U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Implementing Workplace Charging within Federal Agencies

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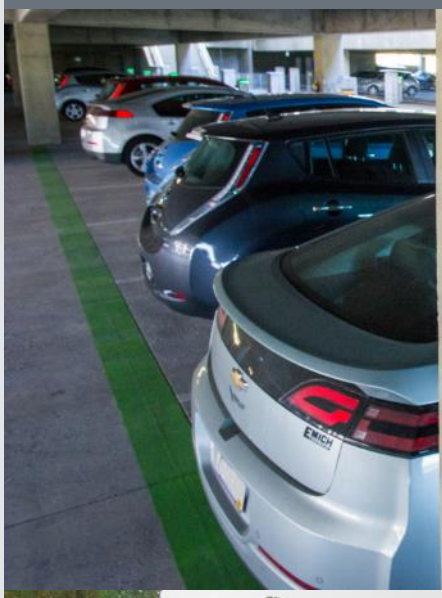

Workplace Charging Challenge
U.S. DEPARTMENT OF ENERGY

Clean Cities
U. S. Department of Energy

Table of Contents

1. Introduction 3
2. Federal Workplace Charging Examples 4
3. Evaluating a Need for Workplace Charging 5
4. Authorized Users 7
5. Engaging Stakeholders in the Planning Process 8
6. Managing Workplace Charging 11
7. Procurement and GSA Considerations 13
8. Funding PEV Charging Stations 16
9. Managing PEV Driver Fees 18
10. Summary 20
11. Additional Resources 21
12. Appendix A. Best Practices for Minimizing Charging Station Costs 22

1. Introduction

The number of Americans that chose to purchase plug-in electric vehicles (PEVs), which include plug-in hybrid electric vehicles (PHEVs) and all-electric vehicles (EVs), has steadily increased since 2011 (See Figure 1). Many of these drivers commute to federal worksites in communities across the country. The opportunity to charge a personal vehicle while at work is valuable to PEV drivers. Employees who have access to workplace charging are six times more likely to own a PEV than those who lack such access.[1]

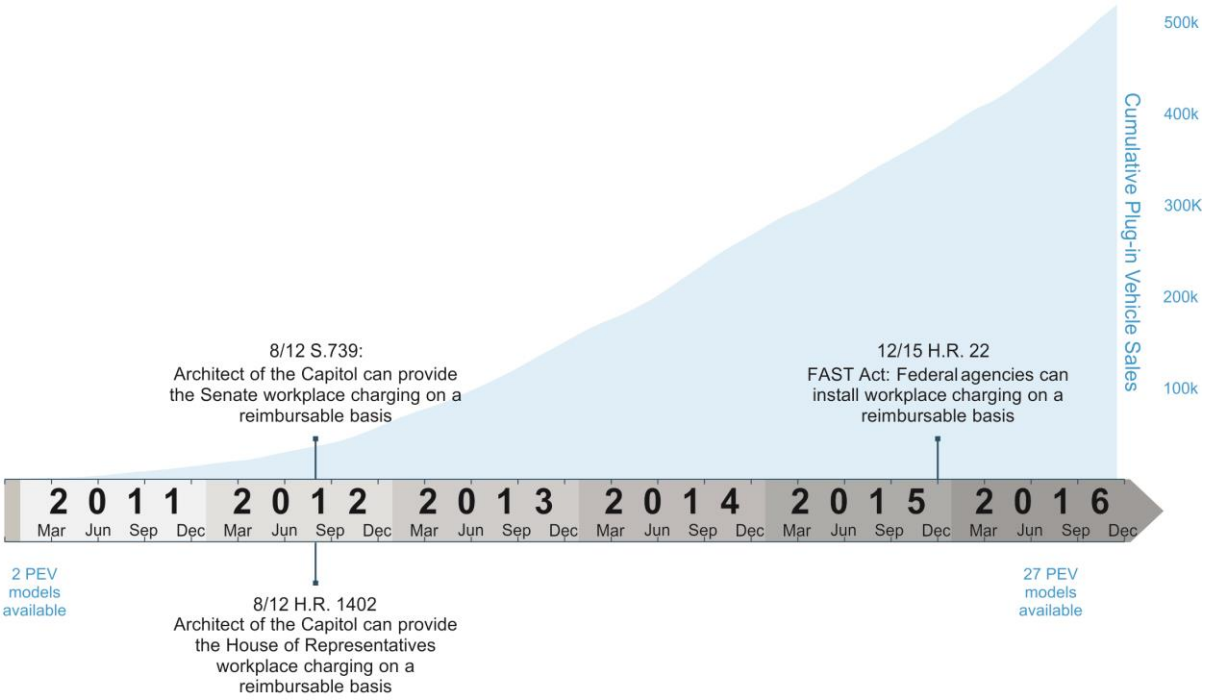

Figure 1. Timeline of key federal workplace charging events and cumulative PEV sales.

The path towards providing federal workplace charging stations began with legislation passed in 2012. Senate Resolution (S.) 739[2] authorizes the Architect of the Capitol (AOC) to establish PEV charging stations for privately owned vehicles in Senate parking areas if there is no net cost to the federal government. House Resolution (H.R.) 1402[3] provides the AOC the same authority for the House of Representatives parking areas.

H.R. 22, the Fixing America's Surface Transportation Act (FAST Act)[4] signed in December 2015, represents another significant step for federal workplace charging. As stated in the FAST Act conference report, "Section 1413(c) authorizes the General Services Administration (GSA) Administrator, or the head of a federal agency, to install, construct, operate, and maintain on a reimbursable basis a battery recharging station (or allow, on a reimbursable basis, the use of a 120-volt electrical receptacle for battery recharging) in a parking area that is in the custody, control, or administrative jurisdiction of the GSA or the federal agency for the use of only privately owned vehicles of federal employees and others

[1] https://energy.gov/sites/prod/files/2017/01/f34/WPCC_2016%20Annual%20Progress%20Report.pdf
[2] http://www.govtrack.us/congress/bills/112/s739
[3] http://www.govtrack.us/congress/bills/112/hr1402
[4] http://www.gpo.gov/fdsys/pkg/BILLS-114hr22enr/pdf/BILLS-114hr22enr.pdf

who are authorized to park in such area to the extent such use by only privately owned vehicles does not interfere with or impede access to the equipment by federal fleet vehicles."[5] In 2016, the Office of Federal Sustainability issued guidance documents on providing federal workplace charging under the FAST Act including reimbursement information.[6]

In October 2016, GSA issued *Order 5605.1 Public Building Service (PBS) Electric Vehicle Supply Equipment (EVSE) Infrastructure Management*,[7] containing information on how agencies in GSA leased or owned space can provide employee charging. It includes guidance on the use of and financial accountability for PEV charging infrastructure under the jurisdiction, custody, or control of the GSA. The policy encompasses PEV charging infrastructure used by government and personally owned vehicles. For more information see the Procurement and GSA Considerations section of the case study.

2. Federal Workplace Charging Examples

Many federal organizations have launched workplace charging programs at their facilities. Although the term federal agency is used frequently throughout this document, many national laboratories and non-agency level federal entities are also engaging in workplace charging. The table below highlights some federal workplace charging programs. A discussion of EVSE technology types can be found in section 7 of this case study.

Federal Organization and Location	U.S. Dept.	Charging Stations	Program Highlights
Department of Energy (DOE) *Washington, DC and Germantown, MD*	Energy	4 Level 2 EVSE (2 in DC and 2 in MD)	Charging stations were installed for fleet vehicles prior to the FAST Act. Charging priority is always given to DOE fleet vehicles over employee vehicles.
Argonne National Laboratory *Lemont, IL*	Energy	9 Level 2 EVSE	PEV drivers can reserve charging via an online registration system for up to four hours per day. Fleet vehicles use the charging stations during evenings and weekends.
Lawrence Berkeley National Laboratory *Berkeley, CA*	Energy	8 Level 1 Charging Receptacles	LBNL Chief Sustainability Officer championed the workplace charging program as a key initiative of the lab's sustainability efforts.
National Renewable Energy Laboratory (NREL) *Golden, CO*	Energy	18 dual port Level 2 EVSE (36 charging ports)	The NREL parking garage, including the charging stations, was constructed in 2011 through appropriations. DOE-funded research and fleet equipment have priority use of the EVSE.
Oak Ridge National Laboratory (ORNL) *Oak Ridge, TN*	Energy	43 Level 2 EVSE and 1 DC fast charger (DCFC)	As part of the DOE-funded EV Project, ORNL installed 25 solar-assisted charging stations on campus.
Sandia National Laboratory at Livermore *Livermore, CA*	Energy	4 Level 1 Charging Receptacles	Sandia initiated its workplace charging program by using existing Level 1 charging receptacles previously used by campus low speed PEVs.
Department of Transportation (DOT) *Washington, DC*	DOT	50 Level 1 Charging Receptacles	The DOT Headquarters parking garage is a GSA leased facility and the property management company, JBG, is a strong supporter of workplace charging.

[5] https://www.gpo.gov/fdsys/pkg/CREC-2015-12-01/pdf/CREC-2015-12-01-pt1-PgH8679-2.pdf
[6] https://www.sustainability.gov/Resources/Guidance_reports/Guidance-for-Federal-Agency-Implementation-of-Workplace-Charging,-Electric-Vehicle-Supply-Equipment.pdf and https://www.fedcenter.gov/_kd/Items/actions.cfm?action=Show&item_id=29808&destination=ShowItem
[7] https://www.gsa.gov/portal/directive/d0/content/535053

Patent and Trademark Office *Alexandria, VA*	Commerce	12 Level 1 Charging Receptacles	PEV drivers pay a $20/month fee in addition to the regular parking fee for a hangtag, which allows them to park at the charging stations.
Centers for Disease Control and Prevention (CDC) *Atlanta, GA*	Health and Human Services	4 Level 2 EVSE	PEV drivers use an existing conference room reservation tool to reserve 3 hour time slots up to 3 times per week. The reservations are approved by a manager who oversees the WPC program.
National Institutes of Health (NIH) *Bethesda, MD*	Health and Human Services	8 Level 1 Charging Receptacles	By forming a memorandum of understanding with the NIH Federal Credit Union, NIH achieved sponsorship, which launched the program's pilot phase.

Table 1. Federal workplace charging examples (See section 9 of this case study for information on fee management).

3. Evaluating a Need for Workplace Charging

Employers choose to pursue workplace charging for many reasons. When asked about their motivation for implementing a workplace charging program, managers at federal agencies expressed desires to motivate employees and meet sustainability goals. Managers at national laboratories also described an interest in exploring PEV technology and its interaction with the grid. Even with many reasons for pursuing workplace charging, it can be difficult to educate the necessary decision makers and move forward with a workplace charging program. It is beneficial to have a champion within the organization who is enthusiastic about workplace charging and therefore willing to promote it to leaders and decision makers. Many times workplace charging is initiated by employees at the ground-level rather than a top down approach.

Some agencies have found that showing a relationship between the agency's mission and workplace charging is an effective step kicking off the implementation of a workplace charging program. For agencies focused on health issues such as the National Institutes of Health (NIH) and Centers for Disease Control and Prevention (CDC), supporting PEVs is part of promoting cleaner air and reducing public health issues due to poor air quality. At the Department of Transportation (DOT), encouraging employees to drive PEVs and installing charging infrastructure supports its mission to promote an efficient and convenient transportation system that enhances Americans' quality of life. Other agencies may be motivated by energy security or fuel diversification.

Photo 1. Level 1 charging receptacles are available for NIH employees. *Photo from NIH, NREL 41422.*

Workplace charging serves as an employee motivator. Employees value the opportunity to run an errand after work without concern about having enough battery range to make it home. Ninety percent of employers who provide PEV

Photo 2. Employees at Lawrence Berkley National Laboratory display the PEVs that they can charge while at work using Level 1 charging receptacles. *Photo from LBNL.*

charging report that their staff expresses satisfaction with their workplace charging program.[1] It can also create a strong PEV community among employees. As cited by federal agencies, some federal workplace charging programs are so popular that they have a waiting list of drivers who want to participate. Providing workplace charging and enabling your employees to drive PEVs can reduce their commuting stress since PEVs can qualify for high-occupancy vehicle lane access in some areas.[8]

Commuting has long been an important component of federal agencies' sustainability efforts. Federal entities work to reduce commute related GHG emissions and petroleum consumption through the promotion of public transportation, bike to work efforts, teleworking, and carpooling. However, over 75% of commuters still travel to work alone by car.[9] With the addition of workplace charging, PEV-driving employees can nearly double their vehicles' all-electric daily commuting range and feel confident that they can get where they need to go during the workday. DOE found that employers helped their staff save 2.4 million gallons of gasoline between 2015 and 2016 by supporting employees' efforts to use electricity as their commuting fuel.[1] The Electric Emissions tool on the Alternative Fuels Data Center (AFDC, www.afdc.energy.gov/vehicles/electric_emissions.php) lets you compare emissions from PEVs in different states with different emission profiles. Because PEV motors are about three times as efficient as gasoline internal combustion engines, PEVs typically have better emission profiles, even in states with high-carbon generation sources. For information about workplace charging credit for green building certifications, visit https://energy.gov/eere/vehicles/workplace-charging-credit-green-building-certification.

Identifying a champion within the organization plays a large role in moving forward with workplace charging. For example, at Lawrence Berkeley National Laboratory, the Chief Sustainability Officer pursued workplace charging as a key initiative for the lab's sustainability efforts. At NIH, the Director of Office of Research Facilities championed the workplace charging efforts. The leadership of a champion who can bring together key players, spearhead the effort to create a plan, and ensure well-thought-out

[8] http://www.afdc.energy.gov/laws
[9] http://www.census.gov/hhes/commuting/files/2014/acs-32.pdf

policies are in place can set an organization on the path to success. Other federal agencies have found champions in individuals with position titles such as Sustainability Director, Chief Administration Officer, Executive Director, Green Transportation Program Manager, and Facilities Manager. Sometimes champions are needed at multiple levels of an agency, such as a headquarters office and regional office, in order for workplace charging to gain traction.

Barriers to Federal Workplace Charging

Federal agencies may need to tackle challenges throughout the process of establishing a workplace charging program. As more federal agencies work through these barriers and there are models that can be replicated, additional best practices could be shared for establishing successful programs. A selection of federal workplace charging barriers cited by federal agencies include:

- **Balancing organizational guidance and flexibility** – Not having an agency-designated workplace charging policy may hold regional offices back from implementing a program if the sub-agencies or field sites feel the need to defer to headquarters for direction. However, having guidance from the agency-level that is too strict may limit flexibility to implement a program in a manner that works best for a particular worksite.
- **Collecting fees from visitors** – Federal facilities that want to allow visitors to use charging stations installed for employees will need to develop a management policy that permits them to collect fees from one-time users who are not a part of a recurring user base.
- **Financing** – There may be roadblocks to designating the funding for purchasing and installing charging stations.
- **Facilities energy intensity tracking** – Some agencies may be concerned about increasing building energy intensity figures on facility reports. The average workplace charging station uses 10 kWh of electricity each day.[1] This is less than the energy consumed by four desktop computers and monitors running for a 24-hour period.
- **Gaining buy-in from stakeholders** – It can be difficult for all stakeholders to agree upon a vision for workplace charging and work together to make progress.
- **Labor force** – Federal agencies that are understaffed or stretched thin may find it challenging to allocate staff time towards implementing workplace charging. Progress with workplace charging may be slow when many other tasks are higher priorities.
- **Security restrictions** – Some sites may have cost effective locations for providing charging stations with security restrictions that prevent personal vehicles from parking there. Needing to place charging stations in areas that are non-secure may hurt the convenience and increase installation costs.

4. Authorized Users

The FAST Act authorizes the GSA and other federal agencies to install, operate and maintain PEV charging stations for privately owned PEVs in parking areas used by federal employees and authorized users, and requires the collection of fees to recover these costs. An authorized user is defined as, an individual authorized by a federal agency to use its parking area. This includes agency employees, as well as its contractors, subcontractors, and visitors. This document focuses on federal employee charging and does not address other authorized users. Many federal worksites do not need to take into consideration

guests who may want to charge a vehicle because they do not have many visitors. However, some federal sites that have large numbers of public visitors, such as those affiliated with the Veterans Health Administration or the National Park Service, will need to consider how the FAST Act applies to charging infrastructure they want to deploy at those sites.

5. Engaging Stakeholders in the Planning Process

Bringing together everyone who may be impacted by or have influence over workplace charging is crucial for a successful program. Some stakeholders need to be involved consistently from the early stages of brainstorming the program through implementation. Other stakeholders may only need to be involved during a portion of the process. As cited by federal agencies, a best practice for engaging stakeholders is to hold recurring meetings with a working group of people who are central to the planning process. Each person in the working group is the assigned point of contact for an area of expertise and ensures information is passed along as needed. Additional stakeholders can be invited to join the working group as needed throughout the process.

Key stakeholders to invite to recurring working group meetings include:

1. A **building or facilities manager** plays a key role in understanding the impact of charging stations on the building's electricity load, determining the charging station design, identifying the location(s) for the charging stations, and possibly using in-house labor to do the installation.
2. The **finance department** helps determine how to pay for charging stations and collect fees.
3. **Fleet managers** are the resident vehicle expert and may be knowledgeable about PEV charging.
4. The **GSA lease administration manager or facility manager** needs to be involved if the site is GSA owned or leased. GSA can also play a key role in selecting and purchasing charging stations.
5. **Labor relations** understands the union contract and can advise on proper processes for communication with unions.
6. The **legal team** helps ensure you are in compliance with the FAST Act and any other agency authorities, requirements, or guidelines.
7. The **parking manager** is affected by the installation of charging stations, fee collection process, and/or new parking policies.
8. The **procurement office** helps purchase EVSE and understand the systems in place by GSA to minimize procurement costs.
9. A **workplace charging manager** will manage day to day operations of the workplace charging program.

Additional stakeholders involved in the planning process, and their potential roles, include:

1. **All employees at the worksite** will need to be notified about the PEV charging program so that all PEV drivers have an equal opportunity to participate in workplace charging and non-PEV drivers understand that supporting PEVs benefits the community as a whole.
2. **Clean Cities coordinators** lead Clean Cities coalitions around the country and may be able to help agencies connect with local PEV resources or nearby employers that offer workplace charging. Find your local Clean Cities coalition at cleancities.energy.gov.
3. The **employee benefits manager** plays a role in managing employee commuting benefits.
4. **Employee PEV drivers** can provide valuable information about how they would use charging stations and provide feedback on charging policies.

5. **Entities across the department's organizational chart** including those at different worksites are important to incorporate in the discussion in advance of making public statements about the agency's workplace charging. Strategically communicating your workplace charging efforts to offices above, below, and across your agency's organizational chart can ensure accurate information about the scope and timeline of workplace charging is provided to all appropriate entities.
6. **Health, environment, and safety** staff may want to discuss concerns such as charging cords becoming a tripping hazard.
7. **Maintenance staff** will need to be prepared for replying to issues if a circuit breaker trips or an outlet repair is needed.
8. **Security staff** may need to enforce policies regarding which vehicles can park at the PEV charging station.
9. **Union representatives** will need to ensure adherence to applicable bargaining unit obligations occur.
10. **Utilities or other power providers** may help address availability of power, possible incentives, rate structure, and demand fees.

One of most common lessons learned by early implementers of federal workplace charging programs is that they could have avoided many hurdles and made progress much faster if they brought all the key players to the table early in the process. When people are asked to participate in early planning stages, they can identify potential barriers at the start and help brainstorm solutions. If these key players gather together with the mission to make a workplace charging program work, they may be motivated to make it succeed.

Photo 3. Atlantic Station offers ten Level 1 charging receptacles in a parking garage underneath one of their office towers. These spaces are reserved for the office workers in the building. *Photo from Don Francis, Clean Cities-Georgia, NREL 39679.*

Each stakeholder brings different ideas or concerns to the planning process. For example, unions want to promote fairness among employees and may have concerns about:

- Providing access to PEV charging for some employees but not offering gas refueling stations for other employees,
- PEV drivers having the most desirable parking spots close to the building (charging station installation costs tend to be lower when installed close to the electrical service), and
- PEV drivers taking a mid-day break to move a vehicle or cord if sharing a charging station.

Large organizations with multiple worksites may prefer to start with a small pilot program at one worksite before implementing workplace charging at other worksites. If so, it is good to communicate to all employees in your organization that a pilot project is underway with a long term plan to expand. This will help manage employee expectations and reduce concerns that some worksites are providing benefits not offered to other worksites.

When addressing concerns regarding workplace charging, it is helpful to communicate the reasons for pursuing this effort, such as agency goals to reduce petroleum consumed during employee commutes and alignment with the organization's mission. In addition to posting signage designating a parking spot for PEV charging only, it may be beneficial to post signage explaining how encouraging PEVs benefits the larger community through improved air quality and energy security.

Photo 4. PEV charging stations within a downtown Los Angeles parking garage. *Photo from Kendall Septon, NREL 37582.*

6. Managing Workplace Charging

The first step toward successful workplace charging administration is to designate a responsible individual or group to manage the ongoing operation and maintenance issues of the charging stations and any related costs. By ensuring all of the appropriate departments and individuals know who is responsible for the administration and enforcement of the program, employers will be able to address challenges swiftly and efficiently. It is important to set clear guidelines in the areas of administration, registration and liability, sharing, and pricing to help ensure a safe and successful workplace charging experience for all. Read about laying the groundwork for a well-managed program on DOE's workplace charging website: http://www.energy.gov/eere/vehicles/workplace-charging-management-policies-administration.

Some policy topics to keep in mind include:

- **Charging Access –** Determine your policy for who has access to the charging stations and ensure that policy is clearly communicated to all drivers who use the parking lot.
- **Enforcement and Security –** Identify who is responsible for enforcing workplace charging policies and what steps should be taken if a violation occurs.
- **Parking and Signage –** Maximize the benefits of the charging stations by clearly communicating the spaces designated for PEVs. In addition to signage, employers may choose to paint the pavement of the parking space.
- **Registration and Liability –** Have PEV-driving employees register their vehicles with the employer to participate in the workplace charging program. Consider adding liability language to the registration form to address employer and employee responsibilities when using the charging stations.
- **Sharing –** If employees will share charging stations, determine the structure to manage sharing such as a reservation system or time limit. Consider whether you want employees to move their cars or move the charging cord when sharing a station. Placing a charging station where the cord can reach two or four cars can simplify the sharing process.

Federal agencies have appointed people from various roles to manage their workplace charging program based on where they see an intersection with current responsibilities. In some agencies it may be easy to identify which person is the best fit for the workplace charging manager while in others it is unclear who is the best fit for the responsibilities. Consider people with the following responsibilities as possible candidates for overseeing the program:

- Employee services and benefits
- Environmental management
- Facilities management
- Green transportation program
- Sustainability coordinator
- Transportation planners

A workplace charging manager will need to:

- Become familiar with PEV and charging station technology
- Oversee finances related to installing charging stations and collecting fees

- Oversee the vehicle registration process and manage a waiting list
- Handle issues that arise such as unauthorized vehicles parking at the charging station
- Update program policies as needed

Some federal agencies may pursue sharing charging stations between fleet and employee vehicles because it simplifies the process for funding the charging stations when agencies are using FAST Act authority. In such a scenario, fleet vehicles have priority for charging over employee vehicles, which can interrupt the availability of workplace charging. Using fleet charging stations for employee vehicles can also cause conflict regarding the location of the charging station. In the private sector, employee charging is almost never managed by a fleet manager since fleet managers are not typically responsible for employee benefits.

Metering the energy used at charging stations by employees is not required by the FAST Act; however, some agencies may choose to track how much energy is used by the charging stations. It is helpful to identify your purpose for tracking the energy consumption in order to choose the preferred technology and design. The agency may want to track the total amount of energy used by charging stations to report how much of the building's energy consumption was due to PEV charging. In that case, metering the output from a group of circuits would suffice. If the agency wants to measure the energy used at individual charging stations, consider purchasing a charging station that provides energy monitoring services or install a secondary system that measures the energy consumed by individual circuits on the electrical panel. However, DOE provides a calculator that helps determine appropriate reimbursement fees so that metering individual charging stations is not needed. More information on fees is in the Managing PEV Driver Fees section of this case study.

Photo 5. The EV fleet charging stations at Public Service Company of New Mexico are clearly marked as EV parking.
Photo from P.J. Ray, NREL 40334.

7. Procurement and GSA Considerations

Before pursuing the purchase of PEV charging stations, you first need to be familiar with the basics of PEVs and charging stations. EVs have larger all-electric ranges than PHEVs, which can run on gasoline when the battery is depleted. Since PEVs have varying electric drive ranges and employees have varying commuting distances, different drivers may have different charging needs. PEV charging stations are parking spots where a vehicle can connect to an electricity source and charge its battery. Electricity is safely delivered from the electricity source to the vehicle using charging equipment also referred to as electric vehicle supply equipment (EVSE). The three main types of EVSE are AC Level 1, AC Level 2, and DC fast charging (DCFC). AC Level 1, which provides about 5 miles of range for every hour of charging, and AC Level 2, which typically provides 10-20 miles of range for every hour of charging are the most common types for workplace charging. The vehicle charging time depends on the state of charge of the battery, the power coming from the EVSE, and the rate a vehicle can accept power, which may be lower than the EVSE power rating.

Federal agencies find it beneficial to survey employees regarding their interest in workplace charging as an early step in the planning process. Gathering information about the types of vehicles employees drive (EV or PHEV), their commute distances, and how much they would be willing to pay to charge at work can help employers identify the type and quantity of charging stations that would be utilized. A sample employee survey for workplace charging is available at https://energy.gov/eere/vehicles/downloads/sample-employee-survey-workplace-charging-planning.

Most, if not all, PEVs will come with a Level 1 EVSE cord, with a standard, three prong household plug on one end and a connector that plugs into the vehicle on the other end. Some federal agencies provide Level 1 charging receptacles – or wall outlets – near a parking space for employees to plug in their own portable Level 1 charging cordset. An agency may procure and install Level 1 charging receptacles as it would for a regular outdoor wall outlet.

Photo 6. A Level 1 charging cordset comes standard with most PEVs and allows a driver to use Level 1 charging receptacles. *Photo from Erik Nelsen, NREL 34792*

Agencies that choose to purchase EVSE and install it next to the parking space will be faced with a wide range of EVSE options from a variety of manufacturers. The process for narrowing down which EVSE is the best fit for a specific agency's needs can be intimidating.

Some key questions to consider when choosing your charging station design include:

- **What level EVSE?** Vehicles are generally parked at work long enough for Level 1 to replenish their work commute. Multiple vehicles could share a Level 2 EVSE each day.
- **How many charging ports?** EVSE can have

multiple charge ports allowing two or more vehicles to charge at the same time. This can cut down on installation cost.

- **Which additional features?** All EVSE available on the market can safely provide power to the vehicle. Some EVSE also offer communications systems that provide features such as tracking energy use, restricting access to certain people, or allowing drivers to pay for their charging session. These additional features increase the cost of the EVSE unit and come with an annual charging network fee. They may also require the user to register with a service provider to gain access to the network.
- **Where will the charging stations be located?** The charging station location plays a major role in determining the costs and user policy. Minimizing the distance from the EVSE to the existing electrical service panel will minimize installation costs.
- **How much does it cost?** Depending on your situation, you may be required by the FAST Act to recover all costs for equipment and installation by collecting driver fees. Minimizing costs for the EVSE unit and installation are important to ensure users will be able to afford workplace charging fees.

Federal agencies may choose to procure their charging equipment through the GSA Schedule (23V, 51V or 56) . There are multiple charging station configurations available on the GSA Schedule including the three charging levels (Level 1, Level 2, and DCFC), single or dual port, indoor or outdoor use, and multiple mounting designs (wall, pole, or pedestal mounted). GSA Office of Fleet Management is GSA's main resource for charging station procurement and procurement best practices. In 2017 GSA arranged a blanket purchase agreement (BPA) that eliminates redundant contract actions and achieves volume discount pricing. Agencies have the opportunity to lease charging stations through GSA or buy directly off of the BPA. Additional information on the BPA (BPA GS-30F-GA083 and BPA GS-30F-GA082) can be found at gsa.gov/EVSE. Equipment, data plans, and installation services are posted on GSA's online shopping and ordering system, GSA Advantage, at www.gsaadvantage.gov. The Motor Vehicles Hallway in the Acquisition Gateway, a collaborative website with resources and tools related to government purchasing, has fact sheets and specific vendor offerings at https://hallways.cap.gsa.gov.[10]

GSA is a helpful resource but it may be beneficial to invite some EVSE manufacturers to provide a presentation to your work group so that everyone will have a chance to ask questions and gather the information needed to inform your charging station design. However, if you choose to do this, please consult your contracting officer on Federal Acquisition Regulation Section 15.2 and Section 10 to ensure you are following all competition rules and relevant policies and procedures for engaging with industry. You may need to afford all vendors on the GSA Schedule the same opportunity. When purchasing EVSE, work with your procurement/contracting staff to ensure you follow the proper protocol for your facility. You may need to request quotes from multiple vendors and take into consideration whether vendors are small and/or minority owned businesses, in addition to identifying the best value.

EVSE manufacturers or installers may also be willing to provide a site assessment including suggestions for charging station locations to minimize installation costs. The DOE Federal Energy Management Program (FEMP) provides EVSE technical guidance for federal agencies through the EVSE Tiger Teams and can also assist with workplace charging. Tiger Teams include electrical engineers and experts who

[10] The Acquisition Gateway, built by GSA, helps federal government buyers from all agencies act as one acquisition community. Information on EVSE can be found in the Motor Vehicles sub-hallway under The Transportation and Logistics Hallway.

Photo 7. National Renewable Energy Laboratory employees pose with their PEVs in front of the Research Support Facility.
Photo from Dennis Schroeder, NREL 32193.

can help agency fleet managers minimize EVSE installation costs. The teams conduct site assessments, review assumptions, provide technical input, and offer ongoing support for PEV and EVSE deployment.[11] FEMP also offers an online training course on federal workplace and fleet EVSE, which is available at http://www.wbdg.org/continuing-education/femp-courses/fempfts31.

Tenants at GSA buildings who want to install EVSE should reach out to their GSA facilities manager. The GSA facilities manager will ask for a feasibility study showing the demand for EVSE and anticipated costs.[7] When submitting a plan for reimbursing the costs, keep in mind that GSA uses local utility rates for FAST Act compliance. If there are other tenants in your building, GSA will reach out to them about the possibility of workplace charging to make sure GSA is planning for the long term anticipated EVSE needs for that parking facility. If there is already an existing Level 1 charging receptacle, or wall outlet, in the parking lot that could be used for PEV charging, the facilities manager can verify the outlet is suitable for PEV charging. At a GSA-leased location, a leasing specialist will work with the landlord to approve or deny a request for EVSE.

General questions related to charging stations and electric vehicles can be sent to GSA's Alternative Fuel Vehicle Inbox at gsafleetafvteam@gsa.gov.

[11] https://federalfleets.energy.gov/fueling_infrastructure#development

8. Funding PEV Charging Stations

Federal agencies using FAST Act authority to procure employee charging infrastructure will ultimately reimburse costs through fee collection. However, agencies will need to identify up-front funding for purchasing and installing charging stations. When evaluating charging station design options, it is important to keep the project costs low enough so that the monthly reimbursement fee is a reasonable cost for employees.

Photo 8. In 2010 Eli Lilly & Company installed several workplace charging stations at its two main campuses in Indianapolis, IN. *Photo from Eli Lilly.*

Utilizing existing Level 1 charging receptacles, or wall outlets, is one method to minimize charging infrastructure costs. The AFDC provides a laws and incentives database (http://www.afdc.energy.gov/laws), which federal agencies can use to search for state EVSE incentives. However, not all incentives may be applicable to federal agencies. Utilities may also be able to assist with identifying incentives or pilot programs that can reduce costs. It is a good practice to talk with your electric utility early in the planning process to understand how EVSE can affect your utility bill and if they have any special electricity rates for EVSE.

Some agencies may find funding for workplace charging in operations, infrastructure, or energy project related budgets. As of February 2017, federal transit subsidy funds cannot be used to supplement federal workplace charging. Agency owned worksites may have internal staff that can do the installation but at other locations you may need to think creatively to fund and install charging stations. Agencies have gone through utility companies, ordered off of GSA or NASA schedules, contracted consulting firms to manage both the purchasing and installing of the stations, and used state grants. Contracting officers at agencies that have already employed workplace charging are good resources on the best way to contract and fund installation and other aspects of your project. It may be easier to get approval for purchasing charging stations if they are needed for fleet vehicles. Keep in mind that workplace charging policy challenges can arise if fleet and personal vehicles share charging stations since fleet vehicles have priority charging access.

According to GSA's *Order 5605.1 PBS EVSE Infrastructure Management*, issued in October 2016, there are three funding options for EVSE at GSA facilities:[12]

- **Option 1.** The requesting agency may reimburse GSA for the infrastructure installation using a Reimbursable Work Authorization (RWA).
- **Option 2.** When EVSE infrastructure is installed as part of a facility renovation or construction project, the installation costs may be factored into the tenant's rent as a tenant improvement, subject to GSA funding availability.

[12] https://www.gsa.gov/portal/directive/d0/content/535053

- **Option 3**. GSA and federal agencies, working with a service provider (i.e. private company, public utility or other entity), may allow the service provider to install, operate, maintain, repair, replace, provide electricity, and collect fees to cover the costs associated for EVSE infrastructure.

Another option for funding charging stations is entering into a Memorandum of Understanding (MOU) with a third party, such as a credit union or utility, which is willing to purchase the charging stations. NIH had success forming an MOU with the NIH Federal Credit Union so that the Credit Union pays for the electricity used by NIH employees at designated Level 1 charging receptacles. In scenarios where a third party is providing free charging equipment, agencies should consult with their legal counsel to determine how this may be covered under gifting authority legislation.

Photo 9. Level 1 charging receptacles can be installed on parking lot lamp posts. *Photo from Idaho National Laboratory.*

EVSE unit cost depends on the mounting system, number of charge ports, communications system, and additional features. Installation costs have the most significant variability and are influenced by how much electrical work is needed, how much trenching or boring is needed, permitting, labor rates, and Americans with Disability Act (ADA) requirements. Contact GSA, EVSE manufacturers, or installation contractors for a site assessment and cost estimate specific to a particular location. The cost of a single port EVSE unit ranges from $300-$1,500 for Level 1, $400-$6,500 for Level 2, and $10,000-$40,000 for DCFC. Installation costs vary greatly from site to site with a rough estimate cost range of $0-$3,000 for Level 1, $600 - $12,700 for Level 2, and $4,000-$51,000 for DCFC.[13] See Appendix A for best practices on minimizing project cost. DOE FEMP Tiger Team experts can conduct a site visit to establish a lowest-cost/best-solution scenario. Tiger Team site visit costs range from $10,000-$15,000 with an opportunity to bundle sites and have saved between $5,000 and $20,000 per EVSE unit installation compared to the estimates provided by private sector companies.

One cost-reducing strategy is to lay the groundwork for charging stations when doing other planned construction. If the agency has interest in providing workplace charging, talk with the facilities manager early in the process and consider incorporating work, such as laying conduit or upgrading an electrical panel in other planned construction. For example, the U.S. Environmental Protection Agency's (EPA) National Vehicle and Fuel Emissions Laboratory laid conduit for charging stations when they were repaving their parking lot. Since the construction equipment was already on site, it was a small additional task to trench deeper to lay the conduit. Taking that step will significantly reduce their

[13] U.S. Department of Energy, November 2015, Costs Associated with Non-Residential Electric Vehicle Supply Equipment, available at http://www.afdc.energy.gov/uploads/publication/evse_cost_report_2015.pdf

installation costs for putting in future charging stations. The cost to install a Level 1 charging receptacle on a lamp post may be minimal if electrical work is already being done in that parking lot.

9. Managing PEV Driver Fees

The FAST Act states that agencies shall charge authorized users an amount to ensure recovery of costs incurred in installing, constructing, operating, and maintaining charging stations. Each agency will need to go through the process of establishing the user fee amount and the process for collecting the fee. Agencies may also have questions about accessing the collected money.

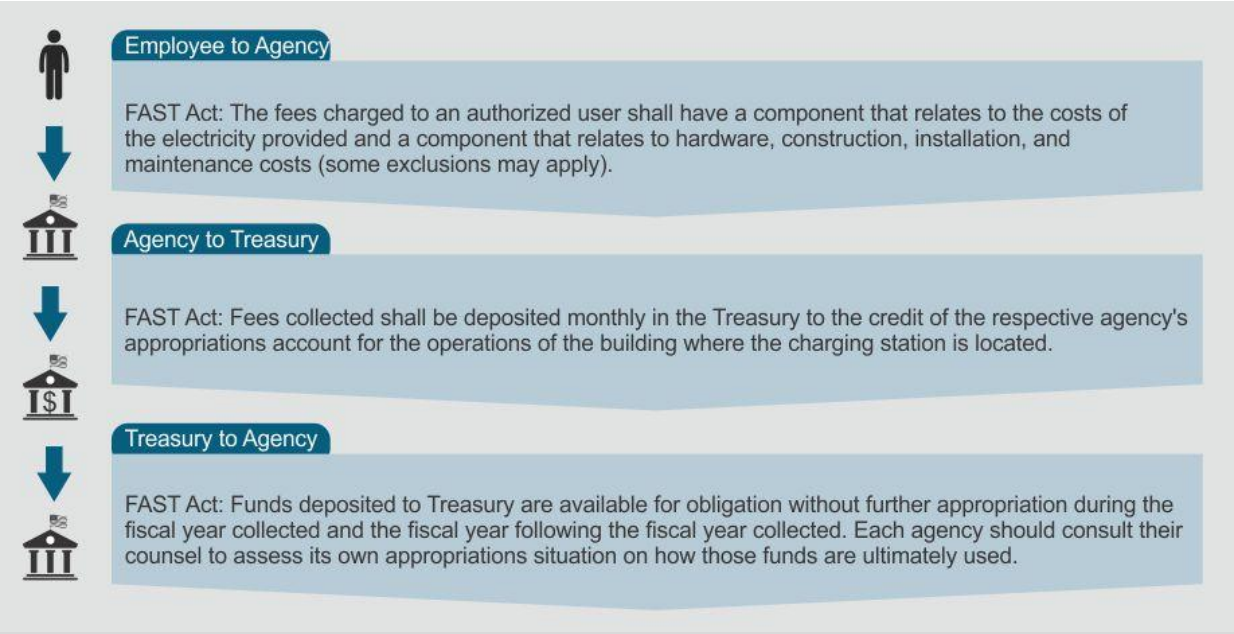

Figure 2. FAST Act workplace charging reimbursement process.

When determining the EVSE costs that need to be recovered, keep in mind the exceptions identified in the FAST Act. Charging station installation and construction costs do not need to be recovered if charging stations:

- were installed before December 4, 2015,
- are primarily used by Federal fleet vehicles, or
- were funded through specific appropriations.

The DOE created a tool to help federal agencies determine the appropriate fee to recover workplace charging costs. It provides agencies with standard assumptions including hardware and installation lifetime periods, electricity costs, and electricity utilization. The calculator allows agencies to enter their anticipated hardware and installation costs and in turn provides a suggested daily per employee fee. The EVSE Reimbursement Tool is available at http://energy.gov/eere/vehicles/downloads/evse-reimbursement-tool-support-federal-agency-implementation-workplace.

Agencies that provide Level 1 Charging Receptacles could consider charging a daily fee of $0.60 for use of existing or new outlets that did not require unusual installation costs such as trenching or boring.[6]

According to the FAST Act, fees collected for workplace charging shall be deposited monthly in the Treasury to the credit of the respective agency's appropriations account for the operations of the building where the EVSE is located. Some possible methods for collecting fees and Treasury deposit include:

- **Pay.gov** – Agencies can customize a payment system through this Treasury-managed e-billing service that will send a monthly bill to employees, allow them to pay the bill online, and deposit the money in the Treasury, from which it can be applied directly to the facilities hosting workplace charging stations.
- **Payroll deduction** – Agencies can withdraw the fee from employee's payroll as a post-tax deduction and then deposit the money in the Treasury.
- **Third party vendor** – A third party vendor such as a charging station network, parking kiosk, or a parking operator could manually or electronically collect the fee and then provide the collected funds to the agency to deposit in the Treasury.

A common method for establishing which vehicles have permission to use workplace charging is for the employer to provide a rearview hangtag or window sticker to employees once they are enrolled in the fee collection system. It is also possible to establish a process where drivers pay for each individual charging sessions but that can require more costly technology and/or administration and is not required.

For agencies using the FAST Act authorization to provide employee charging, the fees deposited in the Treasury are available for obligation without further appropriation during the fiscal year collected and the fiscal year following the fiscal year collected. Each agency should consult its legal counsel to determine options for accessing these funds. When determining how important it is to keep track of the collected fees within the building operations fund and budget them for EVSE related activities, keep in mind the order of magnitude of the fees you are collecting. For instance, an agency collecting $130/month for ten employees using Level 1 charging receptacles may determine that they do not want to manage a process for identifying and obligating the EVSE-related funds at Treasury.

Photo 10. Workplace charging at Valley Hospital in Ridgewood, NJ. *Photo from Hyundai Motor America, NREL 41425.*

10. Summary

The FAST Act authorizes federal agencies to allow employees to use existing or install new charging stations on a reimbursable basis. Now many agencies provide options for charging employee PEVs at work.

Bringing together all of the key stakeholders required to develop a plan and policy for workplace charging can be a challenging process. Many individuals will need to be involved throughout the process including the workplace charging manager, facilities manager, parking manager, employee PEV drivers, legal counsel, employee benefits manager, and union representative. Gathering stakeholder input early in the planning process can help the agency overcome barriers and make progress towards its goal.

Each agency will determine what charging station design is appropriate for a specific worksite. Agencies may choose to simply provide Level 1 charging receptacles for employees to plug in their personal charging equipment or purchase and install charging equipment next to a parking space. Multiple charging stations are available on the GSA schedule and the GSA BPA can help reduce costs. Minimizing the upfront costs will help keep the reimbursement fees within the threshold of what employees are willing to pay.

Ultimately, the amount of money, time and effort that goes into a workplace charging program varies from organization to organization. Federal agencies have their share of challenges when it comes to EV charging, but by using available informational resources and best practices identified by agencies that have already implemented charging, agencies can deploy a successful workplace charging strategy.

11. Additional Resources

For more information about federal workplace charging visit the resources below:

1. DOE Workplace Charging Resources – https://energy.gov/eere/vehicles/workplace-charging
2. Charging at Federal Facilities – https://energy.gov/eere/vehicles/workplace-charging-federal-facilities
3. Plug-In Electric Vehicle Handbook for Workplace Charging Hosts – http://www.afdc.energy.gov/uploads/publication/pev_workplace_charging_hosts.pdf
4. Guidance for Federal Agency Implementation of Workplace Charging: EVSE – https://www.sustainability.gov/Resources/Guidance_reports/Guidance-for-Federal-Agency-Implementation-of-Workplace-Charging,-Electric-Vehicle-Supply-Equipment.pdf
5. Guidance for Federal Agency Implementation of Workplace Charging: Level 1 Charging Receptacles – https://www.fedcenter.gov/_kd/Items/actions.cfm?action=Show&item_id=29808&destination=ShowItem
6. Federal Workplace Charging at GSA Facilities – http://www.gsa.gov/portal/directive/d0/content/535053
7. EVSE Reimbursement Tool to Support Federal Agency Implementation of Workplace Charging – https://energy.gov/eere/vehicles/downloads/evse-reimbursement-tool-support-federal-agency-implementation-workplace
8. FEMP Training on EV Charging for Employee Vehicles and Agency Fleets – http://www.wbdg.org/continuing-education/femp-courses/fempfts31
9. Level 1 Electric Vehicle Charging Stations at the Workplace – https://energy.gov/sites/prod/files/2016/07/f33/WPCC_L1ChargingAtTheWorkplace_0716.pdf
10. Federal Energy Management Program EVSE Tiger Teams – https://federalfleets.energy.gov/fueling_infrastructure#development
11. Workplace Charging Do's and Don'ts – https://avt.inl.gov/sites/default/files/pdf/evse/WorkplaceChargingDosAndDonts.pdf
12. Information on PEVs available and Charging Stations on GSA Schedule – https://www.gsa.gov/portal/category/21845 or gsafleetafvteam@gsa.gov

12. Appendix A. Best Practices for Minimizing Charging Station Costs

The costs associated with installing EVSE can vary widely, depending on site location, available electrical capacity, and labor costs, but federal agencies can use the following installation best practices to minimize project cost drivers[14]:

Procurement

- Participate in aggregated purchases offered by GSA that reduce redundant contract administration action and provide EVSE volume pricing discounts. Contact the GSA Fleet Alternative Fuel Vehicle Team at GSAfleetafvteam@gsa.gov for more information.
- Evaluate EVSE financial incentives offered by utilities, states or other entities.

EVSE Unit

- Choose the EVSE unit with the minimum level of features needed considering operational and data gathering needs to minimize up-front procurement cost and minimize the more periodic maintenance required by advanced units as compared to basic units.
- Choose a wall mounted EVSE, if possible, to minimize concrete or soil excavation or drilling of holes through building structures, known as trenching or boring, for routing of electrical conduit and wiring.
- Choose a dual- or multi- port EVSE to minimize installation costs per charge port.
- Determine the electrical load available at the site and choose the quantity and level of EVSE units to fit within that available electrical capacity.

Location

- Place the EVSE close to the electrical service to minimize the need for trenching/boring and the costs of potential electrical upgrades.
- Instead of locating the EVSE at a highly visible parking spot a great distance from the electrical panel, use signage to direct PEV drivers to the EVSE unit.
- If trenching/boring is needed, minimize the trenching/boring distance.
- Choose a location that already has space on the electrical panel with a dedicated circuit.
- Consult best practices for installing EVSE in compliance with the Americans with Disabilities Act (ADA).15

Long Term Planning

- Contact the site's utility early in the planning stages to discuss electricity consumption and demand charges as well as electrical service needs. Avoid utility demand charges by balancing charging time windows with other electricity usage and working closely with the utility.
- Consider the quantity and location of EVSE that are planned for installation over the next 10-40 years when installing the first unit. Upgrade the electrical service for the anticipated long term EVSE load and run conduit to anticipated future EVSE locations. This will minimize the cost of installing future units.
- Consider the electricity infrastructure for EVSE when building a new facility. It is less expensive to install extra panels and conduit capacity during initial construction than to modify the site later.

[14] Adapted from U.S. Department of Energy, November 2015, Costs Associated with Non-Residential Electric Vehicle Supply Equipment, available at http://www.afdc.energy.gov/uploads/publication/evse_cost_report_2015.pdf.

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NREL parking garage, Dennis Schroeder, NREL 26764; PEV Drivers at Lawrence Berkley National Laboratory, Photo from LBNL