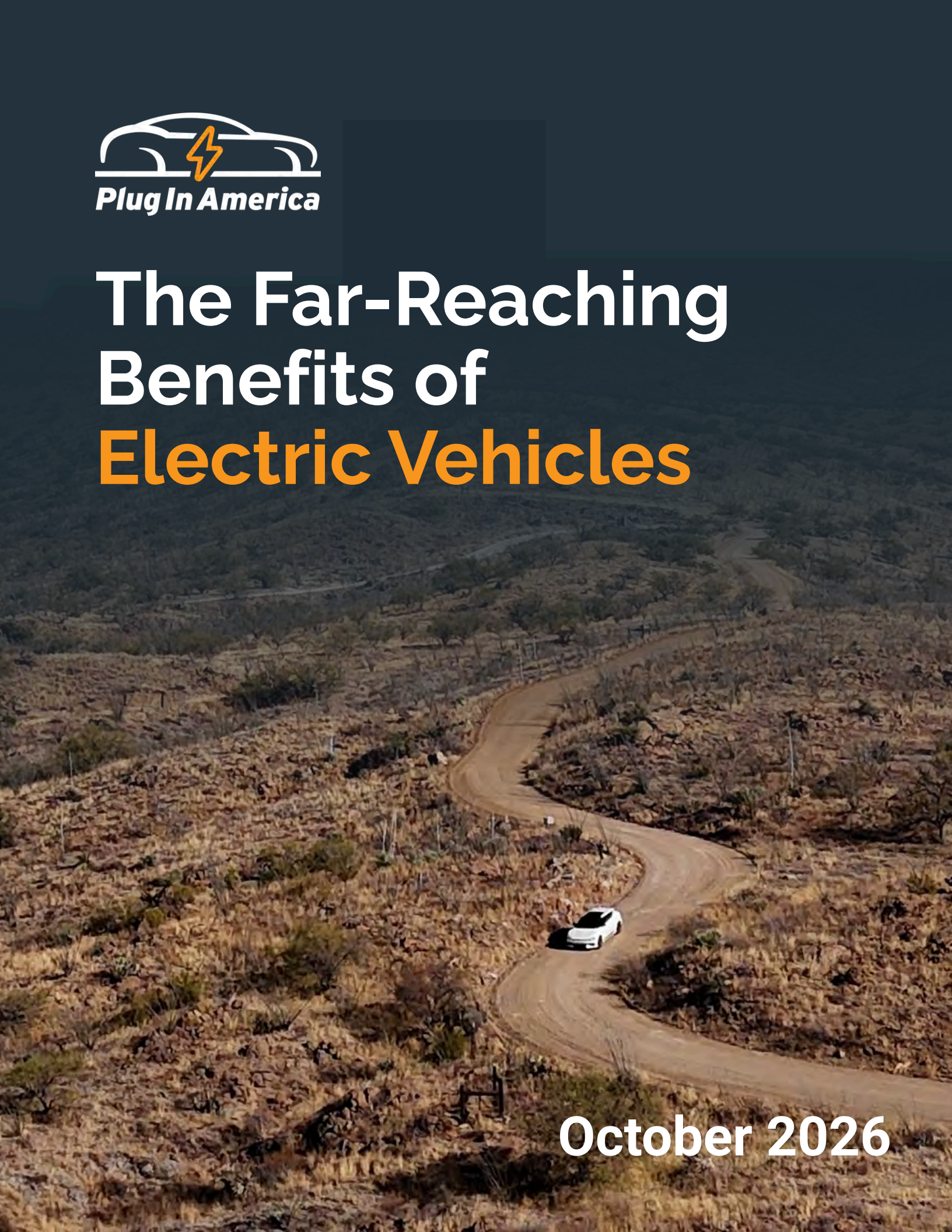
Plug In America

The Far-Reaching Benefits of Electric Vehicles



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THE FAR-REACHING BENEFITS OF ELECTRIC VEHICLES

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Executive Summary

There are dozens of tools and calculators available online to determine how much a consumer can save on fuel by switching from a gasoline-powered vehicle to an electric vehicle (EV). But the economic benefits of EVs extend well beyond reduced fuel costs and consumer savings.

In fact, switching to an electric vehicle will reduce pollution that causes major health problems, saving billions in healthcare costs, lost workdays, and premature deaths. The large batteries in EVs can support the U.S. electric grid and actually make electricity less expensive, not only for EV drivers but for everyone.

Electric vehicles have enormous potential to help address some of the major issues facing our country and the planet today. Electrifying the transportation sector will dramatically reduce greenhouse gas emissions, air pollution, and dependence on fossil fuels. At the same time, EVs can improve domestic energy security, improve public health, drive economic development, and create a more efficient and resilient electric system.

According to recent consumer research, one of the most commonly cited barriers to EV adoption is the upfront purchase price. New EVs have yet to reach price parity with the upfront cost of new gas vehicles. The price of the EV we use in this analysis is $6,000 higher than that of its gasoline-powered counterpart. To purchase a new vehicle, most consumers need to finance it, incurring additional costs. This higher upfront cost creates a major barrier to EV adoption. While our analysis demonstrates the widespread value of an EV over its life, if you can't afford one, none of these benefits are available to you.

This study monetizes the benefits that EVs provide to drivers, to society as a whole (through job creation, pollution reduction, and energy security), and to the electric system (and ultimately ratepayers) to determine whether EV incentives are a good use of taxpayer funds. Ultimately, taxpayers should benefit from how their taxes are spent, and this analysis demonstrates that even for taxpayers who choose not to drive an EV, EV incentives can provide benefits. This analysis also determines estimates of the value of those benefits, which can serve as a guide in setting incentive levels for electric vehicles.

Based on our research, a conservative estimate based on average vehicle miles traveled indicates that each EV can provide over $23,800 in benefits to its driver, society, and the grid over the first ten years of its life. For less efficient vehicles and those that travel more miles each year, the benefits of switching to an EV can be even higher and more impactful. These

benefits extend across local communities, states, countries, and the global community. Monetizing some of these benefits and incorporating them into EV incentives could make EVs more accessible, improve health, reduce pollution, fortify domestic energy security, and grow the U.S. economy.

Introduction

The inspiration for this study is the cost-benefit analyses used by utility regulators around the country to justify investments, programs, and incentives for grid modernization. Because utilities are natural monopolies, states regulate their investments to ensure they make prudent use of ratepayer funds.

Typically, state utility regulators will select one or more cost-benefit analyses to determine whether utility investments are economically sound. Depending on the test used, it can measure the impact of the investment across the entire service territory (Total Resource Cost Test-TRC), the utility (Utility Costs Test-UTC), ratepayers (Ratepayer Impact Measure-RIM), program participants (Participant Cost Test-PCT), or society as a whole (Societal Cost Test-SCT). Sometimes these cost-benefit analyses are modified or combined to assess multiple aspects of a potential investment.

The purpose of this paper is to analyze EV incentives as an investment and to understand their economic impact not only on program participants (EV drivers) but also on ratepayers, the electric system, and society as a whole.

The impacts of choosing to drive electric extend beyond a quiet ride, smooth acceleration, and lower fuel costs. They extend to the local community through economic development and health improvements. They extend to the local electric utility through efficiency and grid resilience. They extend to the national level through energy security and a reduced need to procure or protect oil interests, resulting in wars that are costly in both money and human lives. They extend globally to lower carbon emissions and monetary and human costs associated with climate change.

This analysis builds on an earlier research study developed for the Electric Vehicle Association of Greater Washington, D.C.: The Far-Reaching Benefits of Electric Vehicles, and on an earlier analysis, Quantifying the Societal Benefits of Electric Vehicles, which was published for EVS29 in 2016. When the original study was published, about 560,000 EVs had been sold in the U.S. As of May 2026, over 8.4 million EVs have been sold in the U.S. With the long-term growth in the EV market, numerous additional studies have been undertaken and published, identifying both costs and benefits of EVs for vehicle owners, electric utilities, the environment, and society at large. This paper will assess eight values identified in the original study, incorporating new information and further methodological refinements.

Why offer incentives for EV purchases?

EV adoption has grown dramatically, but unevenly, worldwide. In 2025, EVs made up 25% of the global new car market, yet in the United States, they accounted for just under 10% of new car sales. Over the life of the vehicle, an EV is cost-competitive with a gasoline vehicle, but buyers often focus on the upfront purchase price, which can be a barrier to EV adoption. Financial incentives, particularly at the point of sale, can address the up-front cost barrier, especially since most new vehicles are financed, and higher purchase prices lead to higher sales taxes and finance costs.

To monetize the broader benefits of EVs, we will compare the costs and benefits of the exact same vehicle (a 2026 Chevrolet Equinox) — one with an internal combustion engine and the other with an electric drivetrain. The EV costs about $6,000 more than the internal combustion model. Over time, economies of scale and technological advancements will reduce the cost of electric vehicles, eventually bringing EVs and internal combustion engine (ICE) vehicles to cost parity. Until then, financial incentives help put EVs within reach for more drivers.

The importance of incentives was demonstrated vividly in late 2025, when the federal EV tax credit was discontinued. EV sales spiked to record highs before the tax credit expired, followed by an immediate decline in U.S. EV sales. The reverse holds as well. Adoption slows when policy raises EV ownership costs, whether through aggressive fees and charger-testing requirements or registration taxes that exceed those on gasoline vehicles.

Governments of large economies have supported EV sales through incentives for several reasons, including the fact that EVs offer widely recognized benefits beyond energy savings. These benefits generally align with policy priorities such as climate goals, pollution reduction and related health improvements, economic development and manufacturing leadership, and domestic fuel security. These incentives take the form of education and outreach programs, reduced tolls, HOV lane access, and financial incentives. Critics of EV incentives, such as federal tax credits, argue that they disproportionately benefit wealthier Americans, who are more likely to buy expensive electric vehicles. In practice, incentives can be, and often are, tailored to moderate-income consumers by limiting eligibility based on consumer income and vehicle price. Other critics argue that federal incentives cost taxpayers billions of dollars and that EV sales should not be subsidized but should be subject to market forces. As a point of comparison, the fossil fuel industry has long benefited from substantial federal subsidies. As of 2025, the U.S. has subsidized the fossil fuel industry with over $30 billion each year.

The decision to drive an EV creates benefits that extend across local communities, states, countries, and the global community. Monetizing some of these benefits and incorporating them into EV incentives, especially long-running incentives with clear deadlines, drives EV sales and saves governments money in the long run, while helping them meet important policy goals.

Methodology and Assumptions

The original version of this study used cost-benefit tests developed for the electric utility industry and applied them to electric vehicles. This updated analysis builds on the original version and uses a broader screen to identify and quantify the value of EVss to drivers, the electric system, and society.

The values calculated for each of these benefits rely on several variables, many of which are based on existing research and estimates. Fuel prices, social cost of carbon (SCC), health impact costs, and other metrics included in this analysis vary significantly by geography, regional prices, generation mix, and other factors. The results of this analysis are simplified to demonstrate, on average, the benefits of an EV in the United States.

While care was taken to identify metrics and values that accurately reflect these benefits, and a conservative approach was used to incorporate them, please keep in mind that this research and the resulting values are intended to be illustrative.

The goal of this analysis is to identify some of the most valuable and measurable benefits of EVs and to demonstrate their magnitude. Ideally, this updated research will expand understanding of the range of EV benefits and serve as a tool for policymakers when determining EV incentive levels or considering policies that act as a disincentive.

Methodology

This analysis quantifies the costs and benefits of two identical vehicles: one with a conventional internal combustion engine (ICE) and one with a battery-powered electric motor (EV) that relies exclusively on electricity. We chose the 2026 Chevrolet Equinox as our reference vehicle because it is manufactured and sold with both an ICE and as an EV. This analysis will quantify eight benefits from EVs. They include:

1. Fuel savings
2. Maintenance savings
3. Insurance and taxes
4. Environmental benefits from reduced carbon emissions
5. Health benefits from reduced vehicle emissions
6. Fuel security & national security benefits
7. Economic development benefits
8. Benefits to the electric grid

These benefits will flow to different recipients. The fuel savings and operations & maintenance savings will benefit the EV owner or driver. The benefits of fuel security, economic development, health, and the environment will affect society from the local community level to the global level. Additional EV load on the grid during periods of low utilization will benefit all electric utility customers, even those who do not drive EVs.

Assumptions

The Vehicles: Chevy Equinox	
	
Chevrolet Equinox LT	Chevrolet Equinox EV LT1
27 mpg EPA	31 kWh/100 miles EPA
14.8-gal tank	319-mile range
$30,795 M.S.R.P.	$36,795 M.S.R.P.

Vehicles are both cash purchases and are sold at sticker price.

This simplifies the analysis. It does, however, provide an advantage for the person making an EV purchase. Since EV purchases require a larger upfront investment, the interest charges would be significantly higher if the vehicle's cost were financed. This illustrates the importance of readily available financial incentives at the point of sale.

Vehicle lifetime is assumed to be 10 years.

The average age of a vehicle on the road is about 12.8 years, with passenger cars closer to 14.5. We chose to assess the costs and benefits of the vehicles over the first 10 years of their lives. Annual mileage is assumed to be 11,193 miles, which is the U.S. average in 2024 of the Federal Highway Administration's reported per-vehicle average vehicle miles traveled for passenger cars and light trucks/vans, reflecting the crossover between categories. This resulted in a total vehicle mileage of 111,930 miles over 10 years.

Resale value is another consideration in any vehicle purchase. According to Kelley Blue Book, the average 2026 model-year vehicle retains roughly 45% of its original value after five years. Electric vehicles currently depreciate faster than gas vehicles, with iSeeCars reporting a 57.2% five-year depreciation for EVs compared with a 41.8% average depreciation across all vehicles. At the model level, the difference is narrower. CarEdge projects 57% five-year depreciation for the Equinox EV, compared with 52% for the gas Equinox. Because resale value depends on future market conditions rather than measurable vehicle attributes, this analysis treats it as a qualitative consideration rather than assigning it a dollar value. We also expect the depreciation gap to close as the EV markets mature. We are already seeing used EV prices increase in 2026, as a result of high gas prices and broader affordability pressure on U.S. household budgets.

Gasoline price is assumed to be $3.75 per gallon over the life of the vehicle.

It is challenging to estimate the gasoline costs because of the volatility of prices at the pump. To account for this volatility, we estimated fuel costs over a long period to capture the ups and

downs in prices. We used the average retail gasoline price over the last 5 years (2021-2025), updated for inflation, from the U.S. Energy Information Administration. Choosing a shorter timeframe could create a less accurate cost estimate. It is assumed that gasoline prices over the life of the vehicle will be within the range of the last 5 years, so gasoline prices will be kept constant (at the 5-year average) for the life of the vehicle.

Electricity costs are assumed to be 16.82¢ per kWh over the life of the vehicle.

To estimate the cost of electricity needed to power the EV, consistent with the methodology we used to estimate gasoline prices, we used the average U.S. retail electricity rate over the last 5 years. According to the U.S. Energy Information Administration, the average U.S. retail price per kilowatt-hour (kWh) from 2021 through 2025, adjusted for inflation, was 16.82¢ per kWh.

Many utilities use rate design to incentivize EV owners to charge at off-peak times, such as overnight, when rates are much cheaper. Not all utilities offer these discounted rates, and the discounts vary widely from utility to utility. For simplicity and consistency, we did not include utility rate reductions in this analysis, though they may yield additional savings.

For the purposes of this analysis, it is also assumed that electricity prices will remain stable over the life of the vehicle. While electricity rates have recently increased significantly in some areas of the country, EVs generate more revenue for utilities than they require in investment. Consistent with the approach to gasoline costs, we will assume electricity rates remain stable.

Fuel prices and emissions will be based on national averages.

There is considerable geographic variability in the values we will assess in this analysis. Fuel prices, electricity prices, emissions from power generation, and health impacts all vary greatly throughout the United States. As a result, we will use national averages for these variables.

The electric vehicle purchase includes charging equipment at the EV operator's residence.

This analysis assumes that the EV is charged using the average residential rate. This does not break out workplace charging or public charging, which, depending on location, could be subsidized, resulting in higher or lower rates. The exception to this is the Total Ownership Cost Analysis (shown in Figure 5). In that section, we will include the cost of an installed Level 2 charger.

Both vehicles are driven the same mileage under the same conditions.

The Chevy Equinox internal combustion vehicle has an EPA rating of 27 mpg, average city and highway. The Equinox EV has an EPA rating of 31 kWh per 100 miles. These are the assumptions used in calculating fuel and energy costs.

All values shown are in 2026 dollars.

The benefits in this analysis are monetized based on existing research and literature. In some cases, we were unable to find up-to-date information on monetized values. In these cases, we used the Consumer Price Index inflation calculator to adjust the values to 2026 dollars. Net

Present Value was not calculated because these benefits accrue over the life of the vehicle through avoided fuel use and emissions rather than as a lump sum up front.

Value Ranges

Some of the benefits we assessed resulted in a range of values. In these cases, we selected mid-range or conservative values within these ranges to present a plausible, balanced analysis.

Analysis – Owner Benefits

Fuel Savings $9,710

Using 5-year average costs for gasoline and electricity in the United States (according to U.S. Energy Information Administration data), we calculated the cost to fuel the two vehicles. As shown in the table below, the annual fuel cost for the gasoline-powered vehicle would be $1,554, and the fuel cost for the EV would be $584. Fuel savings for the EV driver would amount to $970.96 per year, totaling $9,710 over the vehicle's 10-year life.

EVs also provide a benefit hard to quantify. Gas prices are highly volatile, while electricity rates are regulated and change slowly and predictably; EV drivers gain a degree of certainty about their fuel costs, which this analysis does not monetize.

Fuel Costs		
	2026 Chevy Equinox	**2026 Chevy Equinox EV**
Annual Mileage	11,193	11,193
Fuel Cost	$3.75/gal	16.82¢ per kWh
Efficiency	27mpg	31kWh/100mi
Annual Fuel $	$1,554.58	$583.63
Annual Difference	**$970.96**	
EV Savings Over Life of Vehicle (10 years)	**$9,710**	

Maintenance Savings $1,757

EVs have far fewer moving parts than conventional ICE vehicles. The battery, motor, and electronics associated with the drivetrain require no regular maintenance. EVs feature regenerative braking, which uses the motor to slow down. This braking system recaptures energy from the vehicle's momentum and stores it in the battery. While EVs do have friction brakes, they are used as a supplement to regenerative braking. This creates less wear on the brakes and provides additional stopping power. According to NAPA Auto Parts, brakes on EVs can last twice as long as those on traditional gasoline-powered vehicles.

The American Automobile Association (AAA) has been publishing information on the costs of maintaining and operating vehicles since 1950. In 2017, their publication, Your Driving Costs began to include an assessment of Electric Vehicle costs. AAA's most recent analysis (2025) includes average maintenance and repair costs for both electric and ICE vehicles, including a small SUV with Front Wheel Drive, which we use for the 2026 model year.

Maintenance Costs		
	2026 Chevrolet Equinox	2026 Chevrolet Equinox EV
Annual Mileage	11,193	11,193
Maintenance per mile	11.64¢	10.07¢
Annual Maintenance	$1,302.87	$1,127.14
Total Maintenance (10 years)	**$13,029**	**$11,271**
EV Savings Over Life of Vehicle	**$ 1,757**	

Taxes and Insurance ($2,092)

Not every financial difference between the two vehicles favors the EV. To present a balanced analysis, we include two costs borne by the EV buyer: higher sales tax and higher insurance premiums. Because the EV carries a higher purchase price, it also carries a higher sales tax bill. Applying the average combined state and local sales tax rate of 7.53% to each vehicle's purchase price yields $2,771 in sales tax for the EV and $2,319 for the gasoline vehicle, a one-time difference of $452. Some states charge EV owners an annual fee in place of gas tax revenue. Spread across the U.S., the effect on our national estimate is minor, but the fees vary widely by state and can matter for an individual buyer's calculation.

Insurance premiums for EVs also run higher than for their gasoline counterparts, driven primarily by higher repair costs and replacement values. Consistent with our approach of comparing the same vehicle in both configurations, we used insurance rate data specific to the Chevrolet Equinox: the Equinox EV averages $2,216 per year to insure, compared to $2,052 for the gasoline Equinox, a difference of $164 per year, or $1,640 over the life of the vehicle. Combined with the sales tax difference, this represents a net cost to the EV owner of $2,092.

Tax and Insurance Costs		
	2026 Chevrolet Equinox	2026 Chevrolet Equinox EV
Sales Tax (7.53%)	$2,319	$2,771
Total Sales Tax Difference	-451.80	
Annual Insurance Costs	$2,052	$2,216
Total Insurance Costs Difference	-1,640	
EV Savings Over Life of Vehicle	**($ 2,092)**	

Analysis – Benefits to Society

Carbon Emissions $1,988

Burning fossil fuels such as gasoline releases carbon dioxide (CO_2) and other greenhouse gases into the atmosphere, which are known to cause climate change. Damage to infrastructure, property, supply chains, agriculture, and human health in 2025 was estimated to be $145 billion. To determine the impact of this CO_2 in the atmosphere, the U.S. The Environmental Protection Agency (EPA) and other federal agencies use the Social Cost of Carbon (SCC) to estimate the climate benefits of reducing CO2 emissions. The SCC value represents an estimate, in dollars, of the economic damages that would result from emitting one additional ton of greenhouse gases into the atmosphere. This value is intended to capture the expense of climate change damages from carbon emissions, including changes in net agricultural productivity, human health, property damage from increased flood risk, and changes in energy system costs, such as reduced heating costs and increased air conditioning costs.

It is widely accepted among researchers that this value fails to capture all the economic, ecological, health, and physical damages associated with climate change because some of these damages are difficult to identify and quantify precisely. In addition, models do not

incorporate all of the damages identified in the literature. This figure also holds the grid constant, so as utilities add renewables and retire fossil generation, the carbon cost of charging an EV will fall over the vehicle's ten-year life. Based on the policy explainer prepared by Resources for the Future (RFF) on the Social Cost of Carbon, the SCC per metric ton is $80.00 in 2026 dollars (Resources for the Future, 2025). Estimates for the Social Cost of Carbon vary widely both in the U.S. and around the world, from a value of near zero to hundreds of dollars. While the U.S. SCC is considered a low estimate, we will use it in this analysis with the understanding that it is a conservative value.

Carbon Emissions		
	2026 Chevrolet Equinox	2026 Chevrolet Equinox EV
Annual Mileage	11,193	11,193
Emissions	20lbs/gallon	.81lbs/kWh
Fuel Economy	27 mpg	31kWh/100mi
Energy use/year	415 gal	3470kWh
CO2 emissions/year	8,291 lbs.	2,811 lbs.
CO2 emissions/year	3.76 metric tons	1.27 metric tons
SCC per metric ton	$80.00	$80.00
SCC for Annual Emissions	$300.81	$101.97
Difference/year	**$198.84**	
EV Savings Over Life of Vehicle	**$1,988.40**	

Health Impact $733

In addition to carbon, other vehicle emissions, including particulate matter (PM2.5) and ozone precursors such as nitrogen oxides, contribute to serious health impacts. The EPA finds that PM2.5 exposure causes premature death and cardiovascular harm, including heart attacks and strokes, along with respiratory effects such as asthma attacks, while ozone increases the frequency of asthma attacks and causes permanent lung damage through long-term exposure.

Researchers have monetized the societal cost per ton of these criteria pollutants and the resulting health damages. Using these data, we have estimated the value of the reduced health damages from driving an electric vehicle compared with a gasoline vehicle.

To estimate the cost of health damages associated with internal combustion vehicle pollution, we relied on data from the Bureau of Transportation Statistics' 2026 prediction to estimate the grams per mile of criteria pollutants, including NO_X and $PM_{2.5}$ from light-duty vehicles. We were then able to calculate the grams (converted to pounds) of these criteria pollutants that were produced each year by the gas vehicle.

To estimate emissions from electricity generation used in powering the EV, we used 2023 eGRID data from the Environmental Protection Agency (EPA). We were able to calculate the pollution generated per kWh of electricity and apply this value to the EV's annual electricity use.

We then applied the average 2025 monetized damage values from Wolfe et al. (2019), *Estimating the Benefit per Ton of Reducing $PM_{2.5}$ Precursors from 17 Sectors* to the emissions produced by each vehicle, including the gasoline vehicle emissions and the power plant emissions from generating the electricity used to power the EV. We also applied data from an EPA technical support document. We adjusted these numbers for inflation using the consumer price index. The net result is that driving an EV will prevent health impacts valued at about $733 total for 10 years.

It is important to note that emissions from power plants are considered less damaging per pound than vehicle emissions because vehicle emissions are released at street level, in much closer proximity to people. Recent analyses find that traffic-derived PM2.5 carries a greater health risk than PM2.5 from other sources.

In addition to providing greater distance between pollutants and people, U.S. electricity generation had been growing steadily cleaner until recently. Power sector CO2 emissions rose slightly in 2025 due to policy initiatives to keep coal power plants in operation and scale back on clean energy deployments by eliminating incentives and canceling projects and funding. EIA projects the grid will resume decarbonizing as coal plants retire, but given the current policy uncertainty, the value was held constant in this analysis.

Another important point is that in earlier versions of this paper, the cost of health impacts from vehicle pollution was over 30% higher. Over the last 6 years, tailpipe emissions have significantly decreased due to federal regulations, including Environmental Protection Agency (EPA) criteria pollutant standards and CAFE standards (which require vehicles to be more fuel-efficient). Older vehicles generate much more pollution and cause greater health damage. Replacing older vehicles with an EV results in much greater health benefits. Some programs factor this into their incentive design by offering additional incentives for retiring an older, high-polluting vehicle.

Health Impacts		
	2026 Chevrolet Equinox	2026 Chevrolet Equinox EV
Pounds of NOx Generated per year	2.99	1.57
Per pound dollar value mortality/morbidity (NOx)	$5.78	$5.53
Annual health damages from NO_X	$17.24	$8.67
Pounds of PM2.5 Generated per year	0.17	0.26
Per pound dollar value mortality/morbidity (PM2.5)	$575.00	$135.11
Annual health damages from $PM_{2.5}$	$99.32	$34.61
Annual value of health damages from tailpipe emissions, tire wear, and brake wear	$116.57	$6.67
Annual value of health damages from electricity generation, tire wear, and brake wear	$0	$36.61
Total health damages from NO_X and $PM_{2.5}$	**$116.57**	**$43.28**
EV savings/year	**$73.29**	
EV savings over Life of Vehicle	**$732.90**	

**Numbers may not be exact due to rounding.*

Fuel Security & National Security $3,841

While the U.S. has been a net exporter of petroleum since 2020, it still imported about 8 million barrels of crude oil *per day* in 2025, and gasoline prices remain tied to a volatile global market. Over the years, numerous studies and publications have quantified the costs of reliance on foreign oil. The study cited in the original publication of this analysis was a 2008 report from Oak Ridge National Laboratory (ORNL). For this update, we continued to rely on ORNL for the values of the monopsony component and macroeconomic disruption for nine of the ten years. We relied on an analysis by SAFE, The Military Cost of Defending the Global Oil Supply for the military costs of defending the oil supply for nine of the years. For 2026, we relied on the current estimated costs of the conflict with Iran that began in February 2026. This war has demonstrated, in real time, exactly what dependence on a volatile global oil market costs American drivers and taxpayers.

Oil, and ultimately gasoline and diesel, is priced globally and is dependent on global supply and demand. Even a country that produces oil is exposed to price shocks when conflict disrupts supply chains. Choke points like the Strait of Hormuz in the Iran conflict create real economic and political costs. To capture these costs, we used the Iran War Energy Cost Tracker, maintained by Brown University's Watson Institute, which tracks the additional cost paid by U.S. consumers for gasoline since the conflict began, relative to a no-war counterfactual baseline. Dividing that total by the gallons of gasoline consumed since the start of the war yields a wartime premium of 71¢ per gallon. This value is not a projection or a model; it reflects what American drivers are actually paying at the pump right now. EVs powered by the U.S. electric grid are not subject to these volatile markets, since electricity is regulated and comes from diverse, domestic fuel sources.

To estimate the 2026 military operations costs for securing oil, we turned to two sources. The first study by Brown University's Watson Institute measured the amount of money spent on operations in Venezuela in the past year. The second source is the Iran War Cost Tracker. By combining the expenses from these two military operations, we can get a per-gallon value over the last 12 months. We used a 12-month window because it captures the full arc of both operations rather than the timing of individual strikes, while staying recent enough to reflect current conditions. Dividing the combined expenses of these two military operations over that period by the oil consumption in the past year yields a conservative estimate of 81¢ per gallon of motor gasoline.

To estimate the remaining 9 years of the 10-year life, we did not want to assume that wartime conditions would persist for a full decade. Instead, we applied the year one costs to 2026 only and used a long-term estimate of U.S. oil dependence costs for the following nine years. That estimate comes from SAFE, which put the cost at 38¢ per gallon. We paired it with the ORNL study for the market costs of oil dependence, which SAFE does not cover. ORNL breaks these into macroeconomic disruption costs, the losses to output and employment that follow a sudden price spike, and monopsony costs, the higher price Americans pay because U.S. demand is large enough to move the global market. These were both adjusted for the portion of oil imported. Adjusted for inflation, those come to 49¢ per gallon, bringing the total for the remaining 9 years to 87¢ per gallon.

Consistent with other values in this analysis, we relied on the more conservative estimate of military costs and combined it with the costs of market impacts from imported petroleum to quantify the value of reducing reliance on foreign oil by powering vehicles with electricity. Very little oil is used to generate electricity in the U.S.

Fuel Security		
	2026 Chevrolet Equinox	2026 Chevrolet Equinox EV (1% Oil)
Annual Gallons	415	415
Military cost of Operations in Iran and Venezuela	81¢ per/ gal	0.81¢ per/ gal
War-time Premium on gas (macroeconomic disruption)	71¢ per/ gal	0.71¢ per/ gal
Total Fuel Security (2026)	$1.52 per/ gal	1.52 ¢ per/ gal
Fuel Security Cost per year (2026)	$630.8	$6.31
Total Difference In Fuel Security (2026)	$624.49	
Military Cost for Defending Oil (Remaining 9 yrs)	38¢ per/ gal	.38¢ per/ gal
Monopsony Component	32¢ per/ gal	.32¢ per/ gal
Macroeconomic Disruption Costs	17¢ per/ gal	.17¢ per/ gal
Annual Fuel Security (Last 9 yrs)	$361.05/yr	$3.61/yr
Total Difference In Fuel Security (remaining 9 Yrs)	$3,216.96	
EV Saving Over Life of Vehicle (2026 + 9 Yrs)	**$ 3,841.45**	

Economic Development $5,380

Every time a driver stops at a gas station and fills up their tank, approximately 23% of the money spent is retained in the local economy, while that number triples when purchasing electricity to power vehicles, with over 70% staying to support local economies. EVs offer two advantages for keeping money in the local economy. The first is that it costs less to power a vehicle with electricity, which means some of the money traditionally spent on gas stays in consumers' wallets. The second is that electricity is more likely to be generated locally, so more of the money spent on transportation energy stays local.

While updating this paper, we found a considerable amount of research done on the economic benefits of EVs, from job creation to the benefits of public chargers. What has not been published since the following three studies is a comparable per-vehicle lifetime estimate, which is the format we need for this analysis. Therefore, we relied on the existing studies updated for inflation in 2026.

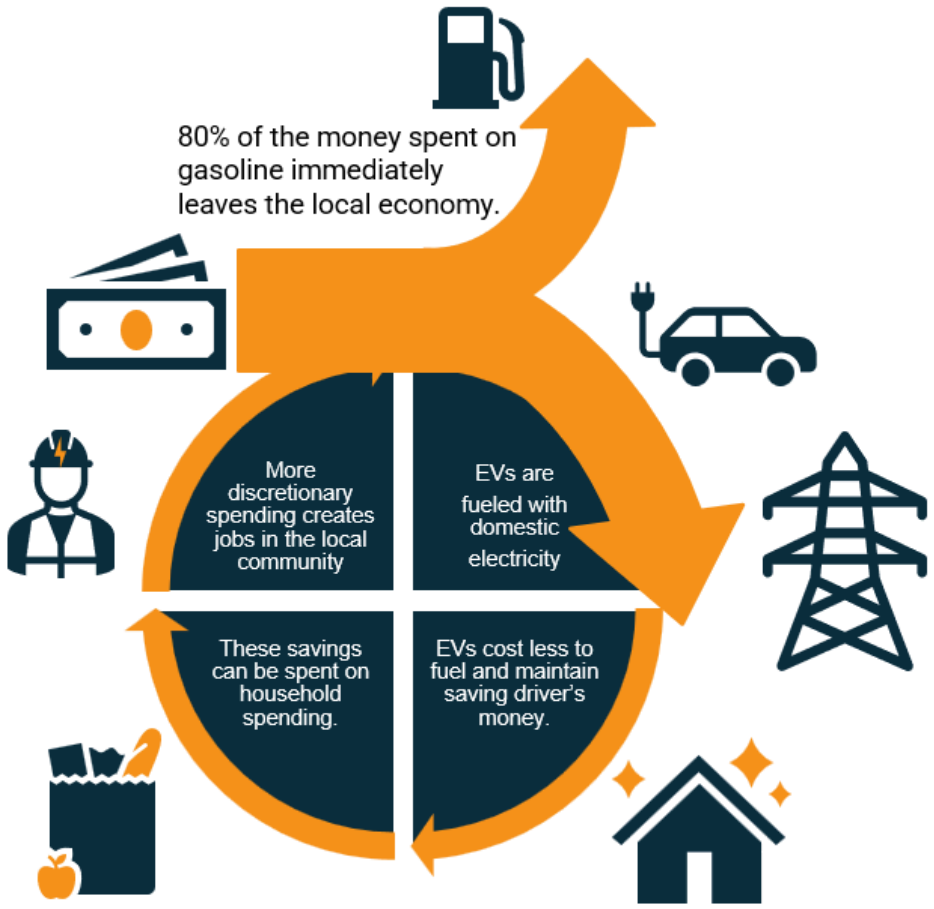

Figure 1: *Economic Multiplier of Electric Vehicles*

A Cal-ETC study estimated that in Florida, households using PEVs would save a net $2,100 per year on fuel and maintenance. It is estimated that most of these savings would be spent on food, household furnishings, clothing, and entertainment. Based on typical spending patterns, the same study estimated that this EV-driving household would increase its food spending by about $970 per year. This additional spending on food would support local farms, markets, and restaurants. Another Cal-ETC study found that for every dollar spent on goods and services in California, 16 more jobs were created than for a dollar spent on gasoline. Each step of the

Economic Multiplier of Electric Vehicles (shown in ***Figure 1***) has the potential to generate tax revenue, which feeds back into the local economy and creates jobs.

Studies conducted by the National Renewable Energy Laboratory (NREL) and Energy & Environmental Economics have shown that reduced gasoline spending associated with owning and operating an EV yields roughly $5,100 in regional economic development over the life of the vehicle. One challenge with these analyses is that they include the value of the federal tax credit.

A separate analysis by Korejwa for Forth (Oregon EV Returns) reached a similar conclusion using a bottom-up approach specific to Oregon, a state that produces no petroleum and imports nearly all its transportation fuel. Combining an IMPLAN input-output model of redirected household fuel spending (about $506 per EV per year) with state and local tax revenue generated from EV-related economic activity in the state (about $64 per EV per year), the study estimated roughly $5,700 in regional economic development over the life of the vehicle.

The $5,380 economic development benefit is a simple average of three per-vehicle lifetime estimates from the peer literature. NREL's National Economic Value Assessment of Plug-In Electric Vehicles estimates a per-vehicle value of $5,134. The Bonneville Environmental Foundation's cost-benefit study estimates a per vehicle value of $5,309. The Korejwa/Forth Oregon EV Returns analysis estimates a per-vehicle value of $5,698. Each estimate was inflation-adjusted to 2026 dollars. Because the three studies span different regions and use different methods, ranging from national top-down multipliers to a Pacific Northwest utility-sector model to an Oregon-specific IMPLAN input-output analysis, averaging them reduces sensitivity to any single set of regional assumptions.

Economic Development		
	2026 Chevrolet Equinox	2026 Chevrolet Equinox EV
Per EV Regional Economic Development	$0	$5,309 Over life of vehicle
Korejwa-Forth Estimate	$0	$5,698
National Average per EV lifetime	$0	$5,134
EV Savings Over Life of Vehicle	**$5,380.00**	

Analysis – Benefits to the Electric Grid

Grid Benefits $2,565

The U.S. electric grid consists of generation facilities, transmission lines, and distribution lines that generate and deliver the energy necessary to meet consumer electricity demand. It has an extremely limited storage capacity and must constantly adjust to provide sufficient power in real time. As demand for power varies throughout the day, the grid must respond immediately. As more renewables contribute power to the grid, overgeneration can occur. Depending on how EVs are integrated with the grid, their impact can range from driving up costs to greatly reducing inefficiencies, building resilience, and putting downward pressure on rates. Synapse Energy Economics analyzed over 2 million EVs sold between 2011 and 2021 and found that EV drivers paid $3.12 billion more in electricity revenue than they cost the system, and $2.44 billion even after utilities' spending on EV programs. Revenues exceeded costs in every region of the country. **This means that even with unmanaged charging, EVs effectively make electricity less expensive – not only for drivers – but for all ratepayers.**

In an ideal world, a graph of electricity usage would be flat, with steady generation and use. In reality, people use more electricity at different times of day and under varying weather conditions, while renewable generation varies with the wind and the sun.

Figure 2: *How EVs Can Incorporate Daily EV Load*

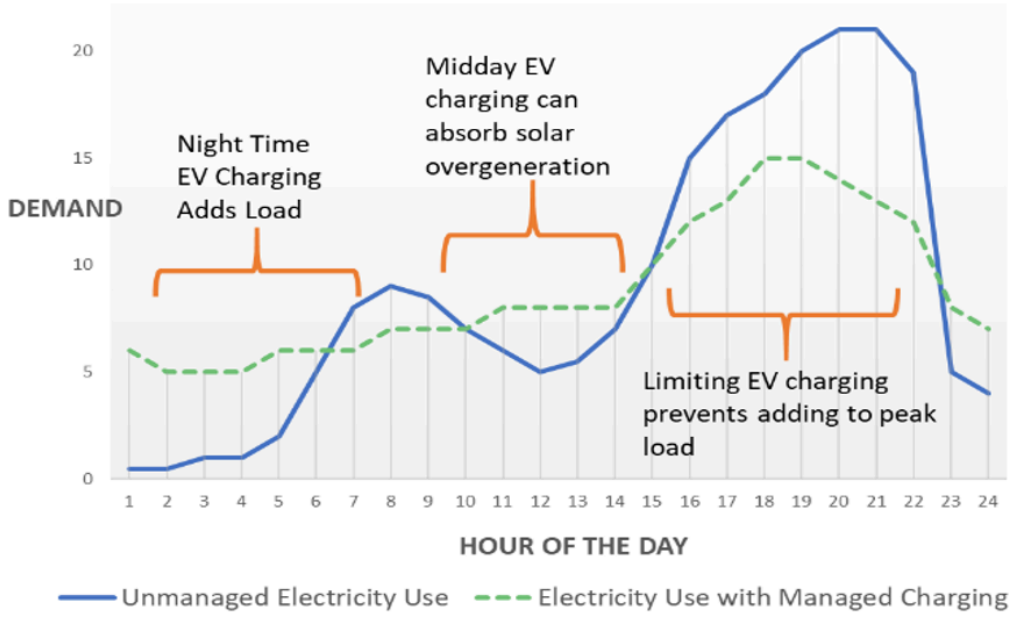

Figure 2 illustrates a simplified day of grid demand and the potential positive impact of EVs on this demand. Simply by charging EVs during periods of low power demand (valleys) and curtailing (or stopping) charging during periods of high demand (peaks), the vehicles can help flatten the electric load, which allows utilities to shift load to parts of the day where the grid is underutilized and has extra capacity. This can save utilities and transmission operators a great deal of money.

Utilities employ several “tools” to help keep electricity supply and demand aligned. Some utilities use rate design (such as time-of-use rates) to offer lower electricity prices, encouraging EV

owners to charge during periods of low demand (typically at night). Another tool utilities use is "Demand Response." As demand for power increases, electricity prices rise exponentially. Demand response techniques involve notifying and encouraging electric customers to reduce their use during periods of high demand in exchange for a financial incentive. Direct or active managed charging allows utilities to remotely curtail EV charging via a customer's home charger to reduce the impact of peak events. Managed charging programs are already operating at scale through some third-party platforms. WeaveGrid partners with Baltimore Gas and Electric to run a Smart Charge Management program that pays EV drivers up to $10 in monthly bill credits per vehicle. Customers may opt out, but in a report to the Vermont State Legislature on Green Mountain Power's managed charging program, only 2% of customers opted out of managed charging during a peak event. These options only require one-way power flow from the grid to the vehicle (V1G).

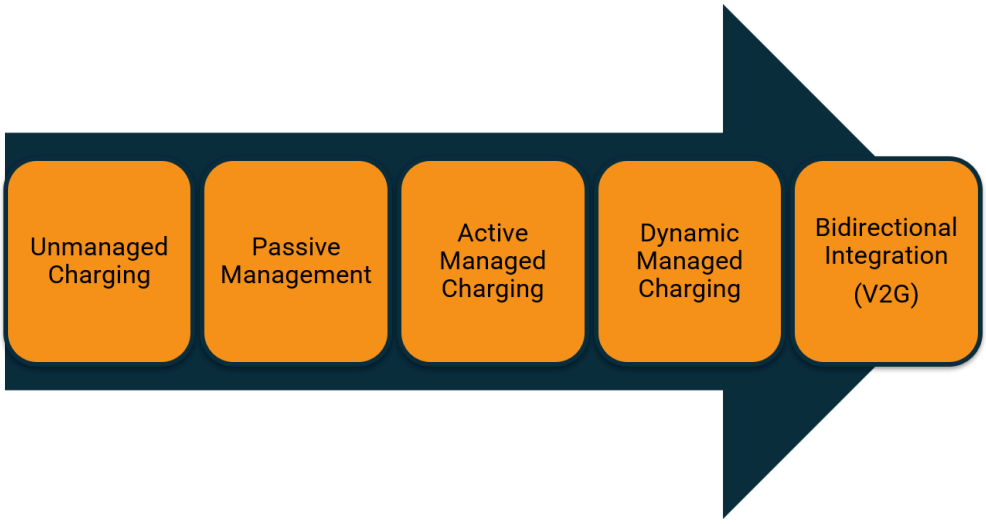

Figure 3: *Levels of EV-Grid Integration*

The next level of services that EVs could provide to the grid, and offer the highest value, is bidirectional charging. This allows power to flow back from the EV battery into the grid (V2G). These services are not yet widely available through utilities, but they offer significant financial potential and are currently being tested in pilot programs across the country and are expected to become widespread in the years ahead. In addition, many mass-market EVs are not currently equipped with onboard bidirectional chargers and cannot feed electricity from their battery back into the grid.

Relying on EV traction batteries as storage to decouple generation from demand allows utilities to reduce capital investments. Increased revenue from off-peak EV charging makes the grid more efficient by using currently underutilized assets and putting downward pressure on rates. Not all utilities offer rate design and/or demand response options to residential customers, but these tools are growing and expected to become widespread over the next several years. They will be valuable for both EV customers and utilities. What we did not quantify was the convenience and resilience benefits of EVs. EVs with bidirectional charging capabilities can feed

power back into a building or home as well as back into the grid. During power outages, EVs can provide backup power to homes, businesses, and even concerts.

There are significant benefits to the grid from EV charging. To estimate the value EVs are likely to provide to the grid in the present or near future, we focused on the benefits they can deliver in the existing technological and regulatory environment.

To quantify the value EVs provide to the grid, we used ratepayer benefits, which are well documented in the existing literature. Our review draws on a range of studies and scenarios, including three accessed through VGIC's analysis. It is important to keep in mind that EVs have great potential to provide much greater value to the grid in the future, but if EV charging is unmanaged, they can also create costs for the grid.

EV Benefits to the Grid		
	Passive Charging	Active Charging
Brattle (2026) EnergyHub Estimate		$230/yr
Brattle (2025) Utility Playbook Estimate	$90–340/yr	$145–575/yr
Energy+Environmental Economics (2024) Estimate	$298/yr	$577/yr
Average per year Estimate	$256.50/yr	$389/yr
National Average per EV lifetime	$2,565	$3,890
EV Savings Over Life of Vehicle (10 Year Passive Charging)	**$2,565**	

Conclusions and Policy Recommendations

Electric Vehicles create broad benefits that extend beyond gas savings. Figure 4 illustrates the compiled value of EV benefits over the course of its first 10 years. Based on the average fuel and electricity prices over the last 5 years, a single EV will save its owner $11,467 in gasoline and maintenance savings. This is the average savings amount, which may be higher or lower depending on local gas and electricity prices. After accounting for higher insurance and registration costs, net owner savings are $9,375.

Conservative estimates indicate that the same EV will yield climate, health, fuel security & national security, and economic development benefits totaling about $11,942. Over the life of the vehicle, it provides benefits that make the electric grid more efficient and resilient, which we conservatively estimate will yield $2,565 in grid benefits. Aside from fuel and maintenance savings, the EV owner derives these benefits by driving an EV but does not receive monetary compensation for them. Over the life of the EV, the benefits will exceed $23,800.

As Figure 4 illustrates, even without EV incentives, when considering the broader benefits an EV provides, the cost of a traditional gasoline-powered vehicle (to the consumer and society) will be greater over the first 10 years than the cost of a comparable Electric Vehicle. Since these savings accrue over time and EVs have higher upfront costs, EV incentives are an important tool for driving EV adoption and enabling access to these benefits.

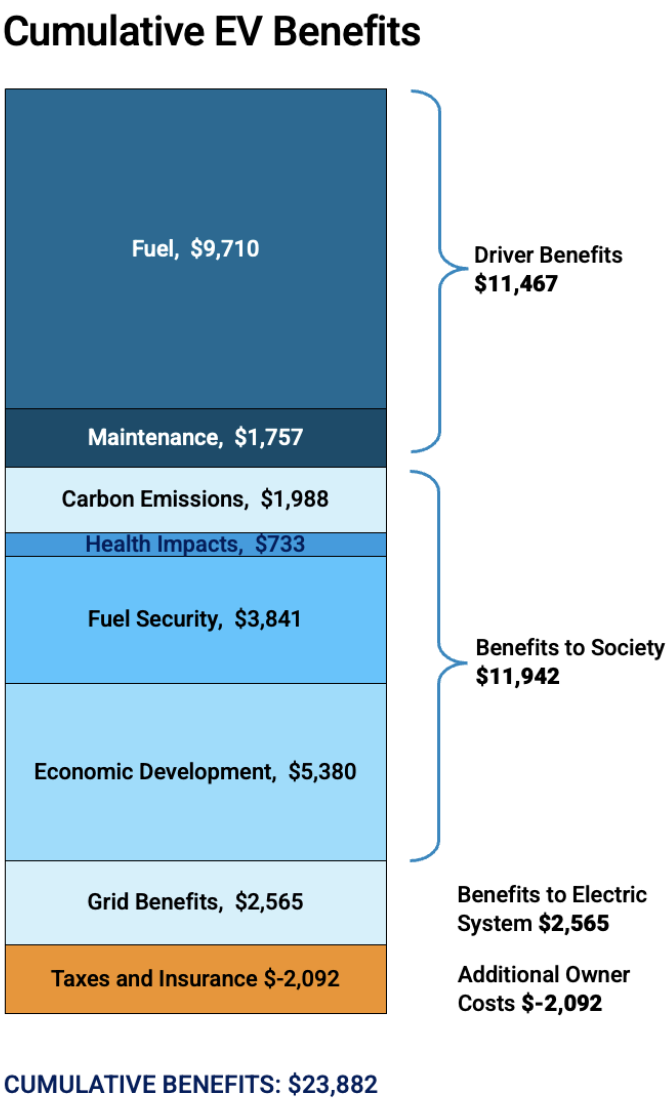

Figure 4: *Compiled EV Benefits over 10 Years & 111,930 miles*

This analysis provides a tool for policymakers to identify and capture the broader benefits of EVs and to set appropriate incentive values that more accurately reflect their value. Policymakers can leverage that value to reduce the incremental cost of EVs in the marketplace, thereby helping meet policy goals and supporting job creation, economic development, national security, public health improvement, climate goals, and a more efficient electric grid.

Figure 5: *Total Vehicle Cost and Benefits*

Vehicle	Chevrolet Equinox ICE	Chevrolet Equinox EV	EV Savings *(Benefits minus additional EV costs)*
Vehicle Cost	$30,795	$36,795	-$6,000
Level 2 Charging Station (Including installation)	$0	$1,600	-$1,600
Energy Costs	$15,540	$5,836	$9,710
Maintenance Costs	$13,029	$11,271	$1,757
Insurance/Tax Cost Premium	$0	$2,092	-$2,092
Social Cost of Carbon	$3,008	$1,020	$1,988
Health Costs of Pollution	$1,166	$433	$733
Economic Development Benefit	$0	$5,380	$5,380
National Security Costs	$3,880	$39	$3,841
Grid Benefit	$0	-$2,565	$2,565
Total 10-Year Cost to Owner and Society	**$66,346**	**$51,141**	**$16,282**

Policy Recommendations

The far-reaching benefits of electric vehicles demonstrate that electrifying the transportation sector yields benefits that extend well beyond EV drivers. By not burning gasoline, EVs prevent pollution that causes cancer, asthma, lost work days, and death. Not burning fossil fuel also reduces climate catastrophes that cost billions of dollars every year (not to mention human lives). Consumers are already seeing the costs themselves as housing insurance increases alongside rising global temperatures. By fueling with ever-cleaner electricity, EVs reduce America's dependence on foreign oil and the need for military operations to protect it. Relying on more efficient technology and fueling with domestic electricity makes transportation more affordable for American households, allowing them to keep more money in their wallets to spend in their communities. Finally, even without planning, EVs in every state contribute more to the grid than they cost. Everyone on the grid benefits, not just EV drivers. Charging overnight

utilizes capacity that would otherwise go unused, spreads fixed costs over more kWh sales, and puts downward pressure on rates for all customers. By scaling up managed charging programs and eventually bidirectional charging, EV batteries can develop their own revenue stream while creating a more efficient, resilient, and affordable electric system. For these reasons, investing taxpayer dollars or ratepayer dollars in EV incentives is a win-win for society and drivers.

1. **Incentivize new, used, and leased EVs.** This analysis demonstrates the widespread benefits that EVs provide to drivers, the electric system and ratepayers, and society as a whole through health benefits, economic development, climate benefits, and energy security. Inversely, eliminate disincentives such as disproportionate registration fees for EVs and high-cost programs that limit access and raise the price of public charging. Ultimately, these disincentives slow EV adoption, leading to higher public health costs, higher insurance costs, damage from extreme weather events, and more taxpayer dollars spent to protect foreign oil. Some ideas for incentives include graduated, declining structures that drive adoption; incentives targeting high-polluting vehicles to maximize health and climate benefits; first-time EV buyer incentives; and incentives for less expensive vehicles to drive manufacturers to make lower-cost models.

2. **Support durable revenue mechanisms in states to fund consistent state EV and charging incentives.** One of the biggest challenges with state incentives is that funding quickly becomes oversubscribed, and programs are implemented inconsistently, causing issues for consumers and dealers alike. Programs like Colorado's enterprise funds have driven EV adoption through minimal charges on e-commerce sales of non-essential items.

3. **Create federal programs to build out ubiquitous low-level charging infrastructure in communities**, especially in areas where private capital is unlikely to invest, such as those with high rental populations and multifamily housing. Engage utilities to develop managed charging programs for these community chargers, making the cost comparable to home charging so that all drivers can experience the cost and convenience benefits of driving electric.

4. **Support clean and efficient vehicle regulations.** One of the most interesting findings from the update is that clean vehicle regulations have reduced harmful emissions from gas vehicles since this paper was last written in 2020, thereby reducing health impacts by over one-third. This demonstrates the importance of the California Waivers, EPA emissions standards, and CAFE standards in reducing vehicle emissions and the associated public health damages and related costs. While the future of these U.S. regulations is unclear, the reduced costs of health damages from vehicles is clear evidence that they are working to reduce damaging emissions and improve vehicle efficiency.

Acknowledgements

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About Plug In America

Plug In America is the nation's leading nonprofit organization dedicated to accelerating the use of plug-in electric vehicles in the United States through education, advocacy, and research. Formed in 2008, Plug In America provides practical, objective information to consumers and dealerships about EVs through various programs, including National Drive Electric Month, Drive Electric Earth Month, PlugStar.com, and other public outreach events. Learn more at PlugInAmerica.org.