



Electric Vehicle Charging Station Plan Update

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Prepared by the St. Lucie TPO

Prepared by the St. Lucie Transportation Planning Organization

Contact: Marceia Lathou
St. Lucie Transportation Planning Organization (TPO)
466 SW Port St. Lucie Boulevard, Suite 111
Port St. Lucie, Florida, 34953
Telephone: (772) 462-1593
Email: lathoum@stlucieco.org

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PURPOSE OF THE PLAN

The purpose of this plan is to identify the location of public charging stations for electric vehicles (EVs) that allow for rapid charging and to assess the need for additional stations. Rapid charging stations are known as DC Fast Chargers or Level 3. The plan also will examine innovations in EV battery and charging station technology that could allow for less frequent and faster EV charging. Partnership strategies for the installation of public charging stations and funding options will be explored.

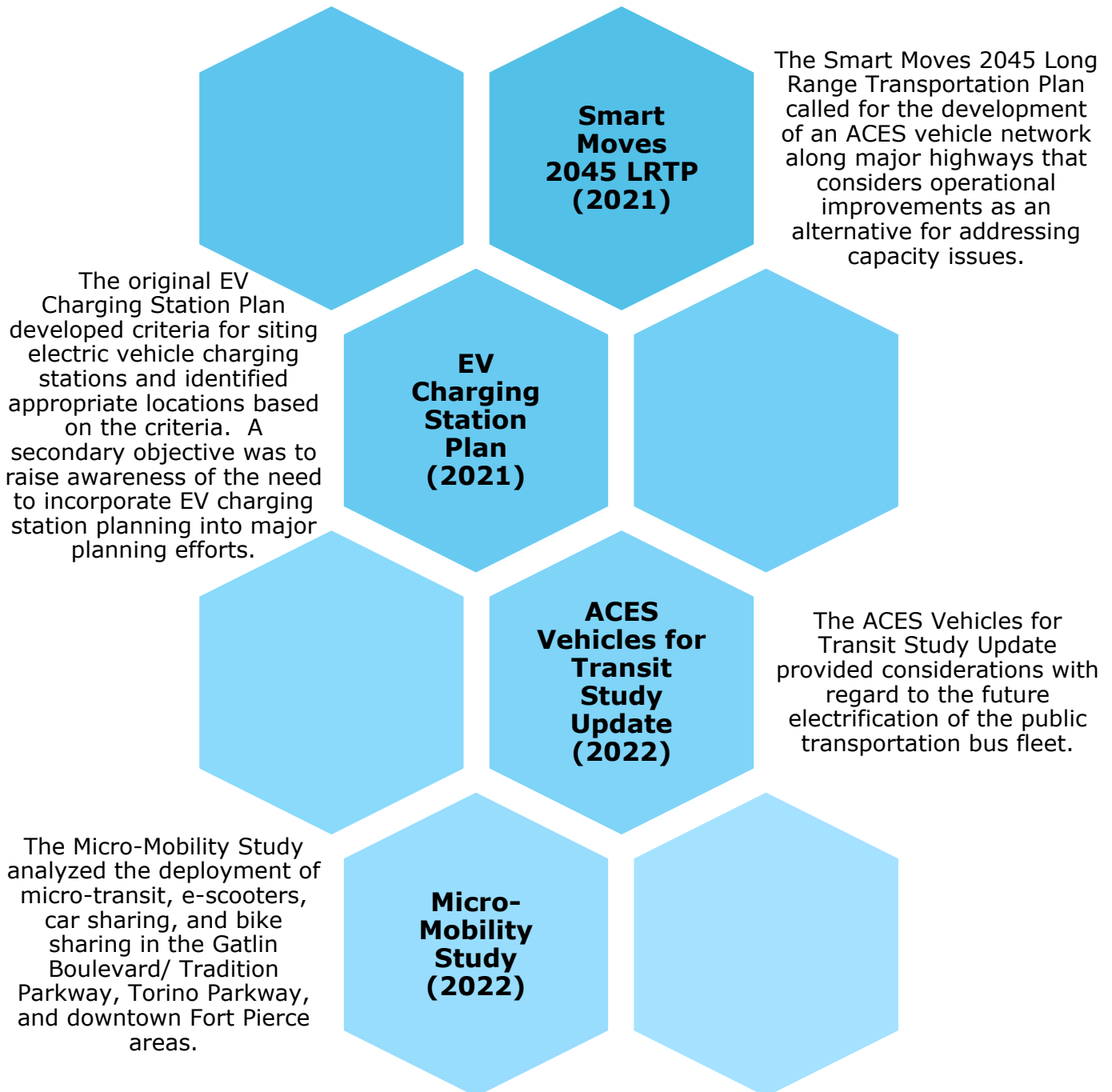
BACKGROUND

As part of the development of the TPO's FY 2022/23 – FY 2023/24 Unified Planning Work Program (UPWP), a Call for UPWP Projects was announced publicly. The Call resulted in several project ideas, one of which was the Electric Vehicle Charging Station Plan Update, described as an update of a previous plan. The update focus is on incorporating Level 3 supercharging stations throughout the TPO area.



EXISTING PLANS AND STUDIES

Throughout the years the TPO has conducted planning projects related to ACES (Automated/Connected/Electric/Shared-Use) vehicle technologies. These include the following:



WHAT IS AN ELECTRIC VEHICLE?

There are three basic types of EVs: All-electric vehicles (AEVs), hybrid-electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs).

AEVs run only on electricity; when the battery becomes depleted, it must be recharged. AEVs always operate in all-electric mode and currently have typical driving ranges exceeding 200+ miles. A driving range is the number of miles an EV can travel between battery charges.

HEVs are powered by an internal combustion engine and an electric motor that uses energy stored in a battery. The battery pack and electric motor provide supplemental power. The vehicle is fueled with gasoline to operate the internal combustion engine, and the battery is charged through regenerative braking, not by plugging in.

PHEVs use both gasoline and electricity as fuel sources, so they have a battery, an electric motor, a gasoline tank, and an internal combustion engine. This allows drivers to use electricity as often as possible while also being able to rely on gasoline-powered propulsion when needed. Most PHEVs can travel a specific range of mileage on electricity alone, and then will operate solely on gasoline.




ELECTRIC VEHICLE CHARGING STATIONS

An EV charging station is a piece of equipment that allows for recharging EV batteries. EV charging stations are classified by how much power they bring to the vehicle and how fast. Stations are generally labeled Level 1, 2, and 3. The graphic on the next page further describes EV charging.

Level 1 charging is typically used when there is only a 120-volt outlet available, such as while charging at home. Many EV owners are able to meet their daily driving needs by charging overnight with Level 1 equipment, requiring no additional installation of equipment.

Level 2 offers charging through voltages typically available in homes or commercial establishments. Level 2 charging stations are appropriate for EV drivers who will be in a particular location for extended periods. These include homes, workplaces, or hotels.

Level 3, sometimes referred to as DC Fast Charging, enables rapid charging at installed stations. These stations are usually available to the public.

 <p>Level 1 <i>2-5 miles of range per hour</i> 120 volt charging, typically from a wall plug using cord provided by vehicle manufacturer with all EVs.</p>	 <p>Level 2 <i>10-20 miles of range per hour</i> 240 volt charging. Most stations can collect data. Data subscriptions vary depending on vendor.</p>	 <p>Level 3 (DC Fast Charging) <i>60-80 miles of range per 30 minutes</i> 480 volt charging. Data subscriptions included on schedule. Not all EVs can use DC fast chargers.</p>
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Generally, an EV driver uses the following steps to charge a vehicle at a public charging station:

- Download the network provider's app to a mobile device.
- Create an account on the app. Locate a nearby charging station. Once at the station, follow prompts on the charger screen and mobile device.
- Select the connector that is right for the vehicle, plug in and start charging.
- If the session ends while the driver is away from the car, the driver receives a mobile alert.
- Once fully charged, idle fees could accrue if the driver fails to unplug the vehicle after a certain amount of time; this ensures the plug is made available for others.
- Some apps can tell the user if plugs are in use and if there is some issue with a station's equipment before the user arrives at the station.

Use of the Tesla Supercharger network differs from the above description. Noted for its user-friendliness, there is no need for an app or credit card. Once the driver pulls up to the charger, opens the charge port cover and plugs the car in, charging begins automatically. Features of the Tesla vehicles allow the driver to monitor the charging status from the vehicle's interior and a built-in GPS shows the locations of nearby chargers and charger locations along planned routes.

EV CHARGING COSTS

The energy efficiency of electric vehicles is expressed in miles per kWh (kilowatt hour). A kilowatt is 1,000 watts. A watt is a unit of electrical power.

Charging power for EVs varies by vehicle and battery state of charge. Older EVs have energy efficiencies of about two miles per kWh. Some newer EVs have energy efficiencies of over six miles per kWh under certain conditions.

Charging at Home

The U.S. Energy Information Administration estimates that Florida's average residential rate for electricity is about 14 cents per kWh. These rates can vary by time of use, day, season, and the region where a person lives.

To estimate the cost of charging at home for a person who drives 1,000 miles per month using an average 4 miles per kWh:

- Divide 1,000 by 4 to get the kWh used monthly = 250 kWh
- Multiply $250 \times .14 = \$35$

So, a typical cost of charging using the above-described scenario would be **\$35 per month** if charging at home.

Charging at Public EV Charging Stations

The range of networks and prices at public charging stations make it difficult to estimate road trip costs. Costs are generally believed to be between \$10 and \$30 per charge.

The U.S. Department of Energy (DOE) estimate of Median Driving Range of All-Electric Vehicles for Model Year 2020 is approximately 250 miles. Using an average of \$15 per charge and a range of 250 miles between charges, it would require approximately four charges at public charging stations for a person who drives 1,000 miles per month, or a cost of **approximately \$60**.

Comparing public charging to charging at home, the least expensive way to charge an EV is almost always at home, overnight. Utilities often have lower rates at night when demand for electricity is lightest.



PUBLIC CHARGING STATIONS: NEED

Although tens of thousands of EV charging stations exist in the United States with new chargers continually being added, available public charging infrastructure remains lacking.

According to a recent Florida Department of Agriculture & Consumer Services Survey:

- 1) The majority of users feel that Florida's public charging infrastructure is inadequate and the availability of public stations needs to be improved.
- 2) The location where EV drivers would most like to see additional public charging infrastructure is along highways or at shopping/entertainment centers.

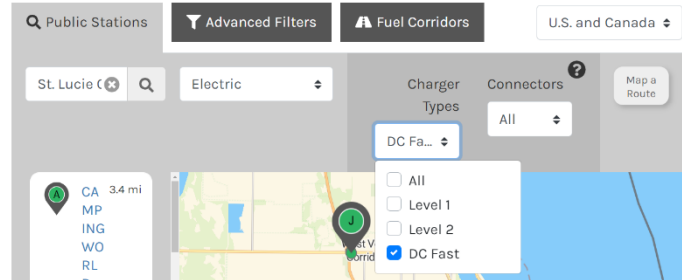
A recent JD Powers survey of EV drivers likewise revealed dissatisfaction with EV charging systems, the exception being Tesla's network. Problems with chargers ranged from inadequate availability to malfunctioning equipment.

Thus, although public charging is increasingly available, reliability is a barrier to the mass adoption of EVs.

EXISTING CHARGING STATIONS

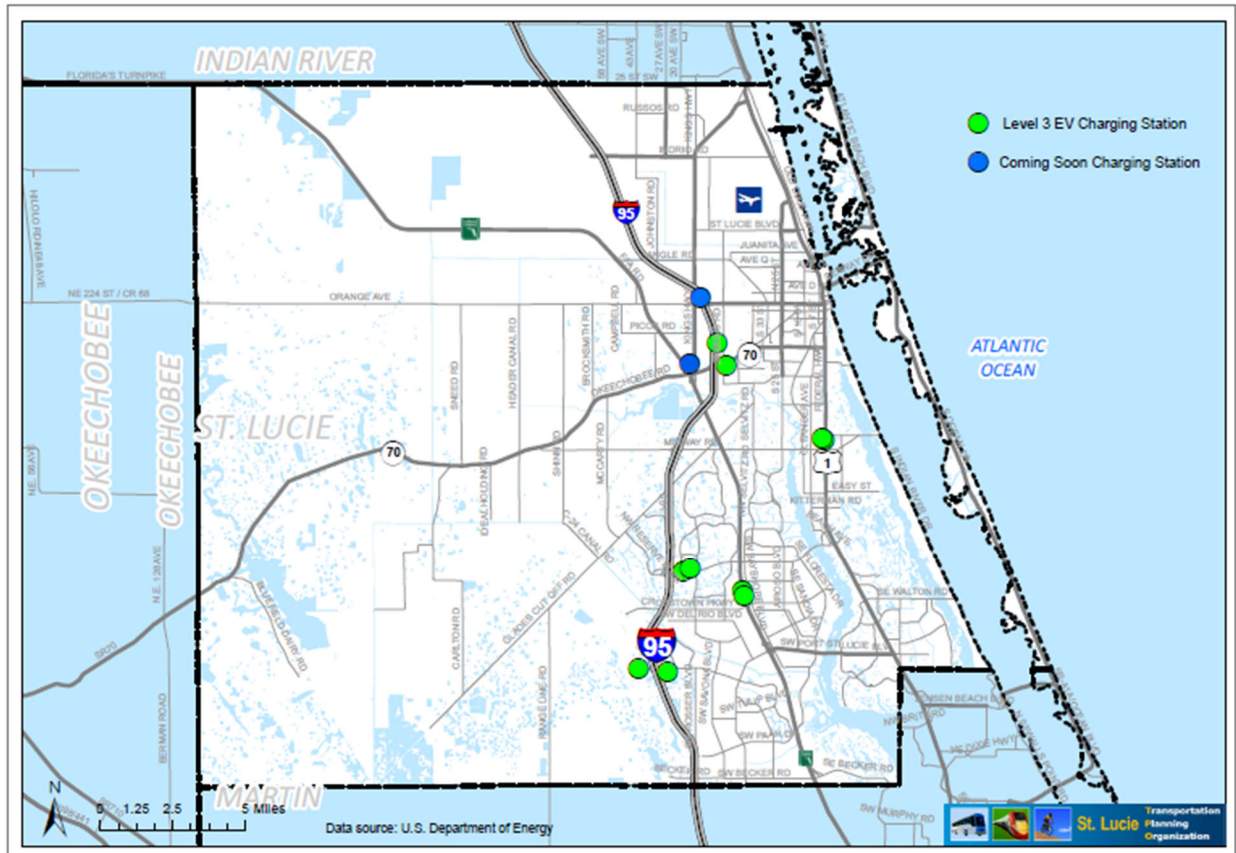
The map below showing the locations of Level 3 public charging stations in St. Lucie County was sourced from the U.S. DOE Alternative Fuels Data Center (AFDC) website. The website allows users to find EV charging stations by charger type. In the graphic to the right, Level 3 (DC Fast) chargers in St. Lucie County has been selected.

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



The map shows that, although EV charging station availability exists both north and south of Midway Road, gaps exist in the following areas: north of Orange Avenue, Hutchinson Island, near Port St. Lucie Boulevard, and east of U.S. 1.

Location of Level 3 EV Charging Stations



HISTORICALLY DISADVANTAGED COMMUNITIES

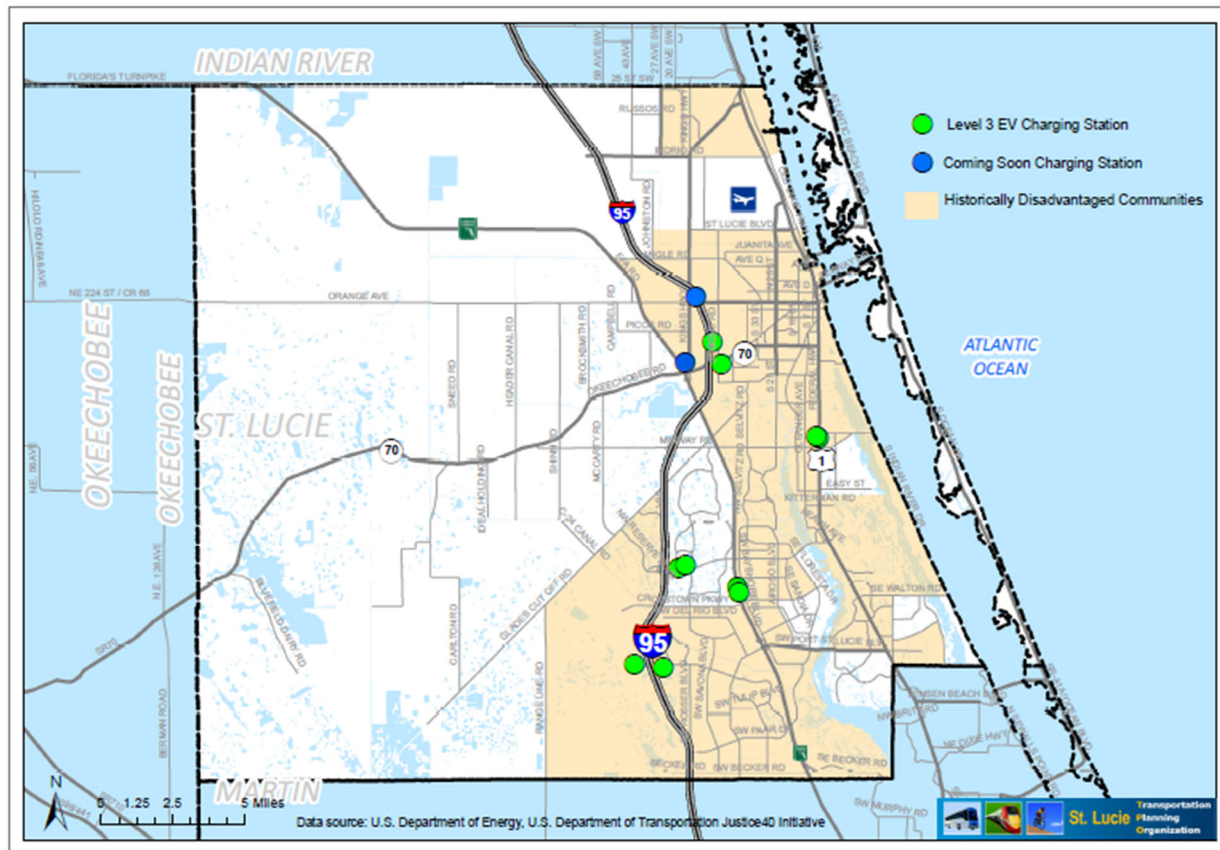
The Justice40 Initiative is the federal government's goal that 40 percent of the overall benefits of certain federal investments flow to disadvantaged communities. These communities are defined as those that are marginalized, underserved, and overburdened by pollution.

To assist in implementing Justice40, the federal government has mapped the location of Historically Disadvantaged Communities throughout the nation based on the following criteria:

- Low income, high and/or persistent poverty
- High unemployment and underemployment
- Racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities
- Linguistic isolation
- High Distressed neighborhoods
- High transportation-cost burden and/or low transportation access
- Disproportionate environmental-stressor burden and high cumulative impacts
- Limited water and sanitation access and affordability
- Disproportionate impacts from climate change
- High energy-cost burden and low energy access
- Jobs lost through the energy transition
- Diminished access to healthcare

The locations of existing Level 3 EV stations were overlaid on a map of Historically Disadvantaged Communities in St. Lucie County. The results are shown on the map on the following page. Gaps exist north of Orange Avenue, near Port St. Lucie Boulevard, and east of U.S. 1.

Location of Level 3 EV Charging Stations and Historically Disadvantaged Communities



"Later this year, Tesla will begin production of new Supercharger equipment that will enable non-Tesla EV drivers in North America to use Tesla Superchargers."

-White House Statement

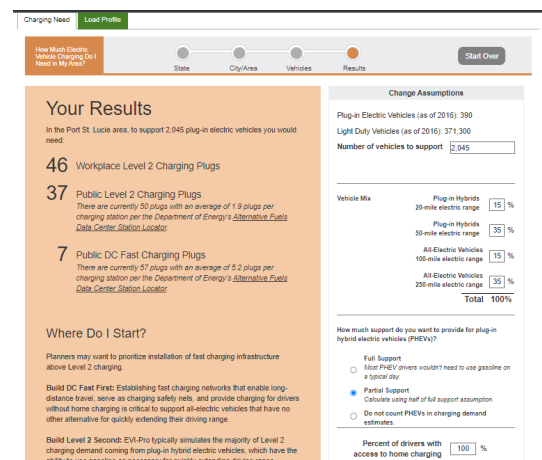
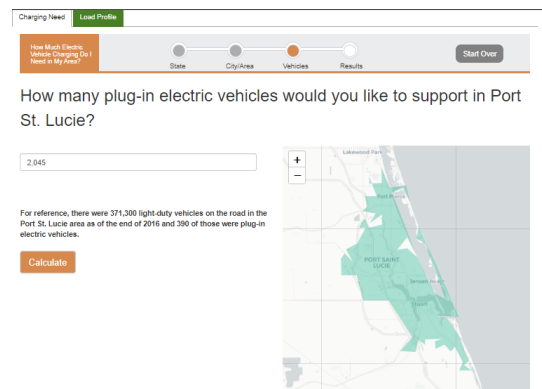
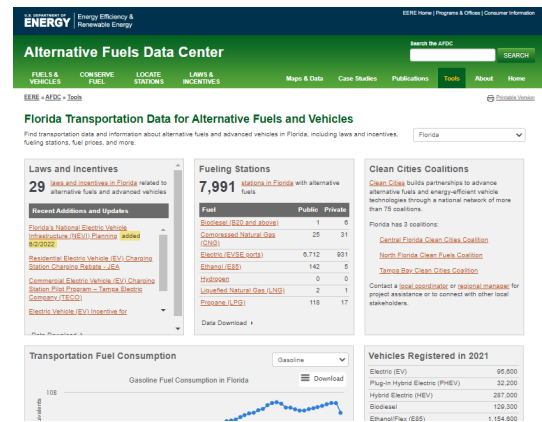
The above map includes Tesla chargers. Even though Tesla's chargers only work with its own vehicles at present, the White House stated in a June 2022 press release, "Later this year, Tesla will begin production of new Supercharger equipment that will enable non-Tesla EV drivers in North America to use Tesla Superchargers."

HOW MANY EV CHARGING STATIONS ARE NEEDED?

The DOE's Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite helps estimate how much electric vehicle charging is needed for a state or urban area. According to the AFDC, as of December 2021, Florida had approximately 95,600 electric vehicles and 32,200 plug-in hybrid electric vehicles, for a total of 127,800 vehicles potentially using public EV stations.

Since St. Lucie County's population is approximately 1.6% of the population of Florida, an estimate of the County's EVs and PHEVs might be 1.6% of 127,800 or 2,045. EVI-Pro Lite does not provide County-level data but does analyze at the urban area level, one of which is Port St. Lucie. As the screenshot to the right shows, the Port St. Lucie Urban Area includes the cities of Port St. Lucie, Fort Pierce, Jensen Beach, and Stuart.

Plugging 2,045 EVs into EVI-Pro Lite produces the following results. According to EVI-Pro Lite, to support the Port St. Lucie urban area's 2,045 EVs, 37 public Level 2 charging plugs and 7 DC Fast (Level 3) charging plugs are needed. Plugs are the equipment that deliver electricity to a vehicle; a station may have several plugs. Combining Level 2 and Level 3 results in 44 plugs needed, a need that should be addressed with fast chargers equitably distributed and located in places that are safe and convenient for the traveling public.

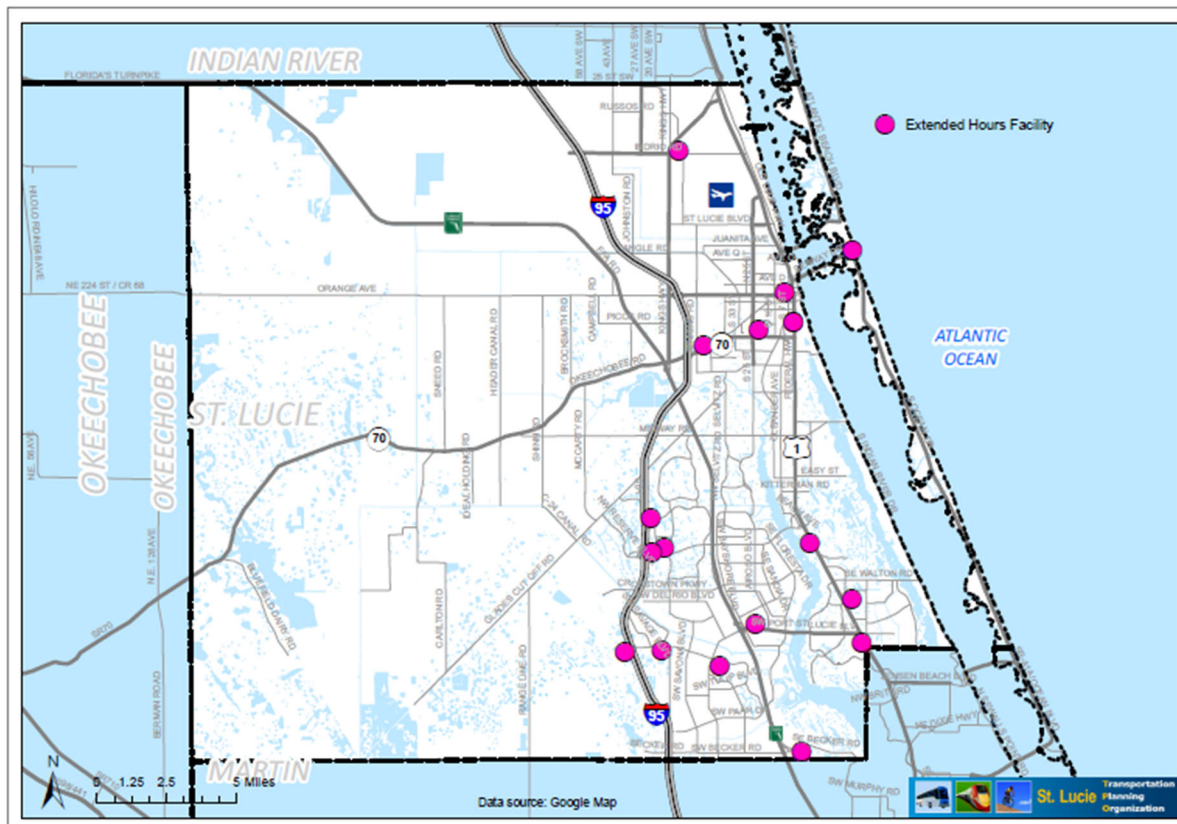


EQUITABLE DISTRIBUTION

Imagine an EV driver needs to use a Level 3 public charger at night, a task that could take as long as 30 minutes. Drivers of gasoline-powered cars can easily locate night-time gas stations and, since most gas stations double as convenience stores, a human attendant is present for an added touch of security. Consequently, gas stations are ideal locations for EV stations. In fact, co-locating EV charging with gas stations has already occurred across the nation, including in St. Lucie County. Other facilities that operate with extended hours are gyms, hospitals, hotel districts, and Walmart Supercenters. The map below identifies Extended Hours facilities that could be suitable for co-locating Level 3 EV charging stations. The map includes the following facilities:

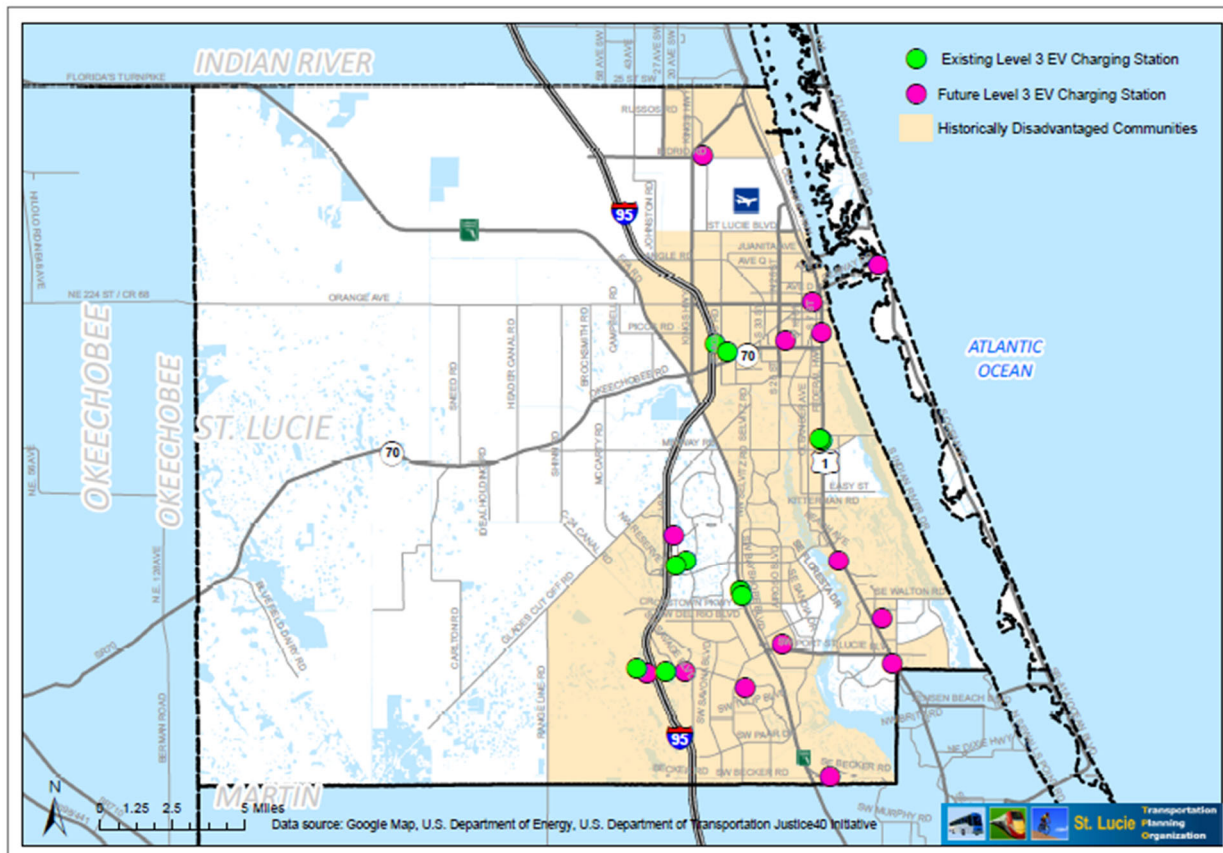
- 24-hour gyms
- Walmart Supercenters
- Hospitals
- St. Lucie West hotel district (near I-95)
- South Hutchinson Island (near Jetty Park)

Location of Extended Hours Facilities



The next step was to map the existing EV stations, potential future EV stations (co-located with Extended Hours facilities) and overlay that map onto the map of Historically Disadvantaged Communities to determine if significant EV charging station gaps would still exist. As shown on the map below, this distribution of EV charging stations would benefit residents of Historically Disadvantaged Communities.

Existing and Future Level 3 EV Charging Stations



EV STATION OWNERSHIP

Charging station ownership varies according to the site host. A site host is the owner or occupant of land on which an EV charging station is installed.



Commercial/Institutional

Commercial/institutional site hosting typically falls into one of two categories: site host-owned or third party-owned. Site-host owned EV charging stations are purchased, installed, and maintained by the site host. Charging owned by a third party is installed and maintained by the third party. In some cases, the site host may also earn revenue by leasing the space occupied by the charging station to a third party.

Site hosts can provide public or private charging. A corporation may wish to allow only its employees to use the charging station. A municipality might want to offer free charging to the public, while a commercial business may wish to charge user fees. Different models of ownership should be based on site conditions and market realities. Given the urgency of building out the charging network, flexibility is key.

To accelerate the pace at which drivers transition to EVs, charging network companies are increasingly partnering with retail businesses to place charging stations at supermarkets, restaurants, banks, and truck stops. Bank of America, Starbucks, IKEA, and Pilot/Flying J Travel Centers are a few of the national chains that offer or are planning to offer EV charging for their customers.

Florida Power & Light (FPL)

FPL is America's largest electric utility. FPL is owned by NextEra Energy, Inc, a company whose stock trades on the New York Stock Exchange.

FPL is installing Level 3 chargers throughout the state through its FPL Evolution program. The goal of the program is to allow drivers to plug in every 50 miles along major highways and corridors at commercial and institutional locations. FPL installs fast chargers that are compatible with all kinds of EVs. FPL provides EV chargers to site hosts and covers installation and maintenance.

FPL is looking for partners that:

- Can dedicate 4-6 parking spaces
- Are located in close proximity to the highway and local amenities

In St. Lucie County, FPL has installed chargers at the Port St. Lucie Turnpike Plaza and at the Jobs Express Terminal park-and-ride lot on Gatlin Boulevard. EV drivers pay to charge their vehicles at these stations.

Fort Pierce Utilities Authority (FPUA)

FPUA is a community-owned electric utility. Besides providing electricity, FPUA also provides water, wastewater, natural gas, and Internet services. FPUA is a Component Unit of the City of Fort Pierce; decisions are made at public meetings. To meet the growing demand for EVs, the City of Fort Pierce, in partnership with FPUA, installed Level 2 EV charging stations in the City Hall Parking Garage in downtown Fort Pierce.

Residential

Most EV drivers charge their vehicles at home, and that trend is expected to continue. According to the Fuels Institute, a non-advocacy research organization dedicated to studying transportation-energy, about 70-80% of charging occurs at home or at a workplace parking lot.

To support residential charging FPL launched a program where the utility will install EV charging infrastructure in single-family homes or townhouses with attached garages and Wi-Fi connections. The program, FPL Evolution Home, installs Level 2 chargers. There is no upfront cost for equipment or installation.

Electrify America, another charging station network, has a home charging program known as Electrify Home. The Electrify Home program sells Level 2 charging equipment; it is the responsibility of the users to install the chargers.

FUNDING FOR PUBLIC CHARGING STATIONS

The federal government's Bipartisan Infrastructure Law (BIL) includes funding for EV charging: the National Electric Vehicle Infrastructure (NEVI) Formula Program and the Charging and Fueling Infrastructure Grants (Community Charging) Program.

Funding under the **NEVI program** is directed to a national network along the Interstate Highway System. When the national network is fully built out, funding may be used on other public roads. The NEVI Program requires each state to submit a plan to the U.S. Department of Transportation (DOT) describing how the state intends to use NEVI funds. The Florida DOT's plan identified the charging station located in St. Lucie West as compliant with NEVI requirements. The Plan identified charging stations within 50 miles north and south of the St. Lucie West station; these stations would require upgrades to be NEVI compliant.

The **Community Charging Program** provides competitive grants to support community and corridor charging, improve local air quality, and increase EV charging access in underserved and overburdened communities. According to the Program Fact Sheet, Charging Program grants can be used to install EV charging and alternative fuel stations in locations on public roads, schools, parks, and in publicly accessible parking facilities. These grants will be prioritized for rural areas, low-and moderate-income neighborhoods, and communities with low ratios of private parking, or high ratios of multiunit dwellings. Post-installation operating assistance is available. State and local governments, MPOs, and tribal governments are eligible to apply for the funds.

Public-private partnerships (P3s) are critical to the success of government EV initiatives. P3s involve partnerships between public agencies (such as local governments and transportation authorities) and private companies to produce publicly accessible EV charging stations. The NEVI Program allows funds to be used to contract with private entities to acquire and install publicly accessible EV charging infrastructure and permits private entities to pay the non-federal share of a project funded under the program.



TECHNOLOGY INNOVATION

EV technology is evolving rapidly. An example is the Nissan Leaf. Whereas a first-generation Leaf could range 75 miles between charges, the range of a current model Leaf exceeds 200 miles. EV models by rival carmakers boast ranges of 300+ miles.

Batteries

One of the EV battery innovations being explored is the use of solid-state batteries. Most EVs are powered by lithium-ion batteries. According to the Clean Energy Institute (CEI) at the University of Washington, lithium-ion batteries are expensive, tend to overheat, and can be damaged at high voltages.

A company called Solid Power is developing a new low-cost, all-solid-state battery for EVs with greater energy storage capacity and a lighter, safer design compared to lithium-ion batteries. Commercialization could take a few years but could extend range to 600 miles. Solid state batteries also could reduce degradation of battery range that occurs with lithium-ion batteries after repeated charging.

Bi-directional Charging

Bi-directional EV charging can take the form of vehicle-to-building (V2B), vehicle-to-vehicle (V2V), or vehicle-to-grid (V2G). An EV could be used as backup generation to support building loads in the event of an outage or to recharge depleted batteries of disabled EVs. Through V2G, bidirectional charging could be used in partnership with utility programs. Under these scenarios, the EV functions as a mobile battery.

Other Innovations

- solar charging
- wireless charging
- in-road charging, vehicles charge by driving over enabled roadway segments
- pop-up charging, portable and relocatable
- mobile charging, alternatives to stationary Level 3 stations
- battery swapping, a method of leasing batteries
- chargeable on-street parking

These are just a few of the numerous innovations in EV charging. It should be noted as well that EVs are considered the launching pads for autonomous vehicles (AVs) because most if not all AVs are expected to be EVs in the future.

LOST REVENUE – GASOLINE TAXES

EVs do not pay fuel taxes. According to the Florida Department of Revenue, highway fuel taxes constitute the oldest continuous source of dedicated funding for roadways. Fuel taxes are assessed on all gasoline products, or any product blended with gasoline, or any fuel placed in the storage supply tank of a gasoline-powered motor vehicle. Revenue collected from fuel taxes help fund transportation projects and keep roads and highways in good condition.

Since EVs do not use fuel, EV drivers do not contribute to the upkeep of roads. One proposal to solve this dilemma is increased registration fees for EVs. An issue with this strategy is that a flat tax rate disproportionately burdens drivers who drive less. Taxes on EV stations have been proposed but since EV drivers mostly charge at home or at the workplace, this proposal would generate relatively limited income.

Vehicle Miles Traveled (VMT) fees for all vehicles has also been proposed. VMT fees are distance-based fees levied on a vehicle user for use of a roadway system. These fees are also known as mileage-based user fees or road usage charges. An issue with VMT fees is that they could prove to be expensive to administer and enforce.

The issue of EVs and lost fuel taxes continues to be discussed at all levels of government throughout the nation. Currently, EV ownership comprises a relatively small percentage of vehicles owned. As EV ownership grows in popularity, strategies to solve the fair-share taxation issue must be implemented.





CONSIDERATIONS

Based on the need for a comprehensive approach to support EV ownership, the following considerations were developed:

- Assist in the development of Level 3 charging stations near extended-hours facilities.
- Require developers of large-scale multifamily housing to set aside an area(s) for an EV charging station(s). Charging at multifamily housing may be more like public charging but with restrictions for use by residents only.
- Encourage FPUA to initiate a program to help offset the cost of installing charging equipment for residents and businesses similar to programs currently in place by other utilities.
- Continue to raise awareness of EVs and EV charging station needs.
- Continue to identify available funding or financing to assist with EV infrastructure projects.
- Consider the needs of the rural community.