

U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

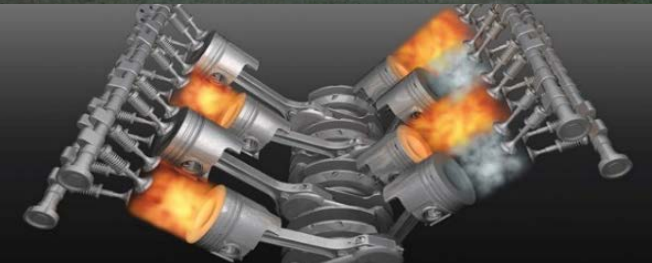


Wisconsin Task Force on Climate Change

Electric Vehicles – Driving Wisconsin Forward

March 10, 2020

Lorrie Lisek, Executive Director



Department of Energy – Transportation Focus



National Security



Economic Growth



**Affordability for Businesses
and Consumers**



Reliability/Resiliency

WI Clean Cities: Local Partnerships – Global Impact

- Statewide organization
- Public/Private Partnerships
- Nearly 36M GGE Petroleum Displaced in 2018
- 2018 Reduction in GHG Emissions 122,000 tons



Since 2011, WCC has assisted in securing over \$21M in funding for transportation projects.

Multi Unit Dwelling EV Data Grant Program

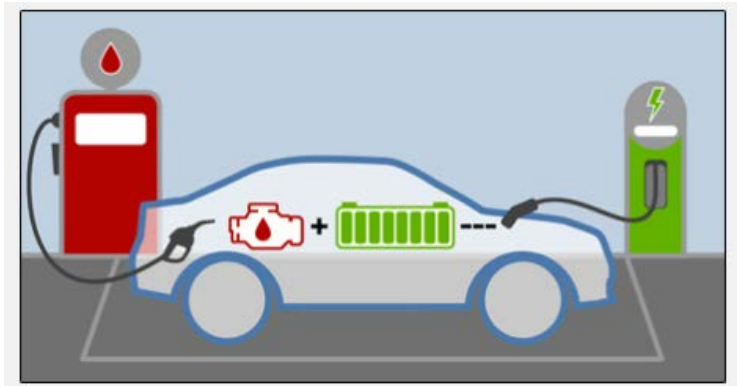
NGV UP TIME – Natural Gas Project

ELECTRIC VEHICLES



WHAT ARE PLUG-IN ELECTRIC VEHICLES?

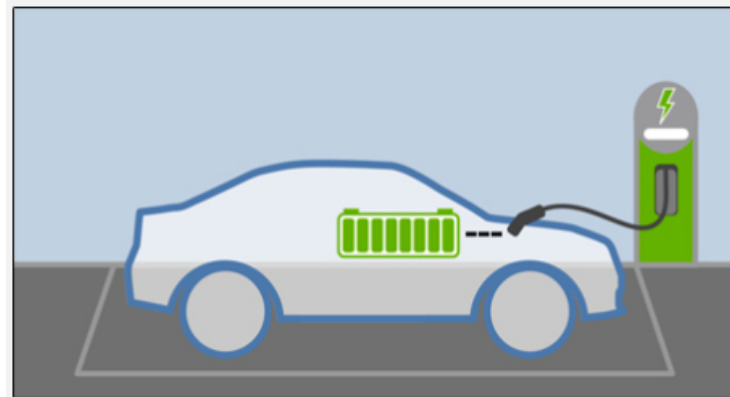
Plug-in Hybrid Electric Vehicle



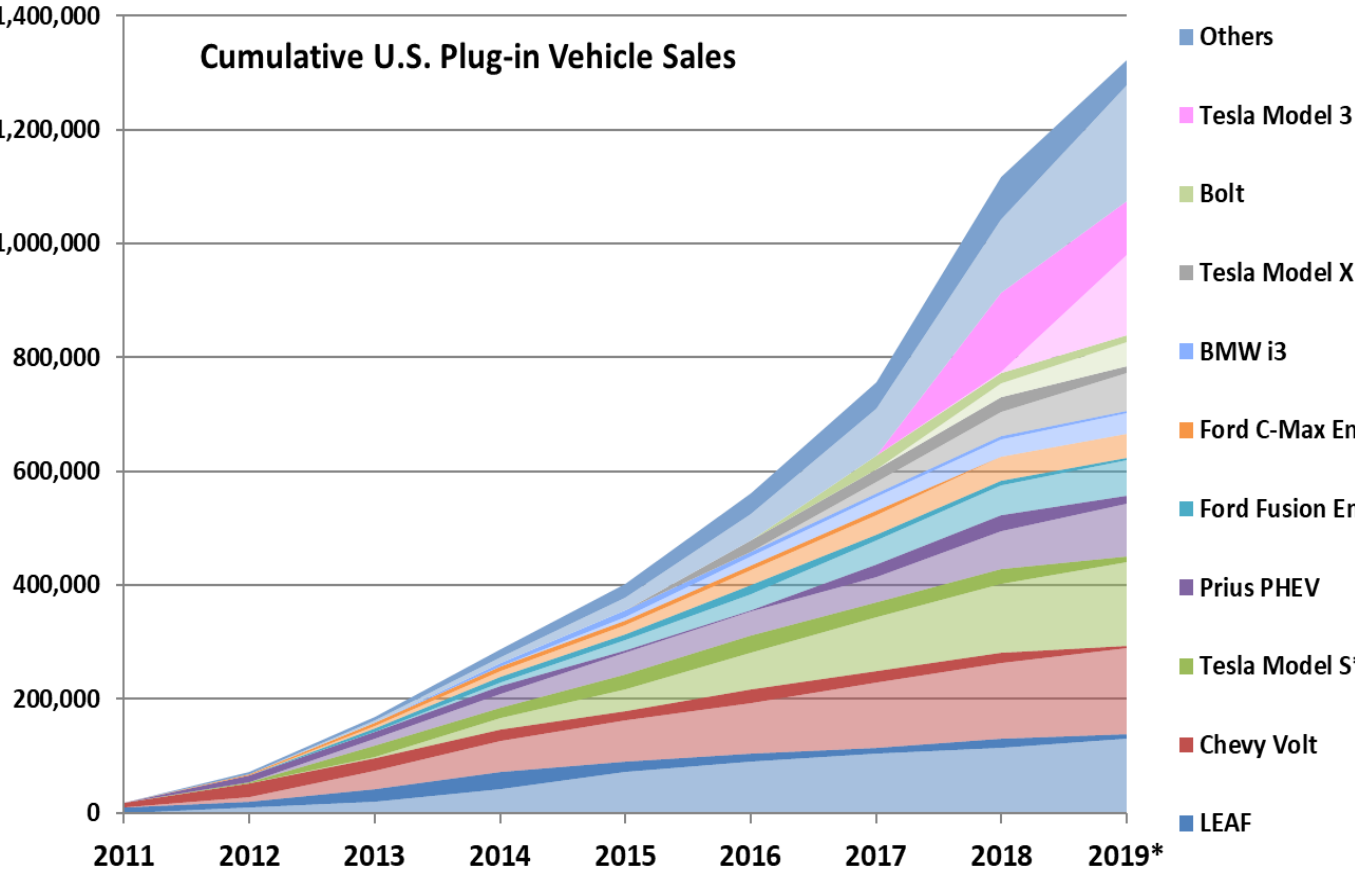
Battery Electric Vehicle (BEV):
All-electric car only powered by batteries.

Plug-in Hybrid Electric Vehicle (PHEV) or Extended Range Electric Vehicle (EREV): Vehicle that can be powered by either batteries, and/or a gasoline engine.

Battery Electric Vehicle



Plug-In Electric Vehicles Sales in the United States



* Updated August, 2019

Sales of all-electric vehicles increased by about 3,000 more sold in 2019 as compared to 2018. Total plug-in vehicle sales were nearly 326,000 or 2% of the nearly 17M vehicles sold in 2019.

- Top 10 selling models account for more than 80% of overall sales
- Nearly 30 models are actively selling in the Midwest market
- Wisconsin has nearly 10,000 registered BEV's and PHEV's.

WHAT VEHICLES ARE AVAILABLE IN THE MIDWEST?

Midwest EV Info List (December 2019)

Page 1 of 2



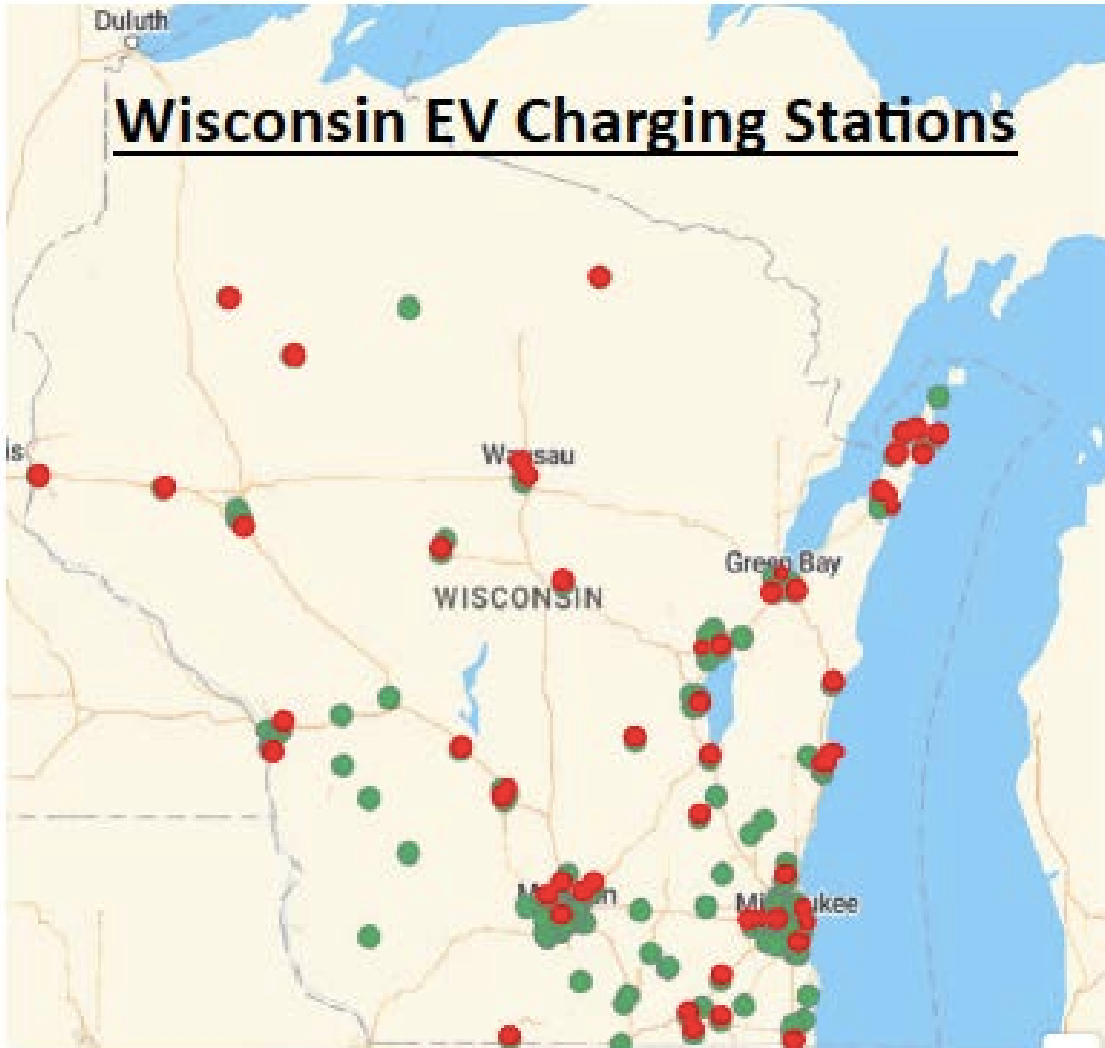
Manufacturer			Range							Charging speed (miles/hr)				Performance						
Make	Model	Photo	Seating	EV Type	FWD/RWD/AWD	Base MSRP	Federal tax credit	Price after federal tax credit	Battery size (kWh)	Electric Range (miles)	Total Range (miles)	Charging rates (kW) L2/DCFC	Level 1 120V	Level 2 240V	DCFC 400+V	MPGe/MPG	Top Spd (mph)	0-60 mph (sec)	Towing capacity (lbs)	Crash Ratings: NHTSA
Audi	e-tron		5	BEV	AWD	\$74,800	\$7,500	\$67,300	95	204	204	11/130	3	24	228	74	155	5.5	4000	Top Safety Pick + / Not rated
BMW	i3		4	BEV	RWD	\$44,450	\$7,500	\$36,950	42	153	153 (200)	7.4/50	4	27	147	124 (39)	93	6.9-7.2	0	Good-Acceptable/ Not rated
BMW	i8		4	PHEV	AWD	\$147,500	\$3,793	\$143,707	7.2	15	330	3.3	3	7	N/A	76/28	155	4.2	0	Not rated/ Not rated
BMW	X5 xDrive40e		5	PHEV	AWD	\$62,100	\$4,700	\$57,400	9	14	540	3.3	2	5	N/A	56/24	130	6.5	0	Top Safety Pick + / 5 stars
BMW	330e		5	PHEV	RWD	\$45,600	\$4,000	\$41,600	7.6	14	350	3.7	3	8	N/A	72/31	130	5.9	0	Top Safety Pick + / 5 star
BMW	530e		5	PHEV	RWD/ AWD	\$53,400	\$4,200	\$49,200	9.2	16	370	3.5	3	7	N/A	72/29	146	6	0	Top Safety Pick + / Not rated
BMW	745e		5	PHEV	AWD	\$95,550	\$4,200	\$91,350	12	16	290	3.7	2	6	N/A	56/22	155	4.9	0	Not rated / Not rated
Chevrolet	Bolt EV		5	BEV	FWD	\$37,495	\$1,875	\$35,620	66	259	259	7.2/50	4	25	140	118	98	6.5	0	Top Safety Pick / 5 star
Chrysler	Pacifica Hybrid (PHEV)		7	PHEV	FWD	\$42,000	\$7,500	\$34,500	16	33	570	6.6	3	16	N/A	84/32	107	7.8	0	Top Safety Pick / 5 star
Ford	Fusion Energi		5	PHEV	FWD	\$34,595	\$4,007	\$30,588	9	26	610	3.3	3	9	N/A	97/42	85	8.5	0	Good/ 5 star
Honda	Clarity PHEV		5	PHEV	FWD	\$33,400	\$7,500	\$25,900	17	48	340	6.6	4	22	N/A	110/42	110	8.8	0	Not rated/ Not rated
Jaguar	I-PACE		5	BEV	AWD	\$69,500	\$7,500	\$62,000	90	246	246	7.0/85	3	16	153	76	124	4.5	0	Not rated
Kia	Niro PHEV		5	PHEV	FWD	\$27,900	\$4,543	\$23,357	8.9	26	560	3.3	4	10	N/A	105/46	107	9	0	Top Safety Pick + / 4 star
Mercedes-Benz	GLC350e		5	PHEV	AWD	\$50,650	\$4,460	\$46,190	8.8	10	350	3.3	2	5	N/A	56/25	130	6.2	3500	Top Safety Pick + / 5 star

This table is updated by Jukka Kukkonen, PlugInConnect.

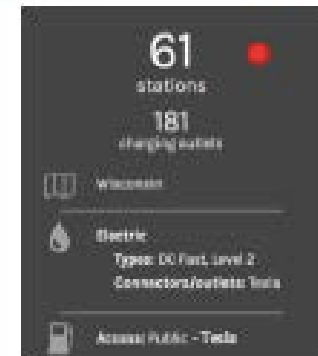
Photos and information sources: Manufacturers' websites and www.fueleconomy.gov

Find the latest version by visiting: www.EVinfoList.com

WHERE ARE THE CHARGING STATIONS?



Public DC Fast and Level 2 chargers in WI. These chargers work for any electric vehicle.



Tesla DC Fast and Level 2 Tesla chargers in WI. These chargers work for Tesla vehicles only.

Data collected from AFDC Station Locator. For more information visit <https://afdc.energy.gov/>

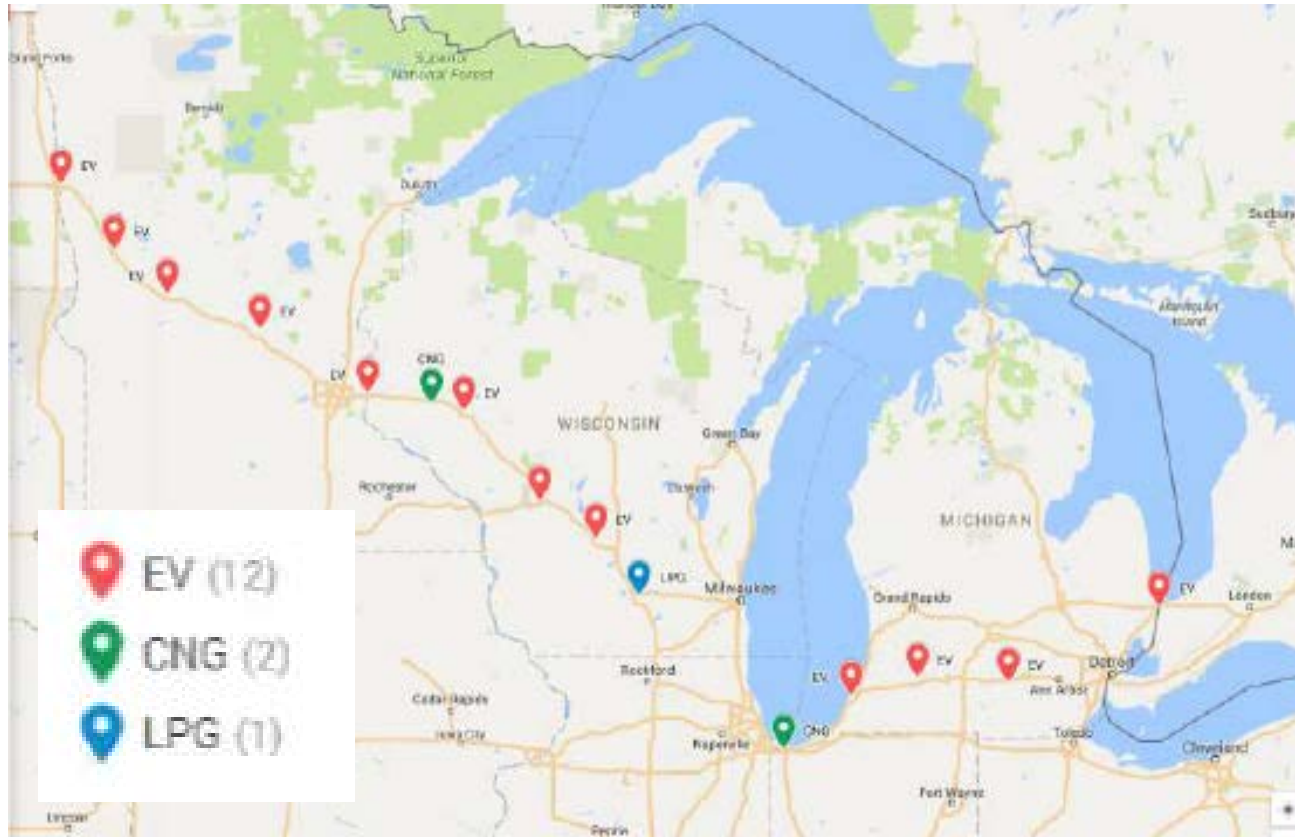
#1 QUESTION AT THE MILWAUKEE AUTO SHOW

FACT:

ACCORDING TO US DEPT. OF ENERGY OVER 80% OF CHARGING HAPPENS AT HOME

*As of February 2020 U.S. Department of Energy AFDC Station locator

MICHIGAN TO MONTANA (M2M) I-94 CORRIDOR PROJECT



- M2M I94 corridor covers 1500 miles
From Billings, Montana to Port Huron, Michigan
- Deployment: 60 trucks, and 15 alternative fueling stations
- Planning: Sustainable alternative fuel corridor model
Provide outreach, training, and community based partnerships.

Michigan to Montana I-94 Corridor Project (M2M)

M2M Current EV Project Status (On-going)

3 EV Deployments: 1) Tomah, WI 2) Moorehead, MN
3) Hudson, WI – Grand Opening April, 2020



Tomah Grand Opening

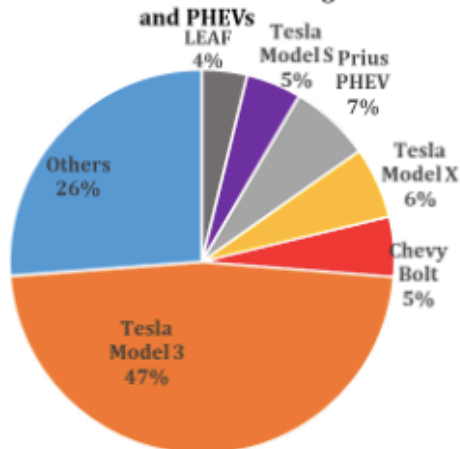
3 Under Construction EV Deployments:
Fergus Falls, MN, Alexandria, MN, St. Cloud, MN
8 Identified Sites: 4 North Dakota, 4 Montana

Wisconsin EV Gap – Wisconsin Dells

WHY ELECTRIC VEHICLES IN WISCONSIN?

Wisconsin EV Fact Sheet

2019 National Sales of Leading BEVs and PHEVs

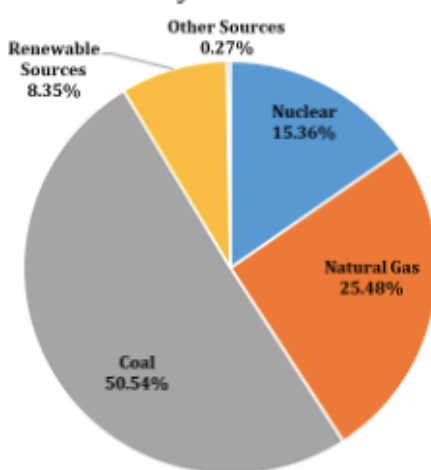


Avg. Price for Gallon of Gasoline in WI:
\$2.45

Avg. Price of Electric Equivalent Gallon in WI:
\$1.39

Wisconsin EV Fact Sheet

WI Electricity Generation Source

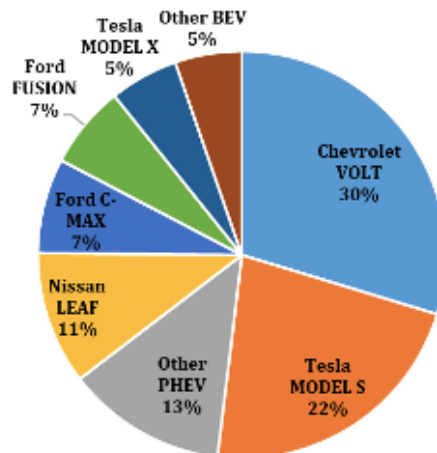


*Renewables (Wind, Solar, Biomass, and Hydro) make up 8.35% of Wisconsin's source for electricity.
~Other Sources includes Oil and Other Miscellaneous Sources

https://www.afdc.energy.gov/vehicles/electric_emissions.php
(Accessed Oct 2019)

Wisconsin EV Fact Sheet

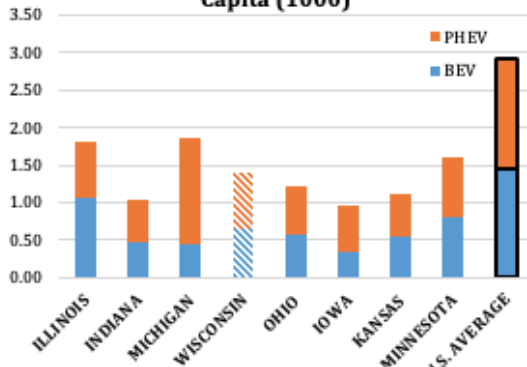
Wisconsin Leading PEV 2017 Registrations



Check model availability on AFDC. Note availability varies by state.

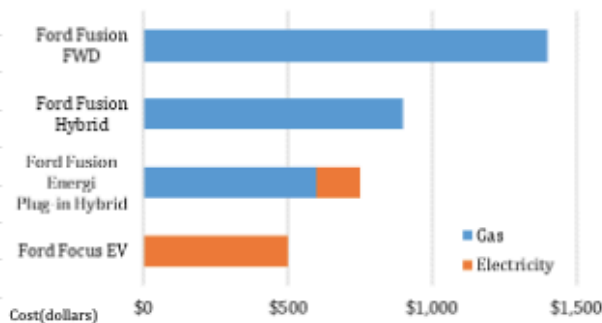
<https://www.afdc.energy.gov/states/>

2018 Midwest PEV Registrations per Capita (1000)



2018 estimated registration = 2017 registration + 2018 sales

Annual Fuel Cost*



*based on 15,000 miles/year, WI averages of gasoline price of \$2.48/gallon and \$0.11/kWh of electricity

WI Share of Total U.S. PEVs

0.78%

Reference:

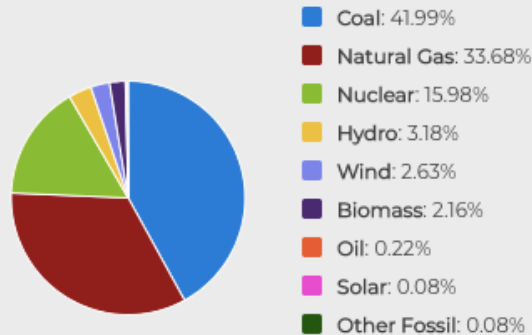
Gasoline and Electricity Price, EIA
Number of chargers by type, AFDC
Vehicle fuel efficiency, Fueleconomy.gov
Registration, IHS Polk Data
PEV Sales, Hybridcars.com
ZEV Dashboard, Auto Alliance



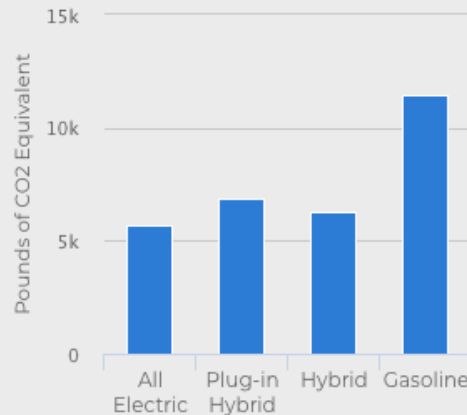
Emissions from Hybrid and Plug-In Electric Vehicles

State Averages for Wisconsin

Electricity Sources

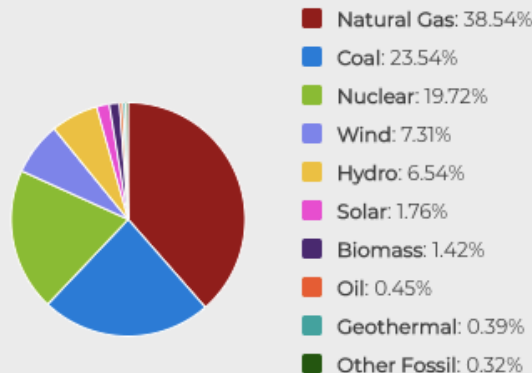


Annual Emissions per Vehicle

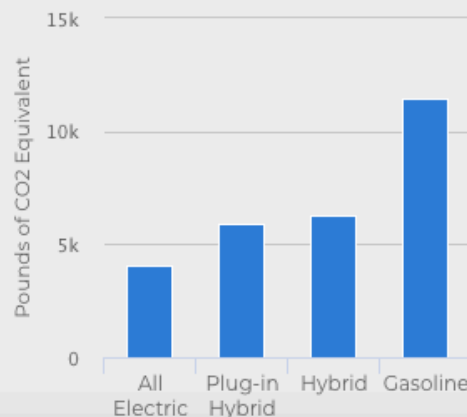


National Averages

Electricity Sources



Annual Emissions per Vehicle



- HEVs, PHEVs, and EVs typically produce lower tailpipe emissions than conventional vehicles
- The source of electricity has a direct impact on emissions
- In geographic areas using relatively low-polluting energy sources for electric generation the well-to-wheel emission benefit is typically greater

Source: US Department of Energy AFDC website

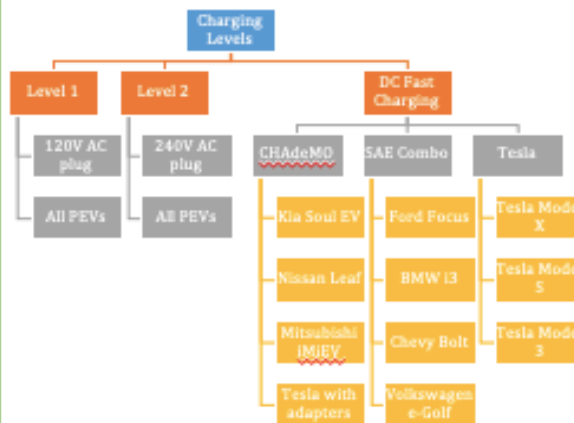
Wisconsin Electric Vehicles Fact Sheet

Charging Your Electric Vehicle:

There are three different levels of charging:

- **AC Level 1:** This provides 120 volts of charging, typically found in a home outlet. Overnight charging can replenish an entire PHEV battery, but not all BEV batteries.
- **AC Level 2:** This level provides 240 volts, about 10-20 miles of range per hour of charging. This can be installed for home charging, but is also used for public charging. In the home, it can replenish an entire BEV battery overnight.
- **DC Fast Charging:** This is for rapid charging along heavy traffic corridors. In 20 minutes it can provide enough battery life for a 50-70 miles of range. In ideal conditions of mild temperatures and a low initial charge, a fast charge to 80% will take about 30 minutes for a BEV, but longer in cold weather. There are three types of DC fast charging systems, depending on the vehicle: SAE J1772 combo, CHAdeMO, and Tesla. Adapter is available for Tesla Model S and Model X to use the CHAdeMO chargers.

Charging Levels and Types

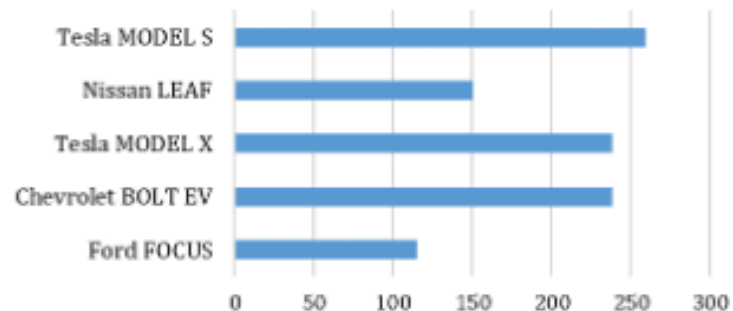


* BMW i3Rex and Outlander PHEV are the only two PHEV to be able fast charged

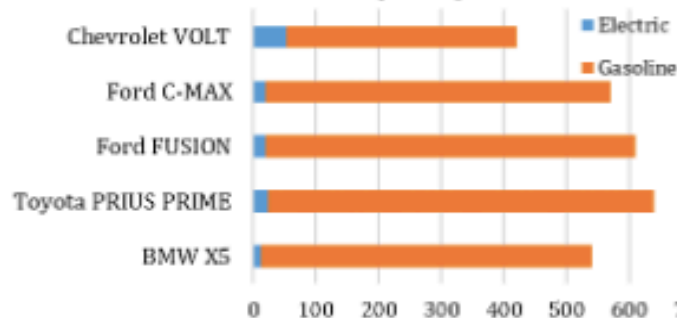
Did You Know?

A full charge can give PHEVs up to 100 miles of electric range and BEVs up to 300 miles of range, depending on the model. These distances can change depending on factors like weather, driving conditions, and driving habits. See on the right how varying your speed, driving behavior, and temperature affect battery range.

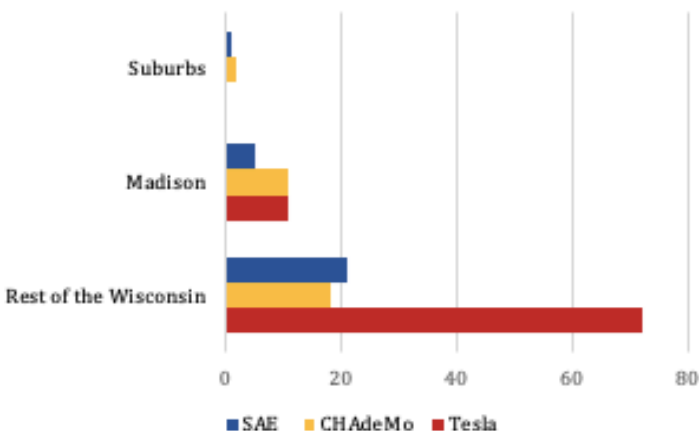
EPA Rated Range of Top Selling BEV in Wisconsin (2018)



EPA Rated Range of Top Selling PHEV in Wisconsin (2018)

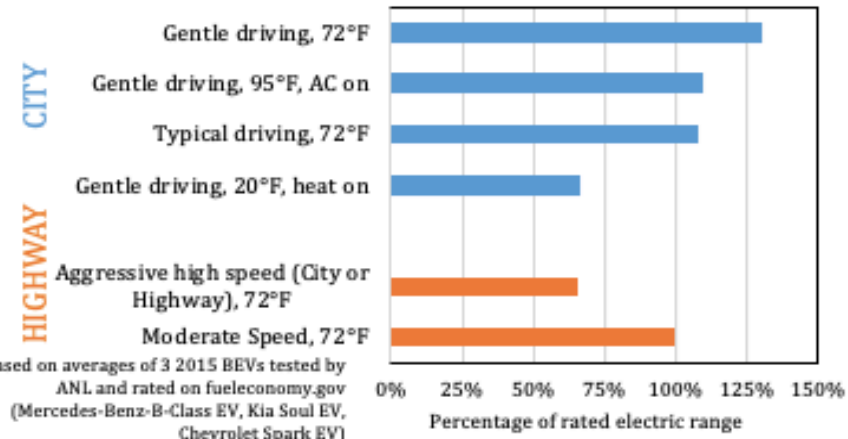


DC Fast Chargers in Wisconsin



Note: A station with both CHAdeMO and SAE availability is assumed to have half CHAdeMO and half SAE (if total # of chargers is an odd number, CHAdeMO is assumed to be one more than SAE)

Range Depletion Dependent on Driving and Weather Conditions



*based on averages of 3 2015 BEVs tested by ANL and rated on fueleconomy.gov (Mercedes-Benz-B-Class EV, Kia Soul EV, Chevrolet Spark EV)

Electric Vehicles and Health Benefits:

- EV's produce no tailpipe emissions-charging the battery may increase pollution at the power plant, total emissions associated with driving EV's are typically less than gasoline cars, particularly when generated by renewable sources.
- Greenhouse gas emissions from transportation sources surpassed those of power plants in December, 2017. According to U.S. Energy Information Administration, 17% of U.S. power is generated by renewables sources. Coal generation is down by 1/3 from 2006.
- The World Health Organization linked increased respiratory diseases such as asthma, lung cancer, and cardiac episodes to air pollution.
- Research shows:
 - Living long term in a city with elevated air pollution affects lungs equal to smoking a pack of cigarettes a day for 30 years.
 - Counties with poor air quality have high rates of bipolar disorder and depression.
 - Exposure to high levels of nitrogen dioxide and carbon monoxide are associated to higher risk of age related macular degeneration.

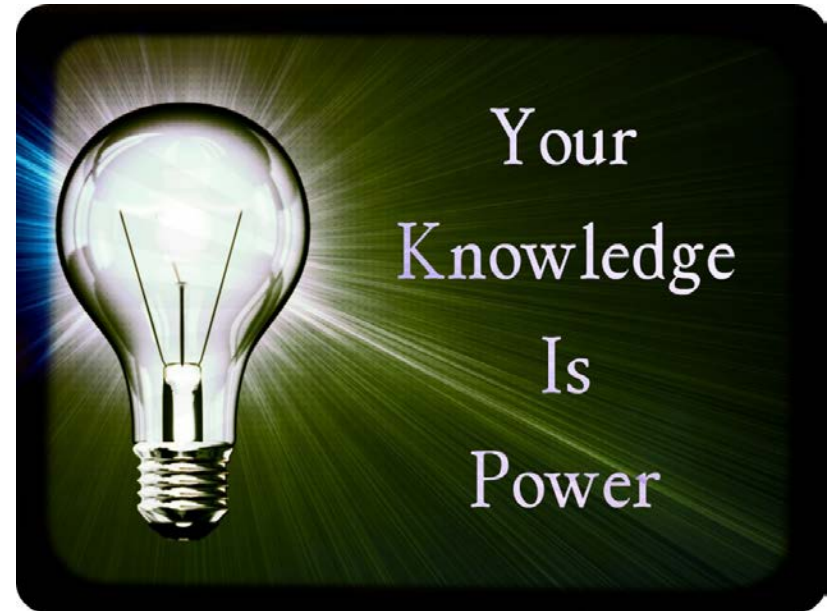


V.S.



Electric Vehicle Barriers

- Range confidence
- Lack of charging in multi unit dwellings
- Cost
- Availability of vehicles
- Dealer education
- Lack of incentives
- Fuel/Road Tax issues



Clean Cities Tools

The screenshot shows the homepage of the Alternative Fuels Data Center (AFDC) under the U.S. Department of Energy. The navigation bar includes 'FUELS & VEHICLES', 'CONSERVATION FUEL', 'LOCATE STATIONS' (circled in red), and 'LAWS & INCENTIVES'. Below the navigation bar, there are links for 'Maps & Data', 'Case Studies', 'Publications', 'Tools', 'About', and 'Home'. A search bar is located at the top right. The main content area is titled 'Tools' and lists several categories: Calculators, Interactive Maps, and Data Searches. Each category contains specific tool links with brief descriptions and icons.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

EERE Home | Programs & Offices | Consumer Information

Alternative Fuels Data Center

Search the AFDC **SEARCH**

FUELS & VEHICLES **CONSERVATION FUEL** **LOCATE STATIONS** **LAWS & INCENTIVES** **Maps & Data** **Case Studies** **Publications** **Tools** **About** **Home**

EERE » AFDC » Tools Printable Version Share

Tools

The Alternative Fuels Data Center offers a large collection of helpful tools. These calculators, interactive maps, and data searches can assist fleets, fuel providers, and other transportation decision makers in their efforts to reduce petroleum use.

- Calculators**
 - Vehicle Cost Calculator**: Compare cost of ownership and emissions for most vehicle models.
 - Petroleum Reduction Planning Tool**: Create a plan for your fleet to reduce petroleum consumption and emissions.
 - CNG VICE Model 2.0**: Evaluate ROI and payback period for natural gas vehicles and infrastructure.
- Interactive Maps**
 - Alternative Fueling Station Locator**: Locate alternative fueling stations and get maps and driving directions.
 - TransAtlas**: Analyze vehicle densities and locations of fueling stations and production facilities.
 - BioFuels Atlas**: Compare feedstocks and analyze biofuel production by location.
- Data Searches**
 - Vehicle Search**: Compare light-duty alternative fuel vehicles, electric vehicles, and hybrids.
 - Laws and Incentives Search**: Search for laws and incentives related to alternative fuels and advanced vehicles.
 - Fuel Properties Comparison**: Compare alternative fuel properties and characteristics.

Bookmark it!

www.afdc.energy.gov

<https://evolution.es.anl.gov>



Wisconsin Clean Cities "Driving Wisconsin Forward"



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Michigan to Montana M2M I-94 Clean Fuel Corridor

The Michigan to Montana (M2M) I-94 Clean Fuel Corridor project seeks to ensure a 1,500-mile span of Interstate 94 from Port Huron, Michigan to Billings, Montana will have adequate fueling sites to serve alternative fuel and electric vehicle driver needs.

While I-94 is a major interstate highway connecting the Great Lakes and intermountain regions of the United States, there are several gaps in alternative fueling infrastructure between Michigan and Montana. The M2M project is being led by Oakdale Electric Cooperative through a \$4.9 million U.S. Department of Energy Grant.

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THE ELECTRIC ROOM
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Thank You!

Lorrie Lisek

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