

**Florida's Future EV Infrastructure  
&  
Infrastructure Models  
Interim Report  
For The  
Florida Electric Vehicle Roadmap**

**June 30, 2020**



# Florida's Future EV Infrastructure & Infrastructure Models Interim Report

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## Introduction

This is the first interim report to be submitted for the Florida Department of Agriculture and Consumer Services, Office of Energy's *Florida Electric Vehicle Roadmap* (FEVR) project. The project and these reports address the Electric Vehicle Supply Equipment (EVSE) infrastructure that is specific to light-duty electric passenger vehicles. Workplace charging and infrastructure to support heavy-duty vehicles and fleets is typically specific to their needs and is not included in the analysis. The need for particular policy or regulatory attention will be noted but not addressed in these reports. These are "Business-as-Usual" evaluations, impacts from the COVID-19 virus have not been considered.

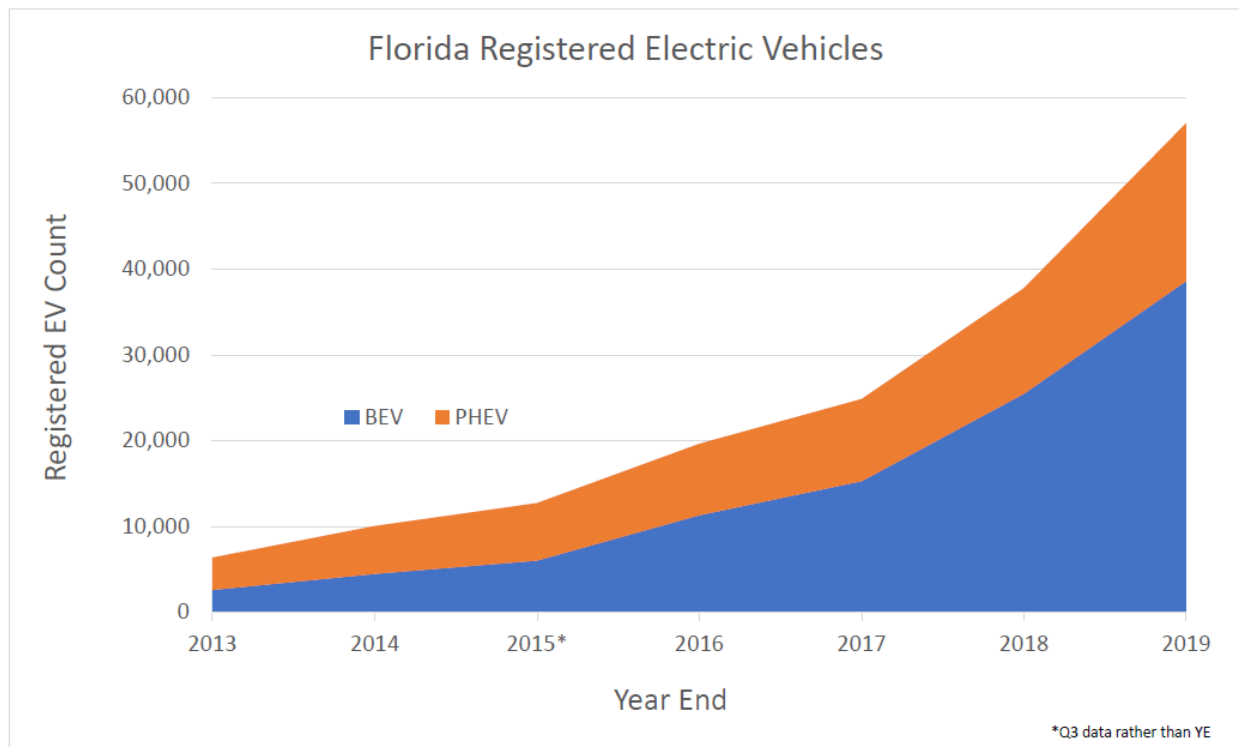
The domestic transportation landscape is being reshaped by technologies that will dramatically improve the efficiency and safety of the way we travel and transport goods. Electric vehicles (EVs) are poised to assume a significant role in transportation over the next five to ten years. EV battery prices continue to decline and electric passenger vehicle cost are expected to reach price parity with conventionally fueled vehicles across the passenger vehicle segment by 2025.<sup>1</sup>

EV adoption in Florida continues to accelerate, and adoption is expected to dramatically increase as price parity is achieved and consumers begin to understand the Total Cost of Ownership (TCO) concept and the savings to be realized when compared to internal combustion engine (ICE) vehicles. There is the very real possibility that growth in EV sales will outpace the deployment of charging infrastructure. The lack of adequate infrastructure will result in a frustrating barrier to the consumer's full use of their EVs as well as complications with emergency incidents. The deployment of autonomous

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<sup>1</sup> [https://www.greencarreports.com/news/1111144\\_electric-cars-will-cost-less-to-buy-than-regular-cars-by-2025-analysis](https://www.greencarreports.com/news/1111144_electric-cars-will-cost-less-to-buy-than-regular-cars-by-2025-analysis)).

vehicles, electric taxis and shuttles, and startup Transportation Network Companies (TNC) such as Lyft and Uber will also be impacted.



Source: Florida Power & Light

### Stakeholder Webinars

FDACS OOE and its partner, the Central Florida Clean Cities Coalition, conducted six webinars between April 28<sup>th</sup> and June 16<sup>th</sup> to discuss future infrastructure considerations with stakeholders. Individual webinars addressed the considerations with stakeholders representing power service providers, infrastructure network providers, advocacy groups, planners, and state agencies. A total of 15 industry representatives from all of the stakeholder groups participated as facilitators for the webinars. More than 500 stakeholders attended over eight hours of webinars. Discussions during the webinars were very productive and useful. Feedback from participants was very positive. Recordings of the webinars and other information is available on the project website at, <https://www.fdacs.gov/Energy/Florida-Electric-Vehicle-Roadmap>.

Topics of discussion during the webinars included:

- Increase in battery efficiency, resulting in 400+ mile range
- Increase in electric vehicle supply equipment (EVSE) output of 600kW+
- Requirements for thermal management of higher EVSE outputs
- Increased grid demands at EVSE locations

- Broad introduction of EV passenger shuttles, taxis, and Transportation Network Companies (TNCs)
- Initial deployment of autonomous vehicles
- Inductive charging
- Networking and internetworking of EVSE
- Siting and upgrade capabilities
- Uptime, Resiliency, Backup Power
- Obsolescence and upgrade of EVSE
- Social equity and underserved communities
- Outreach, education, and training
- Energy consumption
- Environmental
- Site Safety
- Zoning, building codes, and permitting
- Signage

### **Survey of General Public and Enthusiasts**

Gathering information from end users is crucial to understanding the performance of the existing infrastructure, and the planning needed for future infrastructure. FDACS OOE and Clean Cities will be conducting an online survey of what stakeholders think Florida's future charging infrastructure should look like. The survey, which will begin in late July, and will collect information on EV ownership, currently available infrastructure, availability and uptime, residence type, individual charging behavior, charging location priorities, EV fees, and other detailed information.

### **Research Underway**

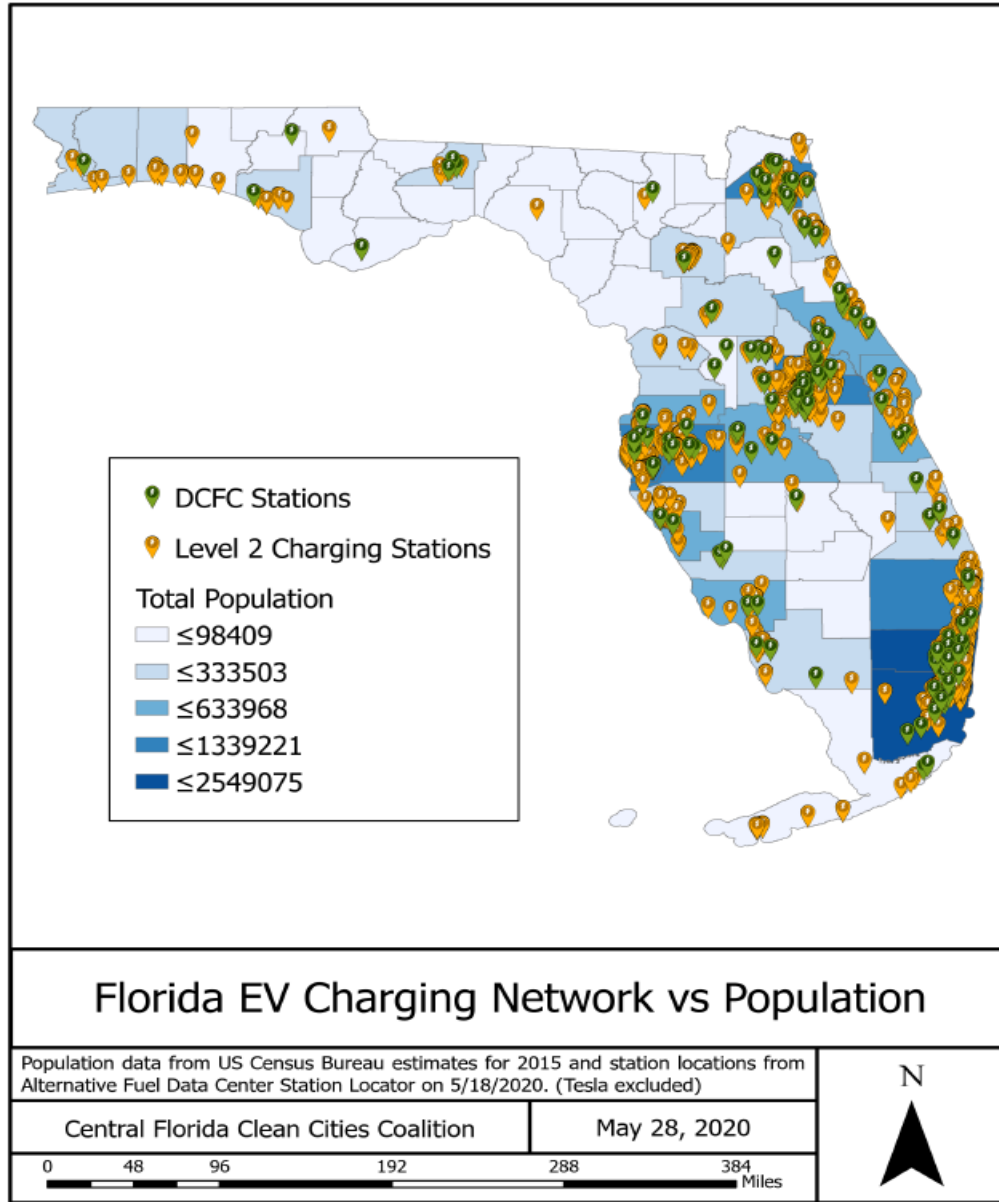
Additional efforts outside of the webinars and the survey includes, gathering data on travel and evacuation, discussions with Florida Department of Transportation (FDOT), Tesla, UL, EVgo and others, review of White Papers and other research, and participation on FDOT's M-CORE panels for considerations associated with new transportation corridors being built in Florida.

The development of Geographic Information Systems (GIS) maps to illustrate existing and recommended infrastructure has begun, the maps will contain the following layers:

1. Layer for all Interstates and State Roads
2. Layer of all DCFC in Florida, including Tesla
3. Layer of all DCFC in Florida, minus Tesla
4. Layer for Volkswagen Settlement (VW) funded Interstate sections
5. Layer for pending, permitting, under construction (PPC)
6. Layer for recommendations
7. Layer for Evac routes with DCFC now

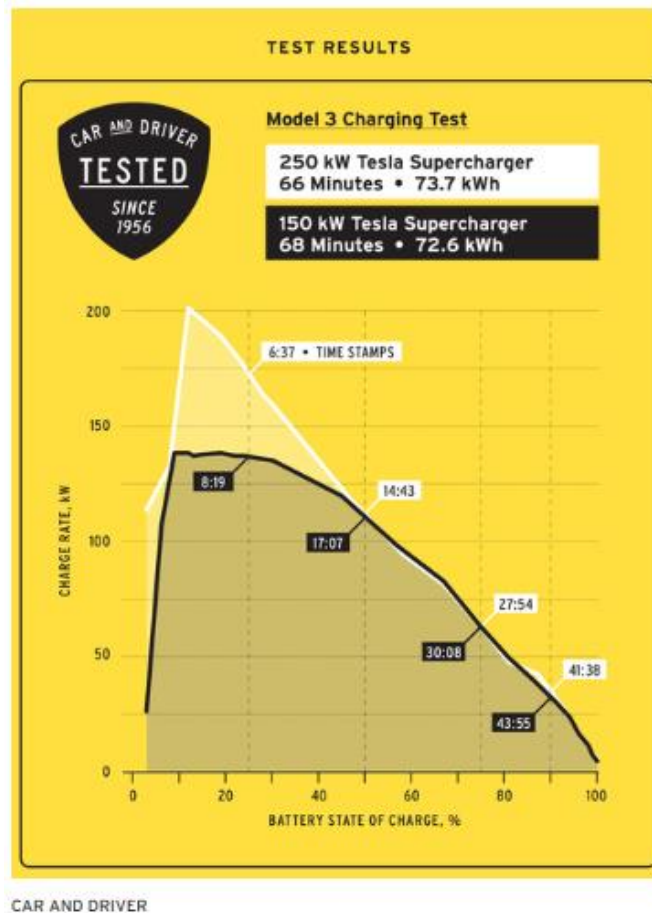
- 8. Layer for evac routes with VW
- 9. Layer for evac routes with: Direct Current Fast Charger (DCFC) now, VW, PPC

**Infrastructure Technology**



First, it should be understood that there are no special requirements for the installation of charging infrastructure, when compared to other electrical appurtenances installed in similar fashion; and in many instances the installations are less complex than a standard traffic control device. Permits and other approvals are required for installation, but generally no more so that other devices installed in similar fashion.

EV infrastructure technology is advancing at a rapid pace in an effort to meet the requirements of longer range EVs, and support the increasing capability of these vehicles to manage much higher recharge power levels. The conventional 50kW DCFC is giving way to DCFCs of 100-350 kW that are currently being installed. Future output capacities are expected to exceed 650 kW. A 50kW DCFC can restore about 120 miles of travel per hour, a 150-350 kW DCFC can provide 800-1000 miles of travel in the same amount of time.<sup>2</sup>



Increased EVSE power outputs require increased grid inputs and other considerations. The placement of the higher power EVSE becomes more difficult and demanding in finding a suitable location that can accommodate the needed grid requirements, additional requirements for the thermal cooling of the supply cables, and data network availability to support monitoring, billing and other back office requirements.

EVSE installations in Florida continue at a strong pace. However, a significant portion of the installations were for Level 2 EVSE with a maximum output of 40kW, 10kW below the 50kW common output of a conventional DCFC. Level 2 installations are adequate

<sup>2</sup> <https://www.caranddriver.com/news/a32132062/tesla-250-kw-vs-150-kw-supercharger-tested/>

for short duration recharges for minimum travel requirements, these installations will not adequately support the rapid charge requirements of long distance EVs on destination travel.

Battery technology and consumer needs will strongly influence infrastructure needs. There are intrinsic incentives for choosing both long and short range EVs. Longer range EVs will provide the most travel flexibility. However, a shorter range EV with less battery capacity can be manufactured and sold at a much lower cost than an ICE vehicle.

### **EVSE Technology<sup>3</sup>**

EVSE delivers electrical energy from an electricity source to charge an EV's battery. The EVSE communicates with the EV to ensure that an appropriate and safe flow of electricity is supplied. EVSE units are commonly referred to as charging stations.

### **Basic EVSE Components**

The following is a fundamental description of the EVSE technology; these technologies can vary; for safety, please review and understand the technology of the specific vehicle and EVSE you use.

**EVSE:** The equipment, connected to an electrical power source, that provides the alternating current (AC) or the direct current (DC) supply to the electric vehicle that is needed to charge the vehicle's traction batteries. EVSE charging capacity options are an important consideration as they have a direct bearing on how fast the batteries can be recharged. As an example, Level 2 EVSE is available in 20, 30 and 40 amp capacities and higher amperage equates to faster recharge times. However, the EV's onboard charger must have the ability to match the full output of the EV to realize the fastest recharge times.

**Electric Vehicle Connector:** The device attached to the EVSE cable that provides the physical connection between the EVSE and the EV. There are three predominant connectors in use today: the SAE J1772 based connector (developed by the U.S. auto standards development organization SAE), the CHAdeMO connector (developed by the Japanese auto standards development organization), and the Tesla developed Supercharger connector that is used exclusively for charging Tesla electric automobiles.

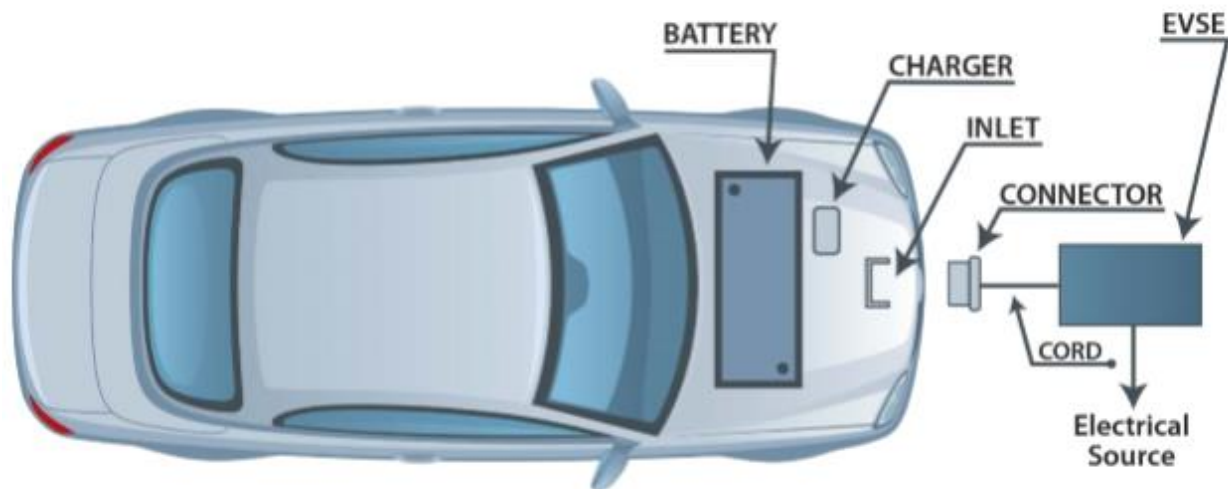
**Electric Vehicle Inlet:** The device on the electric vehicle that provides the physical connection between the EV and the EVSE connector. Some EVs have more than one inlet port and locations vary from vehicle to vehicle.

**Battery Charger:** Level 1 and 2 charging uses the EV's internal battery charger to convert the EVSE alternating current (AC) supply to the direct current (DC) needed to charge the car's traction batteries. DC Fast Chargers (DCFC) supply high-current DC

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<sup>3</sup> <http://www.fsec.ucf.edu/en/publications/pdf/FSEC-CR-1996-15.pdf>

electricity directly to the EV's traction batteries; the onboard charger conversion of AC to DC is not required, and this function of the on-board charger is by-passed when a DCFC is used. On-board battery charger options are an important consideration when purchasing a EV as they have a direct bearing on how fast the batteries can be recharged. There are several options available, some of which do not provide an option for DCFC.



### **EVSE Charger Classifications**

EVSE is normally classified as Level 1, Level 2 or DC Fast Charge (DCFC). In general terms, EVSE classification pertains to the power level that the equipment provides to recharge an EV's batteries. The use of higher charge levels can significantly reduce the time required to recharge batteries.

Levels 1, 2 and DCFC are the most widely deployed classes of chargers, but there are two other classes of lesser known, high-powered EVSE specifications, AC Level 2 and DC Level 2; information on AC Level 2 and DC Level 2 can be found at, [http://standards.sae.org/j2836/2\\_201109/](http://standards.sae.org/j2836/2_201109/)





**Level 1 Charging Cord**  
Source: RoperId



**Level 2 Charging Station**  
Source: ClipperCreek



**DC Fast Charging (DCFC)**  
Source: Evcaro

### AC Level 1 Charging

Level 1 provides charging from a standard residential 120-volt AC outlet, its power consumption is approximately equal to that of a toaster. Most EV manufacturers include a Level 1 EVSE cord set so that no additional charging equipment is required. As a general rule, Level 1 recharging will add approximately four miles of travel per hour. Level 1 charging is the most common form of battery recharging and can typically recharge a EV's batteries overnight; however, a completely depleted EV battery could take up to 20 hours to completely recharge.

### AC Level 2 Charging

Level 2 equipment provides charging using 220-volt residential or 208-volt commercial AC electrical service, its power consumption is approximately equal to that of a residential clothes dryer. As a general rule, Level 2 recharging will supply up to approximately 15 miles of travel for one hour of charging to vehicles with a 3.3 kW onboard charger, or 30 miles of travel for one hour of charging for vehicles with a 6.6kWh on-board charger. Level 2 EVSE utilizes equipment specifically designed to provide accelerated recharging and requires professional electrical installation using a dedicated electrical circuit. Level 2 equipment is available for purchase online or from retailers that sell other residential appliances. A completely depleted EV battery could be recharged in approximately seven hours using a Level 2 charger.

### DC Fast Charging (DCFC)

DCFC equipment requires commercial grade 480-volt AC power service and its power requirements are approximately equal to 15 average size residential central air conditioning units. As a general rule, DCFC recharging will add approximately 80-100 miles of travel with 20-30 minutes of charging. The DCFC EVSE converts AC to DC within the EVSE equipment, bypassing the car's charger to provide high-power DC directly to the EV's traction batteries through the charging inlet on the vehicle. DCFCs are deployed across the United States, typically in public or commercial settings. While

the power supplied to EVs by all DCFCs is standardized, there is not uniform agreement on the connector that is used to connect the charger to the vehicle. There are two competing standards for the vehicle connectors used with DCFCs; one standard is the SAE J1772 Combo developed by the U.S. auto standards development organization SAE and the other is the CHAdeMO connector developed by a Japanese auto standards organization. As a practical matter, both connectors work very well and many (but not all) EVs are equipped to utilize either connector. DCFC's high-power capabilities can restore a depleted EV battery in approximately 30 minutes.

**EVSE General Characteristics** (Completely depleted battery)

	Charge Time	Voltage/Amps	Power Equivalent	Installation
Level 1	Up to 20 hrs.	120/15	Toaster	Self
Level 2	Up to 7 hrs.	240/40	Clothes dryer	Professional
DC Fast Charge	Up to 30 min.	480/125	15 Central A.C.	Professional

EV Battery Systems

EVs actually have two battery systems, the larger “traction” batteries that provide propulsion for the vehicle, and a smaller, conventional 12-volt battery that provides auxiliary power for on-board systems such as the entertainment system, dash lights, etc. The traction batteries come in a wide variety of power ratings that are designed to meet the specific needs of the particular model of EV. Traction batteries are also becoming known by the more technical designation of Rechargeable Energy Storage System (RESS), a reference to their ability to store energy for purposes other than propelling the EV. Most of today’s EVs use lithium-ion batteries, which are much larger versions of the battery technology used in cell phones and other personal electronics.

EVSE/EV Signaling and Communications

EVSE and EV interaction during the battery recharging process can be an interactive and dynamic process that requires communications between both elements. Multiple, ongoing communications exchanges occur during charging, one of the primary purposes of these communications is to regulate the amount of current provided to charge the vehicle. The EVSE informs the vehicle of the maximum current available, allowing the EV to manage current flow within the EVSE’s service breaker capacity. Additional primary communications and interactions take place that monitor the State-of-Charge (SOC) of the batteries and also allow the EV to bypass the on-board charger and use the EVSE charger if a DCFC station is being used.

SAE Recommended Practice SAE J2847/2 establishes requirements and specifications for communication between EVs and the DC Off-board charger. Where relevant, this SAE document notes, but does not formally specify, interactions between the vehicle and vehicle operator. This document applies to the off-board DC charger for conductive charging, which supplies DC current to the batteries of the electric vehicle through a SAE J1772™ coupler. Communications will be on the J1772 Pilot line for Power Line Communication (PLC). The details of PLC communications are found in SAE J2931/4.

The specification supports DC energy transfer via Forward Power Flow (FPF) from source to vehicle.

SAE J2847/2 provides messages for DC energy transfer. The updated version in August, 2012 was aligned with the DIN SPEC 70121 and additions to J1772™ for DC charging, published October, 2012. This revision includes results from implementation and changes not included in the previous version. This revision also includes effects from DC discharging or Reverse Power Flow to off-board equipment that expands on J2847/3 for AC energy flow from the vehicle, and other Distributed Energy Resource functions that are being developed from the use cases in J2836/3™, published January, 2013. [3] SAE International, Communication between Plug-in Vehicles and Off-Board DC Chargers.<sup>4</sup>

### Networking and Interoperability

Most new EVSE includes back-end software developed and maintained by a network service provider. Networked charging stations are connected to the Internet which allows them to communicate with a central control system. Through the network, the station sends important information to the service provider and site host and, in turn, they can control the station remotely.

Networked EVSE allow the hosts to accept payment from EV drivers via credit card, smartphone, or radio-frequency identification (RFID) card. Without the networked connection, chargers are unable to accept any payment. Additionally, the host or network service provider can access stored data from the station to analyze electricity usage, total charge time, frequency of use, or other relevant information. With real-time data, providers can share information about charger availability and functionality with its user apps.

Charging networks need to be able to communicate with each other, and many network service providers use proprietary programming language that can only communicate with their own branded charging stations and networks. The Open Charge Point Protocol (OCPP), while not yet fully adopted as a standard, has been gaining popularity as a method of standardizing charger communications. Standardized protocols allow communications and enable data sharing among providers, which can facilitate network “roaming”. Like a cell phone roaming across networks while traveling, roaming allows EV drivers to charge at stations outside of their provider network without creating a new membership. EV drivers in much of Europe can use a single RFID card to access all public stations being operated by different network providers. Many US network companies, such as ChargePoint, Electrify America, EVgo, EVBox, and EV Connect, have begun bilateral agreements that allow users to charge at any of their stations.

Networked charging stations offer several benefits compared to their non-networked counterparts, while the lack of standardization in the U.S. is a significant barrier. There

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<sup>4</sup> <http://standards.sae.org/wip/j2847/2/>

are already over 20 EVSE network service providers throughout the country, most of which require a membership for access to their stations; drivers have a difficult time keeping up with their accounts and finding a station they can use. The success of the electric vehicle market depends on drivers having access to charging infrastructure whenever necessary, so networks must have interoperability. Interoperability allows chargers to communicate allowing drivers to charge at a station with a single identification or payment method.

OCCP is a standardized communications protocol that allows the site owner to switch network providers. This increases competition among vendors, encouraging them to constantly improve their service.

### Battery Technology

The capacity and efficiency of EV batteries continue to increase as the price for the batteries continues to decline. The primary factors for lower battery pricing are the increase in manufacturing scale and efficiency, advancements in battery technology, and the increased adoption of EVs. Automobile manufacturers continue their commitment to EVs through the acquisition of battery technology companies and their ongoing investment in new large-scale battery manufacturing facilities.

The convergence of factors in battery technology can be seen in Tesla's Model 3 EV. The Model 3 has an average range of 250 miles and cost of approximately \$40,000; the combination of range and price resulted in the sale of over 16,000 vehicles in 2019 alone, or 28 percent of a total sales and a huge contributor to an overall increase of 33 percent.<sup>5</sup>

Researchers and vehicle manufacturers expect a shift from the current lithium-ion chemistry to solid state-batteries within the next five years. Solid-state batteries:

- Are inherently safer than lithium-ion
- Can recharge faster, with a longer useful life.
- Use more common elements like sodium, a few rare-earth minerals
- Significantly less expensive to manufacture
- Potential to more than double the range of EVs

All of the advantages of solid-state batteries will further reduce the cost of EVs and spur additional adoption; which will, in turn, increase infrastructure demand.

### Inductive and Resonant Charging Technologies

Inductive charging, also known as Wireless Power Transfer (WPT), is an emerging technology that allows EV recharging without the use of a cabled connection. The most common application uses a charging pad installed on or in the pavement and a receiving pad installed underneath the EV. Electrical current is passed through the

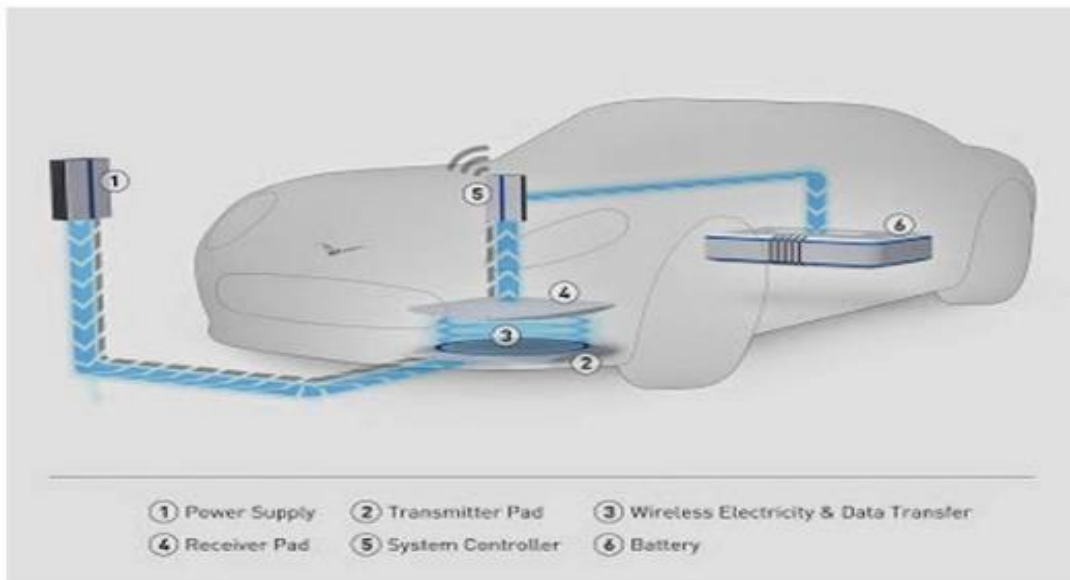
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<sup>5</sup> FPL, EV sales 2019

pavement pad, which creates an inductive electrical field that is captured by the EV's receiving pad to charge the vehicle's batteries.

The successful development and deployment of wireless technology presents the promise of having the convenience of pulling into your garage or a parking spot and having your car recharge without the need to connect and disconnect a cable. Some researchers are also exploring the possibility of embedding wireless charging in the roadway as a method of continuously recharging the vehicle while in motion; this system would dramatically reduce battery size requirements and extend the travel range of EVs. Wireless charging is now offered as an upgrade on some luxury model cars, it is also being actively used by transit agencies to provide on-demand charging of their buses.

Induction chargers typically use an induction coil to create an alternating electromagnetic field from within a charging base station, and a second induction coil in the portable device (i.e., EV) that takes power from the electromagnetic field and converts it back into electrical current to charge the battery. Greater distances between sender and receiver coils can be achieved when the inductive charging system uses resonant inductive coupling. Recent improvements to this resonant system include using a movable transmission coil, and the use of materials for the receiver coil made of silver plated copper or aluminum.



Source: Electric Vehicle News

A significant effort in research and development is underway by academic, governmental and private industry to help realize the promise of the untethered charging of EV batteries. The Massachusetts Institute of Technology (MIT) has marketed a patented WPT technology that applies magnetic resonance to an inductive electrical field.

This technology provides impressive power transfer efficiencies over larger air gaps between the charging transmitter and the EV's charging receiver. MIT's WPT has been licensed to several large automobile manufacturers.

Utah State University is also involved in wireless charging research and has a new research facility that includes an oval track to test technology for recharging electric vehicles while moving.

The Society of Automotive Engineers and the International Electrotechnical Commission develop standards for wireless technology and there is limited commercial availability. The standards reference for SAE is SAE J2954; the IEC reference is IEC 61851-1.

### Obsolescence, Upgrade, Futureproofing

A significant portion of the existing EV infrastructure has been installed for more than six years, or approximately two-thirds of its useful life. Many of these installations are not networked, employ older technology, have proprietary operating and billing systems, and are typically a lower power Level 2 installation.

As the industry grows and adapts, preparing for future demand will become increasingly necessary. Sites can be "future-proofed" by installing additional conduit and addressing other make-ready needs to support future growth. With a few small adjustments, the station can be upgraded to meet future demand without incurring substantial additional costs.

Provisioning the electrical capacity for upgrades during the initial charger construction can help support future demand changes. This includes laying extra conduit that can accommodate future power requirements and leaving space for additional transformers. When it is time to upgrade, installation costs will be significantly lower.

Future-proofing can also be achieved by installing a high-powered charging station upfront and then limiting its output power until necessary. For example, a site host may install a 350 kW charger but limit its output to 50 kW or 150 kW to save money until fast charging demand increases. As more power is needed, a software change and module exchange/additions allow the station to produce more power.

### Uptime, Resiliency and Backup Power

Many of the new EVSE installations include data network connectivity that allows the status monitoring of the installation, including whether the unit is online, how many ports are available, and other metrics.

Unfortunately, there are few established criteria for the performance of installations; it is not unusual for EVSE to be off-line for long periods of time. The cause for these issues can be traced to:

- Support abandonment by a manufacturer who is out of business,
- Low utilization

- No performance goals have been established
- No maintenance and support mechanism has been established

Fortunately, the availability and reliability of these installations is improving, due in large part to the entry of national-scale infrastructure providers that realize the need for monitoring and uptime.

EVSE are critical installations that serve a life-line purpose, and should be maintained as such. Backup power for EVSE installations is virtually non-existent, but should be investigated as it provides critical uptime support for the installation. There is the very real possibility that backup batteries could also help mitigate demand charges for electrical power. *Given the critical nature of these installations, requirements for uptime and availability of these installations needs to be addressed.*

### **EV Infrastructure Models**

From a planning perspective, Florida's EV infrastructure is entering its second generation, a generation that includes interoperability, managed charging, improved efficiency, and modular power upgrades; all significant improvements over the installations from just a decade ago. Planners have also been improving their tools.

There are several approaches to modeling charging infrastructure, some treat geographic areas as a "cluster" and perform an analysis on a specific geographic area and its constituency. An example would be multi-modal transit center at an airport, or a downtown entertainment/shopping center. Tools, such as NREL's EVI-Lite, take a more "blanketed" approach which encompass larger geographic areas and estimates the number of chargers that should be needed.

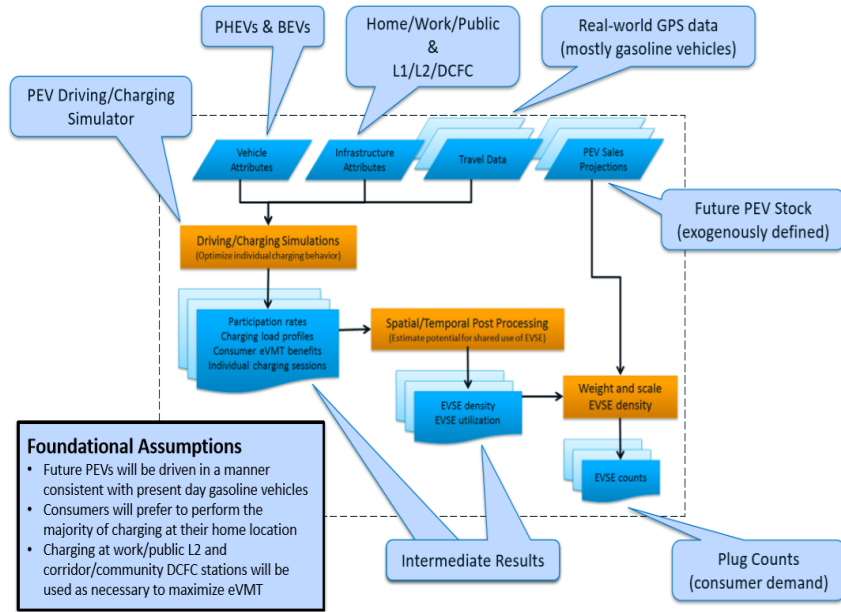
There are many models for evaluating the need for EVSE infrastructure and evaluation of these models is just beginning. Tools from the National Renewable Energy Laboratory (NREL), the Florida Department of Transportation (FDOT), UL, and several others are being evaluated. Additional consultation is being sought from industry and academia. Among the best known is NREL's EV infrastructure projection tools, EVI Pro-Lite.<sup>6</sup> These tools calculate the need for infrastructure base on the input of local data, real world travel documentation and EV adoption projections. Below are illustrations that present the architecture and output of the tool.

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<sup>6</sup> [https://cleancities.energy.gov/files/u/news\\_events/document/document\\_url/361/nrel-evi-pro.pdf](https://cleancities.energy.gov/files/u/news_events/document/document_url/361/nrel-evi-pro.pdf)



# Electric Vehicle Infrastructure Projection Tool (EVI-Pro)



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

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## Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite

This tool provides a simple way to estimate how much electric vehicle charging you might need at a city- and state-level.

How Much Electric Vehicle Charging Do I Need in My Area?

State | Vehicles | Results

Start Over

### Your Results

In Florida, to support 60,000 plug-in electric vehicles you would need:

**260** Workplace Level 2 Charging Plugs

**195** Public Level 2 Charging Plugs

There are currently 3,304 plugs with an average of 2.6 plugs per charging station per the Department of Energy's [Alternative Fuels Data Center Station Locator](#).

**258** Public DC Fast Charging Plugs

There are currently 718 plugs with an average of 3.9 plugs per charging station per the Department of Energy's [Alternative Fuels Data Center Station Locator](#).

### Where Do I Start?

Planners may want to prioritize installation of fast charging infrastructure above Level 2 charging.

**Build DC Fast First:** Establishing fast charging networks that enable long-distance travel, serve as charging safety nets, and provide charging for drivers without home charging is critical to support all-electric vehicles that have no other alternative for quickly extending their driving range.

**Build Level 2 Second:** EVI-Pro typically simulates the majority of Level 2 charging demand coming from plug-in hybrid electric vehicles, which have the ability to use gasoline as necessary for quickly extending driving range.

### Change Assumptions

Plug-in Electric Vehicles (as of 2016): 20,200

Light Duty Vehicles (as of 2016): 16,175,500

Number of vehicles to support:

Vehicle Mix	
Plug-in Hybrids 20-mile electric range	<input type="text" value="15"/> %
Plug-in Hybrids 50-mile electric range	<input type="text" value="15"/> %
All-Electric Vehicles 100-mile electric range	<input type="text" value="20"/> %
All-Electric Vehicles 250-mile electric range	<input type="text" value="50"/> %
<b>Total</b>	<b>100%</b>

How much support do you want to provide for plug-in hybrid electric vehicles (PHEVs)?

- Full Support
- Most PHEV drivers wouldn't need to use gasoline on a typical day.
- Partial Support  
Calculate using half of full support assumption.
- Do not count PHEVs in charging demand estimates.

Percent of drivers with access to home charging:  %

Recalculate

[See all assumptions.](#)

## Electric Vehicle Infrastructure Projection Tool (EV Pro) Lite



EVs have been largely concentrated in metropolitan areas, due in large part to not having long range travel capabilities, and the existence of recharging infrastructure. The now common availability of EVs with a range of over 200 miles has opened up this market segment and changed the considerations when planning EV infrastructure. As an example, public EV charging for rural and underserved communities has been largely considered as economically infeasible, especially for expensive DCFC installations. Support for the home charging environment for those EV owners must be augmented with publically available infrastructure to support long-range round trips. As an alternative to DCFC, high-powered Level 2 infrastructure could be installed; a \$5-8k 40-60 amp charger would provide a charging profile and time similar to \$10-40k DCFC for thousands of dollars less than a DCFC unit and its accompanying grid make-ready.<sup>7</sup>

EV charging networking companies have expanded their footprint and continue to invest in Florida, \$25 million in funding from the State's share of the Volkswagen Settlement is allocated to support the installation of charging infrastructure, and investments from local governments continue to expand charging opportunities in our state. Overall, there is a significant amount of momentum in preparing for an ever increasing number of EVs on the road. All of these elements will be accounted for in the final report.

While the technology associated with charging infrastructure has made significant advancements in the last decade; there has not been much progress in deciding how much infrastructure will be needed. There is not much validated data available, a review of past studies and projections will largely show that assumptions were incorrect, resulting in projections with ranges of variability of 150-200 percent. Accurate historical data of EV sales in Florida is now available, the diversity and detail will allow for more accurate projections of both EV sales and the supporting infrastructure.

EV infrastructure technology has been progressing rapidly over the last several years, largely to accommodate longer range, but also to provide an increased level of reliability and network visibility. The challenge is to understand what technologies will also prove to be viable 10-20 years from now.

This report provides a preliminary high-level technical and operational review of the current and future EVSE infrastructure. Discussions are continuing with the manufacturers, vendors, and others involved with EV infrastructure; information from these discussions will be included in future reports.

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<sup>7</sup> [https://afdc.energy.gov/files/u/publication/EV\\_Charger\\_Selection\\_Guide\\_2018-01-112.pdf](https://afdc.energy.gov/files/u/publication/EV_Charger_Selection_Guide_2018-01-112.pdf)