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Memorandum

October 18, 2019

TO: Interested Persons

FROM: Katie Ruedebusch, Fiscal Analyst, 303-866-3001

SUBJECT: Electric Vehicles in Colorado

Summary

This memorandum provides an overview of electric vehicles, including vehicle electrification policies, electric vehicles in Colorado, recent Colorado legislation, and future considerations.

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Background

In 2018, approximately 17 million vehicles were sold in the United States.[1] The majority of the vehicles sold are powered by an internal combustion engine; however, a growing number of these vehicles are electric. According to BloombergNEF, one of the leaders in electric vehicle forecasting, worldwide electric vehicles sales will grow from 2 million in 2018 to 28 million in 2030 and 56 million by 2040.[2]

Electric vehicle definitions. Electric vehicles, or EVs, are vehicles that rely on electric motors for propulsion, instead of the traditional internal combustion engine. Overall, there are two categories of EVs: hybrid and plug-in. Hybrid EVs, such as the Toyota Prius, have both internal combustion engines and electric motors that store energy, while plug-in EVs connect to external sources of electricity to recharge. The main difference between the two vehicles is in the way the vehicles charge their batteries: hybrid EVs recharge through braking and the internal combustion engine in the vehicle, while plug-in EVs are recharged from an outlet. In addition, there are two types of plug-in EVs:

- *Battery electric vehicles (BEV).* A BEV, or an all-electric vehicle, is an EV that runs entirely on an electric motor and rechargeable battery. A current market example of a BEV is the Nissan Leaf.

[1] *Vehicle Electrification: Federal and State Issues Affecting Deployment*, Congressional Research Service, https://crsreports.congress.gov/product/pdf/R/R45204, *last accessed on August 29, 2019.*
[2] *BloombergNEF Electric Vehicle Outlook 2019*, https://about.bnef.com/electric-vehicle-outlook/#toc-viewreport, *last accessed on August 29, 2019.*

- *Plug-in hybrid electric vehicles (PHEV).* PHEVs combine two propulsion modes: an electric motor and rechargeable battery that can be charged from an outlet, and a combustible engine. For example, a Chevrolet Volt, is able switch to gas once battery power is depleted.

Charging infrastructure. In order to operate, plug-in EVs need to connect to an electrical source in order to recharge the vehicle's battery. There are three major types of plug-in electric vehicle charging:

- ***Level 1*** charging is standard 120-volt outlet charging that requires no additional infrastructure. Level 1 charging is the slowest method of charging; after 10 hours, vehicles add about 40 to 80 miles of range. Level 1 charging capabilities come standard on all EVs and are mostly used for home charging.
- ***Level 2*** requires the installation of additional charging equipment to access 240-volt service. This level of charging is used in both residential and commercial settings and can provide anywhere from 10 to 60 miles per hour of charging.
- ***DC fast charging*** can provide charging up to 500-volts by using direct current (DC), which is very high powered and requires specialized equipment. DC charging can provide 60 to 80 miles of range in 20 minutes and is used almost exclusively at public charging stations. There are currently three different DC fast charging connector types on the market: CHAdeMO, CCS, and Tesla Supercharging.

Market trends. Sales of EVs have increased in recent years. According to BloombergNEF's 2019 Electric Vehicle Outlook, EVs will account for 57 percent of all passenger light duty vehicles sold worldwide in 2040. In addition, in a recent study of the impacts of EVs to Iowa's Road Use Tax Fund, the Iowa Department of Transportation estimates that electric vehicle sales will range from 10 to 33 percent of total U.S. vehicle sales by 2040.[3] No matter the forecast, the consensus is that EV sales will continue to grow because of several factors, including, but not limited to:

- reduction in battery production costs;
- longer range capabilities of EVs;
- increased availability of charging infrastructure;
- reduction in the overall cost of electric vehicles;
- greater vehicle model choice;
- continuing financial incentives; and
- greater awareness of the effects of emissions in the transportation sector.

Vehicle Electrification Policies

The federal and state governments have adopted several policies to incentivize and incorporate EVs into existing transportation infrastructure. Several of those polices are discussed below.

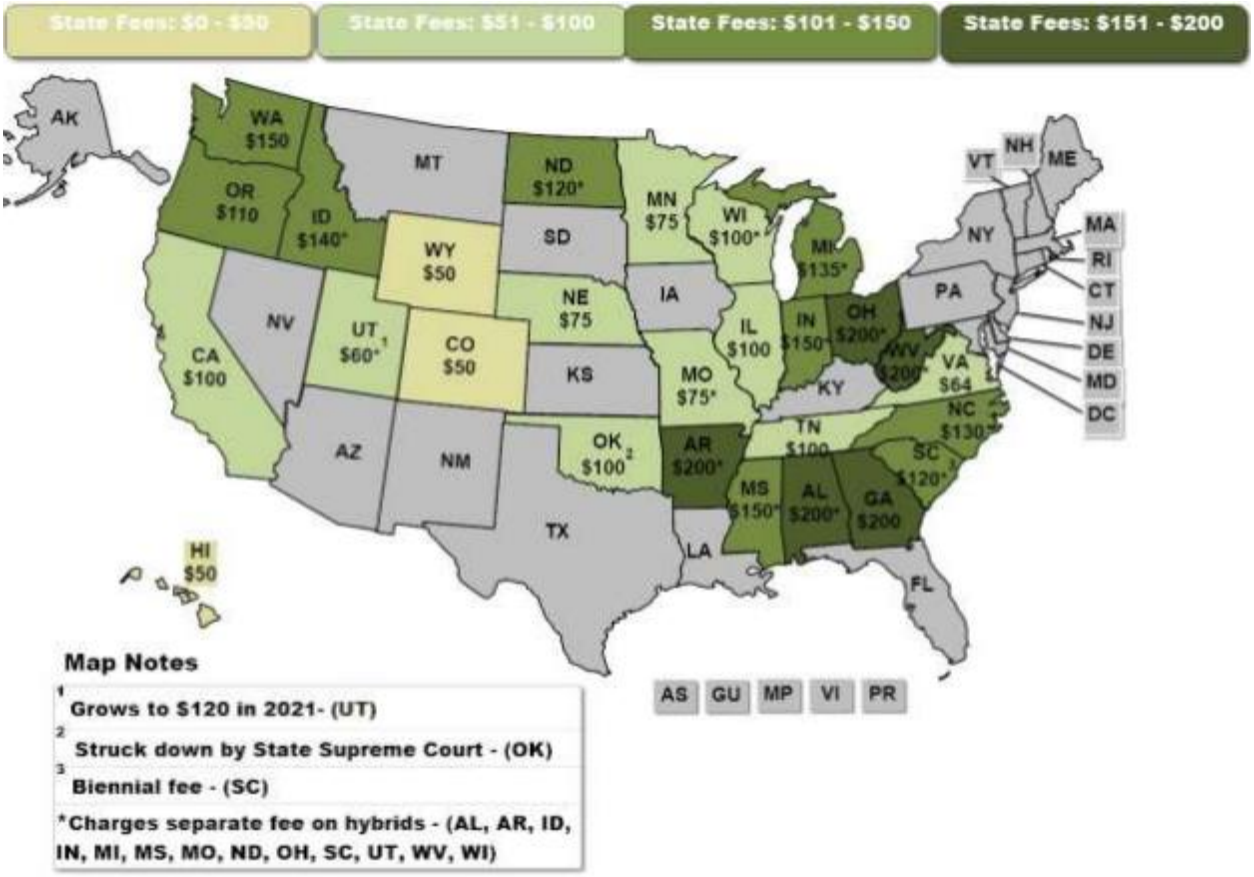
Incentives. The federal government, 45 states, and the District of Columbia offer several incentives to encourage the adoption of EVs. The major financial incentives for EV adoption are tax credits.

[3] *2018 Report on the Impact of Electric Vehicles to the Road Use Tax Fund*, Iowa Department of Transportation, http://publications.iowa.gov/29142/, *last accessed on August 29, 2019.*

Federal and state tax credits are available for individuals purchasing EVs, and for individuals or businesses to install alternative fuel vehicle refueling or charging infrastructure. While the most popular way to increase EV adoption is through tax or financial incentives, states have other policy options beyond tax credits. Other incentives include: adoption of electric fleet vehicle goals; grants for municipal bus electrification; emissions test waivers; parking fee exemptions; toll lane discounts; and programs through regulated electric utilities. In addition, the federal government and some states provides funding for research related to EVs or batteries.

Electric vehicle fees. According to the National Conference of State Legislatures, 26 states assess fees on EV owners. These fees range from $50 to $200. Some states' fees are a flat-rate fee, while other states charge an adjustable fee that increases with inflation, vehicle weight, or fuel economy. Colorado currently assesses a $50 fee on EVs at the time of annual vehicle registration. Figure 1 below shows the EV fees charged by across the United States. These fees are intended to offset lost transportation revenues which will not be paid by owners of EVs, and to fund EV infrastructure.

Figure 1
Electric Vehicle Fees

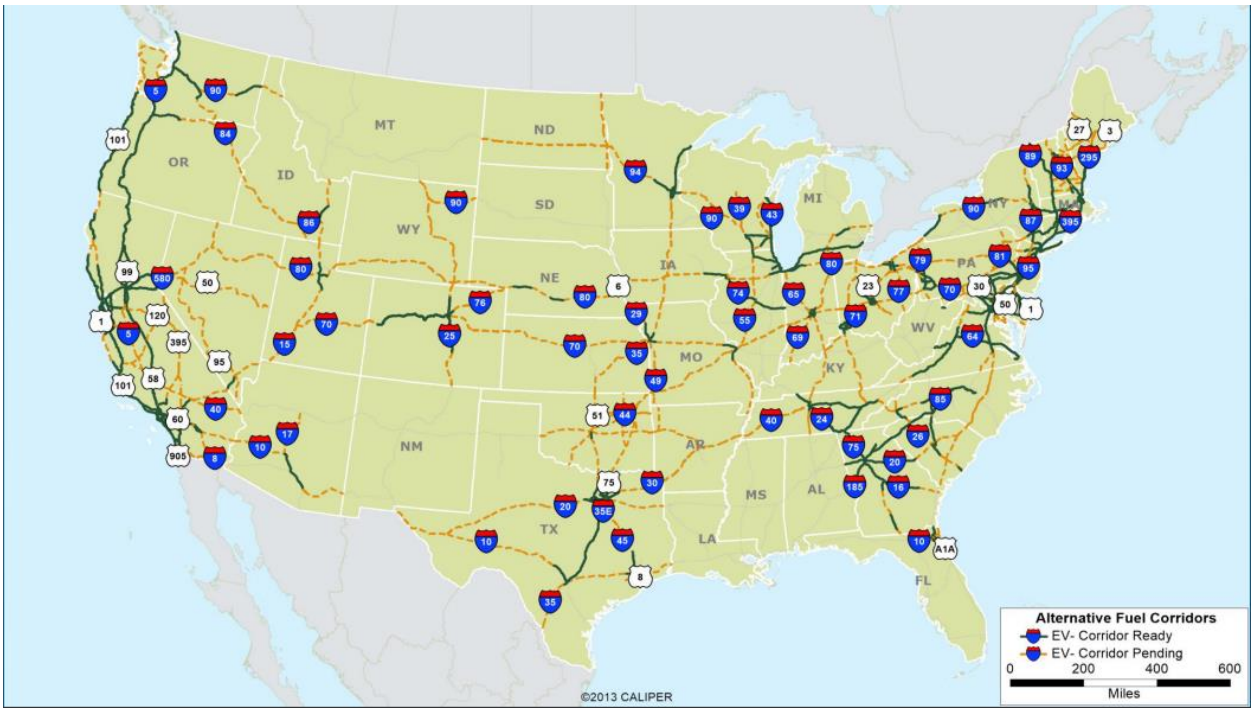


Source: National Conference of State Legislatures.

Alternative fuel corridors. The current federal transportation bill, Fixing America's Surface Transportation (FAST) Act passed by Congress in 2015, requires the U.S. Department of Transportation to designate national alternative fuel corridors, including corridors for EV charging.

To date, these corridors include 135,000 miles on 100 interstates in 46 states.[4] In order to be designated, a corridor must have electric vehicle charging facilities every 50 miles. The Federal Highway Administration has developed signage for the corridors, and several states have already begun installing them. Figure 2 below highlights all the ready and pending EV corridors in the United States.

Figure 2
Alternative Fuel Corridors: Electric Vehicle Corridors Ready and Pending through Rounds 1-3



Source: Federal Highway Administration.

In 2017, Colorado signed a memorandum of understating with Arizona, Idaho, Montana, Nevada, New Mexico, and Wyoming to create the Intermountain West Electric Vehicle Corridor. The states plan to make it possible to travel seamlessly with an EV across the signatory states. Colorado has progressed toward the group's goal through several initiatives and programs discussed in the following sections.

Low-emissions vehicle standards. The California Air Resources Board developed the nation's first vehicle emissions standards in 1966. In 1967, Congress passed the Air Quality Act of 1967, which created federal vehicle emissions standards and preempted states from setting their own vehicle emissions standards. However, the 1967 act specifically exempted California. Section 177 of the Clean Air Act allows other states to follow California's emission standards. These standards, generally

[4] *Alternative Fuel Corridors Handout*, Federal Highway Administration, https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/resources/afc_handout/index.cfm, *last accessed on August 27, 2019.*

referred to as low-emissions vehicle (LEV) standards, have traditionally moved toward greater fuel efficiency and the increased adoption of low emission vehicles. Currently, Colorado and 12 other states (Connecticut, Delaware, Maine, Massachusetts, Maryland, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington), and the District of Columbia follow California's LEV standards.

Zero emissions vehicle (ZEV) standard. In addition to the LEV standard, California has a ZEV standard which is followed by Colorado and nine additional states (Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont). The ZEV standard requires major manufacturers of passenger cars and light trucks (up to 8,500 pounds) to attain a certain number of ZEV credits depending on the number of vehicles produced and delivered for sale in the state.

Electric Vehicles in Colorado

Colorado has one of the highest adoption rates of EVs in the United States.[5] In response, the state has implemented a wide range of laws, regulations, and programs addressing EVs in Colorado.

Colorado Electric Vehicle Plan. In 2017, Governor John Hickenlooper signed Executive Order D 2017-015, Supporting Colorado's Clean Energy Transition. In the order, Governor Hickenlooper directed the Colorado Energy Office (CEO), the Regional Air Quality Council, the Colorado Department of Public Health and Environment, and other state agencies to create a statewide EV plan. In January 2018, the Colorado Electric Vehicle Plan was released.[6] The plan includes strategies, actions, and goals for EV fast-charging corridors and accelerating EV adoption in Colorado.

Electric Vehicle Grant Fund. The main funding mechanism for electric vehicle infrastructure in Colorado is the Electric Vehicle Grant Fund. The EV Grant Fund was established in 2009 through Senate Bill 09-075 to provide grants to local governments to install EV charging stations. The CEO administers the program under the name Charge Ahead Colorado. Initially, the CEO was limited to funding stations through gifts, grants, donations, or other existing funds. In 2013, the General Assembly provided funding through House Bill 13-1110, which created a $50 annual EV registration fee on EV owners, $30 of which goes to the Highway Users Tax Fund, and the remaining $20 of which provides funding to the grant program. In 2013 and 2014, Senate Bill 13-126 and Senate Bill 14-028 expanded eligible recipients of the EV Fund beyond local governments. Recently, House Bill 19-1198 further expanded the use of the EV Grant Fund. Currently:

- the fund may cover the CEO's program administration costs;
- the CEO may prioritize grants based on criteria it defines;
- grants may cover operating costs of EV charging stations in addition to installation; and
- the fund is continuously appropriated to the CEO.

[5] *Colorado Electric Vehicle Plan*, Colorado Energy Office, https://www.colorado.gov/pacific/energyoffice/charge-ahead-colorado, *last accessed on August 29, 2019.*
[6] *Id.*

The competitive grant process takes place three times per year. Grants are made for installation at workplaces, parking lots and garages, multi-family dwellings, and municipal facilities. Grants cover up to 80 percent of project costs up to a cap based on charging station type. As of writing, the fund has provided 73 grants.

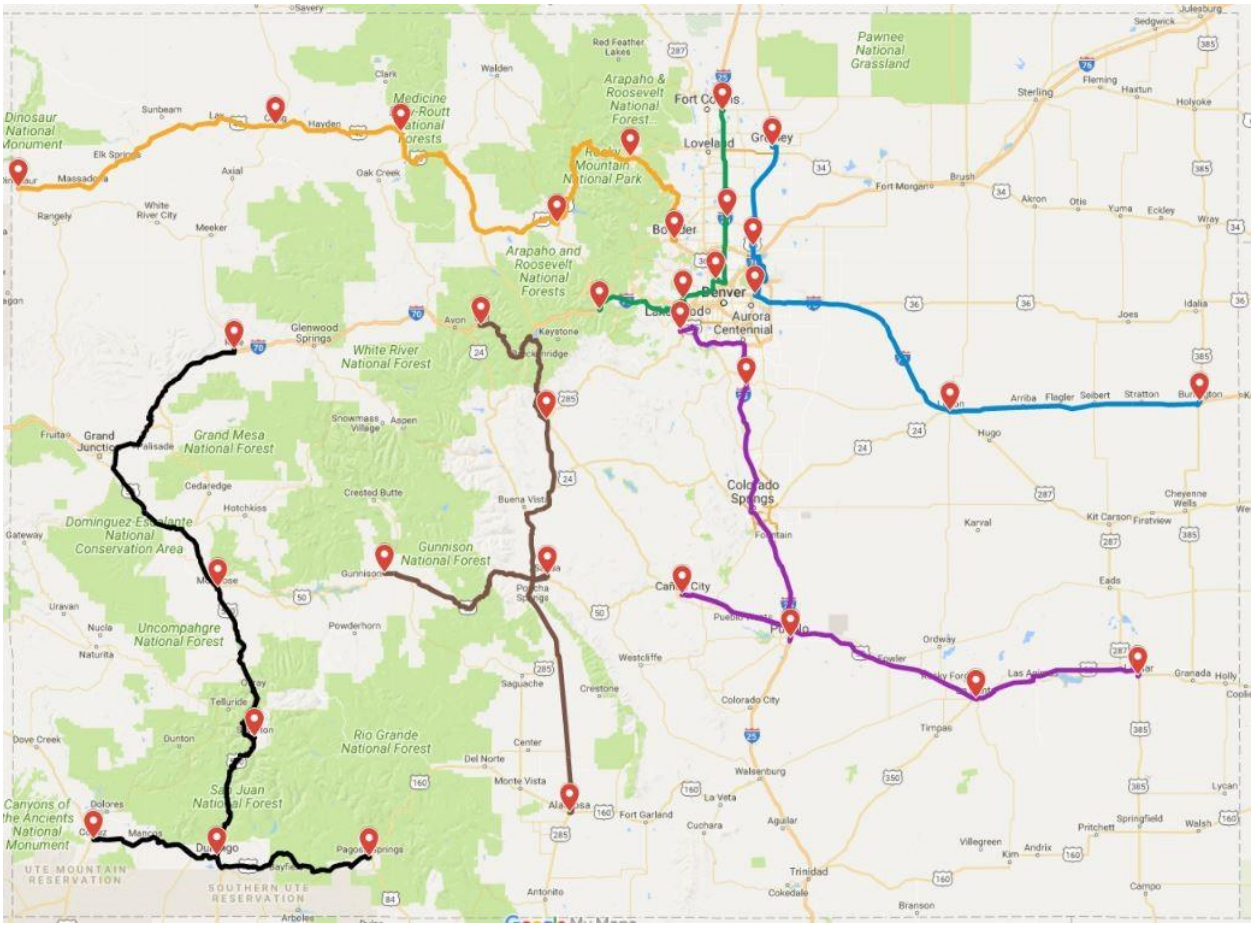
Colorado ZEV program. In January 2019, Governor Jared Polis signed Executive Order B 2019 002, Supporting a Transition to Zero Emission Vehicles. The order required the Department of Public Health and Environment, through the Air Quality Control Commission, to develop and adopt rules to create a Colorado ZEV program. Colorado adopted a ZEV standard on August 16, 2019, stating that 4.9 percent of the vehicles sold in Colorado must be ZEV vehicles by 2023 and up to 6.1 percent by 2030. Manufacturers can use a limited number of credits, capped at 36 percent, from other EVs sold in other states; however, manufacturers and motor vehicle dealers may start meeting the ZEV standards in 2020 to receive credits that apply in Colorado from 2023 to 2025.

Current low-emission or hybrid vehicle program. The Colorado Department of Transportation began a limited low-emission or hybrid vehicle program in 2008 that allowed qualified vehicle owners to apply for a permit to use high-occupancy vehicle and high-occupancy toll lanes with a single occupant. The program has reached its quota of 2,000 permits, with new applicants being placed on a waiting list.

Additional EV programs. In addition to administering Charge Ahead Colorado, the Electrify America program, a part of the Volkswagen settlement (discussed below), plans to build out EV charging infrastructure nationwide. The city and county of Denver was chosen to receive a portion of the first cycle of funds, with the second cycle including investments in both Denver and the city of Boulder. In addition, Refuel Colorado provides EV education and coaching throughout the state. The program works with both public and private sector institutions to encourage EV adoption. Although it is currently on hold, the Colorado EV Wired Workplaces program recognized workplaces in Colorado that promote EV charging while at work.

Volkswagen Diesel Emissions Settlement. Colorado received $68.7 million as part of the recent nationwide Volkswagen Diesel Emissions Settlement. Approximately half of the funds received in the settlement will be distributed to replace school buses, transit buses, and other heavy equipment with alternative fuel or EV vehicles. A portion of the funds are used for ALT Fuels Colorado EV Fast-Charging Corridors Grant Program administered by CEO. The grant program awards funds to public-private partnerships to install EV fast-charging stations along interstates and state highways in Colorado. In April 2019, the CEO awarded a grant of $10.33 million to ChargePoint, a private charging infrastructure company, to build and install 33 DC fast chargers along six travel corridors throughout the state. Figure 3 below shows the locations of these new DC fast charging stations.

Figure 3
ALT Fuel Colorado EV Fast-Charging Corridors



Source: Colorado Energy Office.

Recent Legislation

In addition to the bills discussed previously in the sections above, the General Assembly passed several bills related to EVs in 2019:

- *House Bill 19-1159.* Currently, the state allows a refundable, transferable income tax credit for purchasers and lessees of innovative passenger vehicles and trucks, including vehicles powered by electricity, natural gas, and hydrogen that was set to expire in 2022. House Bill 19-1159 modified the income tax credit for electric and plug-in hybrid electric passenger vehicles and trucks, and the credit for hydrogen passenger vehicles, by extending the credit for tax years 2022 through 2025. Buyers of a new alternative fuel vehicle are eligible for a state tax credit of credit of $4,000 in 2020 and $2,500 in 2021 and 2022, and $2,000 in 2023, 2024, and 2025.

- *House Bill 19-1298.* House Bill 19-1298 allows an owner of public or private property to install a sign that identifies a parking space as a charging station and creates a class B traffic infraction for

parking a motor vehicle in a parking space designated for charging a plug-in electric motor vehicle unless the vehicle is parked for the purpose of charging. Violators are subject to a $150 fine.

- *Senate Bill 19-077*. Senate Bill 19-077 allows a public utility to apply to the Public Utilities Commission (PUC) in the Department of Regulatory Agencies to provide electric vehicle charging services as regulated or unregulated services. Utilities must submit applications to the PUC no later than May 15, 2020, and by that date every three years thereafter. Utilities may recover costs of the electric vehicle charging system investment.

Current Incentives in Colorado

The state innovative motor vehicle income tax credit is intended to reduce the cost of alternative fuel vehicles and incentivize their purchase. The state allows a refundable, transferable income tax credit for purchasers and lessees of innovative passenger vehicles and trucks, including electric vehicles. The income tax credit may only be awarded for the purchase or lease of new vehicles, not used vehicles. A qualifying lease must have a minimum duration of two years. The income tax credit is not available for hybrid vehicles that do not connect into an external electrical source.

Table 1 presents the value of the tax credit for purchases and leases of each electric vehicle for tax years 2020 through 2025

Table 1
State Income Tax Credits for Alternative Fuel Vehicles

Tax Year	2020	2021	2022	2023	2024	2025
Electric Passenger Vehicles						
Purchase Vehicles	$4,000	$2,500	$2,500	$2,000	$2,000	$2,000
Leased Vehicles	$2,000	$1,500	$1,500	$1,500	$1,500	$1,500
Light Duty Electric Truck						
Purchased Vehicles	$5,500	$3,500	$3,500	$2,800	$2,800	$2,800
Lease Vehicles	$2,750	$1,750	$1,750	$1,750	$1,750	$1,750
Medium Duty Electric Truck						
Purchase Vehicles	$8,000	$5,000	$5,000	$4,000	$4,000	$4,000
Leased Vehicles	$4,000	$2,500	$2,500	$2,500	$2,500	$2,500
Heavy Duty Electric Truck						
Purchased Vehicles	$16,000	$10,000	$10,000	$8,000	$8,000	$8,000
Leased Vehicles	$8,000	$5,000	$5,000	$5,000	$5,000	$5,000

Source: Colorado Legislative Council Staff.

Future Considerations

Many factors may impact electric vehicle growth in Colorado and the United States. Along with factors increasing EV adoption discussed above, the factors limiting growth include: the availability of charging infrastructure; vehicle cost; the repeal or expiration of incentives; gas prices; improved fuel efficiency in internal combustion vehicles; the cost of special registration fees; and the cost of electricity. Many of these limiting factors are being addressed by governments and the private sector.

However, two impacts, transportation funding and state utility regulation, will require more consideration from governments in the future as EV adoption accelerates.

Transportation revenue. All 50 states, the District of Columbia, and the federal government levy a motor fuel tax, or gas tax. According to the American Association of State Highway and Transportation Officials, as much as a third of transportation funding in the United States comes from the gas tax.[7] As EV adoption increases, governments may face declining gas tax revenue. Governments may have to find alternative funding methods, such as sales taxes, road-usage charges, higher electric vehicle fees, or increased toll collections, in order to adjust for the lost revenue.

Public utilities and electric vehicle infrastructure. Increased adoption of EVs may impact energy consumption, and these impacts will affect electric utility providers. Electric utilities may play an active role as they look to provide incentives for off-peak charging or to operate vehicle charging stations. Although federal and local governments have some authority over electric utilities, states may play a larger role in determining the regulatory structure and changing nature of electricity use caused by the growth in EV adoption. Future issues states may need to address include cost recovery issues; utility planning; load forecasting; protections for low-income consumers; and support for infrastructure corridors.

[7] *Transportation Funding & Financing*, Build America Transportation Investment Center Institute http://www.financingtransportation.org/funding_financing/funding/, *last accessed on August 29, 2019.*