

**Summary Statistics for Light-Duty Plug-in Electric Vehicles
In Florida, 2011 – 2019**

David Gohlke
Argonne National Laboratory
Energy Systems Division
Systems Assessment Group

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LIST OF ACRONYMS

DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	Environmental Protection Agency
eVMT	electric vehicle miles traveled
GWh	gigawatt-hour
ICE	internal combustion engine
kWh	kilowatt-hour
LDV	light-duty vehicle
mpg	miles per gallon
MPGe	miles per gallon gasoline equivalent
MY	model year
PEV	Plug-in Electric Vehicle
PHEV	Plug-in Hybrid Electric Vehicle
VMT	vehicle miles traveled

SUMMARY STATISTICS FOR LIGHT-DUTY PLUG-IN ELECTRIC VEHICLES IN FLORIDA, 2011 – 2019

ABSTRACT

This report examines properties of plug-in electric vehicles (PEVs) registered in the Florida from 2011 to 2019. Over 50,000 PEVs were registered in Florida in 2019, and these vehicles have driven over one billion miles on electricity in total. This has reduced gasoline consumption by over 50 million gallons and 280 thousand metric tons of carbon dioxide. In 2019, PEVs in Florida used 170 gigawatt-hours of electricity to drive 500 million miles.

1 INTRODUCTION

This analysis builds upon work published by Argonne National Laboratory in the report, “Assessment of Light-Duty Plug-In Electric Vehicles in the United States, 2010–2019” (Gohlke and Zhou, 2020), using annual vehicle registration numbers for the state of Florida supplied by the Central Florida Clean Cities Coalition. Aside from the difference in vehicle count, this analysis uses EPA electricity emissions data specific to Florida (EPA, 2020), rather than the United States grid average.

Table 1 summarizes the high-level impacts of these plug-in electric vehicles for active registrations, electric vehicle miles traveled (eVMT), gasoline displacement, electricity consumption, and reductions in carbon dioxide emissions in each year from 2011 to 2019 in the state of Florida. As the total number of on-road vehicles has grown, each of these quantities has grown since 2011. Through 2019, over 57 thousand PEVs have been registered in Florida and have driven 1.4 billion miles, displacing nearly 60 million gallons of gasoline and nearly 0.3 million metric tons of CO₂, and consuming over 500 gigawatt-hours of electricity.

TABLE 1 Annual Total Registrations of PEVs in Florida, and Total Annual eVMT, Gasoline Reduction, Electricity Consumption, and CO₂ Emissions Reduction by On-Road PEVs

Year	PEV registrations (thousands)	eVMT (million miles)	Gasoline reduction (million gallons)	Electricity consumption (gigawatt-hours)	CO ₂ emissions reduction (thousand metric tons)
2011	1	3	0.1	1	0.6
2012	3	15	0.5	5	2
2013	6	40	1.6	15	7
2014	10	80	3.0	30	14
2015	13	110	4.2	40	20
2016	20	160	6.3	60	30
2017	25	220	9.0	80	45
2018	38	330	13.1	110	66
2019	57	520	19.8	170	101
Total	57	1,480	57.7	510	286

2 FLORIDA-LEVEL IMPACTS

This section presents metrics for PEVs, including vehicle sales, miles traveled, electricity consumed, gasoline displacement and carbon dioxide emissions.

2.1 PEV SALES

Nearly 60,000 PEVs are on the road in Florida. Approximately two-thirds of these are fully electric battery electric vehicles (BEVs), while the remainder are plug-in hybrid electric vehicles (PHEVs). The three most popular vehicles are the Tesla Model 3 (BEV), Tesla Model S (BEV), and the Chevrolet Volt (PHEV). The growth in PEV registrations is shown in Figure 1.

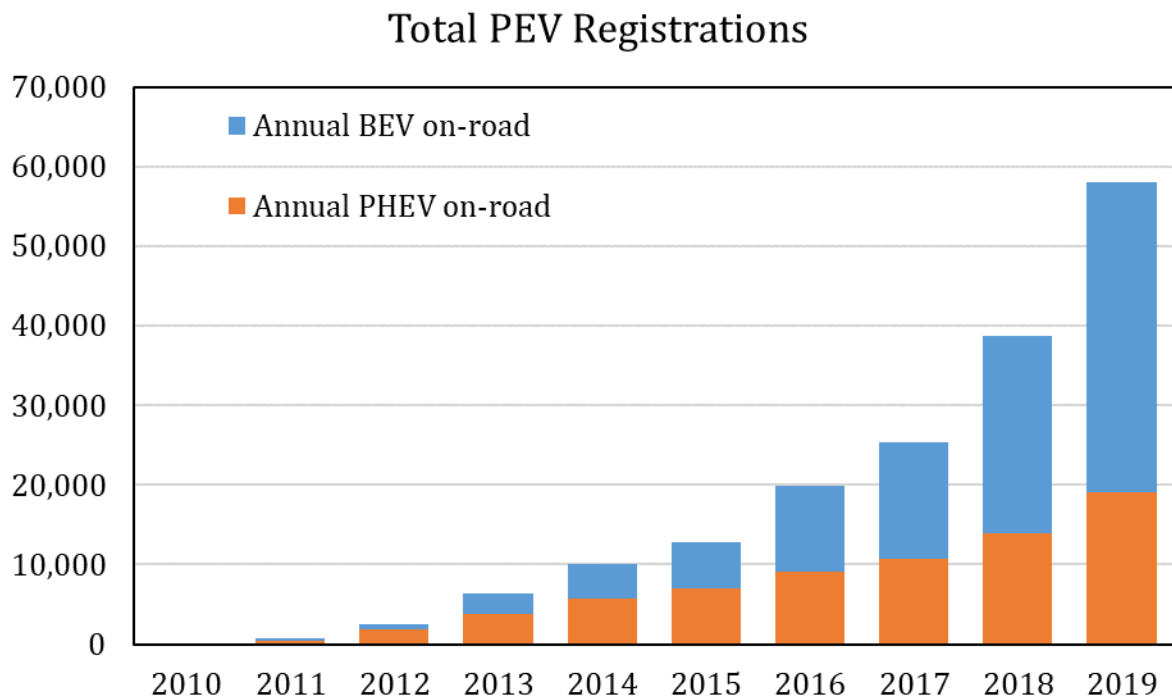


FIGURE 1 Annual total registrations of PEVs in Florida by year

2.2 ELECTRIC MILES TRAVELED

The total annual vehicle miles traveled (VMT) for each PEV depends on traveler behavior and the vehicle's all-electric range. Given the total registration number of PEVs as well as the all-electric range and the effective utility factor for each vehicle, the total mileage driven in all-electric mode across the entire light duty vehicle (LDV) fleet can be estimated. Figure 2 shows the total electric VMT (eVMT) by year in Florida, split by BEVs and PHEVs.

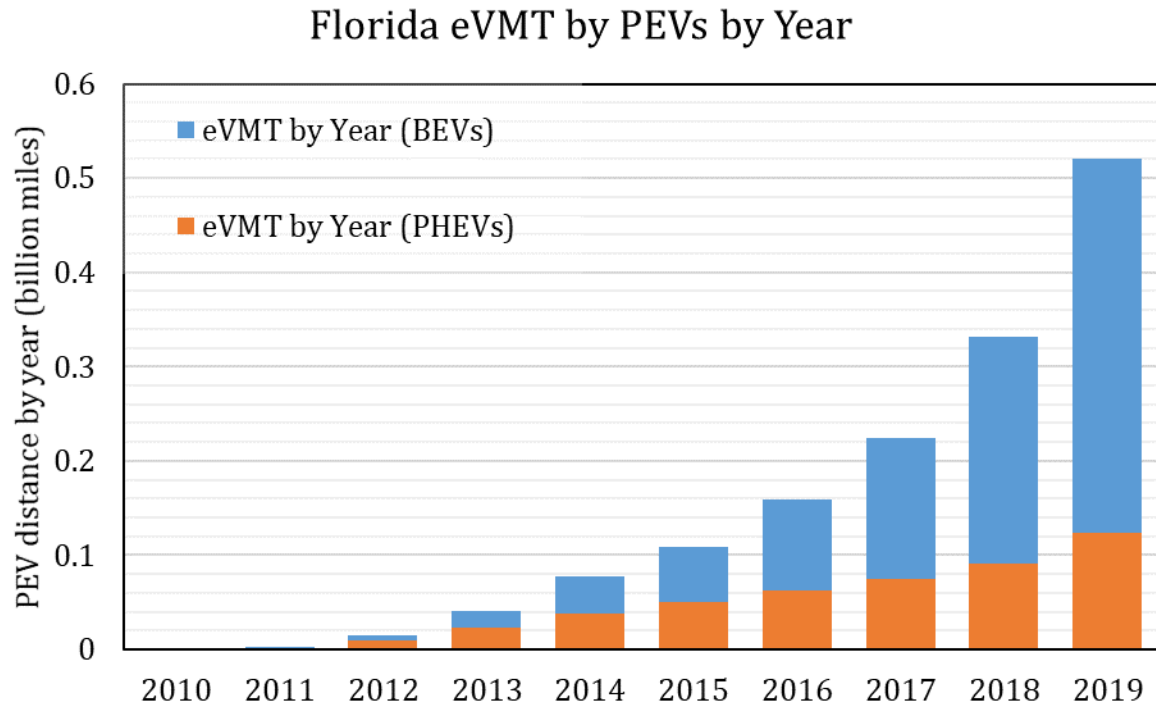


FIGURE 2 Electric vehicle miles traveled by LDVs by year

2.3 ELECTRICITY CONSUMPTION BY PEVs

Combining eVMT with knowledge of vehicle electricity efficiency allows us to determine the total electricity consumption by PEVs in Florida, shown in Figure 3. To find the total electricity consumption, the estimated eVMT in each month is multiplied by the electricity consumption per mile for each vehicle model. In 2019, the total electricity use for LDVs on the road was 170 gigawatt-hours. As a point of comparison, the entire state produced a total of 244,000 gigawatt-hours in 2018 (EIA, 2020).

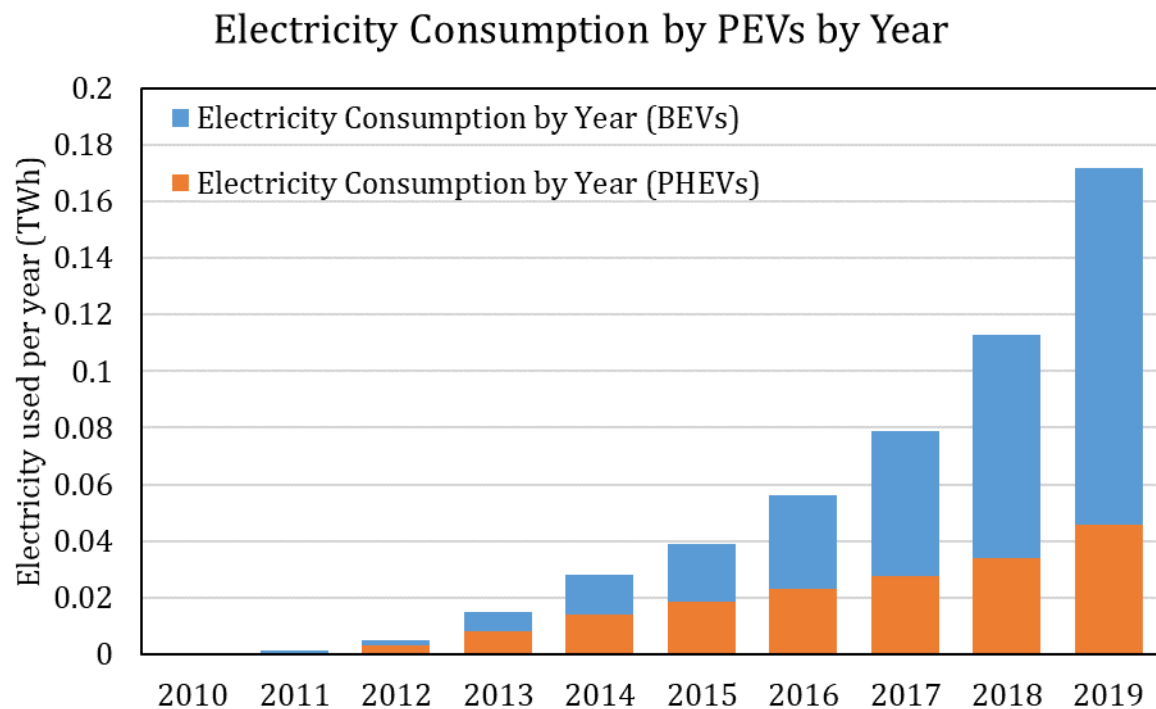


FIGURE 3 Electricity consumption by PEVs by year

2.4 GASOLINE CONSUMPTION REDUCTION

Use of electricity by PEVs displaces gasoline that would otherwise be used by an ICE vehicle.¹ To estimate this reduction in gasoline consumption, we need to make assumptions about how each mile would have otherwise been traveled, detailed in Gohlke & Zhou, 2020. For each PEV, we select a comparable ICE to calculate the gasoline consumption offset by using electricity. The total gasoline displacement by year is graphed in Figure 4. In 2019, nearly 20 million gallons of gasoline were offset by PEVs. Cumulatively, through 2019, PEVs have offset nearly 60 million gallons of gasoline in Florida.

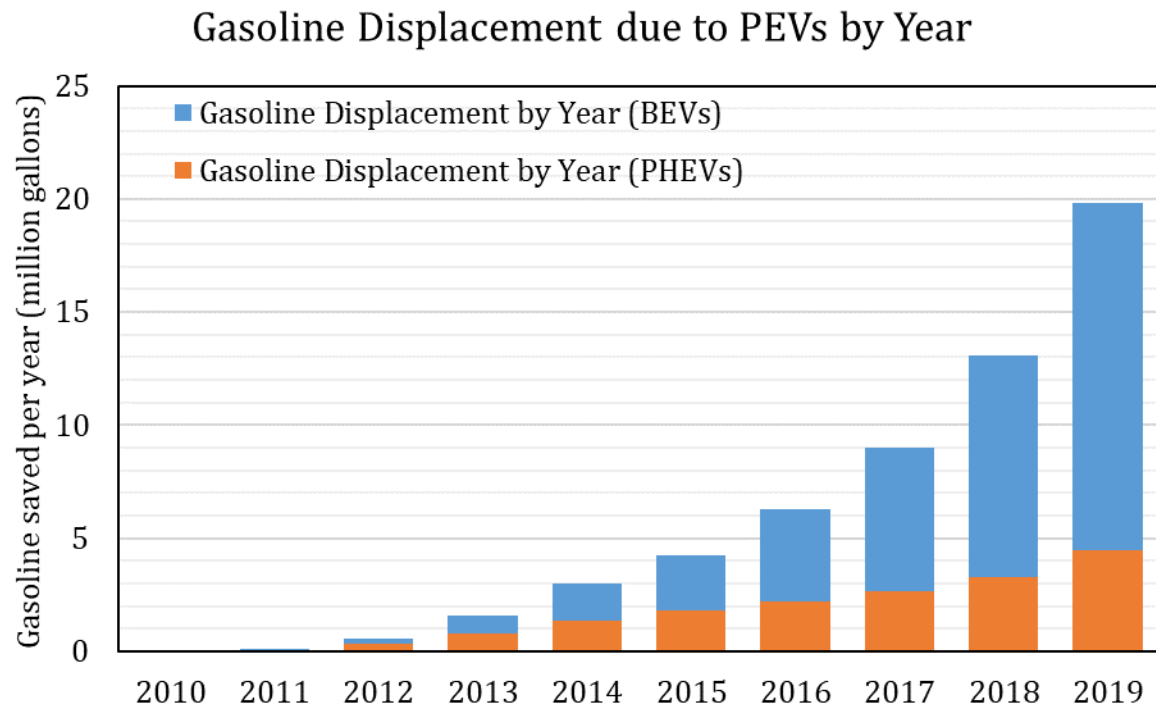


FIGURE 4 Gasoline displacement from ICE vehicles by LDV PEVs by year

¹ This analysis only counts gasoline usage that is offset when the car is operating in electric mode. For PHEVs operating in charge-sustaining mode (i.e., using only gasoline), the hybrid engines are also generally more efficient than the average ICE vehicle, but this reduction in gasoline is not calculated here.

2.5 CARBON DIOXIDE EMISSIONS

Operation of PEVs reduces emissions as well. The EPA states that combustion of each gallon of gasoline emits 8,887 grams of CO₂ (EPA and DOT, 2010).² For an average gasoline vehicle in 2018, with an average fuel economy of 27.7 miles per gallon, this yields 321 grams of CO₂ per mile (Davis and Boundy, 2020). By contrast, electricity production in Florida emitted an average of 430 grams of CO₂ per kilowatt-hour in 2018 (EPA, 2020), down 23% from the 480 g CO₂ / kWh emitted in 2010. The emissions to drive an electric vehicle are found by multiplying the miles driven by the electricity consumption (in kWh per mile) by the emission rate. Across the LDV fleet, this averaged to 185 grams of CO₂ per mile, approximately one-half the carbon emissions of the average conventional ICE vehicle. Figure 5 shows how the total CO₂ emissions have been reduced by PEVs operating on electricity, with over 100 thousand metric tons being offset in 2019.

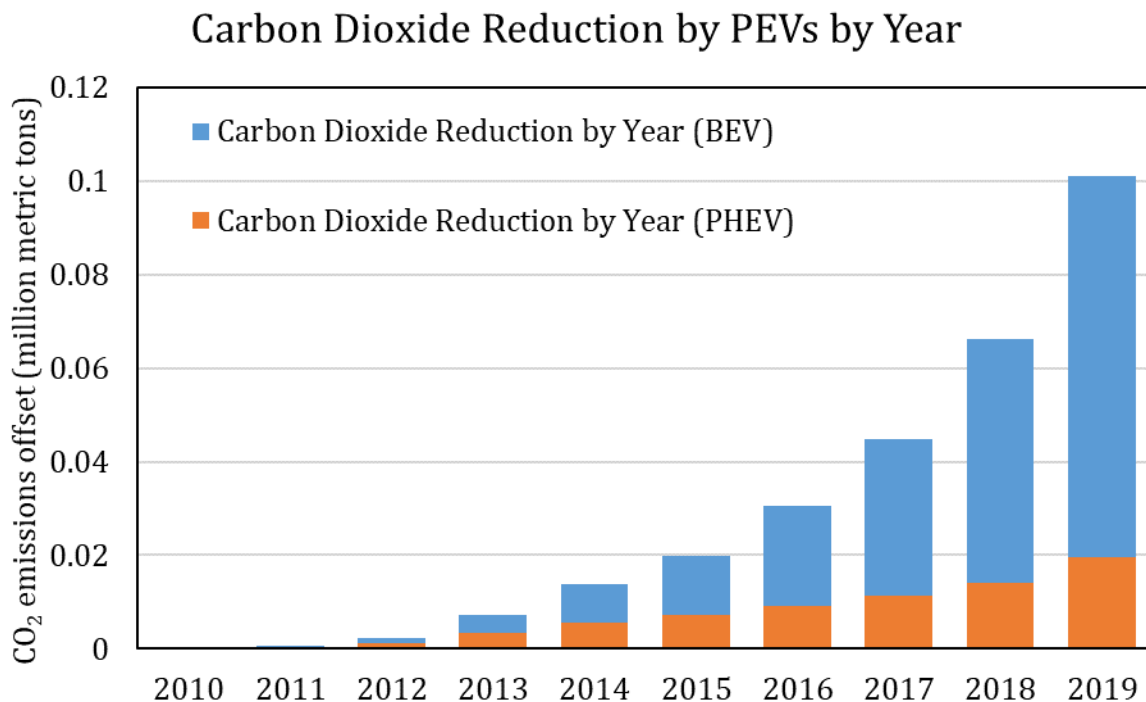


FIGURE 5 Carbon dioxide reduction from LDV PEVs by year

² This calculation is for tailpipe emissions only; that is, it excludes upstream effects for refining and transportation of the fuel, as well as emissions from the production of the vehicles. For electric vehicles, the calculation is for the generation of the electricity for vehicle operation, again excluding vehicle manufacturing. The majority of emissions come from the operation, rather than the manufacturing, of both ICE vehicles and PEVs. A recent study found that tailpipe emissions from a midsize gasoline ICE vehicle were 68% of the total lifetime emissions, while electricity consumption for operation was responsible for 77% of the emissions from a midsize BEV (Elgowainy et al., 2016).

3 CONCLUSIONS

Since the latest generation of light-duty plug-in electric vehicles have been available in the United States, nearly 60,000 PEVs have been registered in Florida, driving nearly 1.5 billion miles on electricity. These 1.5 billion eVMT consumed more than 500 gigawatt-hours of electricity while reducing gasoline consumption statewide by nearly 60 million gallons. From 2011 to 2019, mileage driven by PEVs and electricity consumption has grown, which has offset gasoline consumption and CO₂ emissions from ICE vehicles. Further information about assumptions and calculation methodology can be found in a previous report (Gohlke and Zhou, 2020).

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Energy Systems Division

Argonne National Laboratory
9700 South Cass Avenue, Bldg. 362
Lemont, IL 60439-4832

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