



U.S. DEPARTMENT OF ENERGY

**EV**Grid Assist

ACCELERATING THE TRANSITION

# Freight Electrification, Grid Integration, and Supply Chain Considerations for the Electric Vehicle Sector

NASEO Transportation Committee

Energy Policy Outlook, February 9, 2023



U.S. DEPARTMENT OF  
**ENERGY**

# EVGrid Assist: Accelerating the Transition

## *Comprehensive VGI Technical Assistance Initiative*

A new cross-DOE coordination and technical assistance effort focused on the interface between vehicle charging and the electric grid considering the full spectrum of the R&D, deploy, use, learn cycle.

### **Purpose:**

- Increase stakeholder knowledge
- Drive actions to resolve VGI challenges and barriers
- Provide pathways for stronger VGI coordination

### **Objectives:** Activate the community to

- Prioritize challenges to solve
- Accelerate planning and decision making
- Enable proactive infrastructure investments and supporting markets, rates and regulations
- More quickly achieve decarbonization goals



# RD&D

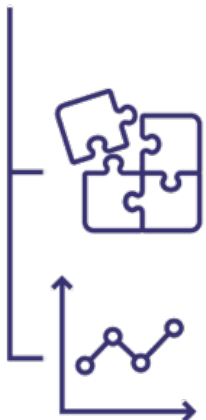


Commercialize

Verify & Iterate

Innovate

# LEARN



Invest New Capital

Iterate Business Models

Evaluate, Measure, & Validate

# DEPLOY

Qualify, Select, & Procure

Manufacture & Supply

Test & Certify



# USE

Defer & Upgrade

Install & Charge

Drive & Save



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## Vehicle Grid Integration Initiative





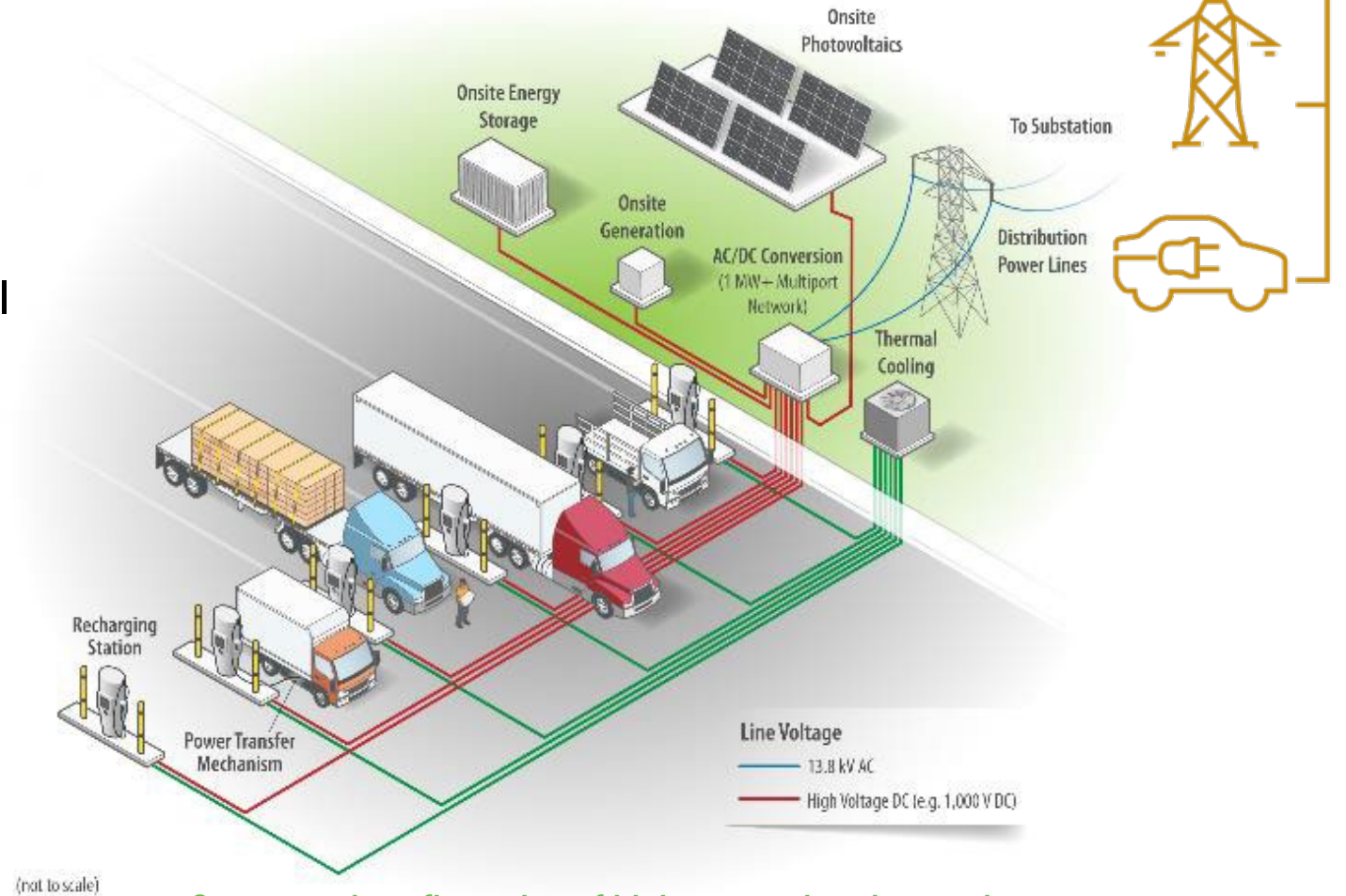
## Inflation Reduction Act Tax Credits for Freight

- **Commercial Clean Vehicle Credit (I.R.C. 45W)**
  - BEVs and FCEVs: lesser of 30% of vehicle cost or the incremental cost
  - Up to \$40,000 for vehicles weighing  $\geq 14,000$  lbs.
- **Alternative Fuel Refueling Property Tax Credit (I.R.C. 30D)**
  - 30% of cost per item of property (e.g. charger, storage)
  - Up to \$100,000 for businesses
  - Low-income communities or Non-urban areas
- [irs.gov/cleanvehicles](https://irs.gov/cleanvehicles) and [IRS Notice 2023-9](#)



# Medium- and Heavy-duty Charging Station Applications

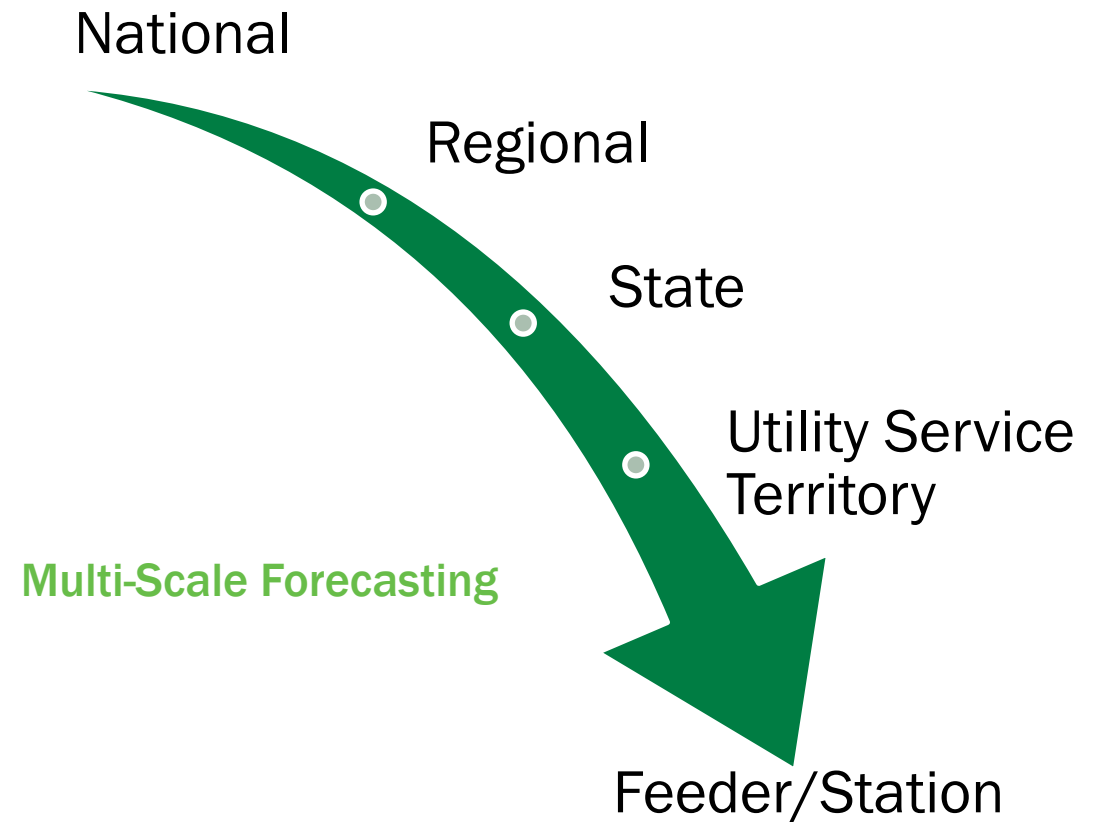
- **Fleet Depots, MHD EVs**
  - 200-300 miles roundtrip and long overnight dwell periods
  - DCFC (150-350 kW), possibly AC Level 2 (19 kW) for MD local delivery
- **Travel Centers, HD EVs**
  - Short dwell times necessitate 1-3 MW charging
  - DCFC (~100kW) when dwell periods (>4hrs) per hours of service regulations
  - Potentially 25-125 MW site power requirements



Conceptual configuration of high-power charging station

# Transmission, Distribution, and other Challenges

- For high levels of EV penetration, challenges exist at the transmission and distribution levels
  - Managing the magnitude and variation in charging according to vehicle schedules
  - Serving site charging loads within legacy infrastructure across dense urban or rural areas
  - Thermal overloading, stability, reaching rated capacity of distribution assets
  - Substation and transmission constraints
- Transportation and energy sector integration is required to ensure reliability and resilience are maintained/improved



# Load Forecasting Tools

Does energy storage lower charging costs?

## EVI-EDGES

Accounts for rate structure, battery life, and cost

How should the stations be designed?

## EVI-EnSite

Station performance, load profile, charge management, and quality-of-service metrics

What is the station cost?

## EVI-FAST

Investor payback period, net present value, and break-even first-year charging cost considering both site and grid infrastructure upgrades

Where should the charging stations be located?

How many chargers and ports are needed?

## EVI-RoadTrip

Based on conventional long-distance travel patterns

What are the equity implications of station location?

## EVI-Equity

Charging infrastructure accessibility from environmental-justice perspective

Does on-site solar reduce charging costs?

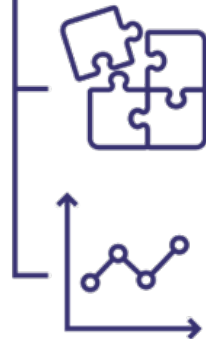
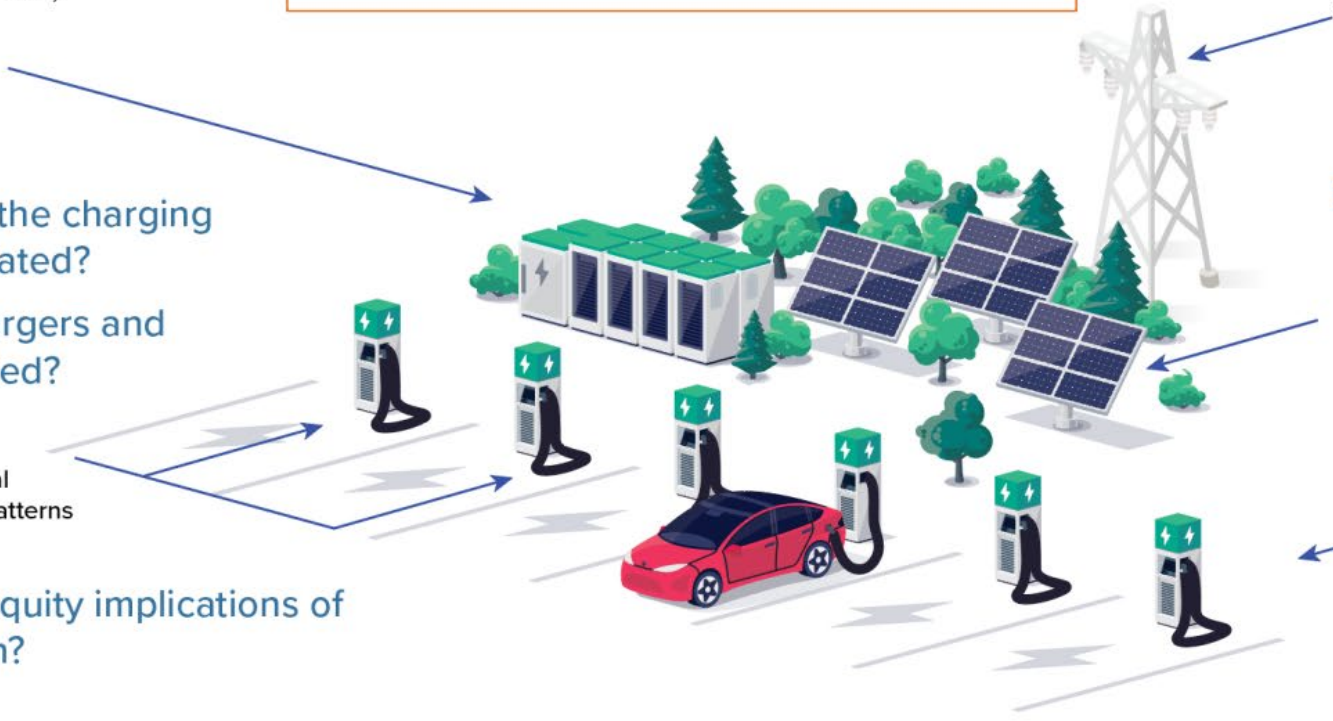
## EVI-EDGES

Accounts for annual solar insolation, building loads, weather, and electricity rates

What power levels are needed?

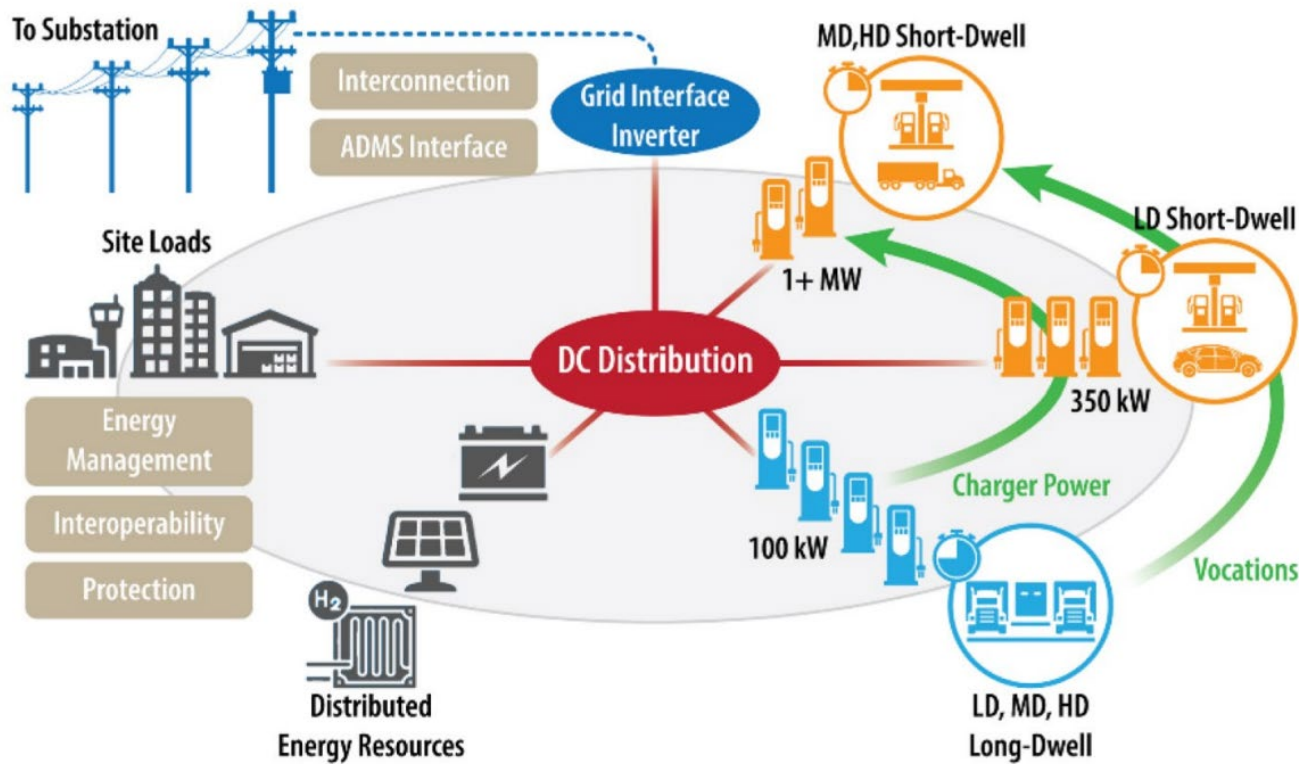
## EVI-EnSite

Queueing model to identify wait times based on vehicle/power levels

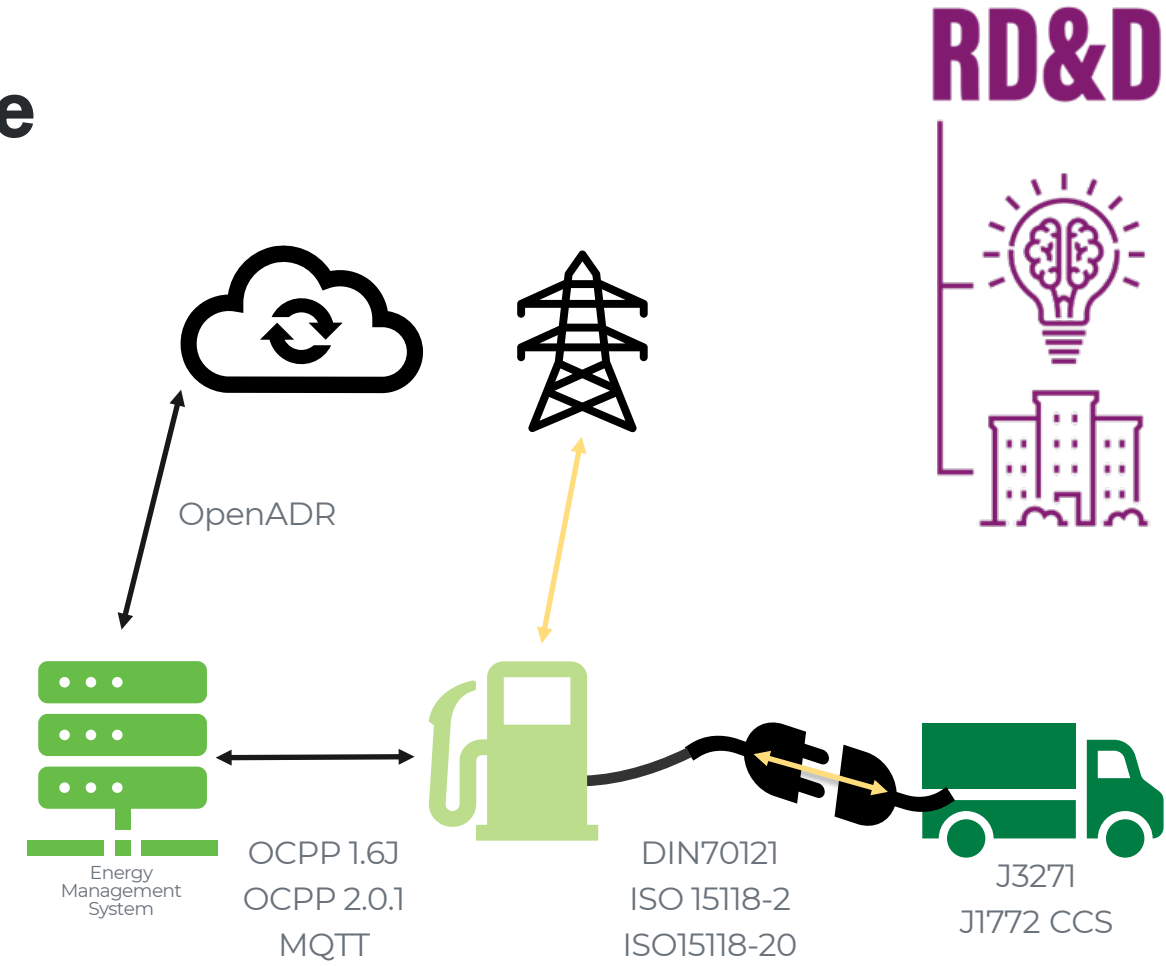




# Technologies to Integrate EVs@Scale



High-power Electric Vehicle Charging Hub Integration Platform



Example Protocols for Site Energy Management



# EVGrid Assist: Strengthening Coordination and Communication

*Enhancing decision making and resolving challenges*

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VGI Vision and DOE Road Map

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Educational Webinar Series and Resource Library

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Stakeholder Processes to Resolve Challenges

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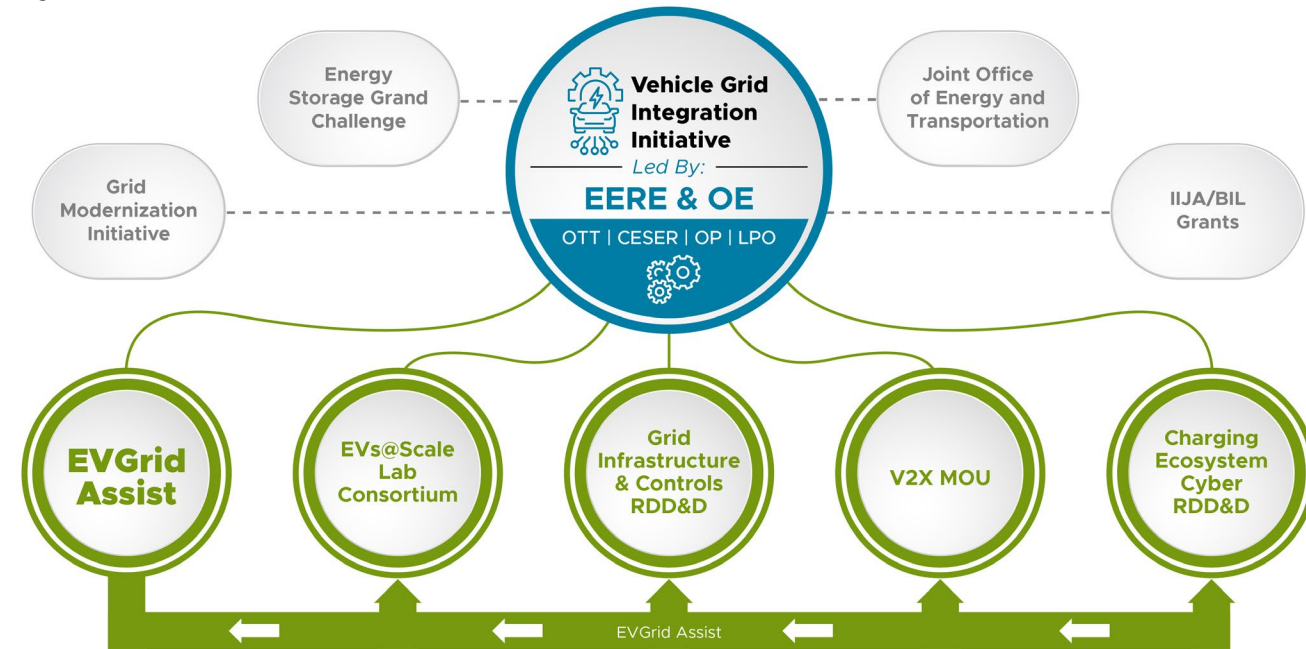
EV Rate Design Considerations

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State-Specific Tool Demonstration Reports

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Direct Technical Assistance



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<https://www.energy.gov/eere/evgrid-assist-accelerating-transition>

























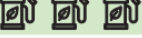



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# U.S. National Transportation Decarbonization Blueprint

Summary of vehicle improvement strategies and technology solutions for different travel modes that are needed to reach a net zero economy in 2050

	 <b>BATTERY/ELECTRIC</b>	 <b>HYDROGEN</b>	 <b>SUSTAINABLE LIQUID FUELS</b>
1 icon represents limited long-term opportunity 2 icons represents large long-term opportunity 3 icons represents greatest long-term opportunity	  		
Light Duty Vehicles (49%)*		—	TBD
Medium, Short-Haul Heavy Trucks & Buses (~14%)			
Long-Haul Heavy Trucks (~7%)			
Off-road (10%)			
Rail (2%)			
Maritime (3%)		 <sup>†</sup>	
Aviation (11%)			
Pipelines (4%)		TBD	TBD
<b>Additional Opportunities</b>	<ul style="list-style-type: none"> <li>• Stationary battery use</li> <li>• Grid support (managed EV charging)</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy industries</li> <li>• Grid support</li> <li>• Feedstock for chemicals and fuels</li> </ul>	<ul style="list-style-type: none"> <li>• Decarbonize plastics/chemicals</li> <li>• Bio-products</li> </ul>
<b>RD&amp;D Priorities</b>	<ul style="list-style-type: none"> <li>• National battery strategy</li> <li>• Charging infrastructure</li> <li>• Grid integration</li> <li>• Battery recycling</li> </ul>	<ul style="list-style-type: none"> <li>• Electrolyzer costs</li> <li>• Fuel cell durability and cost</li> <li>• Clean hydrogen infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple cost-effective drop-in sustainable fuels</li> <li>• Reduce ethanol carbon intensity</li> <li>• Bioenergy scale-up</li> </ul>

\* All emissions shares are for 2019

<sup>†</sup> Includes hydrogen for ammonia and methanol



# References

- [The U.S. National Blueprint for Transportation Decarbonization \(energy.gov\)](#)
- [Electric Vehicles at Scale \(EVs@Scale\) Laboratory Consortium Deep-Dive Technical Meetings: High Power Charging \(HPC\) Summary Report \(nrel.gov\)](#)
- [The Supply Chain Crisis Facing the Nations Electric Grid\\_12.12.22.pdf \(energy.gov\)](#)