

GROWING ELECTRIFICATION OF TRANSPORTATION



Technologies and Key Policy Trends

TECHNOLOGIES.

More than 1 million electric vehicles (EVs) are currently on the roads in the United States (see Figure 1).¹ These principally battery-powered EVs and plug-in hybrid EVs run on gasoline and electricity.²

EVs' many benefits are making them an attractive choice for consumers. Compared with the hundreds of working parts in a traditional internal combustion engine, battery-powered EVs contain only a handful of moving parts and thus requiring less maintenance.³ In addition, batteries respond more quickly than conventional engines, creating cars that are more responsive, have more torque and are quieter.⁴ EVs produce no tailpipe emissions and, depending on the source of electricity, their fuel can be produced emissions free. EVs are typically more digitally connected than conventional vehicles⁵ and have become the platform of choice for autonomous vehicle developers.⁶

ECONOMICS.

Although still a small part of the national fleet, EV sales are increasing quickly. Predictions for the anticipated

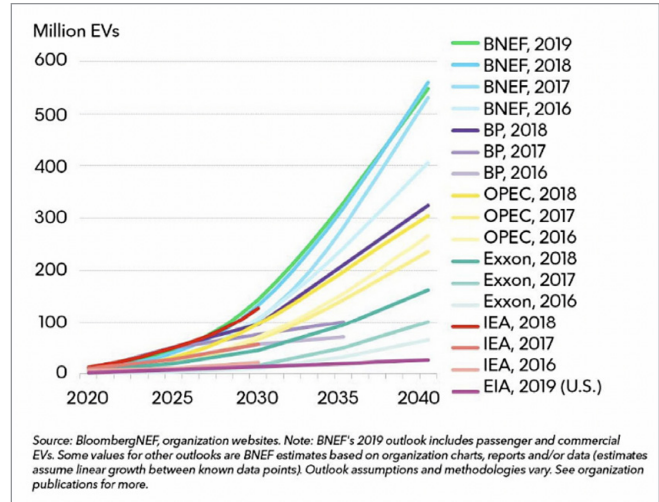


FIGURE 1: Electric vehicle outlooks, then and now

growth of U.S. EV sales vary greatly, but most forecasters (including the major oil companies) anticipate significant EV market growth and have continually revised their forecasts upward year after year.⁷

Automakers are investing heavily in EVs, with \$90 billion expected to enter the market over the next decade.⁸ In addition, 43 brands are expected to offer at least one EV option in the next four years,⁹ including sport utility vehicles (SUVs) and pickup trucks.¹⁰ Approximately 261 models are projected to be available by 2025.¹¹

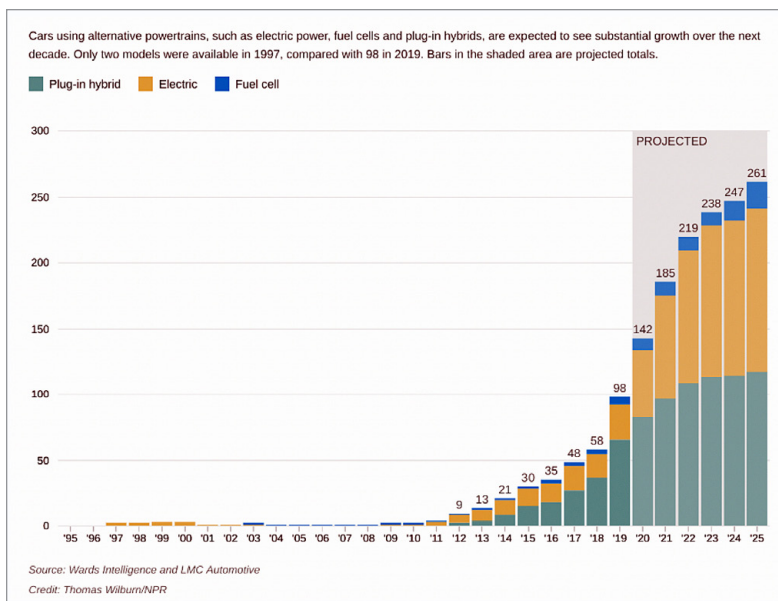


FIGURE 2: Non-gas vehicle models likely to triple by 2025

KEY POLICY TRENDS

State support for EVs remains strong.

Forty-five states offer incentives to accelerate adoption of EVs.¹² Another 14 states have established state EV adoption targets.¹³ Collectively, these states aim to have more than 3.3 million EVs on the road by 2025 (see Figure 2).



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New wave of EV models highlights need for public EV charging infrastructure. With dozens of new EV models (including SUVs and pickup trucks) reported to be in the product pipeline for debut by 2022,¹⁴ state legislatures and utility commissions are increasingly pushing to build public EV charging stations. In addition to taking advantage of billions of dollars in settlement funds from the Volkswagen diesel emissions test cheating, many states are exploring the role of their electric utilities in building the EV charging network needed. State public utility commissions (PUCs) have already approved roughly \$1 billion in utility EV infrastructure investments, with another \$1.5 billion in additional utility investments already proposed.¹⁵

The EV industry is moving on its own to address the EV charging station infrastructure gap. Automakers are moving to build an EV charging network to support vehicle sales. Tesla, for example, has already built a proprietary network of more than 13,000 chargers in 1,500 locations for its customers.¹⁶ Volkswagen has agreed, as part of its Clean Air Act civil settlement, to invest \$2 billion in a wholly owned subsidiary, Electrify America, to build an open-access national EV charging network.¹⁷ Most recently, General Motors (GM) announced a major effort to build fast direct current (DC) charging stations across the nation.¹⁸

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Opportunities, Challenges and State Solutions

OPPORTUNITIES. Electrifying the transportation sector offers a range of environmental, health and economic benefits. First, transportation is the largest source of U.S. anthropogenic greenhouse gas (GHG) emissions, having reached 36% in 2017.¹ Electric vehicles (EVs) produce no direct tailpipe emissions, which helps reduce urban air pollution and address GHG concerns. EVs also typically produce fewer life cycle emissions than conventional vehicles because power plants with modern pollution-control equipment are far cleaner than cars burning gasoline or diesel fuel, although the exact level of pollution benefit varies based on the local electricity mix.²

In addition to reduced fuel costs, EVs have significantly fewer moving parts than conventional vehicles,³ which reduces the consumer's life cycle maintenance costs.⁴ EVs may also be useful in smoothing electricity demand by encouraging refueling at times of excess generation and potentially providing power back to the grid during peak hours of demand.⁵ Meanwhile, public enthusiasm for EVs continues to grow.⁶

CHALLENGES. To achieve wide-scale adoption, EVs need to overcome several challenges. First, most consumers are unfamiliar with the technology and the array of vehicle options and incentives available.⁷ The high upfront costs for most EVs creates another barrier, although some experts predict that the cost of purchasing an EV will be less than a conventional vehicle by as soon as 2022 because of rapidly declining battery costs.⁸ Broader EV adoption will call for widespread public EV charging infrastructure.⁹ In addition, there are concerns that extensive adoption of EVs will cause stress on the existing electricity distribution infrastructure and drive the need for enhanced price signals.¹⁰

STATE SOLUTIONS. Governors have successfully advanced a range of state policies to accelerate adoption of EVs:

- ▶ **Use electric utilities to bridge the EV infrastructure gap.** Create partnerships with publicly regulated, investor-owned utilities to use ratepayer funds to build EV charging stations across the utility's service territories.
- ▶ **Invest Volkswagen's settlement funds in EV charging stations.** States can use the funds they received from the settlement of the Volkswagen diesel emissions test cheating to build EV charging infrastructure.
- ▶ **Provide financial incentives for EV supply equipment.** Offer incentives to defray the costs of installing EV supply equipment for residential, commercial and retail service stations.
- ▶ **Offer incentives beyond rebates.** Create innovative incentives such as high-occupancy vehicle (HOV) lane permits, special parking privileges, exempting EVs from emissions testing, offering discounts on tolls and reduced rates for charging.
- ▶ **Use the state vehicle fleet to lead by example.** Establish state government fleet requirements, acquisition goals or preferences for the procurement of EVs.
- ▶ **Establish zero emission vehicle (ZEV) mandates.** Require automakers to offer for sale a specific number of EVs in the state.
- ▶ **Incorporate transportation electrification into state and utility planning.** Create interagency work groups and integrate growing EV adoption rates into other, ongoing planning activities, such as utility integrated resource plans or congestion mitigation and air quality planning processes. Utilities can also consider offering separate rates for EVs to encourage optimal charging, including time-of-use rates or special nighttime pricing.
- ▶ **Update energy building codes to require EV-ready buildings and homes.** Incorporate into the state's energy building code a requirement to include a percentage of EV supply equipment or EV-ready parking spaces in all new construction.
- ▶ **Offer "cash on the hood" rebates.** Provide incentives to offset the upfront costs of EVs at the time of purchase.



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- 10 Electric vehicle drivers do not pay gasoline taxes, forcing states to find alternative ways to collect funds for roads and highways. National Governors Association will issue a separate white paper on this issue in the near future.



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State Solutions Spotlights

Governors have successfully advanced a range of state policies to accelerate adoption of electric vehicles (EVs):¹

- ▶ Offer “cash on the hood” rebates.
- ▶ Use electric utilities to bridge the EV infrastructure gap.
- ▶ Invest funds from the Volkswagen diesel settlement in EV charging stations.
- ▶ Provide financial incentives for EV supply equipment.
- ▶ Offer incentives beyond rebates.
- ▶ Use the state vehicle fleet to lead by example.
- ▶ Establish zero emission vehicle (ZEV) mandates.
- ▶ Incorporate transportation electrification into state and utility planning.
- ▶ Update energy building codes to require EV-ready buildings and homes.

Offer “cash on the hood” rebates. With Tesla and General Motors (GM) already having reached the 200,000-vehicle limit for the federal EV tax credit,² state incentives have become even more important (see Figure 3). Thirteen states — **California, Connecticut, Colorado, Delaware, Louisiana, Maryland, Massachusetts, New Jersey, New York, Oregon, Pennsylvania, Texas** and **Washington** — offer their own rebates or tax incentives for the purchase of a new EV.³ Washington has also created a rebate for the purchase of a used EV that retails for less than \$30,000.⁴

Ranging from \$1,500 to \$5,000, these “on the hood” incentives, that provide more immediate incentives than tax credits, have proven extremely effective. Revealingly, jurisdictions — including **Georgia** — that have removed or let sunset their EV tax incentives have experienced sales drops of more than 50%.⁵

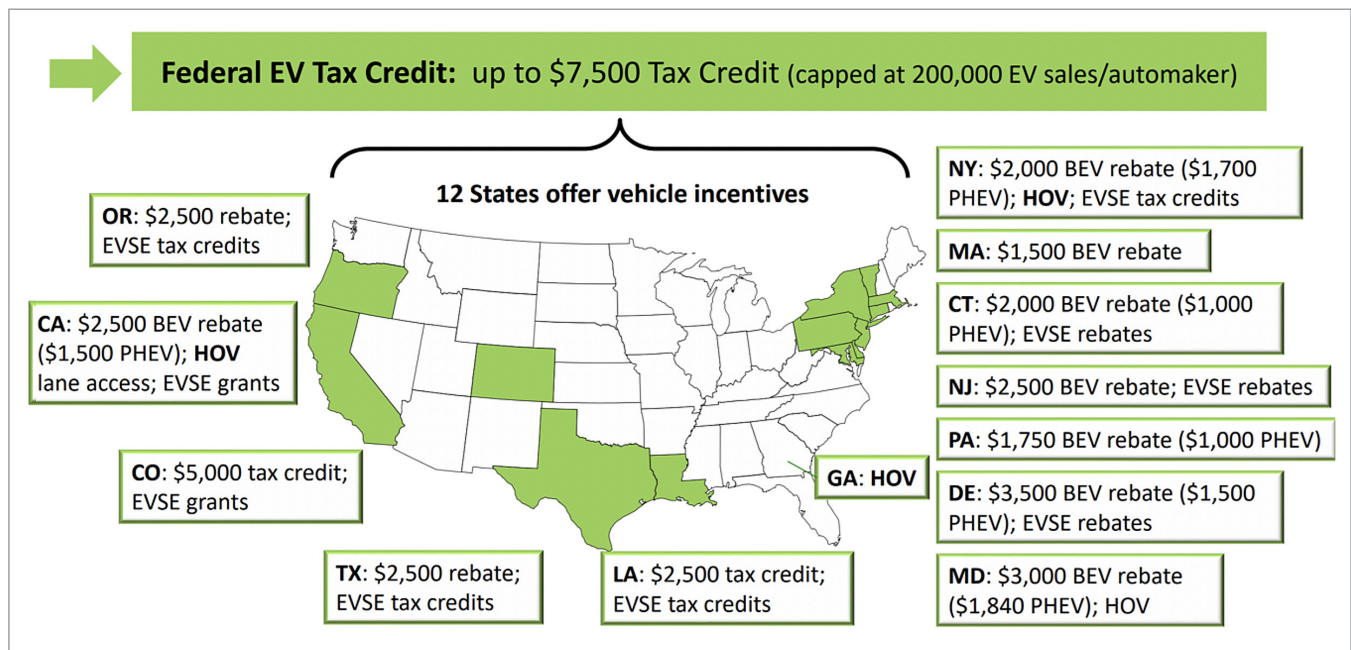


Figure 3: Key federal and state electric vehicle incentives (monetary and nonmonetary)

Source: Britta Gross, director of GM’s Advanced Vehicle Commercialization Policy, presentation at the National Governors Association’s North/Central Regional Transportation Electrification Workshop, Apr. 29, 2019.⁶



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USE ELECTRIC UTILITIES TO BRIDGE THE EV INFRASTRUCTURE GAP. Residential EV drivers do 80% of their EV charging at home,⁷ but broader EV adoption will necessitate widespread public EV charging infrastructure. Some estimate that EV charging infrastructure deployment must grow by 20% annually to meet a projection of 3 million EVs on the road by 2025.⁸

To prepare for this growing demand, states are exploring how best to use their publicly regulated, investor-owned utilities to build the needed EV charging network. Several states, including California, Oregon and **New Mexico**, have recently enacted laws requiring their public utility commissions (PUC) to review utility EV infrastructure programs.⁹ State PUCs have already approved roughly \$1 billion in utility EV infrastructure investments, and utilities have already proposed another \$1.5 billion in additional investments.¹⁰ Consider the following state spotlights:



State spotlight: Maryland. To achieve Maryland's goal of having 60,000 ZEVs on the road by 2020 and 300,000 ZEVs on the road by 2025,¹¹ the Maryland Commission approved a utility proposal in 2019 to use ratepayer funds to install 5,000 EV charging stations.¹² The five-year pilot program will include residential, workplace and public charging. The commission required time-of-use rates to encourage off-peak usage and the creation of a separate rate class for the 900 public charging stations to ensure that those users cover the costs of the stations. The other stations, to be built on private property, will not be utility owned.



State spotlight: Michigan. With 14,000 EVs already on **Michigan's** roads, the Michigan Public Service Commission (MPSC) recently approved its first utility EV infrastructure project: Consumers Energy's PowerMIDrive.¹³ The initiative includes rebates of up to \$5,000 to encourage third parties to install up to 200 Level 2 chargers and incentives of up to \$70,000 for 24 DC fast chargers. The effort includes off-peak and super-off-peak pricing to avoid contributing to peak demand.



State spotlight: New York. Gov. Andrew Cuomo's Charge NY 2.0 initiative set a goal of installing at least 10,000 EV charging stations by the end of 2021.¹⁴ To meet this goal, the New York Public Service

Commission has requested utility proposals for DC fast charging as well as residential charging.¹⁵ The commission is exploring rates that would encourage EV charging at off-peak hours or mitigate renewable energy curtailment.

INVEST FUNDS FROM THE VOLKSWAGEN DIESEL SETTLEMENT IN EV CHARGING STATIONS. As a result of Volkswagen's diesel emissions test cheating, the company agreed to pay U.S. states almost \$3 billion to reduce air pollution, of which 15%, or about \$450 million, can be used for EV charging infrastructure.¹⁶ Consider the following state spotlights:



State spotlight: Colorado. The Colorado Energy Office launched Charge Ahead Colorado, using its Volkswagen settlement money in addition to funds from the Federal Highway Administration's Congestion Mitigation Air Quality program and state dollars.¹⁷ Prioritizing workplace and multifamily locations, the program provides rebates of up to 80% to local governments, school districts, state agencies, nonprofits organizations, apartment/condominium complexes and private businesses. The state also awarded a third-party EV charging company, ChargePoint, more than \$10 million to build a network of 33 DC fast chargers across the state.



State spotlight: Virginia. Virginia was one of the first states to commit to using the full 15% of its Volkswagen settlement funds on EV charging infrastructure. In autumn 2018, the commonwealth entered into a public-private partnership with a third-party EV charging company, EVgo, to spend its \$14 million settlement on a public network of DC fast chargers and Level 2 chargers.¹⁸

PROVIDE FINANCIAL INCENTIVES FOR EV SUPPLY EQUIPMENT. Twenty-seven states offer incentives to defray the costs of installing EV supply equipment for residential, commercial and retail service stations.¹⁹ The price of a Level 2 residential charger ranges from \$500 to \$2,000 for the charger and professional electrical installation.²⁰ Program details vary; for example, Oregon is offering \$300 customer rebates and **Utah's** Rocky Mountain Power utility is offering up to 75% off of equipment costs.²¹




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OFFER INCENTIVES BEYOND REBATES. States are using a creative range of incentives beyond rebates to accelerate EV adoption. Thirteen states allow EVs to use HOV lanes or provide special parking privileges.²² A different set of 14 states exempt hybrid or electric cars from emissions testing.²³ Other incentives include discounts on tolls and reduced rates for charging.

USE THE STATE VEHICLE FLEET TO LEAD BY EXAMPLE. State governments own approximately 500,000 vehicles, which cost more than \$2.5 billion annually to operate and maintain.²⁴ With fewer moving parts than gasoline-powered engines and less expensive fuel costs, EVs are an attractive option for state fleets.

To date, 28 states have EV or hybrid fleet requirements, acquisition goals or preferences for the procurement of EV or hybrid vehicles.²⁵ California has established a process to ensure that, through normal fleet replacement, at least 50% of light-duty vehicles are ZEVs by 2025.²⁶ Colorado aims to purchase at least 200 EVs for the state fleet by 2020, whereas **Illinois** has a goal of 15% EVs by 2025.²⁷ Washington Gov. Jay Inslee issued a 2018 executive order that requires state agencies to prioritize the purchase or lease of EVs.²⁸

ESTABLISH ZEV MANDATES. ZEVs include full battery EVs, hydrogen fuel cell vehicles and plug-in hybrid-electric vehicles. California established its first ZEV regulation in 1990 to require automakers to offer for sale specific numbers of EVs to continue selling cars in the state.²⁹ Nine states — Connecticut, **Maine**, Maryland, Massachusetts, New Jersey, New York, Oregon, **Rhode Island** and **Vermont** have adopted California's ZEV mandate.³⁰ Together with California, these states represent nearly 30% of new car sales in the United States.³¹ Consider the following state spotlights:

 **State spotlight: California.** California aims to be carbon neutral by 2045, so the state has established a goal of 1.5 million ZEVs on the road by 2025, growing to 5 million by 2030.³² California's ZEV mandate requires that auto manufacturers produce a set number of ZEV and plug-in hybrid vehicles each year based on the total number of vehicles each manufacturer sells. The percentage grows from 7% in 2019 to 22% in 2025. Nine other states have adopted the California ZEV regulations.

 **State spotlight: Colorado.** Gov. Jared Polis issued an executive order in January 2019 creating a state agency to develop and propose a ZEV program to the Colorado Air Quality Control Commission,³³ which has since voted unanimously to consider the ZEV proposal in August 2019.³⁴

INCORPORATE TRANSPORTATION ELECTRIFICATION INTO STATE AND UTILITY PLANNING. The impacts of nascent electrification on transportation ripple across state governments, including transportation agencies, PUCs, environment departments and energy offices. Many governors have created interagency work groups to help identify and navigate the opportunities and challenges.³⁵

In addition, states are learning to integrate growing EV adoption into other ongoing planning activities. For example, utility integrated resource plans are increasingly considering the impact of EVs on overall resource adequacy and distribution system planning. Similarly, state environmental agencies are calculating the reduced emissions in their congestion mitigation and air quality planning processes.

UPDATE ENERGY BUILDING CODES TO REQUIRE EV-READY BUILDINGS AND HOMES. One way to reduce the cost of installing the EV charging infrastructure needed is to incorporate it into ongoing construction activities. For example, Oregon Gov. Kate Brown issued a 2017 executive order that, among other things, required parking structures for all newly constructed residential and commercial buildings to support the installation of at least a Level 2 charger by Oct. 1, 2022.³⁶ Similarly, in Vermont, commercial and residential projects over a certain size are required under the state's energy building code to include a percentage of EV supply equipment or EV-ready parking spaces.³⁷



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