

EV Infrastructure 101

An Early Market Guide for Facility Managers



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Electric Vehicles

The new age of mass-market Plug-in Electric Vehicles (PEVs, or EVs) is here as the first shipments of the Chevrolet Volt and Nissan Leaf have arrived while the Tesla Roadster, a high-performance all-electric vehicle, has been selling for over a year. According to the **US Department of Energy**, up to 45,000 PEVs could be available for US drivers by 2011 and that's just the beginning.

In his 2011 State of the Union address, **President Barack Obama** called for putting **one million EVs on US roads by 2015** to build on America's technical leadership, create new jobs and reduce transportation dependence on foreign oil. Pike Research anticipates the U.S. will be the largest market for EVs in 2015, followed by China and Europe.



Electric Vehicle Infrastructure

EV market adoption (and therefore auto sales) will depend on consumers having convenient access to charging stations in their daily lives. EV charging stations are part of the needed EV infrastructure and are sometimes referred to as Electric Vehicle Supply Equipment (EVSE). Early market commitments are already being seen with Level-2 charging stations in major cities like San Francisco and New York; retailers like Best Buy and Walgreens; and employer workplaces like SAP and Netflix. Most early adopters are making headlines and are proud of their investments to encourage their citizens, customers and employees to purchase eco-friendly vehicles.



SAE J1772 Connector

A critical milestone was reached in 2010, where all EV vehicle manufacturers for the North American market agreed to a universal standard for the charging station connector - SAE J1772 (pictured above). This breakthrough opened the industry to free market competition to drive better pricing and variety while eliminating the risk of placing the wrong bet or finding a charging station with the wrong connector (remember Beta vs. VHS video standards battle?). EV buyers can now be comfortable knowing that new EVSE infrastructure deployment at cities, parking structures, shopping centers, retail outlets, and at their work sites will have charging equipment compatible with their new vehicle.

And of course each EV auto dealer will have charging stations on-site so they can sell and service their EV models and deliver them to customers fully charged.



Coulomb Technologies



GE



AeroVironment

Buying an EV, Charging at Home

Prior to buying an EV, customers need to ensure they have safe and easy access to charging at their home. Like a hospital requiring new parents to have a baby seat before they can drive their bundle of joy home, the EV dealer needs to ensure their customer has the charging infrastructure at home to have a great EV ownership experience.



Nissan Leaf battery power plant

Consider, for example, the Nissan Leaf, which is an all-electric car with a lithium-ion battery, top speed of 90 mph and a range of 100 miles. Nissan recommends that each owner installs a 220/240-volt “Level-2” outlet in their garage so they can recharge in about 7 hours – usually at night when electricity is cheapest. Otherwise, a standard 110-volt electrical outlet (Level-1) can take up to 20 hours for a full charge from empty. Authorized Nissan Leaf dealers assist customers with their home charger selection and installation process.



The Chevrolet Volt: Motor Trend's 2011 Car of the Year®

The Chevy Volt is a different type of EV. It is a plug-in extended-range electric vehicle. Its lithium-ion battery stores power from the electric charge and a 9-gallon gasoline tank fuels an on-board gasoline generator. The **electric** motor powers the car for the **first 40 miles** and then the **gas** kicks in to provide another **375 miles** of range on a full tank and relieve the concern of “**range anxiety**”. The Chevy Volt charges in about half the time as the Nissan Leaf, although it has about half of the pure electric range.



Tesla Roadster EV

The ultra-performance Tesla Roadster, an all-electric sports car with a price tag of over \$100,000 can accelerate from **0-60 in 3.7 seconds** and has a range of **240 miles on a single charge** – all while emitting zero emissions!

The Need for EV Charging Stations

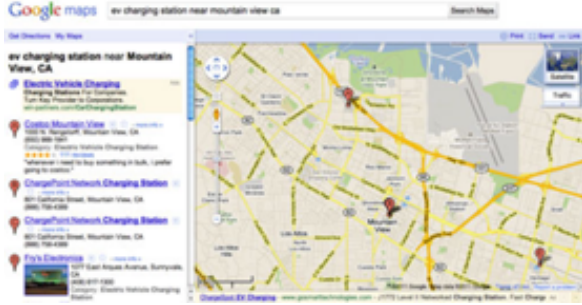
EV charging stations are required across a variety of venues:

- **Parking structures** – Commercial complexes, airports, shopping centers
- **Government** – City, county, state, federal - Public access to charging at downtown parking and shopping, and as an employer and for EV fleets
- **Commercial and industrial** – Employer locations and EV fleets
- **Residential Single Family** – Charging is needed at every EV home
- **Residential Multi-Family**– Multi-tenant sites will need to accommodate



To kick-start the rollout of EV infrastructure, the US government has committed **\$400 million** for rolling out charging infrastructure across selected geographic markets. Therefore, various incentives are available to certain building owners, government agencies and homeowners that meet specific eligibility requirements. **In some cases**, with certain restrictions, **a facility can get a 100% rebate on cost of the EV charging equipment**. The Linc Group, an ABM Company, can assist with evaluating eligibility and rebate processing.

Reasons for Installing EV Charging Stations



As Electric Vehicle adoption grows, consumers will gravitate to places where they can charge up while doing other things like working, shopping or dining. Stadiums with EVSE can let customers charge up while taking in a game or a concert. Consider:

1. A facility might reward employees who made early stage investments in non-petroleum transportation by offering free or subsidized charging
2. Companies, universities and local governments want to show they are doing their part in helping America achieve energy independence while fostering environmental stewardship
3. A large entertainment venue (stadium, theater, etc.) might offer close-up or covered EV charging and parking near the VIP section
4. If the pursuit is a commercial endeavor, a facility can add a surcharge on top of a standard parking fee. Payment options include:
 - a. Fees can be collected as they are today by parking staff
 - b. Valet services can optimize charging station utilization by promptly moving EVs when their allotted time is done
 - c. Premium charging stations have the capability to accept credit cards, selected membership cards, and payment-by-phone
 - d. Some EV charging stations can handle variable billing rates so a facility can optimize time-of-day pricing and prevent lock out certain hours of the day
 - e. A commercial EV charging station can work like an “electronic vending machine” that needs no refills and no middle man
5. New customers, incremental sales: New EVs are equipped with GPS systems that show where charging stations are located. This awareness will help attract EV drivers to those locations where they can stop in for a charge

Types of EV Charging Stations:

- **Level-1** uses a standard 110/120-volt receptacle. Onboard the vehicle and uses a standard household-style AC plug
- **Level-2** uses the SAE J1772 for faster charging. 240-volt, 40 amp
- **Level-3 DC Fast Charge:** will be a rapid DC charger [Not yet standardized]

Considerations Prior to Installing EV Charging Stations

We at The Linc Group believe facilities should consider EV infrastructure as part of a larger Sustainability or Energy-Efficiency strategy, not just an independent green project. Realize in advance how the new EVSE load can alter the energy profile and pricing impact of a building or a campus. Fortunately, a balanced approach can help facilities offset the new load through other energy-reduction programs. Other considerations:



1. Government, commercial and public parking sites:

- a. Requires engineering, electrical permits, and city planning approvals
- b. Wireless networking, software and billing system processes may be required
- c. Must select the best hardware manufacturer for the desired application
- d. Underground work to bring power from buildings to parking lot, plus concrete work
- e. Training of building personnel to ensure proper operations and safety
- f. Additional electrical load requirements. Additional circuits, panels, meters, transformers might be needed, so it is wise to get an expert estimate before deciding on an installation partner

- g. Commercial and public use – Forward-looking discussions on the use of the chargers, equipment upgrade-ability, after-hour access, security, and flexibility in billing. The right decisions will set up a bright future and ensure the EVSE is a great investment
- h. The electrical load created by the EVSE could significantly raise the cost of electricity. Higher electrical price tiers, especially during peak daytime hours, can negatively impact operating costs.
- i. The Linc Group offers a holistic approach with customers to ensure in-building sustainability systems and processes are discussed and in place set to help offset the additional load of EV charging equipment

2. EV Auto Dealerships:

- a. Requires Engineering Electrical permits plus underground and concrete work for bases
- b. Training of dealership personnel. Dealers need to be fluent on options and processes for arranging charging stations at customer homes
- c. Consider possible emergency services or roadside assistance for stranded motorists with a dead EV battery
- d. Customers living in multi-family developments need to work with their property owners
- e. Various EV charger manufacturers are available for different applications and with different levels of sophistication and price
- f. The Linc Group offers a holistic building and customer approach for EV dealers with various sustainability programs available

3. Residences :

- a. Requires electrical permit and inspection by qualified or certified electrician
- b. Home might need electrical panel upgrade and routing of electrical power to charger that is installed in the garage
- c. Purchase of charger (multiple vendor options) and installation fees need to be considered. Pricing and features vary
- d. The Linc Group's experience shows most of the homes we have assessed can accommodate an EV Charger without a significant electrical upgrade. We handle assessments, quotations and installations of home EV chargers

Experience Matters

The Linc Group, an ABM Company, has been involved with EV charging stations long before the new electric vehicles were even shipping. At this early stage, we have already installed hundreds of Level-2 charging stations in multiple states and have performed hundreds of residential assessments. Our experience shows that beyond electrician excellence and certifications, the qualified service partner for installing EVSE requires exceptional customer skills and a willingness to work with cities and utilities.

Trusted Provider

The Linc Group exceeds the standards listed above and would like to become your provider of choice in this exciting yet complex new green market. As a solution provider, we can offer clients:

- Single source provider for consultation, selection, design, installation and maintenance
- Assistance with approval and processing of government rebates and financial incentives
- Close partnership with the various EV charging station vendors and distributors to ensure customer gets the best information, the right fit, and the right solution for your EVSE
- Lower electricity rates through our supply-side power offerings
- Building and facility services to improve energy efficiency through HVAC/Mechanical, Electrical and LED lighting and intelligent lighting controls
- Lower utility bills through whole house energy upgrades offered by GreenHomes America, an ABM company
- Guaranteed energy contracts and funding programs for energy efficiency projects

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