THIRD WAY

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Accelerating Our Transition to Zero-Emission Vehicles

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Takeaways

Zero-emission vehicles (ZEVs) are poised to emerge as the predominant technology on America's roads by the 2030s. We need to put the right policies in place to accelerate our transition to ZEVs so we can meet our climate goals and create good-paying jobs making those vehicles and their parts in America.

For the U.S. to lead on clean vehicles, we need to move quickly to develop and deploy light, medium, and heavy-duty electric and other zero-emission vehicles that cost the same as, if not less than, comparable internal combustion engine vehicles. To get on the path to 100% ZEVs on the road and in people's driveways by 2050, the U.S. must:

- **Scale-up** domestic manufacturing of clean vehicles;
- **Develop and demonstrate** new clean vehicle technologies;
- **Build** consumer demand for clean vehicles inclusive of underserved groups; and
- **Deploy** clean vehicle refueling infrastructure.

We need to go big on clean vehicles

Driving is responsible for over 80 percent of transportation emissions, and it is critical that we transition to electric vehicles (EVs) and other zero-emission vehicles (ZEVs) quickly to avoid the worst consequences of climate change. ZEVs need to account for 100 percent of new sales by 2035 so that they can be 100 percent of all vehicles on the road by 2050. [1]

The good news is that within the next decade, ZEVs will be less expensive to purchase, operate, and maintain than the internal combustion engine cars, trucks, SUVs and delivery vans we use today. [2] As a result, these vehicles will emerge as the dominant technologies and put momentum behind our efforts to decarbonize.

While the transition to clean vehicles is becoming inevitable, important details like the speed of the transition, where they get made, who will make them, and who will be able to afford them are less certain. That is why policy is so critical. Congress and the Administration need to act now to ensure our transition to ZEVs happens quickly, puts American manufacturers and workers first, and that all Americans can benefit from this transition.

Manufacturers build where they sell. While EV sales are growing in the U.S., China [3] and Europe [4] are far outpacing us after years of spending tens of billions of dollars on manufacturing assistance and consumer incentives. Automakers and other manufacturers in the ZEV supply chain are preparing to invest heavily in EVs, [5] but they will continue building their vehicles and components overseas unless we show them there is a market for their products in the U.S. The same will be true for clean medium- and heavy-duty vehicles like trucks and buses.

There are more than 900,000 workers in auto or auto parts manufacturing in the U.S., [6] including 200,000 union workers. [7] Unless we act quickly to create domestic demand for ZEVs and secure opportunities for our domestic auto workforce in clean vehicle manufacturing, these jobs will be gone within a decade. Enacting the right policies will help sustain and create jobs in traditional manufacturing states like Ohio and Michigan, but also in Sun Belt states like Georgia and Texas where auto manufacturing is growing quickly. [8] Smart policies can also help ensure that today's

union autoworkers continue making American clean vehicles, and new autoworkers can join unions if they want.

Domestic manufacturing of clean vehicles is also important for our national security. If we fail to establish robust domestic supply chains for these vehicles and their components, then we risk allowing China to control the entire supply chain from mineral extraction to battery and chip manufacturing to vehicle assembly. [9] While some Americans would buy European-made EVs, the overwhelming majority could opt for cheaper Chinese-made cars, exposing us to security vulnerabilities if tensions rise with China in the future. [10]

As ZEVs become cheaper to buy than today's gas-powered vehicles, we need to make sure all Americans can participate in and benefit from this market shift. That means targeting greater consumer subsidies to low-income buyers and making sure densely populated neighborhoods with unique charging needs and communities of color that are often the most affected by transportation-related pollution have access to EV charging and other clean fueling infrastructure.

Getting all of this done will require faster and equitable adoption of light, medium, and heavy-duty electric and other clean vehicles. The following policy recommendations will help get us on that path.

Policy Recommendations

Scale-up U.S. manufacturing of clean vehicles

To ensure a fast transition to ZEVs that boosts the American economy and creates jobs for American workers, we need federal policy to help domestic manufacturers invest in new and retooled facilities to make these vehicles. The U.S. auto industry employs 900,000 workers in vehicle and parts manufacturing, [11] and many of these jobs will be at risk if automakers and their suppliers don't have funds to retool their plants and lead on ZEV manufacturing.

Additionally, we need to create robust domestic supply chains for these vehicles by ramping up U.S. manufacturing of ZEV components like battery cells and chips—particularly urgent given the chip shortage. [12] President Biden has proposed **$50 billion for semiconductor manufacturing and research** as part of his American Jobs Plan to address the shortage and develop a domestic supply chain for this critical component. [13] Expanding our manufacturing footprint beyond auto assembly to include components manufacturing is critical to sustaining the number of auto workers we have today. [14]

DOE's **Advanced Technology Vehicle Manufacturing** (ATVM) Loan Program provides low-interest rate loans for companies investing in facilities to manufacture clean light-duty vehicles and components. To date, ATVM has loaned $8 billion for projects that have supported the production of more than four million clean vehicles. Ford used an ATVM loan to invest in 13 manufacturing facilities in Michigan, Ohio, and four other states, creating and preserving more than 33,000 jobs at

these facilities. [15] Tesla used a loan to build EVs at a manufacturing plant in California, and is now the global leader in EV sales. [16] Taken together, ATVM loans have supported around 200,000 jobs throughout the economy. [17]

Congress rescinded nearly $2 billion in unused credit subsidy from ATVM in the December omnibus bill. It should restore this funding and lift or eliminate the current $25 billion cap on the program so more manufacturers can access this financing tool. Additionally, Congress should expand eligibility to include clean medium- and heavy-duty vehicles so we can ensure low- and zero-emission buses and trucks are made in America too.

The **48C Advanced Manufacturing Tax Credit** [18] was a competitive tax credit created through the Recovery Act to incentivize businesses to create or expand manufacturing facilities developing clean energy technologies, including EVs. The $2.3 billion offered for the credit was oversubscribed by more than three to one. [19] Only a few of the selected projects were related to clean vehicles; for example, Rogers Foam Automotive corporation was awarded a $300,000 credit to manufacture a component for EV batteries' thermal management systems. [20] Congress should offer $30 billion in new 48C tax credits over the next 10 years and make the credit refundable given the ongoing challenges in tax equity markets. Congress should broaden eligibility so that every manufacturer in the supply chain—including automakers, chipmakers, battery manufacturers, and others—for light, medium, and heavy-duty clean vehicles can apply.

Finally, we will likely need additional support to ramp-up manufacturing of clean heavy-duty vehicles given their relative immaturity as a technology compared to light-duty ZEVs. The GREEN Act, which was reintroduced in the House of Representatives in February 2021, establishes a new **Zero-Emission Heavy Vehicle Credit** providing manufacturers with a tax credit for the sale of heavy-duty ZEVs including buses and commercial vehicles. [21] Congress should pursue this policy to incentivize manufacturers to start producing heavy-duty ZEVs.

Develop and demonstrate new clean vehicle technologies

Innovation will be key to developing and scaling up electric and other zero-emission vehicle technologies. The U.S. Department of Energy (DOE) has several RD&D programs that have helped improve the performance of, and reduce the cost of, EV battery cells. The cost of an EV battery pack has fallen 89 percent over the past 10 years, bringing cost-competitiveness between EVs and internal combustion engine vehicles within reach. Further innovation will help EVs drive further on a single charge, charge faster, and require less cobalt and other rare earth metals. [22]

DOE's **Vehicle Technologies Office** (VTO) provides RD&D grants for electric and other clean vehicle technologies, including funding projects that reduce EV battery cell costs and improve battery cell performance, as well as cleaner and more efficient internal combustion engines. In addition to clean cars, VTO also provides funding for medium- and heavy-duty vehicle projects: the SuperTruck program has helped improve the energy efficiency of heavy trucks by over 50 percent since it began

in 2010. [23] Congress should increase funding for VTO with a focus on demonstration and deployment of EV and other ZEV technologies and on continuing the success of the SuperTruck program. Funding should also focus on developing solid-state batteries—the next generation of EV batteries which could offer more energy storage, faster charging, and a longer life-cycle than the current lithium-ion batteries. [24]

In addition to RD&D funding, VTO also provides funding through the Clean Cities Program to help cities foster broader adoption of clean vehicles and deploy EV chargers and other alternative fueling infrastructure. See the "Deploy the Needed Clean Vehicle Infrastructure" section of this paper for policy recommendations to support the deployment of refueling infrastructure.

Select Examples of VTO Grants

rant mount	Description	Source
1 million	Research all-solid-state lithium-ion batteries for EVs	Link
2.9 million	Develop and demonstrate a plug-in hybrid work truck that reduces fuel consumption by over 50%	Link
7 million	Develop a high-efficiency engine for medium-duty trucks	Link
4.6 million	Accelerate the deployment of alternative fuel vehicles and refueling infrastructure in the southeast U.S.	Link

DOE's **Hydrogen and Fuel Cell Technologies Office** (HFTO) provides RD&D grants for developing hydrogen and fuel cells as viable vehicle propulsion technologies. This will be particularly important for modes of transportation for which electrification is not feasible in the near-term, such as long-distance (or heavy duty) trucking, rail, and aviation. Congress should increase funding for HFTO, directing funds towards developing and demonstrating hydrogen as a fuel source for heavy-duty transportation.

Select Examples of HFTO Grants

ant nount	Description	Source
00,000	Develop cost-effective tube trailer for hydrogen delivery and storage and test at hydrogen fueling stations	Link
50,000	Develop a domestic supply chain for fuel cell and hydrogen systems	Link
.7 million	Develop an assembly for heavy-duty fuel cell trucks	Link
million	Develop a fuel cell hybrid electric walk-in delivery van and test fuel cell hybrid power trains in delivery vans	Link

Lastly, DOE's **Advanced Research Projects Agency—Energy** (ARPA-E) has a variety of programs that support early-stage R&D for battery technologies. Additionally, ARPA-E's new SCALEUP program helps scale new technologies that have already shown promise in early-stage R&D so they can get to commercialization. Congress should increase funding for ARPA-E, particularly for SCALEUP, which is well-positioned to quickly disburse funding to project sponsors that can hire workers and build projects immediately.

Select Examples of ARPA-E Grants

nt	Description	Source
	Develop a lithium-sulfur battery as a cost-effective alternative to lithium-ion batteries	Link
	Develop load-bearing lithium-ion batteries that can be used as structural components of EVs	Link
	Develop smaller and more energy-efficient power converters for EVs	Link
	Develop a lightweight AV-to-DC ultra-fast EV battery charger	Link

In addition to those programs, **Argonne National Laboratory** runs a lithium-ion battery recycling center, ReCell, which is designed to help the U.S. grow a globally competitive EV battery recycling industry. Developing and scaling up methods for recycling or re-manufacturing battery cells will help improve the economics of EV manufacturing, decrease the cost of new EVs, and reduce domestic manufacturers' reliance on foreign countries for raw materials. [25] [25] The results of their work will be in the public domain so private companies can implement their findings. Congress should ramp up funding for Argonne to continue this work, including entering into cooperative research agreements with private companies to develop second-life applications for EV batteries.

Build consumer demand for clean vehicles, inclusive of underserved groups

President Biden recently announced his intention to direct federal agencies to transition their fleets to ZEVs made in the U.S. [26] This is an important step, but most vehicles on the road are owned by private citizens. Demand drivers will have the twin benefits of making it easier and cheaper for consumers to purchase a ZEV and providing a market signal for manufacturers to build their ZEVs and parts here. National governments in the European Union and China have robust policies to encourage consumers to purchase EVs (see Appendix A), and the U.S. will lose out on the manufacturing jobs and other economic benefits if we do not act quickly to spur demand for EVs here. Congress should enact a combination of policies to ensure we can get more ZEVs on the road swiftly, with a particular focus on enabling lower-income Americans to access the benefits of cleaner vehicles.

The **30D Plug-In Electric Drive Vehicle Credit** provides a tax credit up to $7,500 for the purchase of a new EV, with the amount of the credit phasing down after the first 200,000 EVs sold by each

manufacturer. As the market leaders, Tesla and GM have both exceeded the cap and phase-down, so people buying a new EV from those automakers cannot receive the credit. [27] The credit is also available "after the fact," meaning a consumer will pay full price for the EV and then claim the credit when they file their next tax return. This is a burden for consumers and means the benefit of purchasing an EV can only be realized if the consumer has sufficient tax liability to claim some or all of the credit. [28]

Congress should extend the credit for five years and eliminate the manufacturer cap so that more consumers purchasing a new EV will be eligible for the full credit regardless of which automaker they purchase from. Additionally, Congress should make it a point-of-sale credit administered by the dealer so the credit is deducted from the sale price; this would make it a more attractive option for consumers who will see the immediate savings and will make the credit more accessible for low-income consumers. This would have an added benefit of helping people who drive for transportation network companies (TNCs) electrify their vehicles; these are people who drive more than the average car owner and thus would realize greater emissions savings, [29] but are more likely to be low-income than the average EV owner. [30]

Congress should also consider tiering the amount of the credit based on the manufacturer suggested retail price (MSRP) of the vehicle, which could help ensure that lower-income consumers who are more likely to buy a less expensive vehicle get a larger credit than someone purchasing a higher-end model. However, it will also be important not to restrict the credit too much since manufacturers will need to get to high volume of production in order to stay viable and create jobs.

Congress should additionally consider expanding the 30D credit to include the purchase of a used EV, or else create a separate, refundable **tax credit for purchasing a used EV**. This will also help lower-income car buyers who are more likely to purchase a used vehicle. The GREEN Act would accomplish many of these recommendations, including lifting the vehicle cap from 200,000 to 600,000 and creating a new credit for buyers of used EVs. [31]

Similarly, Congress should extend the **30B Fuel Cell Motor Vehicle Tax Credit** to help counteract the higher sticker price of fuel cell motor vehicles. The GREEN Act would extend this credit until 2026.

In addition to tax policy, federal standards such as the **Corporate Average Fuel Economy Standard** (CAFE) can drive investment in clean vehicles and get more ZEVs onto the road quickly. The Trump Administration rolled back the stronger Obama-era CAFE standard and the Greenhouse Gas Emissions Standard for light-duty vehicles. [32] The Administration also attempted to repeal California's ability to set its own, stronger standard. [33] The Biden Administration can immediately begin the process of bringing back the stronger CAFE standard, which would require a 5% per year improvement in an automaker's average fuel economy. Ultimately, we should sync up the federal standard with California's so every state will be on the same schedule and we can drive investment in, and adoption of, ZEVs more quickly. The Administration should similarly strengthen the

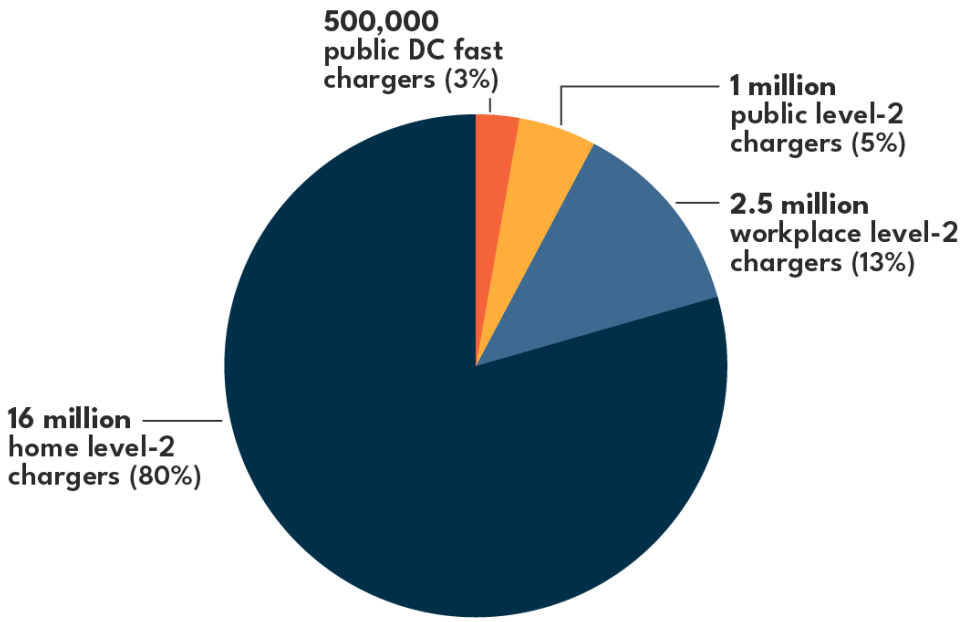
Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles [34] to bring more clean medium- and heavy-duty vehicles to market.

Deploy clean vehicle refueling infrastructure

Key to accelerating adoption of zero-emission vehicles is making sure that we have enough infrastructure deployed so that drivers can refuel their vehicles wherever they are. How many EV chargers we need to deploy, and where they need to be located, is an outstanding question. The vast majority of EV charging will happen at people's homes or offices, but we will also need to install publicly accessible charging stations, particularly in historically underserved communities, in addition to other kinds of alternative refueling infrastructure like hydrogen fueling stations.

President Biden's American Jobs Plan calls for the installation of 500,000 public EV charging stations by 2030. [35] Third Way estimates purchasing and installing this many chargers would cost $7.9 billion, which the federal government would help subsidize through a combination of tax credits and grants. [36] However, Third Way believes we will need far more public chargers deployed by 2030—as many as 1.5 million—to combat range anxiety and ensure we get on the path to 100% ZEVs on the road by 2050. This would cost roughly $20 billion total, and the federal government should partner with the private sector to defray a large portion of these costs using a combination of tax credits and grants to ensure a fast and equitable build-out. Ultimately we could need as many as 55 million public EV charging stations to accommodate an all-ZEV fleet by 2050—one for every five cars on the road [37] —and the more of this infrastructure we build out over the next 10 years, the more consumers will have certainty that they will be able to refuel their EVs wherever they are.

EV Charging Infrastructure by Location (2030)



Source: Edison Electric Institute and Institute for Electric Innovation.

To help people install chargers at their homes and help businesses install chargers at workplaces or in public locations, Congress should extend and expand the **30C Alternative Fuel Refueling Property Credit**. The credit cap should be raised and it should be made refundable at least for the next two years to better incentivize charger installation as the economy recovers. Congress should also change the credit from a per-location basis to a per-charger basis, which would enable fleet owners and other businesses installing multiple chargers in one location to claim the credit for each charger.

In addition to extending and expanding the 30C credit, Congress should also provide grant funding for state and local governments and other entities to deploy publicly available EV charging and other alternative refueling infrastructure. Grant funding will be critical to ensuring that EV infrastructure gets deployed in minority and low-income communities, which have been disproportionately impacted by our current transportation infrastructure [38] and may otherwise get left behind in our transition to clean vehicles. The American Jobs Plan would target 40 percent of the benefits of its climate and clean infrastructure investments to disadvantaged communities; [39] Congress should follow the President's lead and ensure these communities can benefit from the air quality improvements and other benefits of ZEVs.

Third Way estimates that of the $20 billion total cost of EV charging infrastructure deployment, roughly $9 billion of that should be supported by grants to ensure an equitable deployment of

publicly available chargers. Congress should **provide $7.2 billion in grants** with an 80% federal share over the next 10 years to help state and local governments deploy publicly available alternative fueling infrastructure. [40] Most of the vehicles that will need public refueling will be light-duty electric vehicles, but funding should also be available to deploy clean refueling infrastructure for electric delivery vans and other medium- and heavy-duty ZEVs. Funding should be contingent on interoperability; if we are spending billions of taxpayer dollars on deploying a public EV charging network, then we need to make sure every EV user, whether they are an individual motorist or a fleet driver, can charge their vehicle at any charging station. [41] This money should be funneled through existing programs to get the money out the door as quickly as possible. These programs could include DOE's State Energy Program and Clean Cities Program and USDOT's Congestion Mitigation and Air Quality Program (CMAQ).

Congress should also direct USDOT to **establish model building codes** for EV charging infrastructure, focused on multi-unit housing and urban parking structures, as well as **retrofitting guidance for existing structures** that may need to be re-wired to accommodate EV charging. This will help ensure that the 20 percent of households that don't have access to off-street parking—and which are more likely to be lower-income—will be able to access the infrastructure they need to own an EV. [42] The recently-reintroduced CLEAN Future Act included a provision to establish model building codes for integrating EV supply equipment into residential and commercial structures. [43]

Conclusion

Electric and other zero-emission vehicles will be the dominant vehicle technologies of the future, and we need to make sure American workers and businesses lead that future. We also need to make sure our transition to ZEVs includes minority and low-income communities, as they have been harmed the most by our current, pollution-intensive transportation system. The Biden Administration and Congress can act this year to get us on the path to 100 percent ZEVs and put American manufacturing at the forefront of our transition to clean vehicles. They will have several opportunities to do it, including the annual appropriations process, the upcoming surface reauthorization, and any stimulus packages to help the economy recover from the pandemic. Now is the right time to make the investments that will create good-paying jobs in the clean economy while reducing transportation emissions.

APPENDIX A: Comparing Subsidies Offered by Global Competitors

Most of the 27 countries that comprise the European Union, UK, and China are among the many countries that provide support for electric vehicles. Subsidies for electric vehicle purchases have provided significant incentives and has led to rising EV demand.

In 2020, the EV market share in Europe reached 8.7% of total light new vehicle sales, up from 3.7% in 2019. In China, the EV market share rose to 5.5%, up from 4.7% in 2019. Overall, Europe's EV sales surged by 138% in 2020, while China EV sales were up 12%.

Europe's significant EV growth trend is the result of three key developments. First, the CO2 regulations required automakers to sell a fleet of light vehicles that averaged fuel economy of 57 miles per gallon (95 grams of C02 per kilometer), effectively requiring automakers to ramp up production of battery EVs to reach compliance. Failure to meet this requirement was met with government penalties. Second, European countries initiated substantial subsidies available to company and consumer purchases of new vehicles. Finally, the number of EVs available for purchase is increasing, with 20 vehicles selling over 3,000 units last year. [44]

In China, the mandate to achieve 40% EV market share by 2030 is underpinned by fuel economy mandates and support for top EV manufacturers.

A brief summary of some of these country policies are noted below. Many European countries are experimenting with tax and incentive schemes. The European Car Association (ACEA) report provides a comprehensive overview of tax policy and purchase incentives. [45]

Germany's EV Subsidies

- VAT sales tax reduction from 19% to 16% during the June – December 2020 period.
- 10-year tax exemption on a battery electric vehicle (BEV) and a fuel cell vehicle (FCEV) if purchased before yearend 2020.
- Company cars enjoy a reduction in taxable amount from 1% to 0.5% of the gross sticker price.
- Company cars also receive an additional reduction for BEVs with a list price of up to $71,400 (€60,000) from 1% to 0.25% of gross sticker price.
- For consumers purchasing a BEV or a FCEV with a price less than or equal to $47,600 (€40,000), they will receive a subsidy of $10,710 (€9,000) and $8,032 (€6,750) for plug-in electric vehicles (PHEV).
- For consumers purchasing a BEV or a FCEV with a price over $47,600 (€40,000), they will receive a $8,925 (€7,500) subsidy, and $6,694 (€5,625) for the purchase of a PHEV.

France's EV Subsidies

France has recently provided an update to electric vehicle tax policy. The foundation of the regime is to charge a higher tax rate to higher CO2 emitting vehicles. The lower CO2 emitting vehicles receive a rebate as high as €7,000 ($8,240) for battery electric vehicles with 0 to 20 grams CO2 per kilometer.

This type of tax and rebate policy actively discourages purchases of gasoline-powered vehicles and makes it more expensive to emit pollution. The recent changes to the tax policy are more onerous, adding further sting on the backs of those gasoline-powered vehicles.

The program in France also suggests that the days of large, high-end vehicles available only with a combustion engine are behind us. The latest data from Porsche (which recently acquired Fiat Chrysler) shows that over 60% of the company's sales in France last year were either battery electrics or plug-in hybrids. The numbers in 2021 will likely be even higher.

China's EV Subsidies

- China imposed a mandate on automakers requiring that electric vehicles (EVs) make up 40% of all sales by 2030.
- The government began to provide generous subsidies for EV purchases in 2009.
- China's finance ministry has reduced the subsidies for electric vehicles (EVs) for 2021 by 20%.
- Under the new policy for 2021, the subsidy for battery electric vehicles (BEVs) with a driving range of 190 – 250 miles (300-400km) will be lowered to $2,013 per vehicle (13,000 yuan), from $2,500 per vehicle (16,200 yuan) in 2020.
- The subsidy for BEVs with a driving range of 250 miles (400km) or more will drop to $2,800 (18,000 yuan) per vehicle this year, from $3,500 (22,500 yuan) in 2020.

CHINA PURE ELECTRIC VEHICLE SUBSIDIES 2020-2021
(by vehicle driving range)

	300-400 km	≥400 km
2021	13,000 yuan	18,000 yuan
2020	16,200 yuan	22,500 yuan

Source: Ministry of Finance of the People's Republic of China, compiled by Fastmarkets

Source: Shi, Carrie, "China cuts EV subsidy for 2021; market downplays impact on lithium, cobalt prices." Fastmarkets, 5 Jan. 2021, www.metalbulletin.com/Article/3969254/China-cuts-EV-subsidy-for-2021-market-downplays-impact-on-lithium-cobalt-prices.html

- Subsidies for plug-in hybrid vehicles (PHEVs) will be lowered to $1,000 (6,800 yuan) per vehicle in 2021, from $1,300 (8,500 yuan) in 2020.
- This reduction in the EV subsidy follows the government's plan announced in late March 2020 to extend the EV purchase subsidy by a further two years to 2022beyond the original expiry date of December 31, 2020, and to slow the rate of reduction to 10% in 2020, 20% in 2021 and 30% in 2022.

- The requirements get tougher over time, with a goal of having EVs make up 40% of all car sales by 2030.
- The government is balancing the reduction in direct subsidies for EV purchasers against an increasing ZEV mandate in order to achieve the 2030 goal.

Other European Markets, Singapore and Costa Rica Commit to Bans

Many country governments have announced outright bans on gasoline-powered vehicles in the 2030 – 2040 time frame. This "stick" approach to the transition to EVs can be much more effective as the costs of battery packs decline, making EVs competitive with gasoline-powered vehicles. Most experts expect that to occur by mid-decade.

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