ZETA

WHITE PAPER

# Driving Consumer Adoption of Light-Duty Electric Vehicles through Purchase Incentives

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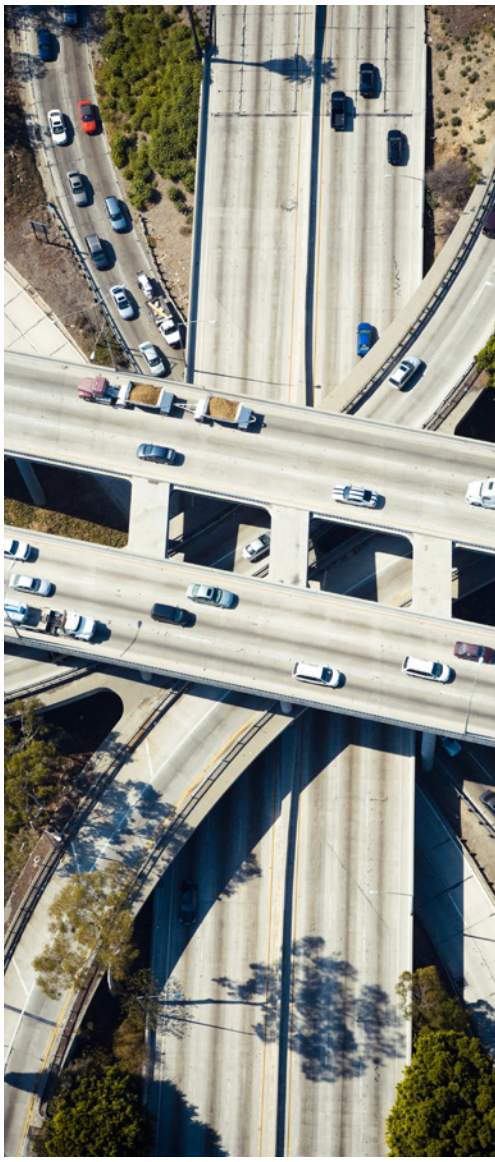
# Abstract

Electric vehicles (EVs) present an unmissable opportunity for the United States to simultaneously address climate change and reboot the economy. While EVs can provide a pathway to meet both goals by reducing emissions and jumpstarting the United States' automotive sector, deploying them will require comprehensive and bold policy action.

Of the policy tools available to lawmakers, consumer purchase incentives are the most effective. Case studies in Norway, Germany, China, and the U.S. have demonstrated their power—the more robust the incentives, the higher the market share is for EVs. Likewise, when incentives are phased out too early, the market share declines. These trends have been observed both internationally and domestically at the state level in California and Georgia.

While § 30D of the U.S. tax code does provide a federal tax credit to consumers who have purchased a qualifying EV, the section requires certain updates to meet its full potential. Recommendations for improvement and expansion include removal of the current 200,000 unit-per-manufacturer cap, which punishes successful EV manufacturers and slows down electrification; expansion to the used EV market, which attracts the majority of U.S. car buyers; application of the incentive at the point of sale rather than on tax returns; introduction of credit refundability so that neither a consumer's income nor tax liability prohibits them from receiving the full credit; and introducing a new replacement program to encourage consumers to trade in their less-efficient internal combustion vehicles (ICEVs) for EVs.

**On the whole, rather than adding on qualifiers or additional barriers, consumer incentives should be expanded to the maximum and made available to all consumers. This adjustment is a critical step to electrifying the U.S. transportation sector as quickly as possible.**

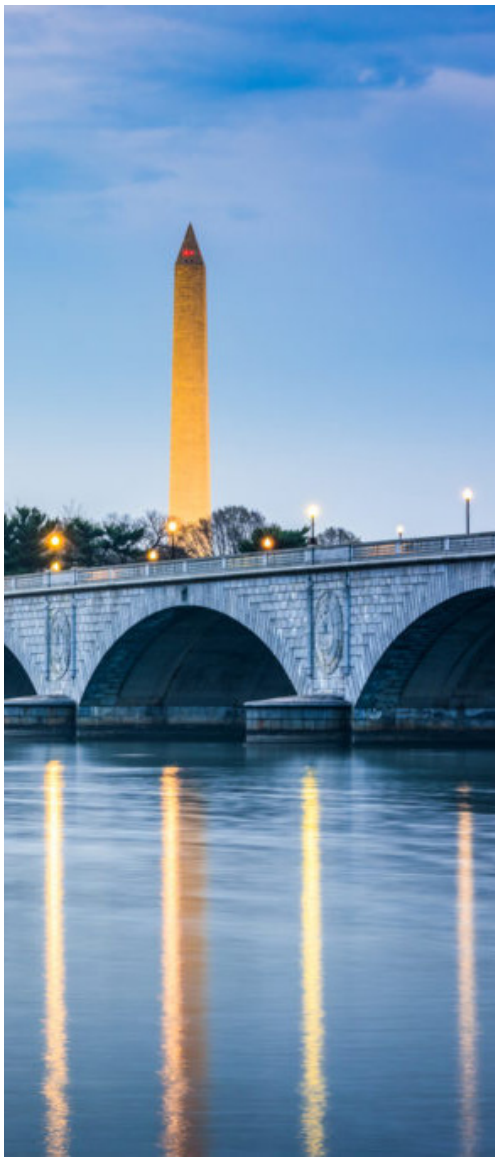


## Key Takeaways

- Approximately **60% of Americans** support EV state incentives and would purchase an EV when the technology reaches price parity with ICEVs.
- **The most persuasive incentive for consumers is a point-of-sale credit**, which lowers the upfront cost of an EV purchase. Point-of-sale incentive delivery can be twice as effective at motivating consumers to buy EV compared to consumers receiving the credit after they file their taxes.
- **Point-of-sale rebates reduce tax credit inequity** by expanding access to consumers whose incomes exclude them from a $7,500 tax liability.
- Reducing consumer incentives slows secondary market growth and creates a significant **barrier to low- and middle-income consumer EV adoption**.
- **Removing the manufacturer cap** and phasing out the incentive in the long run will ensure that successful, early market EV producers are not punished for innovating.
- **Increased new EVs sales yield more used EV sales.** Because used vehicles account for 70% of U.S. vehicle sales, policymakers should encourage used EV availability––by **expanding § 30D to include used vehicles** and creating a program to **encourage consumers to trade in their ICEVs for EVs**.
- Despite growth in global EV sales, **the U.S. lags significantly behind China** and Europe.

# Introduction

As the United States continues to rebuild from the economic devastation caused by the COVID-19 pandemic, the country has an opportunity to foster job creation and reduce its contributions to climate change by bolstering the automotive industry with robust domestic EV manufacturing. Electric vehicles (EVs) are the lynchpin to simultaneously tackling the climate crisis and restoring the United States as a global leader in automotive manufacturing. After all, the transportation sector is the largest source of greenhouse gas (GHG) emissions in the U.S., and EVs have been shown to have dramatically lower well-to-wheel emissions than internal combustion engine vehicles (ICEVs). In order to realize the full potential of the environmental, social, and economic benefits of EVs, federal policymakers must enact policies that encourage consumer EV adoption.



As the market moves out of the EV early adopter phase and enters the mainstream consumer market, incentives' impact on consumer behavior holds added importance. Unlike buyers driven by a desire to be the first to sample a new technology, consumers who choose to purchase EVs because of the potential fuel, service, and maintenance cost-savings are much more likely to respond to incentives like tax credits. Likewise, retaining consumer incentives at a time when manufacturers are introducing more affordable EV models and more varied vehicle segments, including sport utility vehicles (SUVs) and pickup trucks, presents an additional opportunity to grow the market. On the contrary, reducing the availability of consumer incentives could slow the development of the secondary (used car) market and delay low- and middle-income households' ability to purchase EVs.

**Reforming our current federal consumer incentives is essential to electrifying the transportation sector.**

In this report, we outline the current consumer incentive system, examine which policies currently benefit Americans, and provide recommendations for policymakers to further increase EV consumer adoption in the coming years.

# Current Market

The transportation sector accounts for 29% of the United States' GHG emissions—the largest emitter of any economic sector. Light-duty vehicles, specifically, are responsible for nearly 60% of the transportation sector's GHG emissions.

**Without rapid decarbonization of the light-duty sector, the U.S. cannot meet the climate targets necessary to avoid two degrees celsius warming.[1,2]**

EVs present an opportunity to meet this goal, but successfully transitioning American consumers to EVs demands that policymakers first understand the market. That knowledge will allow them to design incentives that meet consumer needs and accelerate rapid, widespread adoption.

Gasoline-powered ICEVs continue to dominate the U.S. automotive market. In particular, larger, used cars have captured a majority of sales. As they have done for the past five years[3], SUVs and pickup trucks constituted most of the new car market in 2020. The Ford-F150 was the best selling vehicle, and only four of the top 20 best-selling cars were traditional sedans. The three most popular vehicles were all pickup trucks, and the light-truck category as a whole—which includes pickups, SUVs, and crossovers—accounted for 76% of all U.S. car sales in 2020.[4]

This may suggest that the sales of larger vehicles are increasingly preferred by consumers, but analyses also indicate that smaller cars are often deliberately crowded out of the new vehicle inventories, thus limiting consumer access to these vehicles. Driven by a desire to avoid fuel efficiency restrictions and generate higher profit margins, auto manufacturers are producing more SUVs than compact sedans. Under federal Corporate Average Fuel Economy (CAFE) standards, vehicles classified as light trucks are subject to less stringent fuel efficiency improvements than sedans, and they sell at a higher price while incurring a comparable cost of production.

In addition, manufacturers are investing more resources into marketing SUVs, trucks, and crossovers, appealing to Americans' desires for outdoor adventure, self-confidence, mastery of the road, and driving safety.[5,6] The success of such marketing strategies—though often at odds with the realities of large vehicles' environmental impact and consumer safety ratings—creates a self-fulfilling prophecy for vehicle sales.

Just as larger vehicles outsell compact cars, used cars significantly outpace new car sales in the U.S. Used cars represent nearly 70% of total annual car sales and, predictably, remain a popular option due to their affordability.[7]

Even with inflated prices due to pandemic-related increases in demand, used vehicles are nearly 40% cheaper than their new counterparts—on average, purchasing a used vehicle costs $25,500, versus $42,000 for a new vehicle.[8,9]

## Consumer Preferences and EV Perceptions

Consumers regularly identify safety, fuel efficiency, quality, and price as critical factors that they consider before purchasing a new vehicle.[10] While it is well understood how the public's perceptions of these factors apply to their purchasing patterns for gas-powered models, their application to EVs is currently undetermined. Awareness of how consumers sense EVs fare in these categories is important to understanding potential hesitancies related to EV adoption.

Americans' understanding of EV costs is fractured: one-third of Americans believe that EVs cost more to buy and maintain than ICEVs, and a large share of the population is unaware of used EV purchase options.[11] Furthermore, with purchase price already top-of-mind for a majority of consumers, other surveys indicate that the pandemic has created an increased demand for smaller, cheaper, and more fuel-efficient vehicles.[12] A 2016 survey by Consumer Reports found that 84% of Americans believe that automakers should continue to make improvements to fuel efficiency, and researchers have found a strong correlation between high mile-per-gallon (mpg) ratings and consumer satisfaction.[13,14]

**As battery range increases, EVs are well-positioned to meet these consumer demands—despite pervasive misconceptions about EV prices, cost of ownership, battery range, and charging availability.**

## Electric Vehicle Market and Projections

In 2020, nearly all major U.S. auto manufacturers reported double-digit percentage declines in car sales. However, established EV manufacturers experienced growth: Tesla sales, in particular, rose by 20.3% from the previous year.[15] In the same year, the number of U.S.-registered EVs tripled from 2016, rising to a high of 1.8 million.[16]


Within the EV market, battery electric vehicles (BEVs) have proven more popular than plug-in electric hybrid (PHEV) vehicles. This comes as a direct result of the increase in availability and range, and the decrease in price of EVs over the last decade: Both trends were driven by government investment in research and development, consumer purchasing, incentives, fuel economy standards, and similar policies.

Battery costs, in particular, have decreased 89% since 2010, and this decline is projected to continue. Bloomberg New Energy Finance's (BNEF) annual EV Outlook predicts that EV sales will continue to grow, but robust federal support is needed for all categories of vehicles—including passenger and heavy-duty cars—to reach net-zero emissions by 2050.[17]

### Though global EV sales have grown exponentially since 2010, sales growth in the U.S. lags behind China and Europe.

U.S. EV registrations account for a mere 17% of the global market: most EVs are found in China, which reports 44% of all registrations, and in Europe, which reports 30%.[18,19] Sales growth in the U.S. has slowed in part due to the phase-out of incentives for Tesla and GM, the two most popular domestic EV manufacturers.

# EV Incentives Background

Federal subsidies in emerging energy and transportation markets are key tools for driving economic growth while lowering carbon emissions––and the United States has a history of supporting, encouraging, and fostering vehicle technologies. Leftover from past investments in gas-powered vehicles, billions of taxpayer dollars are currently tied up in outdated fossil fuel subsidies.


## § 30D EV Incentives

In 2008, Congress passed the Energy Improvement and Extension Act, which established the § 30D tax credit for new qualified plug-in EVs.[20] § 30D provides incentives for consumers purchasing a qualified EV, starting at $2,500 plus $417 for each kilowatt hour (kWh) of battery capacity over 4 kWh, with a maximum credit of $7,500. The first vehicles to qualify for the full $7,500 § 30D credit were the 2010 Nissan Leaf and the Chevy Volt.

The § 30D credit currently begins to phase out once a manufacturer sells 200,000 EVs. In the tax year that the manufacturer reaches the cap, the credit is first dropped to $3,750 for six months, and then to $1,875 for the following six months, until it is phased out completely. The only two automakers that have reached this 200,000-unit cap are Tesla and General Motors (GM); both are domestic manufacturers and produce the most popular EVs. The original intent of the 200,000 vehicle phase-out was rooted in a concern that foreign automakers would dominate the market, as Toyota and Nissan's early success in the hybrid and EV space raised concerns among US carmakers. Contrary to the original intent, the phase-out now harms American workers and disserves consumers: the cap is only applied to domestic automakers and therefore punishes successful EV automakers, disincentivizes EV production by the manufacturer, and creates a contradictory incentive for the consumer to purchase a foreign-made EV in order to obtain the tax rebate.

## Research has consistently shown that the federal § 30D tax incentive is the biggest driver of EV purchase decisions.

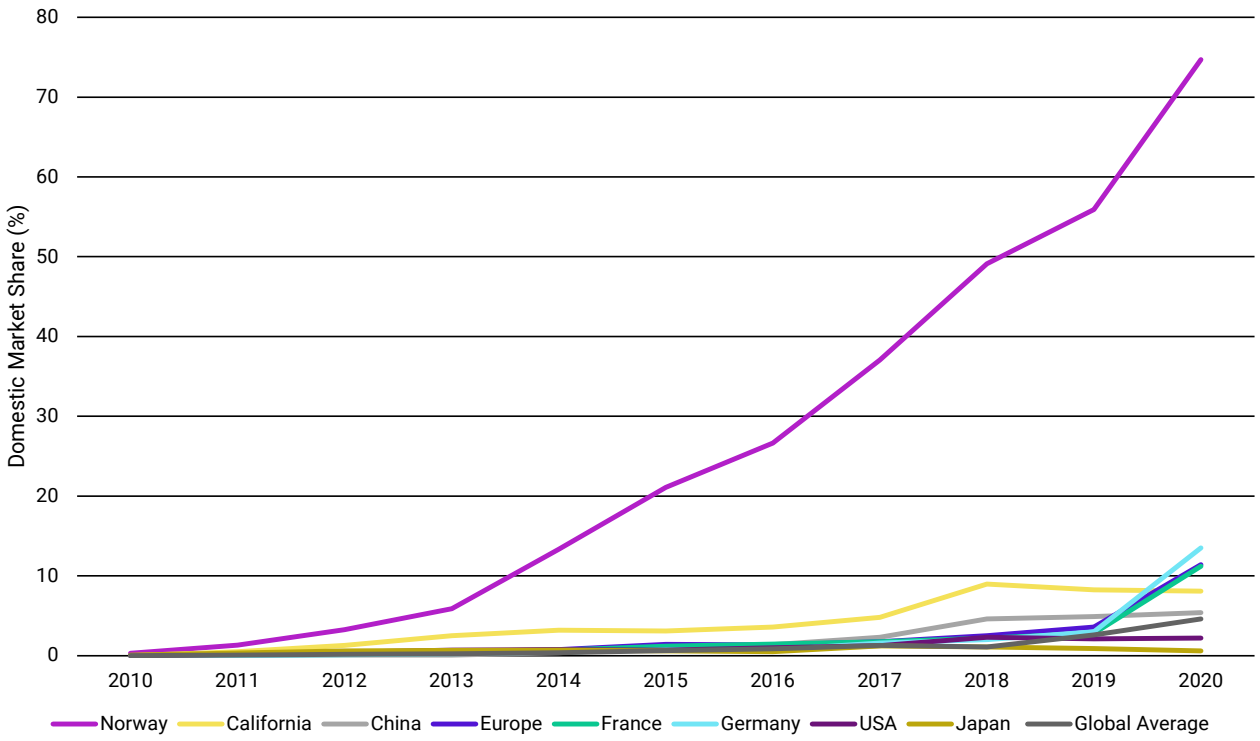
It has also shown that incentives are increasingly important as technology matures and moves out of the early adopter phase.[21] Technological advancements correlate directly to lower costs; in turn, this coincides with an increased adoption by lower-income consumers who are more price-sensitive. In this way, incentives have a larger impact on their decisions.

# International Incentives

## Cost is the primary barrier to purchasing an EV. Approximately 60% of Americans would purchase an EV if it were equal in price to an ICEV, and 60% of Americans support federal and state EV consumer incentives.[22]

Jurisdictions around the world are taking a proactive approach to combating EV price barriers, mainly by introducing consumer incentives. Regions with the highest rates of EV adoption include Norway, Germany, and China; their respective market share of new EV registrations is shown in Figure 1. All of these countries offer various combinations of monetary and non-monetary incentives for both producers and consumers.

**Figure 1: Norway leads the world in total market share of passenger electric vehicle sales due to their generous consumer incentives.[23]**



## Norway

In 2020, EVs represented 74.5% of all new light-duty vehicle registrations in Norway.[24] This was accomplished by exempting EVs from almost all taxes, beginning in 2001. On the contrary, ICEVs were subject to additional taxes, including a value-added tax (VAT) tax, CO2 tax, NOX tax, weight tax, and parking and toll fees. This model is similar to a "feebate" system, where the highest-polluting vehicles pay extra fees that are then used to finance EV incentives (and encourage additional public health and environmental cost savings). This type of incentive system makes EVs considerably less expensive to own over time, and the market has responded accordingly.[25]

A popular electric model in Norway, the Volkswagen e-Golf, has a total cost of ownership of $33,980, compared to the conventional Volkswagen Golf at $34,780.[26] The breakdown of this cost is shown below in Table 1.

**Table 1: A comparison of the cost of an ICE and EV in Norway at the point of sale after tax exemptions are applied. Data from https://elbil.no/english/norwegian-ev-policy/.**

| | VW Golf | VW e-Golf |
|---|---|---|
| Base Price | 22,510 | 33,730 |
| CO2 Tax | 4,440 | 0 |
| NOx Tax | 210 | 0 |
| Registration Tax (weight) | 1,750 | 0 |
| Scrap Fee | 250 | 250 |
| Value-added tax (VAT) | 5,630 | 0 |
| Total Price | $34,780 | $33,980 |

## Upfront price reductions are the most influential incentive for EV adoption.

Rather than enact a retroactive subsidy like the American § 30D incentive, where consumers receive a rebate when they file taxes, consumers in Norway receive the incentive immediately at the point of sale in the form of a discount. Research demonstrates that consumers are strongly persuaded by financial incentives, and the upfront cost influences purchase decisions more than total cost of ownership considerations.[27]

A NREL report found that a $1,000 increase in tax credits leads to a 4.1% increase in BEV purchases, and a $1,000 increase in rebates leads to a 9.4% increase in BEV purchases— more than double the motivating effect.

A total of 80% of EV consumers in Norway indicated choosing an EV for financial reasons—a fact suggesting point-of-sale monetary incentives play a powerful role in encouraging EV proliferation.[28]

## Germany

Germany has experienced rapid growth in the number of EVs purchased annually since the implementation of robust pro-EV policies in 2016. EVs comprised 22% of Germany's new vehicle sales in the last quarter of 2020,[29] with EV market share growing from 0.7% in 2015 to 13.3% in 2020.[30]

Like Norway, the German government subsidizes the sale of plug-in electric vehicles (PEVs) with rebates. Beginning in 2016, full EVs qualified for a 3,000 euro (approximately $3,500) subsidy, with a price cap of 60,000 euros (approximately $70,300). In 2020, the government doubled purchase incentives and reduced the VAT by 3%, a decision that translates to an additional 1,000 euros in savings.[31]

Additional investments in charging infrastructure relieve range anxiety concerns—another key barrier to EV adoption—and the Merkel administration has also invested heavily in national charging infrastructure build-out. From 2017 to 2020, the German government devoted 300 million euros to increasing charging infrastructure availability; recently, the government authorized an additional 2.5 billion euros to reach the country's goal of installing one million stations by 2030.[32] For comparison, the population of Germany is 83 million spread over 138,000 square miles; the U.S. has a goal of installing half a million chargers with a population of 328 million spread over 3.8 million square miles.

**Germany's deployment goals are nearly seven times more ambitious than those of the United States.**

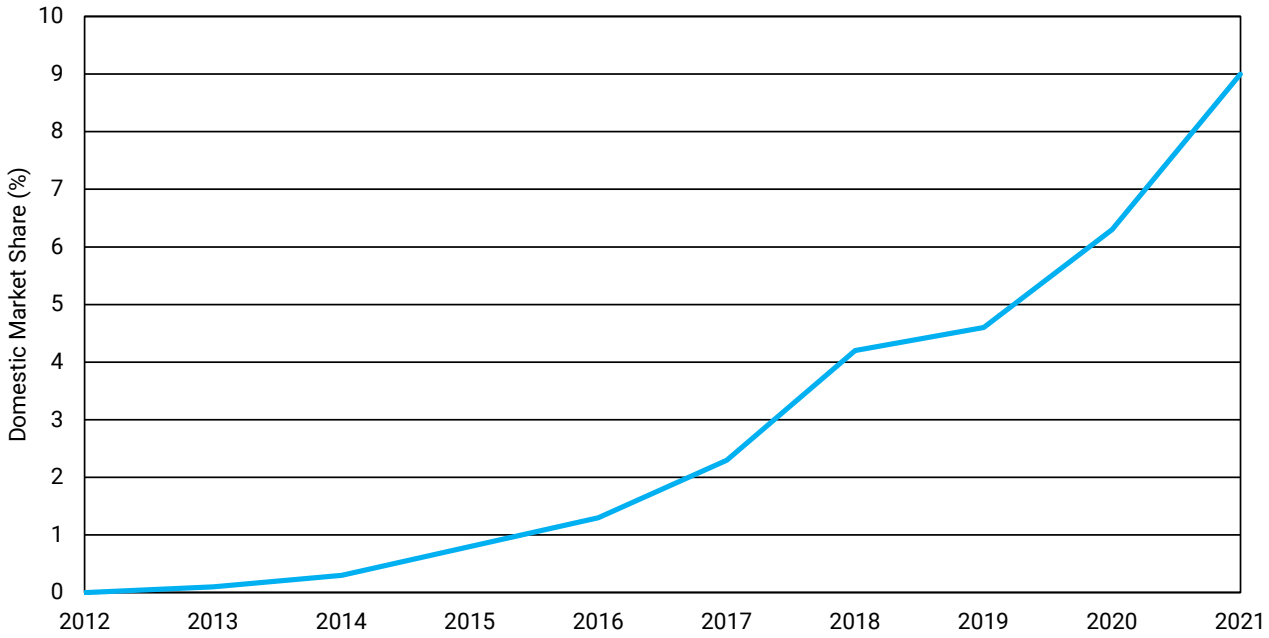
## China

China leads the world in terms of the number of EVs on the road, selling 1.3 million units in 2020.[33] The global breakdown of total stock of EVs in 2020 is represented in Figure 2.

The Chinese approach to EV incentives includes subsidies for EV production and restrictions on the use of conventional vehicles in many cities. Chinese vehicle registrations are subject to a lottery process; EV owners can bypass the process to obtain a vehicle registration and are exempt from city-specific registration fees, which can cost up to $12,000.[34] At the national level, additional purchase subsidies for BEVs vary from the equivalent of $5,000 to $8,600 and are based on the vehicle's range. Cities often fully or partially match, or provide a certain proportion, of the central government's subsidy, which is obtained at the point of sale.[35] These subsidies also protect Chinese manufacturing, as they are only available to consumers purchasing a Chinese-assembled vehicle.

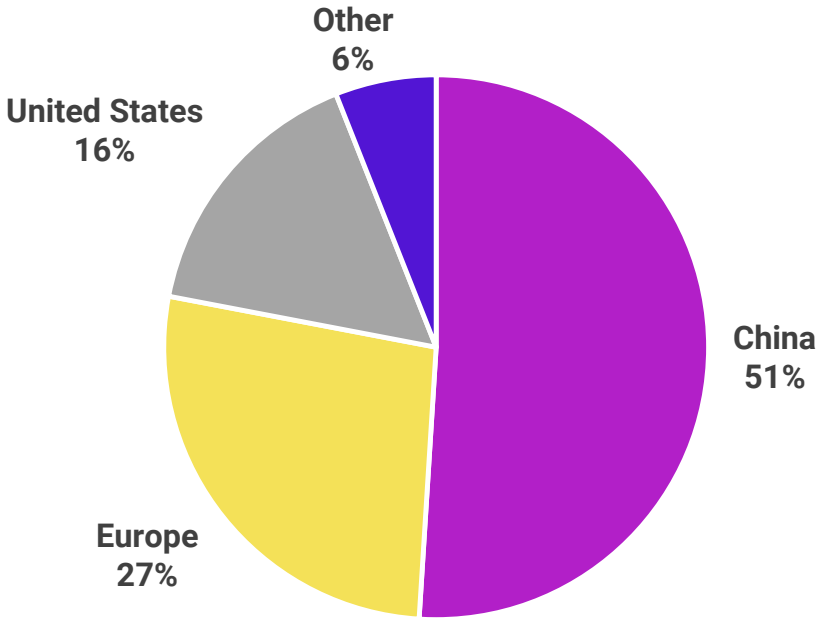
The chart below estimates the growth of EV market share in China through 2021, at which point it is expected to reach 9%.[36]

**Figure 2: PEV market share in China estimated through 2021. 2014 was a turning point for consumer adoption, with the implementation of the EV tax exemption and subsidies.[37]**



The Chinese government has spent over 100 billion yuan (approximately $15 billion) on its burgeoning EV sector, spurring a proliferation in the number of available vehicle options.[38] However, the government is beginning to phase out these subsidies. The reduction in manufacturer and consumer subsidies will likely have a negative effect on the recent growth of China's EV market. In the month after the initial subsidy cut, new EV sales fell 4.7% from the same period the previous year.[39] EV market penetration only reached 5.7% in 2020, falling short of China's national goal to reach 20% by 2025.[40]

**Figure 3: Global BEV Passenger Car Stock 2020. The largest market for EVs is China, with 3.5 million fully electric passenger vehicles as of 2020.[41]**



## Summary

Markets with the highest penetration of EV sales are found in countries with some of the most robust consumer incentives. Table 2 shows the differences in subsidies for four countries with the highest EV penetration. Norway has the most robust monetary incentives, including exemptions from taxes at the point of sale, as well as exemptions from toll road fees.

**Table 2. Summary table of passenger battery electric vehicle incentives for Norway, Germany, China, and the U.S.**

| | Norway | Germany | China | United States |
|---|---|---|---|---|
| Consumer Purchase Subsidy | | ✓ | ✓ | ✓ |
| Registration Fee Exemption | ✓ | | ✓ | |
| VAT Exemption | ✓ | | ✓ | |
| Annual Vehicle Use Fee Exemption | ✓ | ✓ | | |
| Toll / Parking Fee Exemption | ✓ | ✓ | | |
| Charging / Infrastucture Subsidies | ✓ | ✓ | ✓ | ✓ |
| Producer Subsidies | | ✓ | ✓ | |

# State Incentives

In the United States, clear evidence exists that consumer incentives drive EV sales and that repealing incentives too early can have detrimental impacts on the rate of deployment.

## California

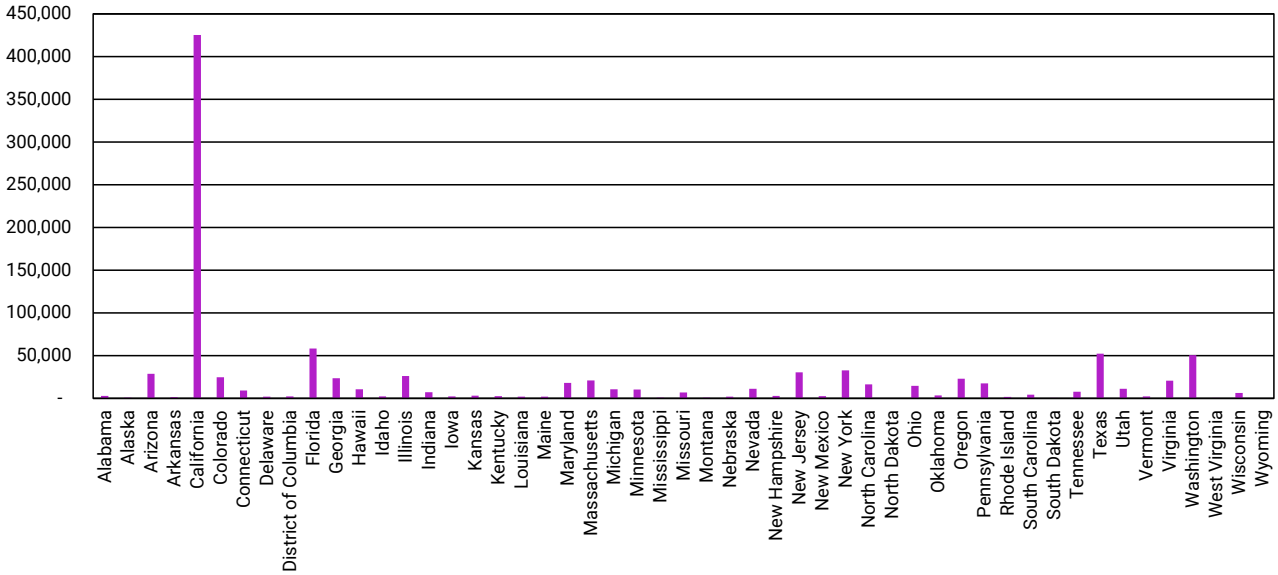
California leads the U.S. in EV sales with 425,300 electric vehicle registrations as of June 2021– making up 42% of the total US EV fleet.[42] Expansive EV deployment in California results from robust state government investment in EV supply equipment (EVSE) and consumer incentive programs.[43] As part of its mission to fight climate change, California committed to ensuring that 100% of all new car and passenger truck sales are zero-emission vehicles by 2035.[44] Consumer incentives will play a key role in accomplishing this goal.

One reason for California's uniquely high levels of adoption is its focus on increasing the accessibility of electric vehicles for lower-income populations. The Clean Vehicle Rebate Program (CVRP), for example, offers a $2,000 incentive for the lease or purchase of a light-duty BEV. In some districts, where individuals with incomes less than or equal to 300% of the federal poverty level, EV purchase incentives are increased up to an additional $2,500. Furthermore, the California government mandates the Air Resources Board (ARB) to launch awareness initiatives within low-income communities in order to inform people about this opportunity.

## Georgia

Largely as a result of a generous tax incentive for zero-emission vehicles, Georgia was the U.S.'s second-leading state in EV adoption. However, in 2015, Georgia passed House Bill 170 and repealed the Zero Emission Vehicle Tax Credit, replacing it with a new registration fee. The credit applied to 20% of a vehicle purchase, with a limit of $5,000. The bill repealed this popular consumer incentive, and it went a step further to establish a new tax for alternative fuel vehicles (AFVs) that rely exclusively on electricity.[45] Despite also being classified as AFVs in the state of Georgia, vehicles fueled by compressed natural gas, liquefied natural gas, or liquefied petroleum gas were exempt from this tax.[46] As a result, EV sales fell from more than 1,400 per year before the credit expired to fewer than 250 per year—representing an 83% drop in 1.5 years.[47] Today, Georgia has fallen to sixth place in the share of U.S. EV sales by state.

**Figure 4: This chart shows the vehicle registration counts of all-electric vehicles (EVs) by state as of December 31, 2020. California has the greatest number of EVs, approximately 42% of EVs nationwide. (DOE AFDC)**



# Recommendations

Consumer purchase incentives are among the most important policy tools for reaching transportation electrification goals. **The federal consumer tax incentive for EVs (§ 30D) is becoming increasingly important for EV adoption as more models become available and EV affordability increases.** The way the law is written, however, leaves room for improvement in a reformed incentive program. Rather than limiting which consumers are eligible for the credit, the focus should be on expanding the credit to transition to U.S.-produced EVs as quickly as possible. Consumer incentives drive public benefits that accrue to everyone, not just the EV consumer. Ubiquitous access to the 30D credit is necessary to facilitate those larger goals.

## Remove the Manufacturer Cap

The current law punishes pioneering automakers by phasing out the incentive after their first 200,000 sales. **The manufacturer cap should be removed, and the incentive should be gradually phased out once the majority of new vehicle sales are zero-emission.** This way, automakers who produce and sell popular EVs are not punished, and EV sales can continue to be incentivized for a more diverse population.

## Incentivize at Point of Sale

The current credit is applied as a refund on taxes at the time of filing. This means the consumer must cover the upfront cost; as a result, this creates an additional price barrier that disproportionately harms low-income consumers. **Studies have shown that delivering the consumer incentive at the point of purchase rather than at the time of filing can more than double the motivating effect of the incentive.**[48] Additionally, because the credit is in the form of a tax rebate (and must be filed annually during tax season), consumers who make below a certain threshold per year do not have a sufficiently high tax liability to benefit from the full refund. On the other hand, higher income taxpayers get the full $7,500 rebate, thus exacerbating the credit's inequity.

Income should not be a qualifier to benefit from the incentive, and it should be applied when the consumer makes the purchase, either by the dealer or the automaker in the case of direct-sales. To improve the equitable distribution of the tax incentive, it should be applied as a refund at time of the vehicle's purchase.

## Appy Incentives to Previously Owned EVs

Consumer incentives expand the EV market for new purchases while priming the secondary market. Contrary to popular belief, most cars on the road do not belong to the original owner—70% of vehicles are purchased used. New vehicles on the road in 2021 will be on the road for an average of 12 years (so, until 2033).

**To decarbonize the transportation sector, EVs must be a part of the used car market, and to be part of the used market, they must make up a significant share of all new vehicles available for purchase now.**

EVs will soon make their way into secondary markets, and they will also become cheaper over time. The International Council on Clean Transportation (ICCT) recently reported that by 2029 EVs will reach price parity with the average vehicle purchased by a low-income household.[49]

As the market accounts for fuel and lower maintenance costs, the savings will continue to benefit all income groups over time.[50]

In addition to expanding the new EV consumer incentive to help prime the secondary market, Congress should also create a used EV consumer incentive, or expand the § 30D credit to used EVs. This will help used EVs compete with used ICEVs, especially considering used EVs' relative rarity within the secondary market. When used EVs are more accessible to all incomes, Americans will receive the full environmental and public health benefits of an electrified transportation sector.

## Create a Retirement Incentive for Combustion Vehicles

The most-polluting vehicles on the road today are the oldest ICEVs, especially those powered by diesel. In 2009, the Obama administration introduced the Car Allowance Rebate System (CARS). The program provided consumers with an incentive to trade in a vehicle that had an Environmental Protection Agency-rated average of fewer than 18 mpg for a new vehicle with a rating of over 22 mpg. Depending on the difference in the fuel economy of the two vehicles, the credit was between $3,500 and $4,500, and was provided in the form of a voucher.[51]

An improved program should be designed to encourage consumers to trade in inefficient ICEVs for EVs, which would accelerate new sales and could be designed to help low-income and disadvantaged communities afford the upfront cost of a new EV.

A similar proposal was introduced by Senator Schumer, who estimated that there would be 63 million fewer ICEVs on the road by 2030 if the program were adopted.[52]

# Conclusion

EV adoption is essential to meeting the emissions reduction goals needed to avoid the worst impacts of climate change. ZETA's goal of 100% EV sales by 2030 can only be achieved with ambitious policy action, of which consumer incentives are key. As the § 30D federal consumer incentive is being extended and reformed, policymakers must aim to rapidly maximize EV sales. To reach this goal, they must ensure that the incentive is available and utilized by any consumer interested in purchasing an EV.

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OUR MISSION

# 100% electric vehicle sales by 2030.

The next decade will be critical in implementing federal policies that accelerate the transition to zero emission vehicles and help address these problems head-on.

The advanced transportation sector already boasts hundreds of thousands of jobs but, if we encourage its growth, the U.S. can decisively win the global race to develop a new clean vehicle economy. This leadership will drive American prosperity and secure billions of dollars of economic benefits and job creation for generations to come.

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