004	0.10	0.08	0.00	1.05	0.00	0.81	0.00	**2.05**	14.14
2005	0.09	0.14	0.00	1.65	0.00	1.58	0.01	**3.48**	17.81
2006	0.10	0.25	0.00	2.32	0.00	2.05	0.01	**4.75**	26.59
2007	0.11	0.66	0.00	2.76	0.00	2.64	0.01	**6.19**	34.45
2008	0.49	2.34	0.24	4.08	0.14	4.35	0.02	**11.66**	55.36
2009	1.05	2.82	1.40	7.42	0.30	5.05	0.01	**18.06**	73.89
2010	1.09	4.45	2.93	9.17	0.36	4.79	0.01	**22.81**	94.65
2011	1.19	6.21	3.29	10.71	0.46	6.73	0.20	**28.78**	120.18
2012	1.56	7.73	3.21	14.03	1.13	8.18	0.99	**36.82**	140.82
2013	1.56	9.63	3.48	15.57	2.80	8.26	1.15	**42.44**	167.84
2014	1.62	10.08	3.50	16.31	3.87	9.69	1.15	**46.22**	181.66
2015	1.59	10.75	4.52	17.87	4.80	9.78	1.20	**50.50**	190.72
2016	1.52	10.63	4.90	20.05	4.69	9.93	1.26	**52.98**	226.87
2017	1.64	12.27	5.09	21.37	5.19	11.14	1.59	**58.29**	254.30

Wisconsin and Midwest Wind Generation 2000-2017 (Millions of MWh)



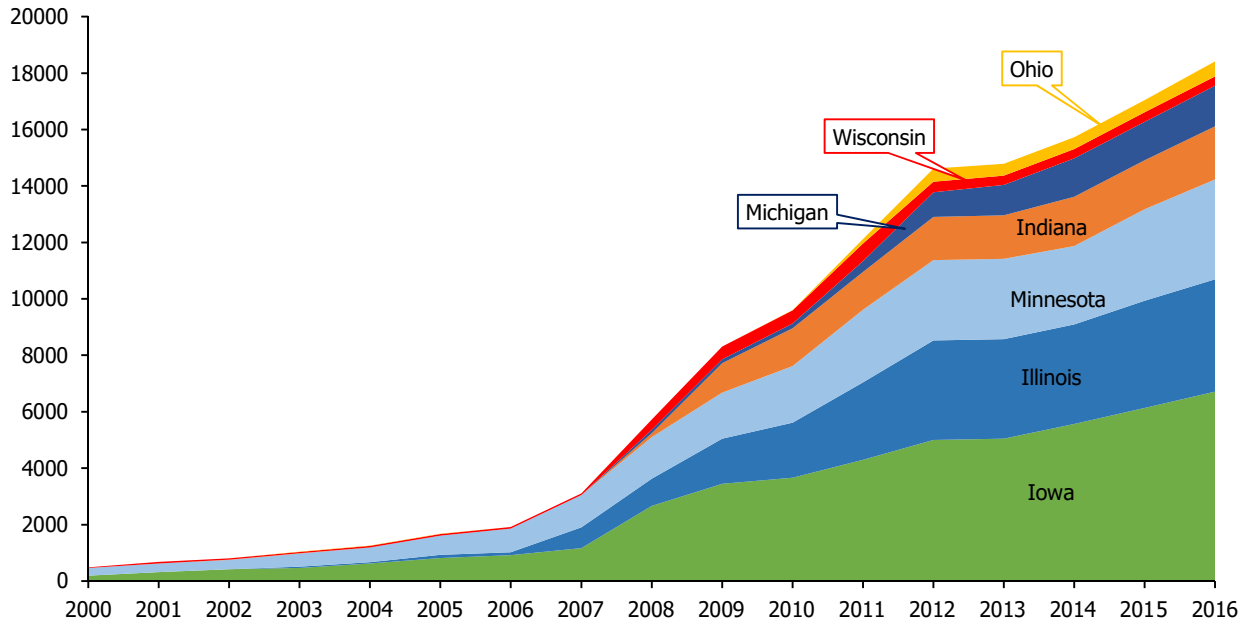
[a] Differences in wind generation in book data due to different data sources.
*The total here represents the total wind generated electricity in Mid-West Region and not specific to Wisconsin owned utilities.
Source: U.S Energy Information Administration, Electricity: Net Generation by State by Type of Producer by Energy Source (EIA-906, EIA-920, and EIA-923), annual_generation_state.xls https://www.eia.gov/electricity/data/state/

Wisconsin, Midwest, and U.S. Wind Generation Capacity

2000-2016 (MW)

Year	Wisconsin	Illinois	Indiana	Iowa	Michigan	Minnesota	Ohio	Midwest Total	United States
2000	23	0	1	197	1	271	0	493	2394
2001	54	0	1	318	1	303	0	677	3918
2002	53	0	1	416	2	338	0	810	4531
2003	53	50	1	462	2	468	4	1040	6121
2004	53	50	1	623	2	518	7	1254	6522
2005	53	105	1	820	2	687	7	1675	8733
2006	53	105	1	921	2	829	7	1918	11334
2007	53	740	1	1170	2	1139	7	3112	16596
2008	365	962	131	2661	124	1481	7	5731	24980
2009	449	1596	1037	3448	143	1636	7	8316	34683
2010	469	1946	1340	3665	164	2009	7	9600	39516
2011	631	2737	1340	4302	376	2580	160	12126	45982
2012	369.6	3520.1	1539.7	5005	874.4	2842.3	461.7	14612.8	59074.8
2013	328.6	3525.1	1539.7	5047	1080.3	2843.7	424.1	14788.5	59973.4
2014	331.7	3526.8	1739.7	5562.2	1360.1	2787.8	424.1	15732.4	64231.5
2015	331.4	3799.8	1739.7	6134.2	1360.1	3240.7	431.6	17037.5	72573.4
2016	331.4	3983.8	1889.7	6709.6	1439.5	3531.7	533.9	18419.6	81311.5

Wisconsin and Midwest Wind Generating Capacity (2000-2016)



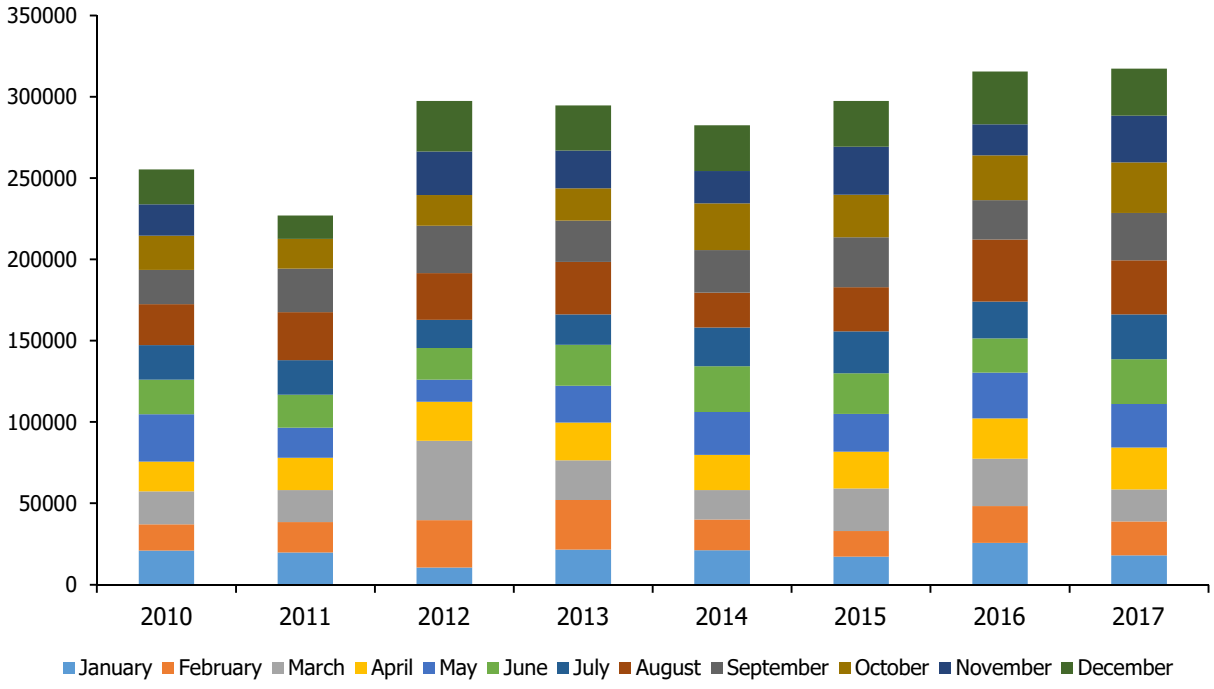
Source: U.S. Energy Information Administration, Existing Electric Power Plant Generating Capacity by Energy Source by Producer by State Back to 1990 (2000-2016), existcapacity_annual.xls: https://www.eia.gov/state/search/?sid=US#?1=111&5=124&r=false.

Ethanol[b] Monthly Sales in Wisconsin

2010-2017 (1000s of Gallons)

Year	2010	2011	2012	2013	2014	2015	2016	2017
January	21016.7	19876.14	10446.77	21601.7	21139.62	17223.96	25766.72	17992.3
February	16084.9	18561.83	29310.9	30396.09	18838.17	15787.86	22614.83	20857.11
March	20355.57	19688.72	48700.88	24448.24	18159.17	26160.49	29143.93	19614.86
April	18167.96	19903.52	24007.59	23193.65	21735.75	22526.85	24684.58	25860.31
May	29282.83	18557.22	13583.02	22769.53	26278.15	23285.93	28209.76	26741.06
June	21107.55	20137.38	19411.38	25096.29	28195.71	24924.19	21021.32	27686.63
July	21345.24	21441.77	17382.31	18725.94	23867.01	25932.89	22743.17	27514.84
August	25073.35	29380.93	28805.28	32221.08	21425.16	27131.44	38154.13	33136.62
September	21058.68	26771.33	29090.96	25382.01	26052.52	30687.81	24197.95	29247.26
October	21148.86	18416.37	18899.04	19847.11	28884.4	26124.08	27516.63	30975.6
November	19211.3	0	26763.77	23304.14	19845.57	29591.85	19106.53	28878.12
December	21508.62	14342.7	31087.37	27697.86	28128.13	28138.78	32452	28909.98
Ethanol Total	**255361.6**	**227077.9**	**297489.3**	**294683.6**	**282549.4**	**297516.1**	**315611.5**	**317414.7**

Ethanol Sales in Wisconsin 2010-2017 (1000s of Gallons)



[b] Ethanol is a transportation fuel primarily made from corn. It is used as the oxygenate in reformulated gasoline sold in southwestern Wisconsin and as E10 and E85 through the state.
Source: Personal Communication with Department of Revenue (2005-2017)

Focus on Energy

Focus on Energy is Wisconsin's energy efficiency and renewable resource program. Since 2001, Focus on Energy has been providing tools and resources to help Wisconsin use energy smarter and reduce energy waste. Focus on Energy is funded by 108 utilities in the state, including all of Wisconsin's electric and natural gas investor-owned utilities, and participating municipal utilities and electric cooperatives. Focus on Energy works with eligible Wisconsin residents and businesses to install cost effective energy efficiency and renewable energy projects, by providing information, resources and financial incentives to help implement projects that otherwise would not get completed, or to accelerate the adoption of energy efficient products and practices.

In 2018, energy savings and environmental benefits from completed projects produced a $5.16 return for every dollar invested. The program's efforts have also strengthened the state's economy by helping homeowners, businesses, farms and schools manage energy costs. Wisconsin's Focus on Energy program investments supported more than 1,000 jobs during 2018 programs. Helping Wisconsin residents and businesses reduce energy waste and manage rising energy usage promotes in-state economic development and protects natural resources. For the period of 2015- 2018, the Focus on Energy programs resulted in 28,531,208 tons of avoided CO_2.

Source: Focus on Energy Quadrennial Achievement Report https://focusonenergy.com/sites/default/files/FOE_Volume_zero_053119.pdf

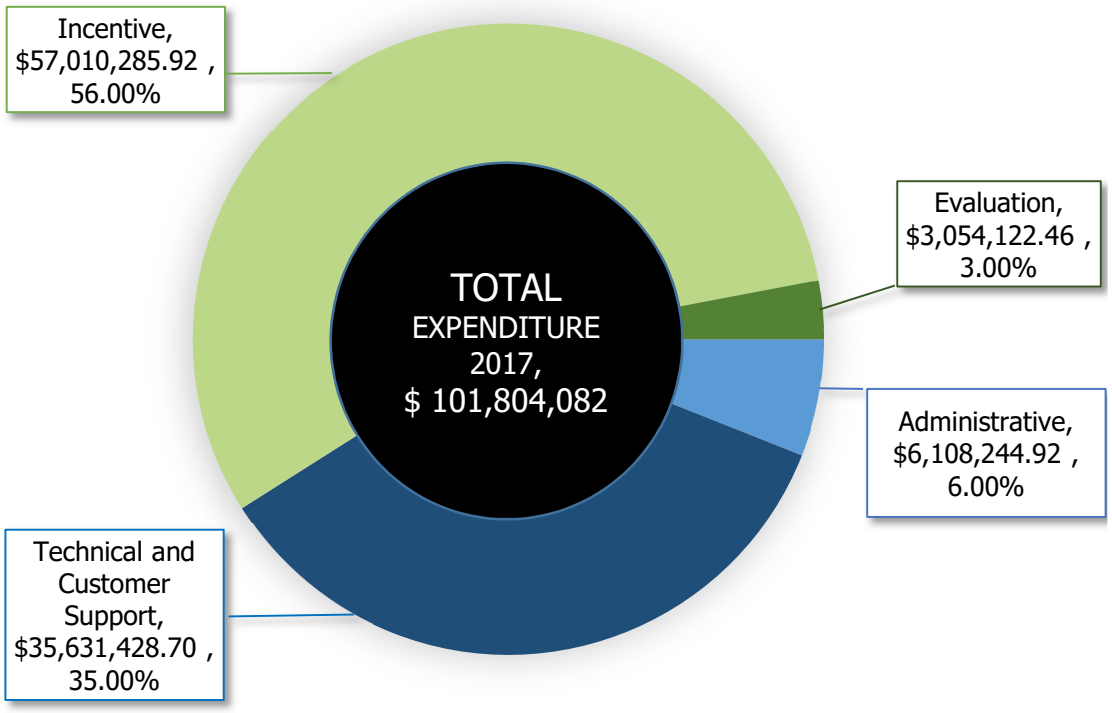
ADMINISTRATIVE costs are the costs not directly associated with a specific program activity but which are necessary to the development and administration of programs, including record keeping, payroll, accounting, auditing, billing, business management, budgeting and related activities, overhead allocation and other costs necessary to direct the organization of the program, but do not include program evaluation.

TECHNICAL & CUSTOMER SUPPORT costs are those associated with project identification, engineering calculation & modeling, inspection of installed projects, trade ally contractor outreach, technical training, and customer service.

INCENTIVES costs are cash incentives payable to Customers & Trade Allies and instant discounts received at point of purchase at participating retail locations

EVALUATION costs are those associated with independently verifying program energy savings and supporting continuous program improvement through analysis of markets, technologies and program operations.

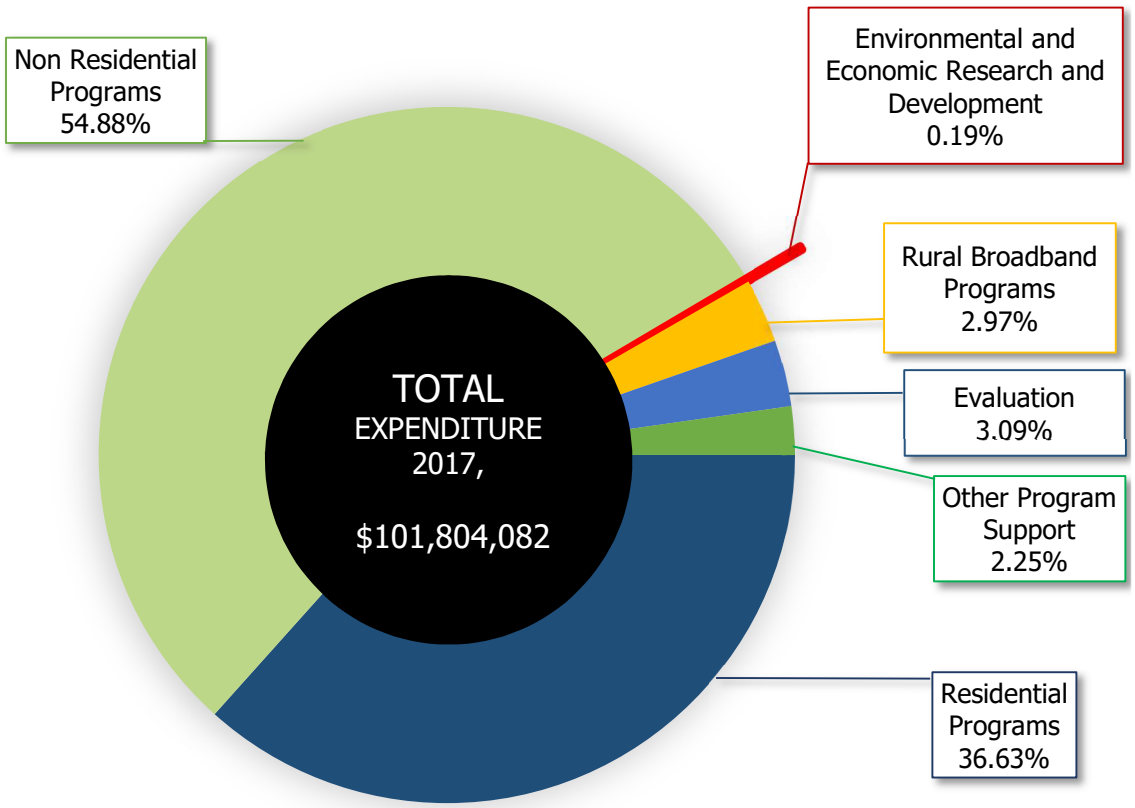
Focus on Energy, Total dollars spent by Expenditure category, 2017



Source: Public Service Commission of Wisconsin, Public Service Commission Report to the Legislature, Energy Efficiency and Renewable Resource Program Activities in Wisconsin (2017) Focus on Energy, Evaluation Report https://psc.wi.gov/Documents/Reports/2017FocusReportToLegislatureFINAL.pdf.

The total spending by the Focus on Energy can be explained in terms of its various programs. The Commission approved the following programs and funding allocations: Rural Broadband Program, Environmental & Economic Research and Development Program (EERD), Non-Residential Business Energy Efficiency Programs and Residential Energy Efficiency Programs.

Focus on Energy, Total dollars spent by Programs, 2017



Source: Public Service Commission of Wisconsin, Public Service Commission Report to the Legislature, Energy Efficiency and Renewable Resource Program Activities in Wisconsin (2017) Focus on Energy, Evaluation Report https://psc.wi.gov/Documents/Reports/2017FocusReportToLegislatureFINAL.pdf.

Annual Verified Gross and Net Savings, by Segment

2011-2017 (kWh and Therms, in Millions)

RESIDENTIAL

Year	Gross kWh	Net kWh	Gross Therms	Net Therms
2011	93.89	61.37	2.88	2.09
2012	201.52	126.37	4.13	3.27
2013	375.44	297.88	4.59	3.41
2014	331.06	239.16	4.27	3.08
2015	234.34	206.53	3.66	2.23
2016	199.52	148.37	4.38	3.02
2017	234.60	127.92	4.05	2.43

NONRESIDENTIAL

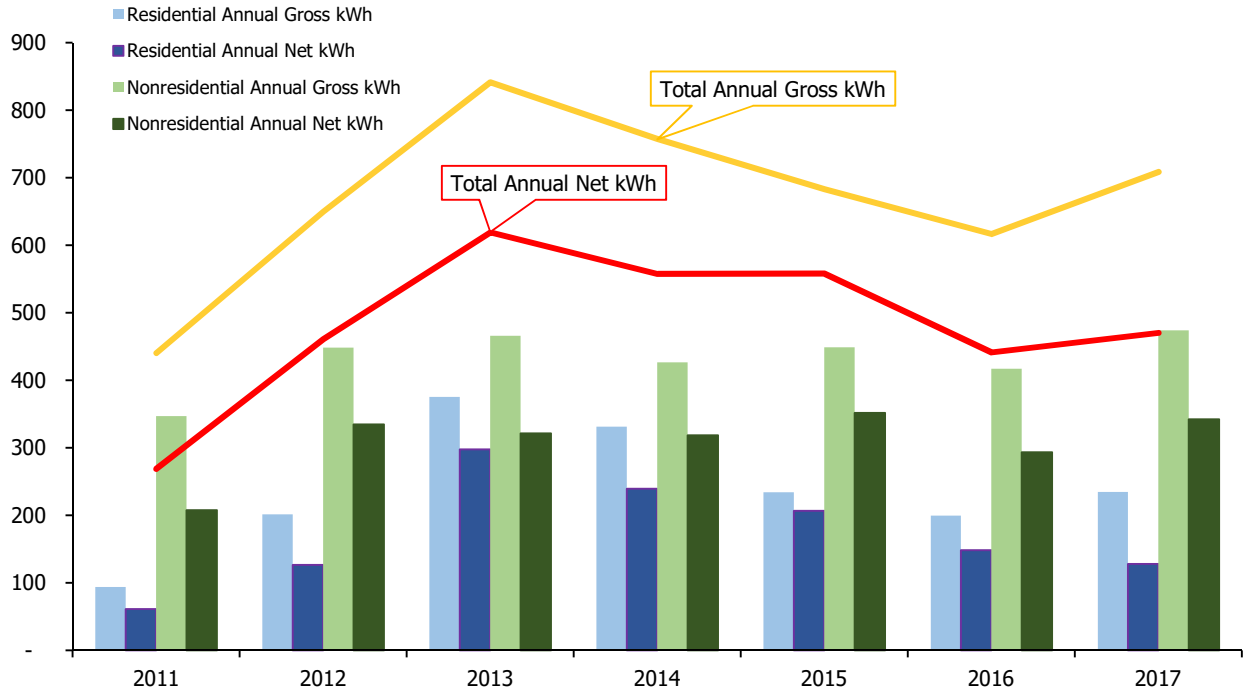
Year	Gross kWh	Net kWh	Gross Therms	Net Therms
2011	346.71	207.60	13.83	9.16
2012	448.37	334.42	22.04	13.20
2013	465.83	321.54	17.66	14.06
2014	426.32	318.56	20.16	15.24
2015	448.87	351.71	33.82	26.70
2016	417.20	293.18	22.00	16.58
2017	474.03	342.36	14.38	11.19

TOTAL [a]

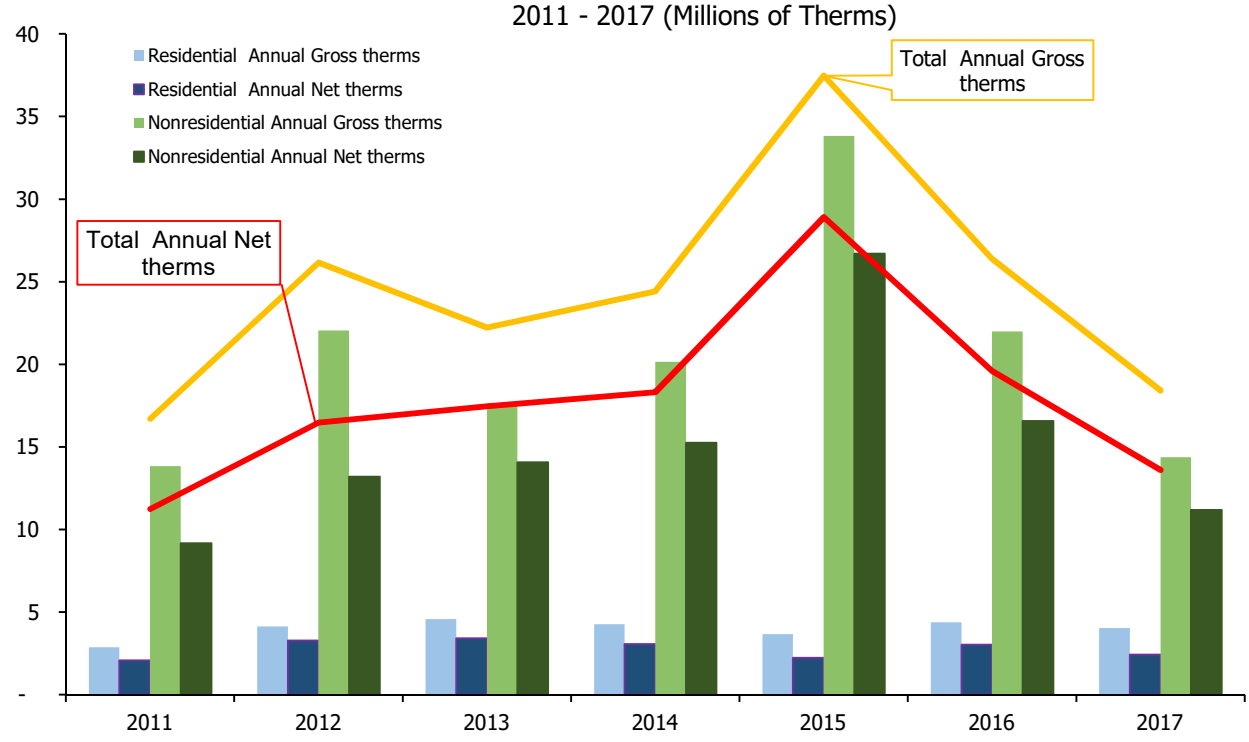
Year	Gross kWh	Net kWh	Gross Therms	Net Therms
2011	440.60	268.97	16.71	11.25
2012	649.90	460.78	26.17	16.48
2013	841.27	619.42	22.24	17.48
2014	757.38	557.72	24.43	18.32
2015	683.21	558.24	37.48	28.92
2016	616.72	441.55	26.38	19.60
2017	708.63	470.29	18.42	13.62

[a] The total savings figures do not include savings from pilots
Source: Focus on Energy, *Evaluation Report (2011- 2017)* https://focusonenergy.com/evaluation-reports.

Annual Verified Gross and Net Electric Savings, by Segment
2011 - 2017 (Millions of kWh)



Annual Verified Gross and Net Natural Gas Savings, by Segment
2011 - 2017 (Millions of Therms)



Lifecycle Verified Gross and Net Savings, by Segment

2011-2017 (kWh and Therms, in Millions)

Residential

Year	Gross kWh	Net kWh	Gross Therms	Net Therms
2011	885.56	590.18	60.44	49.96
2012	1578.66	1047.91	80.25	65.00
2013	2965.15	1842.97	90.42	63.88
2014	2696.99	1929.32	94.54	66.92
2015	223.10	1867.45	82.48	43.57
2016	3199.63	2287.78	88.12	52.03
2017	4503.85	2383.18	81.71	42.20

Nonresidential

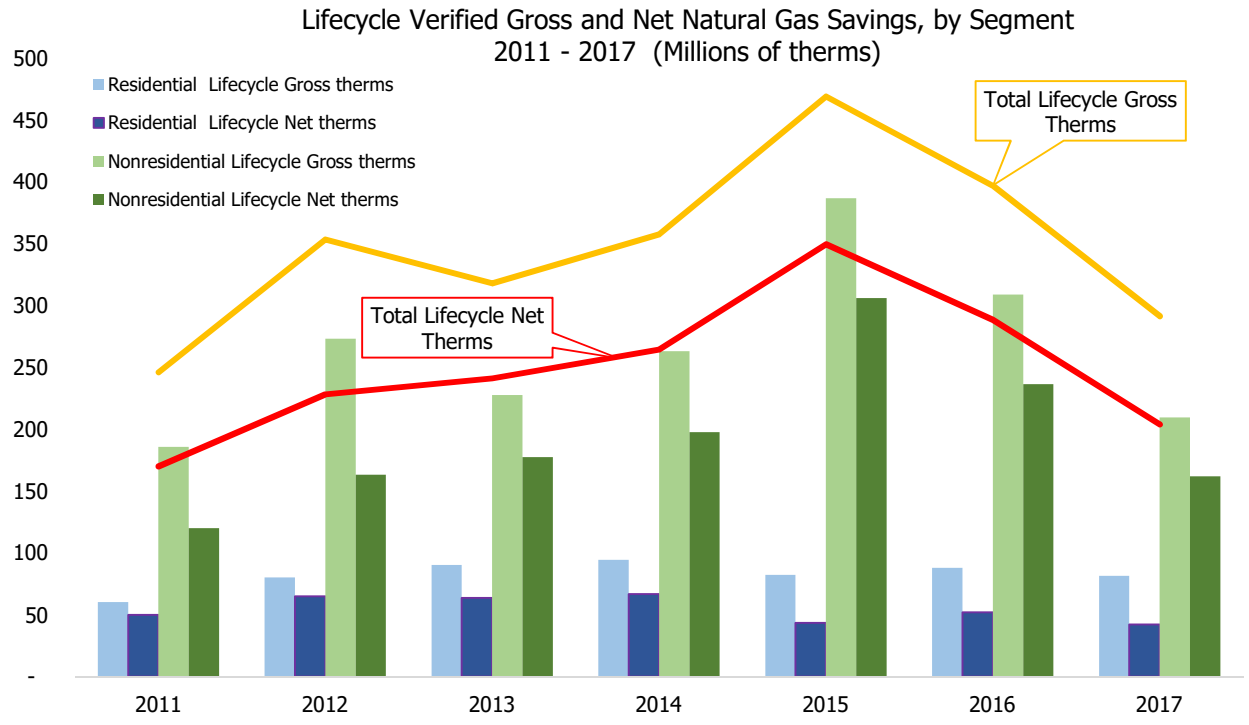
Year	Gross kWh	Net kWh	Gross Therms	Net Therms
2011	4374.34	2598.97	185.74	120.19
2012	5390.37	4013.37	273.27	163.42
2013	5628.50	3821.94	227.67	177.47
2014	5490.29	4100.21	263.26	197.71
2015	6583.67	5175.47	386.77	306.14
2016	6291.67	4450.77	308.98	236.56
2017	7204.86	5144.02	209.68	161.95

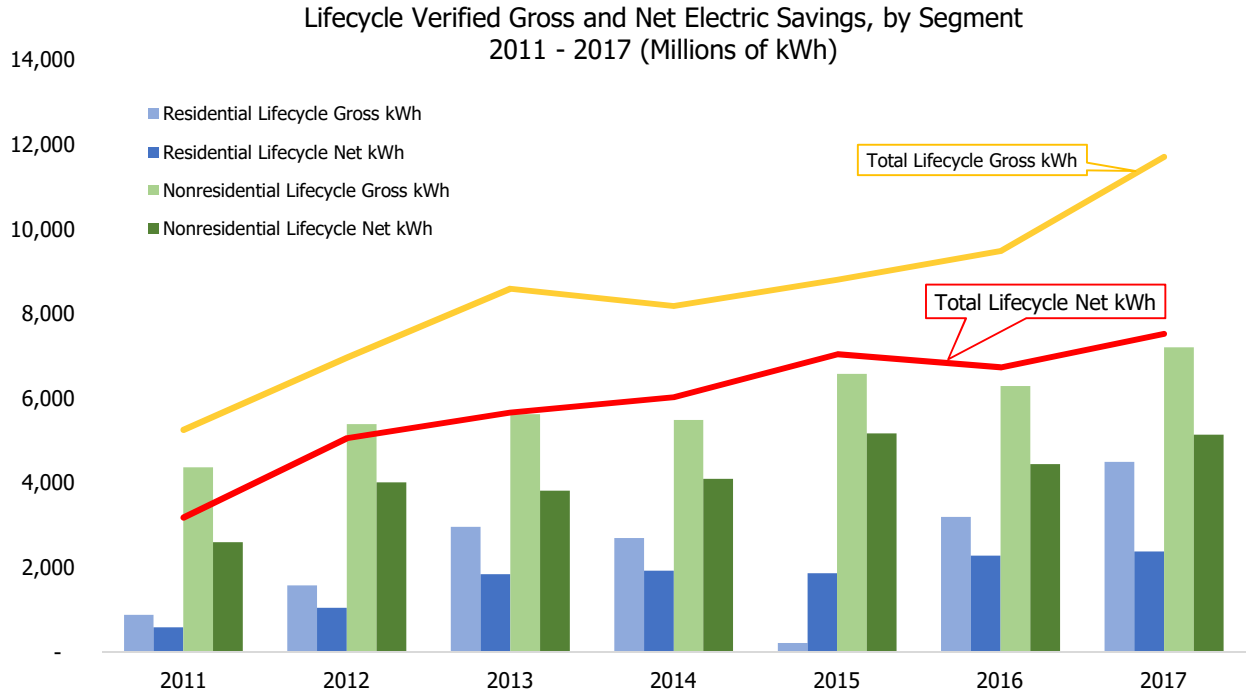
Total[a]

Year	Gross kWh	Net kWh	Gross therms	Net therms
2011	5259.90	3189.15	246.17	170.15
2012	6969.02	5061.28	353.52	228.42
2013	8593.66	5664.91	318.09	241.35
2014	8187.28	6029.52	357.81	264.64
2015	8806.77	7042.92	469.25	349.71
2016	9491.29	6738.55	397.10	288.59
2017	11708.71	7527.21	291.39	204.14

[a] The total savings figures do not include savings from pilots

Source: Focus on Energy, *Evaluation Report (2011- 2017)* https://focusonenergy.com/evaluation-reports.


Lifecycle Verified Gross and Net Natural Gas Savings, by Segment
2011 - 2017 (Millions of therms)
Residential Lifecycle Gross therms
Residential Lifecycle Net therms
Nonresidential Lifecycle Gross therms
Nonresidential Lifecycle Net therms
Total Lifecycle Gross Therms
Total Lifecycle Net Therms
500
450
400
350
300
250
200
150
100
50
-
2011
2012
2013
2014
2015
2016
2017


Lifecycle Verified Gross and Net Electric Savings, by Segment
2011 - 2017 (Millions of kWh)
Residential Lifecycle Gross kWh
Residential Lifecycle Net kWh
Nonresidential Lifecycle Gross kWh
Nonresidential Lifecycle Net kWh
Total Lifecycle Gross kWh
Total Lifecycle Net kWh
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
2011
2012
2013
2014
2015
2016
2017

Glossary

DEFINITIONS

Energy is the ability to do work. It is stored in various forms including chemical energy in biomass, coal and oil, nuclear energy in uranium, gravitational energy in water used in hydroelectric plants, the wind and the sun.

There are two common ways to account for energy use; **resource energy consumption (Primary Use)** and **end-use energy consumption**. End-use refers to the energy content of electricity and other fuels at the point of use by customers. Resource energy includes all energy resources used to generate electricity, including the energy content of the coal, petroleum, nuclear and renewable fuels

One **British thermal unit (Btu)** is the amount of energy in the form of heat which will raise the temperature of one pound of water one degree Fahrenheit.

One **calorie** is the amount of energy in the form of heat which will raise the temperature of one gram of water one degree Centigrade.

One **Btu** is equal to 252 calories.

One **watt** is a unit of power, or rate of energy delivery, of one joule per second, or equivalently, one ampere of electric current delivered across a potential of one volt. One kilowatt (kW) is 1,000 watts. Ten 100-watt light bulbs require 1,000 watts or 1 kW of power to stay lit at any point in time.

One **kilowatt-hour (kWh)** is one kilowatt of electric power delivered for one hour (or the equivalent). One kilowatt- hour is 1,000 watt-hours. Ten 100-watt light bulbs burning for one hour consume 1,000 watt-hours or 1 kWh.

Heating degree days are relative measurements of outdoor air temperature and are obtained by subtracting the mean daily temperature from an established base temperature of 65 degrees Fahrenheit.

Cooling degree days are relative measurements of outdoor air temperature and are obtained by subtracting an established base temperature of 65 degrees Fahrenheit from the mean daily temperature.

City Gate: The point where a pipeline or distribution company delivers natural gas to the natural gas utility serving the city and the surrounding area.

Electric imports: The estimated resource energy used in other states (or Canada) to produce the electricity imported into Wisconsin. This resource energy is estimated assuming 11,300 Btu of resource energy per kWh imported into Wisconsin.

Non-attainment Areas: A designation of the Environmental Protection Agency. See http://www.epa.gov/oaqps001/greenbk/ancl.html for additional information.

Non-coincident peak demand: The sum of individual monthly peak electric demands from a given set of utility companies.

PADD II: Petroleum Area Defense District 2; encompasses 15 midwestern states: IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, OK, SD, TN, WI.

Population-weighted heating/cooling degree days: are derived by multiplying the number of heating/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).

MEASUREMENT OF ENERGY SUPPLIES

Petroleum products are measured in either gallons or barrels. A barrel contains 42 gallons. Petroleum is refined from crude oil into various products such as kerosene, diesel fuel, home heating oil (No. 1 and No. 2 oils), and other heating oils (No. 3 – No. 6), gasoline and liquefied petroleum gas (propane). The energy content of a gallon of each product is listed in the conversion table.

Natural Gas is measured in either Mcf (1,000 cubic feet) or in therms. One Mcf contains approximately ten therms or one million Btu.

Coal is measured in tons. The three broad classifications of coal, in order of greatest energy content, are bituminous, sub-bituminous and lignite.

Wood is usually measured in either tons or cords. A cord is an amount of stacked wood measuring 8 feet x 4 feet x 4 feet. The weight of a cord of wood varies according to the type of wood and its moisture content, but is estimated at 1.5 to 2 tons. A face cord is the 8 feet x 4 feet face of a stacked cord but of shorter width. Common usage is three face cords to a full cord.

Conversion Factors

AVERAGE ENERGY CONTENT OF VARIOUS FUELS	
1 kilowatt-hour of electricity	3,413 Btu
1 cubic foot of natural gas	1,008 to 1,034 Btu
1 therm of natural gas	100,000 Btu
1 gallon of liquefied petroleum gas (LPG)	95,475 Btu
1 gallon of crude oil	138,095 Btu
1 barrel of crude oil	5,800,000 Btu
1 gallon of kerosene or light distillate oil	135,000 Btu
1 gallon of middle distillate or diesel fuel oil	138,690 Btu
1 gallon of residual fuel oil	149,690 Btu
1 gallon of gasoline	125,000 Btu
1 gallon of ethanol	84,400 Btu
1 gallon of methanol	62,800 Btu
1 gallon of gasohol (10% ethanol, 90% gasoline)	120,900 Btu
1 pound of coal	8,100 to 13,000 Btu
1 ton of coal	16,200,000 to 26,000,000 Btu
1 ton of coke	26,000,000 Btu
1 ton of wood	9,000,000 to 12,000,000 Btu
1 standard cord of wood	18,000,000 to 24,000,000 Btu
1 face cord of wood	6,000,000 to 8,000,000 Btu
1 pound of low pressure steam (recoverable heat)	1,000 Btu
1 compressed natural gas gasoline gallon equivalent	114,818 Btu

MEASUREMENT CONVERSIONS
1 short ton (ton) = 2,000 pounds = 6.65 barrels (crude oil)
1 metric ton (tonn) = 2,200 pounds
1 barrel (bbl) = 42 gallons = 5.615 cubic feet = 159.0 liters
1 Mcf = 1,000 cubic feet
1 therm = 105 Btu = 100,000 Btu
1 thousand Btu (KBtu) = 1,000 Btu
1 million Btu (MMBtu) = 1,000,000 Btu
1 quad = 10^{15} (quadrillion) Btu or 1,000,000,000 MMBtu
1 kilowatt-hour (kWh) = 1,000 watt-hours
1 megawatt-hour (MWh) = 1,000 kWh or 1,000,000 watthours
1 gigawatt-hour (GWh) = 1,000 MWh or 1,000,000,000 watt-hours
1 gallon = 4.524 pounds liquefied petroleum gas
1 standard cord of wood = 8 feet x 4 feet x 4 feet = 128 cubic feet = approx. 3,000-4,000 lbs.
1 face cord of wood = 8 feet x 4 feet x 16 inches = 42.7 cubic feet = approx. 1,333 lbs.