The role of supply-side regulations in meeting Indonesia's 2030 electric vehicle target

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In 2021, Indonesia set targets for reducing greenhouse gas (GHG) emissions from transport, including a goal of putting 2 million electric four-wheelers (4Ws) on the nation's roads by 2030. This would potentially mean that electric vehicles (EVs) are one out of every 13 cars on the road.[1] This target aligns with the global shift to EVs. As EV costs decline, many major economies are setting EV sales targets and implementing policies to accelerate EV uptake.[2]

In Indonesia, battery electric vehicle (BEV) sales have grown from 0.1% of new passenger car sales in 2021 to 4.8% in the first 4 months of 2024. Meanwhile, plug-in hybrid electric vehicles (PHEVs) have consistently accounted for approximately 0.01% of new passenger car sales since 2019. This suggests that Indonesia's EV target will likely be met primarily through adoption of BEVs.

Indonesia has supported BEV passenger car sales growth with fiscal incentives for consumers, but these incentives alone are likely insufficient to meet the 2030 EV target. In January 2024, the Ministry of Finance issued Regulation No. 8 of 2024, which reduces the Value Added Tax from 11% to 1% for EVs that meet a 40% minimum domestic content requirement.[3] We estimate this incentive amounts to an average of US$2,700 for each qualifying BEV sold in the country. Based on an analysis of Indonesia's current market, we project EVs could reach between 12% and 18% of new passenger car sales by 2030 if current fiscal incentives are continued.[4] This would result in between 630,000 and 840,000 EVs sold in Indonesia cumulatively through 2030—less than half the government's target—and the estimated cost to the government if current subsidies are sustained would be US$1.7–$2.3 billion.

1 Ministry of Energy and Mineral Resources, "Indonesian Govt Supports EV Charging Application," press release, February 1, 2021, https://www.esdm.go.id/en/media-center/news-archives/indonesian-govt-supports-ev-charging-application.

2 "Tracking Progress," ZEV Transition Council, accessed June 21, 2024, https://zevtc.org/tracking-progress/.

3 Ministry of Finance Regulation Number 8 of 2024 concerning Value Added Tax on the Delivery of Certain Four-Wheeled Battery-Based Electric Motorized Vehicles and Certain Bus Battery-Based Electric Motorized Vehicles Borne by the Government for the 2024 Fiscal Year (2024). https://jdih.kemenkeu.go.id/download/7178d808-6b33-415c-ba1c-087952552b0c/2024pmkeuangan008.pdf

4 EV projections to 2030 are based on linear projections of the last 12 months of EV sales in Indonesia from vehicle sales data published by Gaikindo, https://www.gaikindo.or.id/indonesian-automobile-industry-data/.

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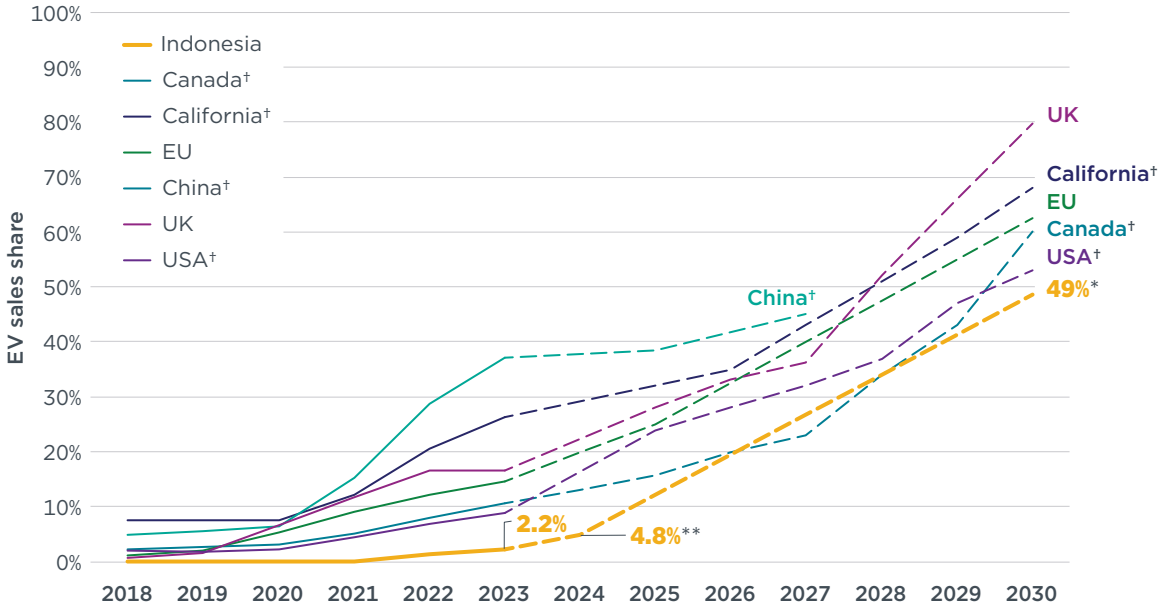
To meet the target, Indonesia will likely need steady growth in the EV share of new car sales to 49% by 2030 to deliver 2 million cumulative electric passenger car sales by 2030.[5] This scenario is shown in the yellow dashed line in Figure 1. This assumes an annual growth rate in the sales of new passenger cars of 6.4% per year between 2023 and 2030.[6] The solid portion of the yellow line shows Indonesia's electric car sales share from 2020–2023.

This trajectory is aligned with those of other countries. Figure 1 also shows the 2020–2023 sales shares (solid lines) and projected future sales (dashed lines) based on existing policies in six major vehicle markets: California, Canada, China, the European Union (EU), the United Kingdom (UK), and the United States (USA).[7] These countries are expected to achieve EV growth with a combination of government-led policies and programs that include supply-side regulations, industrial incentives, and support for infrastructure development in addition to fiscal incentives for consumers.

Figure 1 shows that while achieving Indonesia's targets requires consistent growth in EV uptake, that growth is reasonable based on the trajectories for other markets with strong EV policies.

Figure 1

Historical and projected EV share of new passenger car sales in Indonesia and six leading markets, 2018–2030



* Indonesia projections show the EV sales shares needed to reach the 2 million cumulative sales target.

** Indonesia's projected EV sales share for 2024 is based on data for the first 4 months of the year. This sales share is approximately 4 years behind leading major markets.

† In selected markets, some PHEVs are included in future EV targets.

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5 Because the electric sales share of light commercial vehicles (LCVs) was only 1/20th that of passenger cars in Indonesia in 2023 and electric LCVs have lagged electric cars in most other global markets, we do not assume that LCVs will contribute to the 2 million electric 4W target. Regulation of the LCV segment could deliver additional EV sales.

6 This level of sales growth is based on a projection of annual 4W sales over the past 5 years, excluding 2021 and 2022 due to the COVID-19 pandemic, and projecting the value to reach the government's projection of 90 cars per 1,000 people by 2030.

7 Historical EV sales from EV-Volumes, "EV Data Center," 2024, https://www.ev-volumes.com/datacenter/. Projected sales from ICCT analysis of policy targets, update from Arijit Sen and Josh Miller, *Vision 2050: Update on the Global Zero-Emission Vehicle Transition in 2023* (International Council on Clean Transportation, 2023), https://theicct.org/publication/vision-2050-global-zev-update-sept23/

Indonesia does not yet have any supply-side regulations in place to ensure the continued decarbonization of new cars. This briefing describes two proven policy options that can accelerate Indonesia's EV transition with greater certainty and at a lower cost to the government than relying on fiscal incentives: fuel consumption standards, which set maximum fuel consumption levels that automakers' new vehicles must meet on average, and EV sales requirements, which require automakers to sell a minimum percentage of EVs.

After describing these two policies, this briefing cites examples of successful regulations adopted in other major markets. It then analyzes the level of stringency needed for each policy option to achieve Indonesia's 2030 EV target. It concludes with a discussion of how supply-side regulations could help achieve Indonesia's EV target. Although this paper focuses on passenger cars, these types of supply-side policies can be designed and implemented for two-wheelers, light commercial vehicles, and medium- and heavy-duty vehicles.

SUPPLY-SIDE REGULATIONS TO ACCELERATE EV UPTAKE

Fuel consumption standards

Fuel consumption standards for cars were first adopted by the United States in 1975 to address energy security concerns. Many major vehicle markets have since implemented such standards to meet climate and/or energy security objectives. These standards can be expressed as fuel consumption (L/100 km) or fuel economy (km/L) standards. Several markets also use CO_2 or greenhouse gas emission standards (e.g., gCO_2/km); these have a similar effect because CO_2 emissions are proportional to the amount of fuel consumed.

Fuel consumption standards require vehicle manufacturers to reduce the amount of fuel their new vehicles consume per unit distance, and most often they are measured in liters per 100 kilometers (L/100 km). To implement such a standard, the government must certify the fuel consumption of each vehicle model sold in Indonesia and track sales for each manufacturer and model. For reference, the best-selling car in Indonesia in 2023, the Toyota Avanza, consumes 6.8 L/100 km under laboratory testing conditions.

The goal of fuel consumption standards is to ensure manufacturers offer more fuel-efficient vehicles over time. Average fuel consumption is calculated each year for all the new cars sold by each manufacturer in a country; their performance varies according to the mix of vehicles sold each year. If a manufacturer's average fuel consumption is below the target (i.e., it has over-complied), the difference may be converted into "credits" that can either be saved and applied toward compliance in future years or sold to other manufacturers.[8] If a manufacturer's average fuel consumption is above the target (i.e., it has under-complied), it must either purchase credits from another manufacturer or pay a fine. This allows each manufacturer to reduce their vehicles' fuel consumption according to their own strategy and rewards manufacturers that sell the most-efficient vehicles.

Manufacturers have many technology options to reduce average fuel consumption, including more advanced internal combustion engines (ICE) and transmissions, "mild" hybrids, "full" hybrids, and EVs. An advantage of fuel consumption standards is that

8 Fuel consumption credits are part of a banking system to reward over-complying manufacturers while facilitating compliance for those unable to meet the targets (i.e., those that incur deficits). For example, if a manufacturer's average fuel consumption is 0.1 L/100 km below the fuel consumption target and it sells 50,000 vehicles, it would generate 0.1x50,000= 5,000 credits that year. Credits can be sold to other manufacturers in deficit; the price is defined among themselves, with the government acting only as an auditor for that transaction.

they allow manufacturers to choose the mix of technologies to comply. The more stringent the fuel consumption standard, the more attractive manufacturing and selling EVs will be for manufacturers. This is especially true for BEVs, because they are much more energy efficient than conventional vehicles and, in the case of CO_2 standards, typically count as zero emissions. On the other hand, a weak fuel consumption standard may not drive any increased EV uptake at all. It is thus important to ensure the standard is stringent enough to achieve the targeted level of EV uptake.[9]

If a fuel consumption standard is adopted as a major strategy to achieve Indonesia's goal of 2 million EVs by 2030, it would need to be quite stringent. The standard would have to drive fuel consumption reductions from a fleet average of 6.7 L/100 km in 2024[10] to 3.1 L/100 km by 2030, which requires a 12.1% annual fleet average fuel consumption reduction across all vehicles, including ICE vehicles and EVs, as illustrated in the left panel of Figure 2. We calculate that this fuel consumption standard would be sufficiently stringent to drive EV sales to 49% of new cars in 2030—shown in the green line on the right panel—alongside continued improvements in ICE vehicles and hybrids.[11] Based on recent experience from other countries, we expect around a 3% improvement each year in ICE vehicle efficiency from 2025–2030 (shown in the green line in the middle panel).[12]

Figure 2 also illustrates that a fuel consumption standard alone does not guarantee specific EV sales; rather, the exact share of EV sales depends on the extent to which manufacturers improve the efficiency of their ICE vehicles. The dashed lines in the middle and right panels indicate alternative plausible compliance paths. In the orange "flat ICE efficiency" scenario, new ICE vehicle fuel consumption remains constant through 2030; as a result, BEV sales must increase faster (to 56% in 2030) to meet the overall fuel consumption targets. In contrast, the blue line shows that if ICE vehicle fuel consumption were reduced by 5% annually from 2025–2030 (for example, by selling a high share of hybrids), BEV sales could rise more slowly and reach 43% by 2030. In the latter case, total EV sales would likely not reach 2 million by 2030.

9 Nic Lutsey, *Modernizing Vehicle Regulations for Electrification* (International Council on Clean Transportation, 2018), https://theicct.org/publication/modernizing-vehicle-regulations-for-electrification/.

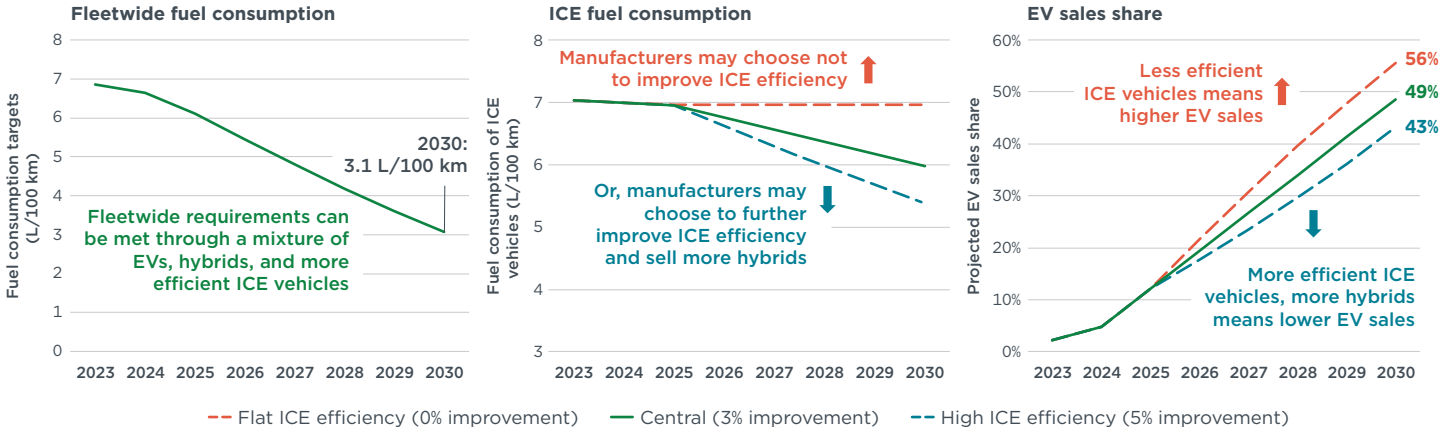
10 The 6.7 L/100 km fleet average fuel consumption was derived from an ASEAN report that lists 7.3 L/100 km for Indonesia in 2017. The 2024 value was estimated after assuming a 0.5% annual fuel consumption improvement for ICE vehicles through 2024 and factoring in the effects of EV uptake. The 0.5% annual improvement rate is considered a conservative fuel consumption improvement driven by the market in the absence of fuel consumption standards. See ASEAN Secretariat, *ASEAN Fuel Economy Roadmap for the Transport Sector 2018-2025: with Focus on Light-Duty Vehicles* (2019), https://asean.org/wp-content/uploads/2021/08/ASEAN-Fuel-Economy-Roadmap-FINAL-2.pdf.

11 Although PHEVs could also be part of a compliance pathway, given their costs are higher than BEVs and there has been negligible uptake in Indonesia to date, we estimate that the most likely compliance pathway would rely on BEV uptake and ICE vehicle improvements.

12 Based on a review of data from Canada, China, the EU, India, Japan, South Korea, and the United States, 3% is a typical annual rate of fuel consumption improvement for ICE cars in markets with regulations. See International Council on Clean Transportation, "Passenger Vehicle Greenhouse Gas Emissions and Fuel Consumption," accessed November 9, 2023, https://theicct.org/pv-fuel-economy/.

Figure 2

Illustration of a fuel consumption standard consistent with Indonesia's 2 million EV target and possible compliance pathways



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EV sales requirements

EV sales requirements were first implemented in the U.S. state of California in 2003 and have become increasingly popular as governments target higher EV sales. These regulations set targets for the percentage of new vehicle sales that must be electric in a given year, and they are enforced for each manufacturer. Unlike fuel consumption standards, EV sales requirements can only be satisfied by selling EVs; more-efficient conventional vehicles like hybrids are typically not counted. In some regulations, PHEVs may count for a limited share of the EV requirement. In California and Canada, for example, PHEVs may count for no more than 20% of the EV requirement each year. Conventional hybrid vehicles are not EVs because all of their energy is derived from gasoline; they should not count toward EV requirements or be treated as EVs in fuel economy standards.

It is much simpler to monitor and enforce EV sales requirements than fuel consumption standards; regulators primarily need to know the number of EVs and the total number of vehicles a manufacturer sells each year. Sales requirements also send a clearer market signal to manufacturers and other stakeholders like charging infrastructure companies because they know how many EVs to expect to plan their investment.

One option for annual requirements for EV sales shares that are aligned with Indonesia's goal of 2 million EVs by 2030 is presented in the yellow dashed line in Figure 1 and in Table 1. The requirements increase by roughly 7 percentage points annually, beginning at 12% in 2025 (compared with 5% in the first 4 months of 2024) and rising to 49% in 2030. The total number of EVs sold depends on how quickly Indonesia's overall vehicle fleet grows over this period, and as above, we assume 6.4% annual growth in overall vehicle sales. Other sets of requirements that meet the 2030 target are also possible: For example, targets could start lower but ramp up more quickly in later years, as in the UK regulation.

As with fuel consumption standards, EV sales requirements typically allow trading and banking of credits. If a manufacturer sells a higher share of EVs than the annual target, excess EV sales could be turned into "credits" that can be sold to other companies or saved and used in future years. While still providing certainty regarding overall EV uptake, this encourages manufacturers to accelerate their transition to EVs and allows manufacturers that need more time to transition to comply by purchasing credits on a marketplace rather than paying a fine.

Comparing the options

This paper analyzes how two options for supply-side regulations could set the groundwork for Indonesia to meet its target of 2 million EVs on the road in 2030: a fuel consumption standard and an EV sales requirement. Table 1 lists the annual targets for each option from 2025 to 2030. In each case, targets would be enforced for each manufacturer that sells vehicles in Indonesia. To provide some perspective on the state of manufacturer EV sales in Indonesia, Hyundai and Wuling's EV shares already reached 20.1% and 29.6%, respectively, in 2023, according to Gaikindo's data.[13]

Table 1

Annual targets for a fuel consumption standard or EV sales requirements to meet Indonesia's 2030 EV target

Year	2025	2026	2027	2028	2029	2030
Option 1: Fuel consumption target (L/100 km)	6.1	5.4	4.8	4.2	3.6	3.1
Option 2: EV sales requirement (EV share of new car sales)	12%	19%	27%	34%	41%	49%

Table 2 compares other key attributes of the policy options. Note that this table and the preceding sections describe only the core provisions of these types of regulations. In practice, some regulations have additional flexibilities and customized designs to fit local circumstances.[14] Flexibilities must be carefully negotiated on a case-by-case basis, as some may dilute the stringency of the standard and reduce its impact.

Table 2

Key attributes of fuel consumption standards and EV sales requirements

	Option 1: Fuel consumption standard	Option 2: EV sales requirement
Metric	Average fuel consumption (e.g., L/100 km) of new vehicles sold	Percentage of new vehicles sold that are EVs
Ways to comply	More efficient ICE vehicles, hybrids, and increased EV sales	Increased EV sales shares, potentially including limited PHEVs
Certainty for EV supply chains and infrastructure	Moderate	High
Certainty of meeting EV stock target	Moderate	High
Encourages ICE vehicle efficiency improvements	Yes	No
Can allow trading among manufacturers	Yes	Yes
Regions with policy in place for passenger cars	Australia, Brazil, Canada, China, Chile, EU, India, Japan, Mexico, New Zealand, South Korea, United Kingdom,[a] United States	California and 17 other U.S. states,[b] Canada, China, United Kingdom

[a] The UK supplements its ZEV sales requirements with a fuel consumption standard for non-ZEV cars (including PHEVs) that prevents backsliding on ICE efficiency.

[b] "States that Have Adopted California's Vehicle Regulations," California Air Resources Board, last modified May 2024, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/states-have-adopted-californias-vehicle-regulations.

13 Total 2023 vehicle sales from the Gaikindo database; EV sales for 2023 were collected by Katadata based on Gaikindo sales numbers. See, "Penjualan Mobil Listrik di Indonesia Melonjak pada Akhir 2023 [Electric Car Sales in Indonesia Will Soar at the End of 2023]," Katadata Media Network, January 16, 2024, https://databoks.katadata.co.id/datapublish/2024/01/16/penjualan-mobil-listrik-di-indonesia-melonjak-pada-akhir-2023.

14 "Passenger Vehicle Greenhouse Gas Emissions and Fuel Consumption," International Council on Clean Transportation, accessed November 9, 2023, https://theicct.org/pv-fuel-economy/; Sunitha Anup and Shikha Rokadiya, *Designing a Zero-Emission Vehicle Sales Regulation for Two-Wheelers in India* (International Council on Clean Transportation, 2024), https://theicct.org/publication/designing-a-zero-emission-vehicle-sales-regulation-for-2w-in-india-mar24/.

BENEFITS OF VEHICLE SUPPLY-SIDE REGULATIONS

Proven track record of boosting EV sales

All 15 of the largest EV markets in the world in 2023 had EV sales requirements, fuel consumption or CO_2 standards, or a combination. There are many examples of these standards leading to higher EV sales, including:

- When new CO_2 regulations for cars came into place in the EU in 2020, its EV sales share for new cars increased from less than 3% to more than 10% in a single year.[15]
- In the United States, California had a nation-leading EV sales share of 26% in 2023; other states that adopted California's ZEV regulation ("ZEV states") had an average EV sales share of 12% in 2023 compared with 6% in the other states ("non-ZEV states"). The ZEV states also had 30% more EV models available than non-ZEV states.[16]
- In Canada, the sales share of EVs across the two provinces (British Columbia and Quebec) with EV sales requirements in place in 2023 was 3.4 times higher than the EV sales share across the rest of the country.[17]

Binding regulations have consistently been met and exceeded by manufacturers in major markets, even though such requirements are often criticized as overly ambitious at the time of adoption.[18] For example, in 2019, the California Air Resources Board projected that EVs would account for 8% of new vehicle sales in the state in 2025.[19] Yet by 2023, California's EV sales share had already reached 26%. Similarly, China has consistently exceeded its EV targets; the EV share of new passenger car sales in 2023 reached 34%,[20] far surpassing the target of about 20% EV sales in 2025.[21]

Clear milestones allow stakeholders to coordinate planning

A rapid transition to EVs requires that many stakeholders act in unison: manufacturers must design and produce new vehicles in higher volumes; fleets must purchase vehicles and charging infrastructure; the minerals sector must increase output from mines and refineries; and charging providers must build chargers and connect them to the power grid. Without common targets, it is nearly impossible for each of these steps to happen at the right time and at the right scale. The business case for a new mine, car factory, or charging network becomes much clearer with clear market signals about what future EV volumes to expect, and this makes financing easier to access.

While goals such as Indonesia's target for 2 million EVs by 2030 are helpful in coordinating investments and planning, binding regulations provide greater certainty that these targets will be met and can also provide valuable interim milestones. While EV sales regulations provide the greatest certainty for EV sales, fuel consumption

15 "European Union (EU27)," European Alternative Fuels Observatory, accessed June 21, 2024, https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/european-union-eu27/vehicles-and-fleet.

16 Several of these states also had BEV purchase incentives with an average approximate value of US$ 2,000. Anh Bui and Peter Slowik, *Electric Vehicle Market and Policy Developments in U.S. States, 2023* (International Council on Clean Transportation, 2024), https://theicct.org/publication/ev-ldv-us-major-markets-monitor-2023-june24/.

17 "New Motor Vehicle Registrations, Quarterly," Statistics Canada, last modified June 13, 2024, https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=2010002401.

18 Maria Gallucci, "California's Landmark Clean Car Mandate: How It Works and What It Means," *Reuters*, May 18, 2012, https://www.reuters.com/article/business/environment/californias-landmark-clean-car-mandate-how-it-works-and-what-it-means-idUS804239642/.

19 California Air Resources Board, *The Zero Emission Vehicle Regulation* (California Air Resources Board, 2019), https://ww2.arb.ca.gov/sites/default/files/2019-06/zev_regulation_factsheet_082418_0.pdf.

20 Ilma Fadhil and Chang Shen, *Electric Vehicles Market Monitor for Light-Duty Vehicles: China, Europe, United States, and India, 2023* (International Council on Clean Transportation, 2023), https://theicct.org/publication/ev-ldv-major-markets-monitor-2023-may24/.

21 Yidan Chu, Hongyang Cui, and Hui He, *Nine Trends in the Development of China's Electric Passenger Car Market* (International Council on Clean Transportation, 2023), https://theicct.org/publication/passenger-cars-china-trends-market-mar23/.

standards offer substantially greater certainty than non-binding EV targets. The certainty offered by fuel consumption standards also increases as the stringency increases, because BEVs tend to be the most cost-effective option after the least-cost ICE vehicle technologies have already been deployed (as is the case for the EU targets for 2025 and later).[22]

A clear, binding regulatory framework improves the certainty of investments in battery supply chains, vehicle manufacturing, and charging infrastructure. Together, these support growth in domestic industry. Regions that adopt stringent regulations tend to see increased investment in EV supply chains as manufacturers and suppliers prepare to meet demand in the local market.[23] For example:

» After the UK government confirmed that it would adopt a ZEV sales regulation for cars and vans in 2023, five major car manufacturers (BMW, Ford, Nissan, Stellantis, and Tata) collectively announced more than £8 billion in new investments in the country to produce EVs and their batteries.[24]

» After Canada announced its ZEV sales requirements in December 2023 and an EV supply chain investment tax credit in April 2024, Honda announced an investment of US$11 billion to develop a comprehensive EV supply chain in the province of Ontario.[25]

» California saw its conventional vehicle manufacturing industry decline dramatically from the 1970s to the 2000s, and the last ICE vehicle assembly plant closed in 2010. Following adoption of its EV sales requirements, investment in EV manufacturing soared and EVs became the state's top export in 2020.[26]

Reducing government costs in the energy transition

As of 2024, EVs tend to have a higher purchase price than comparable ICE vehicles. Higher price is one of the main barriers to consumers choosing an EV in Indonesia.[27] As the costs of batteries and other components continue to fall as a result of economies of scale and innovation, EVs are projected to reach purchase price parity and ultimately become less expensive to buy than ICE vehicles; this is expected in the 2025–2030 period, depending on the market, vehicle segment, and range.[28] Without supply-side regulations, manufacturers have little incentive to supply EVs in high enough volumes

22 Peter Mock, *Technology Potential and Cost for Reducing Vehicle CO_2 Emission Levels* (International Council on Clean Transportation, 2021), https://theicct.org/publication/european-union-co2-standards-for-new-passenger-cars-and-vans-technology-potential-and-cost-for-reducing-vehicle-co2-emission-levels/.

23 Nic Lutsey et al., *Power Play: How Governments Are Spurring the Electric Vehicle Industry* (International Council on Clean Transportation, 2018), https://theicct.org/publication/power-play-how-governments-are-spurring-the-electric-vehicle-industry.

24 United Kingdom Department for Transport, Office for Zero Emission Vehicles, "Pathway for Zero Emission Vehicle Transition by 2035 Becomes Law," press release, January 3, 2024, https://www.gov.uk/government/news/pathway-for-zero-emission-vehicle-transition-by-2035-becomes-law.

25 Prime Minister of Canada Justin Trudeau, "Honda to Build Canada's First Comprehensive Electric Vehicle Supply Chain, Creating Thousands of New Jobs in Ontario," press release, April 25, 2024, https://www.pm.gc.ca/en/news/news-releases/2024/04/25/honda-build-canadas-first-comprehensive-electric-vehicle-supply-chain.

26 Walton, "EVs Hit 1M Sold, Are Now California's Top Export as Energy Transition Drives Economy: CEC Chair," Utility Dive, accessed June 26, 2024, https://www.utilitydive.com/news/evs-hit-1m-sold-are-now-californias-top-export-as-energy-transition-drive/610099/.

27 Cliford Septian Candra, "Evaluation of Barriers to Electric Vehicle Adoption in Indonesia through Grey Ordinal Priority Approach," *International Journal of Grey Systems*, 2, no. 1 (2022): 38–56, https://doi.org/10.52812/ijgs.46; Triyono Widi Sasongko et al. "Identification of Electric Vehicle Adoption and Production Factors Based on an Ecosystem Perspective in Indonesia," *Cogent Business & Management*, 11, no. 1 (2024), https://doi.org/10.1080/23311975.2024.2332497.

28 Nic Lutsey, Hongyang Cui, and Rujie Yu, *Evaluating Electric Vehicle Costs and Benefits in China in the 2020–2035 Time Frame* (International Council on Clean Transportation, 2021), https://theicct.org/publication/evaluating-electric-vehicle-costs-and-benefits-in-china-in-the-2020-2035-time-frame/; Peter Slowik et al., *Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022–2035 Time Frame* (International Council on Clean Transportation, 2022), https://theicct.org/publication/ev-cost-benefits-2035-oct22/.

to lower costs. Efforts to bridge the purchase price differential purely through fiscal policy can become quite costly to the government.

With supply-side regulations that require manufacturers to meet targets or pay substantial fines, the industry must make EVs affordable and attractive to consumers; the costs of the technology transition are thus balanced internally without relying on consumers or the government to bear them. This could be done by re-investing profits from ICE vehicles into EVs, changing pricing across the product portfolio, selling excess credits from over-complying with standards, and securing more favorable financing made possible through greater confidence in the transition. For manufacturers whose internal product development timelines do not align exactly with the regulation, a credit trading market and other flexibilities can enable compliance as they shift their production plans to EVs.

With fuel consumption standards and EV sales requirements, the only costs to the government are monitoring and enforcement. These costs are expected to be minimal since powertrain type and fuel consumption are already monitored for all new cars sold in Indonesia. Additionally, the processes for recording and enforcing such standards are already well established by international precedent. This is in stark contrast to traditional consumer incentive programs such as subsidies and tax breaks, which incur high costs that are proportional to EV sales. If Indonesia adopts supply-side regulations to meet its EV target, the costs to the government from the current Value Added Tax incentive for EVs could be reduced by transitioning it to a revenue-neutral feebate or by narrowing the scope of the incentive.[29] For example, as California's EV sales shares have increased, the state restricted eligibility for its EV incentives by introducing limits on household income and vehicle purchase price.[30]

29 Sandra Wappelhorst, "Incentivizing Zero- and Low-Emission Vehicles: The Magic of Feebate Programs," International Council on Clean Transportation Staff Blog, June 8, 2022, https://theicct.org/magic-of-feebate-programs-jun22/.

30 Alexander Tankou, Dale Hall, and Peter Slowik, *Adapting Zero-Emission Vehicle Incentives for a Mainstream Market* (International Zero Emission Vehicle Alliance, 2024), https://theicct.org/publication/izeva-adapting-zev-incentives-for-a-mainstream-market-april24/.

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