

# WELCOME to Today's Webinar!



**TMACOG Tech:  
Lead the Charge**

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**Toledo Metropolitan Area Council of Governments**



# EV Charging 101

TMACOG Tech  
September 14, 2023

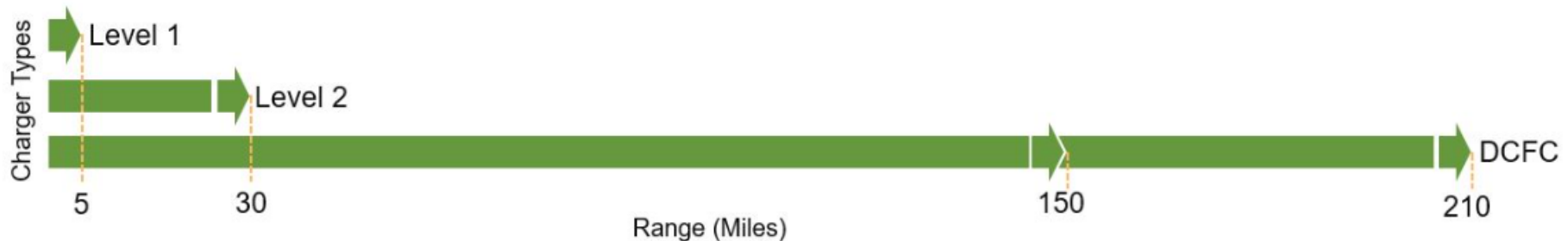
PRESENTED BY  
Van Defibaugh, PE, PMP, LEED AP  
*Senior Associate / Senior Project  
Manager*

# EV Charging Equipment Overview

## Three (3) Types of Charging Equipment

1. Level 1 Charging
2. Level 2 Charging
3. Level 3 or Direct Current (DC) Fast Charging

What **One Hour of Charging** with Different Chargers Look Like?



### Level 1 Charging

One hour of Level 1 charging provides up to 5 miles of range, depending on the vehicle model.

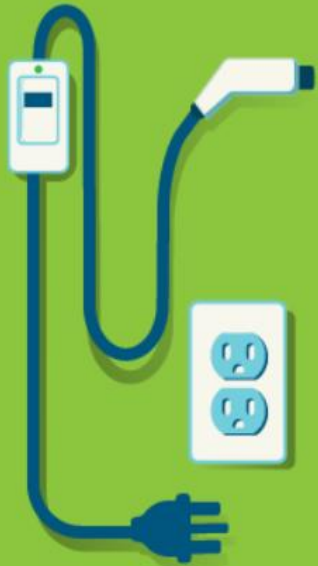
### Level 2 Charging

One hour of Level 2 charging provides up to 30 miles of range, depending on the vehicle model.

### DC Fast Charging

One hour of DCFC charging provides about 150 to 210 miles of range, depending on the vehicle model and DCFC power level.

# Level 1 Charging Equipment



## Level One

120V  
Electrical source from  
a regular home outlet.

**Charge Time**  
2-5 miles of range  
per 1 hour of charging.

### Connector Types:

- *J1772 charger port*



### Outlet:

- *120 V*



### Power Consumption

- *~Equal to Toaster Use*



### Power Output

- *Approx. 3kW*

### Best suited for:

- *Overnight charging*
- *At Home charging*



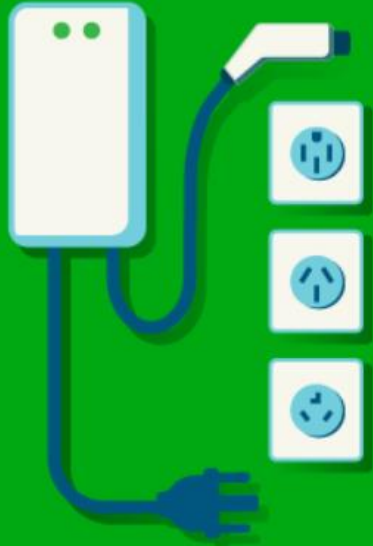
### Quick Facts:

*The standard wall outlet of 120 volts.*

*It is the slowest charge level and requires 11-20 hours to fully charge an all-electric vehicle and several hours for a plug-in hybrid.*

*Level 1 charging stations should typically be located where vehicle owners are highly concentrated and parked for long periods of time.*

# Level 2 Charging Equipment



## Level Two

220V

Electrical source from a regular home dryer outlet, home hardwire, or public station.

### Charge Time

10-20 miles of range per 1 hour of charging.

### Connector Types:

- *J1772 charger port*



### Outlet:

- *240V in Residential*
- *208V in Commercial*

### Power Consumption

- *~Equal to residential clothes dryer use*



### Power Output

- *7.2kW in Residential*
- *19.2kW in Commercial*

### Best suited for:

- *Workplace*
- *Retail & Government Offices*
- *Airports*
- *At Home charging*



### Quick Facts:

*The typical EV plug found in homes and garages.*

*Most public charging stations are level 2.*

*RV plugs (NEMA 14-50) are also considered level 2 Chargers.*

*Level 2 charging stations should typically be located where vehicle owners are highly concentrated and parked for long periods of time.*

# DC (Level 3) Fast Charging Equipment



## DC Fast Charge

208 or 480V 3-Phase AC  
Electrical source from a  
public station.

### Charge Time

60-80 miles of range  
per 20 minutes of charging.

### Connector Types:

- *CCS charge port*
- *CHAdeMO charge port*
- *NACS (Tesla) charge port*



### Outlet:

- *208V / 480V*

### Power Consumption

- *~Equal to 15 average size residential central air conditioning units use*

### Power Output

- *Ranges from 50kW, 150kW, to 350kW+*

### Best suited for:

- *Along Highway Corridors*
- *Downtown Showcases*



### Quick Facts:

*DCFCs are ideal for highway corridors and downtown showcases as EV drivers will utilize them on longer trips when they need a full battery charge.*

*A dual CCS+CHAdeMO unit is often required for DCFC stations in public applications to serve as many EVs as possible.*



# DC Fast Charging Equipment (continued)



**DC Fast Chargers –  
Quick Facts (continued):  
*Most passenger EV models use CCS  
connector.***

***Depending on the size and  
specifications of the battery, DC  
Fast chargers can charge some EVs  
up to 80% in as few as 20-30  
minutes.***

***Each hour adds approximately 100  
miles of driving range.***

***A DC Fast charger would require a  
480V, 3-phase transformer which  
typically costs at least \$50,000***

# EV Chargers - Required Infrastructure

## Required Infrastructure for Public EV Chargers:

1. **Site Selection, Planning & Design**
2. **EV Charging Equipment (Level 1, 2 or DCFC)**
3. **Electric Power Source**
  - *Level 1 – 120 Volt outlet*
  - *Level 2 – 208 / 240 Volt*
  - *DCFC (L3) – 208 / 480 Volt, 3-Phase (480 transformer)*
4. **Network (wired or wireless internet or cellular service)**
  - *Networked charging infrastructure is connection to the internet which allows advanced utilization monitoring or payment capabilities.*
  - *Non-network infrastructure is not connected to the internet and provides basic charging capabilities without advanced utilization monitoring or payment capabilities.*
5. **EV Charging Management Software**
  - *Software platform that processes payments, monitors charging stations, and manages energy usage and billing management.*
6. **Maintenance and Operation**
  - *Develop a plan for maintenance and operation of the EV Chargers.*





# Strategy for EV Charging Deployment

## 1. Site Location

- Level 1 chargers are best suited for residential where vehicle dwell times are over 8 hours.
- Level 2 chargers should be installed where vehicle dwell times are 0.5-8 hours.
- DC Fast chargers should be installed where vehicle dwell times are less than 0.5 hours.

## 2. EV Charging Equipment & Installation Costs

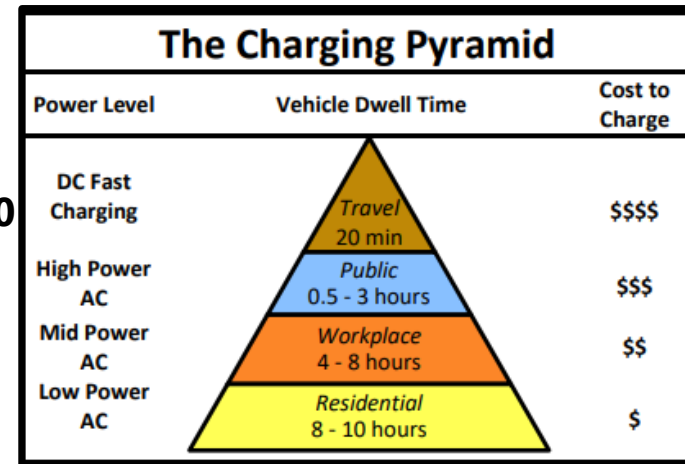
- Level 1 – Typical cost range of \$300 - \$800
- Level 2 – Typical cost range of \$5,000 - \$35,000
- DCFC (L3) – Typical cost range of \$40,000 - \$150,000

## 3. Hardware Considerations

- Mounting: Pedestal or Wall
- Cable management strategy (coil, retractable, etc.)
- Number of Charging Ports/Types
- Theft: Systems available to prevent theft or vandalism
- Operating Conditions: Temperature and humidity operating limits
- Network available (wired or wireless)

## 4. Software Considerations

- Management software
- Payment System: Payment methods, fee structure, network and maintenance fees.



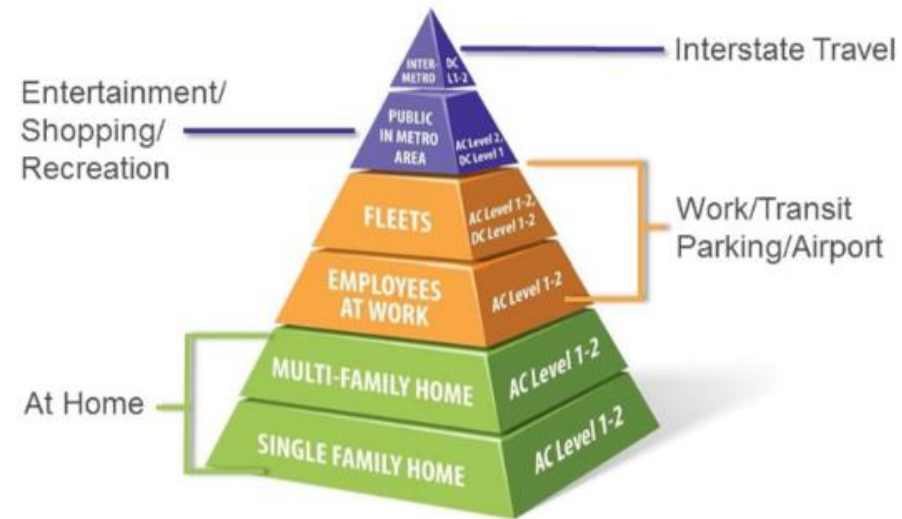
# Strategy for EV Charging Deployment

The Charging Pyramid on the right displays the needed charging infrastructure in descending order of priority:

1. Single-family residential
2. Multi-family residential
3. Workplace
4. Public and private fleet
5. Public metro areas
6. Inter-metro transportation corridors

For residential, workplace, and some fleet charging, Alternating Current (AC) Level 1 or 2 can cost-effectively accommodate charging needs.

For public charging, especially stations on highways between metro areas, DC fast charging stations are needed to deliver significant charges within typical travel schedules.

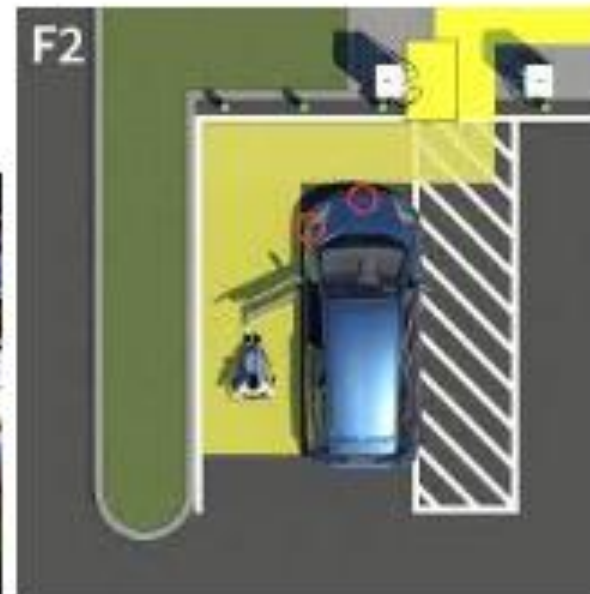


The EV Charging Pyramid. Developed by Ted Bohn, Argonne National Laboratory

# Thank You

## FUTURE DEVELOPMENT

- DC superfast charging 500kW – 750 kW
- In vehicle, AI trip planning based on charger availability
- Universal plug



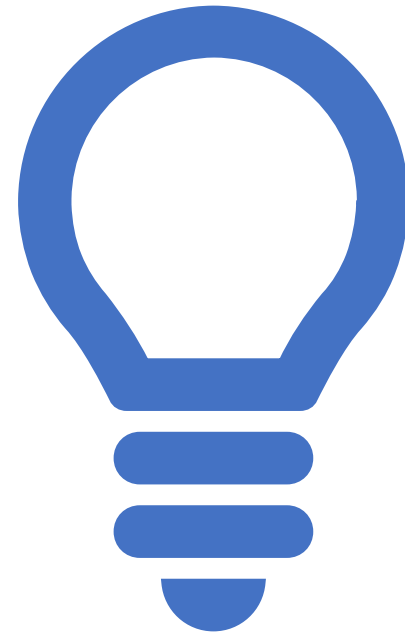


# Community Readiness for Electric Vehicle Charging Stations

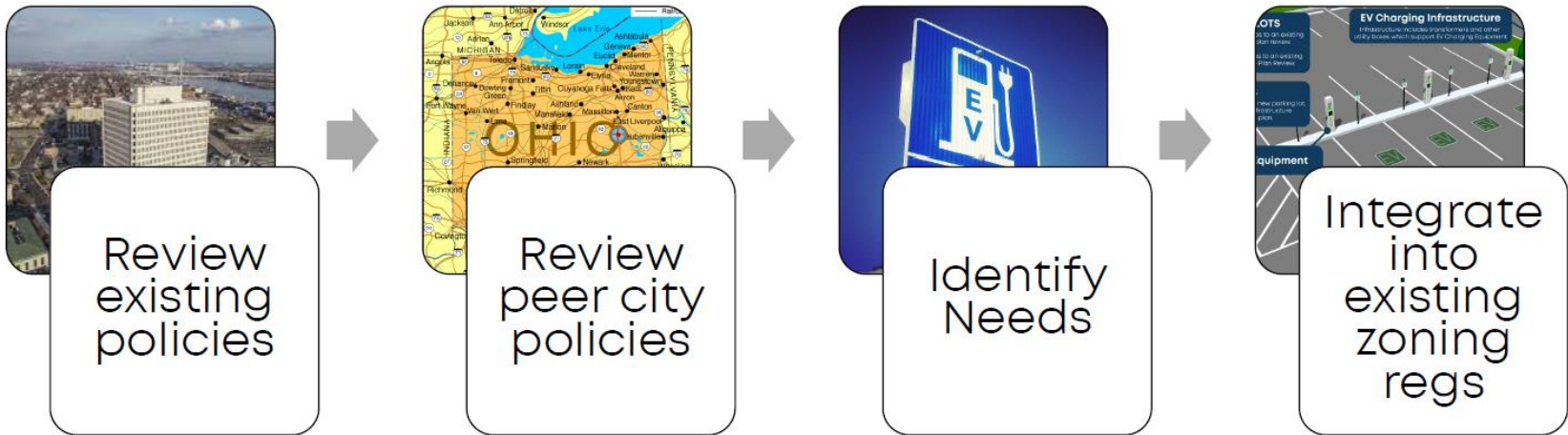
TMACOG Tech  
September 13, 2023

# Disclaimer

- We thank our friends at the Toledo Lucas County Plan Commissions (TLCPC) for information relative to their study and approach for land use planning and electric vehicle charging
- Information provided in this section is a combination from TLCPC and other sources



# TLCPC Process





Defines EV charging as Motor Vehicle Maintenance – No Specific regulations.



Off-street parking spaces dedicated to EV charging count towards parking minimums and not towards maximums.

No zoning regulations regarding EV.

All publicly funded parking garages require 1% EV spaces, 5% potential EV spaces.



No zoning regulations regarding EV.



Defines EV charging as vehicle fueling.

# Peer City Policies

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# Planning Tools



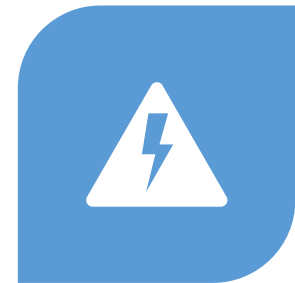
**ZONING**



**PARKING**



**CODES**



**PERMITTING**



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# Zoning

Planning  
Tools



# Planning Tools



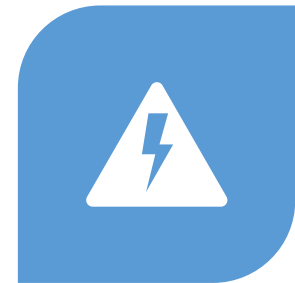
**ZONING**



**PARKING**



**CODES**



**PERMITTING**

Planning  
Tools

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# Parking



# Planning Tools



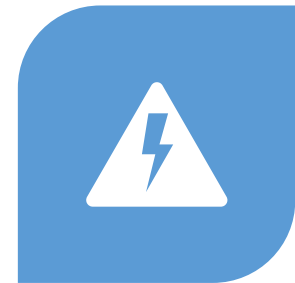
**ZONING**



**PARKING**



**CODES**



**PERMITTING**

# Planning Tools

# Codes

## EVSE BUILDING CODES



# Planning Tools



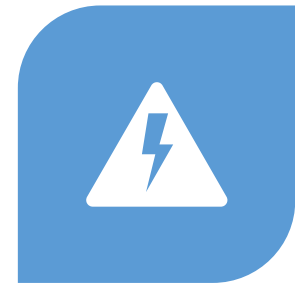
**ZONING**



**PARKING**



**CODES**

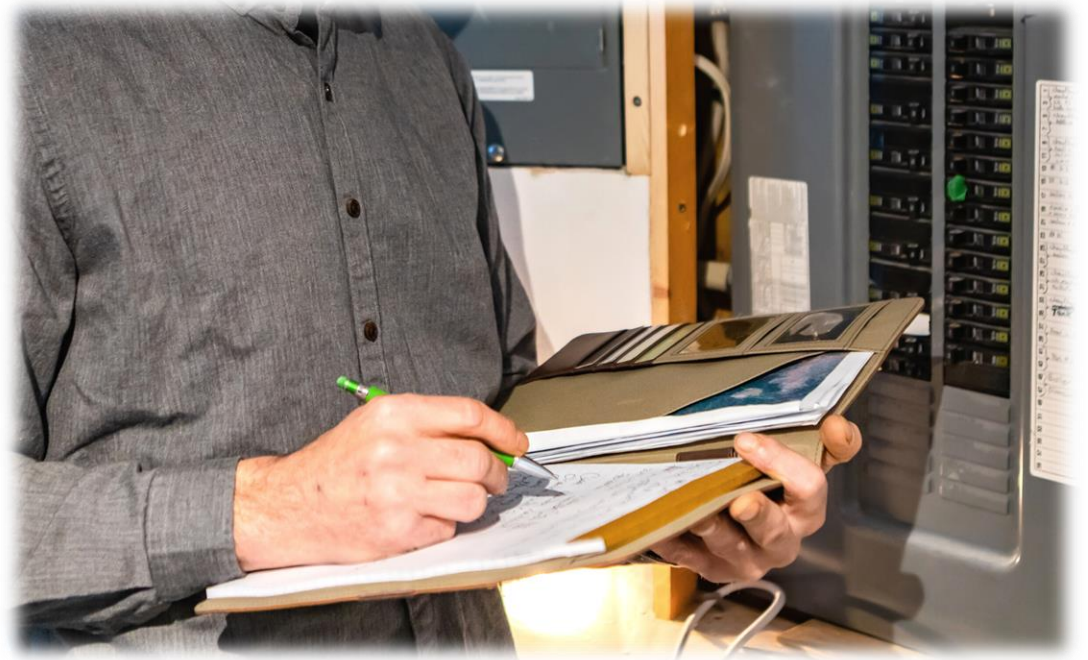


**PERMITTING**

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# Permitting

Planning  
Tools



Local  
Considerations



Accessibility

Signage

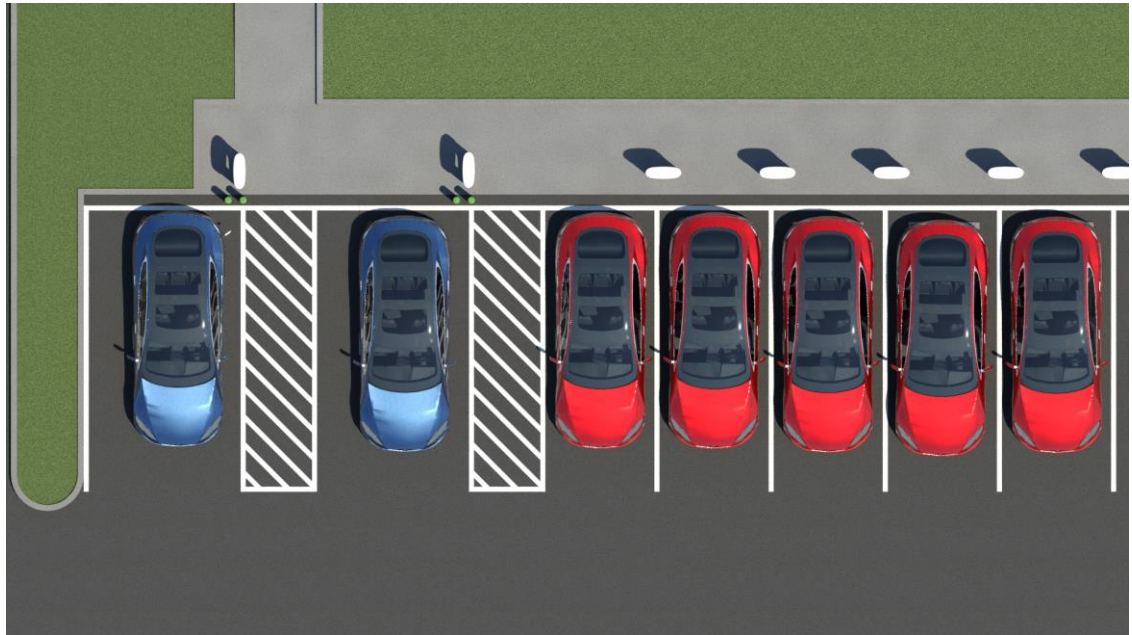
Equity

Costs



# Accessibility

Local  
Considerations



- <https://www.access-board.gov/ta/tad/ev/>

Local  
Considerations



Accessibility

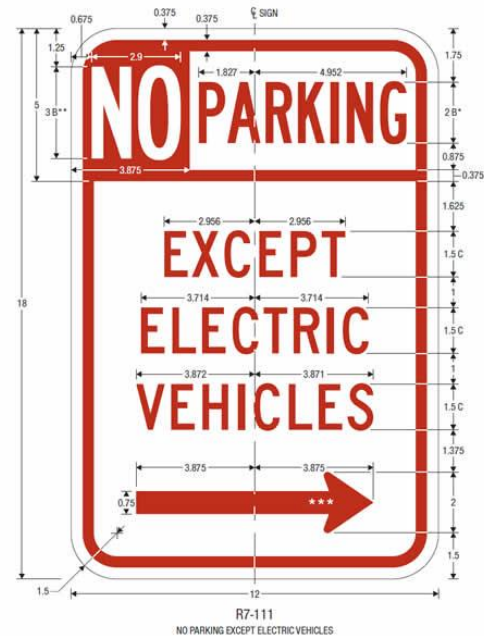
Signage

Equity

Costs

# Signage

Local  
Considerations



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BACKGROUND — RED (RETROREFLECTIVE)

UPPER RIGHT SECTION  
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LOWER SECTION  
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[https://afdc.energy.gov/fuels/electricity\\_charging\\_station\\_signage.html](https://afdc.energy.gov/fuels/electricity_charging_station_signage.html)

Local  
Considerations



Accessibility

Signage

Equity

Costs

# Equity

Local  
Considerations



- <https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-planning/equity-considerations>

Local  
Considerations



Accessibility

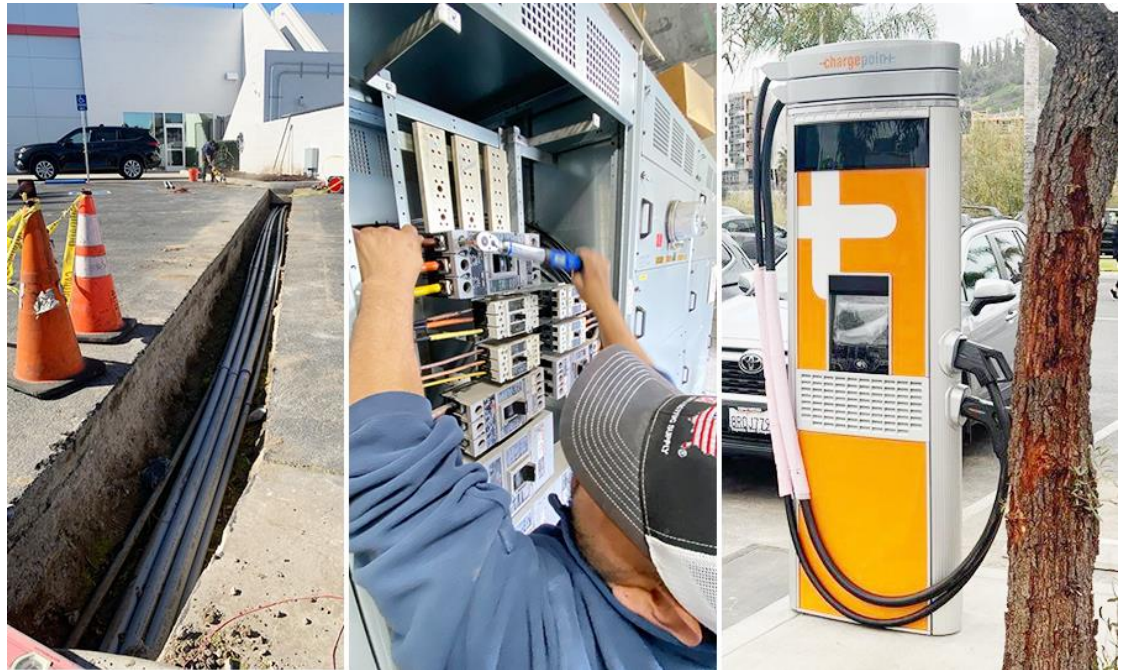
Signage

Equity

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# Costs

Local  
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Thank you

Questions