Submission to the Productivity Commission's Low Emissions Economy Draft Report.

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This submission offers overall support to, and adds specific comments to, the draft report's material on Electric Vehicles in Section 11 Transport.

Key take away from this submission is that: the feebate must also cover the import of used vehicles, and a 2030 "goal" (not "ban") of all imports (new and used) being zero emission has strong merit.

Draft Report Section	Submission on Draft Content
F11.1 At the current low-emissions price, the New Zealand Emissions Trading Scheme (NZ ETS) has a small effect on fuel prices, and accordingly, a small effect on consumer behaviour and transport emissions. A higher emissions price would have a greater impact. Yet, because consumers are relatively unresponsive to changes in fuel prices, additional measures will be required to achieve large emissions reductions.	**Agree** with finding. The cost of carbon would have to reach unlikely extremes (e.g. over $200 per tonne) before light vehicle drivers would seriously respond by curbing driving and reducing emissions. The ETS should still apply to transport, however as the report notes, and because transport has practical low-emission solutions commercially available now that we seek to be widely adopted, *separate measures are thus justified*.
F11.2 Light vehicles entering New Zealand's fleet emit significantly more CO_2 than in most developed countries, and efficiency improvements have stalled since 2013. Evidence suggests vehicle manufacturers are opting to provide less efficient variants of vehicle models to the New Zealand market compared to markets where CO_2 emissions standards apply.	**Agree** with finding. Additionally, it is concerning that efficiency improvements have stalled despite the mass availability of cheap used 'plug-less' hybrids (e.g. Toyota Prius from Japan). The finding is unsurprising given we have no emissions import rule, and, related, New Zealand's love affair with high-emission utes (Ford Ranger and Toyota Hilux are consistently our #1 and #2 most purchased vehicle). More than half of the top 10 vehicles in 2017[1] were utes (bold): **Ford Ranger (9420) - UTE** **Toyota Hilux (8106) - UTE** Toyota Corolla (7797) Toyota RAV4 (4629) **Holden Colorado (4489) - UTE** **Mitsubishi Triton (4070) - UTE** Kia Sportage (3555) Mazda CX-5 (3236) **Nissan Navara (3055) - UTE** Toyota Hiace (2961)
F11.3 Vehicle CO_2 emissions standards are warranted because buyers tend to	**Agree** with finding. Buyers downplay running costs versus other characteristics (especially

[1] https://i.stuff.co.nz/motoring/news/100417840/most-popular-nz-car-for-2017-still-a-truck

discount future fuel savings at a much higher rate than is socially optimal. Domestic standards could also mitigate risks around "dumping" of high-emissions vehicles in New Zealand due to stringent standards and regulations adopted in other regions.	features such as cargo or passenger capacity, comfort, etc). Additionally, without a standard, if overseas high-emission vehicles are cheap to purchase: NZ consumers might just as much be to blame in 'pulling' demand (we kiwis tend to love a bargain, after all), as automakers are to blame in 'dumping' or 'pushing' their obsolete products here. Finally, introduction of a standard leads to an equity 'benefit', i.e. the more of our imported vehicles are lower in emissions, the more likely that second, third, and onward owners (i.e. people on lower incomes) are themselves contributing to emission reductions, than would otherwise be the case. This is a desirable outcome, noting the report states "F9.3: Lower-income households are less able to make investments that enable them to reduce the emissions intensity of their consumption.")
R11.1 The Government should introduce CO_2 emissions standards for light vehicles entering the New Zealand fleet, subject to detailed consideration of design options (for example, including or excluding small traders).	**Agree** with recommendation. **Comments:** 1. This rule must include both new and used imports, as cheap used fuel vehicles could pose a high risk towards the 'dumping' issue. 2. Further work is needed on how to manage small traders. Grouping in pools would seem more attractive a strategy than borrowing across years in terms of delivering emission reductions sooner. 3. It is not clear from the report why heavy vehicles should be exempt from such standards, especially as the report states they are responsible for 40% of the recent rise of transport emissions. Fleet operators today are more concerned with low cost than low emissions. A 'heavy standard' could be used to promote better adoption of newer 'Euro' emissions standards today, and anticipate broad availability of hybrid and zero-emission vehicles in coming years.
Q11.1 How could New Zealand signal a commitment to a widespread transition away from fossil-fuel vehicles? For example, should New Zealand explicitly aim to phase out the importing of fossil-fuel vehicles by some specified future date?	Yes, the New Zealand Government **should** publicly state an appropriate follow-up to its short term expectation of 64,000 EVs by 2021 by: **signalling a <u>zero</u>-emissions-vehicle-only import goal from <u>2030</u>.** 1. Note the use of (a non-binding) **'goal'** rather than 'ban', to inspire market movement rather than act punitively. Conceiving a "goal" also reduces risk - if the "goal" cannot be achieved due to delays by automakers to provide enough well priced, capable vehicles across all segments, the government should have less cause for embarrassment. The optics of the government "failing a goal" are generally better than "failing to ban". 2. That said, to be meaningful, the goal must have financial, legislative, and promotional backing, namely in the form of a feebate and emissions standards, at minimum, so that the goal can more realistically be achieved and believed. 3. The year should be *soon* enough to create an emotional response and *late* enough to be realistic, hence 2030. Most automakers (including mid and lower-cost brands such as Toyota) are on record for stating all models will be partially or fully electric well before 2030; fully electric vehicles would therefore be available both new, and perhaps more importantly, as second-hand used

imports from Japan at low cost pricing suiting mainstream adoption in New Zealand before 2030.

4. Even so, especially over the next 5 years, automakers have finite marketing budgets and production capabilities, and will supply electric vehicles firstly where they have confidence in the 'fertility' of the electric vehicle market. A country goal for zero emission vehicles by 2030 (and backed with feebates, et al) gives automakers the confidence to bring electric models here early relative to other markets. An example of this in practice is how Hyundai and other brands have brought electric models to New Zealand before Australia, likely due the greater customer demand and the advanced rollout of our charging network.
5. 2030 is also selected as it is the year from which "almost all vehicles need to be electric" (F11.5 / Concept Consulting); 2030 is thus a **deadline**.
6. Plug-in hybrids and hybrids in the *light vehicle segment* should be **excluded from the goal;** they stop being a valid interim technology after 2030 given the imperative we have for net zero emissions nation by 2050.
7. Heavy vehicles *should be included in a zero-emissions commitment*, although it may require softer wording such as "encouragement". (For example, "The Government encourages all heavy vehicles bought from 2030 to be zero emission"). The rationale for softer wording is that while certain segments appear reasonably certain (e.g. mass produced electric urban buses and trucks doing under 300km per day), it is the cost *not the capability* of other segments (e.g. long-haul trucks or specialised trucks like airport fire appliances) that makes it unclear in 2018 whether <u>all</u> heavy vehicles could be purchased zero emission from 2030. (For reference, the global leader Norway has the following heavy vehicle target: "*By 2030, all new heavy duty vehicles, 75 per cent of new long distance coaches and 50 per cent of new trucks shall be zero emission vehicles*".)
   Financial and/or emissions standards for heavy vehicles would assist this "encouragement" here.
8. New Zealand could publicly join an international alliance of countries working towards all vehicle sales being zero emissions (www.zevalliance.org).
9. Importantly, as a show of commitment and demonstration of feasibility to the wider market, the entire **New Zealand Government fleet** (road vehicles held by all agencies) would need to be zero emissions by 2030, with any per-vehicle exceptions needing to logically explainable.

10. Logical interim **commitments should extend beyond road** into marine and aviation. Norway could offer well-researched inspiration here; its 2018 National Transport Plan[2] notes *"The Government will introduce a blend-in requirement of 1 per cent sustainable biofuel in aviation from 2019, targeting a 30 per cent blend-in requirement in 2030. In the railway sector, the Government requires that all future public procurement of [locomotives] will be zero emission"*[3]. Aviation could over-achieve

[2] https://www.ntp.dep.no/English
[3] https://www.regjeringen.no/en/dokumenter/meld.-st.-33-20162017/id2546287/

	as **the Norwegian national airline is planning to replace its fleet of regional route airplanes with electric models by 2030**[4]. Norwegian airline head notes "It could be that we are presenting a tender within a year or two [following 2018] to the market to commercialize electric aircraft," adding that such a tender might be for 5 to 15 planes of between 12 and 50 seats.[5] Norway has also declared its fjords will become the world's first **marine zero-emissions zones** no later than 2026, following a successful long-term trial of a 80-meter all-electric ferry that carries up to 120 cars and 360 passengers and has led to 53 more electric ship orders[6].  *Above: While New Zealand is beginning its electric car journey, other countries are well underway with larger projects. Two swedish ferries were converted to all-electric for approximately NZD50M. (Each can carry 1250 passengers, 260 trucks, 240 cars and 9 passenger train coaches). This comes as Norway is deploying over 50 electric ferries into its fjords.*[7]  *Above: Siemens, Airbus and Rolls-Royce will launch the Airbus E-Fan X*[8] *in 2020, a precursor to all-electric domestic flights.*
F11.4 The use of electric vehicles (EVs) leads to substantial emissions reductions compared to fossil-fuel vehicles, due to New Zealand's low-emissions sources of electricity generation. EVs also contribute to reduced air and noise pollution, and involve lower fuel and maintenance costs.	**Agree** with this finding. Note: The report states electric vehicles have a higher manufacturing carbon footprint than fuel vehicles. As international automakers and upstream supply chains themselves can make use of increasingly "green" electricity grids overseas (which are commonly coal based today, but are trending towards renewable generation), the carbon footprint of manufacturing EVs will improve considerably. (By way of example, the Tesla battery factory is understood to become entirely run by massive rooftop solar array[9]).

[4] https://nordic.businessinsider.com/norway-wants-to-repeat-their-success-with-electric-cars--on-airplanes--/
[5] https://www.reuters.com/article/us-climatechange-aviation/norway-plans-to-buy-electric-planes-mimicking-green-car-success-idUSKBN1GY2O2
[6] https://www.inverse.com/article/44507-norway-zero-emission-fjords
[7] https://spectrum.ieee.org/transportation/marine/the-struggle-to-make-dieselguzzling-cargo-ships-greener
[8] https://en.wikipedia.org/wiki/Airbus_E-Fan_X
[9] https://electrek.co/2018/02/26/tesla-gigafactory-solar-array/

F11.5 A rapid uptake of light EVs will likely be a critical part of achieving a low-emissions economy. To electrify the bulk of the light vehicle fleet by 2050, nearly all newly registered vehicles would need to be electric by the early 2030s.	**Agree** with this finding. This cannot be understated given the challenges in reducing our agricultural footprint and the slow turnover of our vehicles. This underscores the need that the government publicly states a "goal" that all vehicles imported from 2030 are zero emission, certainly for light vehicles, and to the extent possible, also for heavy vehicles. Such a goal would require broader support as noted by the report, at minimum in the form of a feebate and emissions standard. Collectively, this entices automarkes to target their zero emission vehicle offerings to our market, as noted earlier.
F11.6 The most significant barriers inhibiting the uptake of EVs in New Zealand are: 1. - the upfront cost premium compared to petrol and diesel vehicles; 2. - limited travel range, and associated range anxiety; 3. - the lack of public awareness and understanding of EVs; and 4. - the lack of cost-reflective pricing of electricity.	**Partially agree** with this finding. While true today, none of these barriers shall persist for over the long term. It is important to differentiate short term barriers (and thus actions) from long term barriers (and actions). 1. Upfront **cost premium** in New Zealand should be well gone by 2030 (if we accept Bloomberg's 2025 price parity forecast[10] then add a generous lag given many vehicles come to New Zealand as used Japanese imports, which is what much of the population purchase). The cost premium certainly does exist today thus a feebate system will be essential prior to 2030. Following 2030 the feebate (or revised financial disentive) on fuel car imports would remain appropriate, reflecting the negative externalities of such vehicles. The existing RUC exemption on light and heavy electric vehicles should continue as designed (until they reach 2% of their respective classes) and should not be repealed prematurely. 2. All fully electric vehicles manufactured from 2020 will likely have minimum 300km range, ample for urban and road trip use. **Range anxiety** in 2018 is largely an issue relating to the abundant cheap supply of a single model (2011-2017 Nissan Leafs with <200km range), and is not reflective of vehicle capability going forward. In the 12 months from mid 2018 and mid 2019, five brands are on public record to make cars available in New Zealand all with over 300km ranges (Nissan Leaf, Hyundai Kona, Kia Niro, Jaguar iPace, Tesla Model 3), and the Motor Industry Association has surveyed automakers and found about 20 fully electric models will be released in New Zealand in 2019 and 2020 alone.[11] Therefore, while range anxiety is a valid concern today, it will soon dissipate and give way to fresh concerns (such as queues forming at popular charging stations).

[10] https://about.bnef.com/blog/electric-cars-reach-price-parity-2025/

[11] https://www.mia.org.nz/Portals/0/MIA%20Public%20Documents/Environment/2017%20Update%20-%20MIA%20EV%20and%20PHEV%20Model%20Availability%20Survey%202016%20to%202020.pdf

(Above: Hyundai Kona SUV, June 2018 Fieldays, Hamilton, has over 300km all-electric range, joining Tesla as a brand putting an end to range anxiety.)

3. Lack of awareness and understanding of EVs is certainly a concern, but resolving this will be a rather **finite** issue assuming a concerted burst of effort by Government and industry. That said, the automotive industry globally and in New Zealand has not done much to advertise electric vehicles effectively and this will need to change.
4. Cost of price reflective electricity appears much less of a 'barrier'. Many consumers can today pick power companies and pricing plans that reward overnight charging. Reducing the cost and broadening the availability of overnight electricity pricing will of course absolutely help.

The report does not state the following valid barriers:

1. **Outright lack of certain body types.** There is no fully electric ute in the market. This is problematic given the ute format equates to the number #1 (Ford Ranger) and number #2 (Toyota Hilux) consistently best-selling vehicle in the market, and dominates the rest of the Top 10 most sold vehicles. As at 2018, practically no global automakers have indicated a firm timeline or commitment for an electric ute. However, utes and other missing light vehicle body types such as larger vans, stationwagons, two-door coupes, etc, are presumably included when automakers variously state that all of their vehicle line up will be electric before 2030. The MIA survey (see footnote prior page) showing 20 new electric models in 2019 and 2020 alone gives confidence that this issue of lack of body types will be short-lived. However, it may still take some time for all body types to be *both* capable (long range, towing ability, etc) and cheap enough for mass adoption here.
2. **Uncertainty of battery replacement process/costs for used imports.** Half of the country's electric vehicles are used imports. The traction batteries of such vehicles tend to have their manufacturer warranty left behind, valid only if the vehicle were to sent back to country of manufacture (e.g. Japan.), which is logistically and financially undesirable. Such batteries have statistically been shown to work reliably, however not all people will have a good experience. Used vehicle buyers therefore are taking a calculated risk to rely on co-operative dealers, Consumer Guarantees Act, and good fortune. Any mechanism for consumers to pay for replacement batteries is very limited. A better solution will be needed.

	3. **Difficulty for certain groups to charge at home**. For example renters, apartment owners, and those without off-street parking may have nowhere to plug in a vehicle in a routine or convenient fashion. This will become more pronounced as other issues (like overall car pricing) are resolved. Financial support for installing charging in apartments or on residential streets, and, building codes specifying carparks/garages within new buildings must have chargers, will assist.
F11.7 A large uptake of EVs would add significant load to the electricity grid. Without measures to encourage off-peak charging, such as cost-reflective pricing and smart metering, electricity emissions could rise significantly. The additional electricity load could also put significant pressure on the existing network, and require large investments to provide additional capacity.	**Partially agree** to this finding. It is correct that charging needs to occur off-peak as adoption becomes mainstream, and and that expensive upgrades may be needed, particularly in 'last mile' distribution. Lines companies will likely naturally impose premium charges at peak-times as a way to head off the need to further increase peak capacity. The sentiment of the investment aspect of this finding has to be balanced with the fact that billions of dollars of fuel purchased by New Zealanders will divested and instead spent on electricity over the coming decades. In other words, the electricity sector stands to be rewarded handsomely by the electrification of transport (and heating), and accordingly this sector should look positively at investments needed along the way. It is noted the industry is highly regulated and structured in a fractured fashion (particularly lines companies, with differing sizes and profit philosophies) and may not be geared to invest in growth, compared to say, the internet broadband industry which has invested significantly in the past 20 years to attract and match the rise of demand of its technology.
F11.8 Overpricing of off-peak electricity and under-pricing of CO_2 emissions and air pollution from fossil-fuel vehicles means that the running costs of EVs (relative to fossil-fuel vehicles) are higher than they should be. In choosing a vehicle, consumers are also likely to under-value the large emissions that are locked in over the vehicle's lifetime (eg, due to high discounting of future running costs). This provides a case for Government to provide some form of transitional price support to incentivise EV uptake.	**Agree** with finding, with a comment regarding electricity pricing. The lack of externalities not paid when driving fuel vehicles does disadvantage electric vehicles as described. In addition to consumers 'under valuing' emissions while running a vehicle, many consumers simply don't have the capital means to buy a more expensive vehicle even if they wish to reap its operational cost (and emission) savings. Regarding 'over-pricing of offpeak electricity', a number of electricity retailers <u>do</u> offer cheap overnight rates today, and Wellington Electricity in 2018 introduced cheap rates during business hours and weekends (with a premium at weekday breakfast and dinner time). It could be argued current electricity pricing is only a minor barrier, as most electric vehicle owners quickly learn to seek out appropriate electricity plans with low overnight rates to save their own money. Reducing the cost and broadening the availability of overnight electricity pricing will of course absolutely help. Long term, it is not obvious that overnight grid power will continue to be cheap once EV adoption is truly substantial, i.e. once it begins to put strain on certain points in the supply system. By then however, other elements, such as residential battery or vehicle to grid technology, might meaningfully come into play.

F11.9 A well-designed price feebate scheme based on the GHG emissions of light vehicles entering the fleet would provide the most cost-effective approach to incentivising the uptake of low-emission vehicles. The approach: provides a continuous incentive for purchasing lower-emitting vehicles (including fossil-fuel vehicles); is technology neutral; and can be designed to be revenue neutral.	**Agree strongly** with finding with **important comments:** As noted in other responses, the feebate links strongly to findings (i.e. transport has readily available solutions now compared to agriculture; our power is 'green'; our charging network is nationwide; but, we hold onto vehicles too long and our adoption rate, while improving, needs a significant boost if we are to make a meaningful attempt at a net zero-emissions economy). See comments in R11.2 on points about *used* vehicles being included, and design should focus on being at *point of purchase*.
F11.10 The effective design of a feebate scheme is critical for its success. Excessively high or low feebates can lead to adverse outcomes. Applying a one-off feebate when a vehicle enters the fleet provides stronger incentives than an annual charge over time.	**Strongly Agree** with finding; yes buyers disproportionately weight purchase price over running costs. An exception is *heavy* vehicles where fleet managers are more likely to carry out careful whole-of-life calculations. Here a mixture of upfront and ongoing (annual and milage) savings could help to incentivise longer operational lives for zero emission vehicles, and/or help justify replacing vehicles that have high annual mileage (which translates to more emissions being removed).
R11.2 The Government should introduce a price feebate scheme for vehicles entering the fleet, subject to identifying the most suitable design features for the New Zealand context. The feebate scheme should replace the existing road-user charge exemptions for light EVs.	**Strongly Agree with findings** 1. ***Used vehicles* must be specifically noted in your recommendation as being covered by the feebate.** More than 50% of vehicles imported to New Zealand are used. The feebate must apply to the majority of vehicles imported into NZ to be effective. Otherwise the large proportion of buyers who can only ever afford to buy *used* imported cars will continue to purchase fuel vehicles. Being price sensitive already, such buyers will be put off by high upfront electric car prices without a feebate, and conversely, will be more swayed by the positive effect if a feebate is introduced. (For example, a $5000 reduction on a $15,000 *used* EV makes it cheaper than an otherwise half-priced $7,500 *fuel vehicle* if it had a $5000 purchase 'tax' added. The same $5000 reduction on a $50,000 *new* EV remains effective but is less pronounced. Further, a $5000 reduction on a *new* vehicle is unlikely to offer any assistance to a buyer who only has the capital to buy a used vehicle, and, a used car buyer is unlikely to represent an opportunity lost by new car dealerships; the new vs used pricing segments are sufficiently separated.) Including used vehicles helps overcome a challenge noted by section F9.3 that "Lower-income households are less able to make investments that enable them to reduce the emissions intensity of their consumption." 2. Approach **must focus on being 'one off'** as buyers disproportionately place value on purchase price (as the report

	notes by F11.10). If carbon or fuel prices remain low in the long term, a disincentive on fuel vehicles on mileage basis could eventually be added. 3. Out of principle for honoring commitments made, the **<u>light</u> vehicle RUC exemption should continue for the term currently stated** (i.e. continue until the fleet reaches 2% electric, which is likely in 2021). This also ensures recent EV buyers, who will not benefit from the feebate, *do* get some financial reward from being an early adopter; the RUC exemption will have played a part in their financial decision in affording the vehicle. The introduction of the feebate should be done as soon as process allows, presumably around 2019/2020, and thus may have a timing overlap with the RUC exemption. 4. It will remain useful to **keep RUC exception on Heavy Vehicles** until they reach 2% of the fleet as a temporary measure while their purchase price is so high. At present the adoption rate for heavy EVs is very low and provides no short term revenue concern to the government; there are under 100 heavy electric vehicles in NZ as of mid 2018.
Q11.2 Should a price feebate scheme cover vehicles within the heavy vehicle fleet? What other policies are appropriate for incentivising the uptake of low-emission heavy vehicles?	**Answer: Yes** 1. The report states there are less heavy vehicle options today, which is true, however buyers should still be rewarded or answerable for their emissions behaviour; heavy vehicles are significantly more damaging in terms of emissions than light vehicles. A feebate therefore is a reasonable price placed on the environmental impact of a given vehicle. 2. The existing RUC exemption is a blunt tool giving zero emission trucks free use of the roading network; it also does not charge fuel trucks for the pollution they emit; in both cases vehicles should pay fairly for the impact they have. 3. Fleets are managed in a highly cost sensitive manner, and managers will attempt to utilise any pricing relief as best they can. 4. Fleet managers are more likely to carry out careful whole-of-life calculations than mums and dads buying light vehicles. Here a mixture of upfront and especially ongoing (annual and milage) savings could help to incentivise longer operational lives for zero emission vehicles, and/or help justify replacing vehicles that have high annual mileage (which translates to more emissions being removed). Fleet managers will remain more interested in buying vehicles with best overall lifetime cost and are not yet particularly swayed by any emotional 'call' to buy zero-emission vehicles. 5. That said, bus operators in New Zealand have a greater link to consumers demanding electric buses (especially given Wellington has long had electric trolley buses, and given urban commuter trains are predominantly electric). Bus operators appear also to now have good supply of capable fully electric buses; the issue is now explicitly upfront cost. A feebate including buses could help

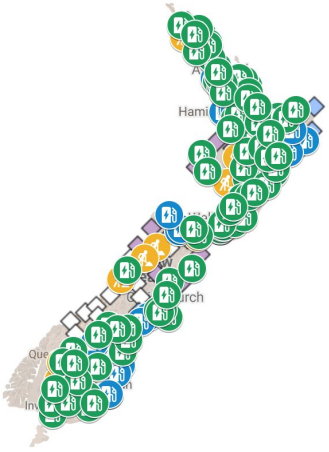
tip the balance towards more electrics, although it may be that additional funding from sources like the National Land Transport Fund would be effective given the price premium per bus is currently several hundred thousand dollars, or around double the cost of an equivalent diesel bus. Overseas, the U.S. California Air Resources Board (CARB) has specific funding to subsidise school buses, and buses serving lower social economic routes (USD400,000 subsidy per eligible bus). *Could the National Land Transport Fund or other mechanism provide a similar support here, particularly on routes or with operators who lack the profit or capital means to go electric within the next decade?* http://stnonline.com/news/latest-news/item/9452-school-buses-benefitting-from-millions-in-calif-cap-and-trade-funds

Above: all-electric double decker buses in Wellington from mid 2018, with 450kW overhead superfast chargers.

6. Supply of zero emission *trucks* in New Zealand is limited across their market spectrum, however demand appears just as much of a concern. High price and lack of buyer confidence appear to prevent purchases to a degree that the existing, niche, supply, is not met with any real demand. Unlike buses, there is currently little vocal public demand for trucks to become quieter and less polluting.
   Current electric truck pricing appears to be roughly double the price point of a comparative diesel truck. Strong case studies and proof cases will be essential to give confidence around capability, work life, and running cost savings. Indirectly related vehicles, such as a 2018 fleet of double decker electric buses in Wellington will still serve to positively demonstrate zero emission capability can suit trucks. **This suggests a much stronger level of investment support is needed until there are real world, production examples covering a wide variety of zero emission truck use cases within New Zealand.** Clearly, more manufacturers need to supply such vehicles in New Zealand, although there are billions of dollars of such investment and thus products should reach our shores within the next few years. At that point, and assuming local confidence in the product, the **remaining question will be solely about price, and this is what the feebate on heavy vehicles can address.**

	a. Telsa is to produce 500 mile, 30 minute recharge time, 36 tonne electric truck costing USD180k, available 2019[12] b. VW is to invest USD 3 billion in e-trucks and buses, first available from 2020.[13] c. Daimler is to invest USD 3 billion in e-trucks, available from 2021[14]  *Above - example of all-electric truck available for sale in NZ (options: 7-10 tonne; 250-350km range; open tray or box body)*[15] 7. It will remain useful to **keep the RUC exception on Heavy Vehicles until they reach 2% of the fleet** as a temporary measure while their purchase price is so high. At present the adoption rate for heavy EVs is very low and provides no short term revenue concern to the government; there are under 100 heavy electric vehicles in NZ as of mid 2018. However, electric trucks do use the road, so it will eventually be necessary for the incentive to shift from a Road User Charge exemption towards some other annual or mileage-based pollution rebate/charge, thereby enabling electric trucks to pay for roads they use and for fuel trucks pay for their environmental damage. Such a scheme is unlikely to create a level playing field on the current 2:1 purchase price disparity; but it will rely on and compliment manufacturing price reductions over coming years.
F11.11 The provision of EV charging infrastructure in New Zealand, especially fast charging stations, has been relatively strong with the current level of government support. Yet, some gaps appear to exist in specific regions, and for slow chargers within urban areas. R11.3 The Government should provide financial support for charging infrastructure projects to support the	**Finding supported, with notes on implementation, and suggestion on potential legislative change.** **"Gaps" to fill:** The Finding and Recommendation appear framed in a short term perspective although the overarching concept of supporting infrastructure is certainly entirely valid. Going forward, the nature of gaps is *not* geographical coverage, per se, but rather of density, redundancy, and capacity, and, addressing isolated cases where obstacles make it hard for some people to routinely recharge vehicles.

[12] https://www.tesla.com/semi?redirect=no
[13] https://i.stuff.co.nz/motoring/news/97797607/vw-to-roll-out-electric-trucks-buses-in-29-billion-push
[14] https://electrek.co/2018/06/07/daimler-electric-semi-truck-ecascadia-tesla-semi/
[15] www.etrucks.co.nz

uptake of EVs. Support should be limited to specific gaps in the charging network that are not commercially attractive to the private sector (eg, charging stations in lowly populated regions).	By the end of 2018, the primary large area missing from the fast charger network will be lower West Coast (e.g. Haast, Franze Josef) plus Te Anau and Arthur's Pass, as shown[16] by white diamonds below. Every expectation is that existing players, including EECA, Charge Net NZ, and lines companies, could support their completion within months). In many respects, New Zealand's charging network will then be the envy of most countries, including Australia.  This then leaves us with a longer term issue where financial support is helpful: 1. Almost every single location in our nationwide charging station network can only charge <u>one vehicle</u> at once. These will need to be expanded to support charging many vehicles at a time. It takes tens of minutes rather than a few minutes to charge an electric car, so queues can become substantial and very frustrating to users. 2. Given locations only charge one vehicle, if any location has a fault or is broken, it can strand an electric vehicle altogether. Adding a second charger at a station will be essential for reliability/redundancy, even if it not routinely used (i.e. does not make financial sense to the provider). 3. Most stations run at current "fast" speeds (50kW) but will need to upgraded to higher speeds that cars will soon support, and that drivers will soon expect (150 to 350kW). 4. All of the above points may require substantial investment in power supply, as well as capital costs of the charging station equipment. 5. Significant ongoing electricity costs for a station relate to the *peak* power demand drawn per month, not *average* power drawn per month. This creates financial challenges for any station that is less than consistently running at peak capacity: it will be paying for electricity that is not actually consuming. This could be common in most locations, but especially problematic in locations that have consistent weekend or holiday peaks, and are much less visited at other times. This creates a tension: should a station have a few chargers with major queues forming at peaks, or, multiple chargers that only rarely get used, just to satisfy the peaks?

[16] Map from www.charge.net.nz/map/

6. An example of the scale of charging stations in a more mature electric vehicle market is pictured below:

About 60km north of Oslo (population 600,000) is the Nebbenes charging station with 28 chargers and over 2 megawatt power supply. (Norway currently has over 200,000 electric vehicles, more than 25x what New Zealand has today.)
The Nebbenes site is currently the largest in the country and serves as a road trip gateway on the outskirts of more a populated area, much like a major town on SH1 might serve in New Zealand near Auckland, Christchurch or Wellington.
In New Zealand a single-car-fast-charger 50kW station costs around $60,000+GST to install (assuming car park and nearby transformer already exist and can be easily connected to); the investment needed for larger and faster speed stations will be a whole order of magnitude more expensive; this will be difficult to commercially justify in the short to medium term without Government support.

Other specific long term challenges:

7. Apartment building carparks, and workplace fleet car parks, consistently have no provision for the level of electricity to charge multiple electric vehicles overnight. It can be cost prohibitive to set up. Apartments have the additional complexity of how users pay for electricity used in a shared space. A government scheme with eligibility criteria could help, especially given any project would support a large number of vehicles, including visitors. This could help with billing systems for apartments, and, increasing power supply to buildings for larger scale fleet projects.
8. One in four Wellington City homes lack parking on their property. That presents a high percentage of Wellingtonians who cannot conveniently charge their vehicle routinely. This issue will increase in Wellington and other cities due to increasingly high density housing developments responding to population growth in New Zealand, and a desire to keep home building costs down. The Wellington City Council is trialing the installation of on-street chargers at 25 locations in residential streets to better understand the approach needed to this problem. Once understood, this is an area that would likely benefit from continued government help.
9. To offset queuing at fast chargers during visitor peaks, hotels and tourism attractions should have chargers in their car parks. These can be low cost chargers that take hours given tourists are busy sleeping or being entertained for an extended period of time. A subsidy for such installations could be helpful and have the positive side effect of making it easier for rental cars and campervans to be electric.

	Any financial assistance around charging infrastructure must be nimble and responsive in form. Issues that confront such fast-moving technology will be hard to anticipate, and it will be helpful for the fund to adapt quickly to solving issues as they arise. An international example of this in practice is found with the UK Office of Low Emission Vehicles, together with councils as necessary, that offer grants to reduce the cost of installing a chargepoint in homes, on residential streets, at workplaces, and commuter carparks: www.gov.uk/government/collections/government-grants-for-low-emission-vehicles. Many countries provide central government funding for public charging networks. **Regulation, not just funding may be part of the puzzle:** In 2011, Vancouver Council (Canada), adopted changes to its Building Code Bylaw requiring: 20% of apartment car-parking and 10% of commercial building car-parking to have 40 amp car chargers, and, new homes to have a 40 amp outlet in garage/carport. (This enables cars to readily charge overnight or during day while drivers are busy sleeping or working; this is not to support fast charging): former.vancouver.ca/blStorage/10908.PDF (Paragraph 10.2.3). Appropriate education or relevant changes to the Wiring Rule, issuing of building consents, or other relevant legislation could help ensure that New Zealand homes, apartments, workplaces, etc, are facilitating a pathway to adopting electric vehicles. Without such rules or education, the risk is that future property developers will look to save costs and not look to provisioning buildings in this way.
R11.4 The Government should encourage government agencies where practical to procure low-emission vehicles.	**Recommendation supported, with increased ambition.** This should be stronger. A specific timeframe for all Government vehicles being electric should be stated, e.g. 2030 assuming that year is targeted as a zero emissions import goal, as it then highlights the goal is realistic. In order to achieve that, all government agency vehicles purchased from 2019 should be electric *where fit for purpose* (which, as of 2018, is the majority of passenger vehicles, but leaves trucks and utes for a future year). A large challenge for Government fleets is justifying the larger capital outlay for electric vehicles and a reluctance to purchase used imports. This supports the introduction of a feebate system, emissions standard, and, the market to mature to a point where warranties and replacements on traction batteries are common-place. Without these, the Government will be hard pressed to fulfil its own goal to reduce transport emissions. The draft notes *'Adoption of EVs may not be practical in all cases, for example where fleets are parked in locations where it is costly to install charging capability.'*. This will be less of an issue when vehicles can travel 300km+ (i.e. many cars bought new 2019+), given fuel vehicles are not constrained by a lack of on-site fuel stations. Further, it should be possible to install *some* charging on-site at low cost in most cases; again if cars can drive 300km+ they would more easily be able to share a facility as they may only need a turn at charging once or twice a week.

F11.12 Several advantages of hydrogen fuel-cell vehicles, including the lower weight and greater travel range, make them especially suited to reducing emissions from road freight. The biggest challenge for achieving uptake in New Zealand is the significant investment needed in new infrastructure.	**Disagree with finding** The implication of stating hydrogen trucks are 'especially suited' is that *electric* trucks are not suited to freight. In fact, there is every expectation that electric trucks *are* suitable. Hydrogen trucks may *also* be suitable, as an alternative, rather than being superior. The immediate challenge facing *both* electric *and* hydrogen heavy vehicles is the lack of supply of cost effective, capable vehicles. Electric buses and trucks are now beginning to be mass produced, and their use in production is reducing the perceived advantage that hydrogen has. The draft notes that *"The travel range of HFVs is more similar to a fossil-fuel vehicle and therefore much greater than EVs. Recharging HFVs is also considerably faster than for EVs."*. This may be overstating the benefits. The Tesla Semi coming 2019 can drive a 36 tonne load over 800km, and recharge at a rate of 600km per 30 minutes. Note that Picton to Dunedin is 700km. Auckland to Wellington is 650km. The Tesla Semi is one of the first large all-electric trucks, and would appear to work very well even in demanding routes for New Zealand. Electric technology will no doubt improve in the decades ahead. By comparison the Nikola One hydrogen truck with similar payload has a stated 15 minute refill time and a 500km or 1000km range. Better, yes, but the electric truck seems more than satisfactory as it stands. The article notes that urban buses and rubbish trucks, with return to base operations, could also suit hydrogen. However, this is an area that electric vehicles will likely shine, given battery sizes can be smaller (i.e. cheaper), and electricity will already be available in depots; no complex hydrogen operation needs to be added. Electric rubbish trucks and buses are being adopted in rising numbers, thanks to efforts by Waste Management, bus operators, and others. Estimates and trial data vary considerably, but consistently show that hydrogen vehicles require substantially more energy to travel than electric, owing to the energy losses in creating, transporting, storing, and pressurising hydrogen. The "significant investment needed in new infrastructure" is a challenge, and there just as much challenge again in the ongoing cost and electricity production (for electrolysis) relative to charging batteries. While hydrogen has a real refueling and cost challenge, the one thing it does avoid is the challenge of how to create, replace, and dispose of large batteries. This finding should acknowledge that electric trucks show strong promise, and that hydrogen is an alternative with a variety of pros and cons. Both are yet to be entirely proven.

	 *Above - The pictured Tesla semi may show electric trucks are well up to the job for long-haul freight, encouraging traditional market players to invest and copy.*
F11.13 Biofuels can potentially deliver considerable reductions in emissions, especially for transport modes that are more challenging to electrify (eg, heavy vehicles, aviation and shipping). New Zealand's current production of biofuels is relatively small. A higher emissions price in the NZ ETS would create a greater incentive to develop and switch to biofuels. However, the biofuel technologies with the greatest promise for New Zealand's context are not yet commercially proven.	**Agree** with finding NZ will be better off focussing on awareness building and economics of purchasing and running zero emissions vehicles that are mass produced internationally, so that trucks, buses, and trains are electric, and boats and airplanes are either fully electric, or electric/hydrogen hybrids. Focussing too much on an interim step (biofuel) could delay the 'end game' (zero emissions). In Norway, "The Government will introduce a blend-in requirement of 1 per cent sustainable biofuel in aviation from 2019, targeting a 30 per cent blend-in requirement in 2030."[17]. It may prove useful to investigate this further and consider whether this should be applied locally, given it may be 10-20 years before zero emission planes are commercially viable (Norway expects all domestic planes to be zero emissions between 2030-2040; it is also expecting significant adoption of zero emission coasting shipping to begin 2026).
F11.14 Increasing the use of public transport, and cycling and walking provide relatively small emissions reductions benefits. On the other hand, shifting to these modes can achieve significant other benefits, including reduced congestion, better health outcomes and overall productivity gains.	**Agree** with submission Further to mode shift, targeted funding to replacing buses with electric, and electrifying train networks would strengthen both the real and emotional case that public transport has broader benefits. For example, the U.S. California Air Resources Board (CARB) has specific funding to subsidise school buses, and buses serving lower social economic routes (USD400,000 subsidy per eligible bus). Could the National Land Transport Fund or other mechanism provide a similar support here, particularly on routes or with operators who lack the profit or capital means to go electric within the next decade? http://stnonline.com/news/latest-news/item/9452-school-buses-benefitting-from-millions-in-calif-cap-and-trade-funds

[17] https://www.regjeringen.no/en/dokumenter/meld.-st.-33-20162017/id2546287/

	 *One of 150 all-electric school buses in California, May 2018.*
F11.15 Moving freight via rail and coastal shipping is less emissions intensive than road transport. However, because a large proportion of freight carried by road is not economically contestable, the potential to reduce emissions from shifting modes of freight is limited. Electrifying rail would enhance the emissions reductions from shifting to rail, but would require significant capital expenditure.	**Agree** overall with finding, but with comments 1. The report fails to note that shifting trucks from roads onto rail has a safety advantage. (Even if the offending vehicle is a car, a crash with a truck is less likely to be survivable than between two cars). 2. Battery-supplemented trains could offer an option for electric rains between Auckland and Hamilton and Wellington and Palmerston North, i.e. connecting Wellington with Auckland. Such train engines exist and were recently contemplated for Auckland commuters. It is noted that the unelectrified terrain is substantially flatter than the electrified central plateau and thus would be less energy intensive, reducing the amount of battery needed. Battery-supplemented trains could be trialled or converted one train at a time, reducing risk and enabling benefits before a overwhelming investment is needed. (If a long-haul train can be configured to also charge off the commuter network, which operates at a different level power configuration to the main trunk, then the Wellington to Palmerston North gap reduces to a short 80km Waikanae to Palmerston North gap.)
F11.16 Developing demand management and intelligent transport systems provides new opportunities to make the transport system more efficient. A more efficient system can reduce emissions and achieve wider benefits such as lower congestion.	True, although how to realise such gains is somewhat amorphous.
R11.5 The Government should take steps to amend the pricing system for transport so that a greater share of the external costs associated with private vehicle use are internalised. For example, Government should	**Agree** with submission The London £11.50 “congestion charge” has interim exemption allowing zero-emission vehicles to enter the city for free. This has had a noticeable benefit in terms of reducing congestion (encouraging other forms of transport) and has supported electric vehicle adoption. (NB: Eventually when electric vehicle numbers are substantial, a small congestion charge

work with councils to enable and encourage the use of road pricing tools to reduce congestion and emissions in main urban centres.	would need to be introduced for electrics too; ensuring a transport hierarchy is financially signalled, i.e: public transport *is better than* electric private transport *is better than* fuel private transport). Local Government also does not have specific tools if it wished to declare certain streets as 'zero emission zones'. (i.e. banning or charging a fee for fuel vehicles to travel down a specific street). It is unclear how Auckland Council is to achieve its stated noble goal of having "fossil fuel free" CBD streets by 2025 without such tools. http://ourauckland.aucklandcouncil.govt.nz/articles/news/2017/10/mayor-commits-to-a-greener-auckland/ Note - over 200 European cities have "no" or "low" emission zones; this is a common tool globally, al biet originally designed for health and air quality issues rather than climate change.
F11.17 New Zealand's current transport investment system is biased towards investment in roading. An efficient transition to a low-emissions transport future requires an investment system that is: better integrated across modes; more flexible, with greater competition for funding across different transport modes and activities, and greater autonomy for councils; more neutral, by removing distortions and biases that favour particular modes or activities, and fully accounting for social, economic and environmental costs and benefits.	**Agree** with finding. A more balanced approach to treating transport investments is eminently sensible. The thinking and implications of the draft could go further - 1. The report notes how expensive logging truck roading would receive funding where inexpensive barges would not. The implication is that a future investment system would support a barge approach. However, could it go further, and support additional funding for such a *zero emission* barge to be purchased, to maximise dollar *and* emission savings? 2. An well balanced system system could cater for sensible investments, into zero emission trains (battery or overhead lines), buses (noting they cost about double a diesel equivalent today), and in time aviation and marine (given they will be very much part of the mix well before 2050).
R11.6 The Government should make emissions reductions a stronger strategic focus in transport investment. This should include changes to the Government Policy Statement on Land Transport to broaden its scope to cover the whole land transport system and make the transition to a low-emissions economy a strategic priority.	**Agree** with recommendation, with added ambition This may require specific permission being given to spend addition money in order to reap emissions savings. It should also link to broader goals (e.g. goal for all light vehicles imported from 2030 to be zero emission, and for all heavy road, train, bus, aviation, and trucks to adopted as much as technical and commercial feasibility enables). The Norwegian National Transport Plan may offer insights which covers both land and marine and aviation: https://www.ntp.dep.no/English

Disclosure: I am an independent contractor on Electric Vehicle Infrastructure and Fleet projects for organisations including Foodstuffs New Zealand and Wellington City Council however this submission is written in my independant capacity.