# Preparing for Vehicle Electrification

November 15, 2022

ACEC

## Phil Jonat, PE, CEM
National Market Leader, Electrification

- 14 years of experience in microgrids, energy efficiency, central plants, and electrification

## Lilly Picchione, AICP
Zero Emission Senior PM

- 18 years of experience in public transit systems, green infrastructure, and resiliency

## Sean O'Rourke
Director, Electrical Engineering

- 20 years of experience in design of electrical power distribution systems, renewable energy and vehicle electrification

## WSP ELECTRIC VEHICLE NATIONAL FOOTPRINT

## WSP BY THE NUMBERS

**120+**
Zero-Emission Projects Supported

**70**
Electric Bus Projects

**SEVEN**
State-wide or Multi-state Projects

**35**
Public EV Charging Projects

**14K+**
Vehicles in ZEV Master Planning

**800+**
Facilities Designed

**10 OF 25**
Largest U.S. Public Transit Agencies Served

**230+**
Facilities with EV Chargers

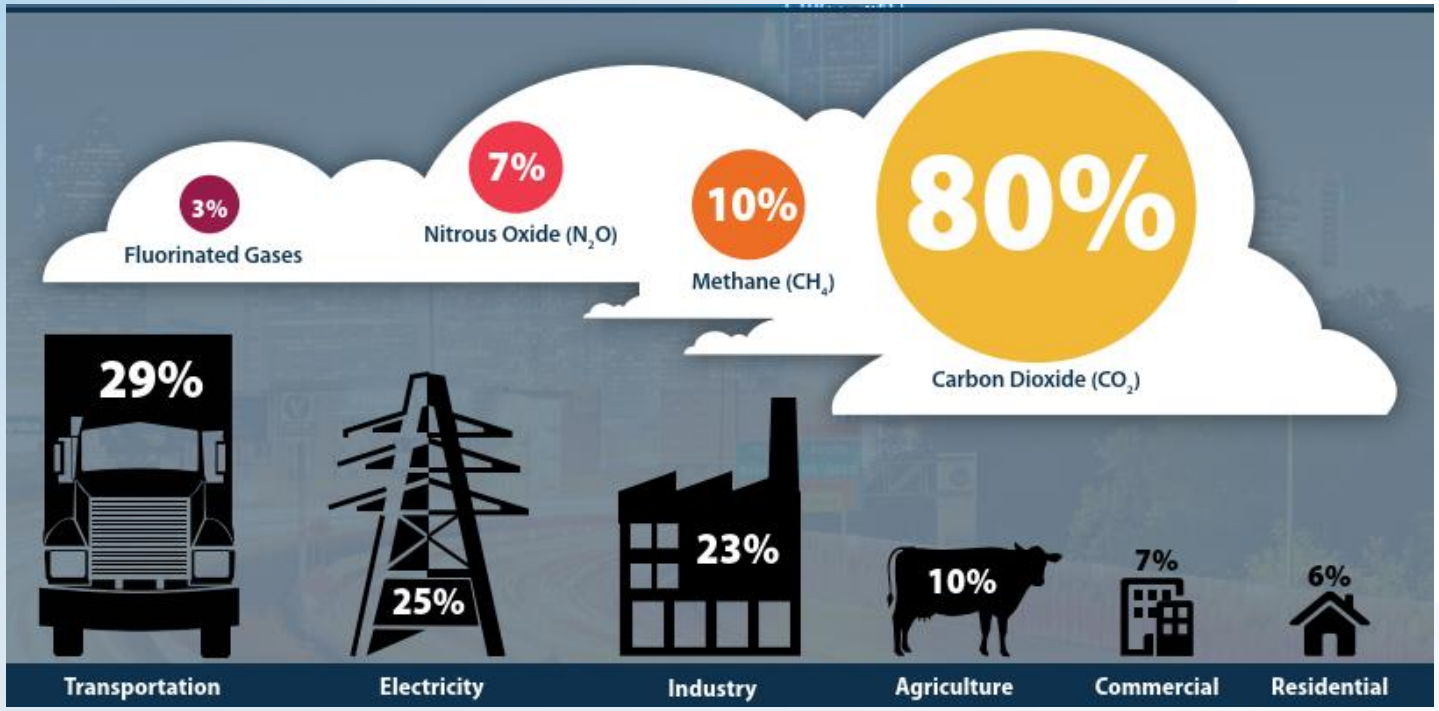
**15,500**
Total U.S. Employees

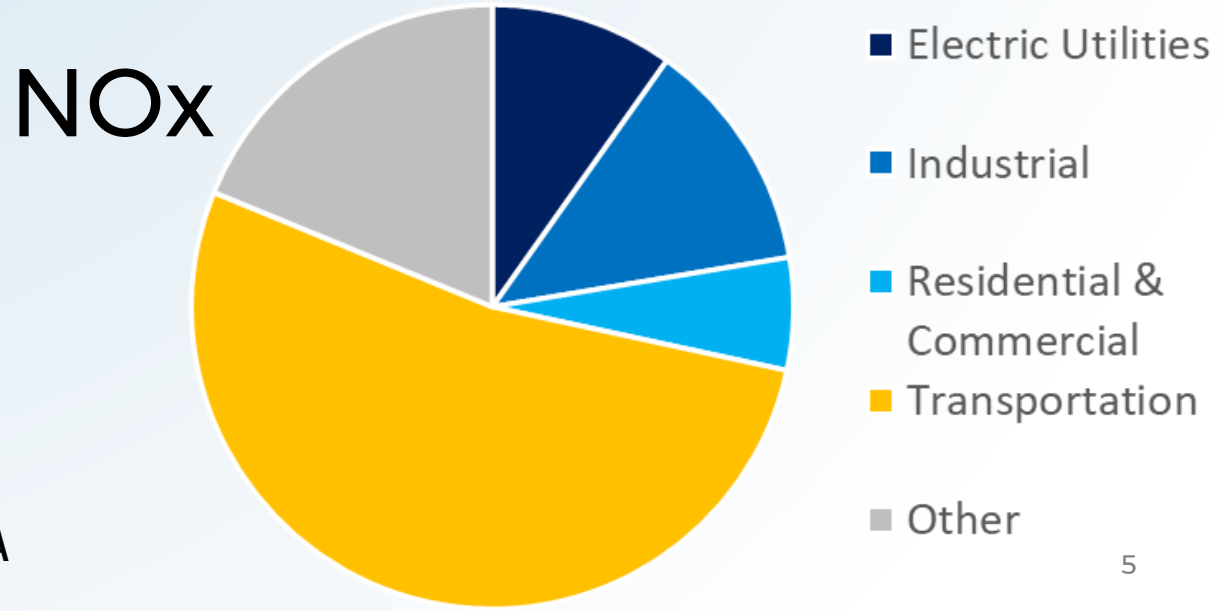
# Agenda

- Fast Facts
- Key Sectors
  - Fleet Charging Infrastructure
  - Public Charging Infrastructure
  - Commercial/Residential Charging Infrastructure
- Vehicle Electrification Trends
- Q&A

# About ZEV: Emissions

Vehicles contribute 29% of US GHG emissions but 53% of ozone producing NOx emissions

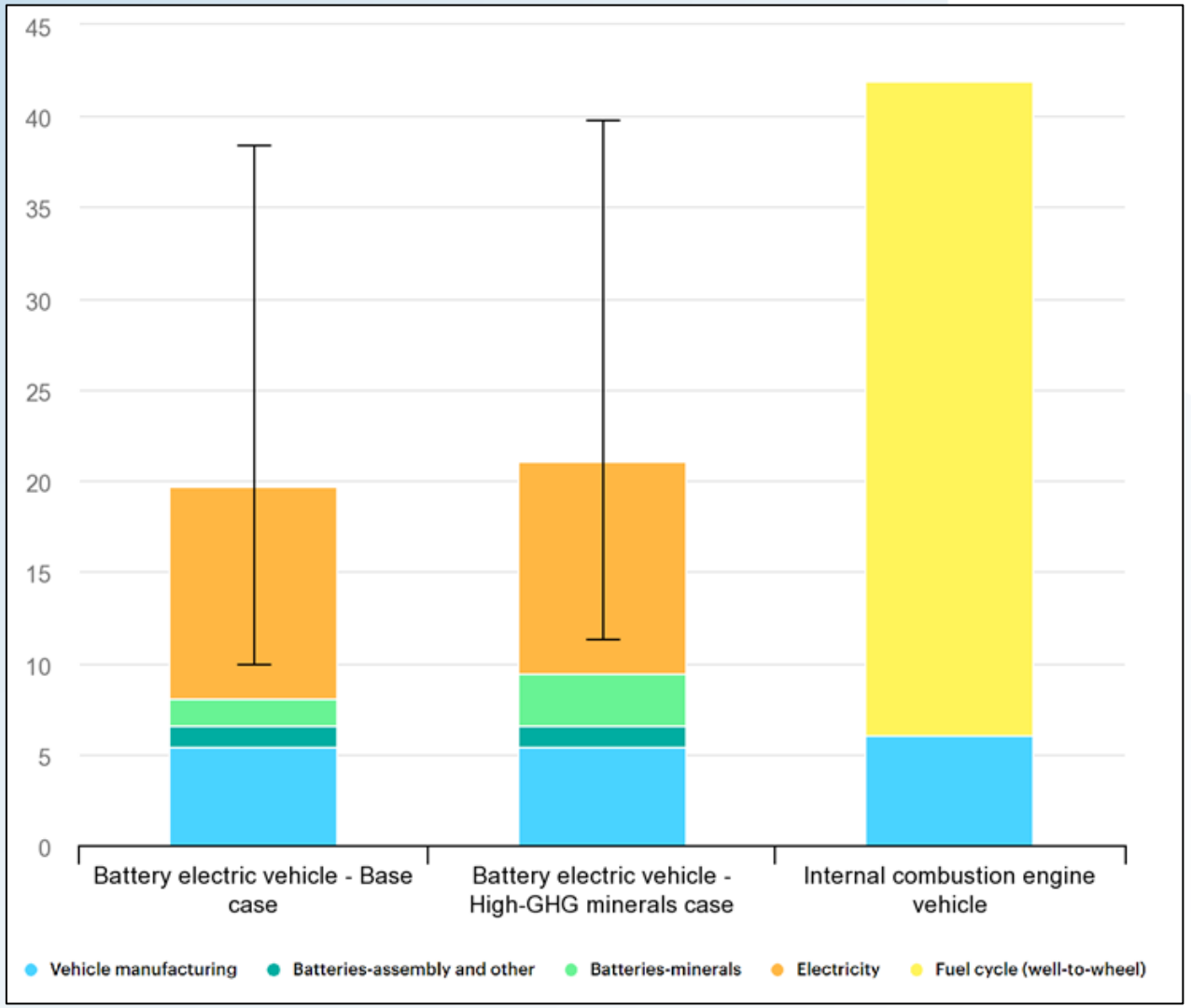



*Source: US EPA*

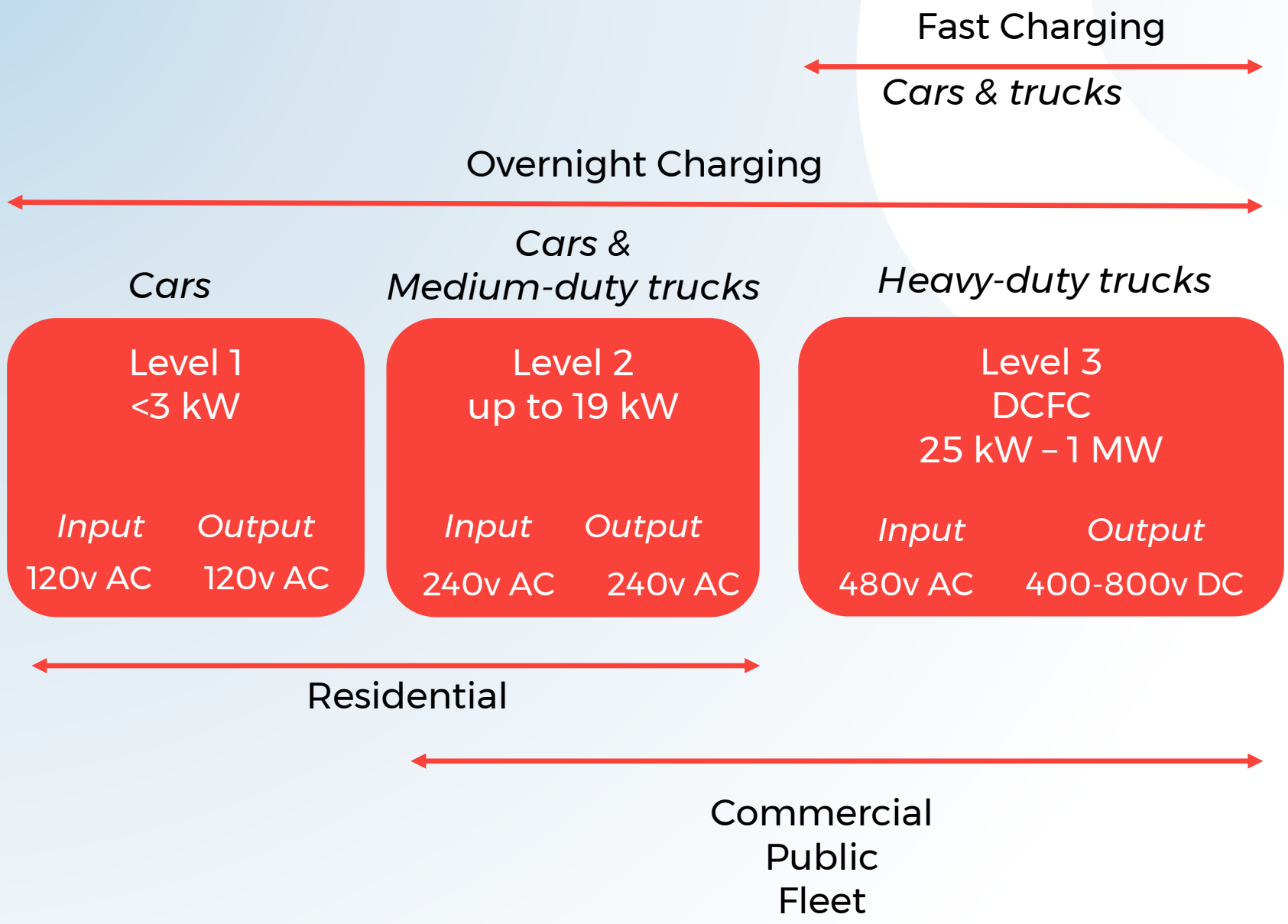
# About ZEV: Full Lifecycle GHG

Figure 2 - Comparative life-cycle greenhouse gas emissions of a mid-size BEV and ICE vehicle




IEA 2021; *Executive Summary – The Role of Critical Minerals in Clean Energy Transitions*; Link to Executive Summary; License: CC BY 4.0

# About ZEV: Types of Chargers



# Fleet Charging: Bus Fleets

## *LA Metro ZEB Program Master Plan*

| | |
|---|---|
| Location | Los Angeles, California, USA |
| Client | LA Metro |
| Status | On-going |
| Description | Developed full program plan for conversion of fixed-route bus fleet to 100% ZEV by 2030<br>• 2,200 buses<br>• 11 bus depots |
| Services | • Technology evaluation<br>• Infrastructure conceptual design and construction phasing<br>• Network phasing<br>• Equity analysis<br>• Procurement support |

# Fleet Electrification Challenges

For large fleets very concentrated electrical loads, an order of magnitude greater than many commercial buildings

Long planning horizon and lead time for utility interconnection

Space claim of additional infrastructure may reduce site parking capacity

Need to plan for resiliency – to maintain operations if the grid is down

Limited on-board battery capacity (cost, weight) may require additional vehicles, changes to scheduling and operations

Workforce impacts with new vehicle technology and need to maintain significant new infrastructure

*Robust but flexible plans and early utility coordination are keys to success*

*Begin with the end in mind*

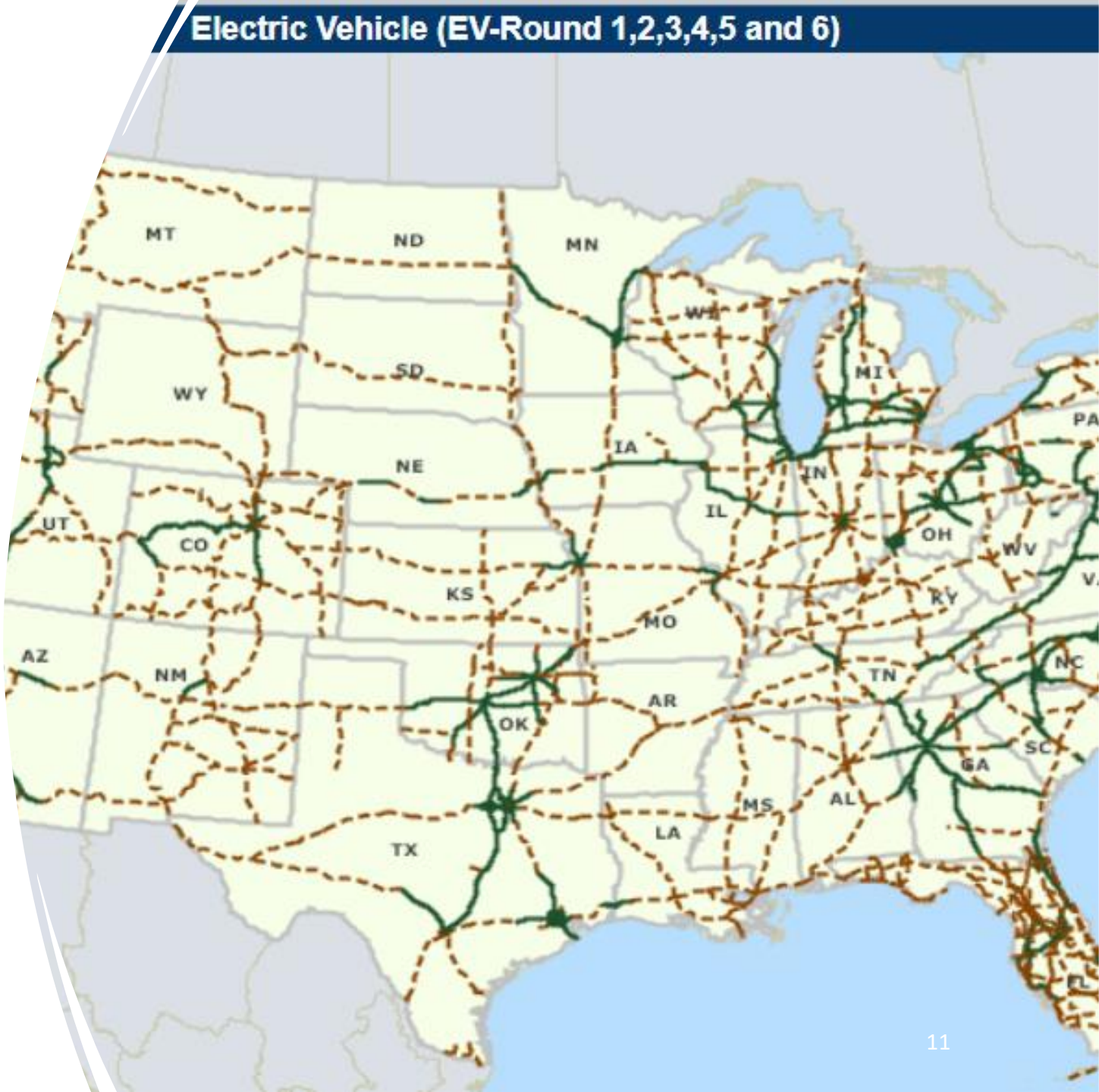
# Public Charging

## *Dominion Clean Energy Park*

| | |
|---|---|
| Location | Richmond, VA |
| Client | Dominion Energy |
| Status | In construction |
| Description | 2-acre plaza in the heart of Richmond, as a model for integrating EV charging into the public realm. Includes 20 DCFC and solar canopy along with public green spaces |
| Services | • Lead designer for conceptual plan<br>• Landscape architecture, lighting concepts, building massing, support for electric infrastructure |

# Public Charging Challenges

- Road trip range anxiety
- DC Fast Chargers
- NEVI minimum standards
- Alternative Fuel Corridors
- Grid impacts



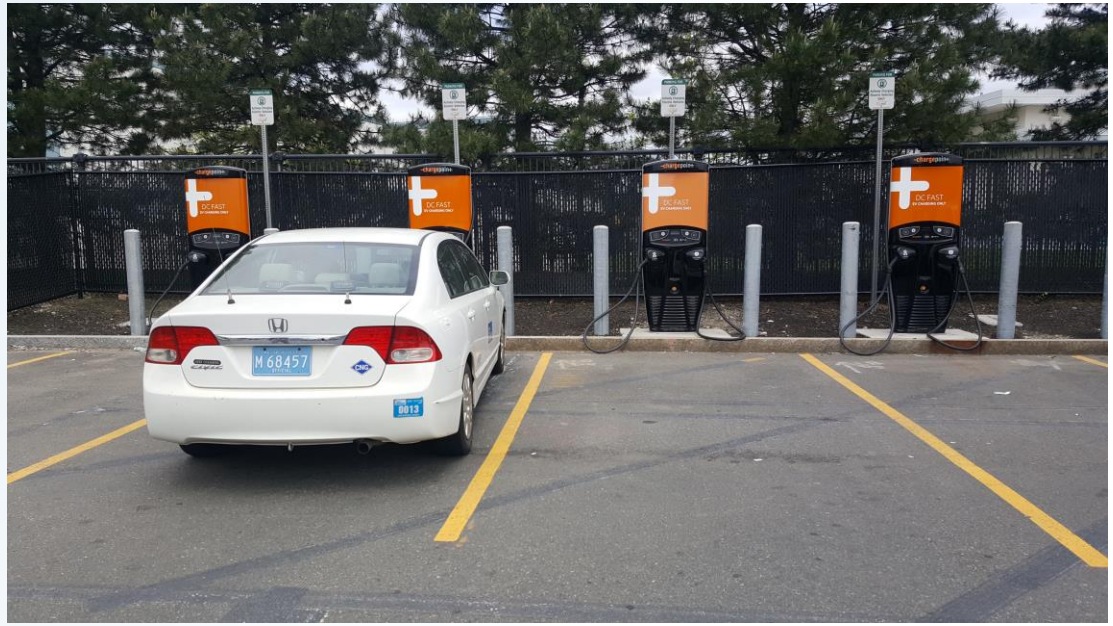

Source: Electric Vehicle (EV-Round 1,2,3,4,5 and 6) - FHWA HEPGIS Maps (dot.gov)

# Public Street Charging

- Dense cities with common street parking
- Overnight slow charging or DC fast charging?
- Equity considerations

# Commercial/Residential Charging

| | |
|---|---|
| Location | Boston, MA |
| Client | MassPort |
| Status | Ongoing Design / In Construction |
| Description | Level 2 and Level 3 EVSE at landside facilities.<br><br>Owner's Rep for EV study at Rental Car Center |
| Services | • Lead designer for EVSE at Logan and Worcester Airports<br>• Lead for Electrical Capacity Study |

# Massport 2031 NetZero Goal

- WSP Design/Installed Level 2 and Level 3 EVSE landside at the Logan Airport and Worcester Airport including:
  - Taxi Pool
  - Parking Lots
  - Garages
  - Employee Fleet Vehicles

- WSP has developed an Electrical Capacity Study on existing electrical infrastructure of Rental Car Facility for electrification of rental car fleets.

# Electrical Infrastructure

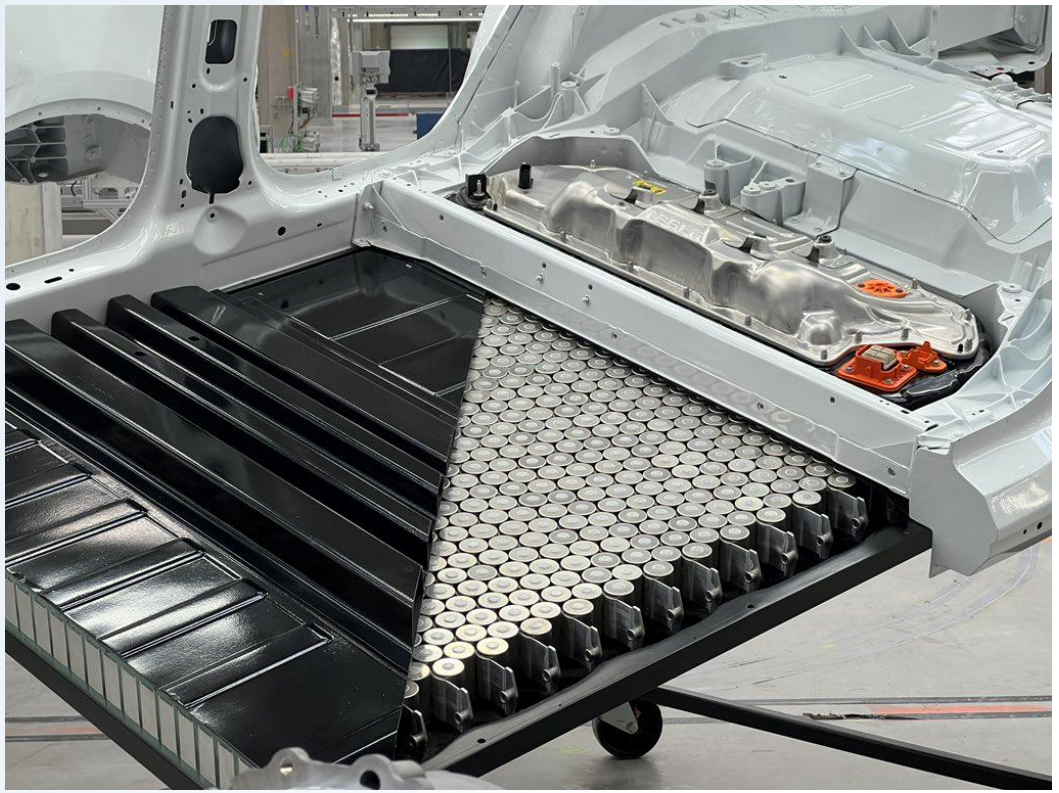
- Reviewed existing electrical meter data.
- Reviewed existing electrical infrastructure capacity
- Compared proposed EVSE requests against existing electrical infrastructure
- Captured ‘pinch’ points in system for identification of initial upgrades necessary
- Identified  capacity ‘ceilings’ where additional long-term infrastructure is required.

# Commercial/Residential Charging Challenges

**ELECTRICAL:**
New: *Larger Electrical Services*
Renovation: *Existing Electrical Service Capacity*

**MECHANICAL:**
*Ventilation Required where Indoor and interlocked with chargers*

**FIRE PROTECTION:**
*Thermal Runaway - Fire*



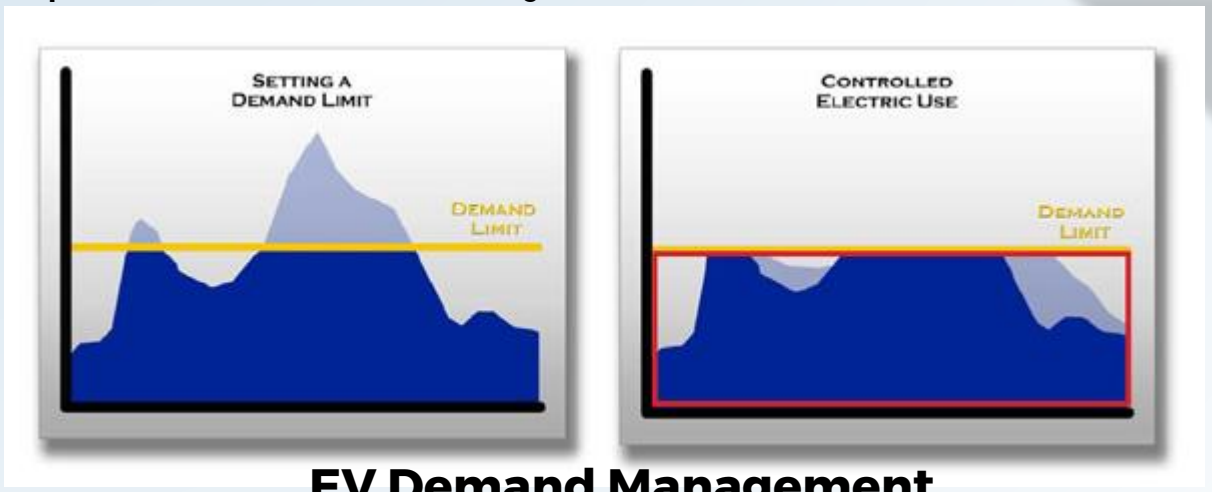
# Commercial/Residential Charging Challenges

NEC 625.42 Rating:
*"... Electric vehicle charging shall be considered to be continuous loads for the purpose of this article."*

No Demand Factor (%) allowed for multiple EVSE.
*Example: 10 Level 2 EVSE (15kW each) = 150kW*

Deployments of large quantities of EVSE = Larger Electrical Service

Utilize an automatic load management system to cap demand of EVSE system.




**EV Demand Management**

duty and shall have a rating of not less than 125 percent of the maximum load of the equipment. Where noncontinuous loads are supplied from the same feeder, the overcurrent device shall have a rating of not less than the sum of the noncontinuous loads plus 125 percent of the continuous loads.

**625.42 Rating.** The power transfer equipment shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Service and feeder shall be sized in accordance with the product ratings. Where an automatic load management system is used, the maximum equipment load on a service and feeder shall be the maximum load permitted by the automatic load management system.

Adjustable settings shall be permitted on fixed-in-place equipment only. If adjustments have an impact on the rating label, those changes shall be in accordance with manufacturer's instructions, and the adjusted rating shall appear with sufficient durability to withstand the environment involved on the rating

# Thank you!

Phil Jonat Philip.Jonat@wsp.com
Lilly Picchione Lillian.Picchione@wsp.com
Sean O'Rouke Sean.P.ORourke@wsp.com

*wsp.com*