

AGRICULTURE AND TRANSPORTATION COMMITTEE - ELECTRIC VEHICLE INFRASTRUCTURE - BACKGROUND MEMORANDUM

Section 2 of Senate Bill No. 2061 (2019) directs the Legislative Management to study current methods, using the electric vehicle infrastructure coalition, led by the Department of Transportation, to collaborate with the North Dakota utility industry, and North Dakota electric vehicle stakeholder groups, to design a jointly owned, public and private network of electric vehicle infrastructure to support both commercial and noncommercial vehicles and make recommendations regarding electric vehicle charging infrastructure. The study must include the evaluation of the relative costs and benefits associated with various options for electric vehicle infrastructure support and estimate the future annual economic impact.

SENATE BILL NO. 2061 Study Directive

Senate Bill No. 2061, as introduced, would have created an annual road use fee for electric and hybrid vehicles of \$248 per electric vehicle registered and \$71 per hybrid vehicle registered, in addition to all other fees required for annual motor vehicle registration. The bill would have required funds collected to be deposited into the highway tax distribution fund. The bill also defined an electric vehicle and a hybrid vehicle.

The Senate amended the bill to change the fees collected to \$110 per electric vehicle and \$50 for a hybrid vehicle, and to provide for a Legislative Management study.

The House amended the bill to change the fees collected to \$120 per electric vehicle, changed the term "hybrid vehicle" to "plug-in hybrid vehicle," added an annual road use fee of \$20 per electric motorcycle, and added a definition of an electric motorcycle.

Testimony

According to the testimony, 200,000 electric vehicles were sold in the United States in 2017. Electric vehicle sales make up approximately 1 percent of light-duty car sales in the United States, but because of expanding development and production there are concerns with declining gas tax revenues. More than 1.4 million plug-in cars were sold in the United States in 2018.

Road repairs, snow plowing, law enforcement, and improvements traditionally have been funded primarily through state and federal gas taxes collected at gasoline pumps. Electric vehicles pay the same registration fees as traditional vehicles, but because the vehicles use no or less gasoline, the electric vehicles do not contribute as much to maintain the roadways through the gas tax.

As of October 2018, 21 states had enacted legislation requiring a special registration fee for electric and hybrid vehicles. Proponents of implementing an additional fee contended the special fee for electric and hybrid vehicles would help create equality among drivers regarding paying for the building and maintenance of roads. In addition to gas taxes at the pump, heavier vehicles, such as commercial motor vehicles, pay additional permitting and registration fees. A commercial motor vehicle may pay up to an additional \$1,000 for a license when compared to a traditional motor vehicle.

Testimony in opposition to the bill suggested the proposed fees for hybrid and electric vehicles was too high. Opposition testimony also indicated the state may wish to consider raising registration fees for all vehicles in the state, or implementing a per-mile fee for road use.

Opposition testimony suggested any additional fees levied by the state should be used for electric vehicle infrastructure and charging stations rather than road use maintenance. Another alternative suggested would be to levy a surcharge on electric bills by multiplying the number of electric vehicles a person has registered by a certain amount per kilowatt-hour used.

Testimony in support of the study indicated fees for electric and hybrid vehicles could be implemented while simultaneously studying the issues related to electric vehicle infrastructure.

Representatives of the North Dakota League of Cities, General Motors, the North Dakota Motor Carriers Association, and the Associated General Contractors of North Dakota testified in support of the bill.

Representatives of Global Automakers, Auto Alliance, and several other individuals testified in opposition to the bill.

TYPES OF VEHICLES

According to the United States Department of Energy, a vehicle powered by an internal combustion engine runs on gasoline, diesel, or renewable and alternative fuels such as biodiesel and ethanol; however, an electric vehicle or plug-in electric vehicle derives all or part of its power from electricity supplied by the electric grid.

There are two basic types of electric vehicles--all-electric vehicles and plug-in hybrid electric vehicles. A major feature of electric vehicles is the vehicles can be plugged in to charge from an off-board electric power source. A plug-in hybrid electric vehicle is distinguished from a hybrid electric vehicle (non-plug-in) in that a hybrid electric vehicle supplements its internal combustion engine with battery power, but cannot be plugged in to an external power source.

An all-electric vehicle runs only on electricity and is powered by one or more electric motors that receive electricity from an electric grid and stores the electricity in onboard batteries. All-electric vehicles include battery electric vehicles and fuel cell electric vehicles. Both battery electric vehicles and fuel cell electric vehicles are charged by being plugged in to the electrical grid. However, both also are charged in part by regenerative braking. Regenerative braking generates electricity from some of the energy normally lost when braking.

According to the United States Department of Energy, most all-electric vehicles have ranges of 80 to 100 miles, and some can travel up to 250 miles on a single charge. When the battery is depleted, all-electric vehicles must be recharged. Recharging an all-electric vehicle can take between 30 minutes to nearly a full day, depending on the type of charger and battery.

Plug-in hybrid electric vehicles run on electricity for 6 to 40 miles, then switch to an internal combustion engine and run on gasoline when the battery power is depleted, allowing drivers to use electricity when possible and gasoline when needed. Some types of plug-in hybrid electric vehicles also are called extended-range electric vehicles.

According to a 2019 report by the International Council on Clean Transportation entitled *The Surge of Electric Vehicles in United States Cities*, global annual light-duty electric vehicle sales surpassed 2 million in 2018. According to the report, electric vehicle sales in the United States increased from 200,000 in 2017 to over 350,000 in 2018, with 65 percent of the sales in all-electric vehicles and 35 percent of the sales in plug-in hybrid electric vehicles.

TYPES OF ELECTRIC VEHICLE BATTERIES AND CHARGING STATIONS

According to the United States Department of Energy, batteries are essential for most types of electric vehicles. The following are the most common types of energy storage systems in electric vehicles:

- Lithium-ion batteries have a high energy per unit mass relative to other electrical energy storage systems, high power to weight ratio, high energy efficiency, good high temperature performance, low self-discharge, and most components can be recycled. Most all-electric vehicles and plug-in hybrid electric vehicles use this type of battery.
- Nickel-metal hydride batteries have reasonable specific energy and power capabilities. These batteries have a longer life cycle than lead-acid batteries and are safe and abuse tolerant. However, these batteries have high costs, high self-discharge, high heat generation, and the need to control hydrogen loss. These batteries are used widely in hybrid electric vehicles.
- Lead-acid batteries are inexpensive, safe, and reliable. However, these batteries have low energy, poor cold-temperature performance, and short life cycles. These batteries typically are used only in electric drive vehicles for ancillary loads.
- Ultracapacitors store energy in a polarized liquid between an electrode and an electrolyte. Ultracapacitors can provide vehicles additional power during acceleration and hill climbing and help recover braking energy.

According to EVgo Services LLC., one of the largest public fast-charging networks in the United States, and the United States Department of Energy, electric vehicle chargers are classified based on the speed by which the charger recharges a battery. There are three levels of plug-in chargers:

- Level 1 charger uses a standard household 120 volt wall outlet to charge an electric vehicle. A level 1 charger has the ability to charge most electric vehicles on the market and takes over 8 hours to charge an electric vehicle for approximately 75 to 80 miles at a charging rate of 2 to 5 miles of range per hour.

- Level 2 charger requires a specialized station that provides power at 240 volts. A level 2 charger has the ability to charge most vehicles on the market and takes approximately 4 hours to charge a battery to 75 to 80 miles at a charging rate of up to 25 miles of range per hour.
- Level 3 chargers (DC fast charger) are located at dedicated electric vehicle charging stations and charge a battery, using specialized equipment through a 480 volt input, up to 80 percent capacity or 90 miles in approximately 30 minutes. A level 3 charger is compatible only with certain models of electric vehicles, as it requires a special plug that is not compatible with the plug used for level 1 and 2 chargers. There are no level 3 chargers in North Dakota.

In addition to the three types of charging, wireless charging is being developed, using an electromagnetic field to transfer electricity to an electric vehicle without a cord. Wireless chargers currently are available in only certain models of electric vehicles, as the technology is being developed.

INFRASTRUCTURE, CHARGING STATIONS, FEES AND RELEVANT INFORMATION REGARDING OTHER STATES AND TRENDS

According to the *North Dakota Transportation Handbook 2019*, in 2018 North Dakota had 141 electric vehicles and 3,849 hybrid electric vehicles registered, which includes passenger cars, pickups, and light trucks. In 2017 the state had 562,341 licensed drivers, and approximately 1.1 million vehicle registration renewals were issued. As of 2018, there were 106,978 miles of road in the state, which includes approximately 7,414 miles of road on the state highway system. The Department of Transportation maintains approximately 8,622 miles of highway, including miles in each direction on four-lane highways. The state has 3,720 miles of road on the National Highway system, including 571 miles of interstate road that are a part of the state highway network. The remaining mileage is a combination of county roads, other rural roads, city streets, and trails. State highways make up approximately 7 percent of the total miles of road in the state. However, 63 percent of all vehicle miles traveled occur on state highways, with the remainder occurring on other public roads.

The Department of Transportation's main source of state funding for road maintenance comes from state fuel taxes, and a smaller amount comes from vehicle registration fees. The state fuel tax is 23 cents per gallon. From 2015 to 2017, the state generated \$198.5 million in gasoline/gasohol taxes, \$184.6 million in vehicle registration fees, and \$146.3 million in diesel fuel taxes. Additional transportation funding comes from the federal government. The federal fuel tax is 18 cents per gallon for gasoline and 24 cents per gallon for diesel fuel.

As of 2017, it cost \$1 million per mile for asphalt surfacing reconstruction. From 2005 to 2017, all vehicle traffic numbers on state highways have increased 30 percent.

According to the United States Department of Energy, there are thousands of public electric vehicle charging outlets in the United States. Over 22,000 public charging outlets exist in California, while there are 29 public charging outlets in Alaska. North Dakota has 40 public charging outlets.

Information from driveelectricnd.com indicated level 2 medium charging stations exist at the following locations:

- Lignite Energy Council - Bismarck
- Roosevelt Place Hotel - Bismarck
- Lake Metigoshe State Park - Bottineau
- International Peace Garden - Interpretive Center - Dunseith
- Happy Harry's Bottle Shop - Fargo
- Luther Family Ford - Fargo
- Sanford Health - Fargo
- Prairie Knights Casino & Resort - Fort Yates
- Minnkota Power Cooperative - Grand Forks
- Best Western - Grand Forks
- Nissan of Grand Forks - Grand Forks
- University of Jamestown - Jamestown

- RM Stoudt - Jamestown
- National Buffalo Museum - Jamestown
- NISC - Mandan
- Ryan Nissan - Minot
- Minot Automotive Center - Minot
- West Fargo Sports Arena - West Fargo
- Element Fargo - West Fargo
- Mountrail Williams Electric Cooperative - Williston

According to the National Conference of State Legislatures, at least 25 models of plug-in electric vehicles were available in the United States as of 2017. Over 600,000 vehicles have been sold in the United States. More than 16,000 charging stations exist in the United States, with more than one-half of those being built since 2015. Forty-five states provide incentives for electric and hybrid vehicles. The incentives range from tax credits and rebates to exemptions from emissions testing. North Dakota is one of five states that does not have any laws or policies specifically impacting the buying of an electric vehicle or the building of electric vehicle supply equipment. As of 2019, 26 states have enacted legislation to implement a special registration fee on alternatively fueled or electric vehicles in addition to the standard registration fees. The fees vary from \$50 to \$200 per year in addition to standard motor vehicle registration fees. North Dakota joined other states that have a special registration fee on electric vehicles with the passage of Senate Bill No. 2061 (2019).

COSTS TO BUILD OUT ELECTRIC VEHICLE INFRASTRUCTURE AND CHARGING STATIONS IN THE STATE

According to a 2015 United States Department of Energy report entitled *Costs Associated with Non-Residential Electric Vehicle Supply Equipment - Factors to Consider in the Implementation of Electric Vehicle Charging Stations*, the average cost of electric vehicle charging supply equipment and installation for charging stations was:

- Single port level 1 charging unit: \$300 to \$1,500 equipment, \$0 to \$3,000 installation
- Single port level 2 charging unit: \$400 to \$6,500 equipment, \$600 to \$12,700 installation
- Single port level 3 (DC fast charging) charging unit: \$10,000 to \$40,000 equipment, \$4,000 to \$51,000 installation

RELEVANT NORTH DAKOTA LEGISLATION REGARDING ELECTRIC VEHICLES

There were several bills introduced during the 2019 legislative session related to electric vehicles.

- House Bill No. 1238, as introduced, would have required all-electric motor vehicle owners to pay an initial and renewal registration fee of \$180 each year, or the owner could have chosen to provide a sworn affidavit of the vehicle's mileage traveled during the 12-month cycle and paid an amount equal to one-half cent per mile. The bill was amended to adjust the amount to \$120 each year and remove the option to pay a per mile fee. The bill failed to pass the Senate.
- House Bill No. 1405 mandates that a parking space designated for a plug-in electric vehicle must be indicated by signage approved by the Department of Transportation which indicates the space is for plug-in electric vehicle charging only. The signage must be consistent with the United States Federal Highway Administration's *Manual on Uniform Traffic Control Devices for Streets and Highways*. The bill prohibits an individual from stopping, standing, or parking a motor vehicle within any parking space specifically designated for parking and charging a plug-in electric vehicle unless the motor vehicle is connected to the charger. A fee of \$50 applies for unauthorized use of a space designated for plug-in electric vehicles.

STUDY APPROACH

In conducting this study, the committee may wish to receive testimony from:

- The United States Department of Transportation and North Dakota Department of Transportation regarding the electric vehicle infrastructure coalition and infrastructure concerns;
- The Highway Patrol;
- The Public Service Commission regarding electricity and vehicle charging costs;

- The Upper Great Plains Transportation Institute;
- The Industrial Commission;
- The North Dakota Motor Carriers Association;
- The North Dakota League of Cities;
- The Department of Commerce; and
- Representatives of the utility industry and electric vehicle stakeholder groups.

The committee also may seek additional information regarding electric vehicles, infrastructure, costs, and best practices from organizations such as the National Conference of State Legislatures.