EV Champion Training

Webinar 4: Advanced Site Operations

Leidy Boyce – Research Engineer, NREL
Jesse Bennett – Research Engineer, NREL
Jeff Gingrich – Accelerated Deployment & Decision Support Center, NREL
Tony Markel – Senior Researcher, Partnership Development, NREL

FEMP EV Champion Training Curriculum

EV Technology

- ICE, HEV, PHEV, BEV
- L1, L2, DCFC
- FAST VLD Reporting

EV Financials

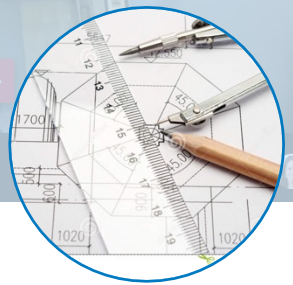
- EV TCO calculations
- Utility bill analysis
- FAST EVSE reporting

Training 1

EVSE & Energy

- EVSE charging/install
- Electric service review
- EVSE cybersecurity

Training 2



Site Design

- Equipment requirements
- Construction planning
- Utility interconnection

Training 3

Site Operations

- Partnership Opportunities for EV Infrastructure
- Managed charging
- Cybersecurity

Training 4

1. Introduction / Alternative Fueling Station
2. Partnership Opportunities for EV Infrastructure
3. Smart Charging & Smart Management Strategies
4. Managing Workplace Charging
5. Performance Contracting Options by Jeff Gingrich
6. Cybersecurity by Tony Markel
7. Q&A

Course Objectives and CEUs

Course Learning Objectives:

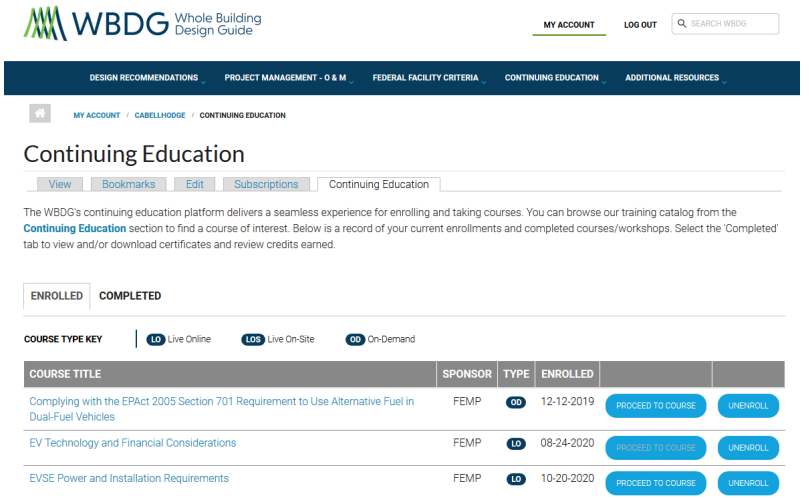
- Identify partnership opportunities when planning electrical charging infrastructure.
- Gain knowledge on smart managing charging solutions.
- Understand performance contracting options.
- Be aware of EVSE vulnerability → cybersecurity concerns

Continuing Education Units:

- Navigate through WBDG to “My Account”
- “Proceed to Course”
- “Course Post Test”

Questions and Answers:

- Ask through “Q+A”
- Panelists will monitor “Chat” as well
- We will address most questions at the end of each section



To Receive IACET-Certified CEUs

- IACET (International Association for Continuing Education and Training.
- CEU is a unit of credit to 10 hrs of participation (contact hours) in an accredited program.

- **How do I earn CEUs for training I've taken?**

- Attend the training in full-no exceptions.
- Complete the assessment/quizzes for each session. Attendees must score 80% or higher on the assessment for professional development.
- Complete the assessment within six weeks of the training.

Supplemental Training Materials

Supporting Materials:

- **EV Training Videos**
  1. EV Technology Overview
  2. EV Financial Considerations
  3. EVSE Infrastructure Requirements
- **EV Champion Worksheets**
  1. EV Adoption Plan
  2. EVSE Planning

EV TECHNOLOGY OVERVIEW

EV FINANCIAL CONSIDERATIONS

EVSE INFRASTRUCTURE

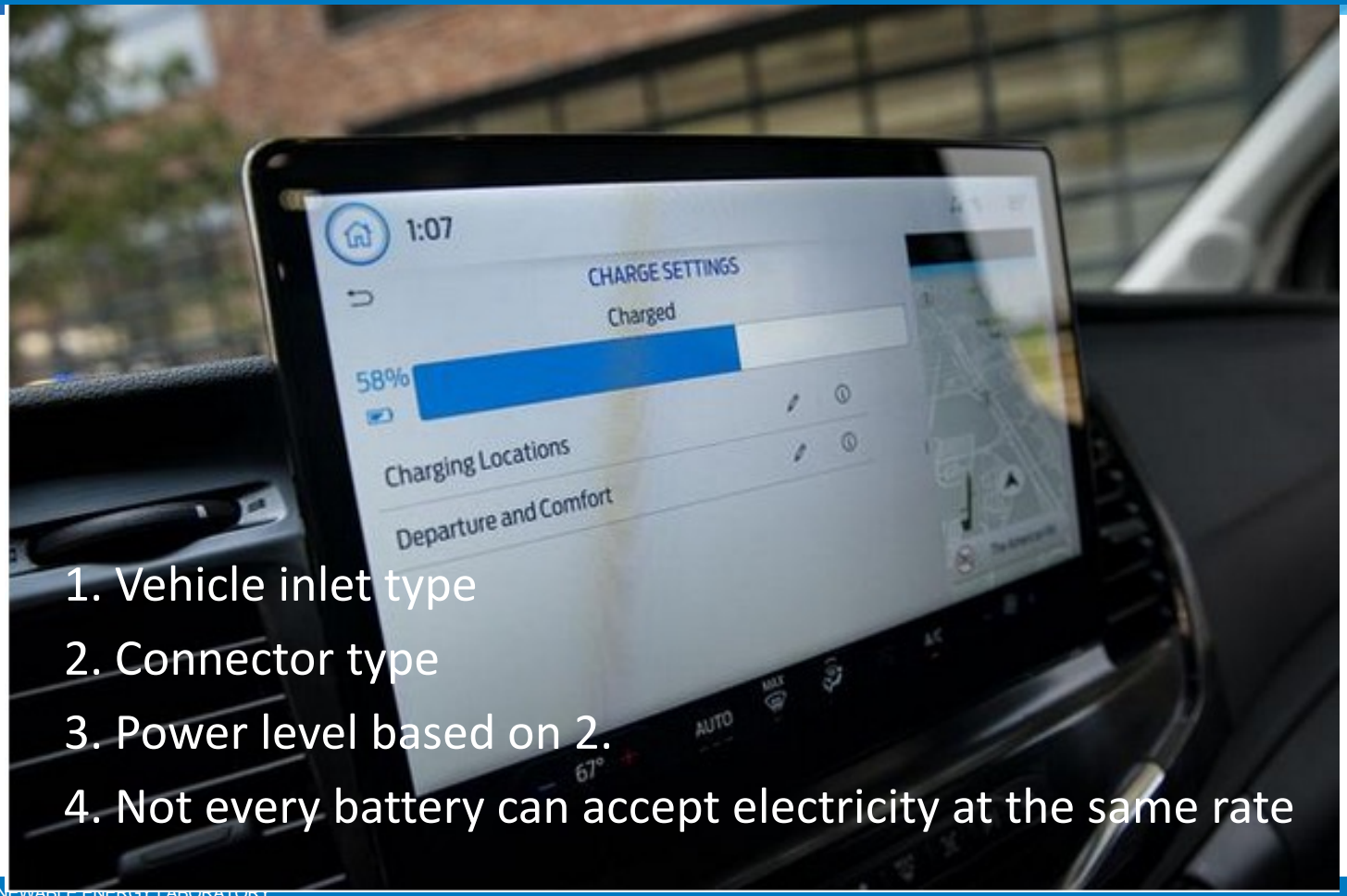
- EV Technology and Financial Considerations (Worksheet 1)
- EVSE Power and Electric Utility Considerations (Worksheet 2)
- EV Site Assessment and Construction Planning
- Advanced EV Site Assessment and Operations.

https://www.energy.gov/eere/femp/electric-vehicle-training

Four small steps for fleets, one giant leap for fleet-kind!

1. Plan
2. Design
3. Execute
4. Manage

WHERE & WHEN TO CHARGE?

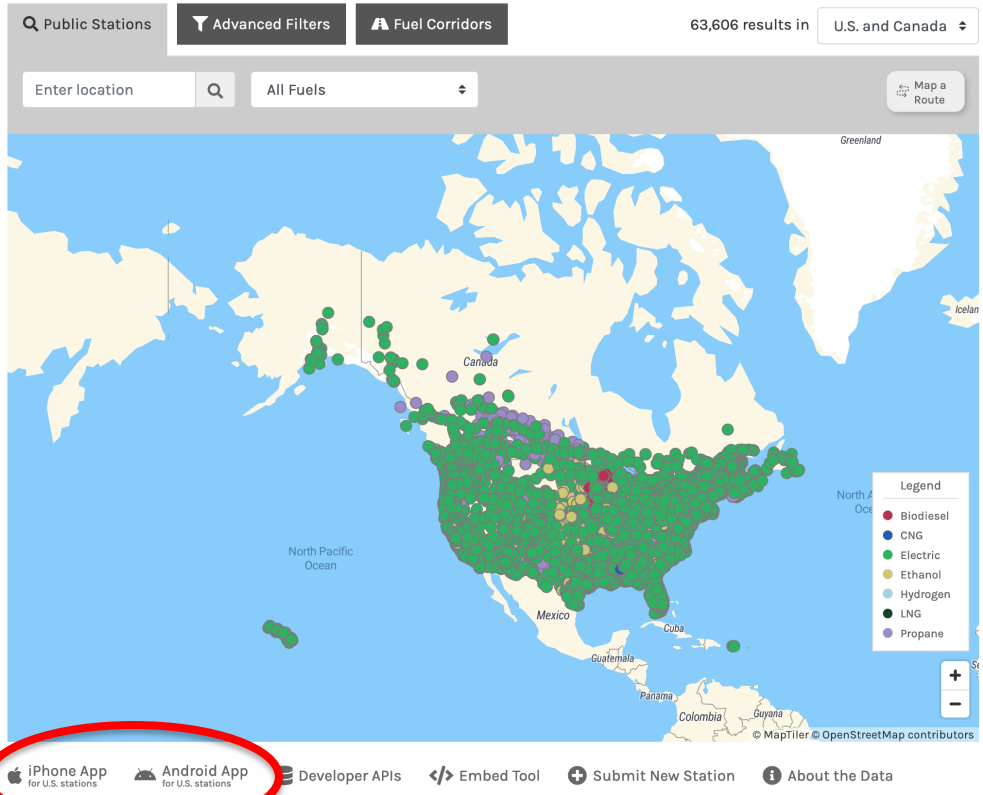


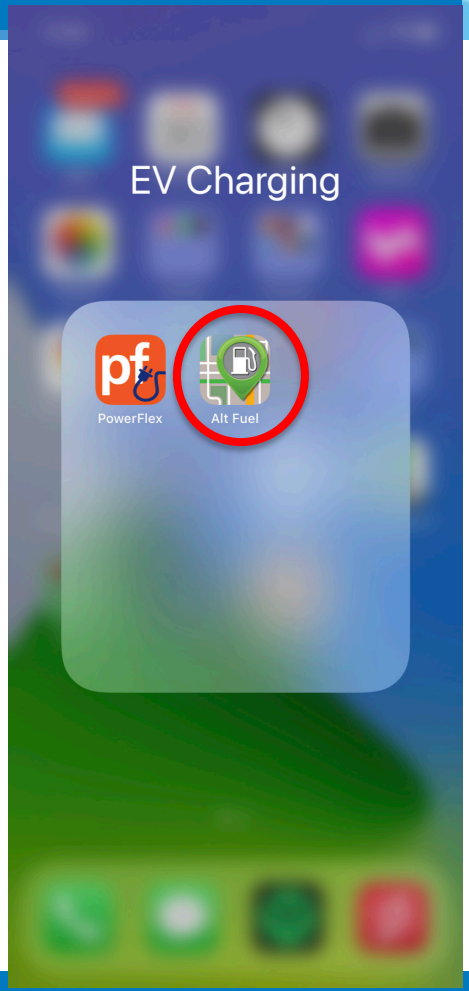
1. Vehicle inlet type
2. Connector type
3. Power level based on 2.
4. Not every battery can accept electricity at the same rate

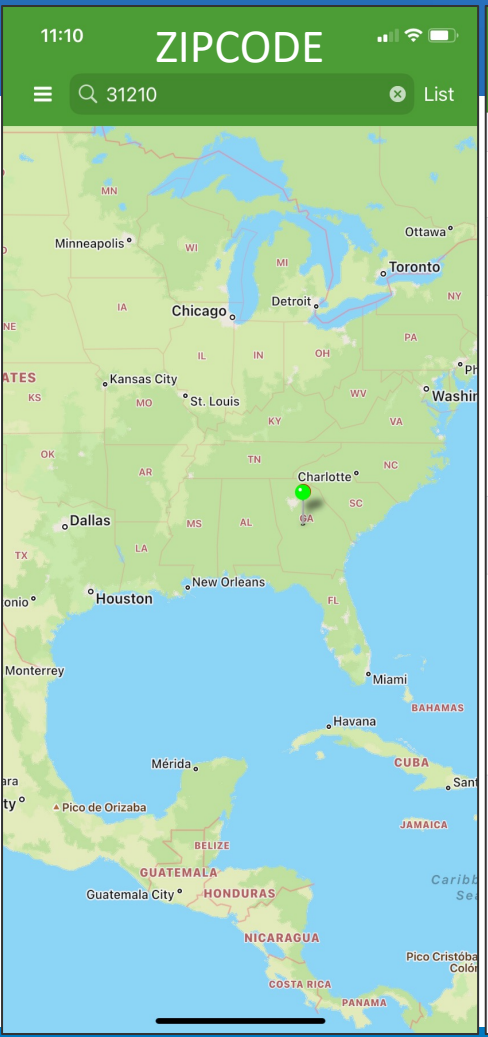
WHERE TO CHARGE? Alternative Fueling Station

Alternative Fueling Station Locator

Find alternative fueling stations in the United States and Canada. For U.S. stations, see data by state. For Canadian stations in French, see Natural Resources Canada.



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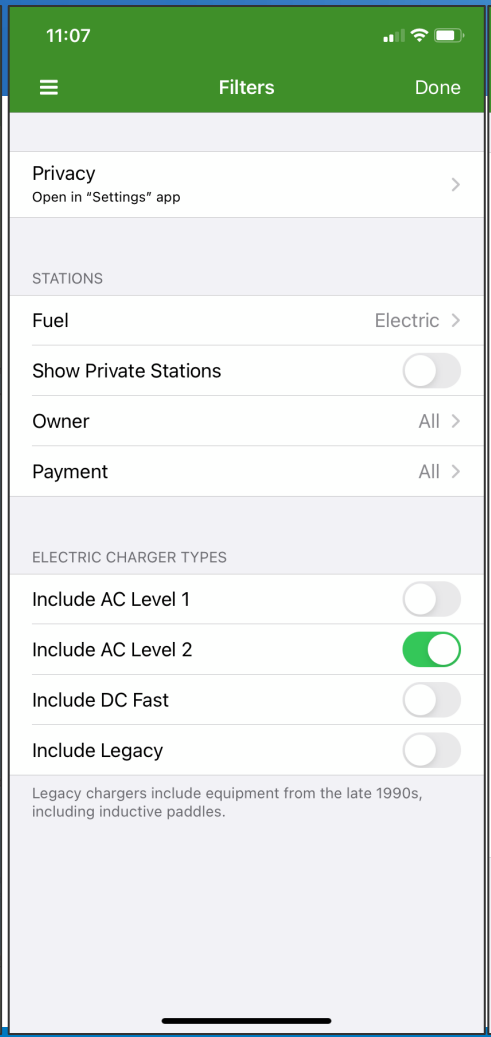
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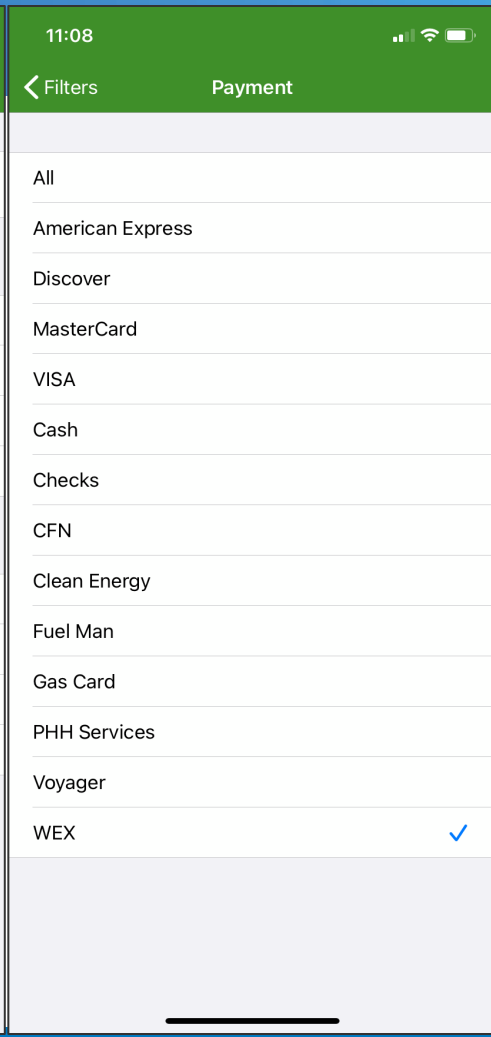
ELECTRIC CHARGER TYPES
Include AC Level 1
Include AC Level 2
Include DC Fast
Include Legacy
Legacy chargers include equipment from the late 1990s, including inductive paddles.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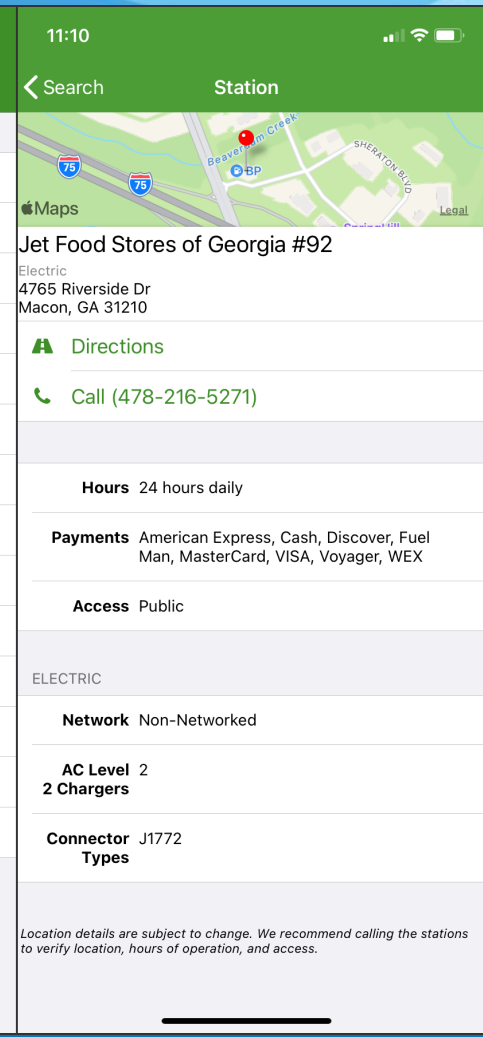
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Directions
Call (478-216-5271)
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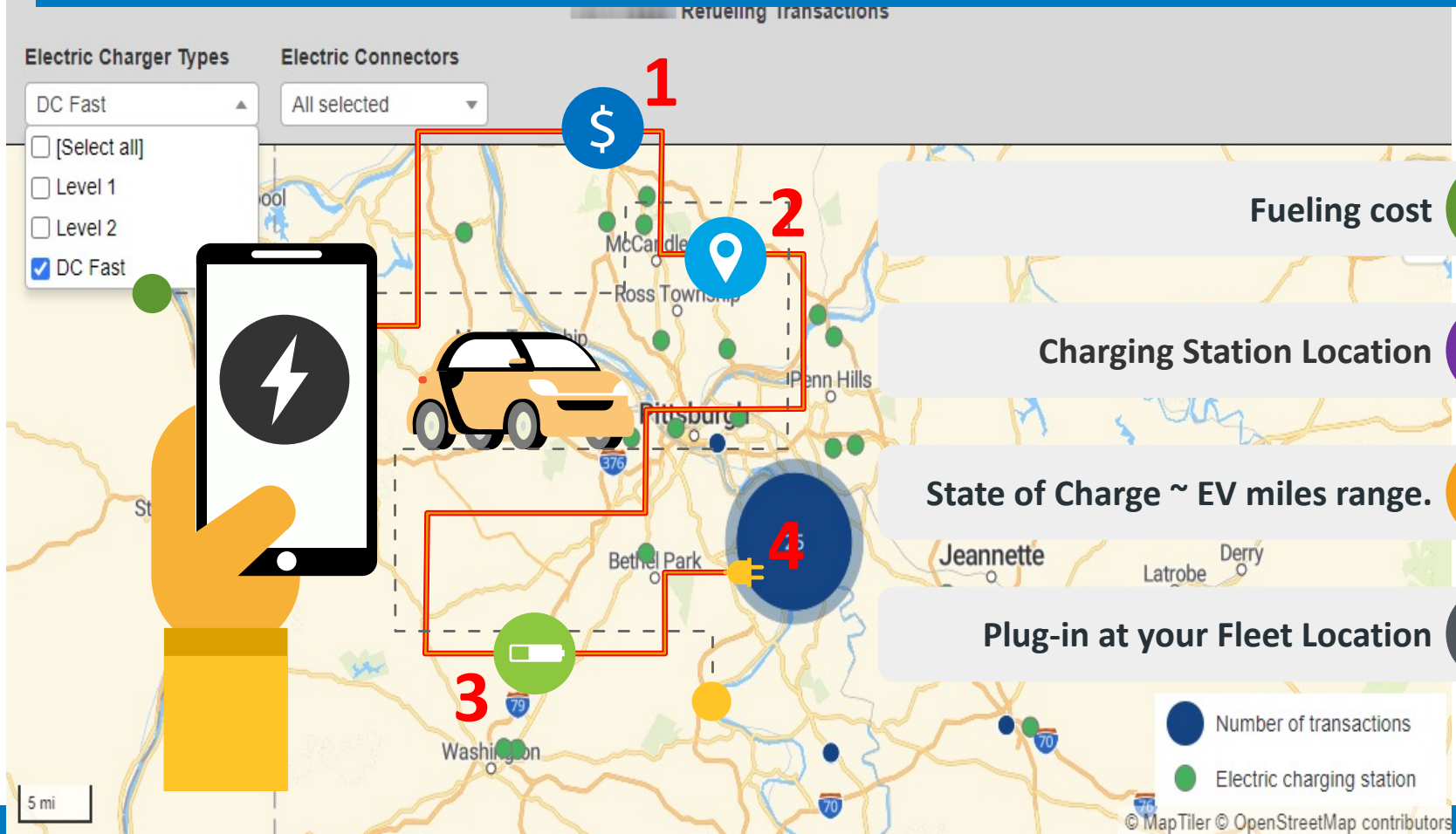
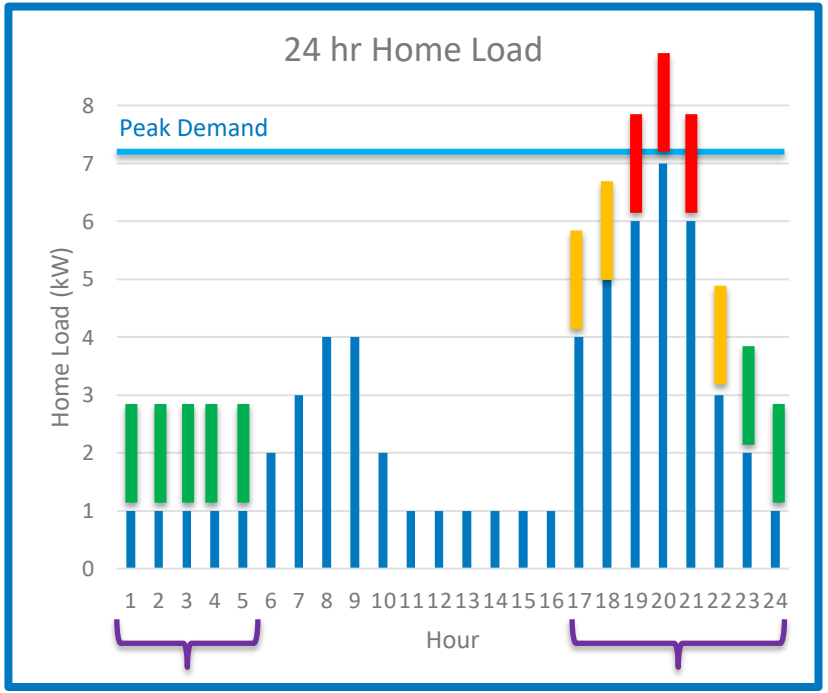
Payments American Express, Cash, Discover, Fuel Man, MasterCard, VISA, Voyager, WEX
Access Public
ELECTRIC
Network Non-Networked
AC Level 2 Chargers 2
Connector Types J1772
Location details are subject to change. We recommend calling the stations to verify location, hours of operation, and access.

WHERE TO CHARGE? (https://afdc.energy.gov/stations/#/find/nearest)



When to charge an EV? Keep costs low

- Home Peak Demand
  - Usually a result of HVAC systems
  - Often occurring in the late afternoon
  - Typically a similar profile for Mon-Fri and Sat/Sun
- EVSE Peak Demand
  - Dependent on vehicle travel and dwell patterns
  - Dependent on EVSE quantity and power
  - Overnight charging is typically best
- Consider the best times to charge EVs
  - Review facility load profile
  - Determine vehicle dwell period and energy needs
  - Estimate optimal charging window



$$Energy\ (kWh) = Distance(mi) \times Efficiency\ (kWh/mi)$$

$$Charge\ Time(hrs) = \frac{Energy\ (kWh)}{Charge\ Rate\ (kW)}$$

EV charging spots are for charging, not parking!

1. Move along (and don't squat)

2. Don’t unplug others

3. Don’t *always* aim for 100%

Partnership Opportunities for EV Infrastructure

Unified we succeed

Partnership Opportunities for EV Infrastructure

1. **Statewide and Multistate Partners** including organizations planning for EV corridors, State environmental, energy, and transportation agencies.

2. **Local and Regional Planning Partners** include Clean Cities coalitions

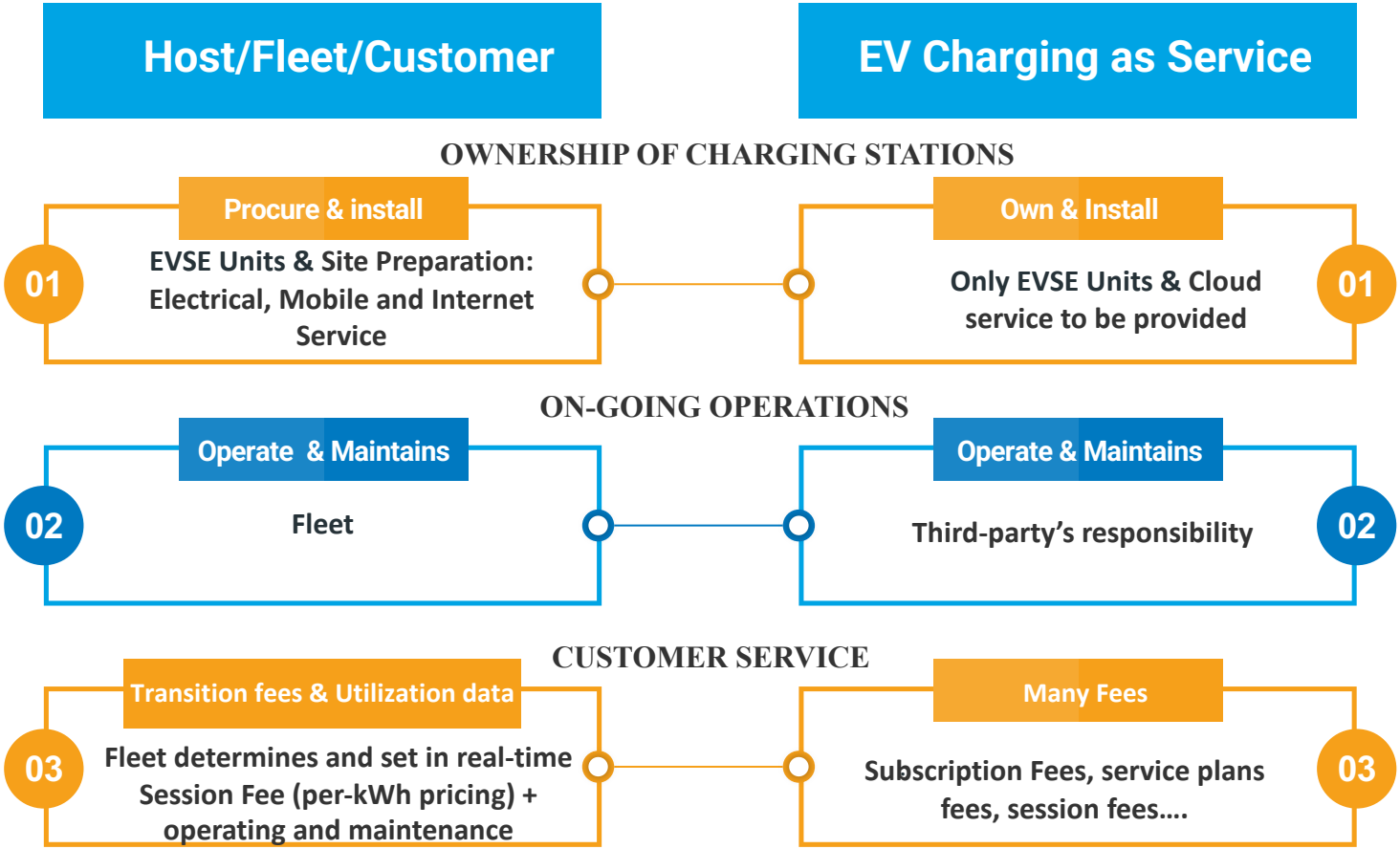
3. **Electric Utilities**

4. **Charging Networks**

5. **Site Hosts:** hotels, public libraries, universities, airports**,** retails & restaurants…

SOURCE: https://www.transportation.gov/rural/ev/toolkit/ev-partnership-opportunities

Ownership Structures: EV charging responsibilities?



Smart Charging & Smart Management Strategies

Gain power over your EVSE

Network connected EVSE features and types

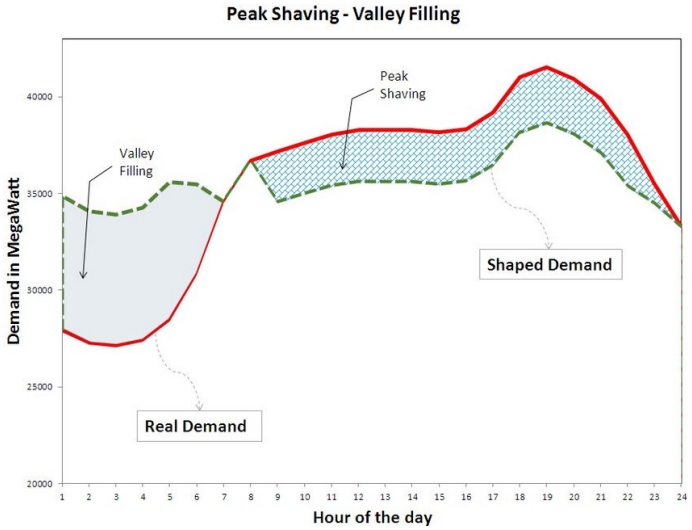
What is the Difference?

	SMART CHARGING	MANAGED CHARGING
Remote Management - On/Off	✓	✓
Sequential Charging (Time of Day, Day of Week)	✓	✓
Adaptive Charging (Dynamic Scheduling)		✓
Error Alerts & Reporting	✓	✓
Error Correction	✓	✓
Power Supply Management		✓
Vehicle Prioritization		✓
Geo-fencing of Entire Yard Operations		✓
Telematics, Fleet Management, and Maintenance Systems Integrations		✓
24/7 Remote Monitoring		✓
Customized Solutions		✓
24/7 Client Services		✓

Source: https://www.usgain.com/blog/the-difference-between-smart-charging-and-managed-charging/

What is Smart Energy Management for EV Charging?

- EV charging may be managed and controlled through software to:
  - Reduce demand charges
    - Shifting load away from facility peak
  - Avoid expensive upgrades
    - Set limit on system load
  - Reduce energy costs
    - Shift charging to off-peak pricing hours
  - Manage a large fleet
    - Ensure EVs are charged when needed

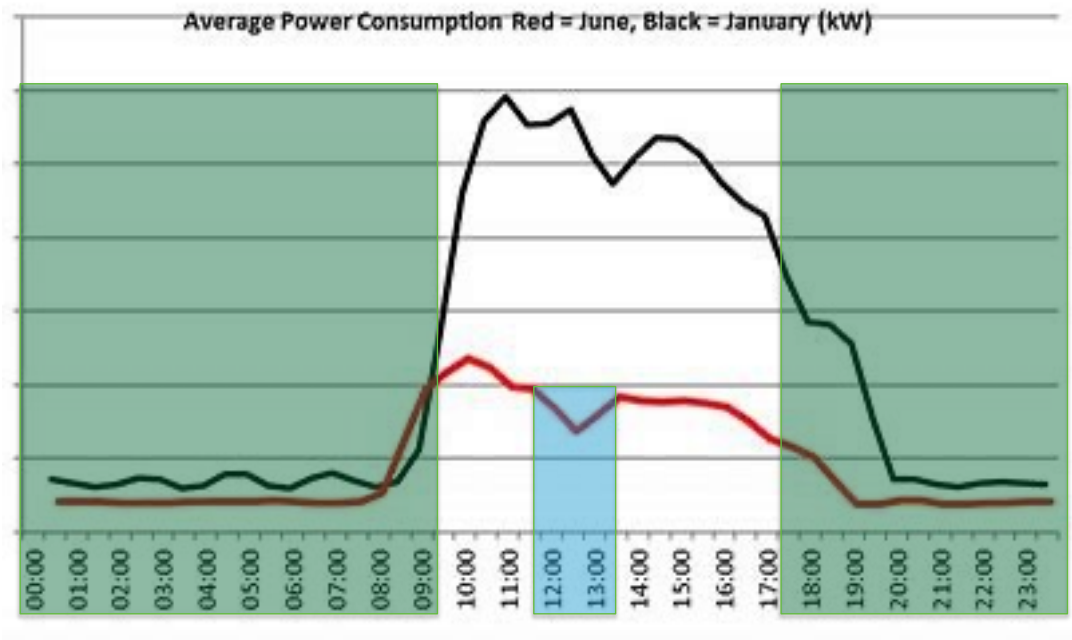


- Requires a networked EVSE with a standard communication protocol (such as OCPP or similar) to communicate with management software.

Building Load Considerations

- Understand the nearby building load profile to determine the peak demand.

- Consider how load profiles may differ by season
- Periods of high peak demand will determine the facility demand charge
- Coordinate EV charging to occur during off-peak hours to reduce the cost to charge



Cost savings & Energy efficiency

- **Smart Charging** can also help reducing the number of chargers required in order to achieve a certain Quality of Service.

- **Smart energy management** optimizes the charging infrastructure by efficiently delivering available power to EVs, shifting charging loads across energy sources to safely deliver electricity without interfering with the power needs of buildings, homes, or other power consumers.

Deploy systems with automated load management – avoiding costly service upgrades and ensuring you never surpass your allotted power threshold

Managed Charging

Using an Adaptive Charging Network (ACN):

- Avoid upgrades and/or minimize infrastructure costs
- Limits or eliminates EVSE demand charges during peak campus demand events
- Enables facilities to install more EVSEs without upgrading infrastructure

Integrating Electric Vehicle Charging Infrastructure into Commercial Buildings and Mixed-Use Communities: Design, Modeling, and Control Optimization Opportunities

Preprint

Shanti Pless, Amy Allen, Lissa Myers, David Goldwasser, Andrew Meintz, Ben Polly, and Stephen Frank

National Renewable Energy Laboratory

Presented at the 2020 ACEEE Summer Study on Energy Efficiency in Buildings
August 17-21, 2020

NREL Garage Case Study

"EVSE Upgrades in NREL's Parking Garage Generate Financial Benefits"

- Installed 72 EVSE ports expanding workplace charging from 36 to 108 ports.
  - Total peak demand capacity of 720 kW!
  - Exceeding garage transformer and service panel capacity ($$$)
- Managed charging solution
  - Employees input desired mileage and dwell period
  - Schedule charging to meet requirements and limit facility peak demand
  - Limit max garage load to less than transformer rating
  - Limit specific service panel circuits to avoid overloads
- Mitigating upgrade costs and demand charges, while meeting the energy needs of all users

Workplace Charging

Electrify your fleet and workforce

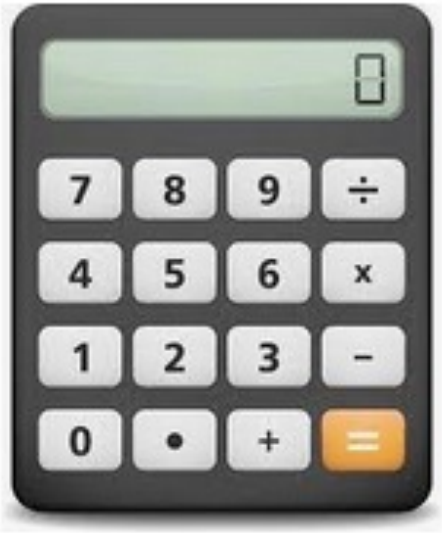
Workplace Charging Program Guide

- A document prepared by the FEMP Fleet Team to provide:
  - Example WPC program structure
  - Steps to plan for and implement a new agency-wide program
  - Example fee structure and calculations to recoup all program costs
  - Industry best practices for steps such as EVSE installation and fee collection

Roles and Responsibilities

- National Project Leader
  - Develop agency program and guidance documents
  - Collect data for EVSE reporting in FAST
  - Monitor installation progress and program effectiveness
- Facility Coordinator
  - Collect EVSE survey results
  - Plan for and oversee EVSE installation process
  - Report EVSE data and program effectiveness to Project Leader

WORKPLACE CHARGING TOOLS



- **Federal Workplace Charging Fee Calculator**

  femp-workplace-charging-fee-calculator.xlsx

- **Estimating Electricity Consumption in Federal Electric Vehicles Calculator**

  ev-electricity-in-gge-calculator.xlsx

Source: https://www.energy.gov/eere/femp/articles/federal-workplace-charging-program-guide

Reimburse is mandatory

Alternative to New Unit Installation

Employees will need to reimburse the facility for the cost of electricity but not the cost of the unit or installation. 42 U.S.C. §6364.

New Unit Installation

per the FAST Act, it is necessary to collect fees from POV charging at government-owned EVSE, which may include electricity costs, unit and installation costs, network fees, and transaction fees.

POV Privately Owned Vehicle

Workplace Charging Fee Structure

Electricity fee
Recoup the cost of electricity as a result of EV charging.

Maintenance Fee
Recover maintenance associated cots

Unit Fee
Recoup the cost of the EVSE over the expected life of the unit.

Network fee
Cover the networking and connection fees required for advanced EVSE units

Installation fee
Recoup the cost of the installation over the expected life of the infrastructure.

Total Charging Fee/Session

Appendix C: POV Fee Calculations

$$Electricity + Network + Unit + Installation = Total\ Fee$$

KEY PARAMETERS;

- **Estimated/Meter Electricity Cost per Charging Session**
- **Sessions per month or Year**
- **Amortization Period**

	Electricity Fee	Network Fee	Unit Fee	Installation Fee	Total Session Fee
120 V Receptacle	$0.41	-	$0.04	$0.05	**$0.50**
Networked Level 2	$0.41	$0.54	$0.67	$0.05	**$1.67**

How to collect Fee Collection?

1. **Pay.gov**

Agencies may work with Pay.gov's implementation team at pay.gov@fiscal.treasury.gov to establish a web-based collection system using either a general form or unique bill issued for each employee.

2. Payroll Deduction

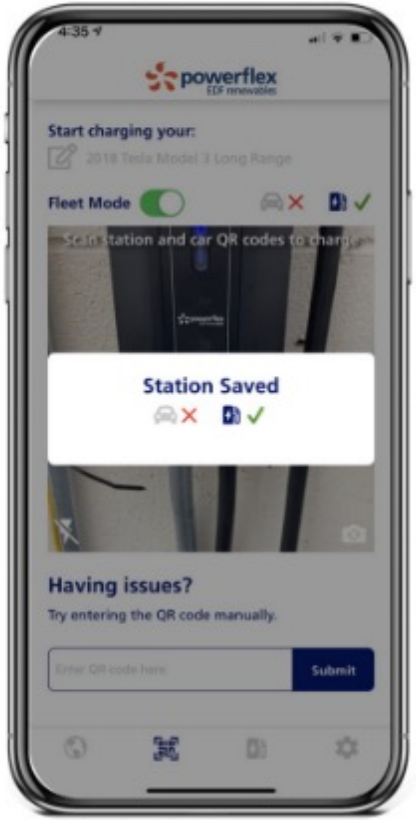
Agencies may alternatively withdraw the fee from employee's payroll as a post-tax deduction and then deposit the money into a Treasury account.

3.Third-Party Vendor

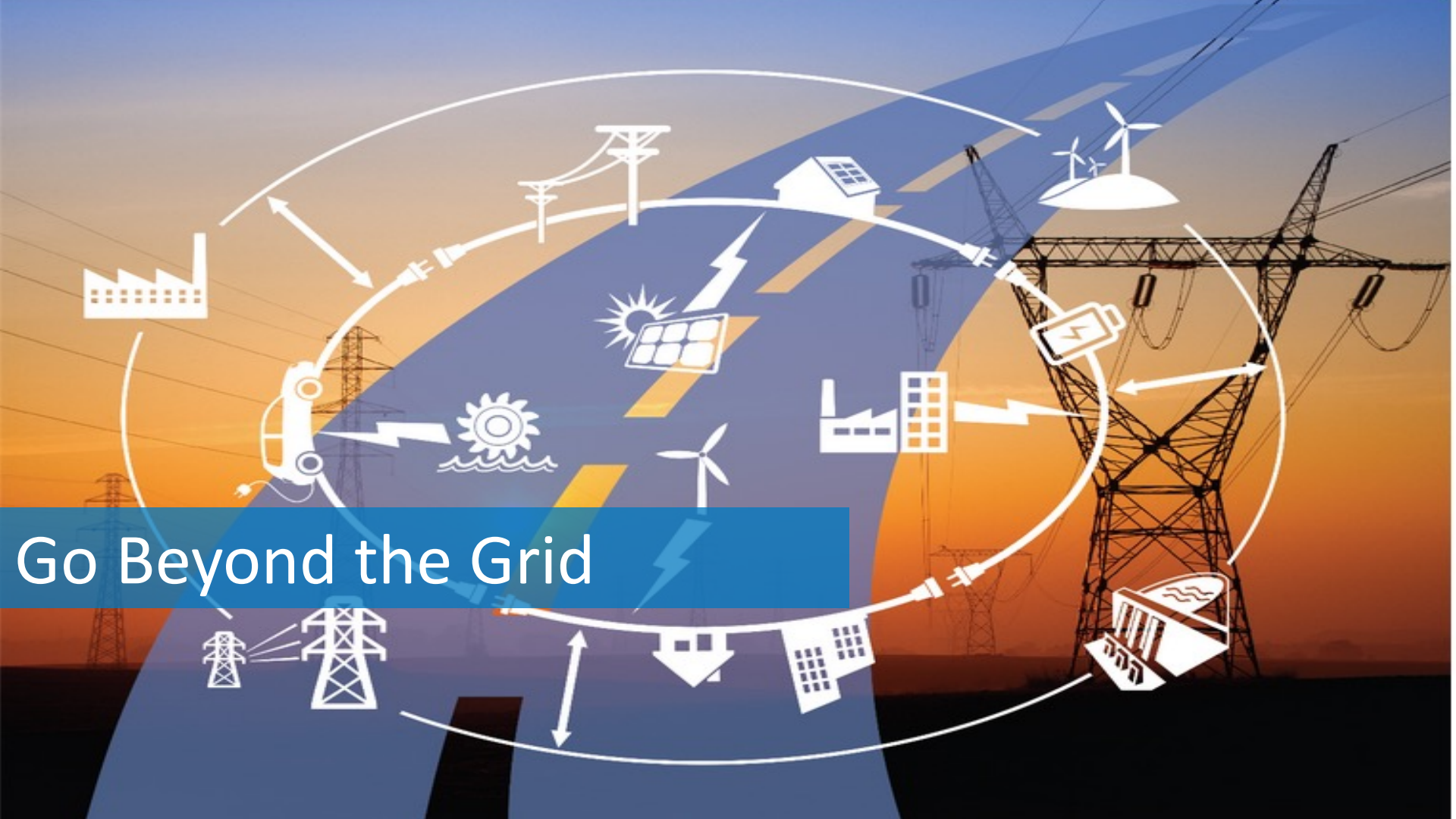
A third-party vendor, such as a charging station network, parking kiosk, or a parking operator, could manually or electronically collect fees and send the agency checks, direct debit deposits, or wire transfers on a periodic basis.

Source: https://www.pay.gov/public/home

Fleet Charging at Workplace Charging Stations

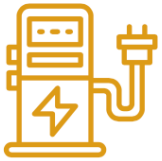


- To use – must be a registered user
- QR code on the Fleet vehicle is scanned
- Delivered energy is reported separately from workplace charging
- Reduces the need for employee charging to recoup the cost of EVSE infrastructure


Go Beyond the Grid

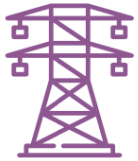
Smart Charging Technologies

Smart charging, also known as V1G charging



V1G = UNIDIRECTIONAL CONTROLLED CHARGING

Vehicles or charging infrastructure adjust their rate of charging

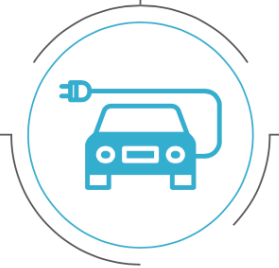


V2G = VEHICLE-TO-GRID

Smart grid controls vehicle charging and returns electricity to the grid

V2H/B = VEHICLE-TO-HOME/- BUILDING

Vehicles will act as supplement power suppliers to the home



Source: IRENA, 2019c

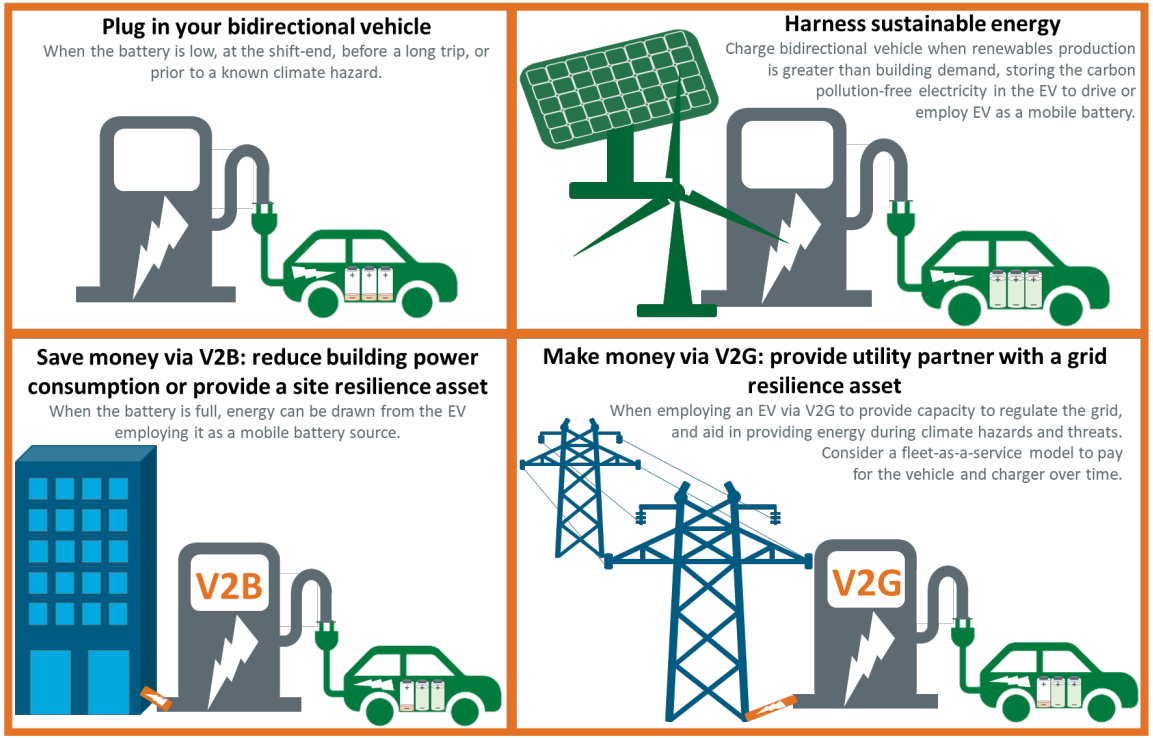
Cars, including EVs, are currently parked on average over 90% of their lifetime (Barter, 2013).

Why should you care about V2G?

In tackling the climate crisis:

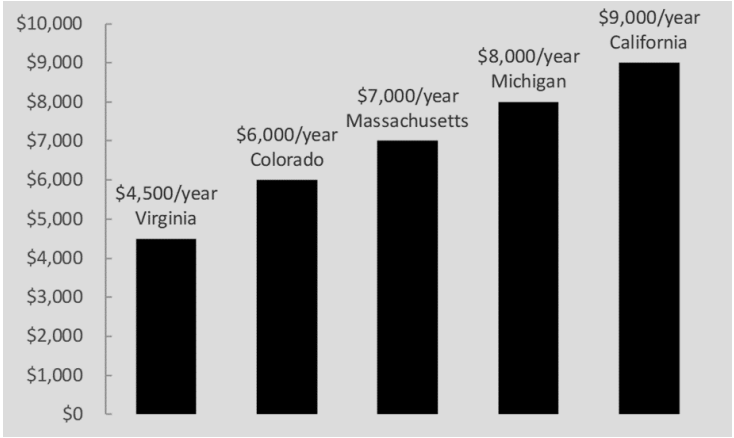
1. Electrification,
2. Energy efficiency, and
3. Decarbonisation.

Electric vehicle batteries are by far the most cost-efficient form of energy storage since they require no additional investments in hardware.



Bidirectional Charging

- Benefits:
  - Help meet resilience goals
  - Replace (or augment) stationary storage with mobile storage
  - Improve EV economics by limiting demand charges, participating in demand response programs, and taking advantage of utility incentive programs
- Technology:
  - Bidirectional chargers operate much like an inverter and convert AC to direct current (DC)
  - CHAdeMo vehicles (such as Nissan). Nissan has long offered bidirectional charging with the Leaf
  - To participate in V2G programs, you will require a bidirectional DC charger and a compatible EV.



Example Per-EV Earnings Possible Currently
(Glenn Skutt, Fermata Energy)

Performance Contracting Options

Upgrades Paid for with Energy Savings

Jeffrey Gingrich

Performance Contracting Options

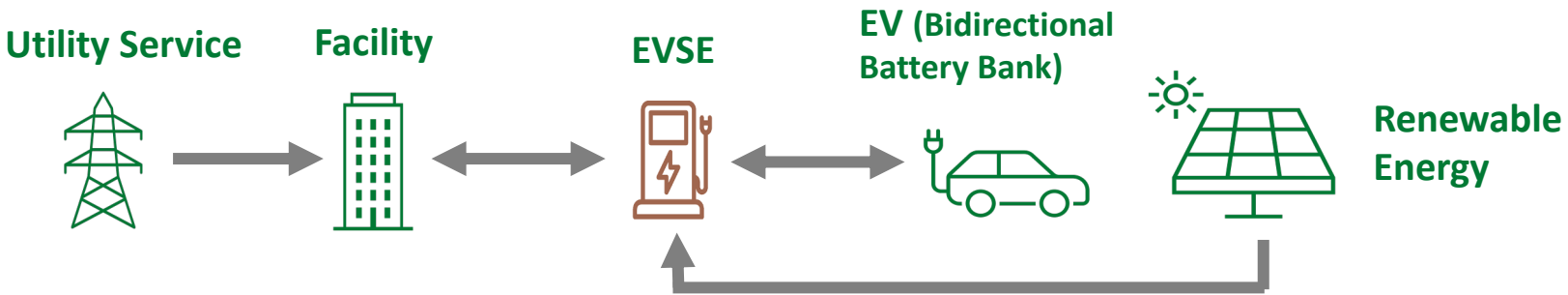
Identifying energy and cost savings associated with added resilience, enhanced efficiency, and grid benefits may enable EVSE to be integrated into federal performance contracts.

- Types of performance contracts include:
  - Energy Savings Performance Contracts (ESPC) = Primary contractor is a DOE qualified ESCO
  - Utility Energy Service Contracts (UESC) = Primary contractor is a local distribution utility
- Energy conservation measures (ECMs) must produce measurable energy, water, or demand reduction.
  - Defined as measures applied to a Federal building (*42 U.S.C. § 8259 (4)*)
- Savings can be measured in various ways, including but not limited to:
  - Accounting for the additional benefits of bi-directional EVSE plus electric vehicles (EVs) as demand management assets
  - Evaluating the increased efficiency of electricity usage with a dual-use mobile battery
  - Comparing use of mobile batteries to primary or secondary emergency diesel generators

ESPC: **EVSE**

EVSE may be incorporated into an ESPC if it is part of an energy conservation measure (ECM) or if it is demonstrated that the EVSE results in energy savings to a federal building.

- 3 examples demonstrate permissible instances:
  - A power generation ECM, such as PV or cogeneration, that includes EVSE to facilitate delivery of power to an end use
  - EVSE with charging capabilities employed for load management (e.g., kW savings and energy related cost savings), such as participation in a demand response program
  - Replacing existing EVSE with more efficient EVSE, where doing so results in energy savings to a federal building



ESPC: **Electric Vehicles**

ESPC statute does not confer authority for agencies to procure EVs as an ECM.

- In limited circumstances there may be an opportunity for **components of EVs** to be included in an ESPC
- Ex: Bi-directional charging from an EV to provide power for building backup or load management
  - Could incorporate EV components used to enable participation in a demand response program (e.g., the vehicle's battery, charging unit, controls, related construction and/or supporting infrastructure)
  - Where EV components are incorporated in an ESPC, energy used by the EV (e.g., gasoline, electricity, or other) for non-building purposes would not be included in the building energy use calculations.

More Information and Support

- Contact FEMP - ESPC applications for EVSE and EV are limited and could be complex. Agencies should contact FEMP as they consider incorporation in an ESPC.
- More information is available on the FEMP website and in the updated ESPC FAQs resource

UESCs and Utility Partnerships

The integration of EVSE and EVs into UESCs is a new potential application of 42 USC 8256

- Agencies are encouraged to work with their legal and contracting teams to determine what is appropriate to include in a UESC *executed outside of a GSA Areawide*
- If using an AWC, contact GSA with questions regarding what is appropriate (energy@gsa.gov)
- FEMP does not have a collection of case studies and information upon which to recommend best practices at this time

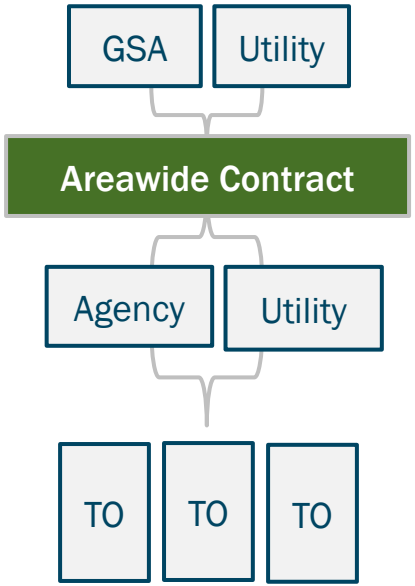
One potential option for acquiring EVSE is to use the AWC Authorization for Electric Service (Exhibit A)

- Note – projects implemented under AWC Exhibit A are not UESCs and measures do not need to result in savings

Utilizing GSA AWC for EVSE Procurement

Under Exhibit A of an Areawide Contract (AWC), the serving utility can fund the upfront cost of charging infrastructure with the assurance the federal customer will repay the cost over 10 years as part of its utility bill as a special facility charge.

- FAR Part 41 authorizes GSA to establish AWCs to be used by all federal agencies to procure utility service within the utility's franchised service territory
- AWC is bilaterally signed by GSA and utility
- Agencies can place task orders with the utility under the AWC
- GSA has over 100 active Areawide contracts



FAR Part 41.204 GSA Areawide Contracts

How does it Work?

Process for implementing EV infrastructure measures with a utility that has existing AWC

1. Agency and utility bilaterally sign AWC Exhibit A for initiating utility services for EV-related measures
2. Utility provides up front funding and installs EV/EVSE measures using Exhibit A for Special Facilities
3. Agency pays facilities charge:
   - One-time payment
   - Monthly on-bill special facilities charge
   - Other agreed upon payment methods

NOTE: *Agencies exploring ordering EVSE services via Exhibit A should consider whether these are regulated offerings and follow appropriate competition requirements (contact energy@gsa.gov with questions)*

Photo by Dennis Schroeder / NREL, 39216

AWC Exhibit A Examples

- **EVSE station & installation**
- **Conduit trenching**
- **Main/circuit breaker & service panel**
- **Transformer upgrades**
- Customer-owned substation and distribution system upgrades
- Line extensions
- Advanced meters
- Emergency restoration/repairs
- Redundant/alternate feeder

Photo by Dennis Schroeder / NREL, 49472

FEMP's ESPC and UESC Resources

www.energy.gov/eere/femp/utility-program-and-utility-energy-service-contracts-federal-agencies

www.energy.gov/eere/femp/energy-savings-performance-contracts-federal-agencies

Essential Education

- Project Implementation and Best Practices
- Case Studies
- Fact Sheets
- On-Demand Webinars

Topic Specific Resources

- DE Screening Tools
- Guidance for Measurement & Verification
- Performance Assurance Planning
- Cybersecurity for Performance Contracts

Access to FEMP Services

Technical Assistance | Training | Events

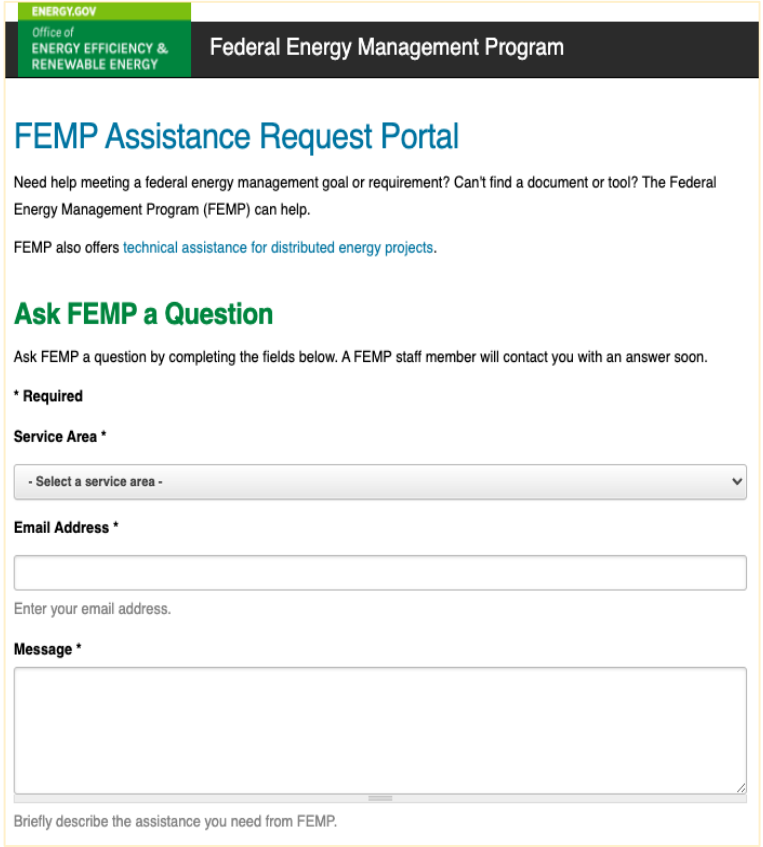
FEMP Project Support

- Project guidance and discussions with Federal Project Executives (FPEs)
- Technical assistance provided by DOE National Labs
- Tailored training for agencies and utilities
- Strategic partnership meetings

Submit questions or requests for support through the

FEMP Assistance Request Portal

(https://www7.eere.energy.gov/femp/assistance/)



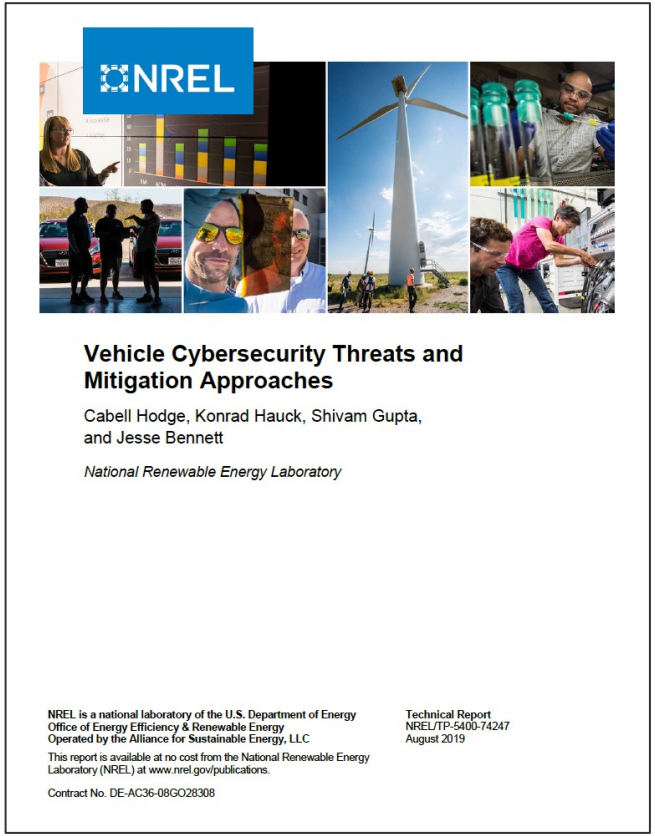
FEMP EVSE Champion Training Cybersecurity and Resilience

Tony Markel
Senior Researcher, Partnership Development

7/12/2022

EVSE Cybersecurity

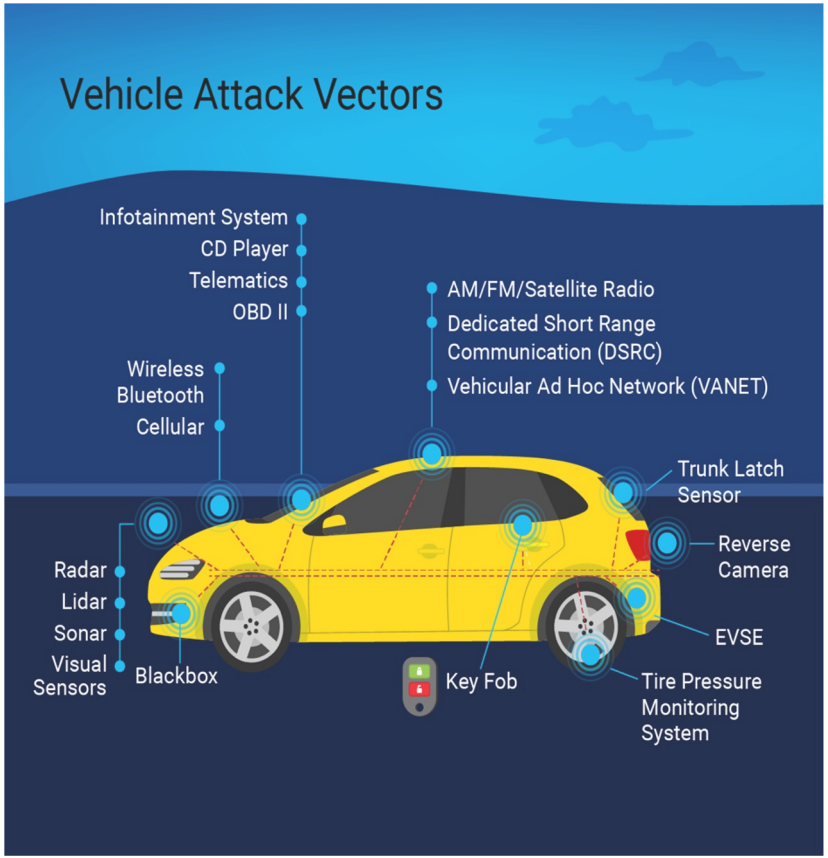
- In 2019 the FEMP Fleet Team at NREL published a report on Vehicle Cybersecurity Threats and Mitigation Approaches
  - Outlines Threat Vectors
    - Modern Vehicles
    - Connected and Automated Vehicles (CAV)
    - Telematics
    - EVSE
  - Risk Mitigation Techniques
  - Procurement Language



https://www.energy.gov/eere/femp/federal-fleet-cybersecurity

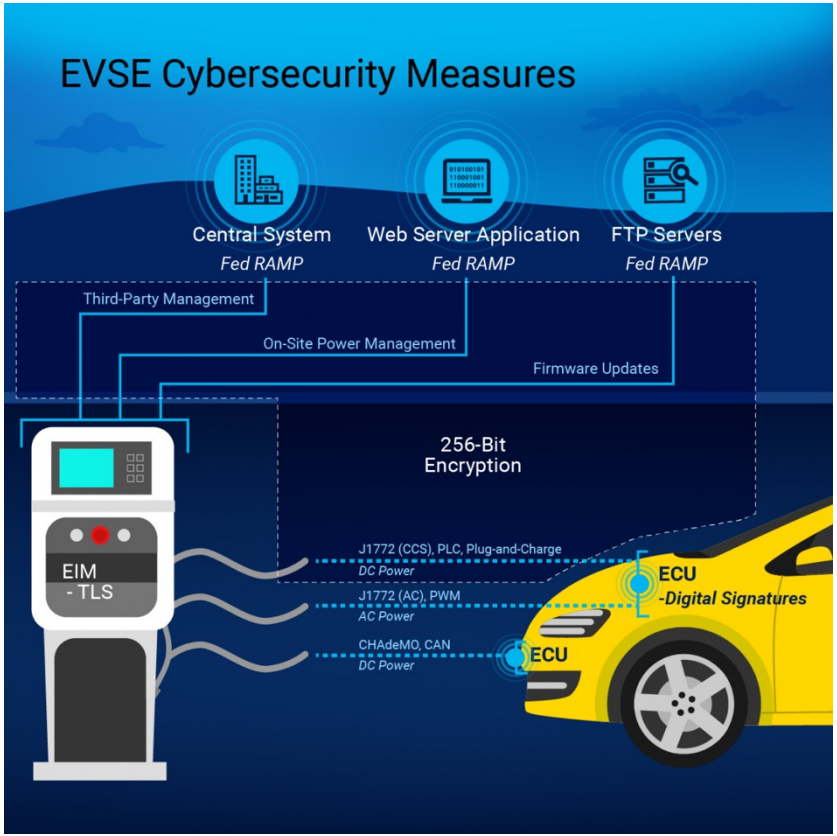
EVSE Cybersecurity Risks

- Physical Access
  - An attacker with direct access to EVSE ports could directly upload malicious code resulting in malfunctioning EVSE or the release of PII.
  - Malfunctioning EVSE could impact power equipment.
- Remote Access
  - Access to information flow between EVSE and remote management service for wireless firmware updates, EVSE management, or transaction processing.
  - An attacker could acquire valuable user data or manipulate firmware updates to create EVSE malfunctions.



Cybersecurity Risk Mitigation

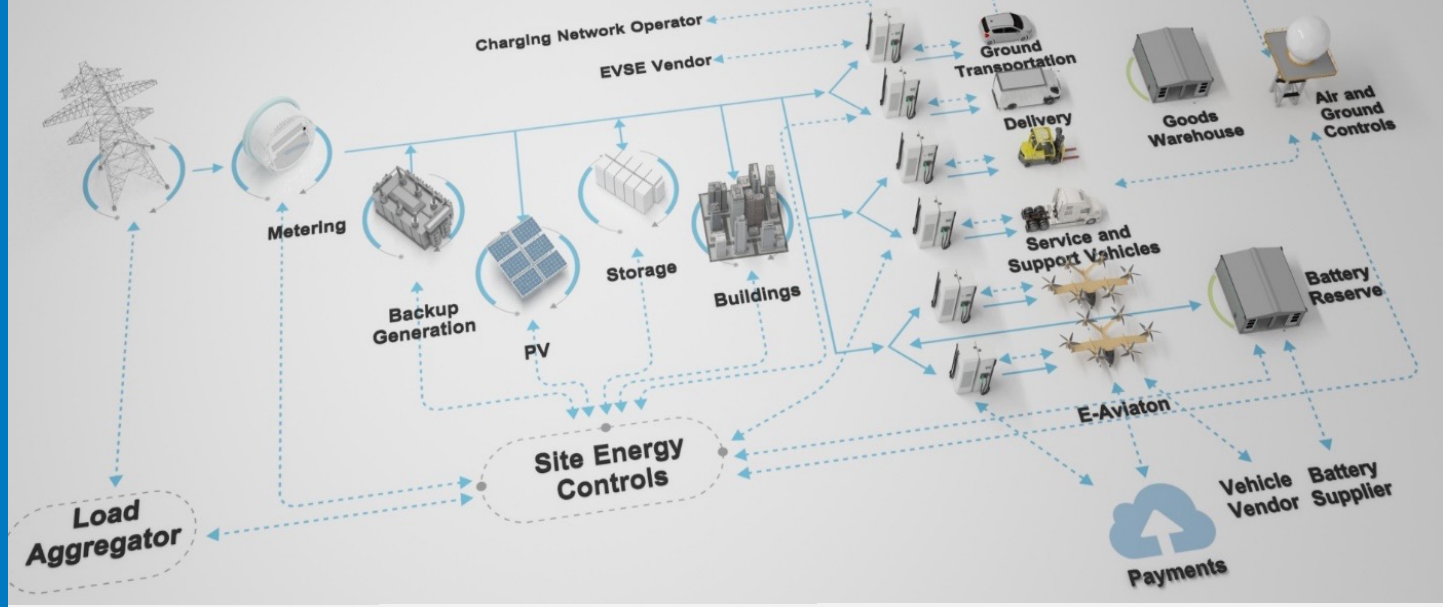
- Physical Access
  - EVSE should be constructed without external control board physical access.
  - All communication and management of the EVSE should include high-level encryption.
- Remote Access
  - Firmware updates should be encrypted.
  - Federal cloud servers must meet FedRAMP standards.
  - All remote access to EVSE through a web server should use secure communication.



Resources for Further Study

- Government Fleet and Public Sector Electric Vehicle Supply Equipment (EVSE) Cybersecurity Best Practices and Procurement Language Report (Volpe, 2019) - https://rosap.ntl.bts.gov/view/dot/43606/dot_43606_DS1.pdf
- Vehicle Cybersecurity Threats and Mitigation Approaches (NREL, 2019) https://www.nrel.gov/docs/fy19osti/74247.pdf
- DOE labs conducting research
  - Recommended EVSE cybersecurity practices (SNL, 2021) – (https://doi.org/10.13140/RG.2.2.11141.37602)
  - Survey of EVSE vulnerabilities (SNL, 2022) – (https://www.mdpi.com/1996-1073/15/11/3931)
- Joint Office of Energy and Transportation (DOT/DOE)
  - National Electric Vehicle Infrastructure Formula Program (DOT, 2022) (https://www.govinfo.gov/content/pkg/FR-2022-06-22/pdf/2022-12704.pdf)
- Industry activities
  - SAE PKI Task Force - https://www.sae.org/news/press-room/2022/04/sae-international-performs-first-test-of-ev-charging-pki-design
  - SAE/ISO Vehicle Cybersecurity Engineering - https://www.sae.org/standards/content/iso/sae21434/
  - Auto-ISAC Community Calls - https://automotiveisac.com/community-calls
  - Open Charge Alliance - Improved security for OCPP 1.6-J edition 3 FINAL, 2022-02-17 - https://www.openchargealliance.org/about-us/info-en-whitepapers/

Components and Interfaces



Components

EVSE

Vehicle

Charge Network Operations Center

Stakeholders

Charge Network Owner/Operator

EVSE Manufacturer

User/Driver

Vehicle Manufacturer

Fleet Operator

Interfaces

User to EVSE

User to Charge Network Operations

Vehicle to EVSE

EVSE to Charge Network Operations

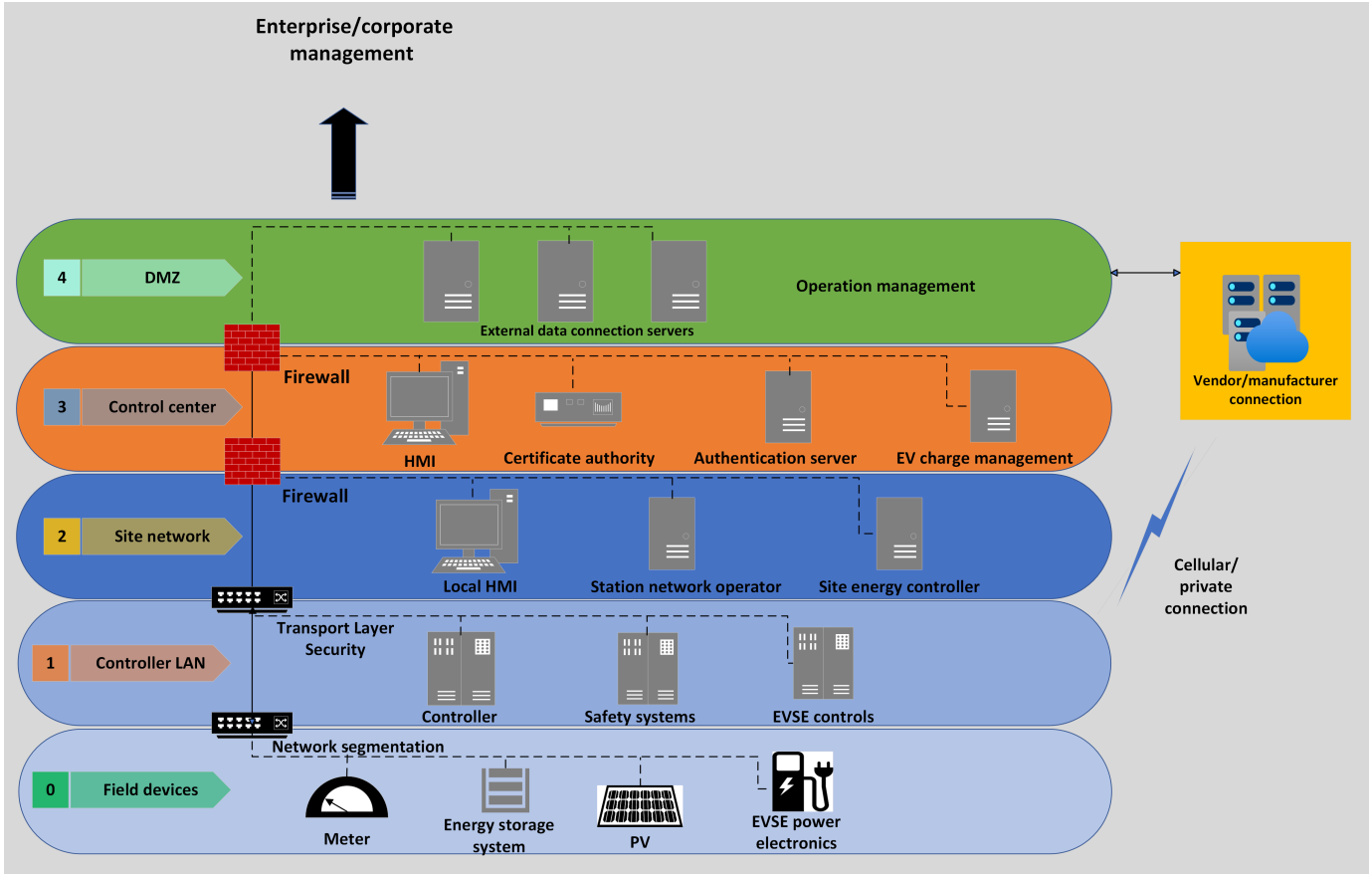
Fleet Operator to EVSE/Charge Network Operations

Design, Planning, and Procurement

- Limit physical access to data ports/interfaces
  - Fencing
  - Access cards
  - Device casing and notifications of physical access
- Considerations
  - FedRAMP for data storage and handling
    - Ensures that sensitive operations data is access protected and encrypted
  - Cybersecurity training and certifications of personnel with responsibility for design, installation, and operations
- How will supply chain risk management be addressed?
  - Section 889 (https://www.acquisition.gov/FAR-Case-2019-009/889_Part_B)
    - Prohibits use of telecommunications equipment that presents a national security risk
  - Can vendors provide a software or hardware bill of materials?
  - What's the ability to acquire short-term replacements in case of failure?

Government Fleet and Public Sector Electric Vehicle Supply Equipment (EVSE) Cybersecurity Best Practices and Procurement Language Report (Volpe, 2019) - https://rosap.ntl.bts.gov/view/dot/43606/dot_43606_DS1.pdf

Defense in Depth



- Network layers that incorporate progressively more restrictive access depending on the sensitivity of the device and/or data
- Monitoring data and user activity for appropriateness within a layer

PKI for Electric Vehicles and Chargers

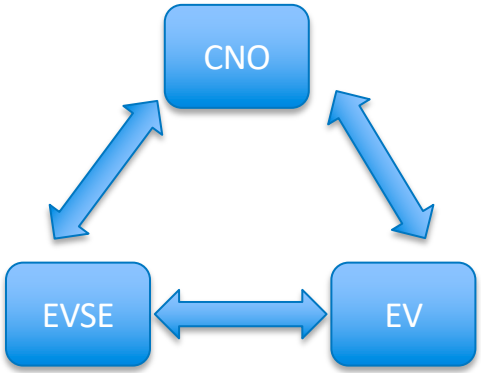
SAE-led PKI Working Group

Testing Event – April 2022

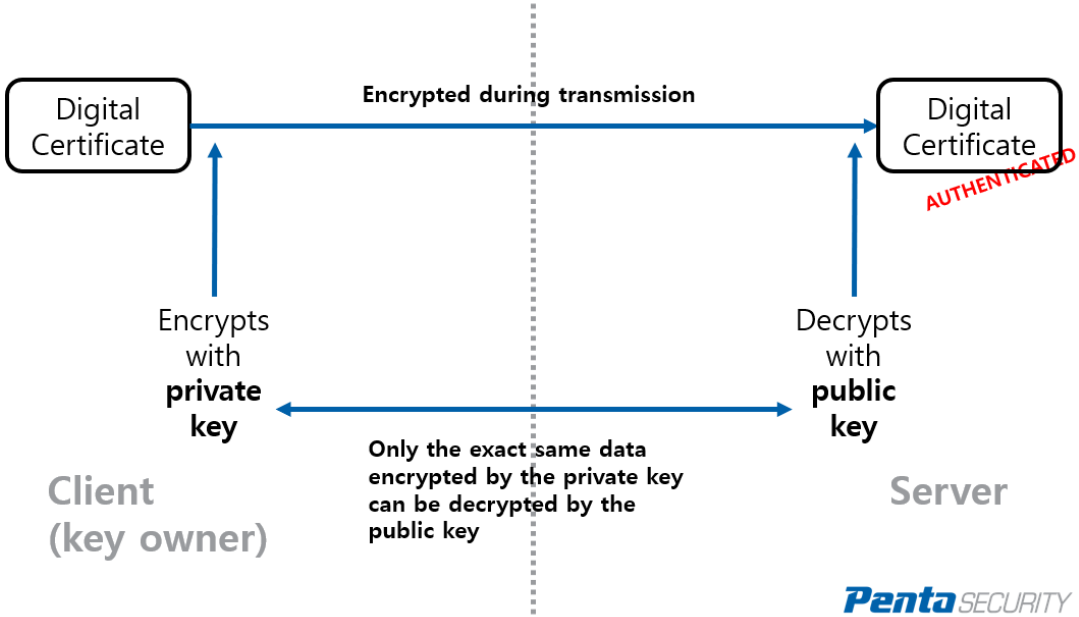
NREL Image #67573

What is PKI and its Importance to EV?

- Public-key cryptography is a cryptographic system that uses pairs of keys: **public keys** which may be disseminated widely, and **private keys** which are known only to the owner/device



Today, this relies on the security of the tunnel. Authentication of the device and encryption of data is lacking but is needed to enable Plug-N-Charge.



Combinations of hardware, software, and assessment tools advance cybersecurity strategies for EV adoption


EVSE hardware testing takes place within NREL's ESIF


Emulated power and communication networks builds cyber mitigation strategies

Risk Assessment and Management Tools for preparedness

Cyber Awareness and Response

- Situational Awareness
  - Will EVSE access, changes, alerts, and alarms be logged to the site/facility cyber security operations center (SOC)?
- Response and Incident Management
  - Who's responsible for addressing physical and cyber alerts?
    - Identify a lead point of contact
  - At what level will alerts need to be raised for internal and external awareness?
    - Who are the external entities on my contact list? DHS, FBI, Vendors
- Information Sharing
  - Join communities of interest
  - Share incident information for improved response

Summary

- EVSE cybersecurity is evolving
- Prior vulnerabilities have been identified and others are likely to be identified in the future
- Risk reduction/mitigation
  - Leverage procurement guidance
  - Assess risk level of data exchanges and site-specific handling requirements
  - Use defense in depth design and engineering approaches
    - Consider cyber monitoring solutions that can provide awareness of unexpected operations
  - Prepare a response strategy for cyber events

Terms	Definitions
Defense in Depth	a type of cybersecurity in which several independent layers of security controls are used so that if one fails another will be operative
Cyber Risk Assessment	risk assessments are used to identify, estimate, and prioritize risk to organizational operations, organizational assets, individuals, other organizations, and the Nation, resulting from the operation and use of information systems. (NIST)
Threats	Any circumstance or event with the potential to adversely impact organizational operations, organizational assets, individuals, other organizations, or the Nation through a system via unauthorized access, destruction, disclosure, modification of information, and/or denial of service. (NIST)
Vulnerability	Weakness in an information system, system security procedures, internal controls, or implementation that could be exploited or triggered by a threat source. (NIST)
OCPP	Open Charge Point Protocol – works to create interoperability between EVSE and charge network operations such that various operators could manage a broad range of EVSE models
ISO 15118	an international standard that outlines the digital communication protocol that an electric vehicle (EV) and charging station use to recharge the EV's high-voltage battery (SwithEV)
Public Key Infrastructure	A process in which associated pairs of cryptographic keys are used to validate authenticity of communicating parties and integrity of the information exchanged
Encryption	The cryptographic transformation of data to produce ciphertext. (NIST)
Plug and Charge	means a method of initiating charging, whereby an EV charging customer plugs a connector into their vehicle and their identity is authenticated, a charging session initiates, and a payment is transacted automatically, without any other customer actions required at the point of use (from Fed Register)
Security Operations Center (SOC)	A central point of data collection for cyber operations data that helps teams monitor, analyze, and protect an organization's assets including data and devices

Stretch your thinking

- How many fleet EVs can be served by one EVSE?
- All managed charging solutions require a network connected EVSE?
- Which of the following provides fleets the ability to automatically mitigate electrical equipment upgrades and reduce demand charges by regulating the power output of EVSE?

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- Workplace charging programs may use federal fleet EVSE if their use does not impede fleet operations?
- What equipment upgrades can be mitigated by smart charge management (managed charging)?
- All cybersecurity threats to EVSE require physical access to the charging station?
- How should you determine that you need more workplace charging?

FEMP EV Champion Training Curriculum

EV Technology

- ICE, HEV, PHEV, BEV
- L1, L2, DCFC
- FAST VLD Reporting

EV Financials

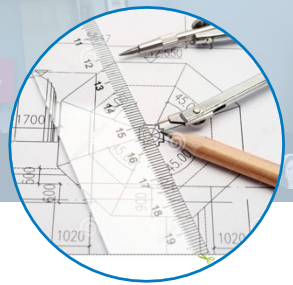
- EV TCO calculations
- Utility bill analysis
- FAST EVSE reporting

Training 1

EVSE & Energy

- EVSE charging/install
- Electric service review
- EVSE cybersecurity

Training 2



Site Design

- Equipment requirements
- Construction planning
- Utility interconnection

Training 3

Site Operations

- Partnership Opportunities for EV Infrastructure
- Managed charging
- Cybersecurity

Training 4

Questions?

www.nrel.gov

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