

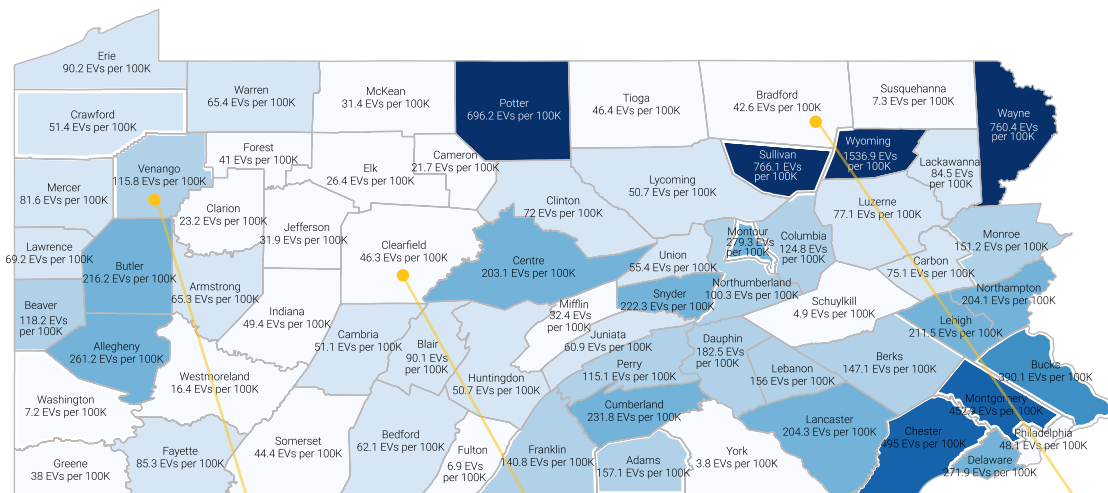
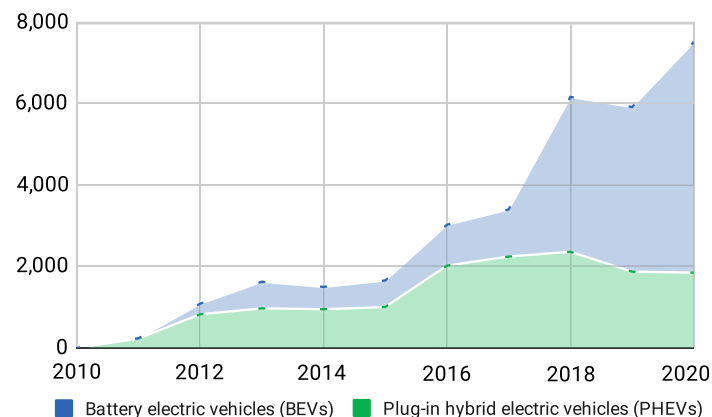
# Electric Vehicle Growth in Pennsylvania



EVs are on the rise in PA with a 151% increase from 11,347 in 2017 to 28,460 in February 2021. Supportive policy can ensure that residents and businesses fully realize the benefits of this market transformation. Proposed legislation targets expanding electrification infrastructure by 50% above the forecast for 2030. This means we need enough infrastructure for 1.8 million EVs by 2030.

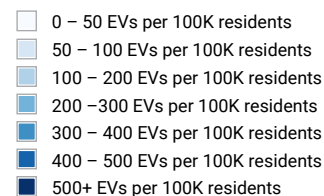
**PA needs EV infrastructure  
to support EV owners**

**PA Electric Vehicle Sales 2010 - 2020**



## The average EV driver:

- Spends 30 minutes in the community when using a fast charger and 70 minutes when using a level 2 charger
- Saves \$6,000-\$10,000 over the life of the vehicle versus a comparable gas-powered vehicle



## EV Stations Support Residents, Workers, and Tourists

### Cornplanter Square

**Location:** Oil City - Venango County  
**Population:** 9,846  
**Median Income:** \$39,750

- Supports workers and visitors
- 1.5 hours north of Pittsburgh
- Charging station installed by Venango County Redevelopment Authority as part of a larger project, also provided parking to commercial tenants in the repurposed Mellon Bank building

### Walmart

**Location:** Dubois - Clearfield County  
**Population:** 7,462  
**Median Income:** \$46,409

- Supports shoppers and tourism
- Off I-80, connects to Central PA's state parks, State College, and points East
- Charging station installed in 2019 through a national Electrify America-Walmart partnership

### Paradise Inn

**Location:** Towanda - Bradford County  
**Population:** 2,842  
**Median Income:** \$40,625

- Supports tourism and recreation
- 1 hour south of the Finger Lakes, 60 miles west of Scranton, along Susquehanna River
- Charging station is an amenity for hotel guests commonly used for work and hunting trips.

# Who benefits from investment in EV?

## TOURISM

**\$46B**

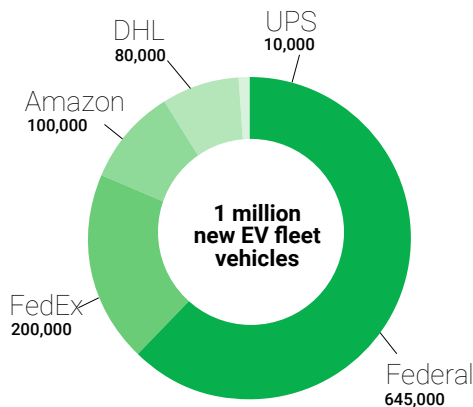
spent by 211 million visitors to Pennsylvania in 2019.

The overnight trips from 75 million out of state visitors account for \$29.3 billion of that spending. This supports 521,100 jobs in PA. Tourism spending has grown 45% from 2009 to 2019.

Pennsylvania currently ranks 41st among all states in DC fast charging EV stations per capita. The lack of a robust EV infrastructure may inhibit the growth of tourism in communities throughout the state.

## FREIGHT & LOGISTICS

The recent commitment to electrify the government fleet of 645,000 vehicles with American made EVs has the potential to create 1 million American auto worker jobs – with the private commitments from Amazon, DHL, FedEx and UPS to replace 1 million trucks with net-zero emissions vehicles. This commitment presents an opportunity for the EV Manufacturing sector in Pennsylvania, but it also means that a robust EV infrastructure system will soon be vital to the daily lives and success of all Pennsylvania residents and businesses.



## MANUFACTURING

Advanced Energy Economy estimated that EV Manufacturing in Pennsylvania supported 4,400 jobs in 2019, as many jobs as natural gas extraction. This added more than \$430 million in gross state product comparable to sporting goods stores in the state. The report identified 151 EV Manufacturing suppliers (see samples below), and an additional 540+ companies that could be retooled for the EV supply chain.

- Eaton
- LORD Corporation
- Accurate Control & Design Co.
- Siemens
- Mars Electric Inc.
- Mitsubishi Electric Power Products
- Choctaw Kaul
- Momentum Dynamics
- DURYEA Technologies
- Morgan Advanced Materials
- Burns Industrial Equipment
- Clipper Creek
- ABB
- Vivint Solar
- C.H. Waltz Sons Inc.
- Lion Electric Company

**↑24%**

projected job growth

EV manufacturing supply chain jobs are projected to grow 24% between 2019 and 2024, compared with 3% growth across statewide employment over the same timeframe.

**4,400**  
jobs

EV manufacturing jobs in 2019 that paid **+\$20/hour**. Growing to **5,500 jobs** by 2024.

## CONSTRUCTION

To support this growth, the state will need nearly 180,000 non-residential Level 2 charging plugs and nearly 4,500 public DC Fast Charging plugs.

**6,484**  
jobs

Construction Jobs to build the infrastructure to support 1.8 million EVs by 2030

## MACK: MADE IN PA

In September 2020, Mack Trucks announced plans to manufacture the Mack® LR Electric at Mack's Lehigh Valley Operations (LVO) in Macungie, Pennsylvania, where all heavy-duty Mack trucks built for North America are assembled. This revolutionary refuse truck has a fully electric integrated Mack drivetrain. This presents an opportunity for EV Manufacturing suppliers throughout Pennsylvania.



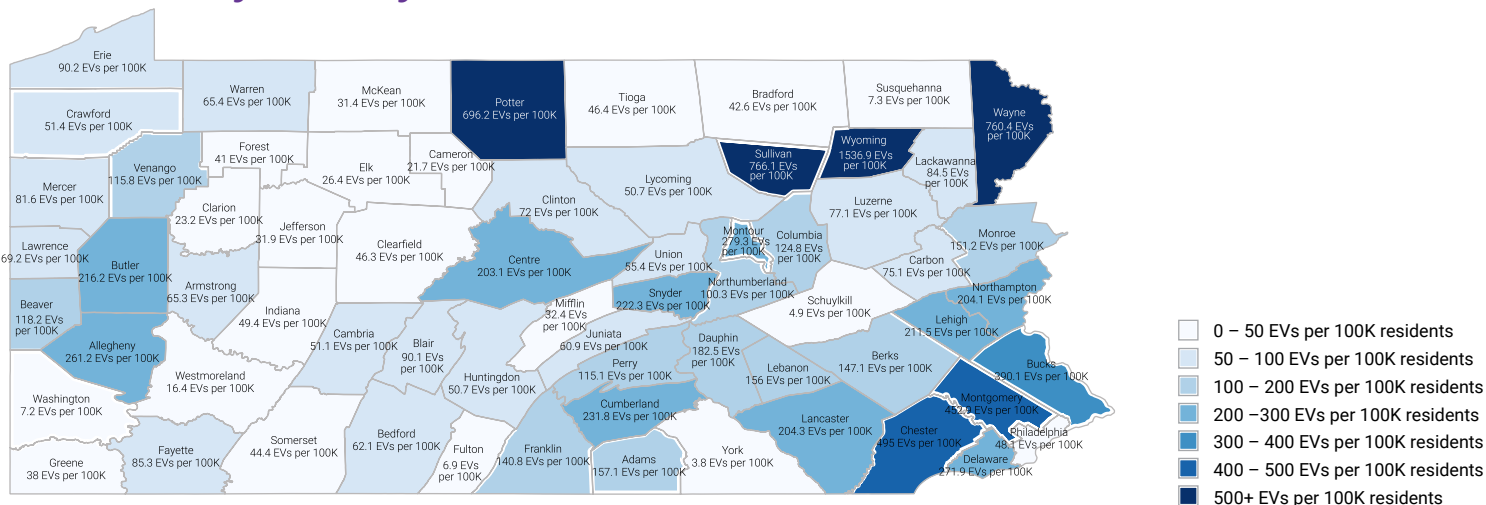
# Electric Vehicle Ownership is Growing in PA



**151% increase in EVs in Pennsylvania from 11,347 in 2017 to 28,460 in February 2021, according to data provided by the Pennsylvania Department of Environmental Protection (PA DEP).<sup>1</sup>**

Most of that early market has been captured by one automaker, Tesla, in part due to the fact that they have developed their own charging stations. PA residents and businesses would benefit from EV chargers that can support all EV models, including new vehicles such as the Chevy Bolt EUV, the exciting new Ford Mustang Mach-E, and the new Mack® LR Electric, which will be made at Mack's Lehigh Valley Operations (LVO) in Macungie, Pennsylvania. This revolutionary refuse truck has a fully electric integrated Mack drivetrain. The growth of EVs presents an opportunity for automotive suppliers throughout Pennsylvania.

## EV Owners by County





# EV Growth Generates Economic Benefits



A recent survey of Duquesne Light customers cited concerns about the range of EVs and the availability of charging infrastructure as the primary barriers to further EV adoption. The first barrier is being addressed by automakers. The second is a public policy issue addressed by proposed legislation that is currently under deliberation in Pennsylvania.

**Pennsylvania currently has about 1,800 public EV Level 2 charging stations and 120 Public DC Fast charging stations that are available for all EV drivers.**

Proposed legislation sets a target for expanding electrification infrastructure to 50% above the forecast for 2030. This means we need enough infrastructure for **1.8 million EVs** by 2030. To support this growth, the state will need nearly **180,000** public and private Level 2 charging ports and nearly **4,500** public DC Fast charging ports at a projected public-private investment of more than **\$1.1 billion**.

Purchases of EVs in Pennsylvania are already above the EPRI low scenario with no policy support; the market is proving the demand.<sup>2</sup>

Explore the potential for EV manufacturing, the growth of EV ownership and the existing charging infrastructure in Pennsylvania that supports the nearly **30,000 residents** that currently have EVs in Pennsylvania: [PA EV StoryMap](#).

## EV Scenarios from the Electric Power Research Institute (EPRI):

### EV low scenario assumes:

- Public EV charging speeds and costs are not accepted by consumers
- Regulations that drive EV sales are canceled
- Incentives are reduced

### EV high scenario assumes:

- Conditions are highly favorable toward EV adoption
- Consumers quickly understand EV benefits and adopt based on lower long term ownership costs
- EV infrastructure is available everywhere drivers need it at low cost and with an excellent experience

## Effective EV Infrastructure

Having a mix of both Level 2 and DC Fast chargers is necessary to meet EV drivers' needs, and creates the opportunity for those drivers to spend time in the community supporting local businesses.

Public DC Fast charging networks support long-distance travel and tourism and provide charging for drivers who lack home charging. The average DC Fast Charge user spends 30 minutes to charge their vehicle.

Public Level 2 chargers support the charging needs of EV drivers who plan to stay in one location for a few hours at a time - like at a sporting event, a local restaurant, a hotel or shopping center. The average Level 2 user spends 70 minutes to charge their vehicle.

<sup>1</sup> Data on charging stations was downloaded on March 24, 2021 from the [Alternative Fuels Data Center: Alternative Fueling Station Locator](#). Fourth Economy summarized the data on public charging stations as it was published and cannot verify the accuracy of the information reported. Data for individual stations have been updated between November 2020 and March 24, 2021.

<sup>2</sup> See Assumptions in the EPRI scenarios for more information about these scenarios. Additional information on the methodology for our analysis is available here: [EV Infrastructure - Methodology](#).

# Growing EV Ownership Demands More Infrastructure



**211 Million visitors to PA in 2019, that spent \$46B** - supports 521,100 jobs in PA. Tourism spending has grown **45%** from 2009 to 2019.

**75 Million overnight visitors - spending \$29.3B.** Deploying EV infrastructure is critical to retaining and growing our share of the overnight tourism market.

Overnight trips from out of state visitors are usually trips of more than 100 miles. As more consumers in PA and elsewhere adopt EVs, the lack of a robust charging infrastructure may **inhibit the growth of tourism** throughout the state.

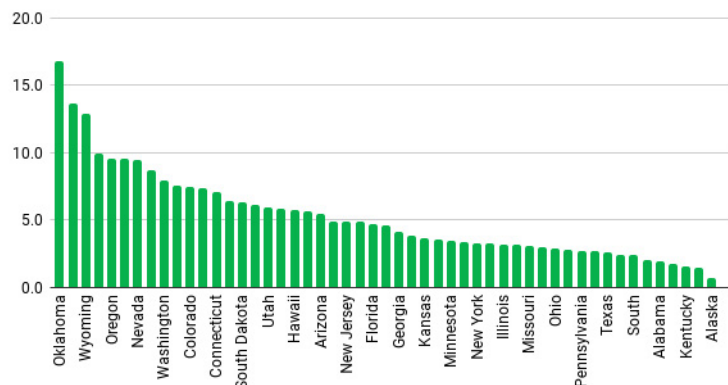
In the states near Pennsylvania the average market share for EVs is 1.5% and it is growing at more than 70% annually.

State	EV Sales 2017	EV Sales 2018	2018-2017 Sales Increase
District of Columbia	398	761	91%
Massachusetts	4,632	8,990	94%
Connecticut	2,304	3,415	48%
Maryland	3,244	6,299	94%
Virginia	2,932	6,375	117%
New Jersey	5,033	9,230	83%
New York	10,090	15,752	56%
Delaware	401	627	56%
Pennsylvania	3,346	6,063	81%
Ohio	2,091	4,456	113%
Michigan	2,742	3,571	30%
West Virginia	113	218	93%

Source: [EV Market Share by State – EVAdoption](#)

Unfortunately, PA Currently ranks **41st among all states** in DC Fast Charging stations per capita!

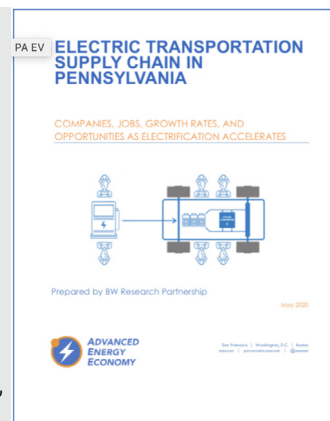
DC Fast Charging Per 100,000 People



## EV MANUFACTURING JOBS

Jobs in EV Manufacturing: **4,400 jobs in EV Manufacturing now - 5,500 by 2024 that pay +\$20/hour<sup>1</sup>**

“[Electric Transportation Supply Chain in Pennsylvania](#),” prepared for AEE by BW Research Partnership, a global leader in workforce and economic development research, finds that, **in 2019 the EV Manufacturing supply chain in Pennsylvania supported nearly 4,400 jobs in 151 different companies** and accounted for more than \$430 million in gross state product - as many jobs as natural gas extraction and as much economic activity as sporting goods stores in the state.



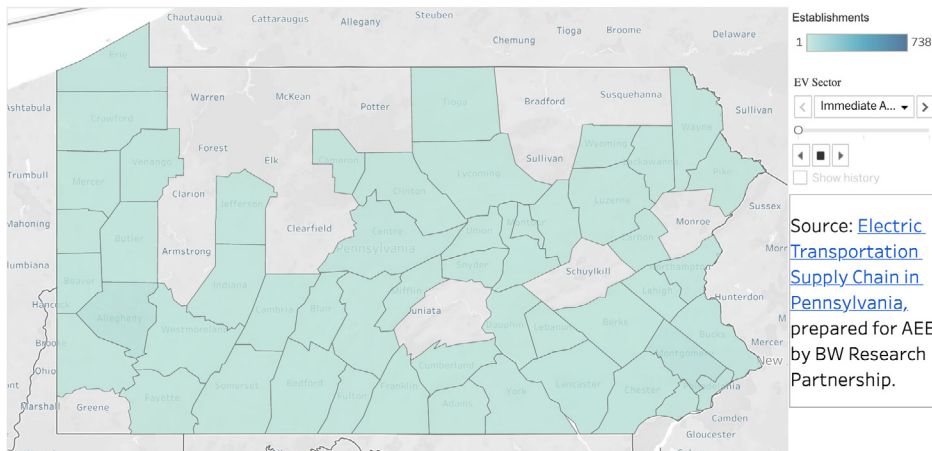
## Workforce Benefits

### EV INFRASTRUCTURE JOBS

Jobs from building EV infrastructure: **6,500 jobs to build the charging infrastructure to support 1.8 million vehicles by 2030**

<sup>1</sup> Weighted average of hourly pay for the occupations in Table 2: Key ET Occupations in “[Electric Transportation Supply Chain in Pennsylvania](#),” prepared for AEE by BW Research Partnership.

# Map of Establishments in Industries that Support the EV Supply Chain



Jobs in the state's EV manufacturing were projected to grow **24% between 2019 and 2024, compared with 3% growth across statewide employment** over the same timeframe. For the same period, consumer adoption of electric vehicles in Pennsylvania was projected to grow 400% between 2019 and 2024.

**Growth for the future: + 350 companies** could be immediately retooled and retrofitted to supply the ET market, and **190 firms** could transition to ET activity with slightly more time and investment.

Note: See more about the [EV Supply Chain](#).

## Sample of Existing EV Manufacturing Suppliers Firms in PA

- ABB
- Accurate Control & Design Co.
- Burns Industrial Equipment
- C.H. Waltz Sons Inc.
- Choctaw Kaul
- Clipper Creek
- DURYEA Technologies
- Eaton
- Lion Electric Company
- LORD Corporation
- Mars Electric Inc.
- Mitsubishi Electric Power Products
- Momentum Dynamics
- Morgan Advanced Materials
- Siemens
- Vivint Solar

Source: "[Electric Transportation Supply Chain in Pennsylvania](#)," prepared for AEE by BW Research Partnership

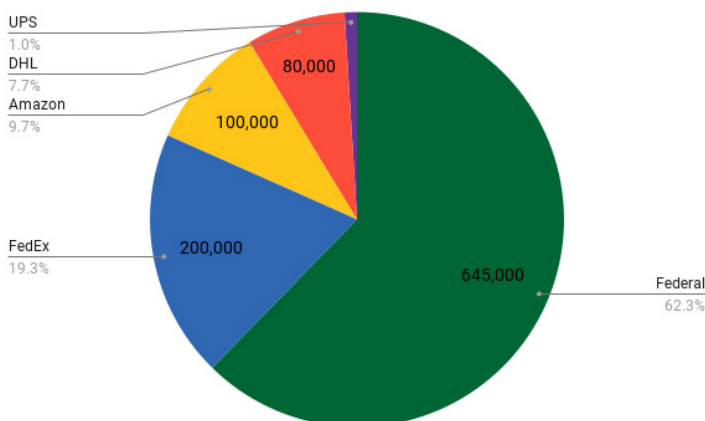
## Freight and Logistics

Recent plans to electrify the federal fleet of **645,000** vehicles with American-made EVs has the potential to create **1 million** American auto worker jobs. This does not include announcements to electrify private fleets from Amazon, DHL, FedEx and UPS that will add another **355,000** EVs for a total of **1 million** new trucks with net-zero emissions.

These commitments present an opportunity for the **EV Manufacturing** sector in Pennsylvania. Furthermore, as more freight and logistics go electric, all Pennsylvania residents and businesses will need a robust EV infrastructure to remain connected to the larger economy. Ignoring new technologies that were changing the market devastated our manufacturing industry in the 1980s, Pennsylvania can't afford to ignore the innovations in alternative energy.

The Federal Government has also proposed investing **\$400 billion** over 10 years in clean energy research and innovation in an effort to create a stable source of demand and to accelerate the U.S. industrial capacity to produce clean vehicles and components.

## EV Fleet Commitments



- [Biden Commits to Electrify Federal Fleet - Green Fleet](#)
- [From Amazon To FedEx, The Delivery Truck Is Going Electric](#): UPS has placed an order for 10,000 electric delivery vehicles and Amazon is buying 100,000 EV trucks from the start-up Rivian.
- By 2030, [DHL will have 80,000 e-vehicles](#) deployed for last-mile deliveries, resulting in 60% electrification of the fleet
- [FedEx Commits to Carbon-Neutral Operations by 2040](#): By 2040, the entire FedEx parcel pickup and delivery (PUD) fleet will be zero-emission electric vehicles. [FedEx has a fleet of more than 200,000 vehicles](#).



# EV Infrastructure Methodology



For the station/infrastructure costs, we used the U.S. DOE 2015 report, Costs Associated With Non-Residential Electric Vehicle Supply Equipment. This report provided the estimates for the units costs and the installation costs. The calculations used the mid-range estimates, un-adjusted prices for inflation. The report mentioned that costs were likely to fall over time, but recent projects and upgrades in the charging units suggest that prices have not fallen dramatically. Therefore it seemed a reasonable assumption to avoid the high-end cost estimates.

The supporting information for the unit and installation costs is reproduced below:

## U.S. DOE Unit Costs

### Ballpark Cost Ranges for Level 2 EVSE

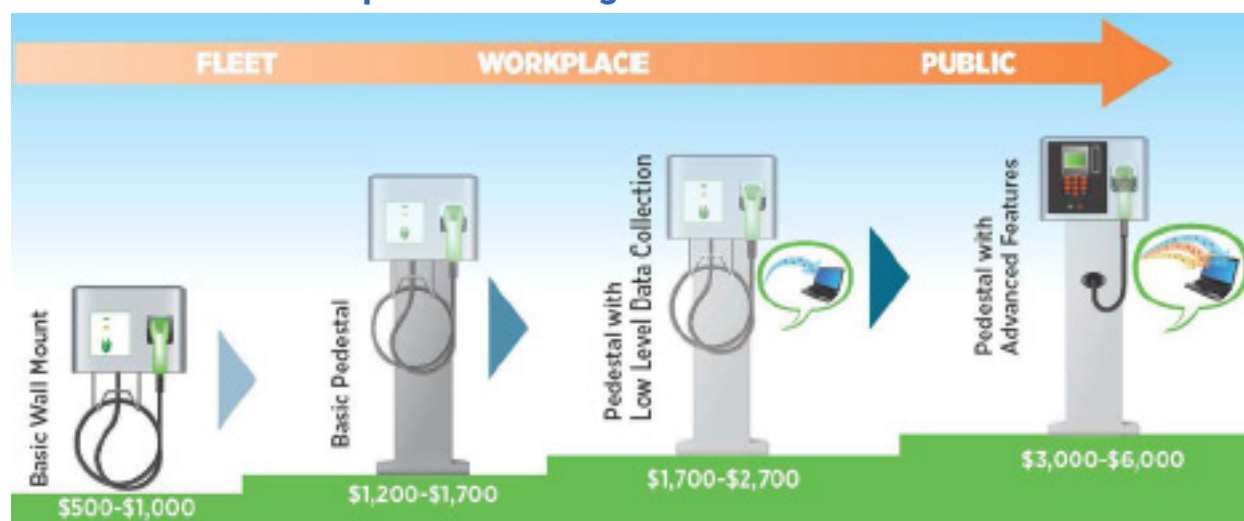


Figure 5. Ballpark cost ranges for different tiers of Level 2 EVSE units. Image from Kristina Rivenbark, New West Technologies.

Source: U.S. DOE (2015), [Costs Associated With Non-Residential Electric Vehicle Supply Equipment](#).

### EVSE Unit Costs

EVSE Type (single port)	EVSE Unit Cost Range
Level 1	\$300-\$1,500
Level 2	\$400-\$6,500
DCFC	\$10,000-\$40,000

Table 1. EVSE unit cost ranges based on units available in 2015

Source: U.S. DOE (2015), [Costs Associated With Non-Residential Electric Vehicle Supply Equipment](#).

In 2015, most DCFC were only 50kW. Today many new installs are 150kW, and therefore the cost is higher, about \$75,000 each. Fourth Economy included the higher unit cost of \$75,000 for DCFC installations.

# U.S. DOE Unit Costs

## Ballpark EVSE Installation Costs

EVSE Type	Average Installation Cost (per unit)	Installation Cost Range (per unit)
Level 1	not available	\$0-\$3,000* <i>Source: Industry Interviews</i>
Level 2	~\$3,000 <i>EV Project (INL 2015b)</i>	\$600-\$12,700 <i>EV Project (INL 2015b)</i>
DCFC	~\$21,000 <i>EV Project (INL 2015d)</i>	\$4,000-\$51,000 <i>EV Project (INL 2015d) and (OUC 2014)</i>

Table 2. Ballpark costs for installation of Level 1, Level 2, and DCFC EVSE (not including the EVSE unit.)

\*The \$0 installation cost assumes the site host is offering an outlet for PEV users to plug in their Level 1 EVSE cordsets and that the outlet already has a dedicated circuit.

Source: U.S. DOE (2015), [Costs Associated With Non-Residential Electric Vehicle Supply Equipment](#).

Not included in our cost estimates are the costs for utility service upgrades. These costs are highly variable and not needed for every location:

*DCFC sites or sites with many Level 2 units are more likely to require a service upgrade than a single Level 1 or Level 2 EVSE. For the DCFC stations along the [West Coast Electric Highway] WCEH, it cost \$10,000-\$25,000 for service upgrades such as installing a new transformer (Botsford 2014). Some installations may need to bring in new electrical service from the grid to the host site. (INL 2015a).<sup>1</sup>*

### Estimates Used in the Calculations

The specific estimates used in the calculations are provided in the Table 1 below:

Table 1

	Unit Costs	Installation Cost	Total Cost
Level 2 Charging Plugs	\$3,500	\$3,000	\$6,500
DC Fast Charging Plugs	\$85,000	\$75,000	\$160,000

### Cost Assumptions

- L2 Per Port Cost – \$3,500 (This includes hardware, network, shipping, commissioning)
- L2 per Port Installation/Construction Cost – \$3,000 (This includes all infrastructure needed on customer side of the meter)
- DCFC Per Unit Cost – \$85,000 - assumes a 150 KW unit
- DCFC Per Unit Installation/Construction Cost - \$75,000 (This includes all infrastructure needed on the customer side of the meter).

The unit costs are derived from the U.S. DOE, estimates from EPRI, and the experience of several EV pilot projects with a Pennsylvania utility. These costs were assigned to the electrical equipment industry in our model. For the model, the installation costs in table 1 were allocated to the Non-Residential Construction sector.

In order to estimate the costs statewide, U.S. DOE data from the [Alternative Fueling Station Locator](#) provided data on existing EV stations in PA. On March 24, 2021, Fourth Economy downloaded and summarized that data in the Existing column on Table 3 (below). The U.S. DOE EVI-Pro Lite tool was used to estimate the need for EV infrastructure to support 1.8 million EVs, which represents the EPRI 2030 scenario of 1.2 million EVs plus the 50% called for in SB 596. The number of stations needed to support that number of EVs is in 2030 Need in Table 2.

Table 2: Existing Charging Plugs and Projected 2030 Need

	Existing	2030 Need
Level 2 Charging Plugs	1,545	178,680
DC Fast Charging Plugs	120	4,483
Total	1,665	183,163

<sup>1</sup> See [Costs Associated With Non-Residential Electric Vehicle Supply Equipment](#), 2015. Prepared by New West Technologies, LLC for the U.S. Department of Energy Vehicle Technologies Office, page 15. See also EPRI's [Product Abstract](#).



Table 3 presents the additional charging infrastructure (2030 Need - Existing) that will need to be built to support the projected level of EV adoption.

Table 3: Units Needed and Investment Required

	2030 Need - Existing	Investment
Level 2 Charging Plugs	177,135	\$451,165,000
Public DC Fast Charging Plugs	4,363	\$698,080,000
Total	181,498	\$1,149,245,000

Table 4 presents the breakdown of costs for units, modeled as IMPLAN Sector 339 (All other miscellaneous electrical equipment and component manufacturing) and installation, modeled as IMPLAN Sector 52 (Construction of new power and communication structures).

Table 4: Costs for Units and Installation

	Unit	Installation	Total
Level 2 Charging Plugs	\$242,935,000	\$208,230,000	\$451,165,000
DC Fast Charging Plugs	\$370,855,000	\$327,225,000	\$698,080,000
Total	\$613,790,000	\$535,455,000	\$1,149,245,000

The U.S. DOE EVI-Pro Lite tool was used to generate the estimated need for charging infrastructure in Pennsylvania for 2030 based on the following assumptions:

Assumptions	
Number of EVs to support	1,752,000
Vehicle Mix	
Plug-in Hybrids, 20-mile electric range	18%
Plug-in Hybrids, 50-mile electric range	18%
All Electric, 100-mile electric range	3%
All Electric, 250-mile electric range	61%
Total	100%
Percent of drivers with access to home charging	83%

The model also assumed that the future charging infrastructure would provide full support for plug-in hybrid electric vehicles (PHEVs). Full support means that most PHEV drivers wouldn't need to use gasoline on a typical day.