



ADVANCING FEDERAL  
INFRASTRUCTURE  
THROUGH INNOVATION



CINCINNATI, OHIO  
OCTOBER 25-27, 2022

# Selecting Electric Vehicle Charging Infrastructure Wisely

Technical Considerations



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# Selecting EV Charging Infrastructure



## Site Power

- Peak Demand
- Demand Charges
- Facility Loads



## Solutions

- Managed Charging
- Grid Services
- Bidirectional EVSE

## EVSE Needs

- AC Level 1, Level 2
- DC Fast Charging
- Port Count



## Interconnection

- Site Capacity
- Equipment Upgrades
- Grid Capacity



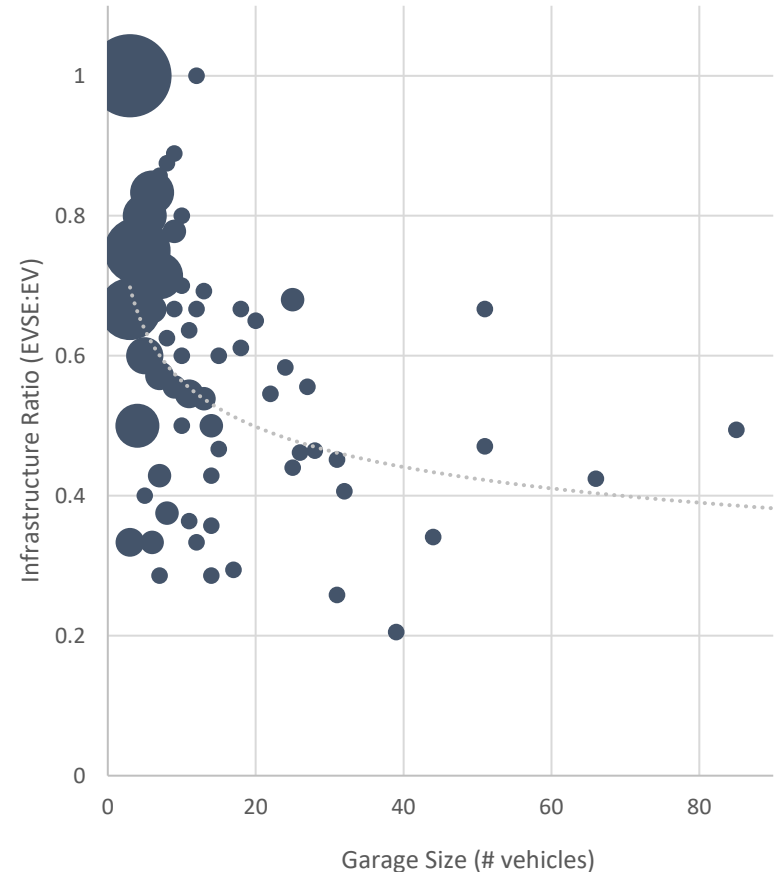
# EVSE Needs - AC vs DC

- Consider the EVSE technology that best suits fleet needs
- AC Level 1 or Level 2 EVSE
  - AC Level 1 optimal for PHEVs or low-VMT BEVs
    - Approximately 5 miles/hr (1.9 kW @ 120 V)
  - AC Level 2 is optimal for most BEVs
    - Approximately 25 miles/hr (6+ kw @ 208-240 V)
- DC Fast Charging
  - Best for 3-shift operations & could benefit large fleets with high-VMT operations near garage.
    - Approximately 100-200+ miles/hr (50-350 kW @ 480 V 3φ)
- Smart EVSE Features
  - Consider the benefits and costs of smart or networked EVSE units
    - Data collection, transaction processing, managed charging



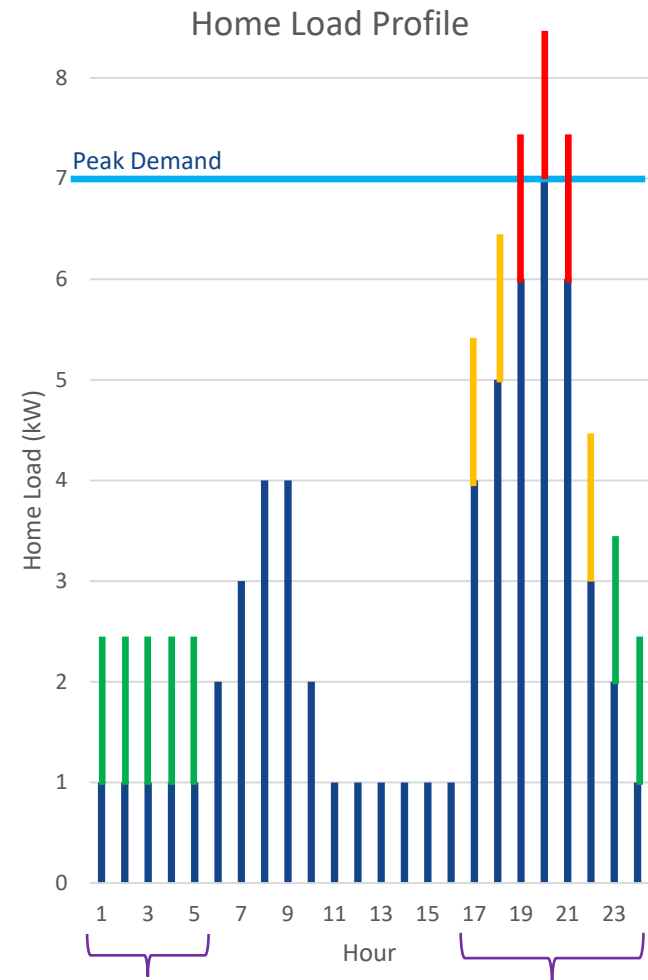
# EVSE Needs - Port Count

- How many EVSE Ports will be needed for an electrified fleet?
  - How often will a vehicle require a charge?
- Plan for the future by installing more EVSE than is currently necessary.
  - Reduce infrastructure and construction project management costs
- Reduce EVSE at the largest garages
  - Larger garages typically require a lower EV/EVSE infrastructure ratio



# Site Power - Peak Demand

- Consider the **maximum charging power** for all EVSE.
  - When will vehicles arrive back and how long must they charge overnight?
- What is the **coincident peak** for the site?
  - What will the load be when the sum of facility and EV charging loads is highest?
- What are the pros and cons of each power?
  - Higher power charging **increases flexibility**
    - Upgrades could be required or possibly mitigated
  - Lower charging power **increases utilization**
    - Fewer upgrades and less flexibility for managed charging



# Interconnection - Equipment Upgrades

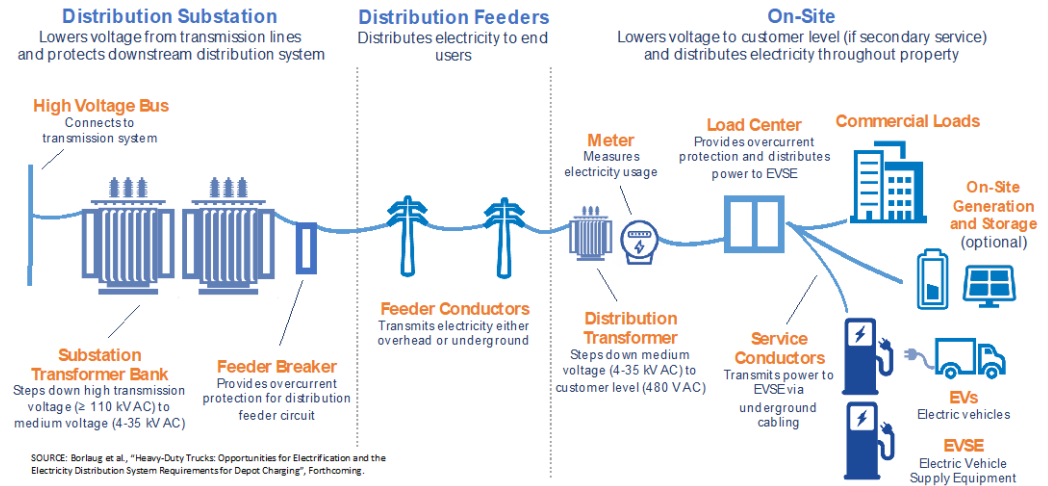
- Increasing a site's peak demand from new EVSE could require **service upgrades** from the utility to support a larger load.
- These upgrades typically include **facility and utility owned equipment**

- Facility Equipment

- **Service Panel**, Service Drop, Distribution Transformer

- Utility Equipment

- **Distribution Transformer**, Electric Meters, Feeder Conductors





# Solutions - Managed Charging

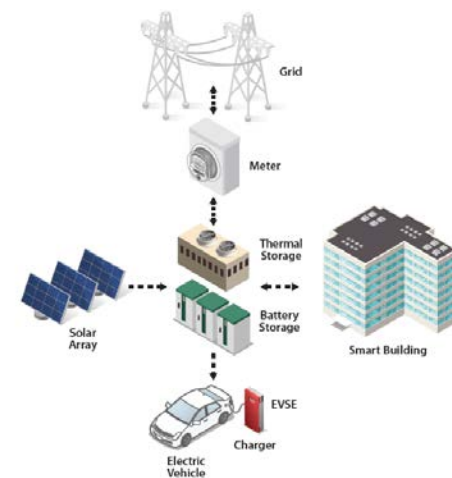
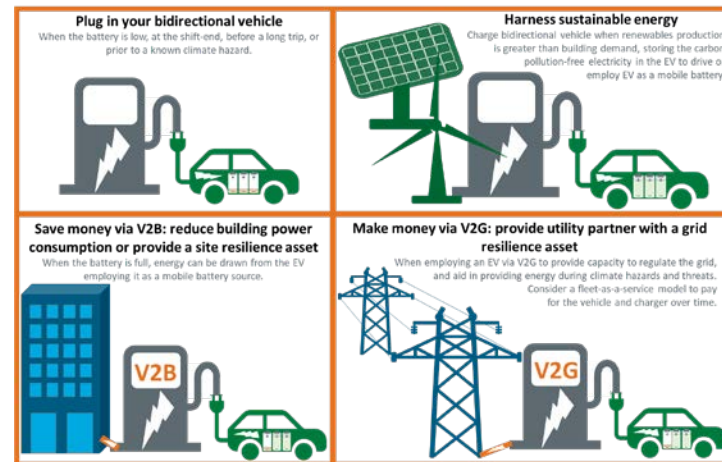


- Managed charging can leverage **EV charge session flexibility** to shift EV charge sessions to periods of the day with lower energy costs, mitigate equipment upgrades, or reduce grid impacts.
- Time-of use (TOU) rates and demand charges
  - Charge when **TOU rates are** low or reduce the facility and EV coincident peak to mitigate **peak demand**
- Equipment upgrade mitigation
  - Set a **power ceiling** for all EVSE to ensure equipment is not overloaded and avoid upgrades
- Grid impact reduction
  - Coordinate EV charging with **utility services** (such as demand response) to support the grid



# Solutions - “Energy Storage”

- How can energy storage provide solutions where managed charging is not practical?
- Install Distributed Energy Resources (DER)
  - Behind-the-meter storage or generation can **reduce net peak demand** when timed with EV charging
- Consider bidirectional charging technologies
  - Leverage one vehicle’s energy to support the needs of another
  - Provide grid services when requested or **support facility energy needs in an islanded microgrid** during an outage.
  - Bidirectional charging has limitations due to market availability, **additional infrastructure needs, and utility program limitations**



# FEMP Resources

- FEMP EV Overview Videos:
  - [https://youtube.com/playlist?list=PLmIn8HnCs7bEa\\_NOG5Y8EZYONoxJtTOEF](https://youtube.com/playlist?list=PLmIn8HnCs7bEa_NOG5Y8EZYONoxJtTOEF)
- FEMP EV Champion Training:
  - <https://www.wbdg.org/continuing-education/femp-courses/fempodw109>
- Fleet Electrification Success Stories
  - <https://www.energy.gov/eere/femp/fleet-electrification-success-stories>
- Federal Workplace Charging
  - <https://www.energy.gov/eere/femp/fleet-electrification-success-stories>



- Managed/Bidirectional Charging
  - <https://www.energy.gov/eere/femp/managed-charging-bidirectional-charging-and-electric-vehicles-mobile-storage>
- EV/EVSE Reporting
  - <https://www.energy.gov/eere/femp/electric-vehicle-and-electric-vehicle-supply-equipment-reporting>

# EVU-Finder

- Discover utility contacts and find EV incentives for fleet electrification

## EV U-Finder: Electric Vehicle Utility Finder

Enter ZIP Code to identify local utilities, electric vehicle support programs, and Clean Cities Coalitions.

92313 Powered by the U.S. Utility Rate Database (<https://openei.org/apps/USURDB/>)  
Utility territories last updated February 2021.

See Introduction worksheet for notes on using EV U-Finder.



### Identified active utilities in 92313

\*Customer Types:

G: Government or Public; C: Commercial; R: Residential

Utility	Utility Name	Utility Ownership	Known EVSE Funding Eligibility?*	Known Advisory Services Eligibility?*	Known Federal EVSE Incentives?	GSA Area-wide Contract?	Identified Utility Contact or Phone Number (as available)	Identified Utility Contact Email	Known UESC Contact?	Known UESC Email?
1	Southern California Edison Co	INVESTOR	GC	GC	Y	Y	California			
2	City of Colton, California (Utility Company)	PUBLIC	CR	CR			562-933-1111			
3	NA	NA								
4	NA	NA								
5	NA	NA								
6	NA	NA								
7	NA	NA								
8	NA	NA								
9	NA	NA								

### Utility Associations

Utility Ownership	Directory or Contact
INVESTOR	<a href="#">EEL Utility Federal Contacts</a>
PUBLIC	<a href="#">APPA Utility Directory</a>
COOPERATIVE	<a href="#">NRECA Utility Directory</a>
Cooperative Contact	<a href="#">NRECA Federal Coordinator</a>

<https://www.eel.org/about/affiliates/national/keys/accounts/IPages/Federal-Utility-Directory.aspx>

<https://www.publicpower.org/where-public-power>

<https://www.electric.coop/our-organization/nreca-member-directory>

### State Level Incentives

State:	CA
Known EVSE Funding Eligibility?*	GCR

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### Clean Cities Coalition

Coalition:	Southern California Clean Cities Coalition
Coordinator:	
email:	
website:	<a href="http://www.scag.ca.gov/cleancities/">http://www.scag.ca.gov/cleancities/</a>

### Additional Incentive Search Tools

<b>Alternative Fuels Data Center (AFDC) Laws and Incentives</b>
<a href="https://afdc.energy.gov/laws/state">https://afdc.energy.gov/laws/state</a>
<b>Database of State Incentives for Renewables &amp; Efficiency (DSIRE)</b>
<a href="https://www.dsireusa.org/">https://www.dsireusa.org/</a>
<b>Demand Response and Time-VARIABLE Pricing Programs</b>
<a href="https://www.energy.gov/eere/femp/demand-response-and-time-variable-pricing-programs">https://www.energy.gov/eere/femp/demand-response-and-time-variable-pricing-programs</a>

<https://www.energy.gov/eere/femp/electric-vehicles-federal-fleets>



Thank you

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# Additional Resources

- Smart Charge Solution Slide Deck
  - <https://www.nrel.gov/docs/fy22osti/82738.pdf>
- EV Basics Pamphlet
  - <https://www.nrel.gov/docs/fy21osti/80605.pdf>
- EVs@Scale Lab Consortium Bi-annual Stakeholder Meeting Slide Deck
  - <https://www.nrel.gov/docs/fy22osti/83838.pdf>
- EVSE Deployment Fact Sheet
  - [https://www.energy.gov/sites/default/files/2022-02/femp\\_tiger\\_team\\_fact\\_sheet.pdf](https://www.energy.gov/sites/default/files/2022-02/femp_tiger_team_fact_sheet.pdf)