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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

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Memorandum
Re: Land Transport (Clean Vehicles) Amendment Bill
To: Ministry of Transportation
From: Zifei Yang, Alexander Tankou, International Council on Clean Transportation (ICCT)
Date: February 7, 2022

General statement of ICCT's support to the Clean Vehicle Standards

We compliment New Zealand's efforts to decarbonize its light vehicle fleet through Clean Vehicle Standards. It will put New Zealand on track to a full transition to a zero-emission light duty vehicle (LDV) fleet. We are especially supportive of the following aspects of the standards:

- **Setting long term targets for 2023-2027** provides regulatory certainty for the industry to develop their business strategy. This is in line with the latest practices in the major vehicle markets, for example, the US has set its standards until 2026, Japan and Korea have standards until 2030, and the EU has already proposed standards for 2030 and 2035. A longer-term standard also gives higher certainty for New Zealand to evaluate the progress toward its 2050 net-zero carbon emissions target.

- **Setting annual CO_2 targets** ensures a consistent CO_2 reduction effort year over year. This will eliminate the risk that importers choose not to adopt better technology in the intervening years, which provides great climate benefit because the sooner the light vehicle CO_2 emission levels fall, the faster annual fleet-wide CO_2 emissions decline and the higher cumulative CO_2 benefits are, relative to a business-as-usual scenario.[1]

- **Setting parameter-based vehicle emissions targets**. A flat emission standard that requires every importer's vehicle fleet to meet the same emission target favors importers that import vehicles at the "lower" end of the market spectrum and can set higher barriers for importers of high-end and specialized vehicles. This approach can interfere with the competitiveness between importers and also fail to reflect any utility attributes that are seen or needed by customers. The weight-based targets in the Clean Vehicle Standards largely avoid the drawbacks of the flat emission standards. The major weakness of such system is that the approach discourages the reduction of vehicle weight, as lighter vehicles are subject to a lower CO_2 target.[2] The footprint-based targets would be technology neutral and can be considered by the New Zealand government for emission standard making.

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[1] Peter Mock, (2021). "Europe's lost decade: About the importance of interim targets (blog post)," ICCT staff blog, May 9, 2021, https://theicct.org/blog/staff/interim-targets-europe-may2021; Joshua Miller and Arijit Sen, (2021). "Details matter: The outsized climate benefits of setting annual targets for new cars in Europe (blog post)," ICCT staff blog, 8 July 2021, https://theicct.org/blog/staff/details-matter-annual-targets-europe-jul2021
[2] Mock, P. (2011). Evaluation of parameter-based vehicle emissions targets in the EU. ICCT.

- **Setting fleet average CO_2 targets that align with New Zealand's vision on zero emission vehicle transition.** The standards, especially the 2026 and 2027 targets, would require a significant uptake of zero emission vehicles in both new and used light vehicle imports. This would be an essential policy lever for New Zealand to meet its commitment toward a zero emission fleet, including New Zealand's signature on the COP26 declaration on accelerating the transition to 100 percent zero emission cars and vans, which has a 100 percent zero emission light vehicle sales target by 2035-2040[3] and the 2021 recommendation by the independent Climate Change Commission to phase out the importation of internal combustion vehicles as soon as 2030.[4]

Key comments regarding to the stringency of the 2026 and 2027 targets

We support New Zealand in maintaining the proposed 2026 and 2027 target values for both PCs and light-commercial vehicle in its final Clean Vehicle Standards. The targets in the Clean Vehicle Standards will put New Zealand on the path toward a fully zero emission vehicle future. Any further delay in setting technology enforcing targets would slow down New Zealand's progress toward its decarbonization target – 50 percent below 2005 level by 2030 - pledged at the United Nations COP26.

- **The targets are feasible to be met with a combination of CO_2 reduction of internal combustion engine (ICE) vehicles and significant uptake of electric vehicles (EVs).** The technology efficiencies in ICE vehicles (including hybrids) will be further optimized, and the electric vehicle deployment will ramp up, thus providing various technology pathways for importers to comply with the standards.

- **We support the suggestion to review the 2027 targets in 2024 in the Land Transport (Clean Vehicles) Amendment Bill departmental report[5]**, given the uncertainty on technology availability, especially on electric vehicle availability in certain segments. As the EV development is very dynamic, evaluating the availability of low and zero emission vehicles will be more robust in two years.

- **We suggest the New Zealand government considering setting a 0 g/km target to align with its 100percent ICE vehicle phase out plan for the long term.** The feasibility of the 0 g/km target can be analyzed during the reviewing of the 2027 targets or as a separate assessment in preparation for the next phase of Clean Vehicle Standards beyond 2027.

Detailed comments and analyses on the stringency of the 2026 and 2027 targets

[3] UKCOP26. (2021). COP26 declaration on accelerating the transition to 100% zero emission cars and vans. https://ukcop26.org/cop26-declaration-on-accelerating-the-transition-to-100-zero-emission-cars-and-vans/
[4] Autofile. (2021). Call for ICE ban by 2030. https://autofile.co.nz/call-for-ice-ban-by-2030-
[5] New Zealand Parliament. (2021). Land Transport (Clean Vehicles) Amendment Bill. https://www.parliament.nz/en/pb/sc/submissions-and-advice/document/53SCTI_ADV_115766_TI2141/te-manat%C5%AB-waka-ministry-of-transport-departmental-report

We would like to comment on the potential technology pathways to achieve the targets set by the Clean Vehicle Standard in the context of the policy development in the major vehicle markets.

1. The targets will make New Zealand one of the leaders in decarbonizing the light vehicle fleet.

Figure 1 and
Figure 2 compare the historical and future CO_2 emission standards between New Zealand and other major vehicle markets, including the EU, US, China, Japan, Korea, Canada, and India. All CO_2 values are normalized to the 3-phase WLTP test cycle using the test cycle conversion factors generated by the ICCT.[6]

In general, New Zealand's long-term targets are in line with the standard stringency set by other leading markets. For both passenger cars (PCs) and light-commercial vehicles (LCVs), New Zealand's proposed 2026 target is close to where the US and EU will be in 2026. New Zealand's 2027 targets are currently taking a leading position compared with the CO_2 emission or fuel consumption standards in other countries, with the absence of 2027 and onward targets in the US. The US vehicle fleet on average is much heavier than the New Zealand fleet: in 2021, the fleet average curb weight of new PCs sold in the US was 1,663 kg[7] compared with 1,493 kg of PCs first registered in New Zealand.[8] For LCVs, the average curb weight was 2,124 kg in the US compared with 2,056 kg in New Zealand in 2021. Thus the US 2026 targets would be closer to New Zealand's 2027 targets if adjusted to the curb weight of the fleet.

There are other countries that have set a 100 percent electrification target by 2025-2030 for PCs (e.g. Singapore and Iceland by 2030) or LDVs (e.g. Norway by 2025), the average CO_2 of their new fleet in 2027 will likely exceed the New Zealand's 2027 targets.

As New Zealand is a small market that completely relies on vehicle imports, it will need to import production/technologies available in the other markets. As the major vehicle markets move toward the same level of CO_2 requirement of the new light vehicle fleet, the technologies and products will be ready in the mainstream market.

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[6] Yang, Z. & Bandivadekar, A. (2021). Methods of converting the type-approval fuel economy and CO2 emission values of light vehicles: an analysis for New Zealand. https://www.transport.govt.nz/assets/Uploads/NZ-conversion-factor-report_20210302_final-1.pdf
[7] U.S. EPA. (2022). Explore the Automotive Trends Data. https://www.epa.gov/automotive-trends/explore-automotive-trends-data#DetailedData
[8] Data provided by the transport agency of the Ministry of Transport of New Zealand.

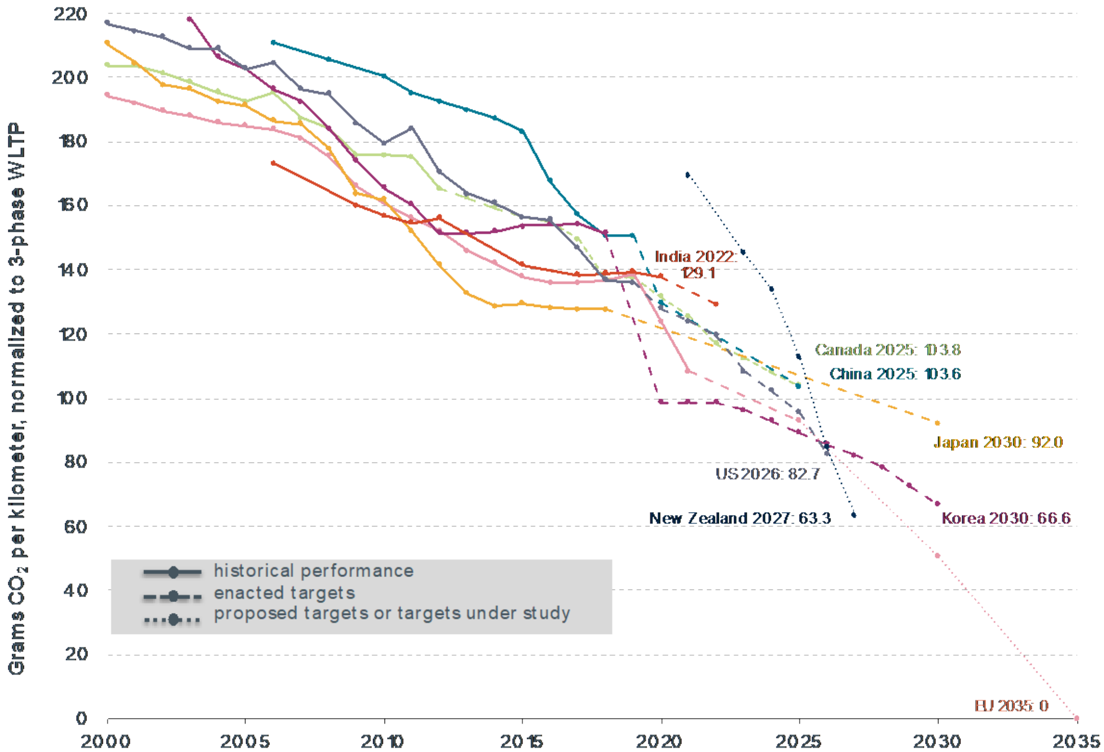

Figure 1 Historical trend and future PC CO_2 emission standards normalized to 3-phase WLTP of selected regions

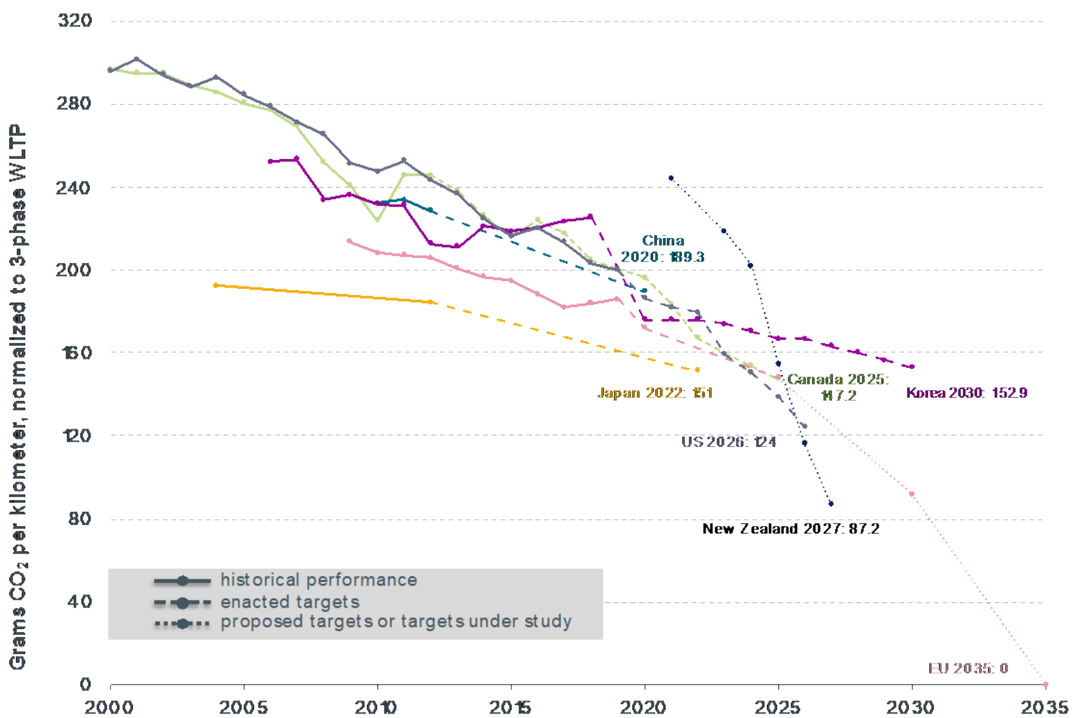

Figure 2 Historical trend and future light-commercial vehicle CO_2 emission standards normalized to 3-phase WLTP of selected regions

2. The standards are feasible to be met with a combination of CO_2 reduction of internal combustion engine vehicles and significant uptake of electric vehicles (EVs) in both new and used vehicles

2.1 ICE vehicle technology potential

There is great potential in ICE technologies to reduce the CO_2 emissions of ICE vehicles. An ICCT study[9] projects the average CO_2 emissions of ICE gasoline PCs will be 113 g/km in 2027, which is a 14 percent reduction compared with the 2021 baseline of non-hybrid ICE vehicles. The CO_2 emission levels under 4 Phase-WLTP (4P-WLTP) in the report are converted to 3 Phase-WLTP (3P-WLTP) using the conversion factors developed by the ICCT report[10]. The full hybrid would further reduce CO_2 emission level to as low as 84 g/km in 2027, a 36 percent reduction compared with the 2021 non-hybrid ICE vehicles (Table 1).

Table 1 3P-WLTP CO_2 emission levels of PCs, by vehicle type, for the years 2021–2030

	2021	2025	2026	2027	2028	2029	2030
ICE	132	116	114	113	112	110	109
Mild hybrid	117	102	101	99	98	97	95
Full hybrid	101	87	86	84	83	82	81

The analysis does not take diesel technology into consideration, because gasoline is the dominant fuel type of PCs in most major markets, including the U.S. and Japan. In the EU, the diesel market share significantly dropped from 49 percent in 2016 to 29 percent in 2020 given the intention of several manufacturers to stop investing in the further development of PC diesel engines.[11] In New Zealand, the diesel market share of new and used PCs was 6.6 percent for the second half of 2021.[12]

Previous ICCT study on CO_2 reduction technologies for the EU 2025-2030 LCVs fleet has shown that there are still great potential for ICE LCVs to reduce CO_2 emissions through existing technologies (including hybrid).[13] However, ICCT has not finalized a detailed analysis for potential CO_2 reduction for LCVs in the EU. Therefore, the estimation of LCVs CO_2 emission of future years is based on the same reduction rate as in the PC estimation. The 2021 baseline (including gasoline and diesel) is adjusted based on the 2020 EU fleet analysis. Assuming the CO_2 reduction rate is the same as the PCs, then the average 2026 and 2027 CO_2 emissions of non-hybrid ICE LCVs are 158 g/km and 156 g/km, respectively. For a baseline of full hybrid LCVs of 141 g/km in 2021, the 2026 and 2027 CO_2 level of full hybrid LCVs are 120 g/km and 118 g/km respectively (Table 2). Note that

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[9] Mock, P. & Diaz, S. (2021). Pathway to decarbonization: the European PC market in the years 2021-2035. https://theicct.org/publication/pathways-to-decarbonization-the-european-passenger-car-market-2021-2035/

[10] Yang & Bandivadekar. (2021). Methods of converting the type-approval fuel economy and CO_2 emission values

[11] Mock, P., Tietge, U., Wappelhorst, S., Bieker, G., & Dornoff, J. (2021). Market monitor: European PC registrations, January–December 2020. Retrieved from the International Council on Clean Transportation, https://theicct.org/publications/market-monitor-eu-jan2021

[12] New Zealand Ministry of Transport. (2021). Fleet statistics. https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/sheet/light-motor-vehicle-registrations

[13] Meszler, D., German, J., Mock, P., & Bandivadekar, A. (2016). CO2 reduction technologies for the European car and van fleet: a 2025-2030 assessment. https://theicct.org/publication/co2-reduction-technologies-for-the-european-car-and-van-fleet-a-2025-2030-assessment-2/

this is a rough and simplified estimation only to illustrate the potential average CO_2 level of LCVs in the future years in the EU.

Table 2 3P-WLTP CO_2 emission levels of light commercial vehicles, by vehicle type, for the years 2021-2026

	2021	2026	2027
ICE	182	158	156
Full hybrid	141	120	118

Hybridization rate varies by market as automakers choose different strategies to achieve CO_2 reduction targets. In the EU, the penetration of full hybrid vehicles in PCs increased from 1.5 percent in 2015 to 5 percent in 2020 but remained at 0.1 percent for LCVs. In the US, there has been a rapid increase in hybrid vehicles in light-commercial vehicle production (i.e. truck SUV, minivan/Van, pickup) in the last five years (Figure 3).

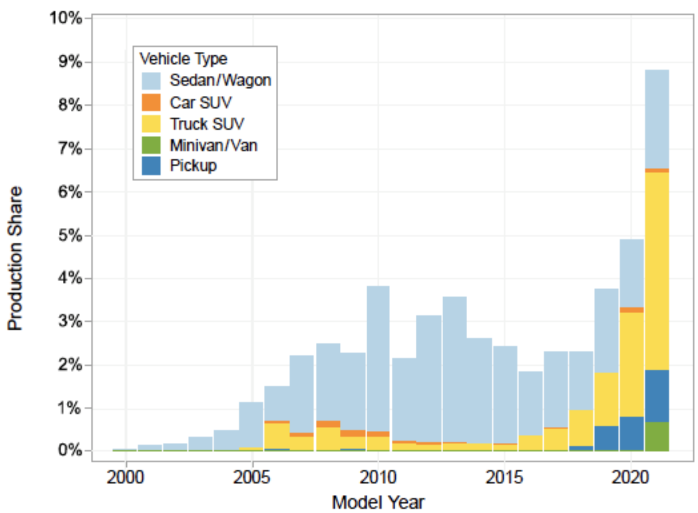

Figure 3 Gasoline hybrid engine production share by vehicle type in the US[14]

2.2 EV uptake potential

EV production (mainly battery electric vehicles - BEVs and plug-in hybrid electric vehicles - PHEVs) will ramp up globally in respond to a combination of government ICE vehicle phase-out targets, automaker commitments, and EV investment.

Around three quarters of the global PC and LCV markets have made strong commitments toward phasing out ICE PCs and LCVs[15] (Figure 4). These markets include 16 national and sub-national governments[16] that have set targets to fully end the new sale or registration of ICE PCs mainly in the 2025 to 2035 timeframe. With the exception of Singapore and Iceland, all 100 percent ICE phase-out targets include phasing out ICE LCVs. The EU proposed CO_2 emission standards would only allow the registration of

[14] U.S. EPA. (2021). The 2021 EPA automotive trends report. Greenhouse gas emissions, fuel economy, and technology since 1975. https://www.epa.gov/automotive-trends

[15] The market share refers to the 2020 sales data and the ICE phase out commitments refer to official announcement and proposal as of September 2021.

[16] 16 governments include 10 European countries, as well as Canada, Costa Rica, Cape Verde, Singapore, and at the sub-national level, the U.S. states of California and New York. Some EU countries are merged with the EU block in figure 4.

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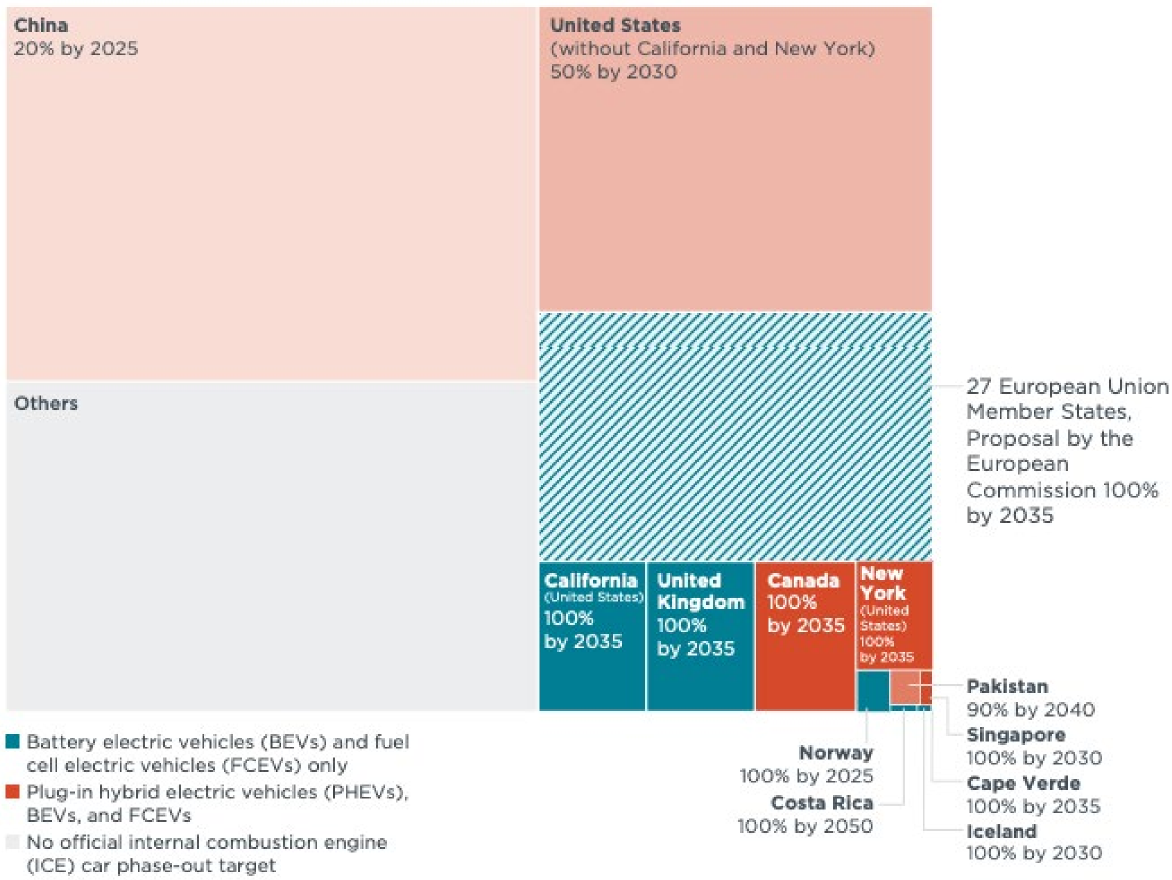

Figure 4 Government targets to 100 percent phase out the sale or registration of new ICE cars, status through September 2021.[18]

Automaker announcements show that they are on track to provide sufficient EVs to meet the demand indicated by these targets. Among the top 20 global automaker groups, 17 groups have announced targets for BEVs, PHEVs, and FCEVs in the 2025 to 2040 timeframe as of December 2021. The targets together account for around 59 percent of total LDV sales in major markets in 2020.[19] Nine automaker groups have announced 100

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[17] Data srouce for Norway; https://www.reuters.com/business/autos-transportation/electric-cars-take-two-thirds-norway-car-market-led-by-tesla-2022-01-03/#:~:text=Overall%20new%20sales%20in%20Norway,up%20from%2054%25%20in%202020; EU: Dataforce; China: Marklines

[18] Wappelhorst, S. (2021). Global PC market share of countries planning to phase out new sales of internal combustion engine vehicles.

[19] Major markets include China, EU, US, India, Japan, and Korea.

percent targets for BEVs (including Tesla that already sells 100 percent BEVs globally) (Table 3).

Table 3 Announcement of EV targets of Top 20 global OEMs groups

	Automaker group	Target Year	% new sales	New propulsion type	Market scope
1	Volkswagen	2030	70% 50%	BEV	Europe China, US
2	Toyota	2025	100%	BEV, PHEV, or hybrid	Global
3	GM	2035	100%	BEV	Leading markets
4	Hyundai Kia	2040	100%	BEV	Major markets
5	Honda	2040	100%	BEV and FCEV	Major markets
6	Ford	2035	100%	BEV	Leading markets
7	Daimler	2030	100%	BEV	Global
8	BMW	2030	100%	BEV	Global
9	Dongfeng	2024	100%	BEV, PHEV	Global
10	Mazda	2030	25%	BEV	Global
11	SAIC	2025	32%	BEV, PHEV	Global
12	Stellantis	2030	60%	BEV	Europe, US
13	Geely (Volvo)	2030	100%	BEV	Global
14	Nissan	2030	40%	BEV	US
15	Suzuki	N/A	N/A	N/A	N/A
16	Changan	2030	60%	BEV, PHEV	Global
17	Great Wall	2025	80%	BEV, PHEV	Global
18	Subaru	2030	40%	BEV or hybrid	Global
19	Tata-Jaguar Land Rover	2035	100%	BEV	Leading markets
20	Tesla	/	100%	BEV	Global

With strong policy and industry commitment to the electric vehicle transition, several hundred billion dollars in electric vehicle investments are slated to be made before 2030 to ensure manufacturing capacity meets these EV sales targets. As of June 2021, announcements by automakers reached a total of approximately $345 billion in global investments through 2030, which increased by 20 percent from the $275 billion estimate in December 2020, showing rapidly growing interest in EV investment.[20] This number is dynamic and will keep growing. The actual investment is likely to be greater if it includes associated battery procurement and strategic plans that are not fully disclosed.

An ICCT report looking at automaker investments in EV transition concludes that EV manufacturing grows where policies are spurring EV growth in major vehicle markets.[21] Although New Zealand is a relatively small market that relies on imports, its strong policies,

[20] Bui, A., Slowik, P., & Lutsey. (2021). Power play: evaluating the U.S. position in the global electric vehicle transition. https://theicct.org/publication/power-play-evaluating-the-u-s-position-in-the-global-electric-vehicle-transition/
[21] Ibid.

such as Clean Car Discount programs, could complement the proposed 2023-2037 targets in the Clean Vehicle Standards to attract automakers to sell their EVs to this market.

2.3 Availability of *used* EVs

As EV will continue growing in the global vehicle market, more and more *used* EVs will flow to the *used* vehicle market. We project *used* EV availability in New Zealand in 2026 and 2027, adopting the methodology in Tankou et al., 2021.[22] As New Zealand is a right-hand drive country, we only project the *used* EVs available from Japan and UK, as both are right-hand drive countries. Data from the Energy Efficiency and Conservation Authority (EECA) shows that from 2013 to 2020, New Zealand has imported most of its *used* EVs from Japan (98 percent in 2020), with some also coming from the United Kingdom.[23] It is worth noting that other right-hand drive markets, although smaller than Japan and the UK, will also potentially export *used* EVs to New Zealand.

The projection assumes a general five-year ownership period for first ownership of EVs, except in Europe where shorter ownership period from company leases is assumed to last four years on average. The new EV projections in Japan and UK come from ICCT's roadmap estimation based on the so-called "Progress to date" scenario, which take in consideration latest policy developments (e.g., United Kingdom 100 percent ZEV by 2035 commitment).[24]

Figure 5 shows our projection of the number of first owner BEVs and PHEVs entering the *used* EV market in Japan and UK for PCs. It shows that in 2026, Japan would have around 37,000 first-owner passenger EVs enter the *used* market and UK would have around 355,000 EVs enter the *used* market. In 2027, the numbers will increase to 146,000 in Japan and 451,000 in UK. These EVs that newly enter the *used* vehicle market, together with some *used* EVs already in the *used* vehicle market from previous years, can be traded within the country or exported to the other countries, including New Zealand.

[22] Tankou, A., Hall, D., & Lutsey, N. (2021). *Understanding and supporting the used ZEV market. International Council on Clean Transportation*. http://www.zevalliance.org/used-zero-emission-dec21/

[23] Energy Efficiency and Conservation Authority. (2021). *Review and analysis of electric vehicle supply and demand constraints.* Retrieved from https://www.eeca.govt.nz/insights/eeca-insights/review-and-analysis-of-electric-vehicle-supply-and-demand-constraints/

[24] Miller, J., Khan, T., Yang, Z., Sen, A., & Kohli, S. (2021). *Decarbonizing road transport by 2050: accelerating the global transition to zero-emission vehicles.* Retrieved from the International Council on Clean Transportation https://theicct.org/publication/zevtc-accelerating-global-transition-dec2021/

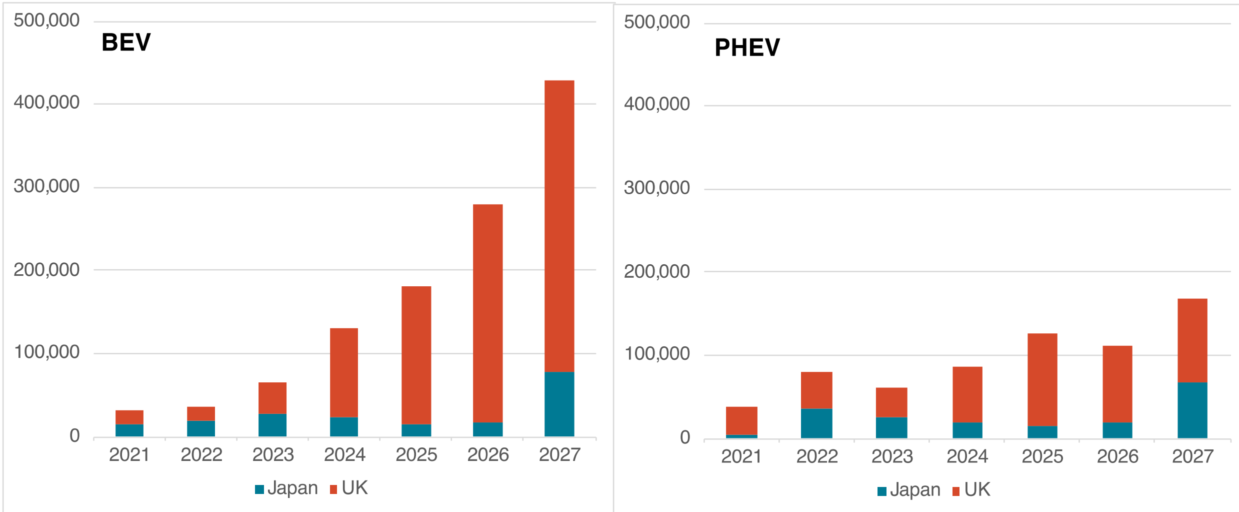

Figure 5 First-owner passenger BEVs entering the used market in Japan and UK from 2021 to 2027

To estimate the number of *used* EVs that could be exported to New Zealand in 2026 and 2027, we adopt the rationales in the EECA report[25] to estimate the percentage of Japanese sales that New Zealand importers are taking. The EECA report compares annual imports to New Zealand of *used* BEVs and PHEVs with the average number of new BEVs and PHEVs sold in the 4, 5, and 6 years previously in Japan, as the equation below:

$$y = \frac{\text{Number of New Zealand used EV imports of year X}}{\text{Average number of new EV sales sold in Japan in the 4, 5, and 6 years before year X}}$$

$$y\ is\ New\ Zealand\ used\ EV\ imports\ of\ year\ X\ as\ \%\ of\ earlier\ Japanese\ sales$$
$$(referred\ as\ \text{“}import\ rate\text{”}\ in\ the\ rest\ of\ Section\ 2.3)$$

Following this methodology, we analyzed the 2009 to 2019 data[26] for BEV and PHEV respectively and find that the import rates range from 12 percent to 24 percent for BEVs and five percent to eight percent for PHEVs. We use these import rates to estimate the number of *used* EV that will be imported to New Zealand from Japan[27] in 2026 and 2027.

The results are presented in the Table 4 below, which shows that 13,439 to 26,878 *used* BEVs will be exported to New Zealand in 2026 and increase to up to 49,686 for BEVs in 2027. There will be less PHEV imports than BEVs. Based on *used* PC sales projection in New Zealand from the Vehicle Fleet Emission Model (VFEM) [28], the estimated used BEV imports from Japan could account for 10 percent to 20 percent of total *used* vehicle imports in 2026 and 18 percent to 35 percent in 2027. Note that the import rates *used* for estimation only reflect the historical trend, and as New Zealand now offers incentives on *used* EVs, it

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[25] Energy Efficiency and Conservation Authority. (2021). *Review and analysis of electric vehicle supply and demand constraints.* Retrieved from https://www.eeca.govt.nz/insights/eeca-insights/review-and-analysis-of-electric-vehicle-supply-and-demand-constraints/

[26] The new sales in Japan of BEV and PHEV come from ICCT's roadmap; the used imports of BEV and PHEV come from the EECA report.

[27] The new EV sales projections in Japan come from ICCT's roadmap estimation based on the so-called "Progress to date" scenario, which take in consideration latest policy developments. Miller, J., et al. (2021). *Decarbonizing road transport by 2050.*

[28] The VFEM projection of used PC sales are 131,097 in 2026 and 133,803 in 2027 and MOT suggests an adjustment of 5% upward, which results in 137,652 in 2026 and 140,493 in 2027.

is likely that the country will be able to attract more *used* EVs than it has in the past. It is also important to note that the estimates in Table 4 only reflect potential imports from Japan. Since the United Kingdom has a larger *used* EV market than Japan, it could potentially supply a much larger number of *used* EVs than Japan to meet the market demand in New Zealand.

Table 4 Projection of used passenger car EV imported from Japan by 2026 and 2027

	BEV		PHEV	
	Imports	Used vehicle market share	Imports	Used vehicle market share
2026	13,439 - 26,878	10% - 20%	5,600 – 8,960	4% - 7%
2027	24,843 – 49,686	18% - 35%	10,351 – 16,562	7% - 12%

2.4 Technology pathway to meet 2026 and 2027 targets

We assume that most importers would apply for category 1 light vehicle importers subject to annual, fleet-based compliance regime[29]. The fleet-based compliance regime provides importers some flexibilities in complying with the standard targets, because low-emitting models can offset the negative impact of higher-emitting models from the same importers.

Table 5 illustrates the potential combination of different technologies for new PC imports to meet the 2026 and 2027 targets. All CO_2 emissions in this session are under 3P-WLTP. Given that many PCs imported to New Zealand are already hybrid (over 18 percent as at the end of 2021 for both new and used PC imports) and 43 percent of new PCs are imported from Japan, for the example pathways we assume continued increase of hybrid market share in future years. If the hybrid market goes higher than the estimates in the table, the required BEV market share would be lower to meet the targets. The type-approval CO_2 emissions of PHEVs are between hybrid and BEV (tailpipe CO_2 emissions as 0 g/km). Thus, it is not analyzed separately in the table. If there is any uptake of PHEVs, the market share of hybrid vehicles and/or BEVs can be reduced. The examples illustrate that the 2026 to 2027 targets can be met with a 15 percent to 35 percent BEV market share.

Table 5 Potential technology pathways for new PC import to meet 2026 and 2027 targets

Year	Target (g/km)	CO_2 average (g/km)	Non-hybrid ICE market share	Fully hybrid market share	BEV market share
2026	84.5	84.3	55%	25%	20%
		84.3	40%	45%	15%
2027	63.3	64.8	35%	30%	35%
		63.4	15%	55%	30%

Table 6 illustrates the potential combination of different technologies for *used* PC imports to meet the 2026 and 2027 targets. For *used* vehicles, we assume that the average CO_2 level of non-hybrid ICE vehicles and fully hybrid vehicles in 2026 and 2027 are equivalent

[29] The alternative category 2 light vehicle importers are subject to a vehicle-by-vehicle compliance regime.

to the CO_2 level of the vehicles in 2021 in the EU. Such assumption aligns with New Zealand's status quo where 60 percent of imported *used* LDVs are 6 years old or less.[30] In the last quarter of 2021, the market share of hybrid PCs reached 21 percent of the *used* PC imports, therefore we assume the hybrid market share will continue to grow, especially with the introduction of the Clean Vehicle Standards and Clean Car Discount programs. For *used* imports, a slightly higher BEV uptake would be needed in the examples given the CO_2 levels of other *used* imports are higher than those imported as new. Again, the table only shows potential technology pathways to achieve the target. If the hybrid market share goes higher than the estimates in the table, the required BEV market share would be lower to meet the targets. According to the projection of *used* BEV imports in 2027 in the Section 2.3, a 40 percent to 45 percent BEV market share in 2027 can be partially met by *used* BEV imports from Japan. If the used BEV imports from Japan can meet 35 percent of total *used* PC demand in 2027 (higher end of estimates in Table 4), then the 5 percent to 10 percent market share gap can be met by *used* BEV imports from other countries like the UK, which will have much larger *used* BEV stock than Japan.

Note that for the examples in Table 6, we assume that the imported *used* vehicle fleet must meet the fleet-average CO_2 standards independently. Since the compliance to the standards does not separate new and used imports, if the *new* imports can achieve lower CO_2 emission level on average than the targets, the *used* imports could subject to lenient targets. If importers plan to use credits from overachievement of their targets in earlier years to offset underachievement in 2026 and 2027, the targets will be less stringent of those years.

Table 6 Potential technology pathways for used PC import to meet 2026 and 2027 targets

Year	Target (g/km)	CO_2 average (g/km)	Non-hybrid ICE market share	Fully hybrid market share	BEV market share
2026	84.5	84.6	45%	25%	30%
		85.0	30%	45%	25%
2027	63.3	63.3	25%	30%	45%
		63.6	10%	50%	40%

For LCVs, the analysis focuses mainly on *new* LCV imports, because *used* LCV imports account for only 13 percent of the LCV import in 2021[31], and will remain low in MOT's projection for the 2026 and 2027 sales.

There are uncertainties about the availability of hybrid and electric vehicle models for the segment, especially utes, due to the lack of manufacturer/importer commitment, which may limit the technology options for LCVs to achieve the 2027 targets. Since importers can transfer the credit from one vehicle type to another, the noncompliance of LCVs can be compensated by overcompliance of PCs. Table 7 tests two extreme cases to illustrate how PCs and LCVs can meet the 2027 fleet average CO_2 emission targets together. The first case assumes no BEV is available for LCV imports, and the second case assumes neither

[30] Analyzed based on 2019 New Zealand LDVs MOT database.
[31] New Zealand Ministry of Transport. (2021). Fleet statistics. https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/sheet/light-motor-vehicle-registrations

BEV nor fully hybrid LCVs are available for imports. The market share of new PC import (78 percent) and LCV import (22 percent) is based on the VFEM projection. The CO_2 estimation of LCVs in New Zealand is assumed to be 7.9 percent higher than the estimation of EU LCVs in Table 2, considering the average curb weight of LCVs in New Zealand (2,056 kg in 2021) is higher than in the EU (1,922 kg in 2020).[32]

The example pathways in Table 7 shows the possibility to meet the PC and LCV combined targets in the absence of BEV and hybrid LCVs. This would potentially necessitate a higher BEV penetration of 50 percent to 55 percent of new PCs in 2027. However, as the analysis in the EV uptake potential indicated, although utes could be a special vehicle type with limited technology options, other vehicle types in the segment (e.g. electric vans) will be available in the market by the 2026 and 2027 timeframe. Therefore, the overcompliance burden on PCs could be lower than the estimation. Given the announcement of ICE phase out targets of several vehicle markets and major OEMs' EV targets in the 2025 to 2035 timeframe, the EV production will ramp up to meet the higher EV demand.

Table 7 Potential technology pathways for new PC and LCV import to meet 2027 targets without BEV LCVs

Scenario	Type	Target (g/km)	Combined target (g/km)	CO_2 average (g/km)	Combined CO_2 (g/km)	Non-hybrid ICE market share	Fully hybrid market share	BEV market share
1	PC	63.3	68.6	46.5	68.8	15%	35%	50%
	LCV	87.2		148.0		50%	50%	0%
2	PC	63.3	68.6	40.8	68.8	10%	35%	55%
	LCV	87.2		168.1		100%	0%	0%

[32] The ratio is generated based on the EU LCV CO2 emission standard curve, target (g/km) = 147 + a*(M-Mo), where a= 0.096, M0 = 1766.4. The targets of an average curb weight of 2,056 kg is 7.9% higher than the targets of an average curb weight of 1,922 kg

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The International Council on Clean Transportation (ICCT) is an independent nonprofit organization founded to provide first-rate, unbiased research and technical and scientific analysis to environmental regulators. Our mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation, in order to benefit public health and mitigate climate change.