



Going Electric

State policies can have an enormous effect on the popularity of plug-in vehicles.

BY GLEN ANDERSEN

Imagine an America where the electric car is more popular and practical than the gas guzzler. Actually, you don't have to imagine it—you just have to read some history.

In the 1890s electric carriages outnumbered gas-powered vehicles by 10-to-1 in the United States. During their heyday in 1912, production peaked, and at least 38,000 electric vehicles were registered in the nation.

Now, advanced motor and battery technologies, higher gas prices and environmental concerns have spawned a resurgence in electric vehicles. Higher prices at the pump may be the biggest driver. The U.S. Department of Energy expects this year will be the first time U.S. drivers see average gasoline prices above \$3 per gallon for the entire year. The department forecasts even higher prices in 2012.

Although the current electric cars have a premium price, they are far less expensive to run. With the national average price for electricity at

9.6 cents per kilowatt hour, new models such as the Nissan Leaf can travel about 30 miles on 70 cents of electricity, about a quarter the cost to drive a similarly equipped car at \$3 a gallon. If gas prices continue to rise, the price difference becomes even more dramatic.

"You pay more when you buy a plug-in electric than for a gasoline-powered vehicle," says Dan Santini, a senior transportation economist at Argonne National Laboratory, "but if you have selected the right plug-in for your patterns of use and local electric rate structures, you should save considerably on fuel costs."

This year, two mass-produced plug-in electric vehicles have been released: the hybrid Chevy Volt and the all-electric Nissan Leaf. Many other auto manufacturers—BMW, Ford, Honda, Toyota and Volvo—plan to release plug-ins in the next two years. The number of plug-in electric vehicles on the road is expected to reach 841,000 by 2015, divided between plug-in hybrids and purely electric vehicles, according to Pike Research.

How popular these vehicles become will be affected in large measure by state policies.

"I'm not sure the exemption is needed to spur sales. Many dealers are reporting pre-orders beyond expectations, so I'm not sure there is price-sensitivity for the supply anticipated in the next couple of years."

—WASHINGTON REPRESENTATIVE
DEBORAH EDDY

States that offer rebates, tax and infrastructure incentives are likely to see the most people buying the new crop of electric cars. Since electric cars cost more, state and federal incentives make them more affordable compared with gasoline-powered cars.

Many lawmakers are willing to support electric vehicles until the technology advances enough to bring costs down. They see the incentives as a worthwhile trade-off to promote the use of domestically produced energy and encourage advanced technology industries.

Glen Andersen directs NCSL's energy program.

“The cost of moving people and goods in our region is overly dependent on oil. ... We need to work in a new direction with more urgency if we are to remain competitive in the world.”

—MAIN REPRESENTATIVE STACEY FITTS

Not everyone thinks state vehicle tax rebates are needed, however, given the large federal rebate.

“I’m not sure the exemption is needed to spur sales,” says Washington Representative Deborah Eddy. “Many dealers reporting pre-orders are beyond expectations, so I’m not sure there is price-sensitivity for the supply anticipated in the next couple of years.”

“As production increases in the years ahead,” she says, “we may want to revisit the question of incentives.”



**REPRESENTATIVE
DEBORAH EDDY
WASHINGTON**

WILL THEY SELL?

A hurdle for the future of electric cars is whether consumers will want them. Will they be willing to pay for them? Will they be able to charge them conveniently? Will the cars perform the way drivers expect?

Drivers are accustomed to cars that go 300 miles or more between fueling; many are wary of being limited to 100 miles between charges. This “range anxiety” may dampen interest in purely electric vehicles, at least until charging stations become more commonplace or the cars can travel farther between charges.

Most new plug-ins are hybrids. Their gasoline engines extend their driving range, but the distance they can drive

More than 45 states offer electric vehicle incentives—tax credits, exemptions, rebates, loans and grants—for buying an electric vehicle or building or buying charging stations.

Fourteen states have tax credits, exemptions or rebates for buying electric vehicles. Louisiana and Oklahoma offer generous tax credits worth 50 percent of the cost of electric vehicles. Illinois has a rebate program providing up to \$4,000 of the cost of purchasing an electric vehicle.

Forty-four states have electric-vehicle laws that range from designating parking only for them to prohibiting insurance companies from imposing surcharges on the cars since they are a new technology. Six states let electric car drivers use high-occupancy vehicle lanes regardless of the number of passengers. New Haven, Conn., provides free parking on all city streets for electric vehicles.

California and Washington are leading the way with development incentives, such as a grants and loans, and requirements that will help make charging stations accessible in homes, businesses and public places. Most states have laws requiring a certain amount of alternative fuel to be used for state fleets with the goal of getting state agencies to purchase alternative-fuel or electric vehicles.

“Having learned a lesson from the introduction of wireless phones 15 years ago, we wanted to send a signal to the auto makers that we would have common standards throughout Washington state,” says Representative Deborah Eddy. “We also have a WSDOT Green Highways project, where we will be installing charging stations at specific points along our interstate corridors. The idea is to send a signal to the public that the infrastructure will be there to ‘re-fuel.’”

Virginia, one of the first markets to receive electric vehicles, is considering a bill to cut the state’s 3 percent titling tax—this could save buyers an additional \$1,300 on a Chevy Volt, for example. “The benefits are many, but electric vehicles will help with our growing problem with mobile emissions in Northern Virginia,” says Representative Emmett Hanger, the bill’s author.



**REPRESENTATIVE
EMMETT HANGER
VIRGINIA**

In Maine, Representative Stacey Fitts has introduced a bill to decrease the state’s oil dependence by supporting the use of other energy resources and electric vehicles.

“The instability of and significant exposure to the oil market affects our economy double what most regions experience as we are also dependent on heating oil,” say Fitts. “We have an abundance of renewable energy options and significant offshore wind potential that could be harnessed in a way to make the use of electric vehicles a possibility.”

In addition to the \$7,500 tax credit for electric car buyers, the federal government offers grants for advanced energy research projects that develop vehicle technologies that reduce the nation’s dependence on foreign energy imports, and loans for improved energy technology.

Another federal tax credit is available to offset the cost of installing alternative fueling equipment, including charging stations. This year, the credit covers up to 30 percent of the cost of equipment up a total of \$30,000.

Since 2009, the U.S. Department of Energy has awarded \$1.5 billion to manufacturers of advanced electric vehicle batteries, \$500 million to U.S. manufacturers to produce electric drive components for vehicles, and \$400 million for transportation electrification projects. The goal was to push the industry to move ahead of China and Japan in battery technology and manufacture.

In the long run, however, the success of electric vehicles will depend on convenience, and that will depend largely on the efforts of business and government.

— By Julia Verdi, NCSL



“The net result [of driving an electric car] will nearly always be reduced overall emissions of the many regulated pollutants.”

—DAN SANTINI, ARGONNE NATIONAL LABORATORY

on an electric charge is shorter. If gas prices continue to rise, the prospect of saving 75 percent on fuel costs may be the antidote to range anxiety. And for most drivers, 100 miles is more than adequate for a day of driving to work, school and shopping.

Although the Nissan Leaf runs for 100 miles before needing a charge, the Chevy Volt, for example, can travel only 40 miles on its electric engine before switching to gas. Other soon-to-be released plug-in hybrids, such as the Toyota Prius and the Ford Escape, are expected to travel only 13 and 30 miles on the electric engine, respectively, before switching to gas. The longer total driving range offered by plug-in hybrids makes for a more complex and potentially more expensive vehicle with higher fuel expenses.

Charging plug-in vehicles presents another challenge. Electric vehicles require four to eight hours for a full charge on a 220-volt circuit. Quick charging—which will charge the batteries to 80 percent power in one hour—will also be an option if stations are made available. Owners will need to be able to charge cars at home, and instal-

lation of charging units can add up to \$2,000 to the cost of operating the car. Federal, state and auto manufacturer incentives, however, are helping consumers pay far less for these charging units. Charging stations in workplaces, malls and other public places will also be needed.

Finally, electric cars are expensive. Although it may be extended, the federal tax credit of \$7,500 stops at the end of this year. This credit softens the price of the \$42,000 Volt and \$32,000 Leaf. Fourteen states offer rebates that bring the price down another \$3,000 to \$6,000. The biggest challenge for manufacturers will be keeping car prices competitive and bringing battery costs down after rebates run out. This will require a large drop in the cost of battery technology, which is significant part of an electric vehicle’s sticker price.

POWER UP

Drivers are all too familiar with fluctuating gas prices. They also know the United States imports much of its oil—more than 50 percent—some of which comes from unstable

or unfriendly nations. Power for electric cars comes from domestic resources, including coal, natural gas, nuclear energy, wind, solar, biomass and other renewables. Electricity prices fluctuate, but not nearly as much as gasoline. In addition, most states are working to diversify their sources of electricity generation, which helps stabilize electricity prices.

“[Fuel] diversity is a driving factor in this,” says Representative Stacey Fitts of Maine. “The cost of moving people and goods in our region is overly dependent on oil, and the run-up in mid-2008 and again more recently has shown that we need to work in a new direction with more urgency if we are to remain competitive in the world.”



**REPRESENTATIVE
STACEY FITTS
MAINE**

The nation’s electrical grid could handle the addition of more than 180 million hybrid plug-ins, according to the U.S. Department of Energy, if electric car owners plug in at the right time.

Since the demand for electricity is highest during the day, especially in summer, plugging in millions of electric cars then would overload the existing infrastructure and probably require building new power plants. Charging at night, however, when electricity use is low, would be a far better, and less costly option. When demand is high, all electric plants have to be used, and the last plants to be utilized are also the most expensive, which drives up the rate for that time period.

Utilities will need to plan for the influx of electric vehicles, each of which, while charging, uses about as much electricity as a central air conditioner in an average home. Smart-grid technologies sense when cars are plugged in and automatically charge them during the night when energy supply is most abundant.

Southern California Edison, which charges five different rates depending on how much a customer consumes, offers special options for electric car owners. The utility offers an off-peak rate of 10 cents a kilowatt hour from midnight to 6 a.m. for those who own electric cars. During peak hours of the day, rates can hit 55 cents a kilowatt hour.

To encourage owners to charge at night, some utilities—Madison Gas and Electric and Southern California Edison are examples—already are charging higher prices for power during the day and lower prices at night. This better reflects the true price of electricity, since the utility usually pays more to produce electricity during the daytime. Electric car owners still will see bigger electric bills, but will save about three times as much because they’re spending less on gas.

HOW GREEN IS GREEN?

One factor driving adoption of electric vehicles is the notion that they’re friendlier to the environment than gas-powered cars.

Battery manufacturing and disposal have environmental impacts, however, as does the production of the electricity. The environmental benefits of the car depend to some extent on how the electricity is produced—from coal, natural gas or renewable sources.

Are electric vehicles powered by coal greener than a gas-powered vehicle? The answer is probably.

Power plants are more efficient at converting coal to useful energy than car engines are at producing useful energy from gasoline, and electric engines are more efficient than gasoline engines. Also, strong emission requirements and increases in efficiency mean coal plants emit less pollution than in the past.

As a result, even if the electricity is predominantly coal-generated, electric vehicles will produce less pollution than gas-powered vehicles of the same weight and size.

“The net result [of driving an electric car] will nearly always be reduced overall emissions of the many regulated pollutants,” says Santini.

In addition, the emissions will be farther from cities, where automotive and diesel truck exhaust cause much of the pollution. When it comes to greenhouse gas emissions, the electric car will emit about 20 percent to 60 percent less, given the average U.S. mix of electricity generation sources. This benefit is likely to increase as more renewable, natural gas and nuclear energy are added to the electric grid.

According to the American Council for an Energy Efficient Economy’s Greenest Vehicles” of 2011, the Nissan Leaf, the only fully electric commercially available vehicle in their ranking, received the same green score ranking as the 1st place compressed natural gas Honda Civic. The ranking considers not only efficiency, weight and emissions but also the environmental impact caused by manufacturing and recycling car components.

While the environmental benefits are positive, the clincher may be the extra green people have in their pockets after fueling their electric cars, and knowing the lower cost of fueling is likely to last.

“On a national average basis, electricity prices have been far more stable than oil prices,” says Santini, “so electricity prices have never risen at rates comparable to gasoline prices, and have been far less volatile.”

SL ONLINE

Learn more about steps states are taking to encourage electric vehicle use at www.ncsl.org/magazine.

With so few public charging stations, operating a purely electric vehicle for long trips requires drivers to plan ahead—estimating mileage and knowing the locations of charging stations. That may make drivers apprehensive about buying a purely electric car. Programs across the country, however, are promoting the construction of charging stations to relieve “range anxiety.”

There are fewer than 700 public charging stations, and only six states have more than 10. California is far ahead with more than 430. Seventeen states offer tax credits, grants, rebates and loans for building public electric vehicle charging stations or for residential charging equipment.

Cities and corporations also are receiving help from the U.S. Department of Energy, which is providing \$400 million to speed up projects that promote electric vehicles through demonstrations, installing electric vehicle infrastructure—such as public charging stations—and offering workforce training to support electric vehicle systems.

Coulomb Technologies, a corporation that focuses on charging stations, used \$37 million of the money to develop ChargePoint America, a program that offers charging stations to individuals and businesses in nine regions around the country. ChargePoint America already has set up hundreds of charging stations and plans a total of 4,600 of them. The energy department estimates that ChargePoint and similar programs will help develop about 20,000 charging stations by 2012.

Homeowners, after installing the correct circuit and charging unit, can plug in their electric cars in their garages and charge them overnight. For city residents who park their cars on the street or in apartment building garages, however, charging is more difficult.

In the San Francisco Bay Area, a project initiated by 350Green and funded in part by a grant from the Bay Area’s Air Quality Management District, hopes to build a national network of fast charging stations close to where drivers who can’t charge at home live and work in six Bay Area cities, including San Francisco. Currently, drivers can pay for charging their vehicle by using credit cards at some stations. The cost is about \$2 to \$4 per charge. They also can sign up for a subscription plan at others, starting from about \$20 per month.

EV-Charge America—a charging station manufacturer that installs and maintains them for cities and state agencies—offers an unlimited monthly plan or cheaper plans that include only nighttime or economy charging. Charging stations at some parking garages, grocery stores and other commercial properties are free, providing an incentive for electric vehicle owners to frequent the businesses.

—By Julia Verdi, NCSL