

# Electric Vehicles and Charging Stations

Electrifying the Municipal Fleet, Promoting Electric Vehicles, and Deploying Charging Stations

Wednesday, April 28, 2021



ENVIRONMENTAL  
FINANCE CENTER



# Presenter

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<https://evadc.org/EVInfo>



# Agenda

- Electric Vehicle and Charging Overview
- Why is Vehicle Electrification Important?
  - Action: Electrifying the Municipal Fleet
  - Action: Residential Electric Vehicles and Public Charging Stations
- Who Should be Involved
- What To Do
- Submission Requirements
- Community Spotlight
- Resources and Tools



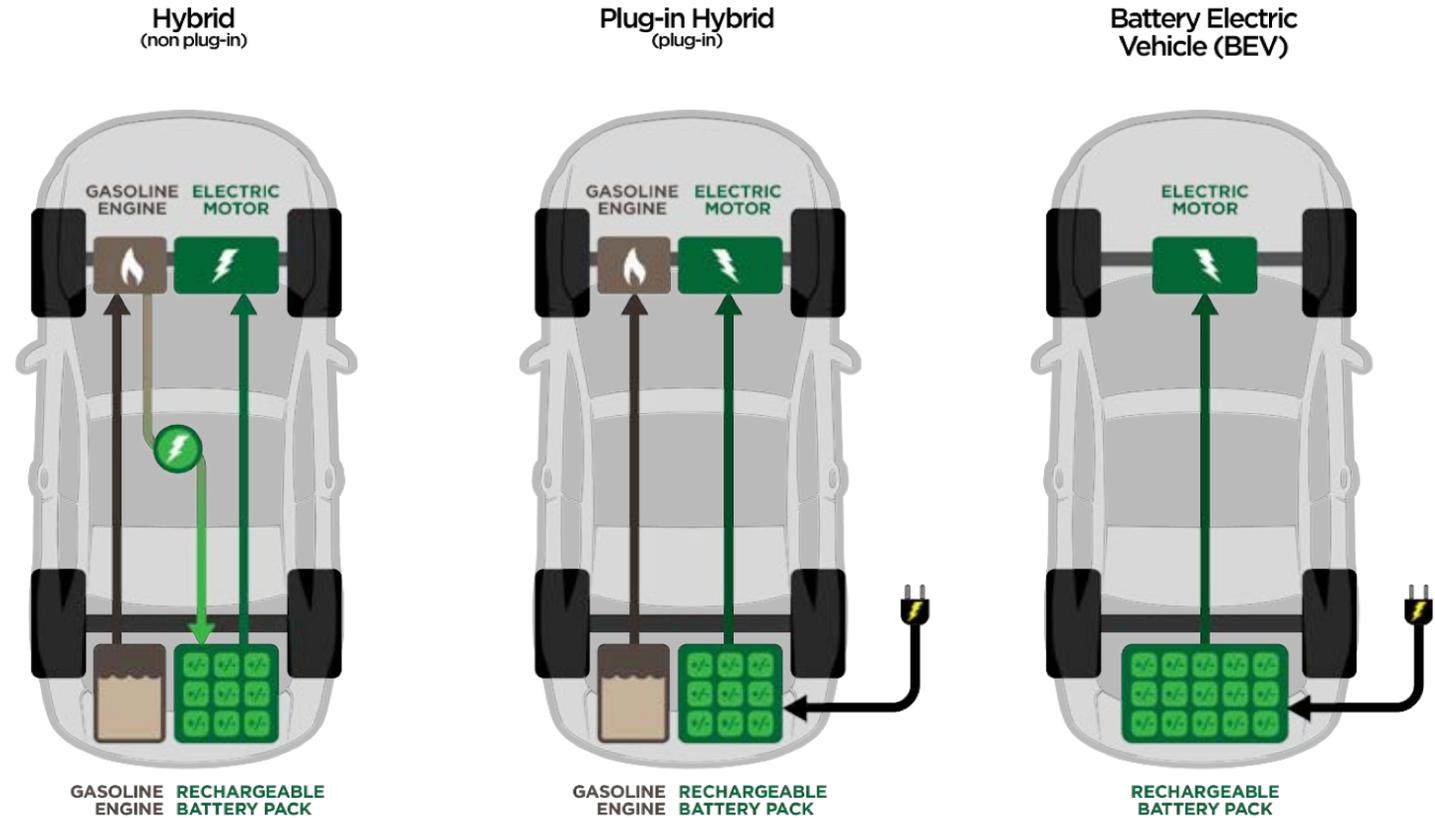
# Electric Vehicle and Charging Overview

- Types of Electrified Vehicles
- Electric Vehicle Benefits
- EV Charging Levels
- Heavy Duty Vehicles
- Climate and Health Benefits
- EVs and the Electric Grid



# Types of Electrified Vehicles

- General public often confused about vehicle electrification.
- Term and descriptions are not used consistently by all manufacturers.
- Electrified vehicles include hybrids.
- Electric vehicles (EVs) have a plug.



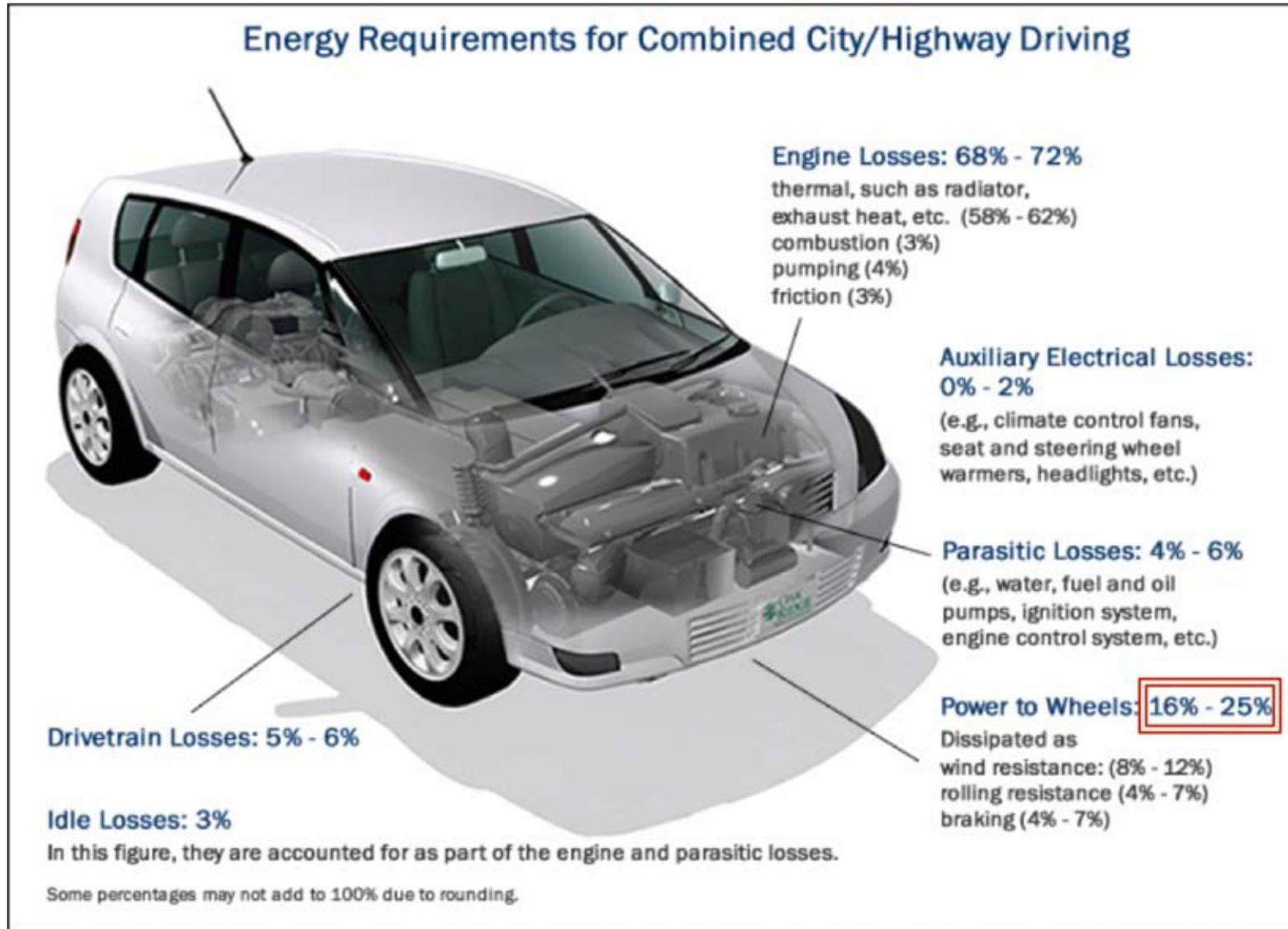
# Electric Vehicle Benefits

- Much lower fuel and operating costs:
  - EVs - 3 to 4 cents per mile, Gasoline - 5 to 30 cents per mile
- Cleaner, No toxic gasoline fumes
- Low maintenance - Mostly just tire rotation, brakes & wiper fluid
  - No tune ups, no oil changes, no exhaust system repairs
- Instant torque results in very good to fantastic acceleration.
  - Quiet and fun to drive, Can be a safety advantage: i.e. merging into traffic
- Regenerative Braking
  - EVs capture energy when braking that gasoline cars lose to heat and friction
  - This extends the life of brakes, resulting in less maintenance



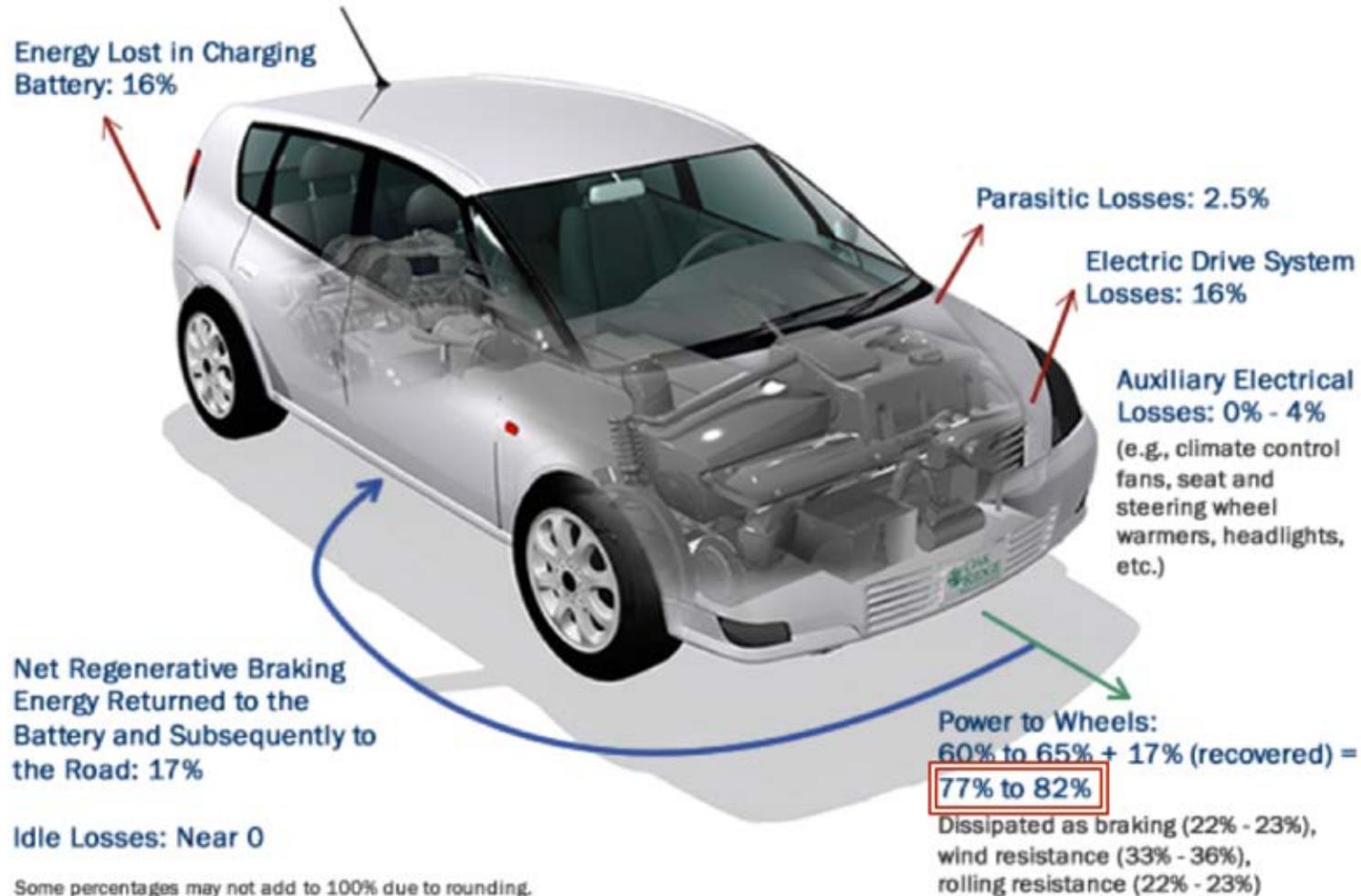
# Electric Vehicle Benefits – ICE Efficiency

ICE:  
Internal  
Combustion  
Engine



# Electric Vehicle Benefits – EV Efficiency

## Energy Requirements for Combined City/Highway Driving - Electric Vehicles



# EV Charging Levels

	Level 1	Level 2	Level 3
Description	Common outlet	Requires “EV Charger” or EVSE (Electric Vehicle Service Equipment)	DC Fast Charging
Plug Type	J1772	J1772	CHAdEMO, CSS, Tesla
Electrical	110/120 Volts 15 Amps	240 Volts Amps 15 to 80	High Voltage DC, Specifics Vary
Miles / Charge	3 to 5 miles per hour	For most EVs between 12 to 46 miles of range per hour	50 to 200 miles per 30 minutes

**J1772 Plug**



**DC FastCharge Plugs**



CHAdEMO



SAE Combo (CCS)



Tesla Supercharger



# Heavy Duty Vehicles

- Large heavy-duty vehicles are candidates for electrification
- Seattle, WA Adds First Class 8 Garbage Truck to its fleet (Spring 2019)

Recology's BYD 8R, the first electric rear-loading class 8 garbage truck in the US.

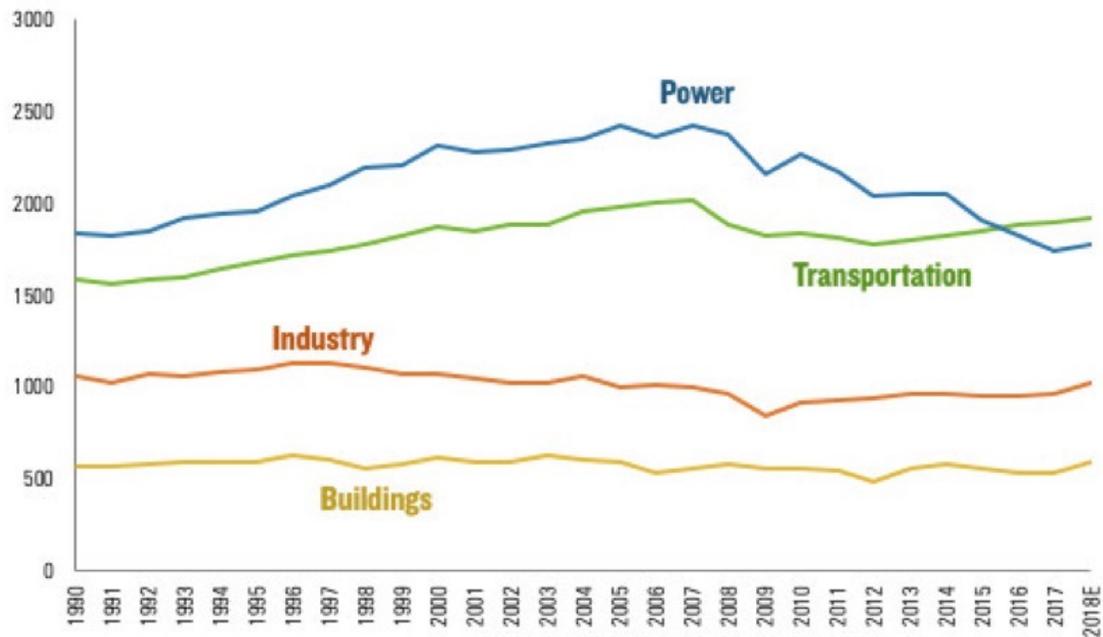


# Climate and Health Benefits

- Electrification Is Key To Reducing Transportation Sector CO<sub>2</sub>
- Research is showing that air pollution is much worse than we thought.

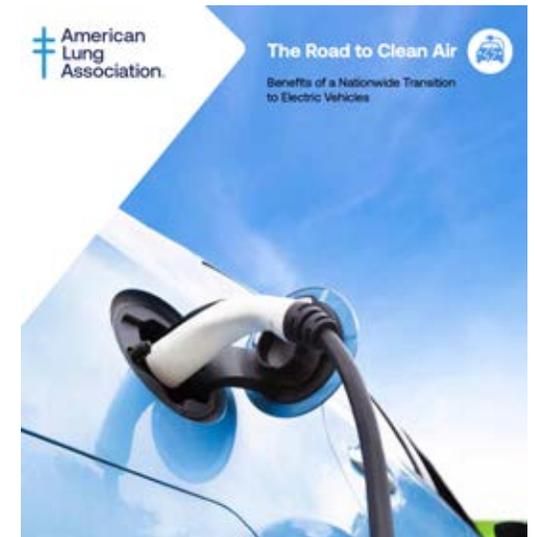
Figure 4: Energy-related CO<sub>2</sub> emissions by sector

Million metric tons



Source: Rhodium US Climate Service

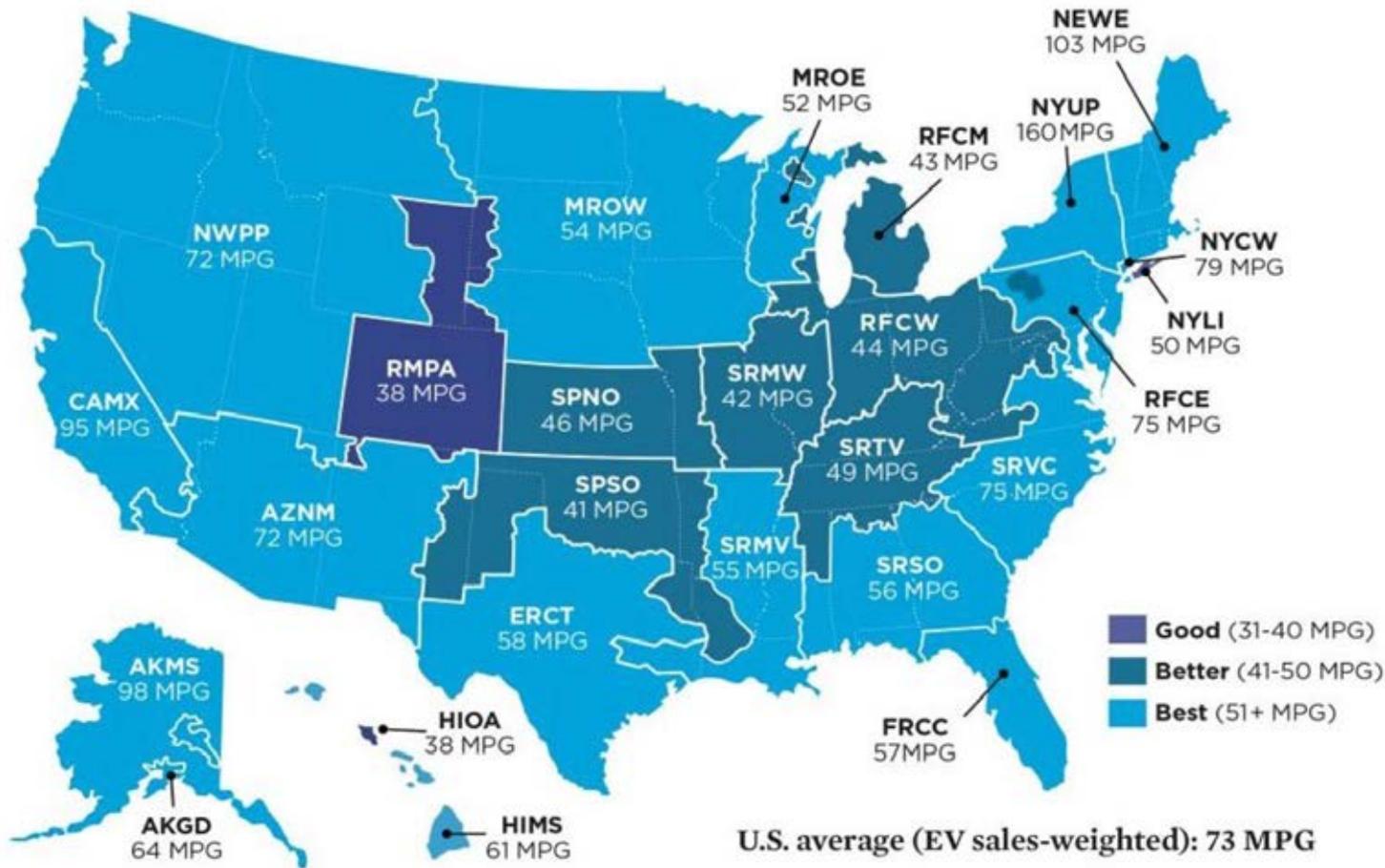
A VISION FOR CLIMATE LEADERSHIP  
IN WASHINGTON, DC  
Seizing the Economic, Climate, and Public Health Benefits of  
Electrifying WMATA's Transit Bus Fleet



See <https://evadc.org/EVPapers>  
for links to the above.



# EVs and the Electric Grid - 2014



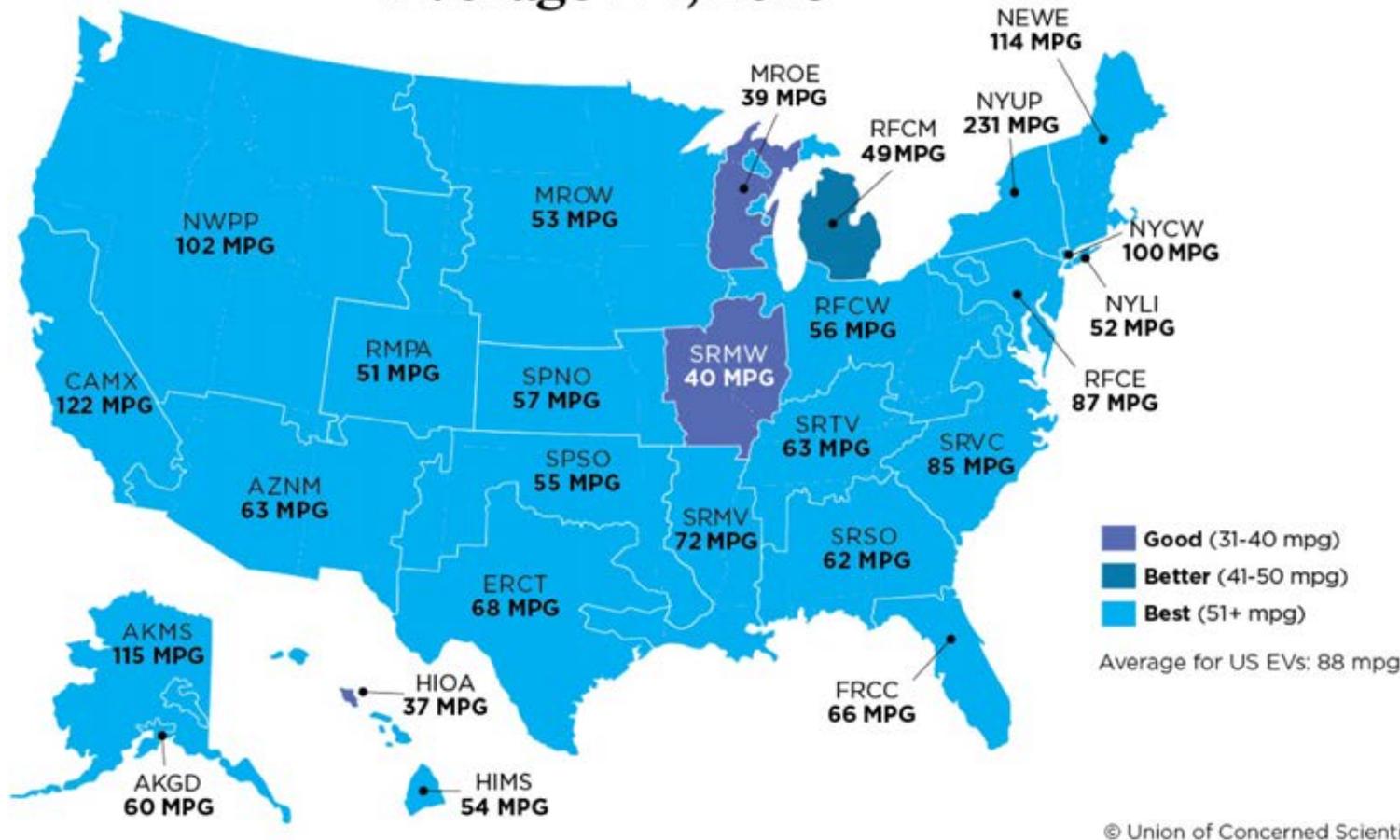
MPG, by region, needed for a gasoline vehicle to match an EV charged from the grid in 2014.

Note: The MPG (miles per gallon) value listed for each region is the combined city/highway fuel economy rating of a gasoline vehicle that would have global warming emissions equivalent to driving an EV. Regional global warming emissions ratings are based on 2014 power plant data in the EPA's eGRID 2014 database (the most recent version). Comparisons include gasoline and electricity fuel production emissions. The 73 MPG U.S. average is a sales-weighted average based on where EVs were sold in 2016.



# EVs and the Electric Grid - 2018

## EV Emissions as Gasoline MPG Equivalent Average EV, 2018



Just 4 years later in 2018, EVs are much cleaner!

An EV gets cleaner as the grid gets cleaner.



# Why is Vehicle Electrification Important?

- Electrifying the Municipal Fleet
  - Objective: To transition the municipal fleet to Electric Vehicles (EV).
  - Secondary Objective: Lead by Example
- Residential Electric Vehicles and Public Charging Stations
  - Objective: To promote Electric Vehicle (EV) use in a community by educating residents about the benefits of EVs and/or providing publicly available charging.
- Together these actions provide sustainability and co-benefits:
  - Reduce smog and particulate air pollution, resulting in a positive impact on air quality and public health
  - Reduce maintenance and fuel costs
  - Reduce greenhouse gas emissions
  - Promote the mass adoption of EV ownership, thus reducing the cost of EV technology



# Who Should Be Involved

- Vehicle electrification efforts will require multiple groups and participants.
- Outreach and education to residents:
  - Communications staff and/or Green Teams to organize EV related events
  - EV advocacy groups to provide educational and outreach opportunities
  - Local automobile dealerships to feature electric vehicle models at events
- Buying, maintaining, and planning for vehicles and charging stations:
  - Elected officials for approval and budgeting
  - Accounts payable and/or procurement specialists
  - Electric vehicle/charging station retailers
  - DPW staff to maintain vehicles and stations
  - Departments/staff that will be using the vehicles

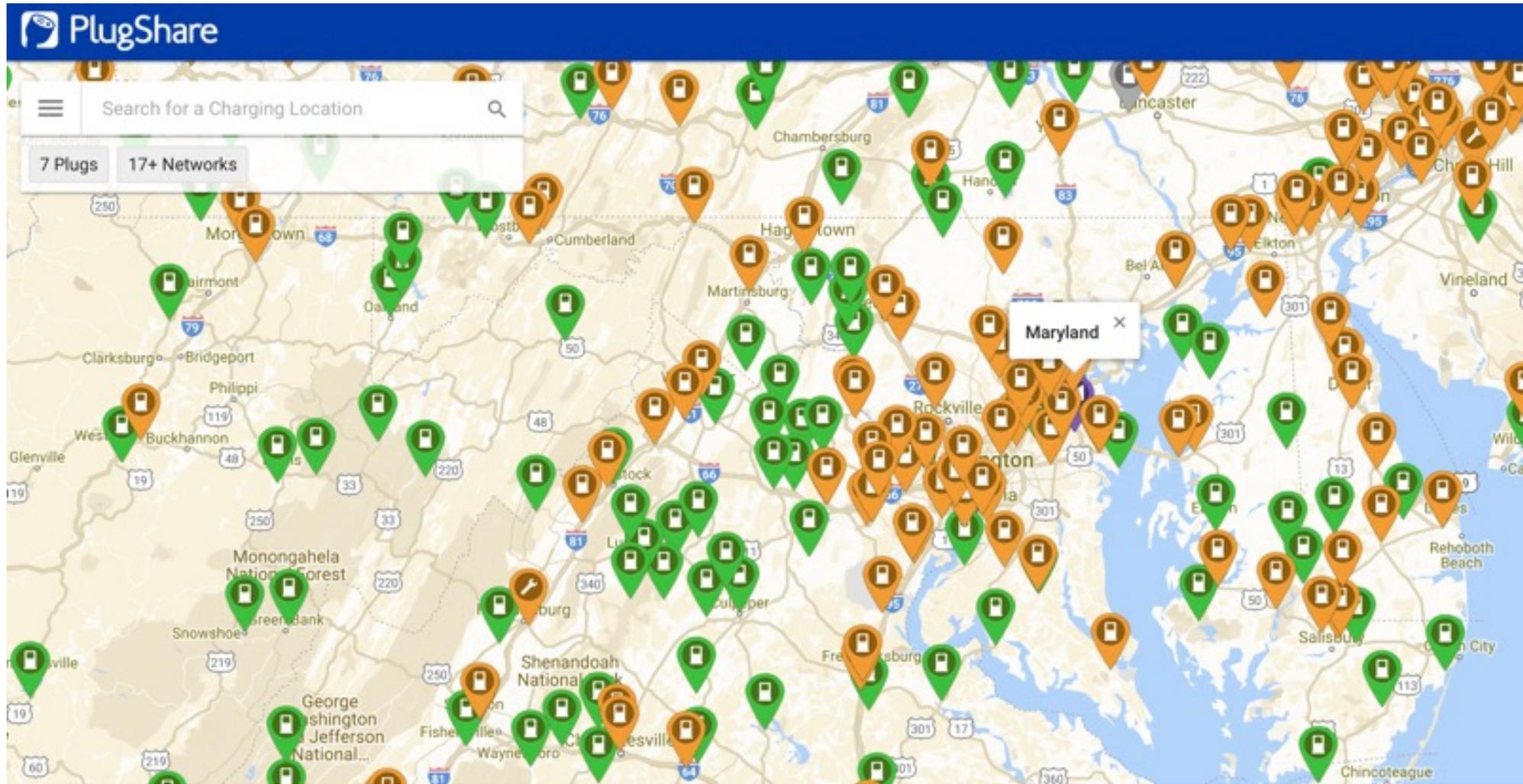


# What To Do - Residential EVs, Public Charging

- Conduct Electric Vehicle Outreach and Education
  - Develop/Find Materials – Handouts, Guides, Flyers
  - Events – Getting people to see and experience EVs is key
  - Webinars – Reach the public, usually virtual, with background and technical info
- Install Public EV Charging Stations
  - Needs Assessment
  - Develop a Plan
  - Quotes, Budgeting
  - Purchase and installation
- Challenges and Pitfalls
  - Resistance to change, Not Considering Lifecycle Costs and Co-Benefits



# What To Do – Finding Public Charging



# What To Do - Electrifying the Municipal Fleet

- Conduct an inventory of the municipal fleet and calculate annual fuel usage
- Create a policy for municipal fleet operators to consider EV purchases/leases
  - Develop an EV adoption goal
  - Include life cycle considerations
  - You will likely need different plans for different types of vehicles
- Develop an EV Charging Plan for municipal vehicles.
  - Determine where the municipal charging stations will be located
  - Determine what level charging will be required for municipal needs
  - Participate in procurement process; Applying for grants
  - Determine if charging stations will be accessible only for government operations or if they will be made available for public use
- Purchase and install electric vehicles and infrastructure
- Promote your actions to the public
- Challenges and Pitfalls
  - Resistance to change, Not Considering Lifecycle Costs and Co-Benefits



# Submission Requirements

- Electrifying the Municipal Fleet
  - Purchase or maintenance of electric vehicles and charging stations in the past year.
  - Supporting documentation: Specifications and metrics on electric vehicles and chargers; At least one example of promotional materials
  - Points: 5 points for 25% or less electrified fleet; 10 points for 25% -50% electrified fleet; and 15 points for 75%-100% electrified fleet.
- Residential Electric Vehicles and Public Charging Stations
  - Promotion of the benefits of electric vehicles to residents and/or purchased or maintained use of publicly available charging stations in the past year.
  - Supporting documentation: Information and photos of charging stations; At least two examples of promotional materials
  - Points: 5 points for educational outreach; 10 points for installing and promoting publicly available EV charging stations.



# Community Spotlight

- Frederick, MD
  - Created an EV Charging Plan in 2018

## Plug-In Electric Vehicle Charging Infrastructure Implementation Plan for the City of Frederick

<https://www.cityoffrederickmd.gov/DocumentCenter/View/10005/18-04-Concerning-the-Adoption-of-a-Plug-in-Electric-Vehicle-Charging-Infrastructure-Implementation-Plan>

- Hyattsville, MD
  - Deployed electric police vehicles in 2018
  - <https://www.hyattsville.org/733/Electric-Police-Vehicles>



# Resources and Tools

- The actions will include links to various resources.
- One example is Cooperative Purchasing via MWCOG contracts
  - <https://www.mwcog.org/purchasing-and-bids/cooperative-purchasing/>
- There are many grants available.
- As communities commit to these actions, more examples and lessons learned will be available to others.
- The Federal Government is expected to make a big push around EVs and EV infrastructure. Plan now so your municipality is ready to take advantage of opportunities.



# Questions

## EV Questions

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## Sustainable Maryland Questions

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Make/Model	MSRP	Price Range	Range	Power
BMW i3	\$41,000	\$37,900 - \$44,000	124	150
BMW i8	\$84,400	\$84,400	299	355
BMW iX	\$77,400	\$77,400	300	355
BMW i4	\$53,400	\$53,400	270	355
BMW i7	\$135,400	\$135,400	500	523
BMW i5	\$54,400	\$54,400	286	355
BMW iX1	\$43,400	\$43,400	160	150
BMW iX3	\$41,400	\$41,400	150	150
BMW i4 M50	\$63,400	\$63,400	270	355
BMW i5 M50	\$63,400	\$63,400	270	355
BMW i7 M50	\$135,400	\$135,400	500	523
BMW iX M50	\$84,400	\$84,400	299	355
BMW i4 M50i	\$63,400	\$63,400	270	355
BMW i5 M50i	\$63,400	\$63,400	270	355
BMW i7 M50i	\$135,400	\$135,400	500	523
BMW iX M50i	\$84,400	\$84,400	299	355
BMW i4 M50e	\$63,400	\$63,400	270	355
BMW i5 M50e	\$63,400	\$63,400	270	355
BMW i7 M50e	\$135,400	\$135,400	500	523
BMW iX M50e	\$84,400	\$84,400	299	355
BMW i4 M50x	\$63,400	\$63,400	270	355
BMW i5 M50x	\$63,400	\$63,400	270	355
BMW i7 M50x	\$135,400	\$135,400	500	523
BMW iX M50x	\$84,400	\$84,400	299	355
BMW i4 M50y	\$63,400	\$63,400	270	355
BMW i5 M50y	\$63,400	\$63,400	270	355
BMW i7 M50y	\$135,400	\$135,400	500	523
BMW iX M50y	\$84,400	\$84,400	299	355

EV Info Sheet and more:  
<https://evadc.org/EVInfo>



First Wednesday of Each Month:  
<https://evadc.org/Ask>

