

EV Readiness Insights for PRTPO Work Program

PRTPO Executive Board Meeting June 18, 2021



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EV Readiness Resources for the Peninsula Region

Go to:

<https://www.prtpo.org/ev-resources>

Local Agency Documents

EV Studies or Plans

Integrating EVs into a City Fleet: Final Internship Report for City of Sequim, June 2020

Transportation Innovations: Preparing for Electric Vehicles and Connected Autonomous Vehicles Plan - CVWCOG, June 2020

Municipal Codes

Electric Vehicle Infrastructure - Sequim

Demand, Forecast, or Feasibility Analysis

City Vehicles Suitable for AVF Replacement - Sequim, Nov 2020
EV Charging Implementation in Grays Harbor - Issue Report (4.2019)

Agreements

Interlocal Agreement b/w City of Sequim and Clallam County PUD 1

State Plans and Strategies

Planning Strategies & Tools for Highway Corridor ZEV

Infrastructure - Nov 2020

Electrification Assessment of Public Vehicles in Washington - Nov2020

WA State EV Action Plan 2015-2020

Prior EVIPP Proposals

US 101 South

Pacific County EDC 2017 Application Packet

US 101 North

NODC 2017 EVIPP Proposal Write-up

NODC Letters of Support - 2017 EVIPP Proposal

2017 EVIPP Budget Worksheet

Other Resources

ChargEVal - Tool for Evaluating Charging Network Changes - Nov 2020

ChargEVal Website and Documentation

Electric Truck Bootcamp Webinar Series, Through August

Business Models for Financially Sustainable EV Charging Networks - 2015, JTC Study

Federally Recognized EV Charging Corridors - map

EV Funding Resources

Green Transportation Capital Grants - WSDOT

Public transit agencies are eligible. Biennial process. Next call for projects in 2022.

Zero Emission Vehicles Infrastructure Partnerships - WSDOT

Local, state, tribal governments and non-profits are eligible. Next call for projects anticipated in 2021.

Regional Mobility Grants - WSDOT

Public transit agencies are eligible. Biennial process. Next call for projects in 2022.

Clean Energy Fund - Grid Modernization Grants - Dept. of Commerce

Retail electric utility providers are eligible. Special priority on projects that address tribal system needs or those of vulnerable populations. PROPOSALS DUE MAY 18, 2021.

Volkswagen Enforcement Action Grants - Dept. of Ecology

Eligible entities and activities based on each grant program. No calls for projects are currently scheduled.

Low or No Emissions Vehicle Program 5339(c) - Federal Transit Admin.

Public transit agencies. Annual program is currently closed.

Presentation Overview

1. Electromobility 101
2. Benefits of EVs
3. EV Adoption Forecasts
4. Emerging Trends in Electromobility
5. EV Charger Funding Opportunity

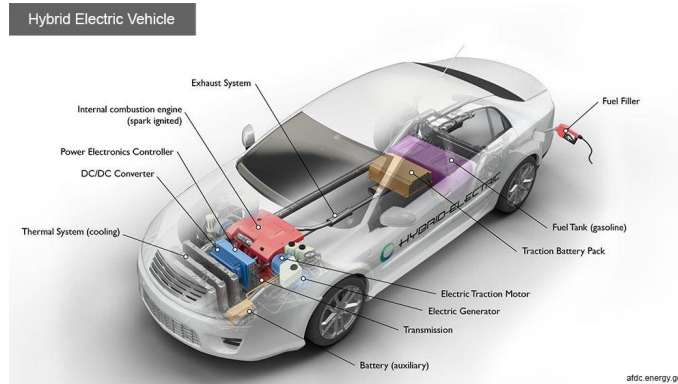
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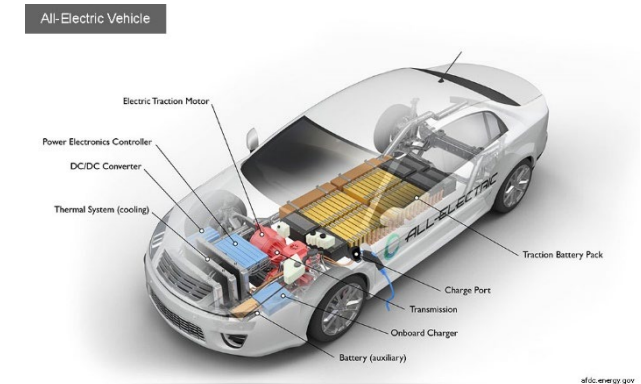


Electromobility 101: EV Types

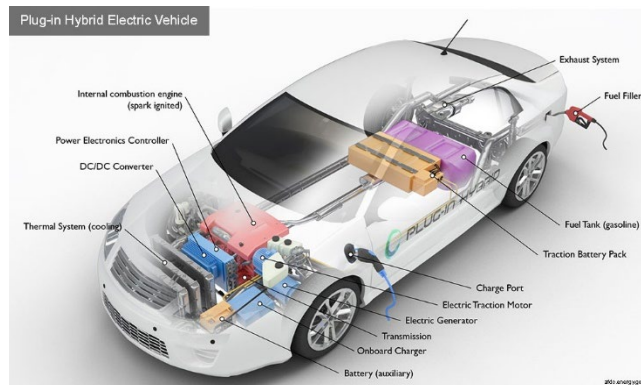
Hybrid electric vehicles (HEVs)



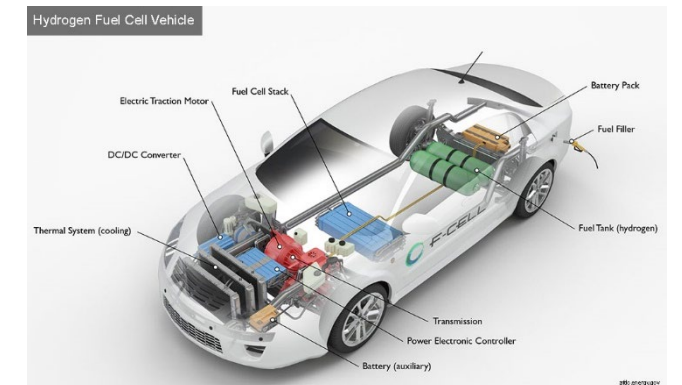
Battery Electric Vehicles (BEVs)



Plug-in hybrid electric vehicles (PHEVs)



Fuel Cell Electric Vehicles (FCEVs)



Electromobility 101: EV Charging

KNOW YOUR EV CHARGING STATIONS

AC Level One



VOLTAGE

120v 1-Phase AC

AMPS

12–16 Amps

CHARGING LOADS

1.4 to 1.9 kW

CHARGE TIME FOR VEHICLE

3–5 Miles of Range Per Hour

AC Level Two



VOLTAGE

208V or 240V 1-Phase AC

AMPS

12–80 Amps (Typ. 32 Amps)

CHARGING LOADS

2.5 to 19.2 kW (Typ. 7 kW)

CHARGE TIME FOR VEHICLE

10–20 Miles of Range Per Hour

DC Fast Charge



VOLTAGE

208V or 480V 3-Phase AC

AMPS

<125 Amps (Typ. 60 Amps)

CHARGING LOADS

<90 kW (Typ. 50 kW)

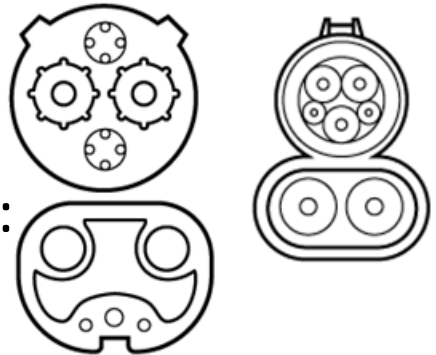
CHARGE TIME FOR VEHICLE

80% Charge in 20–30 Minutes

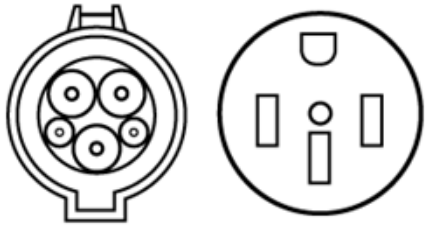
Electromobility 101: EV Charging Types

The Charging Pyramid

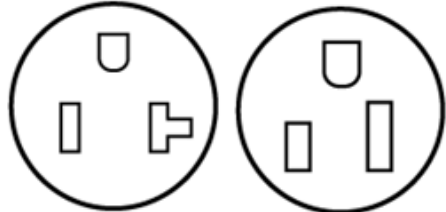
Power Level	Vehicle Dwell Time	Cost to Charge
DC Fast Charging	<i>Travel</i> 20 min	\$\$\$\$
High Power AC	<i>Public</i> 0.5 - 3 hours	\$\$\$
Mid Power AC	<i>Workplace</i> 4 - 8 hours	\$\$
Low Power AC	<i>Residential</i> 8 - 10 hours	\$



DCC Fast Charging:



Level 2 Charging:



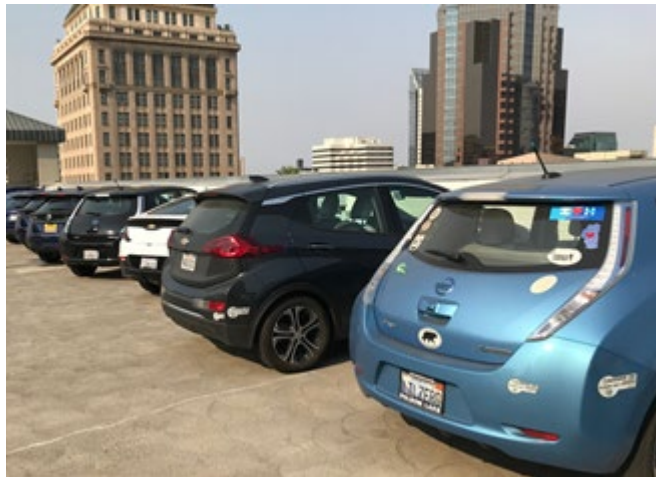
Level 1 Charging:

Electromobility 101: Charging Applications



CHARGING APPLICATIONS

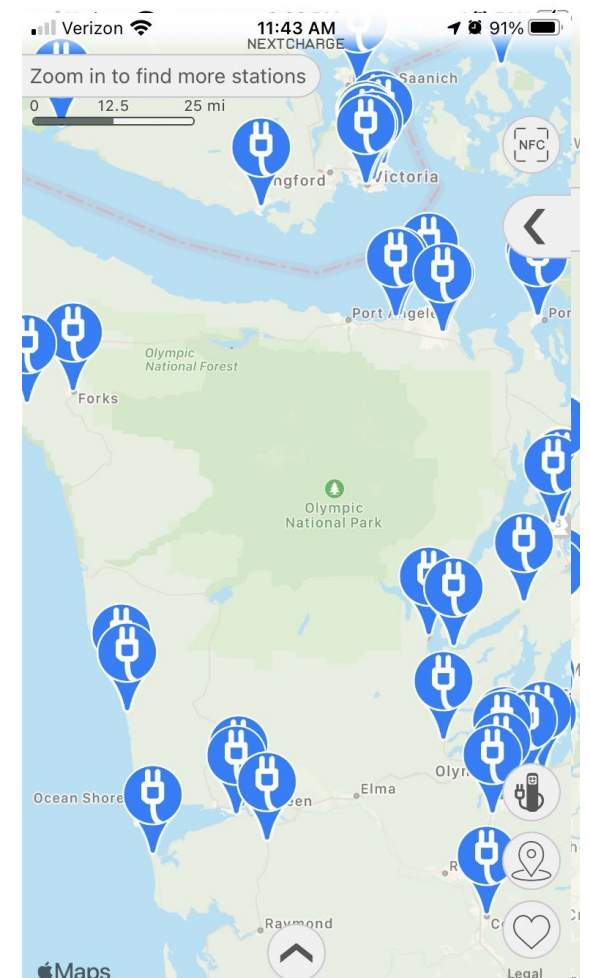
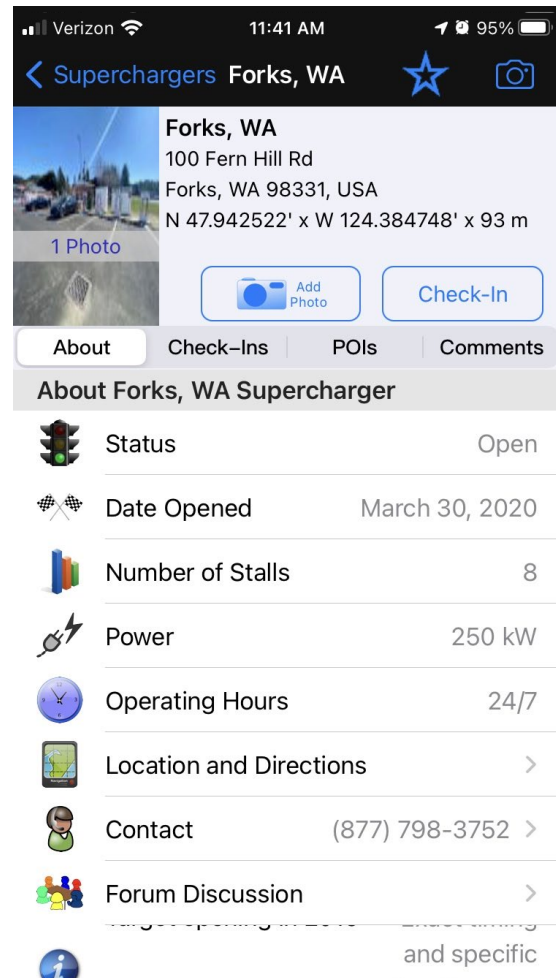
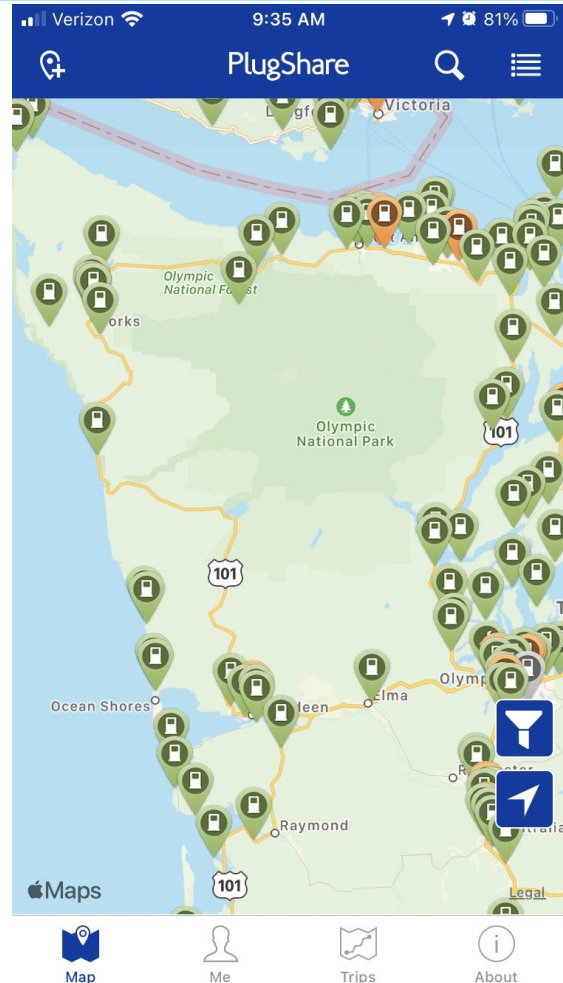
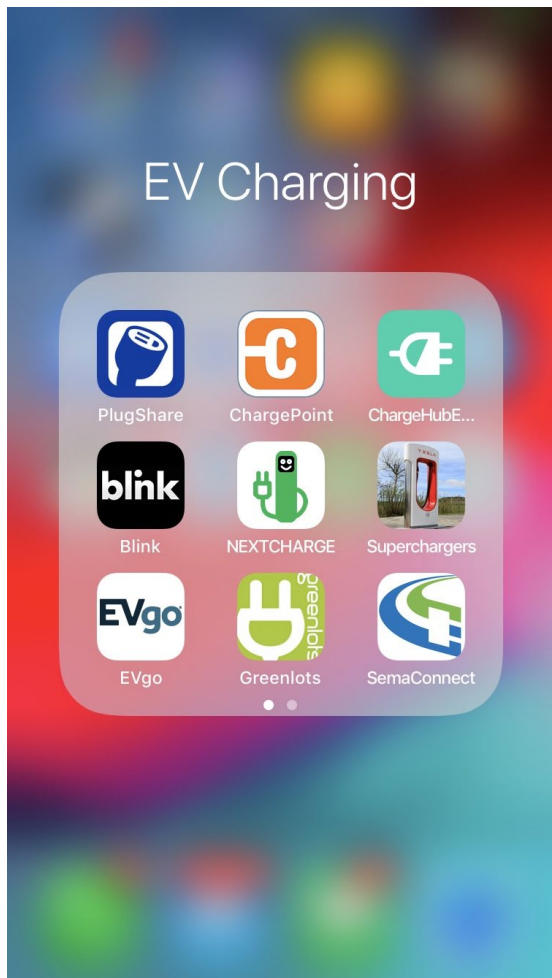
- Residential
- Workplace
- Opportunity
- Destination
- Fleet



WEST COAST
ELECTRIC
HIGHWAY



Electromobility 101: EV Charging Apps

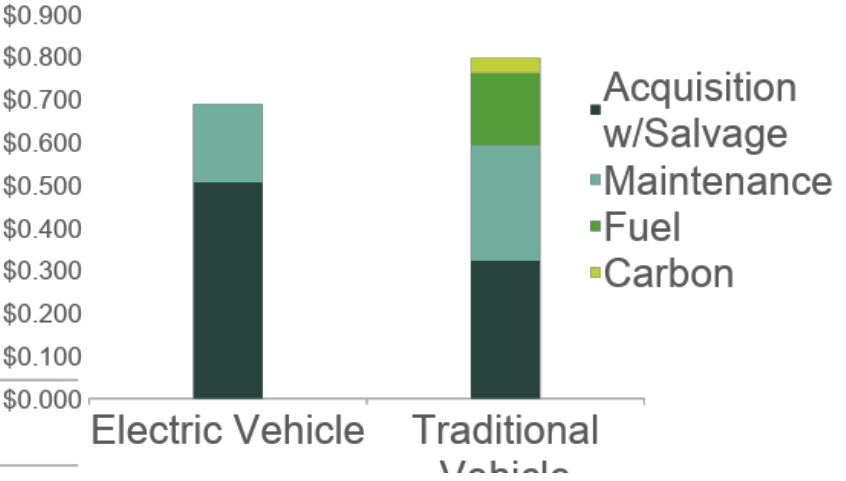
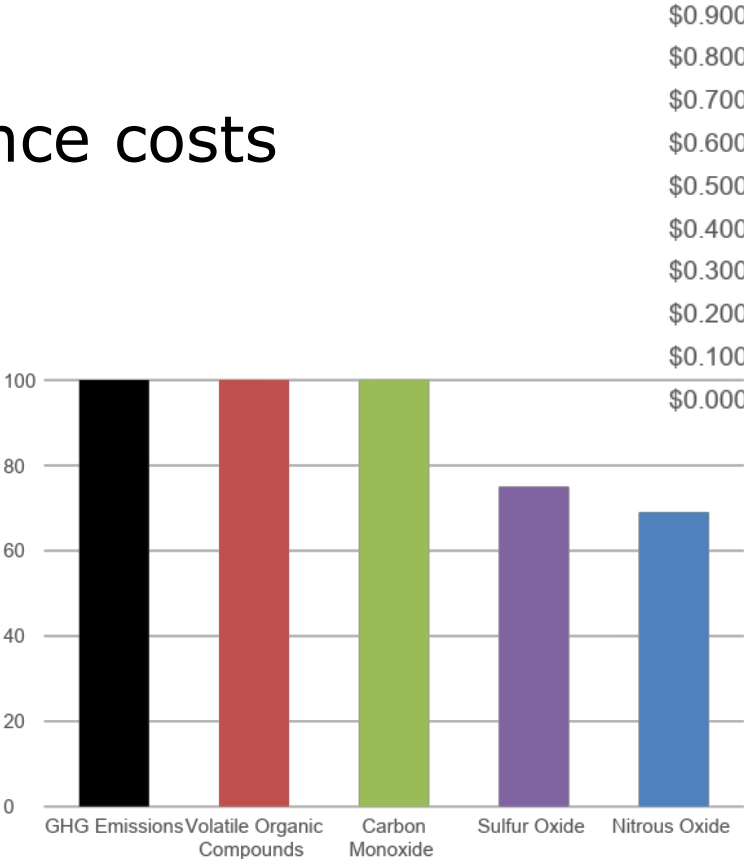
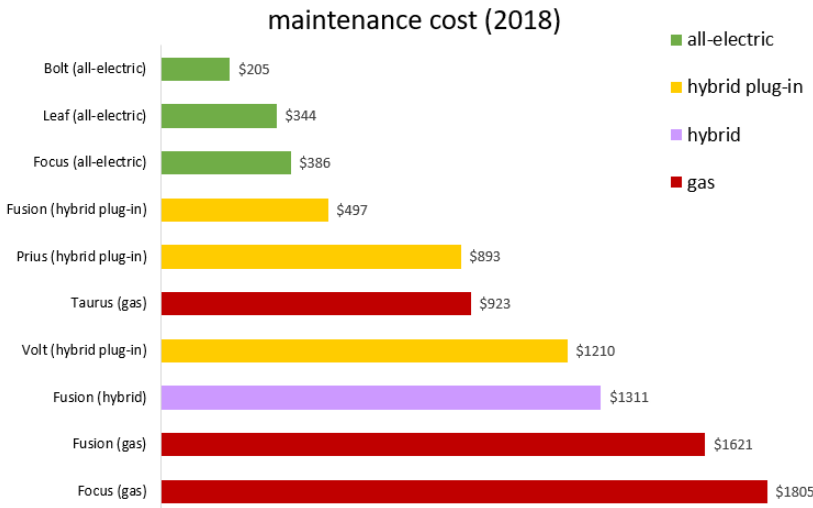


Presentation Overview

1. Electromobility 101
2. Benefits of EVs
3. EV Adoption Forecasts
4. Emerging Trends in Electromobility
5. EV Charger Funding Opportunity

Benefits of EVs

- Lower Emissions
- Reduced Fuel & Maintenance costs
- Superior performance

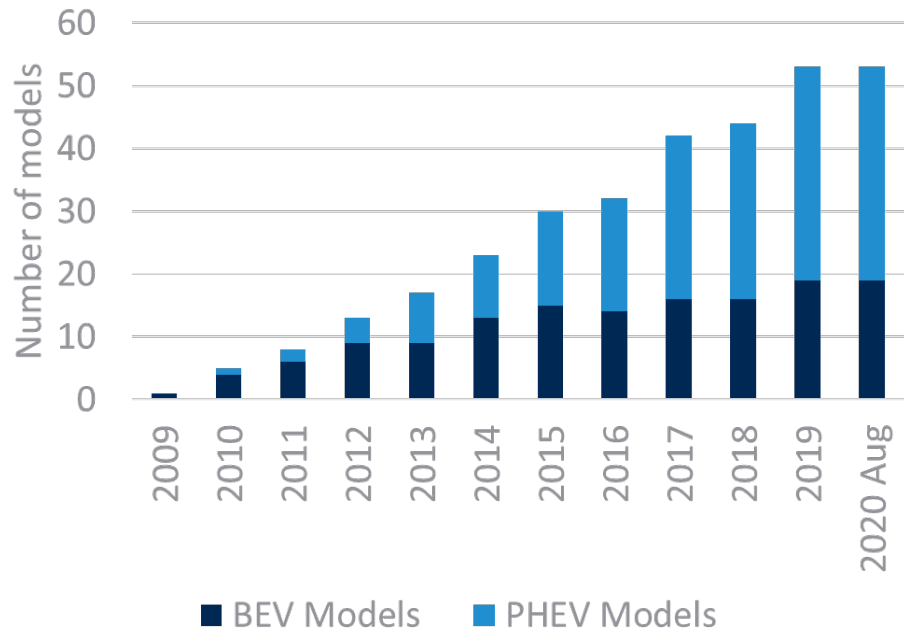


Presentation Overview

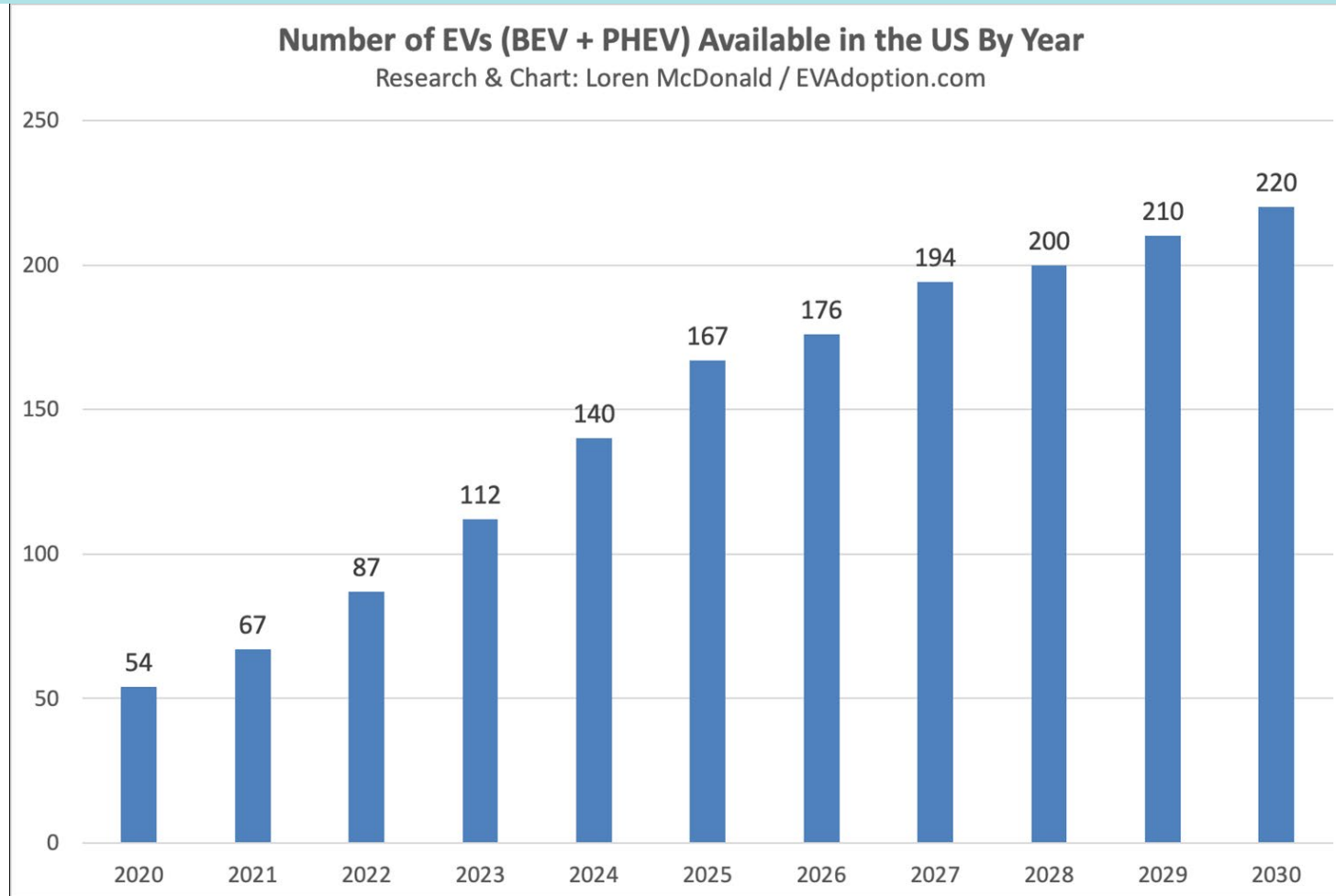
1. Electromobility 101
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4. Emerging Trends in Electromobility
5. Project Needs

EV Adoption Forecasts: Increased EV choice

1. Recent sales data
2. Future projections

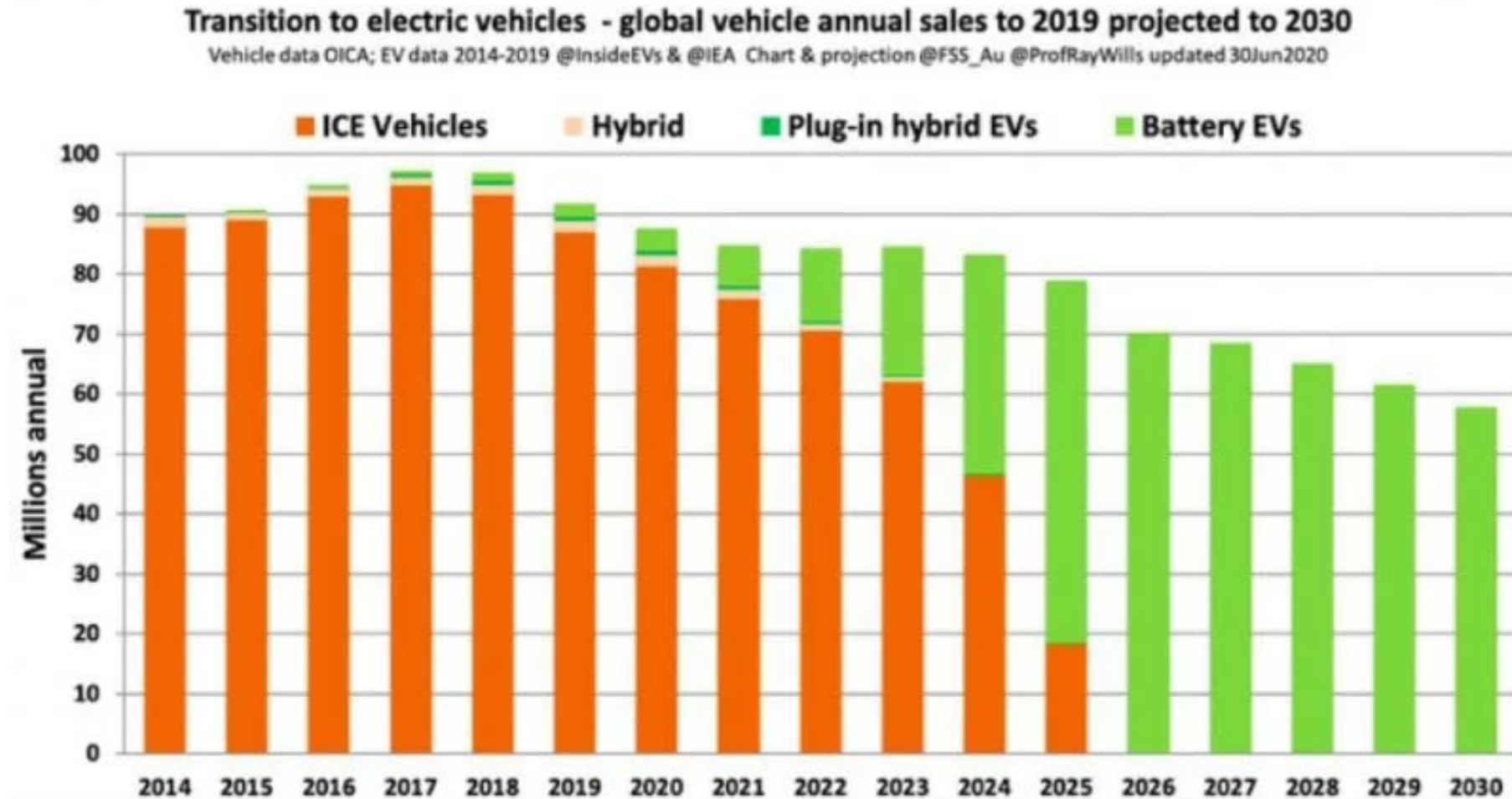


Source: ITS Davis



EV Adoption Forecasts: ICE Displacement

Future sales
projections by
vehicle type



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The Future: What do we know?

**CURRENTLY
AVAILABLE
EV TECHNOLOGY**



**NEAR-TERM
EV TECHNOLOGY**

Vehicles and related technology that have been announced by the industry



**MID-TERM
EV TECHNOLOGY**

Vehicles and related technology likely to be produced in this timeframe



**LONG-TERM
EV TECHNOLOGY**

Beyond 2030 and impossible to predict

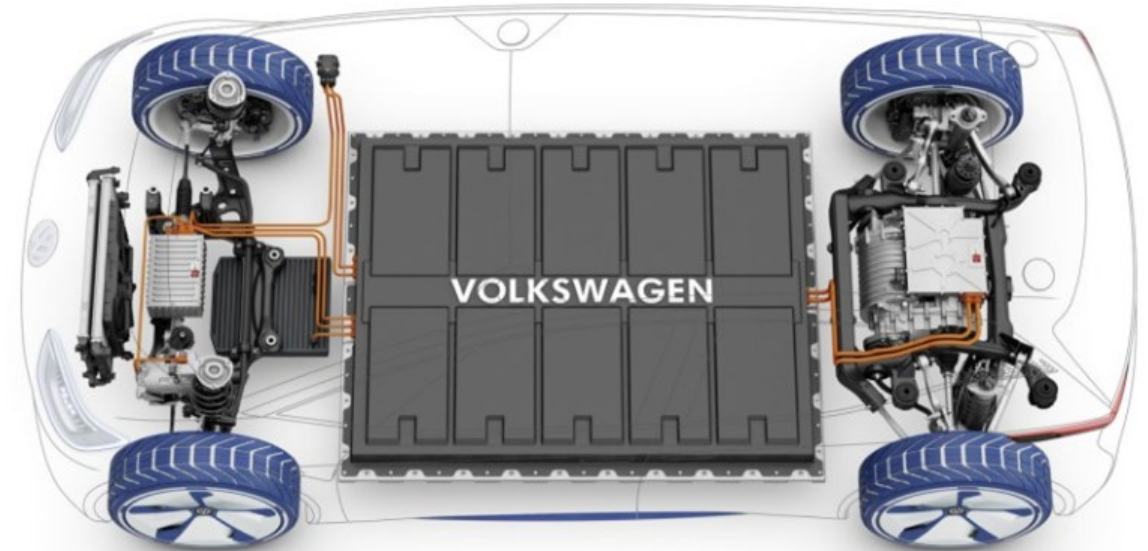


Emerging Trends in Electromobility

Expansion of electric vehicle choice



Rivian's modular "Skateboard" platform



Volkswagen group's MEB platform



Emerging Trends in Electromobility

Expansion of electric vehicle choice



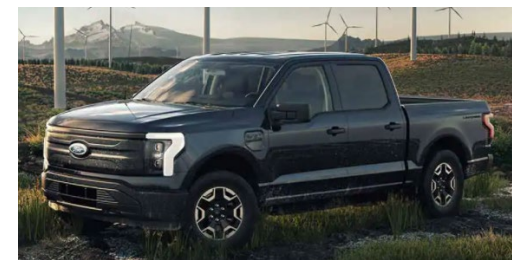
Cars:
Lucid,
Polestar,
Tesla

SUVs:
Ford,
VW,
Nissan

















Pickup Trucks:

Tesla, Workhorse, Ford



Emerging Trends in Electromobility

Expansion of electric vehicle choice

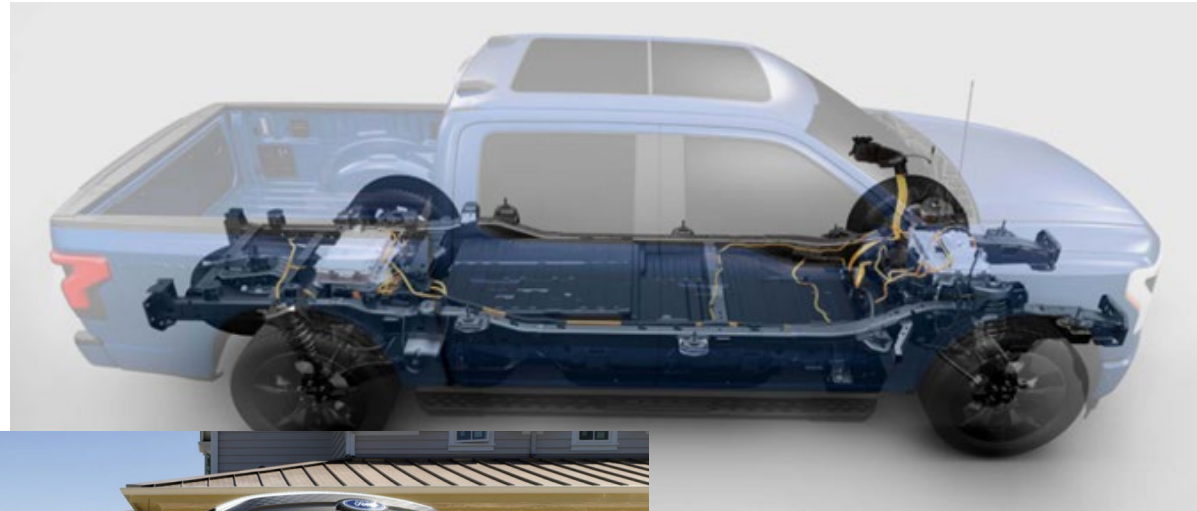
Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
	Envirotech Urban Truck		<u>GreenPower</u> EV Star <u>CarGOVan</u>		Kenworth K370E	
Ford Transit		Lightning Systems Ford E-450		BYD 6D Step Van		Freightliner eCascadia116/ 126
						

Emerging Trends in Electromobility

Expansion of electric vehicle choice

Ford F-150 Lightning

- Cost competitive
- More torque
- New features
 - Mobile power
 - Secure frunk
 - On-board 19.2 kW charger
 - Bidirectional charging
- Available in 2022

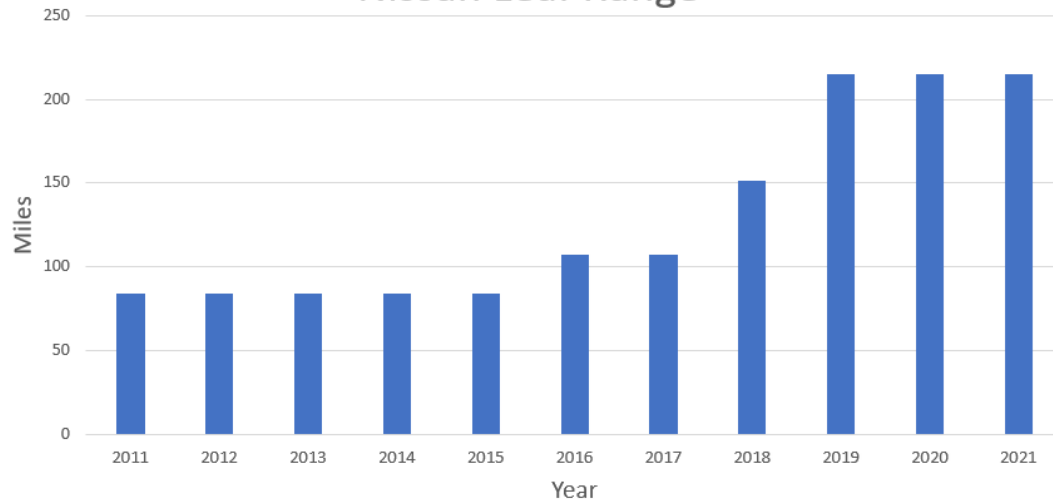


Lower Cost Energy Storage

Lower cost batteries = Longer range batteries

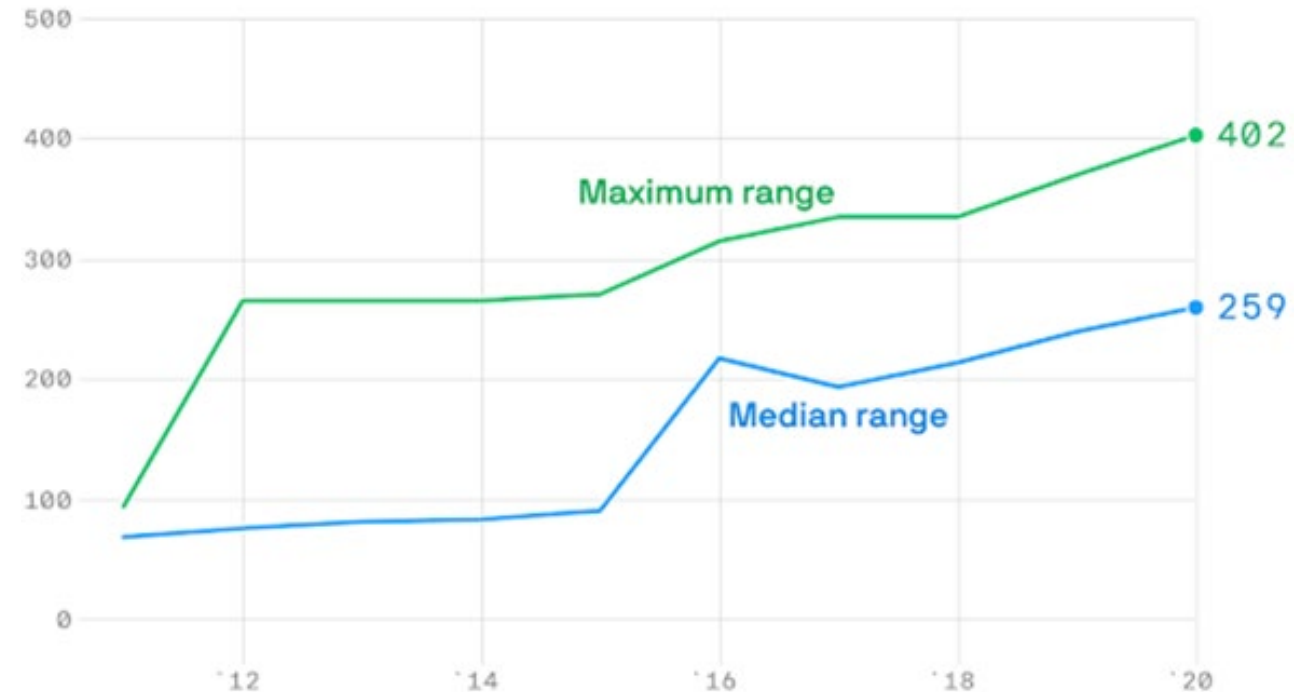


Nissan Leaf Range

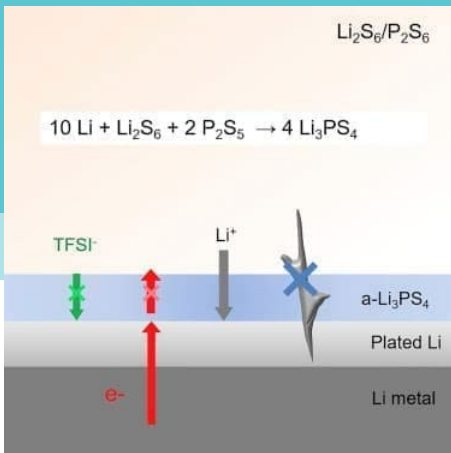


Driving range of electric vehicles offered for sale in the U.S.

Miles, model years 2011-20



Battery Breakthroughs



Joule Article
CellPress
 Asymmetric Temperature Modulation for Extreme Fast Charging of Lithium-Ion Batteries

Highlights:
 - Enhanced kinetics
 - Enhanced transport
 - No Li plating
 - Slow SEI growth

U.S. DOE Target

Lithium-ion battery vs **Lithium-metal battery**

An asymmetric temperature modulation method is presented for the Li-ion cell to rapidly pre-heat the anode and charge at $\sim 60^\circ\text{C}$, and the cell temperature time to 60°C is limited to ~ 10 min per cycle. The elevated temperature enhances kinetics and transport and hence eliminates Li plating, the limiting factor for high-rate charging, and avoids severe materials degradation. We demonstrate a high-rate 10C charge of 10 min at 60°C .

U.S. DOE Target

High-temperature charging eliminates Li plating by enhanced transport and kinetics. Limited exposure time to high temperature avoids severe SEI growth. Elevated charging temperature reduces battery cooling need by $>12\%$.

Performance Requirements	Lithium Metal Anode					QuantumScope	Performance Implication
	Liquids	Polymers	Sulfides	II	Oxides		
1 Charge rate	X	X	X	X	X	✓ 4C fast charge	Fast charge
2 Cycle life	X			X	X	✓ >800 cycles	Vehicle life & cost of ownership
3 30 °C operation		X	X	X	X	✓ 30 °C cycling	Cold temperature driving
4 Anode-free	X	X	X	X	X	✓ Li-free	Energy density (excess lithium required)

Home / Energy / Energy-General



JON LESAGE

Jon Lesage is a California-based journalist covering clean vehicles, alternative energy, and economic and regulatory trends shaping the automotive, transportation, and mobility sectors.

More Info

Solid State Batteries: The Next Big Thing In Electric Cars

By [Jon Lesage](#) - Jun 26, 2019, 12:00 PM CDT



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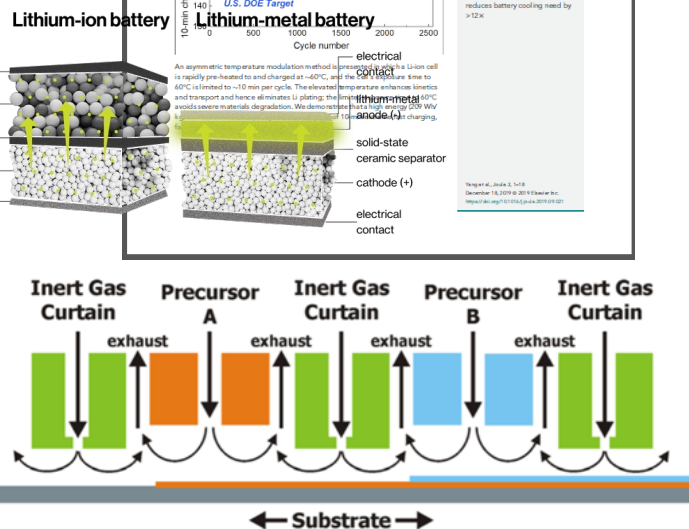
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PREMIUM CONTENT

Plug-in vehicle sales have been seeing sizable growth in recent years, with Tesla grabbing most of the attention. Now [the race is on with Toyota](#) and several other global automakers taking steps forward in being truly Tesla-competitive for the first time.

At [2.1 million sold worldwide](#) last year, sales of battery-electric and plug-in hybrid electric vehicles only saw a peak moment of 3.8 percent of new vehicle sales in December — and only 2.2 percent of sales for the year. For that number to reach 10 percent or higher, they'll need to go 400 or more miles per charge and able to be recharged in about 10 minutes. That's still a long ways off but Toyota, Jaguar, Audi, Volkswagen, and Porsche are



EVs are here. Try to keep up.
CHARGED
 ELECTRIC VEHICLES MAGAZINE

THERMAL MANAGEMENT SILICONES THAT CAN
MOMENTIVE
 THE FUTURE IS

HOME MAGAZINE CONFERENCE NEWSWIRE FEATURES ADVERTISE CONTACT

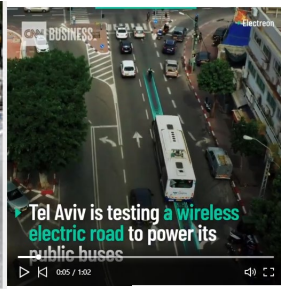
Solid Power introduces all-solid-state lithium metal batteries

Posted October 26, 2020 by [Tom Lombardo](#) & filed under [Newswire](#), [The Tech](#).

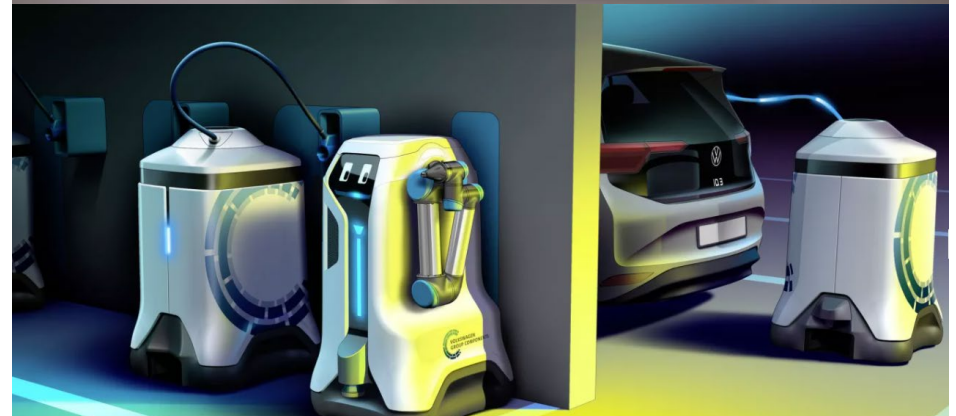


Automated Charging

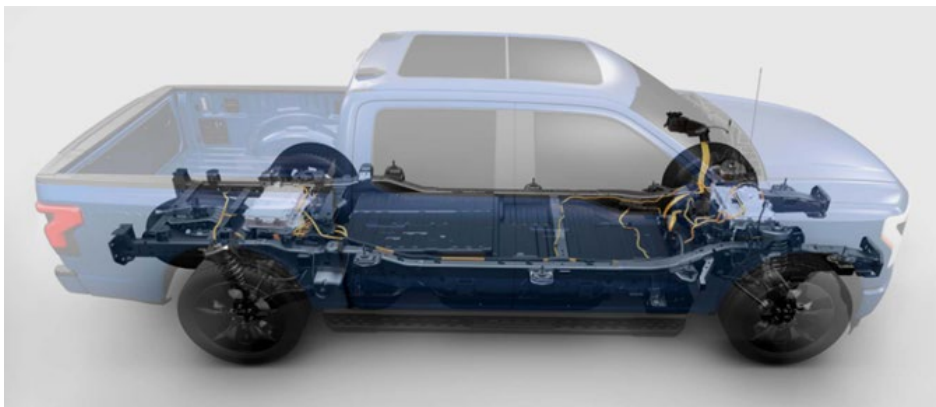
Inductive (Wireless) Charging



Robotic Charging



Bidirectional Power



Ford F-150 Lightning will have bidirectional charging

Vehicle to grid (V2G) energy sales

Source: Stillwater Associates & fleetcarma

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EV Charger Funding Opportunity



Washington State
Department of Transportation

Zero Emission Vehicle Infrastructure Partnerships

What is it?

Grants to support turn-key projects that finance, build, operate, and maintain DCFC at new locations in 50-mile increments along a highway including U.S. Route 101.



U.S. Route 101 corridor

EV Charger Funding Opportunity



Zero Emission Vehicle Infrastructure Partnerships What's WSDOT's Goal?

Leverage \$8 million statewide to encourage private sector investment through matching funds of 50% or higher.

Potential host site requirements:

- | | |
|-------------------------------------|--|
| ● Sufficient 3-phase power | ● Within ½ mile of highway interchange |
| ● Retail, food, and other amenities | ● At least 4 parking stalls |
| ● Available potable water | ● Public restrooms |



Existing public chargers (Source: westcoastgreenhighway.com)

EV Charger Funding Opportunity



Washington State
Department of Transportation

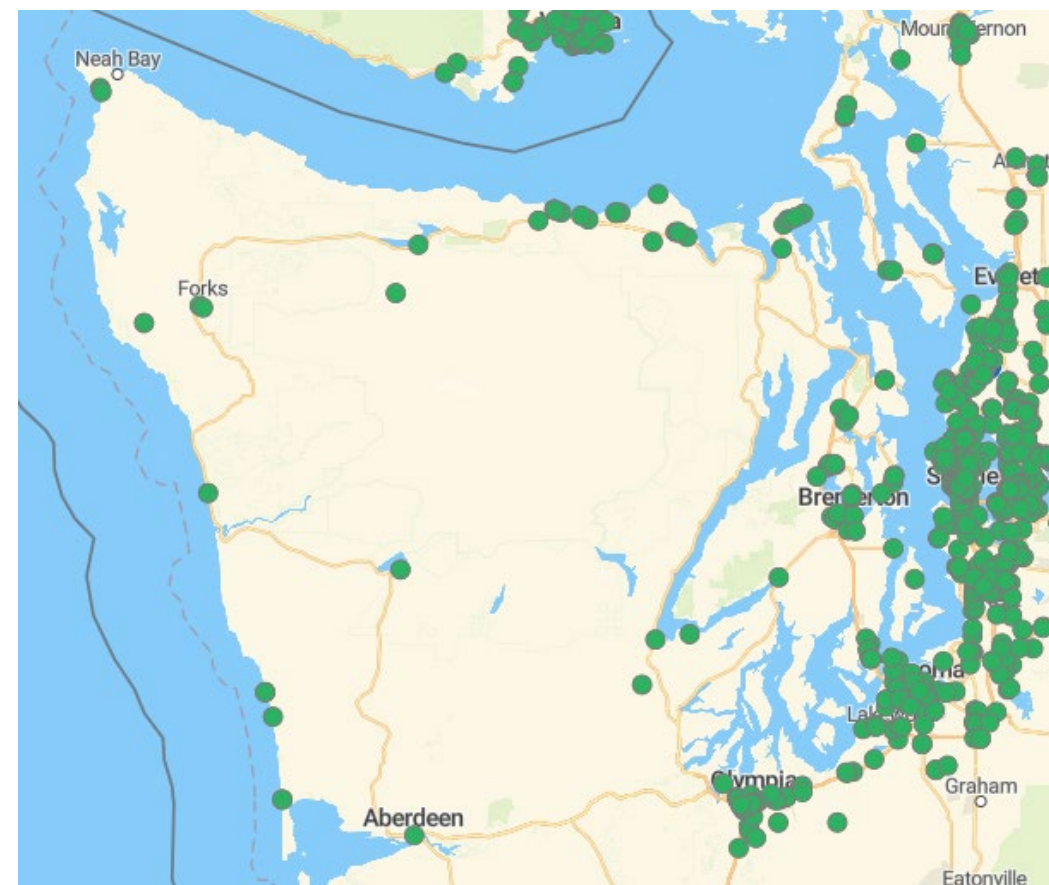
Zero Emission Vehicle Infrastructure Partnerships

Who's Eligible?

Non-profit organizations and local government agencies such as cities, towns, counties, transit agencies and tribes.

When will this happen?

Grant Applications begin this summer.



Existing public chargers (Source: AFDC)

EV Charger Funding Opportunity

Zero Emission Vehicle Infrastructure Partnerships



Where can we get more information?

- <https://wsdot.wa.gov/business/innovative-partnerships/zero-emission-vehicle-infrastructure-partnerships>
- Send an email to: partnerships@wsdot.wa.gov
- Attend ZEVIP Grant Work Session for Peninsula Region, Wednesday, June 23, 10:00am – 12:00pm