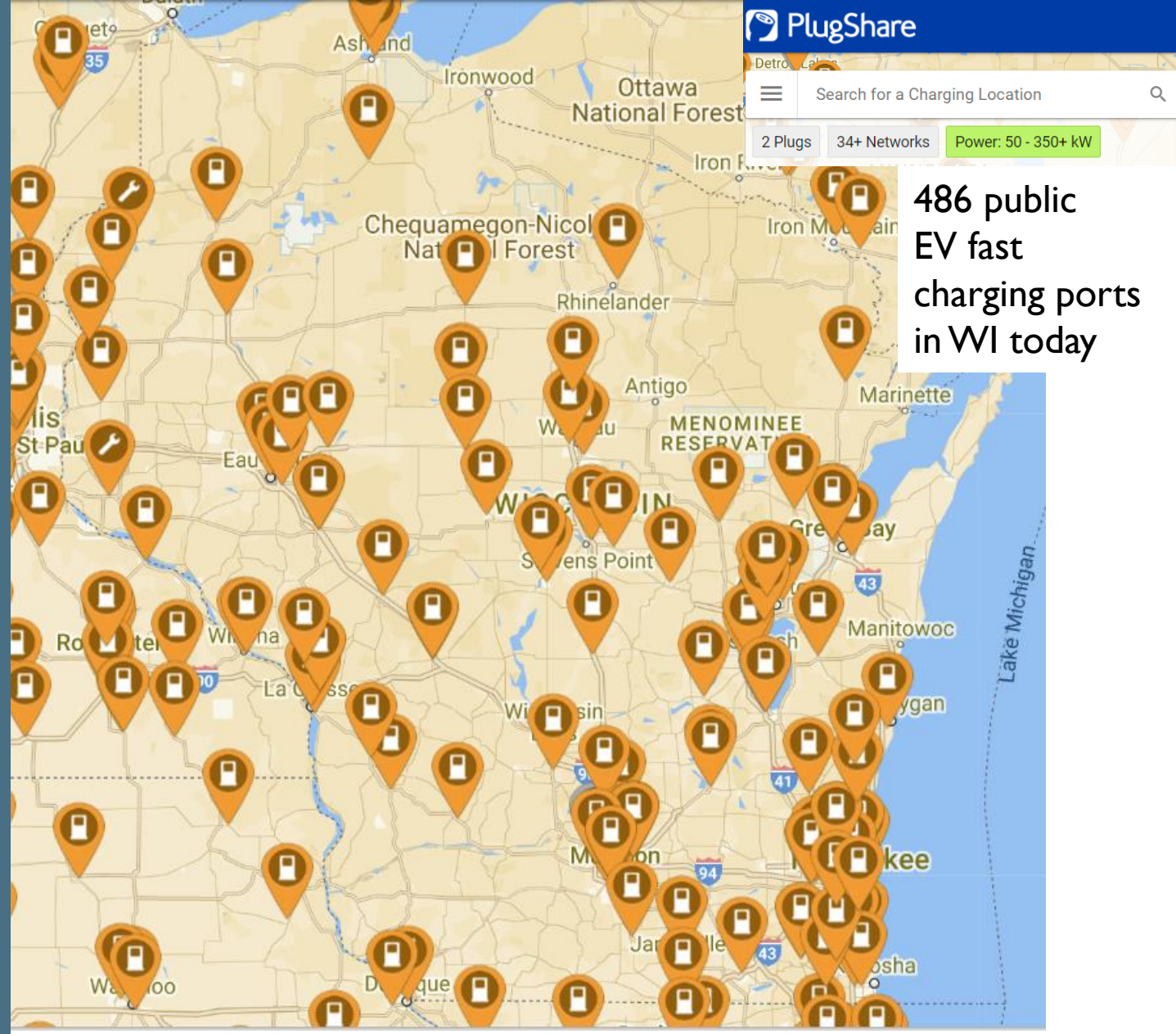
Planning and Zoning for Electric Vehicle Charging

July 25, 2024, Noon to 1pm
CLUE Summer Webinar Series

Thank you for joining us! The webinar will begin at noon.

For best results, please mute your microphone and turn off your video camera.

We will reserve 10 minutes for questions at the end. Please submit questions using the chat box.



486 public EV fast charging ports in WI today

Lynn Markham
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715-346-3879

Center for Land Use Education
College of Natural Resources
University of Wisconsin-Stevens Point

Extension
UNIVERSITY OF WISCONSIN–MADISON

[Photo: Palmyra-Eagle School District]

Fast charger at Wheeler's in Medford

Poll 1

OUTLINE

1. EV concerns
2. Trends in EVs & chargers
3. EV chargers
   - A. Types
   - B. How many public chargers will we need?
   - C. Where to locate?
4. Example zoning ordinance language for EV charging stations

EV FIRES

Fires in hybrid and electric vehicles

National Fire Protection Association, around 125 years

NFPA online training https://www.nfpa.org/for-professionals/training-for-me/alternative-fuel-vehicles-training/electric-vehicles?l=57

Video 2:08-3:09

EV Safe in-person training in WI https://evsafe.org/training-schedule

Fires in hybrid and electric vehicles

National Fire Protection Association, around 125 years

- "While fires involving hybrid or electric vehicles are not considered to be any more dangerous or likely to occur than in conventional vehicles, they do present some unique characteristics that firefighters must understand in order to safely and effectively extinguish the fire." National Fire Protection Association
- Offers free 15-minute intro to EV safety, plus online training and CEUs

NFPA online training https://www.nfpa.org/for-professionals/training-for-me/alternative-fuel-vehicles-training/electric-vehicles?l=57

EV Safe in-person training in WI https://evsafe.org/training-schedule

Do EVs w
when i
cold?

Average EV range at 20-32F was 70% of their range at ideal temps, but each model performs differently

EV ranges around 25F

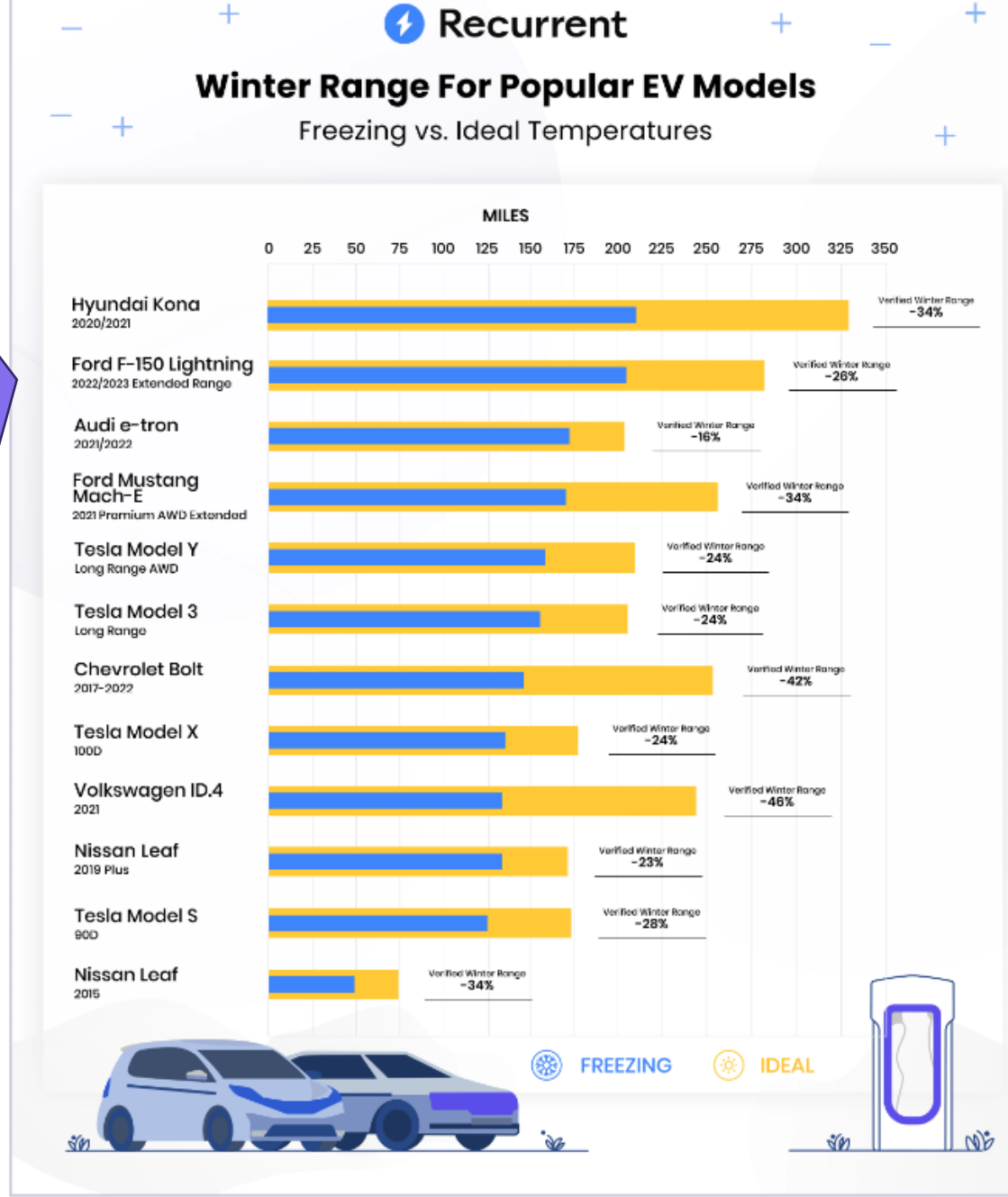
Audi e-tron: 170 mi

Tesla Model 3 long range: 155 mi

Chevy Bolt: 145 mi

VW ID.4: 135 mi

At 20F gas and diesel vehicle range is 76-85% of ideal temp



Verified winter ranges are based on original Recurrent research using a combination of on-boa time usage data providing more than 3,500,000 datapoints.

US: 1.4 million EVs sold in 2023

EV models

84 EVs/PHEVs in the U.S. in June 2024

14 models under $40K before rebates; less for used EVs

US EV Info List (June 2024) Page 1 of 6

cfvrfttt									Range			Charging speed (miles/hr)				
Make	Model	Photo	Seating	EV Type	FWD/ RWD/ AWD	Base MSRP	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
Alfa Romeo	Tonale eAWD		5	PHEV	AWD	$43,845	Fueleconomy.gov	16	33	360	6.6	3	15	N/A	77/29
Audi	Q4 e-tron		5	BEV	AWD	$49,800	Fueleconomy.gov	82	265	265	11/150	3	31	282	95
Audi	Q4 Sportback e-tron		5	BEV	AWD	$58,200	Fueleconomy.gov	82	242	242	11/150	3	31	282	95
Audi	Q8 e-tron (S)		5	BEV	AWD	$74,400	Fueleconomy.gov	106	285	285	9.6-19.2 /170	3	44	315	78
Audi	Q8 e-tron Sportback (S)		5	BEV	AWD	$77,800	Fueleconomy.gov	106	300	300	9.6-19.2 /170	3	44	311	77
Audi	e-tron GT		5	BEV	AWD	$106,500	Fueleconomy.gov	93	249	249	9.6/270	3	23	292	82
Audi	Q5 TFSI e		5	PHEV	AWD	$57,800	Fueleconomy.gov	17.9	24	400	7.4	2	14	N/A	61/26
BMW	i4		5	BEV	RWD/ AWD	$52,200	Fueleconomy.gov	81	227-307	227-307	11/195	4	33	463	80-109
BMW	i5		5	BEV	RWD/ AWD	$66,800	Fueleconomy.gov	81	240-295	240-295	11/195	4	33	463	85-105
BMW	i7		5	BEV	AWD	$105,700	Fueleconomy.gov	106	274-321	274-321	11/195	4	33	412	89
BMW	iX		5	BEV	AWD	$87,250	Fueleconomy.gov	112	284-309	284-309	11/195	3	28	393	83-86
BMW	330e		5	PHEV	RWD/ AWD	$45,600	Fueleconomy.gov	12	23	320	3.7	3	8	N/A	75/28
BMW	750 xDrive		5	PHEV	AWD	$107,000	Fueleconomy.gov	12	16	290	3.7	2	6	N/A	56/22
BMW	X5 xDrive50e		5	PHEV	AWD	$73,100	Fueleconomy.gov	24	39	440	7.4	2	11	N/A	58/20

This table is updated by Jukka Kukkonen, Shift2Electric. Photos and information sources: Manufacturers' websites and www.fueleconomy.gov Get the latest version: www.EVI

https://www.shift2electric.com/evinfolist

EV projections for WI

Table 3-3: Projected Wisconsin Electric Vehicle Registrations

Year	Projected Wisconsin EV Registrations	Percent of Total Fleet
2022	9,039	0.1%
2027	217,048	4.1%
2030	334,097	6.1%
2035	553,686	9.9%
2040	843,623	14.7%
2050	1,863,585	31.0%

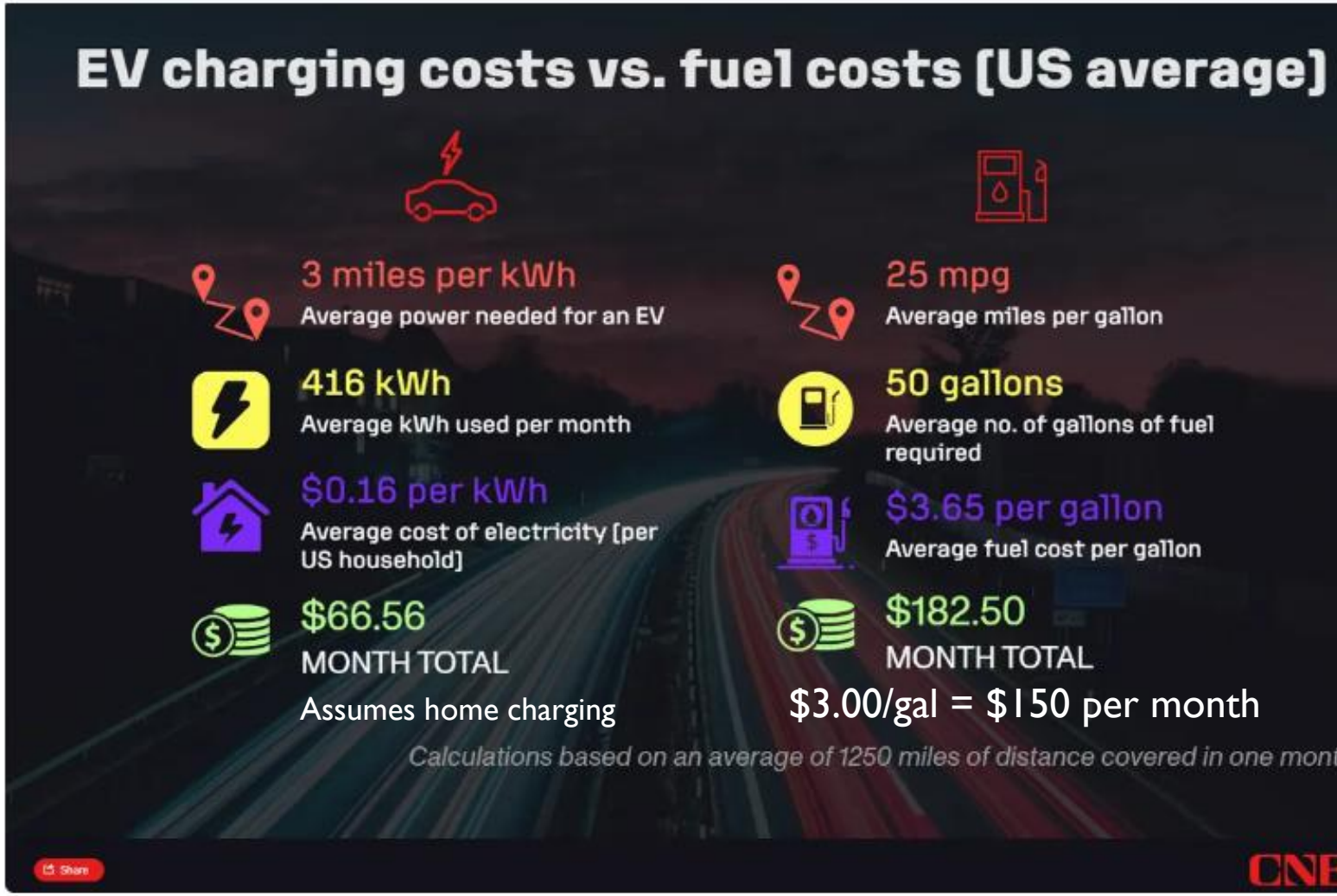
Sources: *DMV Registration reports: vehicle type by fuel type and plate types by vehicle weight; Woods & Poole Economics: Wisconsin population forecast by age group; IHS Markit National unit sales data for light vehicles, light trucks, and heavy & medium trucks; U.S. Energy Information Administration*

Actual 13,731 EVs

May 2024: 23,000 EVs

Wisconsin Electric Vehicle Infrastructure Plan, WDOT, approved September 2022

WHY MORE ELECTRIC VEHICLES?



Data sources for infographic:

Environmental Protection Agency (2024)

Bureau of Transportation Statistics (2021)

Department of Energy (2024)

US Energy Information Administration (2023)

Image credit: Gianmarco Chumbe/CNET

CR Consumer Reports

JUNE 2023

ELECTRIC VEHICLES SAVE CONSUMERS

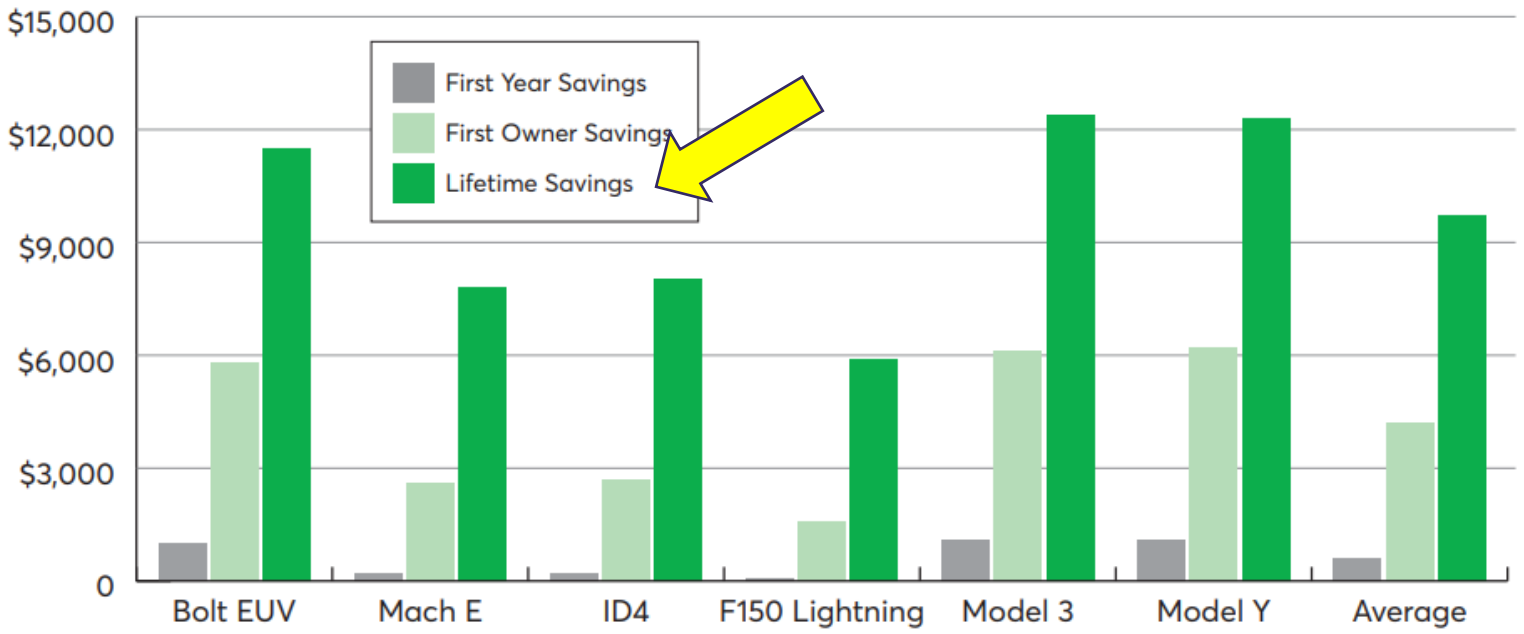
Owning an electric vehicle (EV) will **save the typ**
$12,000 over the life of the vehicle, compared t
gas-powered vehicle. With new federal tax
credits from the Inflation Reduction Act,
consumers can save as much as $1,100 in the first year of ownership!

HOW EVS CAN SAVE CONSUMERS MONEY

- The average EV driver will **spend 60% less to power their vehicle** than the owner of a gas-powered vehicle.
- EV owners are spending **half as much to repair and maintain their vehicle** as owners of gas-powered vehicles; with much of that savings benefiting used car buyers.

This graph shows the ownership savings in the first year, first seven years, and lifetime of the vehicle, for six mainstream EVs compared to traditional vehicles with similar utility and features.

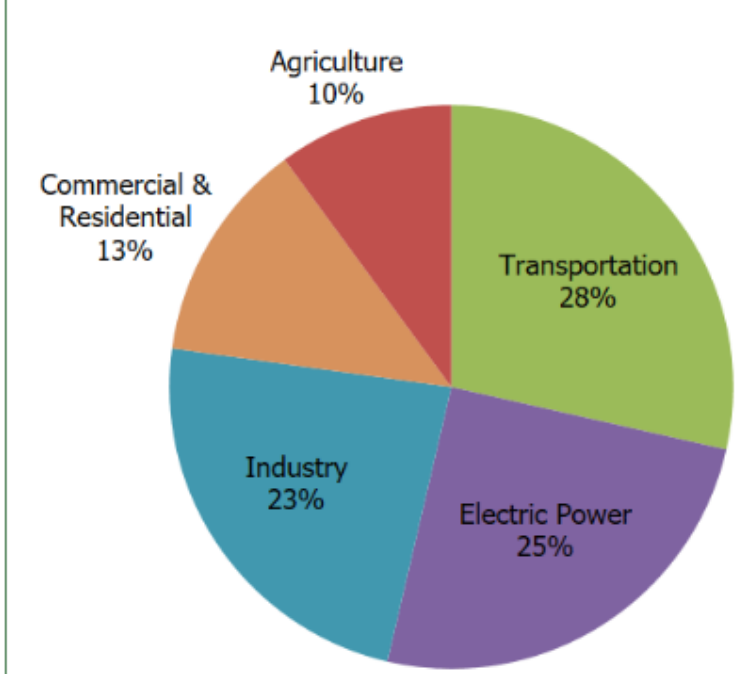
EV NET OWNERSHIP COST SAVINGS RESULTS



Consumer Reports, 2023

WHY?

- Transportation is largest source of GHGs
- Compared to 25 mpg gas vehicles, EVs reduce transportation GHG emissions by 1/3 to 2/3 for large WI utilities shown
- GHG reductions for EVs will increase as electric utilities decrease coal use and increase renewable energy

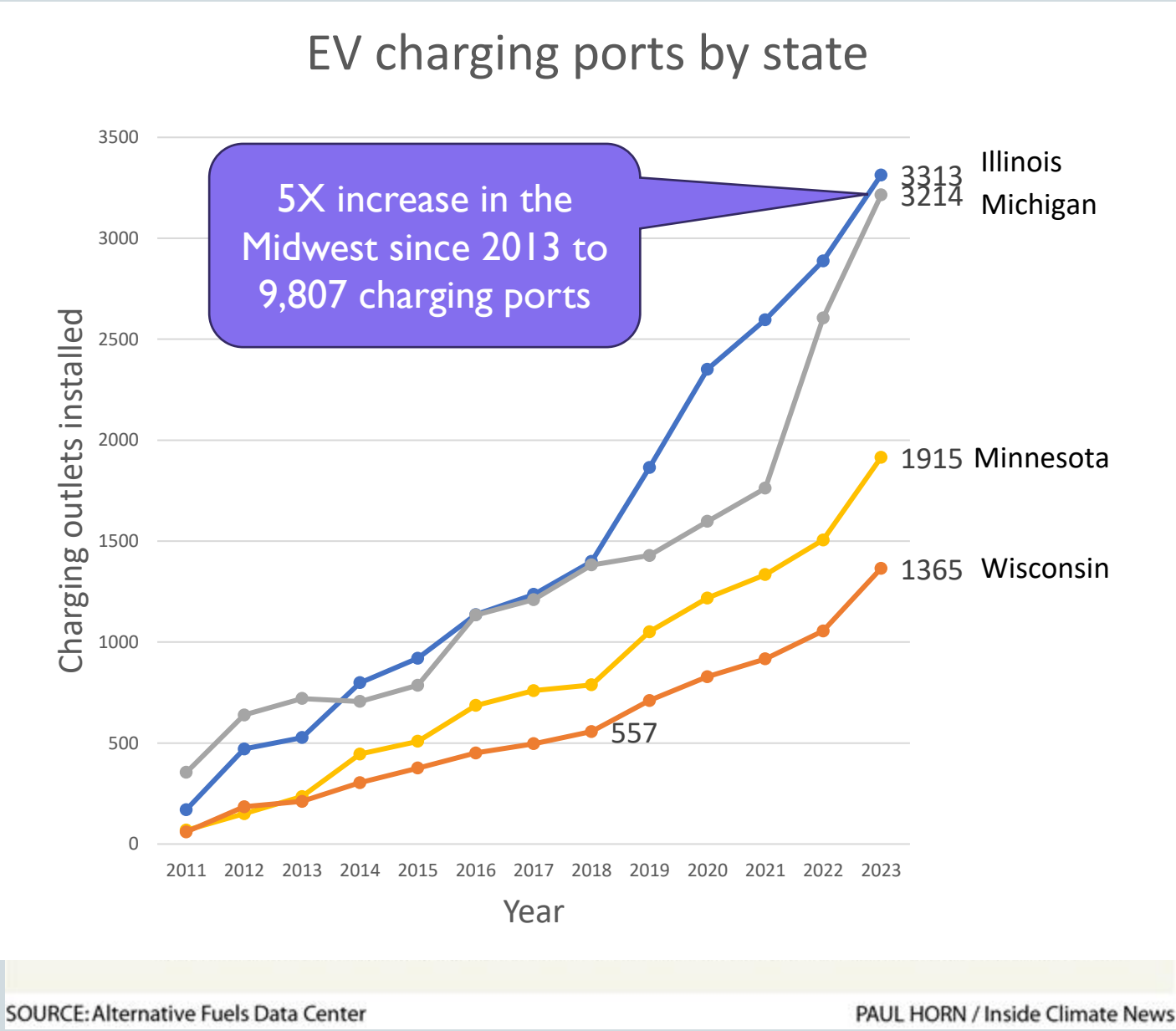


Gasoline or diesel vehicle annual emissions (25 mpg)	3.3 metric tons CO2e
Electric vehicle	
WI Public Service 2022	2.1 metric tons CO2e
WI Power & Light 2022	1.9 metric tons CO2e
We Energies 2022	1.3 metric tons CO2e
Xcel 2022	1.0 metric tons CO2e

TRENDS

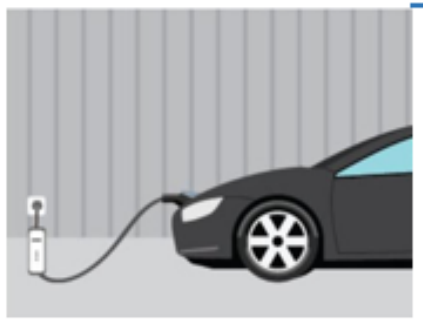
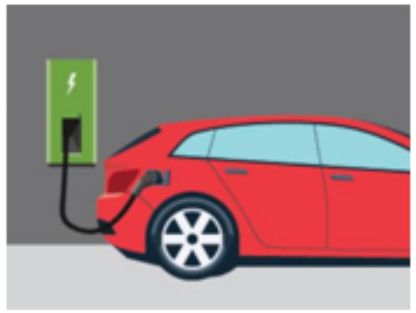
- The number of EVs and EV charging stations is increasing rapidly

Prentice Truck & Travel



Types of EV Charging

Poll 2

		Range	Application
Level 1 120 V		2 to 5 miles of range per hour	• Single Family Homes • Multi-Unit Residential • Condos
Level 2 240 V		10 to 90 miles of range per hour	• Single Family Homes • Multi-Unit Residential • Workplace • Fleet • Public
Level 3 (Direct Current Fast) 480+ V		150 to 350+ miles of range per hour	• Fleet • Public • Multi-Unit Residential

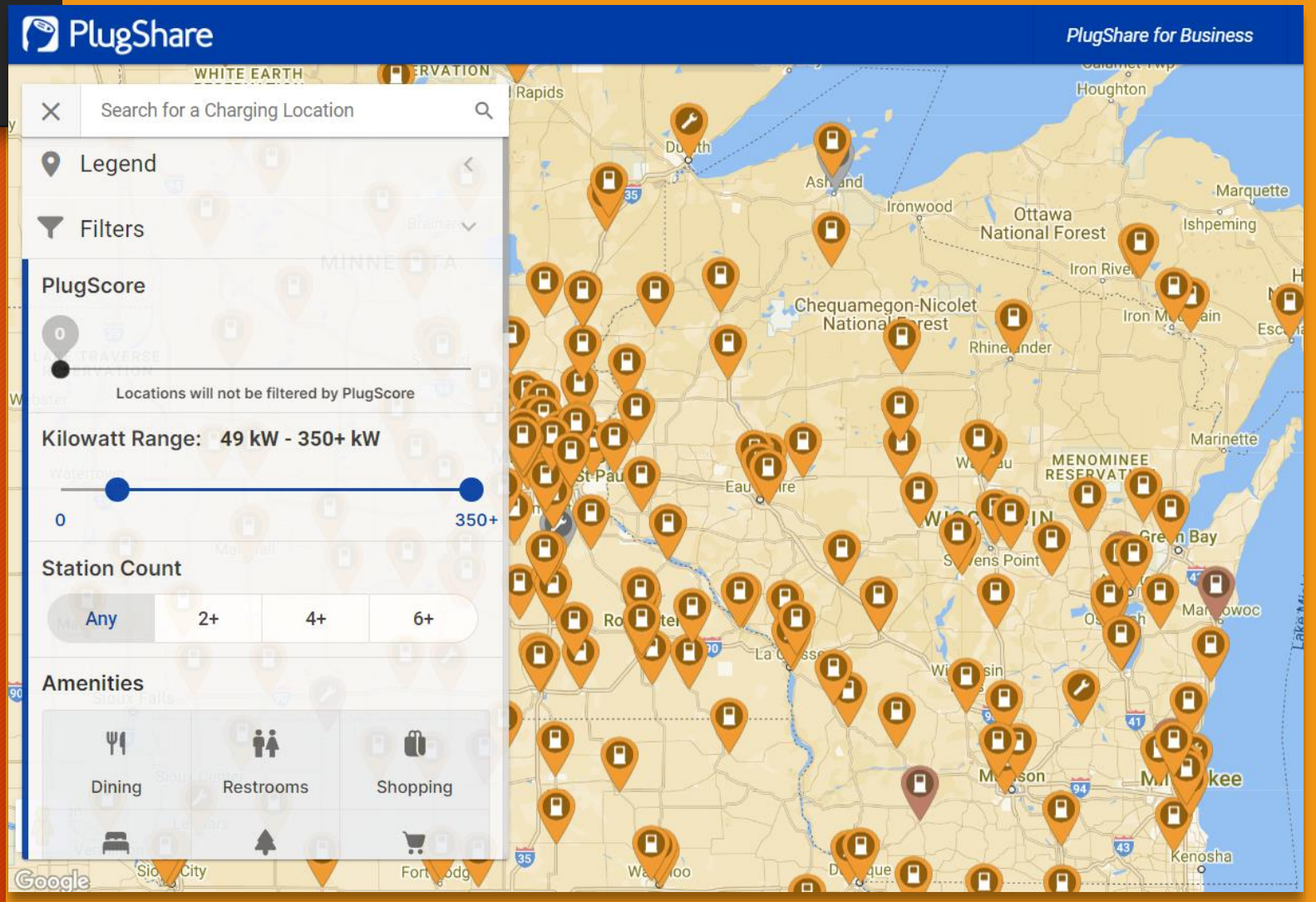
Commuting

Long distance driving / tourism

Electric vehicle DC fast chargers (486 ports)

Who is adding them?

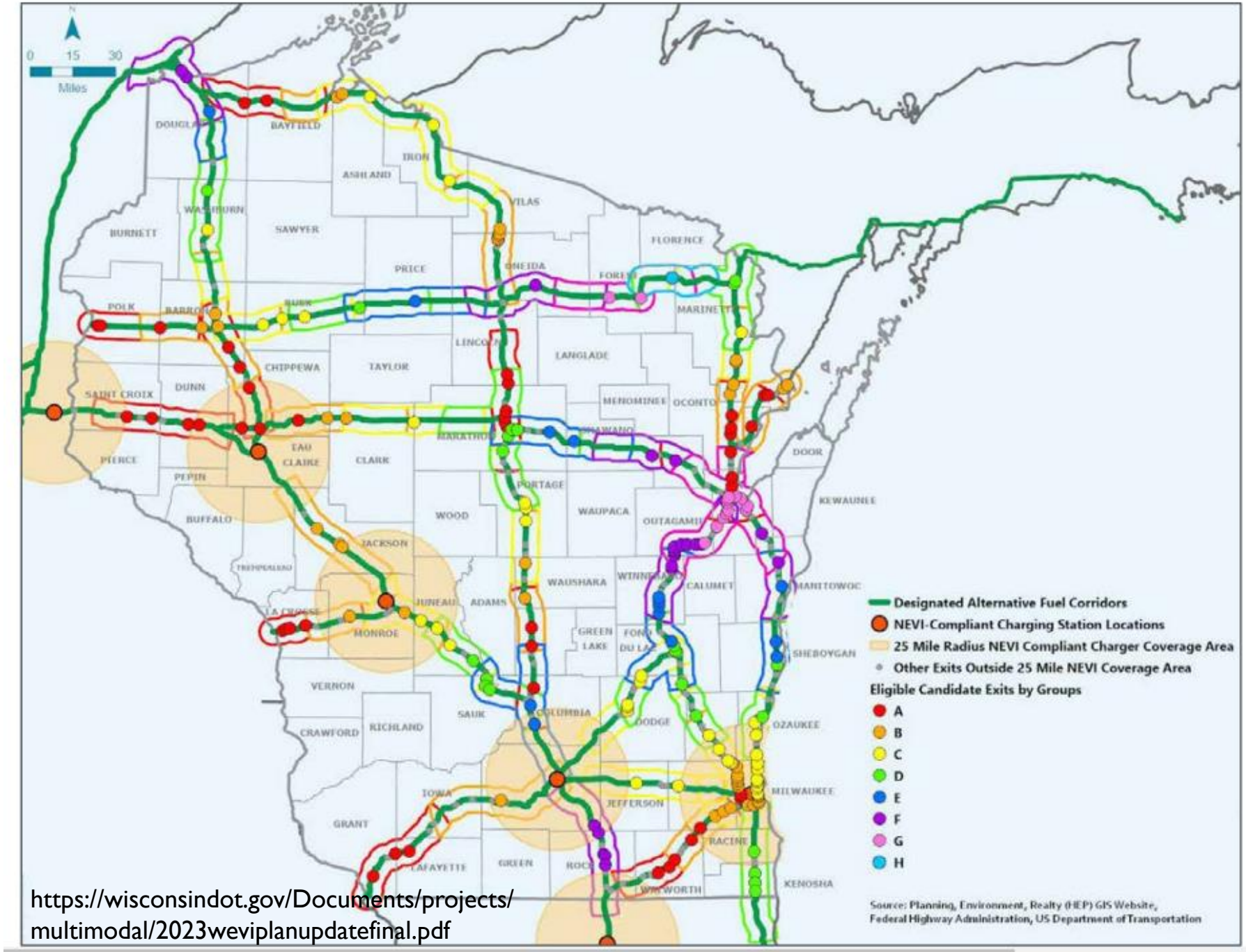
- Vehicle dealerships
- Gas stations
  - kwik trip, BP, mobil, cenex
- Grocery stores
  - piggly wiggly, meijer, hy-vee
- Other stores
  - walmart, home depot, target
- Motels/B&Bs
- Bus/municipal garages
- Federal funding for stations along interstates and state highways



WI Electric Vehicle Infrastructure Plan

- $78 million from BIL coming to WI over 5 years; covers 80% of costs
- 64 fast charging stations predicted
- One charging station will be installed per group of same color dots on map

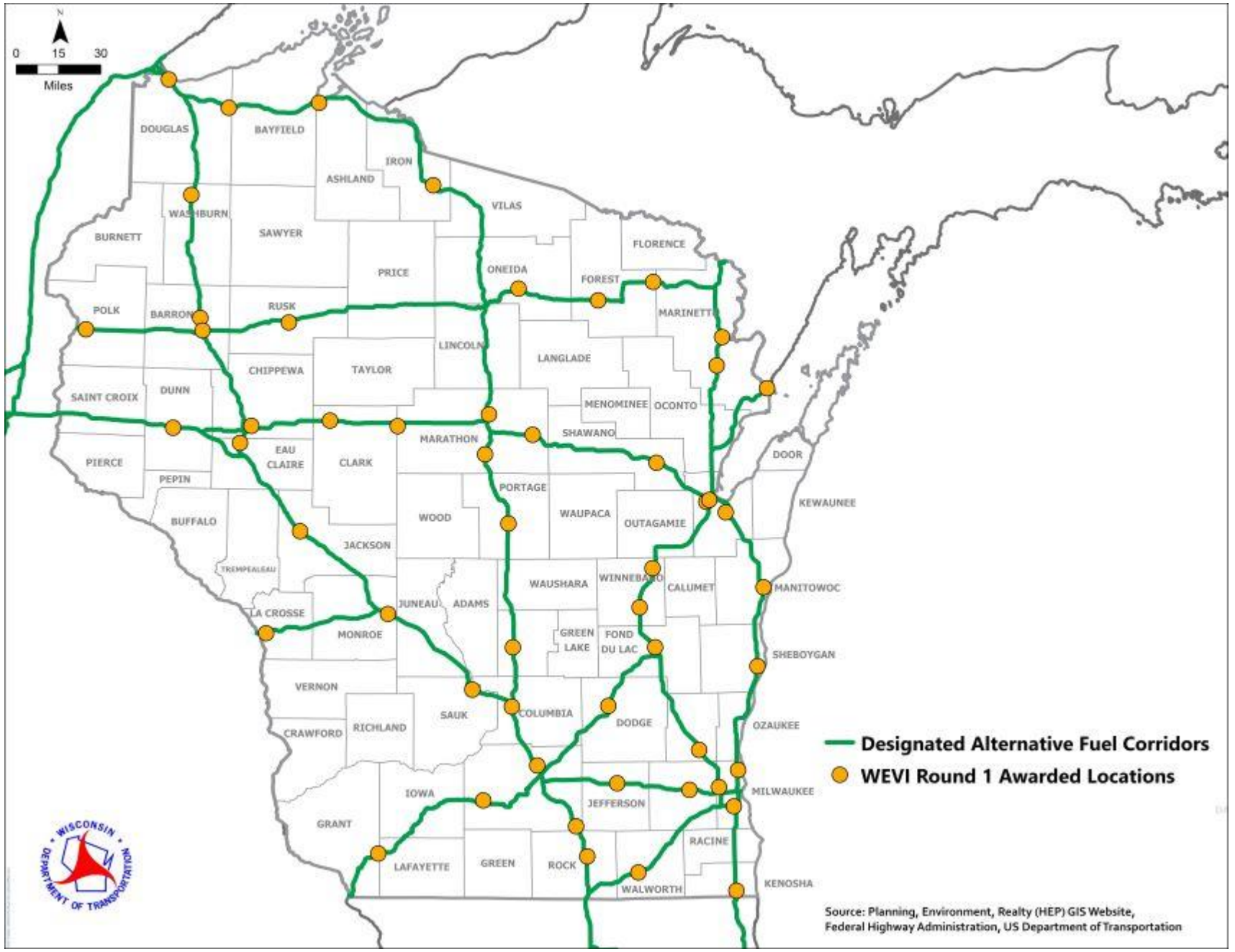
Figure 4-9: Wisconsin Full NEVI-Compliant EV Charging Station Build-Out Coverage Map



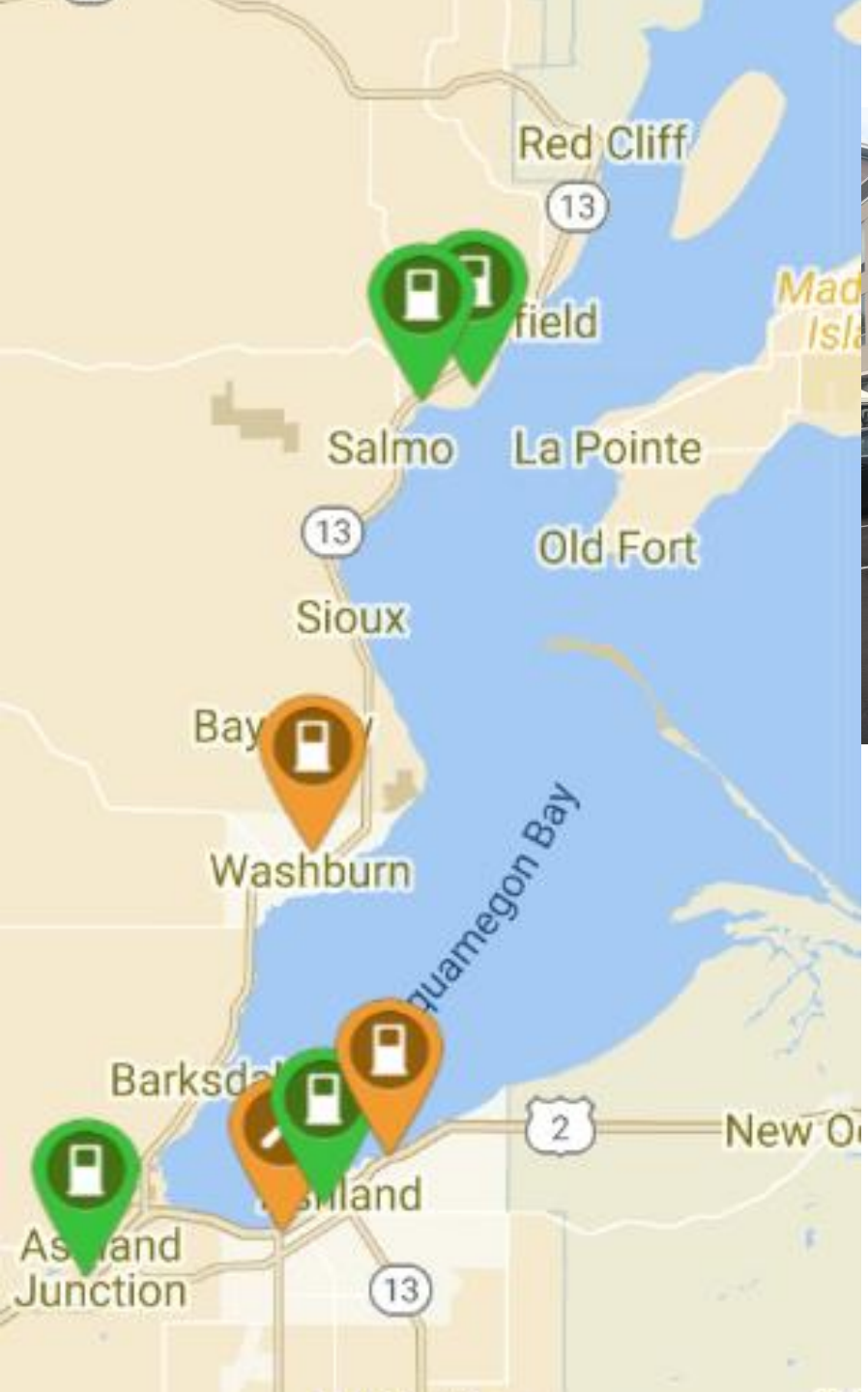
https://wisconsindot.gov/Documents/projects/multimodal/2023weviplanupdatefinal.pdf

Round 1 WEVI award locations May 2024

- 53 locations with 4 fast charger ports per location = 212 more fast charger ports coming
- 24 of these locations are at Kwik Trip gas stations
- 40 locations have adjacent businesses open 24/7
- Installation of charging stations to begin in late fall 2024 or early 2025



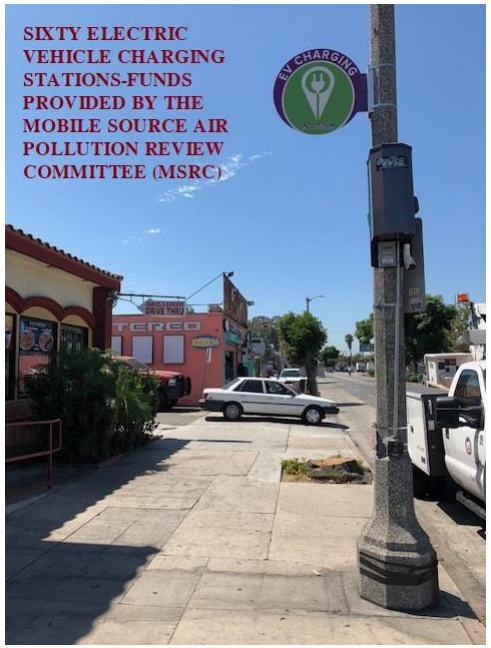
https://wisconsindot.gov/Pages/projects/multimodal/electrification.aspx



La Quinta Inn, Wis. Dells,
2 Level 2 chargers

Chargers for tourists

- Tourism is big business
- Long-distance EV drivers want
  - DC fast charging outlets near their routes, OR
  - Level 2 chargers near their overnight accommodations
- The PlugShare app is commonly used by EV drivers to find chargers; look at your county on this app



Chargers for EV commuters

- EV drivers do over 80% of their charging at home
- 1/3 of Wisconsin households rent their home, and don't control whether they can charge at home
- Potential solutions
  - Require wiring for EV chargers in parking for multi-unit dwellings
  - Workplace charging
  - Install EV charging outlets on streetlight poles in areas near apartments

Potential locations & impacts of charging stations

Any issues with these locations?

- Vehicle dealerships
- Gas stations
- Tesla
- Grocery stores
- Other stores
- Motels/B&Bs
- Restaurants
- Bus/municipal garages
- Along interstates and state highways

Potential impacts

Level 1 and 2 chargers

- People park at for 4+ hours
- Not many cars going in & out

Fast chargers

- A little traffic; more near a highway
- Over time traffic may become similar to a gas station
- People waiting to charge, and waiting while they charge
- Trash
- Lighting

What about

- Residential areas: do you want a fast charger in someone's garage, driveway, or near the road?
- Parks?

Consider including EV charging infrastructure in zoning ordinances

Fast charger at Hyundai dealer in Stevens Point

1. EV charging definitions
2. Where are charging stations permitted uses?
3. Where is wiring for charging stations required as part of new construction?

D. Examples of definitions to include in your ordinance:

Electric Vehicle: any vehicle that is licensed and registered for operation on public and private highways, roads, and streets, and that operates either partially or exclusively, on electrical energy from the grid, or an off-board source, that is stored on-board via a battery for motive purpose. Electric Vehicle includes: (1) a battery electric vehicle; and (2) a plug-in hybrid electric vehicle.

Electric Vehicle Charging Station: A parking space that is served by electric vehicle supply equipment for the purpose of transferring electric energy to a battery or other energy storage device in an electric vehicle.

Electric Vehicle Supply Equipment: The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the electric vehicle connectors, attachment charging outlets, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

EV CHARGING IN ZONING

1. EV charging definitions
2. Where are charging stations permitted uses?
3. Where is wiring for charging stations required as part of new construction?

Level 1: Considered slow charging and operates on a 15 to 20 amp breaker on a 120 volt AC circuit.

Level 2: Considered medium charging and operates on a 40 to 100 amp breaker on a 208 or 240 volt AC circuit.

Level 3: Considered "fast" or "rapid" charging and typically operates on a 60 amp or higher breaker on a 480 volt or higher three phase circuit with special grounding equipment. Level 3 stations are primarily for commercial and public applications and are typically characterized by industrial grade electrical outlets that allow for faster recharging of electric vehicles.

EV CHARGING IN ZONING

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Where are EV charging stations permitted uses?

Cleaner and safer than gas stations

No leaking underground gas/diesel tanks

No harmful fumes (benzene causes cancer)

1. Allow charging stations as permitted uses in all zoning districts like Des Moines, IA.[23]

2. Allow Level 1 and 2 charging stations as permitted uses in all districts. Allow Level 3 as a permitted use in industrial districts and the strip commercial district near Highway 10. Level 3 chargers are a conditional use in other commercial districts. City of Waupaca.

ACCESSORY USES AND STRUCTURES	Zoning District													
	A-1	R-1	R-2	R-3	MH	B-1	B-2	B-3	B-4	B-5	B-6	B-7	I-1	I-2
Accessory dwelling unit, as an accessory to a single-family dwelling	P	P	P	P										
Accessory Structure, excluding detached garages and Transitory Accessory Structures, not to exceed two per lot in residential districts	P	P	P	P		P	P	P	P	P	P	P	P	P
Alternative Energy System: Electric vehicle infrastructure, levels 1, 2 (Am. Ord. #04-22(2022))	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Alternative Energy System: Electric vehicle infrastructure, level 3 (Am. Ord. #04-22(2022))						C	C	C	P	C	C	C	P	P
Alternative Energy System: Geothermal Energy Systems (Am. Ord. #04-22(2022))	P	P	P	P		P	P	P	P	P	P	P	P	P

EV CHARGING IN ZONING

1. EV charging definitions
2. Where are charging stations permitted uses?
3. Where is wiring for charging stations required as part of new construction?

Why consider requiring wiring for charging stations as part of new construction??

- 2-3X less expensive when done during initial construction
- Can make EV charging feasible for people who rent their homes

Study	Construction cost per charger	Retrofit cost per charger
City of Orlando – EV Ready Code	$916	$3,460
Electric Power Research Institute – Electric Vehicle Supply Equipment Installed Cost Analysis	$2,619	$4,160
Electric Vehicle Infrastructure Cost Analysis Report for Peninsula Clean Energy & Silicon Valley Clean Energy	$1,410	$4,443

https://driveelectricmn.org/electric-vehicle-ready-parking-101/

EV CHARGING IN ZONING

1. EV charging definitions
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3. Where is wiring for charging stations required as part of new construction?

New WI Law about EV charging stations

Wis. Stats. 66.0442 **Electric vehicle charging stations**

- (5) No local governmental unit may require a private developer to install an electric vehicle charging station or allow the installation of an electric vehicle charging station on the developer's property as a condition of granting a building permit, conditional use permit, or other approval. This subsection does not apply to the enforcement of a voluntary contractual agreement between a developer and local governmental unit.
- 2023 WI Act 121

- EV charging stations are defined as delivering electricity to an EV's battery

Wis. Stats. 66.0442 says **charging stations** transfer electricity to an EV, and says local governments cannot require a developer to install or allow installation of charging stations

Are these **charging stations** by that definition?

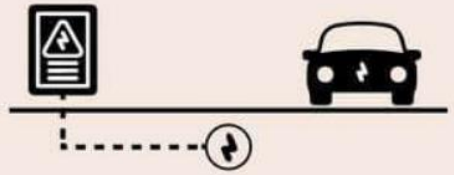
No

1. EV-Capable

Install electrical panel capacity with a dedicated branch circuit and a continuous raceway from the panel to the future EV parking spot.

Aspen, CO: 3% of parking is EV-Capable (IBC)

Atlanta, GA: 20% is EV-Capable (Ordinance)



No

2. EVSE-Ready Outlet

Install electrical panel capacity and raceway with conduit to terminate in a junction box or 240-volt charging outlet (typical clothing dryer outlet).

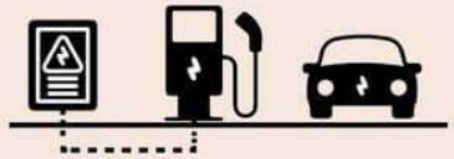
Boulder, CO: 10% of parking is EV-Ready Outlet

Yes

3. EVSE-Installed

Install a minimum number of Level 2 EV charging stations.

Palo Alto, CA: 5-10% of parking is EV-Installed



EV CHARGING IN ZONING

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St. Paul rationale for adding EV charging to zoning

The Looming EV Charging Issue

- EV use is growing
- Charging need is growing
- Most EV charging will be at home
- ~~Most St. Paulites will live in multifamily housing~~
- Retrofits for multifamily are expensive
- Equity: Will multifamily residents be left behind?

In WI, 30% of households rent their home
Higher for younger people; 47% of ages 25-34 r

Retrofits for EV charging can be expensive

- 2x to 10x compared to upfront installations

Upfront prep cost for EV charging is relatively cheap
Estimated 0.1% to 0.2% of overall development costs

Example application: 520 Payne Avenue

- 62-unit residential development with 45 parking spaces. Proposed code amendments would have required:
  - 1 EV-ready space (cost: ~$1,000/space)
  - 36 EV-capable spaces (cost: ~$600/space)
  - Total EV costs: ~$22,600 =0.1% of total cost
- Total development costs: $18.7 million

(note: Figures above are illustrative, with a high plus/minus, and not a customized estimate)

Recommended Amendments

- Apply to surface parking facilities with 16+ parking spaces that require site plan review
- Require 80% of parking spaces to be EV capable
- Require 1 per 30 parking spaces to be EV ready
- No requirement for EV charger itself

Adopted in St. Paul in April 2024

- Short and sweet
- Only new definition needed is "electric vehicle"
- Does not require EV chargers
- Focused on multi-family dwellings

Chapter 63. Zoning

ARTICLE II. 63.200. PARKING REQUIREMENTS

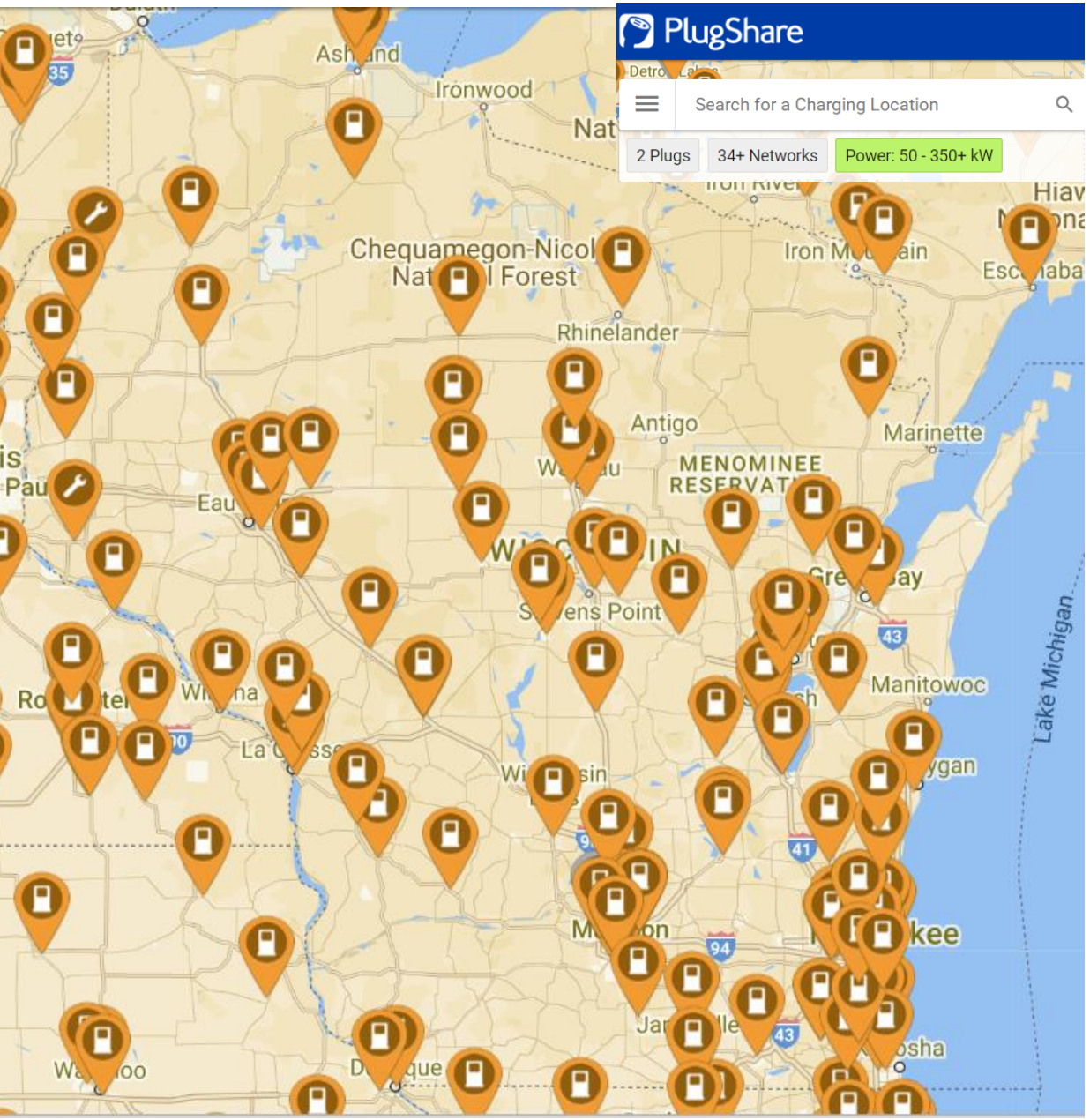
Sec. 63.212. <u>Electric vehicle parking.</u>

For surface parking facilities with more than fifteen (15) parking spaces that require site plan review per Sec. 63.202, electric vehicles shall be accommodated as follows:

(a) If intended to serve any use that includes a multifamily dwelling, at least eighty (80) percent of the facility's parking spaces must have an electrical conduit or raceway connection to electrical service with sufficient panel space reserved that is capable of operating at Level 2 (208 Volts) or greater power. If intended to serve uses that do not include a multifamily dwelling, at least twenty (20) percent of the facility's parking spaces must be served in this manner.

(b) Additionally, for surface parking facilities with more than thirty (30) spaces that require site plan review per Sec. 63.202, and that are intended to serve any use that includes a multifamily dwelling, at least one (1) of the spaces per each thirty (30) must be served by installed wiring in electrical conduit or raceway, and electrical service sufficient to supply electric vehicle charging at a minimum of 208 Volts power level. Such space may or may not include the associated above-ground charging equipment for charging an electric vehicle.

Conduit and raceway required above shall be installed in accordance with the Minnesota State Building Code and National Electrical Code, including with regard to sizing and location, and shall be capped. The amounts of electric vehicles parking infrastructure for structured parking shall be as directed by the Minnesota State Building Code.



Summary

The number of EVs and EV chargers is increasing quickly

EV fast chargers support long-distance travel
486 EV fast chargers today + 212 more awarded funding

- Vehicle dealerships
- Gas stations
- Tesla
- Grocery stores
- Other stores

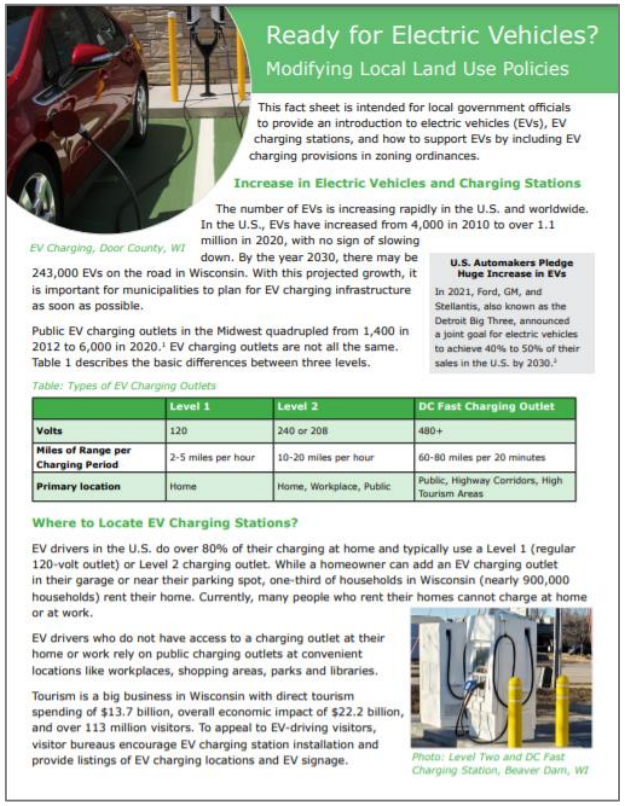
EV commuting is supported by charging at home

- 80% of EV charging done at home
- 30% of households in WI rent their home & don't decide on chargers
- 2-3X more expensive to wire for EV chargers as retrofit after parking is already constructed

Zoning can be used to provide:

1. EV charging definitions
2. Where are charging stations permitted uses?
3. Where is wiring for charging stations required as part of new construction?

Pubs available



- Fact sheet for local officials and public
- 20-page report includes more sample ordinance language

bit.ly/Ready_for_EVs

Rhinelander fast charger at GM dealership

Thank you!

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Poll 3

Extension
UNIVERSITY OF WISCONSIN-MADISON

Center for Land Use Education
College of Natural Resources
University of Wisconsin-Stevens Point

Demographics

Understanding the demographics of our participant helps us improve Extension programs and services. Asking for the following also helps us meet our institutional requirements for compliance with Federal non-discrimination policies. Providing us with this information is **voluntary**.

If you have questions about this survey or why Extension collects this information, please contact Kim Waldman, Compliance Coordinator & Equity Strategist, UW-Madison Division of Extension, (608) 263-2776, kim.waldman@wisc.edu

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