Sales of electric vehicles have risen dramatically in recent years. From advantages such as increased fuel economy and energy security, to tax incentives for consumers and emissions reductions, electric vehicles offer a host of benefits. While the federal government offers incentives and other programs relating to electric vehicles, states, both individually and collaboratively, are developing their own policies in relation to these new vehicle technologies.

Types of Electric Vehicles
Electric vehicles use electricity as either their primary fuel or to improve the efficiency of a traditional gasoline or alternative fuel powered car. Plug-in electric Vehicles, or EVs, generally come in two types:

- All-electric vehicles: EVs run on a motor powered by electric energy stored in a chargeable battery. They must be plugged into a power source to charge the battery. Typical EVs can travel approximately 100 miles on a fully charged battery, however EVs such as the Tesla Model S have 240 miles of range.
- Plug-in hybrid electric vehicles: Like EVs, PHEVs use a battery to store electric energy that powers a motor. However, PHEVs also contain an internal combustion engine that runs on gasoline or alternative fuel. The PHEV can be plugged into an electric power source to charge the battery and can run almost solely on electricity for short distances, typically 10–40 miles, before the internal combustion engine is needed to power the vehicle.

Why are Electric Vehicles Important?
Electric vehicles have the potential to offer a host of benefits to consumers, the environment and public health. A new report estimates that the electricity and transportation sectors combined could achieve a 48 percent reduction in greenhouse gas emissions between 2015 and 2050, with reductions coming from vehicle electrification, existing programs to improve efficiencies in conventional vehicles and a cleaner electricity sector. The same report also projects that electric vehicles can aid in the reduction of particulate matter and ground level ozone in urban and rural areas throughout the nation.

In addition, electric vehicles reduce dependence on petroleum, resulting in the use of more domestic energy resources that are often cheaper and have less volatility in price. Electric vehicles also have the potential to spur the creation of innovative, advanced industries and enhance job opportunities.

Furthermore, in most parts of the country it is far cheaper to drive an electric vehicle compared to a conventional
gasoline-powered vehicle. According to the U.S. Department of Energy, the average cost to drive an electric vehicle is half the cost to drive a similar vehicle that runs on gasoline.

**Sales and Market Share of Electric Vehicles in the United States**

Electric vehicle sales have been increasing dramatically as cheaper batteries have decreased prices and more charging stations are installed across the country.

“This generation” plug-in electric vehicle sales began in 2010, with the introduction of the Nissan Leaf and the Chevrolet Volt. While total plug-in electric vehicle sales were approximately 17,000 in 2011, just four years later, 2015 sales topped 123,000 through November. In addition, while the Leaf and Volt continue to be among the most popular EVs, most major automobile manufacturers now offer at least one plug-in electric vehicle model, with more than 27 models currently on the market. In 2015, the most popular model was the Tesla Model S, an estimated 22,100 of which were sold through November 2015.

**Barriers to the Adoption of Electric Vehicles**

Despite rapidly increasing sales, plug-in electric vehicles represented only 0.7 percent of the market share for vehicles sold in the United States in 2014. When combined with hybrid electric vehicles, the total market share for all electric drive vehicles rises to approximately 3.5 percent.

Although sales have improved dramatically in recent years, electric vehicles are not selling as well as initially predicted. Research cited by *The Wall Street Journal* indicates consumers are not familiar with the vehicles and have misconceptions about the cars. In addition, the typically higher prices of electric vehicles can be a deterrent to consumers.

Misconceptions and unfamiliarity tend to revolve around what is commonly known as “range anxiety” —the fear of running out of power. While such fears tend to taper as consumers gain experience driving electric vehicles, the installation of charging station networks and access to charging at homes and workplaces is also key to ensuring consumer confidence.

**Electric Vehicles Raise a Host of Policy Issues that are Relevant to State Policymakers**

States and the federal government have instituted a variety of policy initiatives related to electric vehicles. Policies tend to address education, research and development, transportation funding, consumer and manufacturer incentives, permitting and code requirements for charging stations, battery recycling and disposal, charging infrastructure, and the integration of charging stations with the electric grid.

As described above, some barriers exist that have resulted in impediments to electric vehicles penetrating the market. The federal and state governments are exploring a variety of options to encourage electric vehicle deployment.

First, the federal government, through the U.S. Department of Energy’s Clean Cities Program, has built a national network of stakeholders and local coalitions to advance alternative fuel vehicles at the local level. The Clean Cities Program also provides funding opportunities to increase the availability of alternative fuel vehicles and infrastructure, and technical expertise to educate consumers and those working to advance alternative fuel vehicles. For example, the Clean Cities Program provides incentives to convert vehicle fleets to electric vehicles.

The federal government also provides funding for research and development, particularly in developing more efficient and lower-cost battery technologies. The development of higher performing batteries that
allow for longer vehicle miles on a single charge would increase consumer confidence and reduce the cost of electric vehicles.¹⁰

These tools will be particularly important for states since state governments will be a key avenue for promoting readiness for electric vehicles. These tools, such as the U.S. Department of Energy’s Plug-In Electric Vehicle Readiness Scorecard (2014) or the Rocky Mountain Institute’s Project Get Ready (2014) can help states assess the various policy options available to them. These include streamlined permitting requirements and utility regulations for charging stations, building code requirements, electricity pricing policies, financial incentives for electric vehicles, zero-emissions vehicle standards, dealership franchise laws, state procurement policies and more. A more detailed discussion of some of the policies states are implementing in relation to electric vehicles follows.

Financial Incentives
Generally, the most familiar form of promoting electric vehicles is monetary incentives. Tax credits are available at the federal and state level. The federal tax credit can be as high as $7,500 depending on the type and manufacturer of the vehicle, while state tax incentives vary in amount and the kinds of vehicles covered. An overview of state tax incentives can be found in the infographic (below). While tax incentives can encourage consumers to purchase electric vehicles, recent research has found that rebates and sales tax exemptions that are realized immediately upon the purchase of the vehicle rather than recouped through tax returns are more effective than tax credits in promoting consumer action. In addition, more education is needed on the availability of these tax incentives, as a recent study found that 94.5 percent of drivers did not know tax credits were available for the
purchase of electric vehicles.\textsuperscript{11}

States also provide ownership incentives that reward purchasers of electric vehicles by reducing the cost to own the vehicle. These incentives include exemptions from registration fees, vehicle inspections, reduced roadway taxes or tolls, and financial incentives for installing charging stations. Many states also provide incentives for using the electric vehicle, such as the ability to drive in otherwise restricted lanes.

**Charging Infrastructure**\textsuperscript{12}

Charging technology is a key factor to increasing deployment of electric vehicles. Charging technology for electric vehicles is currently limited to AC level 1 (120 V) and AC level 2 (240 V) chargers, which charge vehicles slowly and are used when charging time is not a priority, and fast DC chargers that are used when charging time is a prime consideration. AC charging stations typically provide about 10–20 miles for each hour of charge.

According to the U.S. Department of Energy, in 2015 there were about 9,300 public charging stations in the United States, over 90 percent of which were AC charging. While much attention has focused on
the availability of charging stations away from homes to extend the range of electric vehicles, research has shown that only about 15 percent of charging events occur away from homes and vehicles in the U.S. spend about 80 percent of their time at home. However, only an estimated 22 percent of all U.S. vehicles have a dedicated parking spot available at the home that would allow for charging access.

Therefore, lack of access to charging infrastructure at homes represents a significant barrier to plug-in electric vehicle adoption for many Americans, especially those that rent their homes, live in multifamily dwellings, or those without a dedicated parking spot that rely on on-street parking. While changing existing infrastructure to allow for dedicated parking spots with charging infrastructure at these locations would be difficult, some states, such as California, have attempted to address this problem by requiring new multifamily dwellings to be able to support future charging installations.

In addition to home charging, charging installations are becoming more available at workplaces, which could provide an alternative for those who do not have access to charging capabilities at home. Public charging stations, while currently not heavily used or relied upon, are nonetheless critical to provide confidence to drivers and to allow for long-distance travel. At this time, some states provide a tax credit, rebate or subsidies to individuals and businesses to encourage the installation of charging stations. Although research is inconclusive as to whether lack of public charging facilities represents a market barrier for electric vehicles, more research will be necessary to determine the extent to which public infrastructure can help promote electric vehicle adoption and in what ways states might support infrastructure development.

Finally, state policymakers can further encourage the fast and efficient installation of charging stations by streamlining permitting and updating building and electrical codes to address charging station installation. Some jurisdictions are updating their building codes to require new construction to be compatible with future charging station installations. Other states are streamlining the permitting process for charging station installation in a way that provides for environmental protection and public safety, but also ensures efficiency in the permitting process.

**Transportation Tax Policies**

Another issue states are addressing regarding electric vehicles relates to transportation taxes. Traditionally, states have taxed motor vehicle fuels in an effort to recoup the costs of maintaining, improving and repairing roads. With the introduction of electric vehicles, some policymakers are concerned that revenue to fund road projects will decline since plug-in electric vehicles do not use fuel. An additional concern is that electric vehicle users will disproportionately benefit because they are using the roadways, yet not paying a fuel tax.

With the limited market penetration of electric vehicles at this point, it is unlikely that the lack of fuel tax revenue from electric vehicles will have anything but a negligible impact on state transportation budgets over the next few years. In addition, electric vehicles still contribute to state transportation budgets through motor vehicle taxes, fees and other revenue such as sales tax. However, as electric vehicles continue to penetrate the market, policymakers will need to consider alternative transportation funding solutions to ensure appropriate funding and fairness between users of transportation infrastructure.

Some states already have begun to address this issue. Because fuel economy is improving among gasoline-powered vehicles, which also results in decreases in fuel taxes paid, policymakers are considering switching to mileage-based fees in place of a fuel tax. Other states are imposing special taxes, fees or other charges on electric vehicles to make up for the lost fuel tax revenue. However, the imposition of fees and costs on electric vehicles could deter their adoption and some analysts believe that policymakers should avoid imposing additional transportation taxes on electric vehicles until they are more ubiquitous in the marketplace.
Conclusion

Electric vehicles provide a host of benefits. As more consumers purchase electric vehicles, state policymakers increasingly will encounter options for promoting and regulating electric vehicles and the associated charging infrastructure. Electric vehicles may be a large part of the nation’s automobile fleet in the future and policymakers will need to be familiar with the issues these vehicles raise.

Resources:

1 U.S. Department of Energy, “Hybrid and Plug-In Electric Vehicles [4].”
4 U.S. Department of Energy, “eGallon: Compare the costs of driving with electricity [7].”
5 Inside EVs, “Monthly Plug-In Sales Scorecard [8].”
6 Electric Drive Transportation Association, “Electric Drive Sales Dashboard [9].”
9 https://cleancities.energy.gov/ [13].
13 Ibid [16].


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