

Electric Vehicles: The Future of Transportation is NOW!

2021 Wisconsin Counties Association - La Crosse, Wisconsin

Lorrie Lisek, Executive Director, Wisconsin Clean Cities

September 28, 2021



About Wisconsin Clean Cities



- Wisconsin Clean Cities is a 501(c)(3) nonprofit organization managed by Legacy Environmental Services, Inc., an Indiana Certified Women's Business Enterprise.
- Established in 1994, Wisconsin Clean Cities is one of the U.S. Department of Energy's more than 75 Clean Cities coalitions.
- The organizations support the nation's energy and economic security by building partnerships to advance affordable domestic transportation fuels, energy efficient mobility systems and other fuel-saving technologies and practices.



Agenda

- Basics
- Vehicles
- Infrastructure
- Other Considerations
- Additional Resources



Basics: Electric-Drive Vehicles

Electric Vehicles (EVs):

- All-Electric Vehicles
 - Powered by an electric motor
 - Uses charging infrastructure to charge the battery
- Plug-In Hybrid Electric Vehicle (PHEV)
 - Powered by an electric motor and engine
 - Uses charging infrastructure to charge the battery

Hybrid Electric Vehicle (HEV):

- Powered by an engine and electric motor
- Does not use charging infrastructure to charge the battery



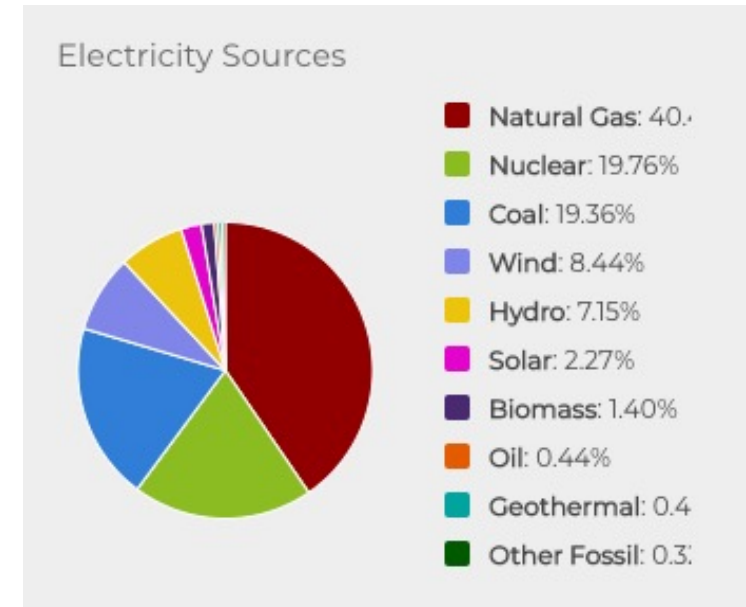
Basics: Electricity as a Fuel Source

- Electricity is considered an alternative fuel under the Energy Policy Act of 1992
- EVs draw from electrical power sources to charge their batteries



Basics: Electricity Production and Distribution

- Sources of electricity vary by region
- With planning, EVs are unlikely to strain existing electricity infrastructure



Helpful Resources

- The Alternative Fuels Data Center (AFDC) **Electricity Sources and Emissions tool**—find state-level electricity sources and how they affect EV well-to-wheels emissions.
- AFDC **EVI-Pro Lite tool**—estimate how increased EV charging may affect your area's electricity load profile.

Basics: Smart Grids and Renewables

- Smart grids allow two-way communication between utilities and customers
- Smart charging paves the way to smoother integration of EVs and renewable energy



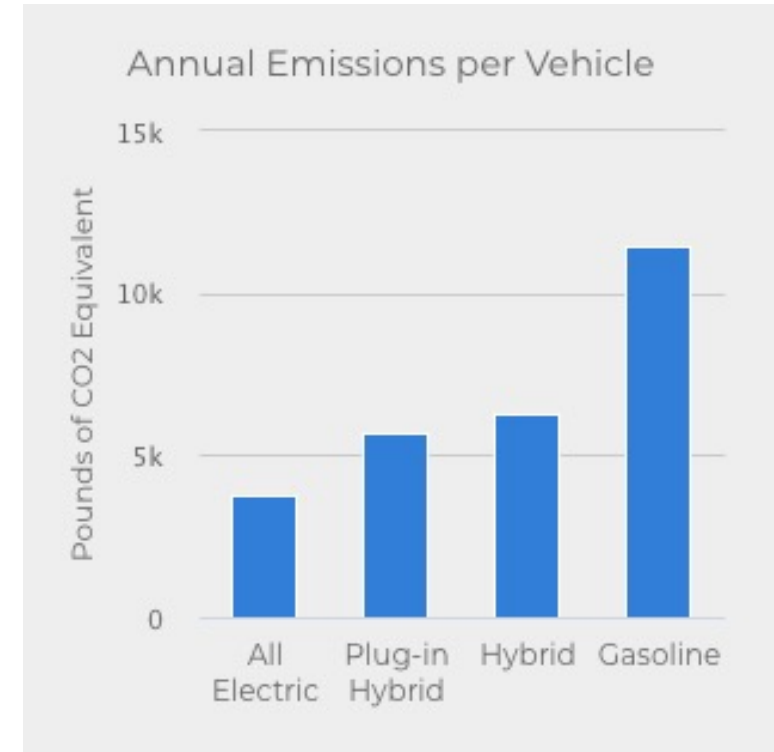
Basics: Benefits

Benefits:

- Increased energy security
- Improved fuel economy
- Lower fuel costs
- Reduced emissions

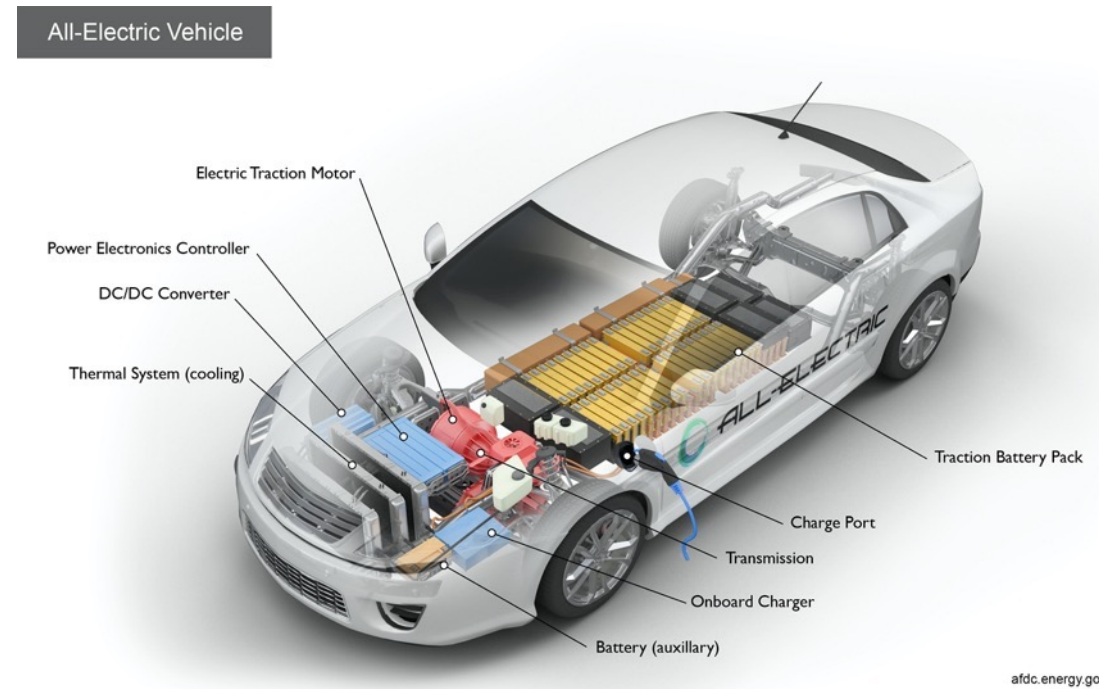
Considerations:

- Higher initial vehicle cost
- Infrastructure availability
- Battery life



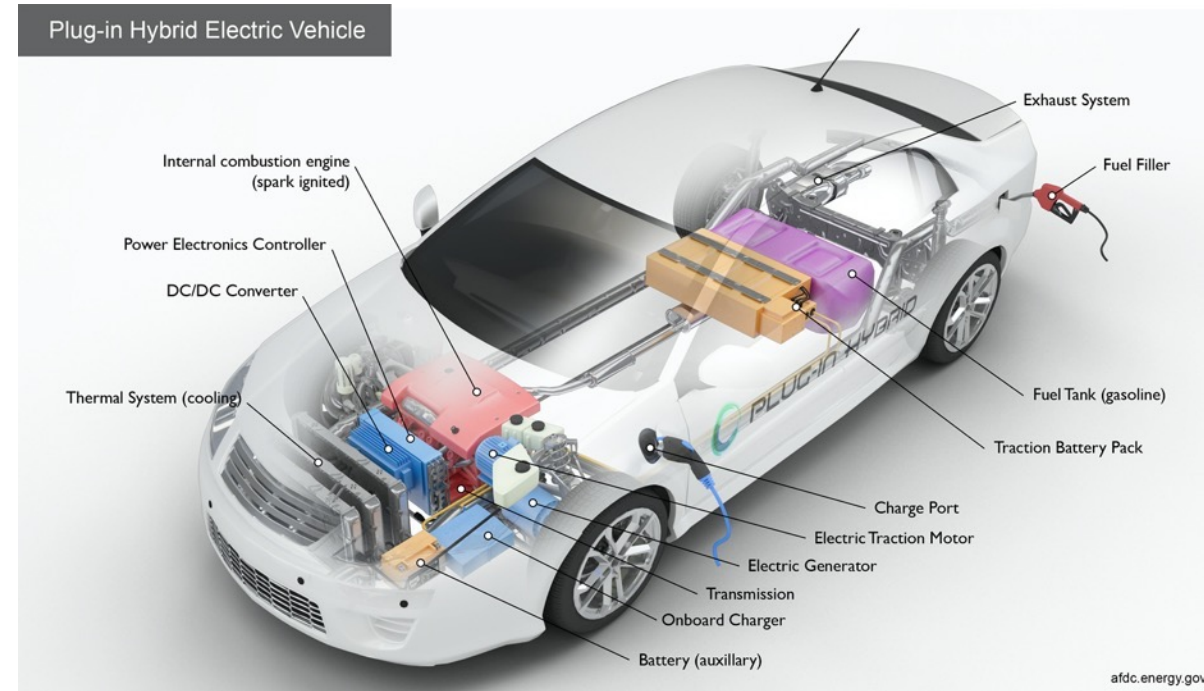
Vehicles: EVs

- Battery stores electrical energy that powers the motor
- Battery charged by plugging in to outside electric power source
- Zero tailpipe emissions, but air pollution may be produced through electricity generation
- Driving range of 100 to over 400+ miles



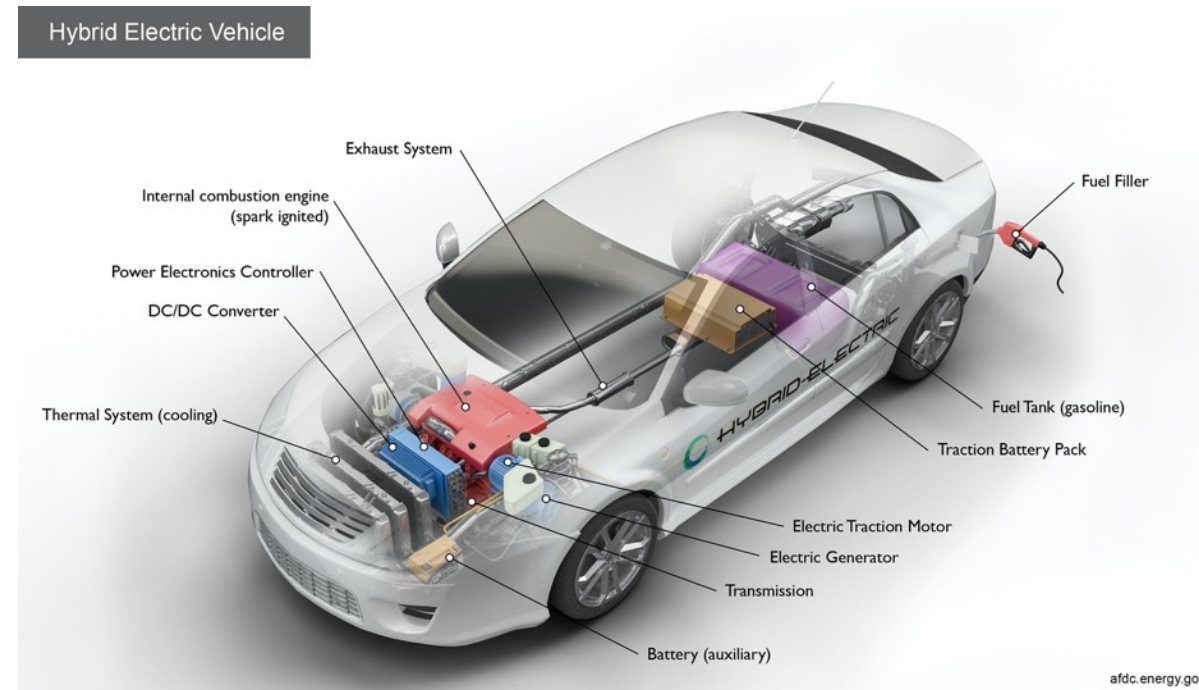
Vehicles: PHEVs

- Internal combustion engine uses alternative or conventional fuel
- Battery charged by outside electric power source, engine, and regenerative braking
- During urban driving, most power comes from stored electricity



Vehicles: HEVs

- Battery is charged by the engine and regenerative braking
- Power from electric motor allows smaller engine and better fuel economy
- Fuel-efficient system design
 - **Mild hybrid:** Cannot power vehicle using electric motor alone
 - **Full hybrid:** More powerful electric motor, larger batteries can drive vehicle on just electric power for short distances and at low speeds



Vehicles: Batteries

- Energy storage systems, such as batteries, are essential for electric-drive vehicles
- All original equipment manufacturer EVs made today use **lithium-ion** batteries.
- Other energy storage options:
 - Nickel-metal hydride batteries (HEVs)
 - Lead-acid batteries
 - Ultracapacitors



Vehicles: Battery Recycling and Second Life

Recycling:

- Separating battery materials is a challenge
- Standardizing battery materials and design could help

Second life:

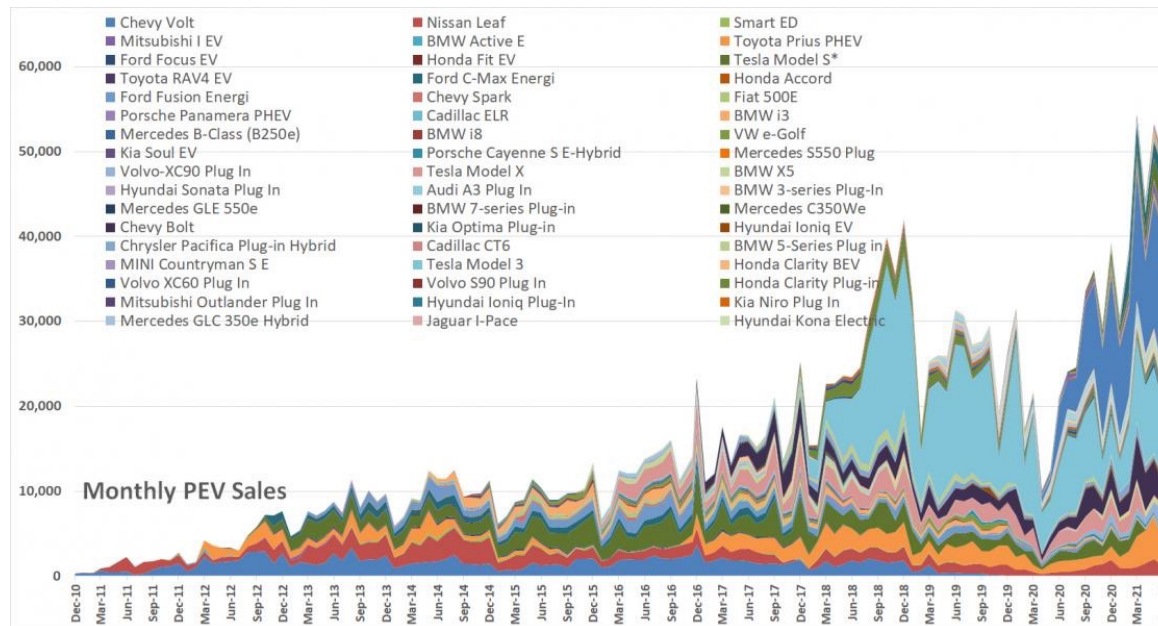
- Battery used in post-vehicle application
- Could help address battery cost barriers



The U.S. Department of Energy is supporting the Lithium-Ion Battery Recycling Prize to develop battery-recycling processes.

Vehicles: Light-Duty Vehicle Availability

- EVs, PHEVs, and HEVs widely available
- New models rolling out nationwide



Helpful Resources

- **AFDC Alternative Fuel and Advanced Vehicle Search**—find available electric-drive vehicle models
- **Electric Drive Transportation Association's Electric Drive Sales page**—see current information on electric-drive vehicle sales

Vehicles:

Medium- and Heavy-Duty Vehicle Availability

Medium-Duty

- Variety of electric vehicles available
- New models becoming available, including vans and pickup trucks
- Certified conversions an option

Heavy-Duty

- Several EV and HEV makes and models available
- EV transit buses growing in popularity
- Regional haulers, refuse trucks, and yard tractors available



Source: https://caletc.com/wp-content/uploads/2019/12/ICF-Truck-Report_Final_December-2019.pdf

Vehicles: Conversions

- Provide options beyond what is standard from manufacturers
- Consider space and weight from added batteries and electric motors
- Conversions must meet vehicle standards



Infrastructure: Electric Vehicle Charging Infrastructure

Type of Charger	Current Type	Input Voltage (V)	Typical Charging Time	Primary Use
Level 1	Alternating Current (AC)	120 V	2–5 miles of range per hour of charging	Residential
Level 2	AC	208 V or 240 V	10–30 miles of range per hour of charging	Residential Commercial
DC Fast	Direct Current (DC)	208 V or 480 V	100–200 miles of range per 30 minutes of charging	Commercial
Wireless	AC	Varies	10–20 miles of range per hour of charging	Commercial



Infrastructure: Extreme Fast Charging

- Power outputs of up to 350 kW and higher
- New EV models will be able to charge at higher rates
- May provide up to 200 miles of charge in less than 10 minutes



Infrastructure: Connectors and Plugs

Type of Charger	Charging Standard
Level 1	SAE J1772 NEMA 5-15 NEMA 5-20
Level 2	SAE J1772
DC Fast	CHAdEMO CCS (SAE J1772 Combo) Tesla Supercharger
Wireless Charging	SAE J2954



Infrastructure: Charging at Home and in Public

Charging at Home

- Most charge overnight at home using a Level 1 outlet or installed Level 2 charging infrastructure
- Installation requires permitting and licensed contractors

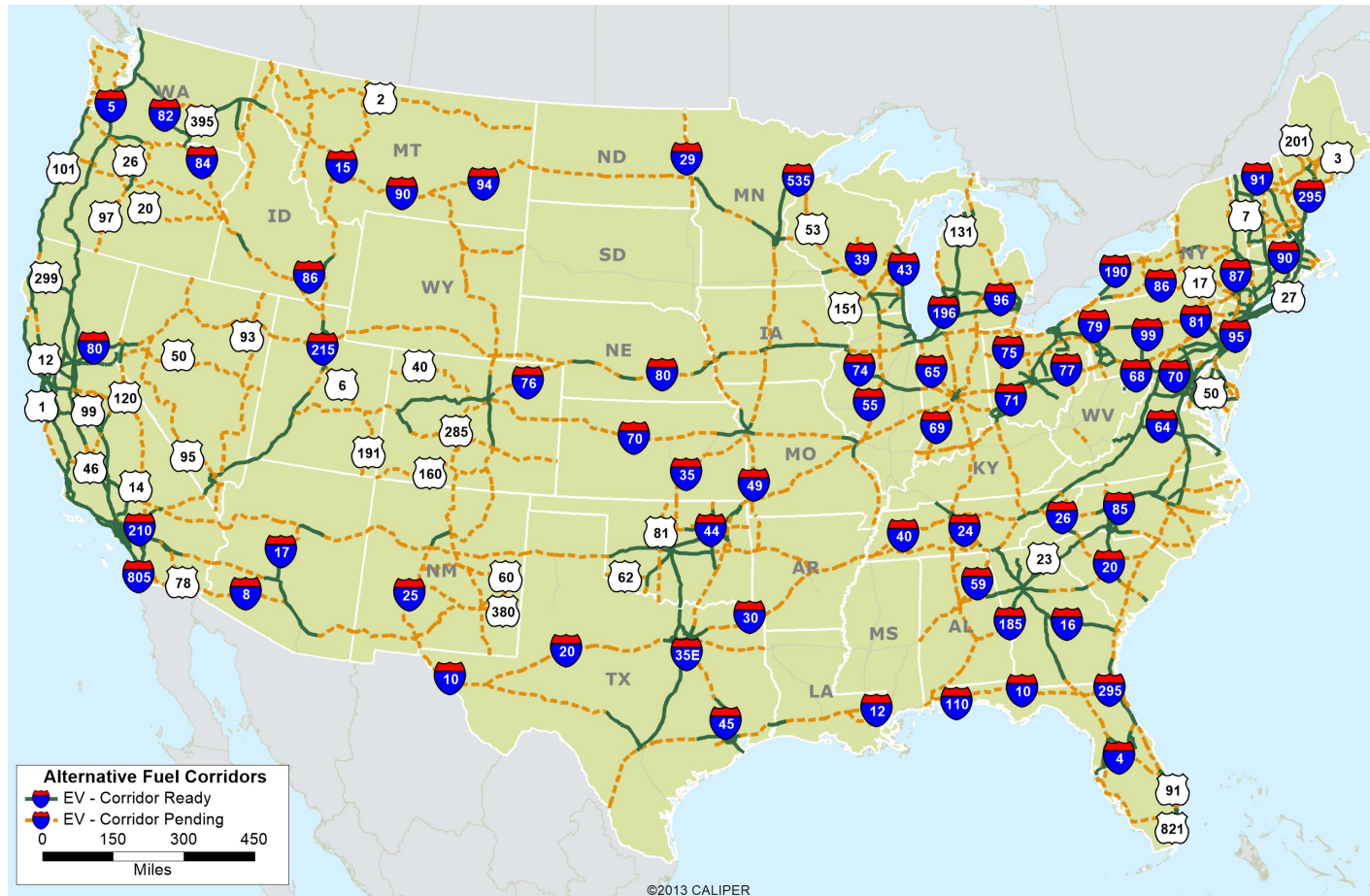
Charging in Public

- Increases vehicle range, especially for consumers in dense urban areas
- Ideal public charging locations include:
 - Workplaces or office buildings
 - Shopping centers
 - City parking lots
 - Airports
 - Hotels



Infrastructure: Alternative Fuel Corridors

Designated EV Corridors:



Other Considerations:

Maintenance and Safety

- PHEVs and HEVs have maintenance requirements like conventional vehicles
- EVs typically need less maintenance:
 - Battery, motor require little to no maintenance
 - Fewer fluids to change
 - Brake wear is reduced due to regenerative braking
 - Fewer moving parts
- Electric-drive vehicles must meet the same safety standards as conventional vehicles



Other Considerations: Tools

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 advance alternative fuels and energy-efficient vehicle technologies.



Calculators



EVI-Pro Lite

Estimate a city or state's need for vehicle charging and the effect on electric load.



AFLEET Tool

Calculate a fleet's petroleum use, cost of ownership, and emissions.



Vehicle Cost Calculator

Compare cost of ownership and emissions for most vehicle models. [mobile](#)



VICE Model

Evaluate the financial case for natural gas vehicles and battery electric buses.



JOBS Model

Estimate economic impacts of natural gas, hydrogen, or fuel cell infrastructure.



Heavy-Duty Vehicle Emissions

Calculate the emissions of alternative fuel medium- and heavy-duty vehicles.



Evolution: E-Drive Vehicle Education

Understand the costs and benefits of electric vehicles based on location.



Interactive Maps



Alternative Fueling Station Locator

Locate alternative fueling stations and get maps and driving directions. [mobile](#)



Alternative Fuel Corridors

Find maps and station data to help with nominating alternative fuel corridors.



TransAtlas

Analyze vehicle densities and locations of fueling stations and production facilities.



Biofuels Atlas

Compare feedstocks and analyze biofuel production by location.



Coalition Locations

Find Clean Cities coalitions and contact information for coordinators.



Data Searches



Vehicle Search

Compare all classes of 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.



Find a Car

Compare fuel efficiency, costs, carbon footprints, and emissions. [mobile](#)



State Information

Find state information about alternative fuels and advanced vehicles.

www.wicleancities.org

www.afdc.energy.gov/tools

Getting Started:

Questions to Ask

- What federal, state, and local incentives are available?
- What are my driving range needs?
- What type of EV is best for me?
- How and where will my EV be charged each day?
- What level of charging will I need?
- Are there charging stations in my area? Are they public or private? Can I visit?
- What support can my local Clean Cities coalition provide?
- **Helpful Resource:**
 - **The AFDC Laws and Incentives Search** provides information about available state and federal incentives for EVs and charging infrastructure.



Statewide Assistance for Energy Resiliency & Reliability (SAFER2)

- WCC in 2020 began the Statewide Assistance for Energy Resiliency and Reliability (SAFER2) grant program, assisting the [Wisconsin Office of Energy Innovation](#) (OEI) in developing a comprehensive statewide effort to improve energy emergency plans at the local level.
- As part of the program, Wisconsin Clean Cities provides in-depth fleet assessments and education/outreach to governments.
- Contact us to get involved & learn more



Drive Clean Rural USA



- Drive Clean Rural USA is engaging with government leaders, business owners, fleet managers and farmers to remove barriers and accelerate access to clean fuel solutions that deliver financial savings, clean air and economic opportunity to rural communities.
- This eight-state DOE-funded project focuses on alternative fuel options through technical assistance, clean fuel transition planning & demo vehicles with an emphasis on business & job growth.
- Contact us for details.



DRIVE Electric Wisconsin

- Drive Electric Wisconsin is part of DRIVE Electric USA, a partnership of U.S. Department of Energy Clean Cities coalitions working to significantly advance EV adoption in their states.
- The overarching goal of DRIVE Electric USA is to substantially increase EV adoption rates across consumer and fleet markets.
- The activities, outputs and outcomes in the project are built on seven priority areas of focused work.



WCC Projects & Programs



National Drive Electric Week™



Wisconsin Clean Cities



Lorrie Lisek

Executive Director

231 W Michigan, P321

Milwaukee, WI 53203

414-221-4958

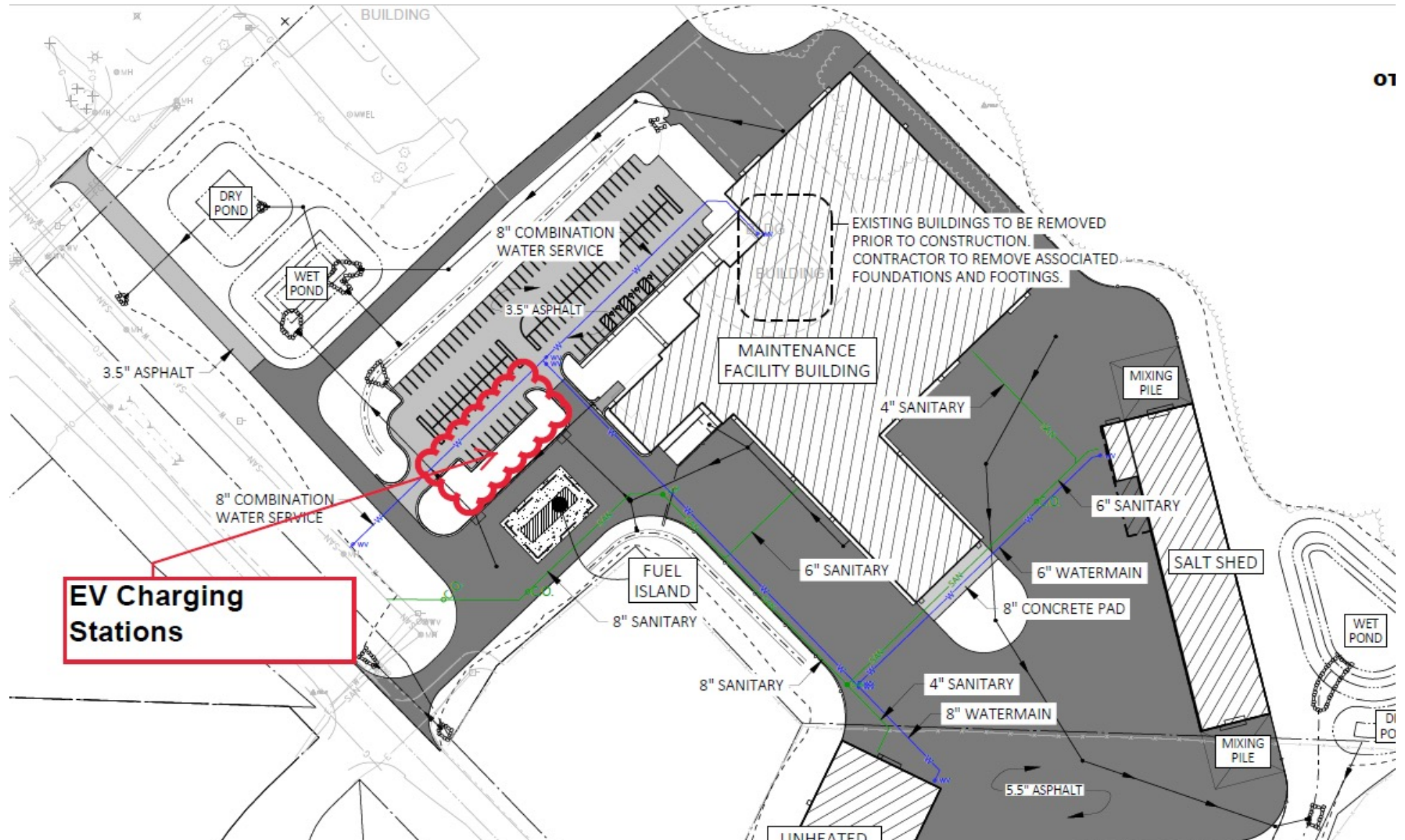
www.wicleancities.org

Thank You!

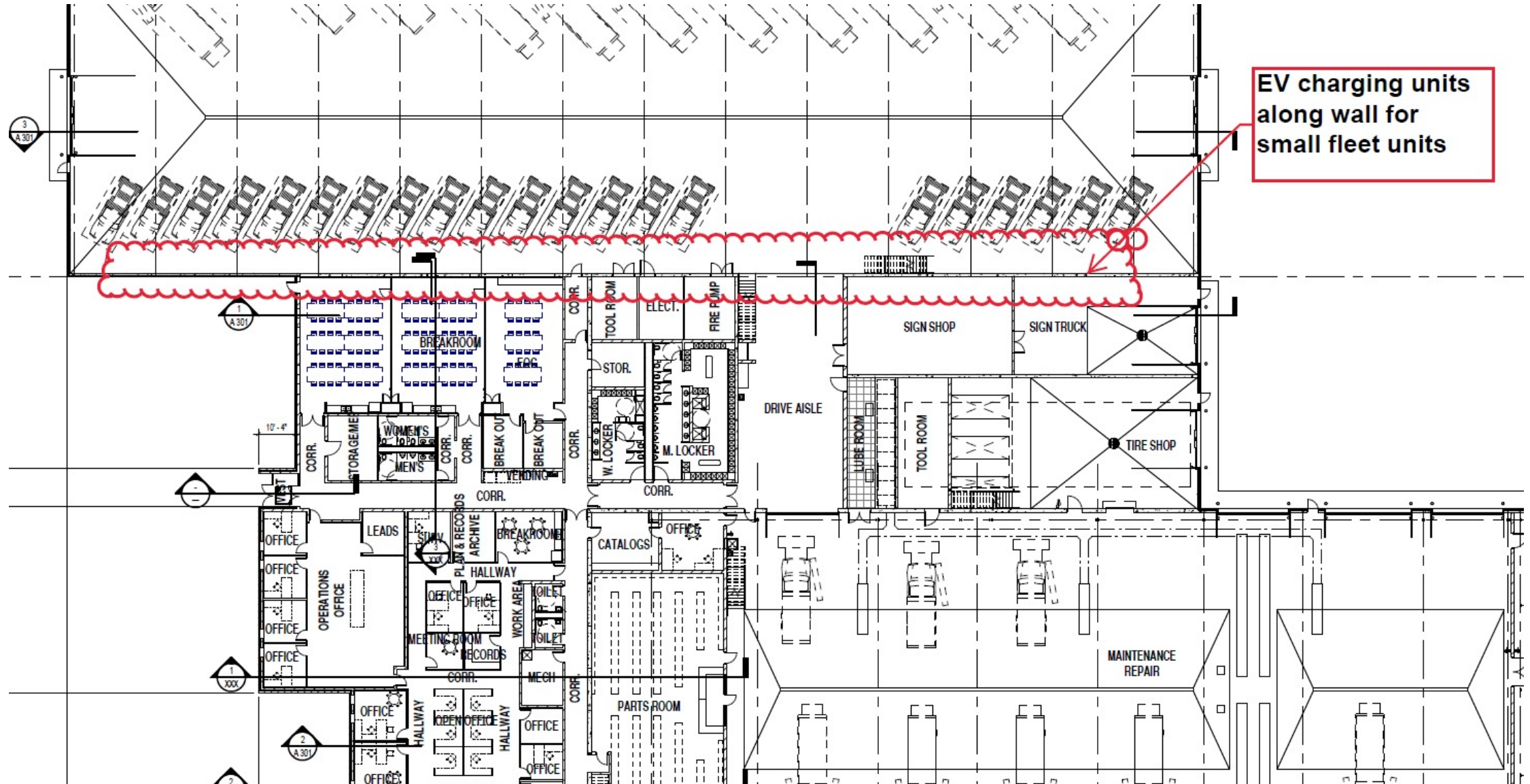
Eau Claire County Highway Facility

- Sustainable Energy Initiatives
 - EV Charging Stations
 - Solar Power Collection System
 - Geothermal

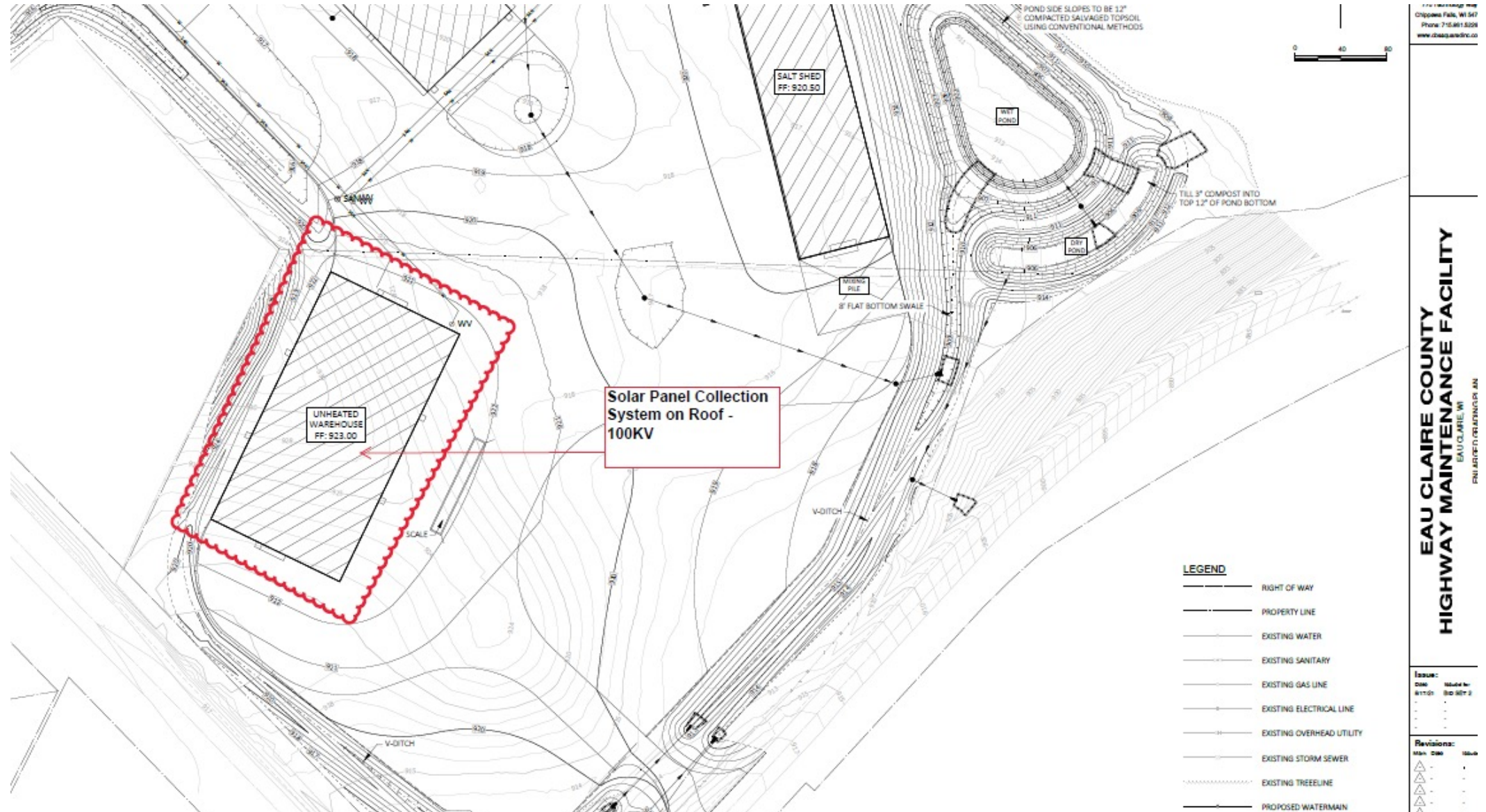
Eau Claire County Highway Facility



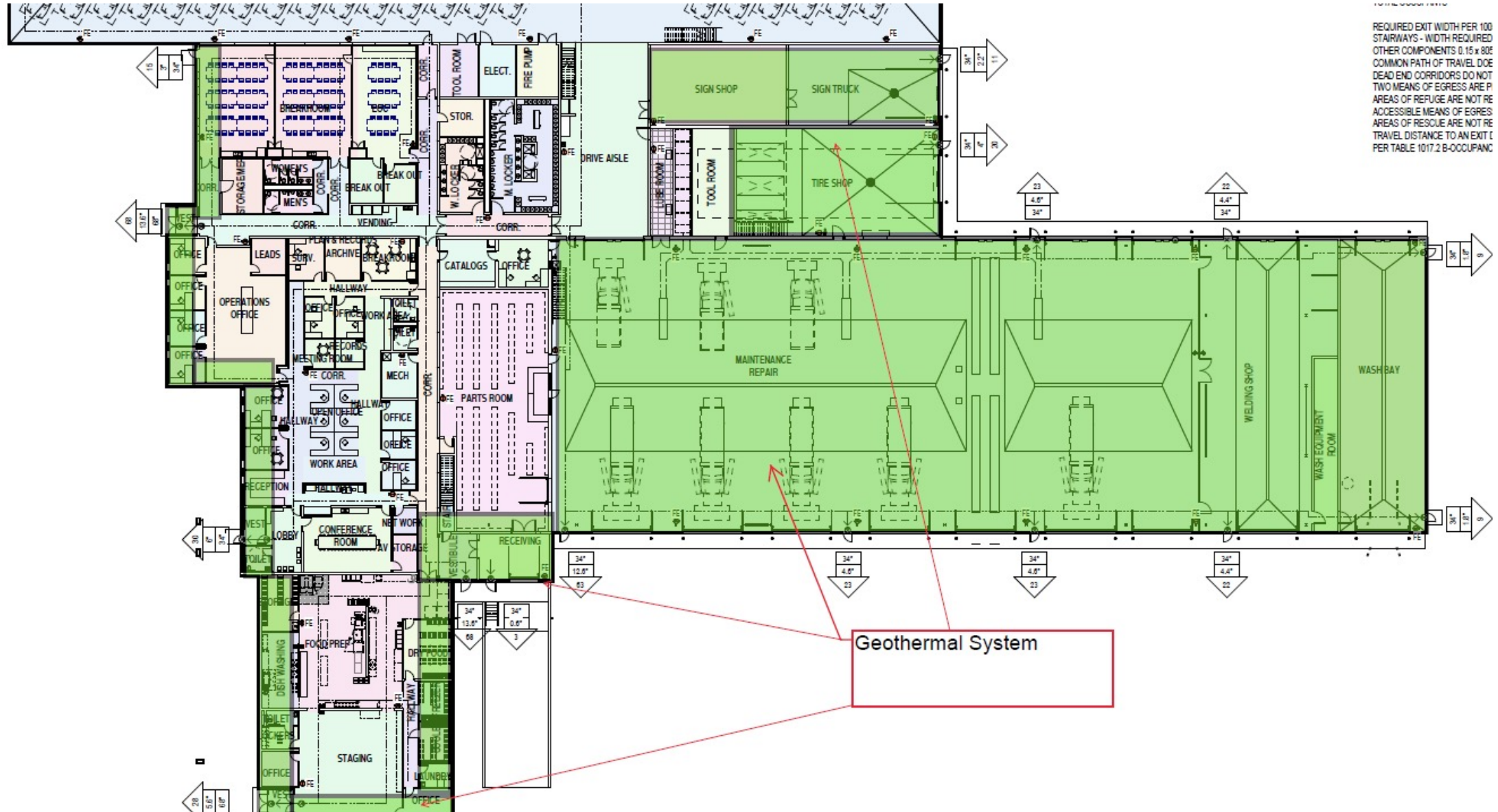
Eau Claire County Highway Facility



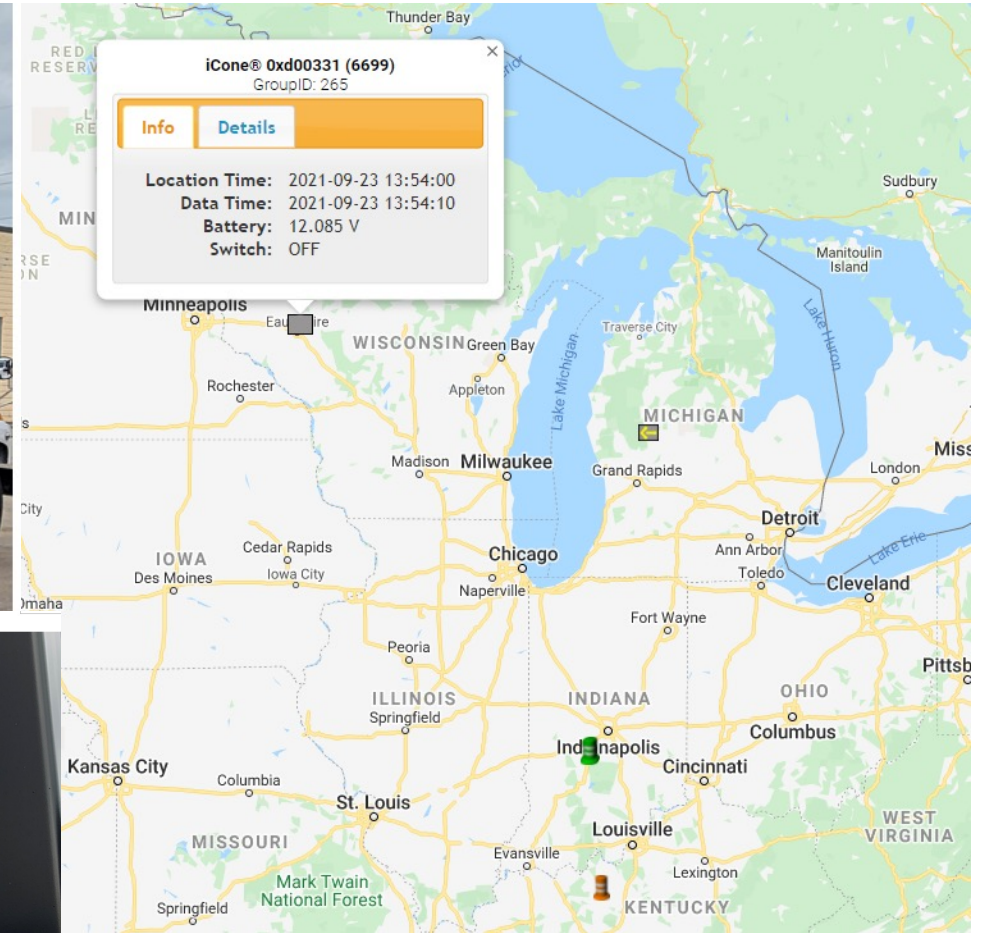
Eau Claire County Highway Facility



Eau Claire County Highway Facility



Eau Claire County Connected Vehicle WorkZones



Thank you

