Dirty and dangerous?

The ‘clean car’ Consultation Document: A review

August 2019

tailrisk economics
te maha hoki o nga pihikete

About Tailrisk economics

Tailrisk economics is a Wellington economics consultancy. It specialises in the economics of low probability, high impact events including financial crises and natural disasters. Tailrisk economics also provides consulting services on:

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Dirty and dangerous?

Part one: Introduction

On 9 July the Associate Ministry for Transport released the Government's 'clean car' proposals. It was accompanied by a Ministry of Transport discussion paper *'Moving the light vehicle fleet to low-emissions: discussion paper on a Clean Car Standard and Clean Car Discount',* which is intended to provide the public with the necessary background to inform their responses in the consultation process. The main purposes of this paper are to review the quality of the information and analysis presented in the discussion paper, and second, to serve as a submission.

The consultation document was released with six accompanying papers: a paper to Cabinet seeking approval for the consultation and release of the paper; a Regulatory Impact Statement (RIS); two cost benefit papers (one each for the emission targets and the 'feebate' proposals; and two Social impact papers. We have read all of the documents (which come to nearly 300 pages), and checked most of the references. Where relevant we refer to material in the supporting documents.

This paper is organised as follows.

Part two: Key conclusions
Part three: The rationale for the policies
Part four: Calibration of the policies
Part five: How the policies might work
Part six: The impact on emissions
Part seven: Cost benefit analysis
Part eight: Equity impacts
Part nine: First to 100: A rational alternative

Part two: Key conclusions

The consultation paper should be withdrawn

The paper is full of errors, misleading statements and is inadequately researched. The supporting cost benefit analysis has been obviously fabricated to produce extravagently positive results, which will mislead the public. The paper as a whole is false and misleading.

The 'clean car' policy could be renamed the dirty and dangerous car policy

The policies will encourage the importation of dirtier diesel cars and less safe small cars.

The cost benefit analysis is grossly misleading

The high benefit to cost ratios were generated by a model that used some absurd assumptions to generate its results.

- It was assumed that consumers only take the first years fuel savings into account when deciding whether to purchase a more fuel efficient car. As a consequence consumers buy fuel inefficient cars which unnecessarily cost them thousands over time. According to the Ministry the polices will save them from their own stupidity. We think that the Ministry's claims are both offensive and clearly fabricated for political purposes. Consumer are not stupid.
- It is assumed that vehicles that can meet the targets will cost only $2000 more than equivalent conventional petrol vehicles. 'Off-the shelf' cars cannot meet the targets, but it is implicitly assumed that overseas manufacturers will develop new variants, just for the New Zealand market, to meet the requirements.
- The current price gap between new electric vehicles and conventional vehicles is assumed to be just $8000. It is more like $25,000.

The policies will have almost no impact on our capacity to meet the 2050 targets

The vehicles affected by the policies will be scrapped by 2050. Subsidising electric cars now will have almost have no impact on the uptake of electric vehicles as prices fall and they become a mass market option in New Zealand, 8 to 15 years from now.

Limited impact on C02 emissions

It is calculated that CO2 emissions will be reduced by a maximum of 5 percent, when more realsistic assumptions suggest a number more like 3 percent. The simpler alternative of increasing fuel prices by 20 cents a litre could, acccording to the Ministry, reduce emissions by 11 percent.

The policies will be inequitable
Lower income consumers will have to pay for the better-off to purchase electric cars with a $8000 rebate.

There is a substantial fiscal risk
The feebate scheme is meant to be self funding, but there is a significant risk that government will have to meet much of the bill.

There are high hidden tax increases
The tax on a new work vehicle could be around $8000. Used japanese imports like people movers could cost lower income purchasers, $4000 to $5000 more, a tax rate of up to 40 to 50 percent.

There are more efficient ways to achieve the policy objectives
Our 'First to 100' proposal will get more international attention and is a more efficient and effective way to reduce emissions. Increasing the carbon tax to $100 on fuel would increase prices by about 10 percent. A fuel tax increase has several obvious advantages:

- It does not require a new, expensive, administrative framework.
- It will be more effective in reducing emissions. On the Ministry's numbers, emissions would fall by 11 percent rather than 5 percent with the proposals. This is is because a fuel price increase impacts on all emitting vehicles immediately, not just new-to-fleet vehicles. It directly targets the problem. Drivers who drive further, drive less efficiently, and have a vehicle with higher fuel consumption, are emittimg more and will pay relatively more.
- It does not involve subsidies to the better off from lower income used car purchasers.
- It would generate revenue that could be spent on safer roads.
- It would send a 'global leadership' signal that New Zealand is serious about reducing emissions, and is not just tinkering with schemes like the feebate proposal, just to be seen to be doing 'something'. For political reasons governments have shied away from fuel price increases because they are unpopular. Being 'first to 100' would demonstrate that the Government is prepared to back its words with deeds and is politically courageous. Other countries may be encouraged to develop a climate change backbone.

Part three: The rationales for the policies

The Associate Minister's forward

The Associate Minister of Transport foreward to the consultation paper sets a tone of necessity and urgency. There is a direct link, we are told, between meeting our Paris commitments, and the proposed measures. We respond to this perspecive in the body of our paper, but address some of the Associate Minister's specific statemenst here.

We also need action in the major emitting sectors. The Interim Climate Change Committee has recommended that the Government prioritise reducing emissions in the transport sector.

The Interim Climate Change Committee is due to report on transport emissions on 30 September 2019. We would have expected that the Government would have held off on pursing these proposals until after the Interim Committee's report was released, and the public had had an opportunity to comment on it. The Associate Minister appears to have jumped the gun, and may have undermined the Interim Committee's independence.

New Zealand is one of only three developed countries that has no regulations, or meaningful incentives, to influence the fuel efficiency of light vehicles entering our country. As a result, the vehicles supplied into New Zealand are among the most fuel inefficient, and polluting, of any OECD country.

This means we end up pumping more pollution into the atmosphere and use more fuel to keep our cars moving. If our cars were as fuel efficient as the vehicles entering the European Union, we would pay on average $794 less per year at the pump.

The Associate Minister has conflated CO2 emissions, which is just a greenhouse gas and not a 'pollutant', with other omissions which are pollutants. In the EU cars do have lower C02 emissions levels, and have better fuel economy, but this is partially because a high proportion are diesels, which are much more polluting than petrol engined vehicles. The effect of the proposed policies will be to increase the share of light diesel vehicles on New Zealand roads. This is acknowledged in the draft Regulatory Impact Statement, but there is no mention of the issue in the Consultation paper. The average fuel savings figure of $794 is an exaggeration based on some invalild data comparisons, and makes no mention of the higher cost of the vehicles that will generate those savings.

The Government is proposing to introduce two proven policies to increase the supply and reduce the cost of fuel efficient and electric vehicles coming into New Zealand. The first policy is the Clean Car Standard (which is a vehicle fuel efficiency standard). This policy would require vehicle importers to bring in progressively more fuel efficient and electric vehicles.

Vehicle fuel efficency standards are not proven in countries with a heavy reliance on used car imports. There is no fuel efficieny standard for used car imports in the EU, for example.

The second policy is the Clean Car Discount (which is a feebate scheme). This policy would make fuel efficient and electric vehicles more affordable for Kiwis to buy, potentially by a discount of up to $8000 for new vehicles and $2,600 on used vehicles.

The description of the second policy as a 'Clean Car Discount' is misleading, deflecting attention from that tax compenent of the feebate scheme. Low emission tax and subsidy scheme would be a fairer description.

The feebate approach has not been widely proven. The Netherlands had a feebate scheme from 2006 to 2010. It had a limited impact (studies varied between 0.1 to 1 percentage point impact on new vehicle emissions[1]) and was scrapped. The French scheme has persisted, but had operational problems[2] , which will probably be repeated in New Zealand, and had little effect on emissions. There are no examples of feebate schemes being applied to used car import markets.

The Clean Car Standard and Clean Car Discount would help us to significantly reduce the emissions from transport, and also result in fuel savings for motorists.

Both statements are misleading. There will be only a limited impact on CO2 emissions, a maximum of 5 percent on the Ministry's calculations, and probably significantly less using more realistic assumptions. The fuel savings will come at the cost of higher vehicle prices and lower choice, which will outweigh those savings.

We now address the arguments in the body of the Consultation Document .

Consultation Document arguments

Schemes necessary to meet 2050 emission targets

One of the key arguments in the Consulation paper is that the scheme is necessary for New Zealand to reach its 2050 emissions targets.

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[1] Arno Schroten,Sanne Aarnink Ben Gardiner, Wojtek Szewczyk, Shalini Mittal 2014 User Guide Feebate

[2] D'Haultfoeuille et al., 2010 X. D'Haultfoeuille, I. Durrmeyer, P. Février What did you expect? Lessons from the French 'Bonus/Malus'

If we want a largely electric fleet by 2050, nearly all newly registered vehicles would need to be electric by the early 2030s. The Ministry of Transport projections suggest that only around 40 percent of vehicles entering New Zealand will be electric in 2030 without further government intervention or incentives

The first statement is obviously not true. With the policies there may be a small uptick in the purchase of EVs through to 2025, but all, or nearly all, of these vehicles will be scrapped by 2050. Similarly all, or nearly all, of internal combustion engine (ICE) vehicles that they will have replaced will be scrapped by then. The widespread uptake of EVs, will depend on further technical developments, a broader model range and critically lower prices, and this will be unaffected by a New Zealand scheme which subsidises EVs during the 2020's. For new EVs vehicles we will probably have to wait to past 2025, before prices come down to make EVs a mass market possibiity. For used vehicles, there will be a lag of five years or so, before the supply of used vehicles in the exporting countries is large enough to make a difference.

The EV market is developing rapidly and we do not need to take action to meet the 2050 targets now. We have at least until 2030 to see how EV uptake evolves and take action then if necessary.

Increasing fuel prices will not make a big enough difference

There is no serious discussion of alternative proposals in the Consultation paper. However, the obvious alternative, increasing fuel prices, was briefly considered in the RIS. It was rejected because it would not make a big enough difference. Over the longer term,the Ministry argued, a 10 percent in fuel prices would only lower fuel consumption by 11 percent. However, the proposals lower consumption by a maximum 5 percent, and that on some very optimistic assumptions. In our book 11 percent is bigger than 5 percent, so it is impossible to understand the Ministry's logic here. The Associate Minister and the Ministry must be dealing with some 'alternative facts.'

Car imports have poor fuel efficiency

The light vehicles imported into New Zealand today are among the most fuel inefficient of any OECD country. As a result, they produce more emissions and cost significantly more to run. The table below shows the average annual fuel use cost to drive a light petrol vehicle in New Zealand, compared to other countries. On average, New Zealanders pay 65 percent more in vehicle fuel costs than the average person in the European Union, even though petrol prices are higher in Europe.

This statement is supported by the following table.

		New Zealand	United Kingdom	European Union	Japan	United States
Fuel efficiency - petrol equivalent	ltrs/100km	9.5	5.8	4.9	6.2	8.6
Petrol Price inclusive of duties & taxes[1]	NZ$/ltr	$1.92	$2.26	$2.25	$1.81	$1.05
Vehicle use	kms	11,000	11,000	11,000	11,000	11,000
Fuel Use Cost	NZ$	$2,007	$1,443	$1,213	$1,235	$995

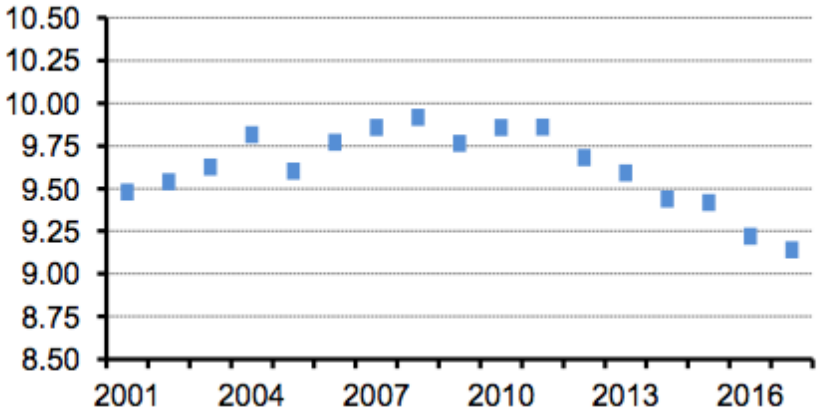
To allow international comparisons 2017 data has been used.

It presents a misleading picture of the relative fuel efficiency of New Zealand imports.

- The New Zealand data appears to be based on the entire fleet average. The comparators are new to fleet averages, which because of improved efficiency over recent years will be lower than the respective entire fleet fuel efficiency figures.
- The New Zealand data is based actual or 'real world' fuel consumption data, which can be about 30 percent higher than the test data for new to fleet vehicles in the table.
- The Ministry has an estimate of the new to fleet fuel 'efficiency' for New Zealand (180gm/km. or 7.6 litres /100 k), but chose not to use it, obviously to make the New Zealand performance look worse.
- The EU data does not include used vehicle imports (that are important in central European countries like Poland).
- The EU figure look good because they include a high proportion of 'dirty' diesel vehicles.
- Fuel usuage is not a good measure of vehicle 'efficiency'. Larger vehicles, which use more fuel, are not necessrily less efficient than a small vehicle, because they are serving different functions. New Zealand vehicles are larger than European vehicles, in part because our needs are different. New Zealand has a higher proportion of commercial vehicles, that use more fuel, in its figures.

Elsewhere the Consultation paper focusses on New Zealand's new to fleet data. ignoring the performance of the overall fleet, which has been improving in recent years.

Figure 1: Average fuel effciency New Nealand fleet



Source: Transport Annual Fleet statistics 2017

Access to the lowest consumption vehicles

The second limb to the argument that New Zealand's current performance is 'poor', is that New Zealanders are not getting a choice of more fuel efficient vehicles. A comparison is made of the lowest fuel consumption of variants of cars imported into both New Zealand and the UK.

Kiwis are also missing out on many of the fuel efficient vehicle models sold overseas. For example, in the United Kingdom the top selling 17 new light vehicle models have on average 21 percent lower emissions that the most efficient variants available in New Zealand. This comparison is shown in Appendix 1.

The comparison was nearly two years out of date, and there have been some changes since it was prepared. For example for the RAV4, the hybrid is now available in New Zealand (and are selling like hotcakes), with a similar fuel consumption to the UK RAV 4 model. But the key difference between the UK and New Zealand lowest fuel consumption data, is that the UK variants with the lower consumption are almost all diesels, whereas in New Zealand they are petrol models. Diesels have been pushed in the UK, and in Europe, to meet fuel consumption standards. We can expect a similar effect in New Zealand.

If the Government is happy with that outcome, to make the new car fuel consumption figures look better in the short run, then that is fine, but diesels are widely regarded as a more polluting option, so the 'clean car' title for the policies is somewhat incongurous.

Table one: UK and New Zealand fuel consumption

Model	Best NZ variant	Tailpipe CO_2 (g/km)	Best UK variant	Tailpipe CO_2 (g/km)	Difference %
Toyota Corolla (sold as Auris in UK)	1.8L Petrol Hybrid	96	1.8L Petrol Hybrid	79	18
Toyota Rav4	GX 2.2D/4WD/6AT/SV/5DR/5S	176	Petrol Hybrid AWD 2.5 VVT-i Auto	118	33
Toyota Yaris	GX 1.3P/5MT/HA/5DR/5S	134	1.5 VVT-i hybrid Auto with 15 inch alloy wheels	75	44
Kia Sportage	Urban EX 2.0P/6AT/SV/5DR/5S	182	'1' 1.7 CRDi 114bhp ISG	119	35
Mazda CX-5	GSX DSL 2.2D/4WD/6AT/SV/5DR/5S	158	2.2 SKYACTIV-D (150PS) 4WD A6	144	9
Mazda 3	GLX 2.0P/6AT/HA/5DR/5S	136	1.5L Turbo Diesel, 6 Spd Manual	99	27
Mitsubishi Outlander	XLS 88KW/PHEV/4WD/AT/SV/5DR/5S	39	GX5h 2.0 PHEV	44	-13
Suzuki Swift	GL 1.2P/5MT/HA/5DR/5S	106	1.2 2WD	116	-9
Suzuki Vitara	SPORT 1.4P/6AT/SV/5DR/5S	138	1.6 2WD	106	23
Hyundai Tucson	2.0 CRDi LIMITED 2.0D/4WD/6AT/SV/5DR/5S	178	2.0l CRDi 4WD, 100kW Diesel A6	160	10
Hyundai i30	GD CRDI 1.6D/7AM/HA/5DR/5S	136	1.6L Turbo Diesel, 6 Spd Manual	94	31
Hyundai Santa Fe	DM 2.2D/4WD/6AT/SV/5DR/5S	205	2.2l CRDi 4WD 18" or 19" wheels	159	22
Nissan Qashqai	N-TEC 2.0P/CVT/HA/5DR/5S	159	dCi 110 16/17 inch wheel	99	38
Nissan X-Trail	ST-L 2.5P/6CVT/SV/5DR/5S	188	dCi 130 2WD 17" wheel	129	31
Ford Focus	Trend Diesel 2.0D/6AT/HA/5DR/5S	115	1.5 Duratorq TDCi (105PS) with stop/start – 5 Door	88	23
Subaru Outback	2.0D SLT Premium 2.0D/4WD/6CVT/SV/5DR/5S	165	2.0D SE Lineartronic AWD CVT	159	4
HONDA HR-V	L 1.8P/CVT/SV/5DR/5S	160	1.6 i-DTEC S	104	35

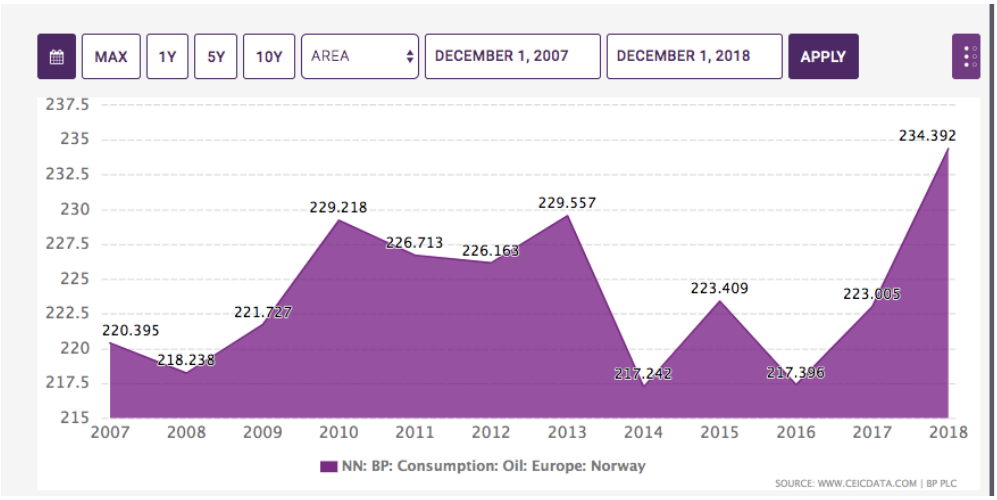
Used car low fuel consumption options

The argument that New Zealanders do not get the choice of the most fuel efficient vehicles simply does not work for used imports, which account for just over half of light vehicle imports. Importers have access to the full range of vehicles on the Japanese used car markets (which accounts for 95 percent of used imports).

Effectiveness of fuel efficiency standards

It is argued that fuel efficiency standards are effective in reducing light vehicle emissions. This claim is supported by an EU study that suggested that 65-85 percent of the improvement in emissions were due to mandatory standards. It is true that emissions standards, when they have applied to large manufactures in large markets, have made a difference to fuel efficiency test results. But it is less obvious that there is such a strong case for vehicle importing countries to apply standards, as they will get the benefits of technological advances in fuel economy in any case. And it appears that the standards have been less effective in reducing actual fuel consumption than the test results, which the standards are based on, would suggest. There has been a steady and substantial divergence between 'real world' (which is what matters from an emissions reduction perspectives) and test results as the pressure to meet the standards has increased.

Norway is a good example. It has had the biggest improvement in new to fleet emissions in Europe (down 65 percent to 93 gm/l. by 2015), but if we look at its fuel consumption figures there appears to have been limited progress.



Other arguments

A 'plague' of big SUVs and pickups

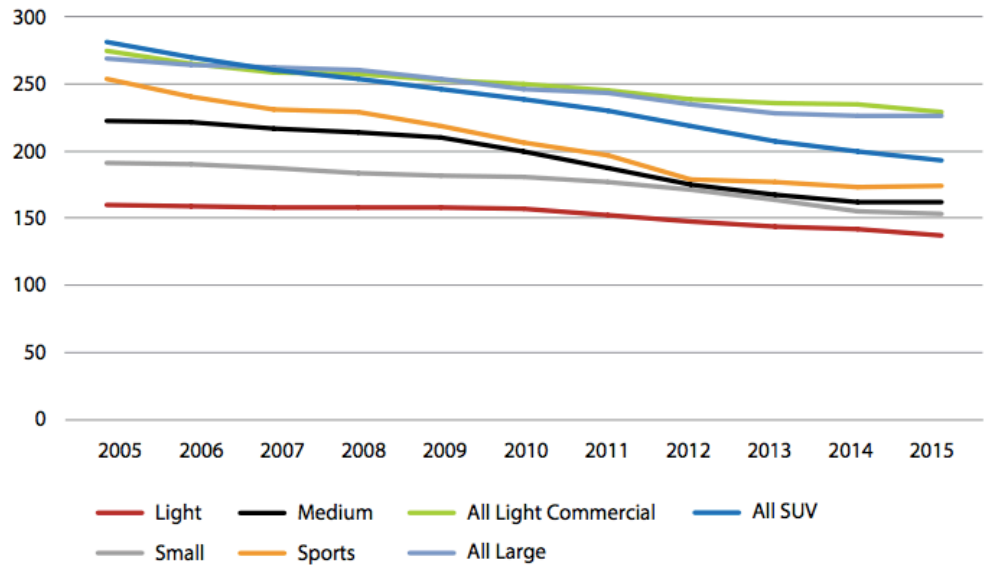
One of the messages that comes through the documents is that one of the problems that has to be addressed is that New Zealanders are buying more big SUVs and pickups. SUV's (more upright versions of small and medium cars, as well as the big units) have become more popular in New Zealand, but this is a world-wide trend. In Canada for example, 50 percent of new vehicles are now SUVs or pickups. But the new big SUVs are not necessatly the gas guzzling monsters they have been painted as. Many have a similar fuel consumption of medium size cars of a few years back.

For example the fuel economy of the popular Ford Ranger at 7.8 l/100km is nearly the same as the new to fleet average of 7.6l/100km.

Figure two: Ford Ranger 2.2

And the Ministy's statistics (their figure 5 below) show that SUVs have had the biggest efficiency gains of any vehicle segment.

Figure 5: Average New Vehicle Efficiency (gCO_2/km)by segment, 2005–15, (NTC 2015, 2016)[10]



New Zealand Productivity Commision Advice

The New Zealand Productivity Commission, in its 2018 'Low-emissions economy' report, favorably reviewed emissions limits and the feebate scheme. We were highly critical of their analysis in our submission on the draft report. It was a poor piece of analysis, at odds with the more authorative Australian Productivity Commission's work. As the Ministry has relied heavily on some of the Commission's analysis we

have presented our submission in Appendix one. It provides more detail on some of the issues.

Possible co-benefits

The RIS states

In terms of interdependencies, as far as possible the Associate Minister of Transport is seeking vehicle emission policies that have the co-benefit of increasing vehicle safety and vice-versa. This is because New Zealand's vehicle fleet is currently not consistent with a transport system that is free of death and serious injury.

The Associate Minister is likely to be disappointed. The incentives are to buy smaller vehicles, but according to the Ministry's preferred used vehicles safety ratings, there is a clear correlation between vehicle weight and death and injury risk. The smaller the vehicle, the greater the risk. While it is true that New Zealand's vehicle fleet is not consistent with a transport system that is free from death and serious injury, no currently conceivable and acceptable[3] transport fleet is.

Part four: Calibration of the policies

Emission standards

There are two components to the proposed emission standard, the average fleet standard and the vehicle weight adjustment factor.

Fleet average emissions

A 105 grams of C02 emissions, per kilometre travelled, target was chosen, in part, we are told, because it aligns with the standard that was recently investigated in Australia by the Australian Department for Infrastructure and Regional Development (DIRD). A 105 gm/km. standard might have been investigated in Australia, along with 115, 125 standards, back in 2016 but it has not been adopted, possibly because the economic analysis that was used to justify the recommended 105 gm./km. target was deeply flawed. We explain why below in the cost benefit analysis section.

This target would not be as stringent as standards in Canada and the European Union. It would also not be as strong as the average emission profile of vehicles already entering the

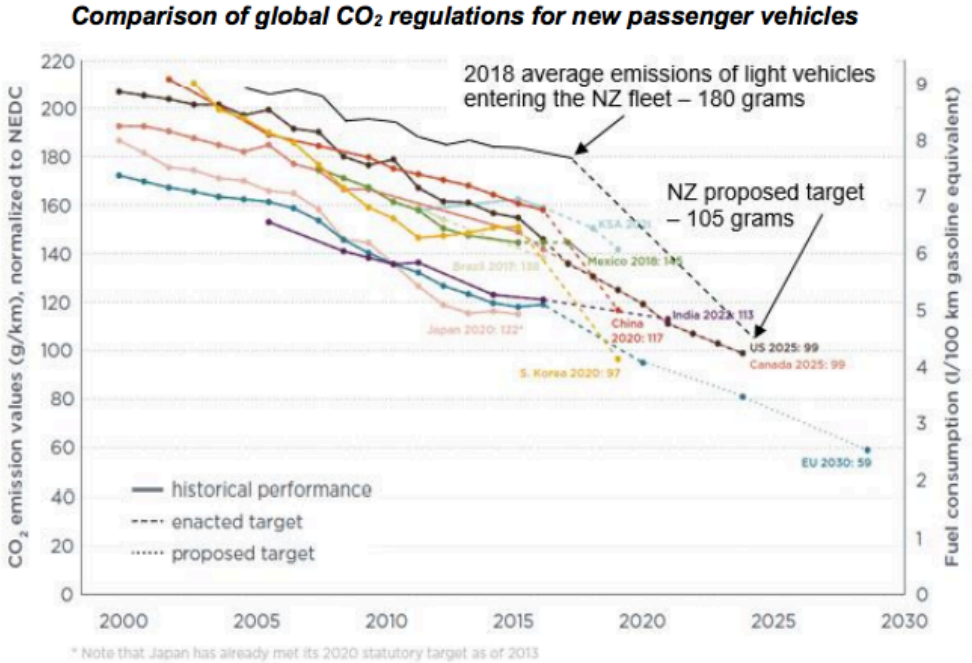
[3] If all cars were limited to a maximum speed of 5kph that might work, but people are likely to object.

Japanese fleet

We don't know enough about the Canadian standard to comment, but on the EU, presumably the Ministry is talking about the 2021 EU limit, which is 95 gm./km. for cars, and 147 for light commercial vehicles. The targets have a number of wrinkles, including a 'super-credit' for low emission vehicles (EVs) and credits for eco-innovations. These can lower the measured emissions by up to 14.5 g/km. It also appears that European car makers will not be able to meet these targets, as consumers shy away from diesel cars, which were the main driver behind the fall in CO2 emission rates. Also, in Europe, used cars imports are not subject to the standards.

So it is by no means clear that the proposed New Zealand standard is above the EU standard.

The critical claim is that the standard is not as strong as vehicles currently entering the Japanese fleet. This is important to understanding how used imports are affected when the policies come fully into effect in 2025.



Source: ICCT (January 2019) *Policy update: CO_2 emissions standards for passenger cars and light-commercial vehicles in the European Union. Note: the Trump administration has removed the US 2025 target.*

The evidence for this claim, presented in the consultation document (and for several other claims) is a single figure, which we reproduce above. It shows that the average for Japan was about 118 g/km and that the 2020 target is 122 g/km. On its

own evidence it appears that the Ministry is simply wrong on its claim about Japan.

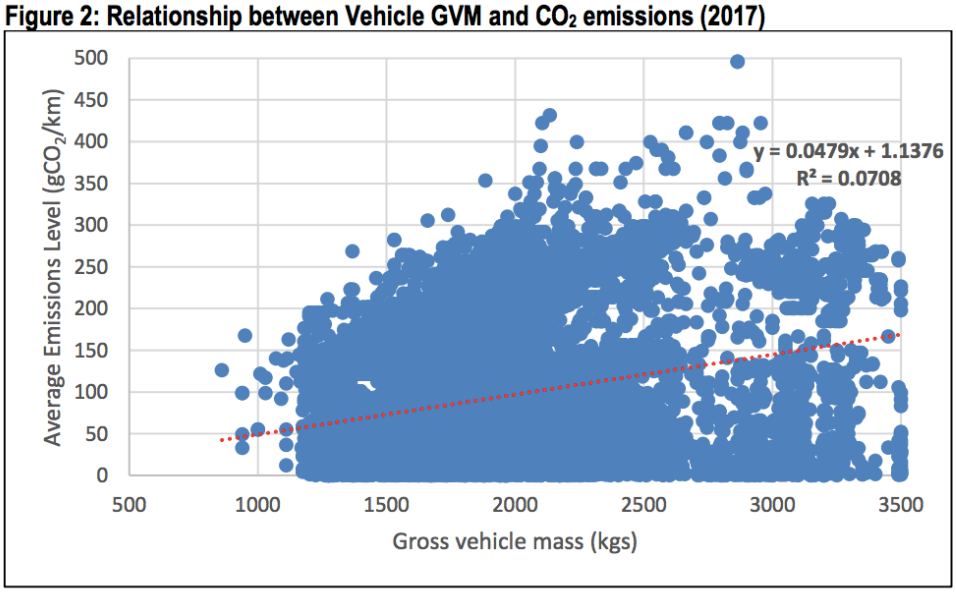
The weight variation factors

The second component is the weight variation factors, which assign different emissions limits to vehicles with different weights. They:

are designed to *help maintain a diversity of vehicle types by allowing suppliers of heavier vehicles, for example utes and large SUVs, to meet higher emissions targets than for average sized vehicles.*

The factors were, purportedly, calculated by estimating a relationship between weight and emissions from actual data from vehicles entering the New Zealand fleet. The data is shown in their figure 2 below. The problems with this analysis is that the exercise was either bungled or fabricated. The data shows a relatively heavy weighting of vehicles with emissions of under 50 gm/k, when only a small proportion of vehicles (EVs and plug-in hybrids) could have meet that standard. It also apparently captures vehiciles that may not even exist. How many EVs sold in New Zealand had a gross weight of between 3000 and 3500 kilograms?

Figure 2: Relationship between Vehicle GVM and CO_2 emissions (2017)



Calibration of the feebate scheme

There is no discussion in the consultation document on why the various fees and rebates in the feebate scheme were set at the proposed levels. In the RIS there is a brief statement that the fees and rebates were set with respect the social costs that

are not captured in fuel prices because the current carbon price of $25 is insufficient to fully cover social costs. The obvious solution is to, as we suggest, increase the carbon price on transport fuel. And how a subsidy for diesel vehicles is somehow justified on other social costs grounds is beyond us.

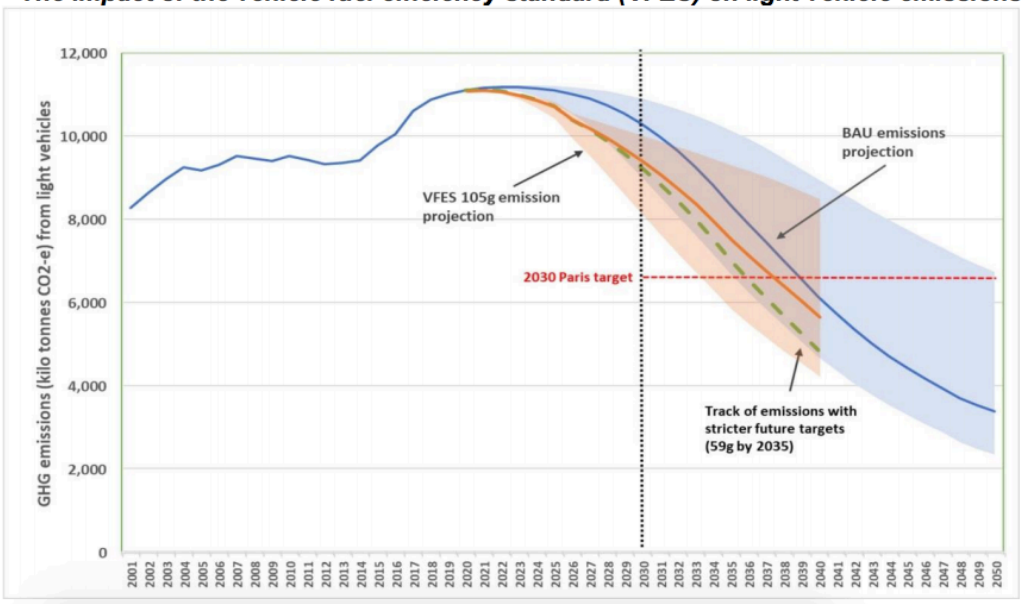
Looking through the cost benefit and social impact papers the proposed fees and rebates have been jumping around (a $5000 EV subsidy appears in one of the documents), and that the assumptions used in the modeling do not match the final figures in the Consultation document proposals. It appears that the final fees and rebates were set on a last minute whim.

Part five: Impact on emissions

We are told that it is estimated that an emissions target of 105 gram CO2/km in 2025 could reduce emissions by 5.1 million tonnes over 2020–2041, and that the feebate scheme will reduce emissions by 1.6 million tonnes over the same period. The reader might think that the two policies together will reduce emissions by 6.7 million tonnes, but that is not the case. The two policies were not modelled together and the results are not additive. The Ministry acknowledges that a combined modelling exercise should have been done, and says that it will do so when it gets around to it. It then then covers itself by saying that the reductions from both policies will be more than one policy alone. Readers, however, are likely be mislead into thinking that the feebate scheme will save an additional 1.6 million tonnes. The relatity is that the Ministry simply doesn't know.

The only information we are given on the impact is a very difficult to read graph shown below.

The impact of the vehicle fuel efficiency standard (VFES) on light vehicle emissions



The contribution of the policies is shown by the difference between the business as usual (orange line) and the green line. By 2025 there is no discernible difference, and we can just make out a difference by 2030, where it is assumed that there has been a further tightening of policy.

What is clear from the figure is that there is great uncertainty around the estimates, so the claim that the proposed policy changes are somehow 'essential' to meet the 2050 target doesn't have much substance.

It is important to understand what the claimed here. It is that over the course of 20 years the policies will reduce emissions by at least 5.1 million tonnes . This is an average of 255,000 tonnes a year. The maximum reduction is about 500,000 tonnes a year, or 5 percent of the business as usual number. This is not a big contribution, and the impact has, almost certainly, been exaggerated.

- The baseline estimates are overstated. No account is taken of any improvement in emissions that will occur in the conventional ICE fleet as more efficient models come into the fleet.

- The base-line assumes a low EV uptake scenario, worsening the do-nothing outcome. A median estimate, would have been more appropriate.

- The impact of the policies on the EV uptake is exaggerted. It is assumed that the uptake of used EVs will increase by a factor of three due to the $2700 subsidy. This is probably impossible. There is a limited supply of Nissan Leafs

(total sales in Japan have been about 100,000) and there is competition for those from other countries. Sri Lanka, for example has 5000 EVs[4], almost all used Nissan Leafs, and has been a vigourous competitor in the used car market. The subsidy will place further pressure on a finite resource, driving up auction prices. Some of the subsidy will flow to Japanese car sellers.

- The uptake of new EVs is based on a model that assumes that the price gap between ICEs and full electric cars is $8000. Consequently, electric car imports are assumed to increase to between 15-35 percent of total imports (depending on the scenario) by 2025. The $8000 price gap is obvious nonsense. The true figure is currently more like $25,000-$30,000. We discuss the Ministry's price gap evidence further below. Only about 40 percent of imports are assumed to be conventional ICEs by 2025, which is a stretch.

- The model was reversed engineered to achieve the 105 gm./km. target. It was just assumed that the objective would be met and the model inputs were adjusted accordingly. There was no serious analysis of whether affordable models that would make this possible would be availalble to New Zealand importers.

A more realistic assessment

A more realistic assessment of the impact would be a 2-3 percent fall in emissions by 2025. The fall in emissions over 2020-2041 will be less than the reported 5.1 million tonnes but is is not possible to assess by how much on the information available to us.

Part six: How the policies might 'work'- the used car market

The Japanese used car market

Before discussing how the policies might work it useful to have a basic understanding of how the used imported car market works. 95 percent of used imports come from Japan and these imports are heavily concentrated in 9 to 12 year group, in order to hit New Zealand retail pricing points in the $8000 to $10,000 range. This means that the cars that will be impacted when the schemes take full

4

effect by 2025 have already been produced so it is important to have a good understanding on the fuel efficiency of vehicles produced in Japan around m the period 2013- 2016.

What impact would the emissions target have on the supply of used vehicles into New Zealand?

The Ministry gives the impression that it will be an easy matter for used car importers to meet the emission standard by adjusting their vehicle mix from a range of low emitting cars that are already in the japanese fleet and that will be available in 2025.

The vehicle fuel efficiency of vehicles entering the Japanese market today is one indicator that there could be a sufficient supply of low-emission vehicles available to vehicle importers to comply with a standard of 105 grams CO2/km in 2025. In 2014, the average emissions of new light vehicles manufactured and registered in Japan met the proposed target of 105 grams CO2/km. This is 10 years ahead of the full phase in date for New Zealand's standard. The Japanese passenger vehicle fleet is now trending to achieve an average of 82 grams CO2/km by 2020. 9

We checked the reference for the 82g/km claim. We found no such evidence. All that appears in that document is the figure shown above. It appears that what the Ministry has done, is trended down the line in the figure. They essentially just made up the number, and then tried to leave the impression that it had authorative support. The ICCT reported that the japanese fleet standard for cars for 2020 is 20.3 litres per litre or about 115g/l.

In the RIS there is also a claim that the average emissions for new cars (not all light vehicles) in Japan in 2018 was 100 g/km. The reference was a report from the Japanese Vehicle Manufactures Association. There is just a single number in that report, with no supporting documentation on how it was calculated, or any breakdown by vehicle subclass. It is likely that the number was heavily influenced by the inclusion of tiny 'Kei' cars. The Kei car class are heavily restricted by dimesions, engine size (660cc) and power, are tax favoured, and are apparently very popular in smaller towns and rural areas In Japan.

A few have appeared in New Zealand, (some are designed for export with a larger engines) but have not sold well, because, amongst other things, their dimensions were calibrated to immediate post war japanese bodies, not your average modern Kiwi family. Many would not meet modern safety standards.

How the Ministry depicts the policy

Appendix 4 of the Consultation Document is a table that show how 50 'illustrative' vehicles might be affected by the policies, in the first operational year. One might expect that they would haved focused on the 2013-16 Japanese vehicles that are most likely to be imported in 2025.

But that is not what is presented. Only 20 or the examples are from Japan. The other models appear to have been selected, in part, to give the impression that there are large numbers of 'gas–guzzling' used imports. The Holden Commodore and the Ford Falcon make the list. The Ministry is perfectly aware of the composition of used imports. The following table, taken from one of the Social Impact reports show the top twenty most popular imports. There is no sign of the 30 non-Japanese vehicles.

Table 28. Top 20 most popular used light vehicles imported from July 2015 to June 2018 for low-income households

Make	Model	Count	Vehicle Type	Tare Weight (kg) > X to <= Y	Indicative CO_2 g/km	Indicative low price	Indicative high price
NISSAN	TIIDA	3180	small ICEV	1200 - 1400	125 - 185	$6,000	$10,000
SUZUKI	SWIFT	3010	small ICEV	up to 1000	120 - 190	$6,000	$11,000
HONDA	FIT	2320	small ICEV	1000-1200	129 - 166	$5,000	$7,000
TOYOTA	WISH	2220	MPV	1400 -1600	159	$7,000	$14,000
MAZDA	DEMIO	2180	Hatchback ICE	1000 - 1200	120 – 145	$9,000	$13,000
TOYOTA	VITZ	1900	small ICEV	1000-1200	117 – 164	$5,000	$14,000
TOYOTA	PRIUS	1580	hybrid	1,200-1,400	80	$9,000	$15,000
MAZDA	MPV	1380	MPV	1800 - 2000	240	$10,000	$22,000
MAZDA	AXELA	1310	ICEV	1200 - 1400	130 - 200	$8,000	$12,000
TOYOTA	HIACE	1300	light van	1600 - 1800	234 - 292	$15,000	$29,000
TOYOTA	ESTIMA	1260	MPV PEHV	1600 - 1800	116	$9,000	$25,000
HONDA	ODYSSEY	1180	MPV	1800 -2000	178 - 218	$6,000	$14,000
NISSAN	NOTE	1140	ICEV	1000 - 1200	119 - 159	$5,000	$10,000
TOYOTA	MARKX	1060	MPV	1400 - 1600	187	$10,000	$15,000
SUBARU	LEGACY	1040	wagon	1400 - 1600	198	$7,000	$17,000
MITSUBISHI	OUTLANDER	1030	MPV	1600 - 1800	215 - 240	$9,000	$19,000
MAZDA	PREMACY	1000	MPV	1200 - 1400	234 - 370	$5,000	$11,000
NISSAN	DUALIS	970	SUV	1400-1600	194.635	$8,000	$15,000
HONDA	STREAM	950	large ICEV	1400-1600	157	$5,000	$14,000
TOYOTA	COROLLA	940	Sedan/Wagon	1000-1400	131.7-155.2	$6,000	$13,000

Data sources:

1. The list of most popular vehicle makes and models is sourced from Treasury's IDI analysis completed in March 2019.
2. Emissions and used cars prices shown in this table are indicative only. They were obtained from Trade-Me based on vehicles manufactured between 2009 and 2010 (searched performed on 29 March 2019) and do not represent the actual emission level or

The Ministry focuses on the first year of the policies

In its discussion of the impact of the feebate scheme the Ministry focusses on the first year where some of the popular imports will get a rebate.

A simple analysis in Appendix C (Appendix four in the Consulation paper) *shows, however, that a number of larger SUVs and utes currently sold in New Zealand would face a fee under the Clean Car Discount policy. At the same time, there are some mid-range price new and used utes and new and used vans, SUVs, and people-movers that would be unaffected in 2021. Some SUVs and vans already sold in New Zealand would attract a discount in 2021.*

The 2025 outcomes are presented in the Consultation paper, but in a tabular form that is hard to read and there is no discussion of the results.

We have represented the relevant information in the table below.

First year winners

Car	**Rebate**
Ford focus, Holden Cruze, Lexus GS300	$200
Citron c3, BMW 116, BMW 3, Toyota Corolla	$500
Nissan Tilda, Suzuki Swift, Honda Fit, Skodia Fabia, Lexus GS300	$800
Mazda Demio, Toyota Camry Hybrid, Toyota Estima PHEV, Hyundi i30	$1100
Losers	
Camry,Nissan Tilda, Mazda 3, Ford Kuga	$1100
Ford Focus, Kia Sportage D, Nissan X-Trail, Nissan Dualis	$1200
Ford Falcon 6, Commodore SV6 ,Honda Odessey	$1300
Ford Territory D,Holden Colorado D	$1400
Holden Commdore V8, Range Rover,Toyota Landcruiser	$1500

2025

Winners	
Toyota Prius H, Honda insight H, Fiat 500 Renault Megane diesel	$500
Porsche Cayenne PHEV, Toyota Yaris hybrid	$900
2016 BMW 740e PHEV, Mercedes C350	$1300
Holden Volt PHEV, Outlander PHEV, Toyota Prius PHEV	$1700
Nissan Leaf, Mitsubshi MiEV	$2100
Losers	
Ford focus D, Holden Cruze D, Lexus RX 450	$700
Mitsubishi Outlander D, Honda Jazz P	$800

Holden Cruze P, Ford Modeo D, Nissan Pulsar	$900
Corolla, Skoda Superb, Mazda Cx5 P Mitsubishi Outlander	$1000
Camry, Tilda, Mazda 3, Ford Kuga	$1100
Focus, Kia Sportage,NissanX-trail, Nissan Duallis	$1200
Ford Falcon,Commodore SV6, Honda Odessey	$1300

To assess what might happen in 2025 we present two data sets. The first is a comparison of the proposed New Zealand emission standards, and the Japanese standards. The relevance of this is that the Ministry has inferred that it will be relatively easy to import low fuel consumption vehicles from Japan , because the standards were already in effect by 2014. The table clearly shows that the Japanese standards are in fact more lenient than the proposed New Zealand standards. In particular it show that for larger vehicles, (work vehicles, MPVs) there is a large gap between New Zealand and Japanese standards.

Table two: Japan/New Zealand emission standards

Weight class Kerb weight kg	**Japan 2020 Km/litre**	**Japan 2020 gm/km.**	**New Zealand proposed gm/km.**
< 740	24.6	96.5	80
741-855	24.5	96.9	80
856-970	23.7	100.2	80
971-1080	23.4	101.5	85
1081-1195	21.8	108.9	85
1196-1310	20.3	117	95
1311-1420	19	125	95
1421-1530	17.6	134.9	103
1531-1650	16.5	143.9	106
1651-1760	15.4	154.2	112
1761-1870	14.4	164.9	117
1871-1990	13.5	175.9	122
1991-2100	12.7	187.0	130
2101-2270	11.9	199.6	136
2271 and above	10.6	224.1	141

Source: TransortPolicy.net

Table three: Consultation paper, proposed emission targets

Vehicle weight band (kilogram tare weight)	105 gram emission target adjusted by weight
Up to 1,000kg	80
>1,000kg to <=1,200kg	85
>1,200kg to <=1,400kg	95
>1,400kg to <=1,600kg	103
>1,600kg to <=1,800kg	112
>1,800kg to <=2,000kg	122
>2,000kg to <=2,200kg	130
>2,200kg	141
Weighted average	**105**

The second set of information was a data set obtained from the New Zealand Vehicles Importers' Association (VIA) which showed the CO2 emissions and prices of 2015 vehicles sold in Japan. 2015 was selected because it will be at the centre of importers' preferred market by 2025. There were a number of vehicles that met the proposed New Zealand standards. Most of these were Kei cars.

The other possibilities were a limited set of mostly Toyota and Honda hybrids. Table four is a list of vehicles with emissions of under 105 gm/l. Those under the standard are shown in red. There will also be a few vehicles, with higher emissions, such as the Toyota Estima hybrid, that will meet the weight adjusted standard.

Table four: Possible complicant used imports 2025

Car	**Type**	**Emission**	**Weight**	**Emission limit proposed policy**
Honda Fit (Jazz)	Small car	94	1170	85
Honda Fit hybrid	Small car	67-81	1170	85
Mazda Demio diesel	Small car	86-100	1040	85
Toyota Fielder (Corolla)	Small station wagon	99	1100-1135	85

Toyota Aqua (Prius c)	Small car	64	1180	85
Toyota Corolla Axio hybrid	Small car	67	1100-1200	85
Honda Shuttle hybrid	Variant of the Fit	73-85	1170	85
Honda Grace hybrid	Small car	68- 77	1180	85
Toyota Sienta hybrid	Mini MPV	84	1210-1310	95
Toyota Corolla Fielder hybrid	Small station wagon	67	1100-1135	85
Honda Vezel hybrid	Small SUV	90-100	1180-1270	95
Toyota Prius	Medium car	67	1380	95
Mazda Cx-3 diesel	Small SUV	95	1340	95
Honda Jade hybrid	Compact MPV	93	1530	103
Toyota Noah hybrid	MPV mainly sold to Asian countries.Limied japan supply	96	1560-1730	103-112
Toyota Prius PHV	Plug –in hybrid	72	1435	103
Daihatsu Altis hybrid	Rebadged Camry	96	1450-1550	103
Toyota Camry hybrid	Medium sized car	97	1450-1550	103

What this shows as that used car consumers will have a much more limited choice of vehicles by 2025. It is will either a Toyota and Honda hybrid or a Kei car. If it is a hybrid then this could come at a price premium of about $3000-4000[5]

How much difference the emissions standards will make to the hybrid car uptake is uncertain. New Zealanders have already discovered used hydrids. At the time of writing there were about 1700 used Toyota hybrids and 500 used Honda hybrids for

[5] VIA estimate. Personal communication.

sale on Trademe. Over the next few years many more Japanese used hybrids will come into the New Zealand point range and a significant increase in import volumes can be expected.

The Kei car option

Kei cars may be one of the few options open to lower income families who can't afford a hybrid. One option that might appeal to rugby fans is the Mazda Scrum pictured below. Unfortunately it will not take a full rugby scrum (or even a single lock, unless he puts his head out the window), and also it will, with emissions of 118 gm/km still incur the fee, and probably a high emission vehicle tax, because it will be over the 80gm/km. limit for a small vehicle.

Mazda scrum

Take a Slash

A compliant Kei car alternative would be the Honda Slash (pictured below), which, with emissions of under 80 gm/km could qualify for a rebate, at least in the early years of the feebate scheme.

2015 Honda Slash

Making Kei cars acceptable

One of the problems with Kei cars (apart from being more dangerous than larger cars) is that they may be perceived as being too small for New Zealanders' needs. The Ministry may be working on this and some promotional material that may help in this respect is presented below.

Can this car fit this family?

Easily

The Guinness Book of Records record for people stuffed into a Smart car is 20.

Toughen up and save the planet!

Insult to injury?

The Ministry adds insult to injury by saying that consumers, who make the switch will be saving money, though lower fuel bills. Consumers are perfectly aware that small cars cost less to run than larger but more suitable vehicles. They will not appreciate being told that they will be so much better off by being forced into a Kei car.

Associate Minister for Transport mislead Cabinet?

In the Cabinet paper seeking Cabinet's consent to the consultation the Associate Minister made the following statement:

I am confident that there will be a sufficient supply of new and used vehicles compliant with a 105 g CO2/km standard. Japan is our largest supplier of new and used vehicles and the average new vehicle entering its fleet had emissions of 105 g CO2/km in 2014.

This was misleading. The Ministry had not done the work to check that there would be a supply of suitable vehicles in Japan to meet the needs of the used car market. Similarly there was no analysis of the new cars currently available on the market, or likely to available by 2025. The statement about average emissions in 2014 was factually wrong.

Other impacts: Market stability

The policies could have a destablising effect on some sectors of the market.

- It will kill the new EV market in the leadup to the introduction of the feebate scheme. Why buy now when if you wait for a while you get a $8000 subsidy. When the French introduced there feebate scheme the lead-in time was just a few months.
- The used Japanese import market will load up on models which will bear heavy taxes later on. People movers will be particulary effected as there are likely to be few low emitting subtitutes. Vehicles can still be obtained but there may be a penalty fee of, say, $3000 (60gm/ X $50) plus the feebate tax of $2000. A total of $5000 on what would have been a $12000 vehicle.
- Purchases of used cars will fall and the existing fleet will be kept for longer.
- The used car market will change to an agency market for cars that exceed emission limits. Cars will be imported in the customers name to keep under the three car limit. Dealers may also enlist 'friends and family' to import three cars each to keep cars on the lot. At an extreme no used cars, exceeding the limits will be subject to policies. On the other hand used cars that are under the limit will be imported in the importers name to secure the rebate. However, In most of our analysis below we have assumed that the loophole will be closed off because the fiscal risk is obvious.

- The emission limit boundaries may be gamed. Importers might select a heavier vehicle just over a weight class boundary, in preference for a lighter more efficient model variant under the boundary. This has been a common experience in overseas markets.

Fiscal risk

The feebate scheme poses a substantial fiscal risk. A noted above, there will be a flood of electric vehicles in the first years. On the other hand only a limited number of cars in the first couple of years will incur a fee. In subsequent years there could be significant leakage to private importing if this is not closed off. New car importers will change their product mix, to more diesels, and lower emissions hybrid and other vehicles which are already in the pipeline for the New Zealand matket. If the government attempts to 'balance the books' by shifing the subsidy/penalty bands, imposing penalties on a wider band of vehicles, this will exacerbate market instabilty. A manufacturer bringing a vehicle to market in New Zealand on the assumption that it will receive a rebate may find that is subject to a fee.
When the French introduced their feebate scheme 2008 they soon ran into fiscal problem, despite the scheme being introduced with only a few months warning. By 2011 the scheme was 1.5 billion euros in deficit.

The only analysis that relates to possible fiscal implications is the following figure presented in the Consultation paper.

There is no evidence, that we could see, in any of the documents that the Ministry actually tried to estimate that actual cash flows of the feebate scheme.

Part seven:The cost benefit analysis

Results

The Ministry says that its 'preliminary' cost-benefit analysis of the proposed clean car standard emission standard indicates that it has a benefit-cost ratio of 3:1 and a

net present value of $2.4 billion. The feebate scheme has a benefit to cost ratio of 2.6 and a net present value of $413 million.

As noted above ,the costs benefit analyses were conducted independently. There was no joint cost benefit analysis, or any assessment of the marginal costs and benefits, of the feebate scheme, assuming the emissions scheme is in place.

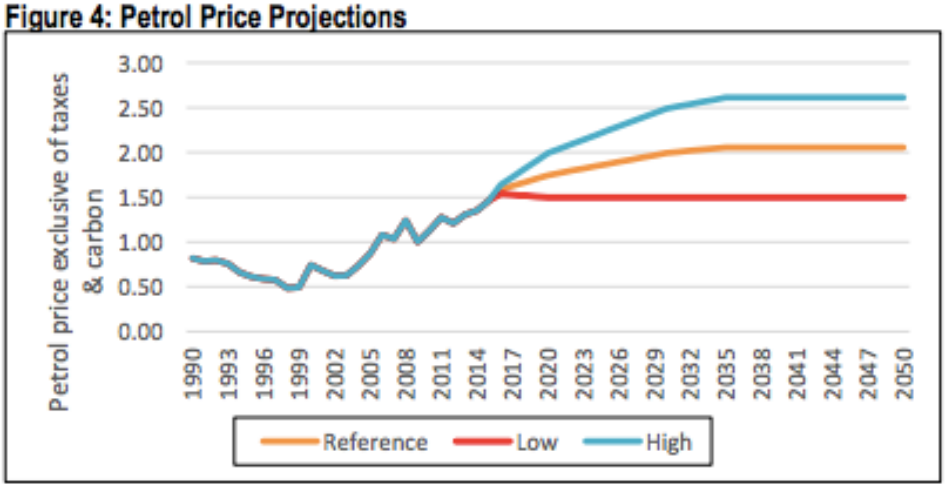
Quite appart from this basic flaw in the analysis, the separate cost benefit analyses were basically scams. Key variables have been manipulated to generate unrealistically favorable results.

The results largely depend three critical inputs.

1. Future fuel prices

The major benefit from the polices is from fuel saving. It is assumed that there will be a substantial increase in fuel prices (the orange line in the figure below), and hence in fuel savings over the modelling horizon. There is no discussion in any of the documents of why this assumption was adopted, or of what it implies in terms of future oil prices. It appears that a doubling of the oil prices has been assumed. A more neutral assumption would have been to hold oil prices steady at current levels. The effect of the Ministry's assumption is to increase gross benefits by about 25 percent.

Figure 4: Petrol Price Projections

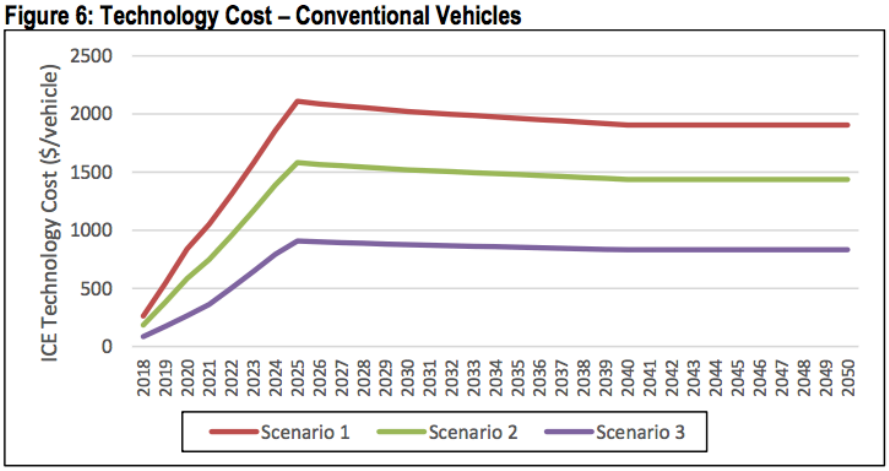


2. Higher cost of more fuel efficient vehicles

The higher costs of more fuel efficient vehicies was taken from a 2016 report by the Australian Department of Infrastucture and Regional Develoment (DIRD). The higher

cost scenario of around $2000 by 2025 in the figure below was assumed. The DIRD analysis, in turn, relied on some US and EU studies, which produced some highly variable results. The obvious problem with the DIRD analysis was that the cost figures related to large European and American manufacturers, who were given many years to make the required improvements. The results are obviously not relevant to New Zealand (or for Australia for that matter). The per unit cost of making any material technical innovations for the New Zealand market would be prohibitive.

Figure 6: Technology Cost – Conventional Vehicles



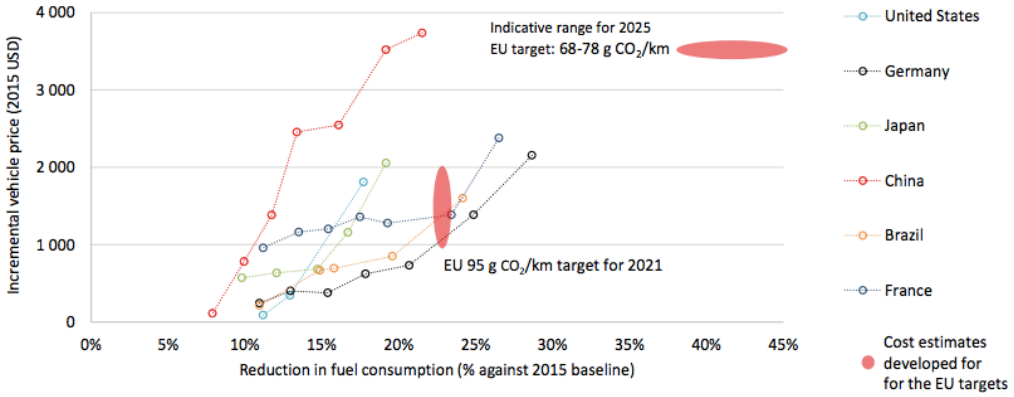
The Ministry did have more relevant information on the likely cost of more fuel effcient vehicles. The following table is from of a recent OECD/IEA report[6], which was referenced in one of the Ministry's papers. The report summarises the data as follows:

Overall, the analysis of price increments and fuel economy improvements across all segments and all countries indicates that consumers across the world pay a price premium for a 15% fuel economy improvement ranging between USD 500 and 2500, with a global average value *in theorder of USD 100 per percentage point reduction in fuel use per km. These ranges grow to USD800 - 4000 for a 20% improvement.*

For New Zealand the proposed standards will require a more than 40 percent increase in fuel efficiency, so any cost assessment from this data would be a multiple of the Minitry's estimate.

[6] OECD/IEA 2017 International comparison of light-duty vehicle fuel economy Ten years of fuel economy benchmarking

Figure 3 • Price increments per percentage point fuel economy improvement[3] in selected markets, 2015



Note: g CO_2/km = gram of carbon dioxide per kilometre.

Sources: the price assessment is from IEA elaboration and enhancement for broader coverage of IHS Markit database; the technology cost estimates for the EU targets are based on the range given by ICCT (2015a) for passenger cars; the indicative target range for 2025 is that indicated by the European Parliament in 2015 (EP, 2015).

Table 4: Average fuel economy improvement and price premiums of hybrids and diesels relative to a similar petrol vehicle, 2017 (Data for advanced economies with fuel price > USD1 per litre)

	City car	Medium car	Small SUV/ pick-up truck	Large car	Large SUV/ pick-up truck
Fuel economy improvements relative to petrol vehicle benchmark (% increment)					
Hybrid	37%	35%	27%	35%	33%
Diesel	24%	25%	20%	27%	25%
Price premium relative to petrol vehicle benchmark (% increment)					
Hybrid	14%	30%	29%	4%	6%
Diesel	19%	12%	21%	9%	11%

Source: OECD/IEA (2019)

And, of course the Ministry could always have surveyed the price premiums for more efficient New Zealand new vehicles. The price premium for a new RAV4 hybrid for example is about $5000. Diesels are available, or could be available, for some models, and they typically cost, around $3000 - $6000 more than the petrol variants.

Diesela and hybrids might make a 30 percent improvement in fuel economy taking the average vehicle emissions down from 180 gm./km. to 125, but that would still leave the difficult 20 gm./km. to go. Assuming that would attract a penalty of $100 a gm., the total cost to consumers is more like $6000, or around $5000 ex GST. The estimate of the capital cost for modelling purposes should have been the 250 percent of the Ministry's figures.

The explanation for using the spurious 'Australian' data is that the Australian market is similar to the New Zealand market.

In 2016, Australia considered introducing a VFES similar to New Zealand's design. Their estimated price changes have been used in the preliminary CBA given a few similar circumstances between New Zealand:

- *The average CO2 emissions of a new light vehicle imported into Australia (at 172g CO2/km in 2017) was close to that of New Zealand (at around 180g CO2/km)*
- *The top ten selling new cars (none of which meets the proposed standard) in Australia in 2017 are also relatively similar to those purchased by New Zealand (Table 3). In fact, only 3.8 percent of all new cars purchased in 2017 in Australia had average emissions of less than 120g CO2/km.*
- *Australia will no longer have any local vehicle manufacturing and, like New Zealand, will need to rely on importing vehicles from other countries.*

The real reason for using the the DIRD data appears obvious. The Ministry wanted to understate the true cost of the policies.

3. Value of Fuel savings –internalisation of fuel costs

The most critical variable in the cost benefit analysis is what the Ministry describes as the 'internalisation of fuel costs' factor. The logic here is that if consumers are forced to buy smaller vehicles they will spend less on fuel, but this does not mean that they are necessarily better off. If they understood that a smaller, or more efficient, vehicle would provide fuel savings over time, but they still preferred a larger vehicle, or cheaper less fuel efficient vehicle, that better suited their needs, then being forced to buy a smaller vehicle would impose a welfare loss. The decrease in fuel costs would be outweighed by the their loss of utility.

For example, take a larger family that buys a people mover that costs $10 more a week to run, compared to a small car, but the famlly gets utility from the larger vehicle of $20 a week. If they have to buy the small vehicle they will be $10 a week worse off, not $10 better off.

The Ministry explains it this way.

Economic theory states that a 'rational' individual would consider the full operating cost of all vehicle types available on the market and will subsequently purchase the one that maximises his/her utility over the whole lifetime of the vehicle. This implies that the individual would purchase the most fuel efficient vehicle available on the market since the fuel savings obtained therefrom would outweigh the additional 'technology' cost of these vehicle types. Hence, it follows that direct government intervention to change consumer behaviour would not be required since a 'rational' individual would automatically choose the best option.

However,the Ministry argues that New Zealand consumers, systematically do not behave rationally. Indeed, they are assumed to be extremely stupid. The Ministry assumes that they only take the first year's fuel savings into account when making a

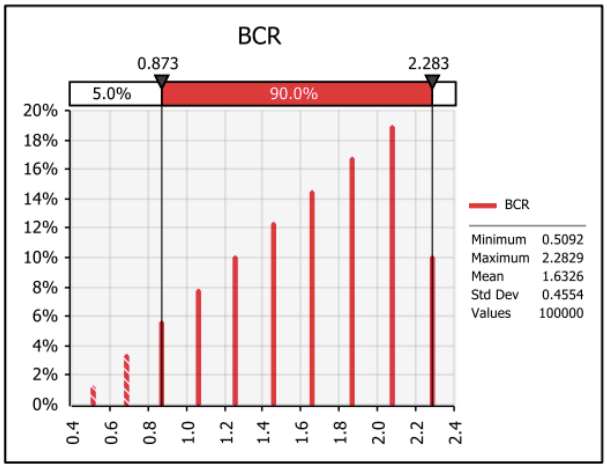
purchasing decision. Faced with the choice of a vehicle that costs, say, $600 more, but saves $500 a year, and a slightly cheaper but much less efficient vehicle, New Zealand consumers always choose the latter. The justication for this assumption is that:

Various studies show that individuals do not internalise the full operating cost of their preferred type and will only consider the total cost of operating the vehicle over one or two years. Therefore, the need for government intervention to incentivise a change in behaviour in favour of fuel efficiency or low emissions vehicles..

The 'various studies' are not cited, because they do not exist. While some studies do suggest that consumers undervalue fuel savings, (while others argue they do not), we have not seen any that makes the extreme claim that the Ministry relies on for its results. In the RIS there is a reference to one study cited by the New Zealand Productivity Commision that suggest consumers overly discount fuel savings in the US. But that study did not cite any evidence. It just reported that the emperical analysis was inconclusive. For a fuller discussion of this issue see Appendix 1.

The Ministry's results are extremely sensitive to their consumer irrationalty assumption. Sensitivity analyses were conducted for all of the important variables in the cost benefit model, but the 'internalisation of fuel costs' sensitivity analysis was done in a way that made it difficult to see what was going on. We are not told how the results would change if different assumptions (say 5 or 10 years savings internalised) were used. We are just presented with a range of benefit/cost ratios, which show that some internatisation assumptions (probably the more plausible ones) generated benefit/cost ratios below 1. This sensitivity analysis was probably designed to give the Ministry 'plausible deniability'. If pressed on the unreasonableness of their assumptions they can say that it was subjected to sensitivity testing , and there was a low probability that it would result in a benefit cost ratio of less that one.

Figure three: Sensivity analysis of internalisation of fuel costs



With respect to consumer rationality the Australian Productivity Comission produced a useful report on the issue in their 'The Private Cost Effectiveness of Increasing Energy Efficiency' in 2005. It discussed the efficiency of a number of markets where regulatory interventions were being contemplated. With respect to motor vehicles their key conclusions were as follows:

The Commission considers that the bounded rationality of consumers is an insufficient ground for justifying intrusive measures such as minimum standards. The case for intervention relies on notions of ***omniscient*** *regulators who are capable of making decisions that are in the best interests of energy users. If those users were capable of collecting and digesting the relevant information, the presumption is that they would come to the same conclusion as the regulator, that is, to not purchase the energy-inefficient appliance. This might decrease search costs but given the diverse preferences of energy users, must inevitably leave some consumers worse off.*

Whether reducing fuel consumption through greater fuel efficiency is privately cost effective will depend on the savings from lower fuel consumption compared to any capital cost of improving fuel consumption and the value to consumers of any other loss in amenity required to achieve those savings. The absence of any clear market failures impeding vehicle buyers from making privately cost-effective energy efficiency improvements suggests that opportunities for such improvements are limited.

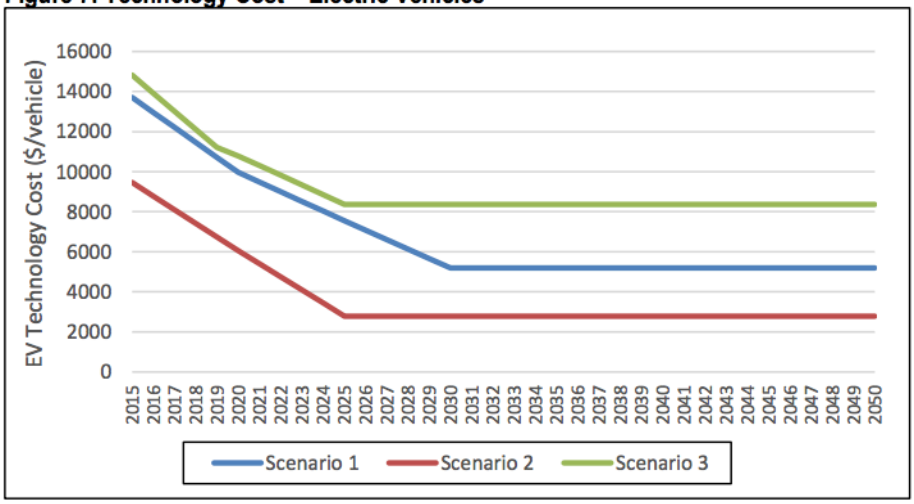
The Ministry obviously is not an omniscient regulator, nor are they acting in the interest of consumers. The economic analysis appears to be designed to serve the interests of the Associate Minister of Transport.

4. Battery Electric car costs

The pricing of electric cars assumptions is described as follows.

The cost estimates for new EVs were obtained from a study undertaken to support the VFEM projections. These costs refer to a battery electric vehicle (BEV) with a range of 160km..

Figure 7: Technology Cost – Electric Vehicles



These assumptions are simply wrong. They are saving that in 2019 the additional cost of an EV is between $6000 and $11,000. They are using an outdated model and the price differentials bear no relationship to the prices of new EVs that are currently available in New Zealand, or that will soon become available.

In the Social Impact Study it appeared to be clarified that the $8000 price differential is based on, amongst other things, the total operating cost over four years

Infometrics estimates that the effective price difference between a battery EV and a petrol ICEV is around $8,000 without the VFES policy. This uses the recently updated EV Projection Model, which takes into account factors such as the implicit price penalties associated with limited model variety and limited battery range. The $8,000 result is from the base case scenario of the model, calculating the present value of the average price difference based on total operating costs spread over 4 years.

Oddly, the Ministry appears to have engaged Infometrics just to run the Minsitry's own model. Perhaps they wanted to shift responsibity for a dubious piece of analysis to an external 'expert;.

We estimated the cost of ownership over four years for a new Nissan Leaf and a Corolla hybrid. The results are shown in table five. Our operating cost differential was $19000.

Table five: Operating costs petrol hybrid and EV. 10.000 km. 4 years

	Corolla Hybrid	**Nissan Leaf**
Assumptions		
Purchase price $ (excluding ORC)	33490	59990
Fuel cost $2.20 ltr., 'real world' consumption 5l/100km (Test 4.2)	1100	
Electricity cost		$300 assumes no charging station costs
RUC Kilometre charge.		$720
Depreciation 4 years	60%	60%
Financing rate	6%	6%
C02 emissions, per year	10,000 x .115= 1.15 tonnes	Assumed to be 20% fossil fuel electricty generation. Approx 0.2 tonnes
Maintenance, servicing cost difference	Free first three years for Hybrid. Assumed equal over four years.	
Cost Difference 4 years		
Depreciation	20094	35940
Financing costs	8038	14398
Running costs	4400	1200
	32532	**51538**
Marginal Cost of C02 emission reduction $ tonne		Net cost/net savigs $5002 (higher if RUC subsidy withdrawn)

Note that the $5000 per tonne of CO2 saved cost is a 'worse case' scenario. If we consider the cost over the life of an EV (optimistically 15 years given uncertianties about battery life) it comes down to $1200-1500 a tonne, depending on kilometres driven.

In the feebate economic analysis the average cost of new vehicles was cited as $60,000. In the RIS there is the following discussion on prices.

The higher upfront cost of purchasing EVs – new EVs are currently more expensive to make and buy than equivalent conventional vehicles. The cheapest new EV retails for around $48,500 compared with $36,500 for its petrol equivalent. Another comparison is the e-Golf at $65,990 compared to the TSI Highline Golf at $41,990. These examples show a 32%, 38% and 57% market premium respectively. Some used EVs entering the fleet are sold at a similar price to petrol or diesel equivalents because they attracted subsidises when first sold in Japan.

This is somewhat confusing, conflating plug-in hybrids with full battery EV prices and missing some obvious comparisons (such as the Hyundai Kona where the price comparison is $32000 for the ICE and $72000 for the RV), and leaving one example out altogether. There are three chnages but only two examples.

There is also mention of the Mitsubishi Outlander Plug-in-hybrid. Rather inconveniently the price of this vehicle has come down to its conventional equivalents, undercutting the Ministry's argument that subsidies for EVs are necessary until price parity is reached with conventional vehicles. The Ministry seems to argue that this may be an outlier, which might be true. Subsidies for plug-in-hybrids have been scrapped in the UK, in part it appears, because some buyers were taking the subsidy but not plugging the vehicles in, running on petrol instead. Sales for the Outlander collapsed and Mitsubshi may be trying to offload excess stock in New Zealand.

It is difficult to understand what the Ministry is up to with EV pricing, but it seems clear that they have got the EV price numbers badly wrong in their economic modelling, and that this has overstated some of the benefits.

5. Welfare losses

The welfare losses capture the costs to consumers from distortions to their preferred purchase patterns.

The present value of these deadweight losses for the fuel efficiency standards is small. The maximum annual cost of $2.9 million, and a net present value cost is $25 million. These low costs are a function of the assumed low capital cost of achieving the emission standards, and would increase in a non-linerar fashion (say by a factor of 6 to 8) with the more realistic cost assumptions discussed above.

For the feebate scheme, however the welfare costs are much higher. The present value cost is $233 million for new vehicles, and $47.5 million for used vehicles. There is no explanation of why the costs are much higher than for the emissions scheme, and why the new vehicles cost is higher than the used vehicle cost. On the

latter point, the difference, probably, is because it is assumed that the cost of these vehicles is relatively low and that the prices increases will also low. Our analysis suggests that the highest proportionate 'taxes' could fall on used imports, so the deadweight losses will be significantly higher than the Ministry's estimates.

Implementation costs

The emissions sceheme has a $7.5 million set-up and $1.5 million annual running cost, with a present value cost of $39.8 million. The feebate scheme costs are $7.5 million and $2.75 million with a midpoint PV cost of $37 million. These costs were overstated. It is assumed that the costs would run on past 2025.

The cost to vehicle importers was not assessed, awaiting responses through the consultation process. .

Conclusion

The Ministry's conclusion that there will be large economic gains from the schemes is based on deeply flawed analysis and appears to be a scam.

- Petrol price savings have been increased by around 25 percent because of unexplained ol price increases
- Capital costs have been understated by a factor of around 2.5. There has been no serious analysis of what the costs will be.
- The assumption that consumers are completely irrational when assessing the value of fuel effcient vehicles is implausible and is not backed by any evidence.
- The Ministry's assumptions on electric car costs appear to bear little connection to reality.

Part eight: Equity impacts

The Ministry goes to considerable effort to examin distributional effects, with a focus on the impact on the low income group. Equity is meant to be a key policy evaluation criteria. The RIS states:

An equitable and inclusive society
8. The extent to which the initiative's costs and benefits impact across society.
Consistent with an equitable and inclusive transition, the initiative's costs and benefits do not disproportionately impact, or focus, on any one group. If they do have disproportionate impacts that are unavoidable, there is a way that their impact can be managed or minimised.

In the RIS, direct government grants were considered, but were rejected on equity grounds.

Many European countries provide grants, or subsidies, for the purchase of new ultra low emissions vehicles, like EVs and plug-in hybrids. However, this option has been discarded in the New Zealand context as a subsidy from government revenue involves a wealth transfer from low income New Zealanders to middle and high income groups.

This argument is not strictly correct, as there is a transfer from tax payers in general to middle and high income groups, rather than from low income New Zealanders as such. But the general idea that the beneficiaries will generally be middle and high income earners is correct.

How the Ministry could come to an apparently different conclusion for the emissions and feebate schemes, which obviously involve a transfer from lower income groups, is not clear, and takes some explaining. The analysis is a combination of obfuscation and muddle, partially designed to deflect attention from the obvious. The urban policy elite's new EVs subsidies will be partially funded by low income families who rely on the used car market for affordable transport.

The Ministry's approach is to demonstrate that not many low income people purchase used or new car imports each year so the impacts are not very consequestial. The table below from the Social Impact study suggests that only 19 percent of the low income group purchased a new or used import over the three years to 2018, compared to 32 percent for the 'not-low income' group.

Table 14: Light vehicle imports purchased, by main income source (July 2015 – June 2018)

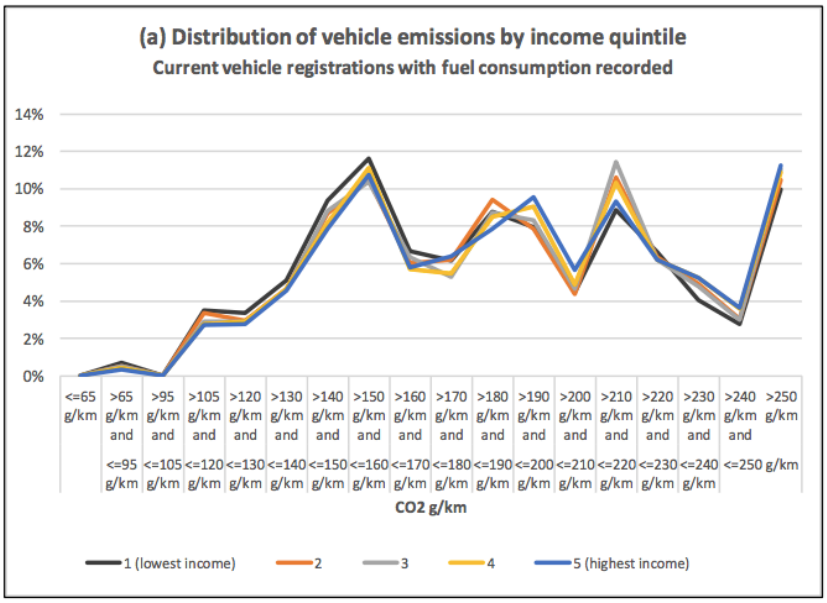
July 2015 – June 2018 June years - light vehicle imports purchase HH income and main income source	% bought new or used imports	% did not buy (note)	Share of all NZ households
Low income - NZ superannuation	16%	84%	8.6%
Low income - benefits	13%	87%	5.2%
Low income - earnings	27%	73%	7.9%
Low income - other/none	18%	82%	2.6%
Not low income - NZ superannuation	20%	80%	7.9%
Not low income - benefits	16%	84%	2.0%
Not low income - earnings	32%	68%	64.4%
Not low income - other/none	27%	73%	1.5%
Total – this table	**28%**	**72%**	**100%**
Previous estimates based on income-based measure only			
Low income households	**19%**	**81%**	-
All households	**28%**	**72%**	-

Note: The above might not sum to the same totals due to disaggregation of information.

What this ignores is that an increase in the price of used imports, or a decrease in availability, will impact on prices across the whole of the used car market. For example, if the price of a used import goes up by $5000, then fives years later, when it is onsold to a still lower income purchasers, then the price will be, say $2500 higher. The market will anticipate these price increases right down the pricing chain. Overtime most people buying a used car for will face higher prices.

The Ministry also claims to have data on the relationship between incomes and car emissions, which helped to inform their analysis. This is unlikley to be true. There is no information on income in vehicle registration forms. The Ministry claims to be relying on linked information, produced by Treasury. It is unlikely that the such data can be generated, without the underlying base data, and there appears to have been some mistake in the data generation process. A clue to this is that the distribution of vehicle emissions, which is identical by income cohort.

Figure 9: Vehicle ownership by income quintile (vehicle registrations as of August 2018)



Let them buy BMWs

The other line of the argument in the Social Impact Analysis is that there are many opportunities for low income buyers to avoid or reduce the cost of the policies by selecting more economical vehicles.

Evidence suggests that vehicle prices are likely to increase and choices are likely to be limited in the short term – i.e. Scenario A.

The question is how long it would take for the market to adjust. There are two possible paths – with either price falling or choice rising first. A study in Australia (NTC, 2018) found that if "Australian consumers had purchased vehicles with best-in-class carbon dioxide emissions in 2017, the national average carbon dioxide emissions would have been reduced to 76 g/km, a 58 per cent reduction". To achieve a similar effect, New Zealand would require consumers to demand the low-emission variants that would not otherwise be imported to New Zealand. This means that the choice of vehicles must increase (as importers import these vehicles to meet demand). If the adjustment takes place relatively quickly, it may be possible to achieve results similar to Scenario B in the short to medium term.

A 58 percent fall in emissions simply by selecting the lowest emission vehicle looks impressive. Until you see the prices of the lowest emission vehicles. This is the list. Looking at the segments, the Fiat 500 and Toyota Prius C are already available in New Zealand. All of the lowest emitters in the other low emission segments are (expensive) BMWs.

Segment	Make and model (fuel source/s)*	Best-in-class vehicle emissions intensity (g/km)
Micro	Fiat 500 (petrol)	90
Light	Toyota Prius C (petrol-electric)	90
Small	BMW i3 REX (electric-petrol)	12
	Toyota Prius C (petrol-electric)	80
Medium	BMW 330E (electric-petrol)	49
	Mercedes-Benz C300 BTH (diesel-electric)	105
Large	BMW 530E (electric-petrol)	46
	Mercedes-Benz E220D (diesel)	108
Upper large	BMW 530E (electric-petrol)	50
	Mercedes-Benz S300 BT (diesel-electric)	118
Sports	BMW i8 (electric-petrol)	49
	BMW 220D coupe (diesel)	107
People mover	Citroen C4 Grand Picasso (diesel)	120
SUV small	Mini Cooper (electric-petrol)	49
	Citroen C4 Cactus (diesel)	92
SUV medium	Mitsubishi Outlander (electric-petrol)	41
	Peugeot 3008 (diesel)	124
SUV large	Volvo XC90 (electric-petrol)	49
SUV upper large	Land Rover Range Rover (diesel)	182
Pick-up/chassis 4×2	Nissan Navara (diesel)	166
Pick-up/chassis 4×4	Nissan Navara (diesel)	172
Vans/cab chassis	Citroen Berlingo (diesel)	108
Light buses	Toyota Hiace (diesel)	228

As noted above the Ministry rejected a straight subsidy to EV puechasers on equity grounds. The logic that it is somehow more acceptable to take money from the lower income families that need an economical people mover, to give to consumers who can afford a $40,000 to $80,000 car, somehow escapes us. We doubt that the lower income families will get much comfort the fact that at least they are not

helping to pay for some richer person's $80,000 plus car. Nor will they get much comfort from the Ministry's 'helpful' advice in Appendix 4 of the Consultation paper that cars that will avoid the fee are available. They could get a $1300 rebate if only they were smart enough to buy a 2016 BMW 740e (which might come down to $80,000 or so by 2025),or a Mercedes C350 PHEV. A Porsche Cayenne PHEV will secure a $900 rebate, possibly not enough to make it affordable for a family shopping at the $8,000 price point.

Other impacts

The other impact of the Clean Car Discount could be for households that require a larger vehicle for work or other purposes. There is limited data available to assess how the Clean Car Standard or discount policies would affect these households. This is primarily because we do not have complete data and pricing information on all vehicles that are available in the market within these vehicle segments.

This is a lame excuse. Half a day on the internet would collect all of the new car prices.

Part nine: First to 100: A rational alternative

There are many alternatives to the proposals. But just within the parameters of proposed framework, the emissions targets could be set at a more realistic and less disruptive levels, and the feenbate scheme could be scrapped. Implementing a scheme which is demonstrably inequitable, not very effective and which will only come into full effect 17 years after the French scheme, will hardly get world attention, if 'global leadership' is the objective.

Our preference is what we call the 'First to 100' proposal. It involves simply increasing the carbon tax, just on fuel, to $100, which would increase fuel prices by about 10 percent. It has a better chance at getting international attention. We would be the first country in the world with a $100 carbon price (albeit one with a limited application). It is a more efficient and effective way to reduce emissions.

The price increase would not have to occur in one hit. There could be a 7 cent increase to a carbon tax of $50 next year, with remaining price increase in, say, 2022. The important thing is that the price increase is signalled.

A fuel tax increase has several obvious advantages:

- It does not require a new, expensive, administrative framework.
- It will be more effective in reducing emissions. On the Ministry's numbers emissions would fall by 11 percent rather than the 5 percent with the Associate Minister's proposals. That is is because a fuel price impacts on all emitting vehicles immediately, not just on new to fleet vehicles. It directly targets the problem. Drivers who drive further, drive less efficiently and have a vehicle with higher fuel consumption are emittimg more, and will pay relatively more. Taxing or subsidising vehicles is an indirect and inefficient way of getting at the problem.
- It does not involve subsidies to the better off from lower income used car purchasers.
- It will generate revenue, which could be used to build safer roads, which is the Government's other policy thrust.
- It would send a 'global leadership' signal that New Zealand is serious about reducing emissions, and is not just tinkering with schemes like the feebate proposal, just to be seen to be doing 'something'. For political reasons governments have often shied away from fuel price increases because they are transparent but unpopular. Being 'first to 100' would demonstrate that the Government is prepared to back its words with deeds and is prepared to be politically courageous. Other countries may be encouraged to develop a climate change backbone.
- It will be a test of whether new Zealanders really support the Government's emission targets.

Appendix 1

The Productivity Commission's recommendations on direct interventions to reduce light vehicle greenhouse emissions: A review

In its draft report 'Low Emissions Economy' the Productivity Commission recommended two additional policies to reduce greenhouse gas emissions from light vehicles.

- Limits on maximum permeated emissions for newly imported vehicles.

- A 'fee-bate' scheme, which would tax relatively high emission imports, and use the proceeds to subsidise vehicles with relatively low emissions. This note reviews the arguments and evidence that supports these recommendations. We proceed by setting out the arguments and evidence in the report, commenting as appropriate. Our key conclusions are:

- The standard of the analysis was poor. Much of it is 'cut and paste' exercise from a few favorable papers. More skeptical analysis was typically ignored; the content of some papers was misrepresented; and there was little critical scrutiny of what was used.

- The policies will not generate least cost abatement and could generate some perverse outcomes. The uptake of new electric vehicles will be encouraged at a cost of more than $1000 per ton of CO2 saved.

- The policies are heavily regressive. The poor will be taxed to subsidise the rich, and corporate virtue signalers. It could be said that the Commission has been more concerned with cheer leading than providing robust and independent scrutiny of the proposals.

Setting the scene

The Commissions sets the scene by trying to convey a sense of the necessity and urgency for action.

The average age of vehicles rose 14.2 compared to 10 for Australia. *Vehicles are*

scrapped after 19 years. This slow turnover implies that purchased in 2018 will likely stay in the fleet until well after 2030 and potentially after 2040. Vehicles entering New Zealand's fleet are more emissions intensive than in many other developed nations.

All this is all true but not a surprise. By developed country standards we are relatively poor (more upper middle income than rich) and heavily rely on imports of older, cheaper, but more emissions intensive second hand vehicles. Vehicles are kept for longer periods because many motorists cannot afford to update to a more modern vehicle. Motorists also have places to park; there is a less of the dense urban environments that favor smaller cars; and more of an outdoors culture that favors larger ones. Our preferences and needs are different to those in Europe and Japan.

Reliance on road transport has led to significant external costs. While there are some externalities; mostly (i.e. congestion) these are not relevant to the emissions issue. As discussed below the amount of relevant unpriced emissions related externalities is not as large as implied.

The obvious solution to unpriced externalities is to apply an appropriate tax on fuel. The emissions price component could be increased, with an additional tax applied to price the health effects of emissions. This has some obvious advantages compared to the Commissions proposals:

- It is easy to do. The pricing mechanism already exists.

- It applies to all vehicles. It will take around 20 years for policies applied to just newly imported vehicles to have their full effect. We conducted a 'back- of-the-envelope' assessment of the relative effectiveness of a 5 percent increase in petrol/diesel prices compared to an emission standard that improved efficiency of new imports by 15 percent. Over 20 years the price increase reduced emissions by a third more.

- It is more precisely directed at the externality problem, which is a function of how far a car is driven, and how it is driven, not just a measure of its emissions performance per kilometre under laboratory conditions. The Commission appears to acknowledge the importance of an efficient pricing mechanism in principle, but argues that complementary policies are still necessarily and that reducing emissions will not come at a large cost.

At current prices the NZ ETS is likely to have a limited impact on transport emissions. The emissions price is a relatively small component of fuel prices at current levels, and fuel demand is relatively unresponsive to changes in price.

The current carbon price is about $25, but even if were doubled this would not make a huge, short run, change to the level of emissions. However, this does not necessarily lead to the conclusion that emission controls or subsidies are necessary. It just means that personal transport is highly valued and that it may be more efficient if net emission savings are obtained elsewhere at a lower economic cost. If vehicle emissions look to be higher in 2050 than projected then the difference can readily be made up by more forestry sequestration, which is a relatively heap form of abatement.

More importantly, for this discussion, is the argument that there is an urgency to improve fuel economy right now. This case is not made. Emission controls and feebates might improve the fuel economy of imported cars, but these will have been scrapped by the target date of 2050. And while there may be some impact on cumulative emissions this can be readily achieved by alternative, much more efficient, mechanisms.

The case for Emissions Controls

To justify the interventions the Commission argues that there are market failures in the car market, which by implication, justify an emissions limit intervention.

First, motorists systematically underprice future fuel savings, and second, manufacturers do not provide New Zealand car buyers with the choice of the most fuel-efficient cars.

Even with much higher emission prices development and uptake of lower- emission vehicles will very likely occur more slowly that optimal from a societal perspective. Evidence suggests that buyers behave as if they heavily discount future fuel savings and that and that uncertainty around future fuel (and emissions) prices may play a role in this.

.... buyers can only act on the choices available to them, and are very unlikely to be aware of more efficient model variants unavailable in NZ.

Manufacturers will chose a selection of vehicles that will maximize their profits – Manufacturers are likely opting to provide less efficient model variants into the New

Zealand market than to markets where standards apply

Obviously manufacturers are seeking to maximize profits, but in a small market where they cannot economically support every model variant, the expectation is that they will restrict themselves to a subset that best matches consumer demand. Further, the majority of New Zealand car registrations are used and parallel imports. It is perfectly possible for buyers to import more fuel-efficient models if they wish to do so.

Here the Commission's analysis is essentially a cut and paste from the Australian Department of Infrastructure and Regional Development's (DIRD) Regulatory Impact Statement (2016) on emissions targets, so we have set out the DIRD's key arguments to give the reader a better sense of the economic logic.

2.3 Government action could help address market failures Market failures are departures from the characteristics necessary for unregulated markets to deliver outcomes that maximise both private (household and business) as well as overall (social) wellbeing (PC 2005, DPMC 2014). The most relevant market failure with respect to light vehicle efficiency is the amount and/or distribution of information in the market, and the ability to process this information.

Vehicle suppliers and buyers generally have asymmetric information about the costs of improving vehicle efficiency (Green 2010). Vehicle makers know the relationship between fuel efficiency and additional vehicle costs for a large range of technologies, including those not currently included in their vehicles, while vehicle buyers generally only know (and can act on) the trade-offs between vehicle costs and efficiency that are currently on offer.

If buyers undervalue efficiency improvements, or have limited capacity to assess the value of those improvements when making purchasing decisions, then manufacturers have less incentive to supply vehicles that maximise private or social wellbeing.

An important behavioral barrier is that any individual's ability to obtain and process complex, changing and uncertain information is finite. In response to complexity, rather than calculate the best possible private decision, individuals tend to adopt rules-of-thumb. Such strategies include purchasing the same brand as a friend, purchasing the same brand that they have bought before, or using simplified choice criteria that focus on a subset of the features of a good *(Green 2010).*

While these measures (fuel efficiency labeling) help consumers assess the relative

efficiency of new vehicles and provide an incentive for consumers to consider the purchase of a more efficient vehicle, these measures do not address the difficulties consumers face in assessing the benefits of efficiency, relative to other attributes such as price, size and performance. As the benefits of purchasing a more efficient vehicle tend to be less immediate and tangible to consumers, this can make it less attractive for vehicle manufacturers to use efficiency as a selling point.

*While a recent survey found that Australians rate fuel efficiency along with reliability as the two most important considerations when buying a car (AAA 2016), there is very little evidence on how they assess the benefits of fuel efficiency–particularly over the longer term. Calculating the benefits from improved fuel efficiency requires both specific information and strong mathematical skills, and is unlikely to be done by all purchasers or for all purchases (see, for example, ABS 2013a**). Evidence from overseas markets such as the US indicates that buyers behave as if they heavily discount future savings from reduced fuel use*** (our emphasis, for its significance see below) (Green 2010, IEA 2012)

These behavioral barriers are likely to have a more pronounced effect on household rather than business vehicle purchases. Nevertheless, there is substantial evidence that similar barriers can also prevent businesses investing in cost-effective efficiency improvements, especially if fuel use is a relatively small component of overall costs (ClimateWorks 2013). For example, fleet buyers are likely to require payback periods of three years or fewer on a more efficient vehicle because most fleet vehicles are re-sold within this period. As just under half of new cars are purchased by fleets (FCAI 2015), this 'split incentive' could limit the take-up of vehicles that would deliver overall financial benefits for motorists but not their first owner (CCA 2014).

On the 'split incentive' problem, this ignores the fact that fuel economy is embedded in used car prices. Other things being equal, superior fuel economy increases the resale price of the vehicle, and reduces the initial buyer's overall vehicle costs. There is no a priori reason to expect that the market does not work in this respect.

And, as noted above, In New Zealand the majority of vehicles are used imports, and so consumers of used vehicles are not constrained by 'inefficient' choices made by domestic new vehicle purchaser.

Green (2010) is the source of most of the DIRD's analysis. This is what was actually said on the evidence that consumers systematically undervalue fuel economy.

The evidence from econometric studies, mostly from the US, is reviewed and shown

to vary widely, providing evidence for both significant under- and over-valuation and everything in between.

The DIRD's representation of what Green et. al said was misleading. They did not say that the evidence indicated that buyers heavily discounted future fuel savings.

Green et. al. also discuss theoretical arguments on the role of risk and loss aversion in decision making. It is claimed that these factors could imply that consumers might undervalue fuel economy relative to its expected value.

Market research is scarce, but indicates that the rational economic model, in general, does not appear to be used by consumers when comparing the fuel economy of new vehicles. Some recent studies have stressed the role of uncertainty and risk or loss aversion in consumers' decision making. Uncertainty plus loss aversion appears to be a reasonable theoretical model of consumers' evaluation of fuel economy, with profound implications for manufacturers' technology and design decisions. The theory implies that markets will substantially undervalue fuel economy relative to its expected present value.

But they concludes by saying:

The theory of bounded rationality implies that if fuel prices are high enough to make fuel economy one of consumers' 3-5 top considerations, it may be considered in a manner closer to the rational economic model.

As fuel prices in Australia (and New Zealand) are much higher than in the US, and fuel economy is an important purchaser consideration in both markets, the conclusion that should have been drawn from Green is that these markets can be expected to be broadly efficient.

The Australian Productivity Commission on market efficiency

In 2005 the Australian Productivity Commission (APC) produced a report (The Private Cost Effectiveness of Increasing Energy Efficiency) on the efficiency of a number of markets where regulatory interventions were being contemplated. With respect to motor vehicles their key conclusions were as follows:

The Commission considers that the bounded rationality of consumers is an insufficient ground for justifying intrusive measures such as minimum standards. The case for intervention relies on notions of omniscient regulators who are capable of making decisions that are in the best interests of energy users. If those users were

capable of collecting and digesting the relevant information, the presumption is that they would come to the same conclusion as the regulator, that is, to not purchase the energy-inefficient appliance. This might decrease search costs but given the diverse preferences of energy users, must inevitably leave some consumers worse off.

Whether reducing fuel consumption through greater fuel efficiency is privately cost effective will depend on the savings from lower fuel consumption compared to any capital cost of improving fuel consumption and the value to consumers of any other loss in amenity required to achieve those savings. The absence of any clear market failures impeding vehicle buyers from making privately cost-effective energy efficiency improvements suggests that opportunities for such improvements are limited.

The highly competitive nature of the Australian motor vehicle market should mean that producers provide the vehicle features sought by consumers, of which energy efficiency is one.

Fleetwide fuel-efficiency targets that go much beyond what the market would deliver are likely to suffer from a number of drawbacks. To the extent that such targets distorted producer and consumer behavior, the resultant energy efficiency gains would not be privately cost effective — consumers would value improved fuel efficiency less than the associated costs and additional constraints on vehicle choice.

There is nothing in the DIRD's analysis that would lead to a different conclusion. Notably, the DIRD cited the APC's report, but did not explain why they came to such a different conclusion. Notably too, the Commission also cited the APC report but did not discuss it, or explain why they have came to a different conclusion.

The DIRD's cost benefit analysis

The Commission also cites the DIRD's cost benefit analysis, which purports to show that the benefits of fuel efficiency standards exceeds the costs, and that the costs of lower carbon emissions are therefore negative.

The Australian Government has modelled the impact of a light vehicle CO2 emission standard at different target levels. The modeling found net economic benefits under all targets considered. The current emissions intensity of NZs light vehicle fleet is very similar to Australia's so it is likely that similar results could be obtained.

The DIRD's methodology was as follows:

- The fuel costs savings from the projected improvement in vehicles efficiency was

calculated.

- The value of the associated C02 reductions was calculated using a carbon price of A$35 per ton.

- The cost of meeting the higher targets were taken from US and European government studies of the higher manufacturing costs to meet emission standards in those countries. These estimates were described as uncertain.

- The costs and benefits are calculated annually out to 2040 and then expressed as present values. The present value of fuel savings and carbon reduction benefits for the most stringent of three requirements were $27.5 billion and $2.7 billion respectively. The cost was $16.2 billion. As the financial benefits are higher than the costs there is a negative cost for reducing carbon emissions. The obvious problem with this analysis is that the cost figures relate to large European and American manufacturers. However, the per unit cost of making any material technical innovations for the Australian market would be much higher.

- Manufacturers might do some minor tinkering, but the main response would be to withdraw product lines; or depending on market dynamics, raise prices for the less fuel-efficient models to choke off some of the demand. The presumption, as the APC has argued must be that these responses will have a net welfare cost. There will be a stronger presumption of a loss in the much smaller New Zealand market.

In short there is no free lunch here. The DIRD cost benefit analysis did not seriously engaged with the key issue, which is whether they can increase welfare by interfering with market processes. Obviously fuel consumption can be reduced by compelling people to drive smaller cars. But this comes at a cost because users value other vehicle attributes, not just fuel economy.

Another serious shortcoming in the Commission's analysis is the lack of any consideration of the impact of emission standards on the used import market, which account for more than half of vehicle registrations. There is a discussion of administrative difficulties in applying the standards to used imports. However, they do not consider the effect of the emission standards themselves on the functioning of the used import market.

The latest statistics show that average age of used imports is 10 years. There must

be a significant risk that many older cars will not meet lower and increasingly restrictive efficiency standards, and that a material part of the supply will be choked off. Used imports are critical in supplying poorer New Zealanders with affordable transport, so the effect of the policies will fall disproportionately on them. They will have to pay more for a much newer vehicle, buy a car that is too small for their needs, or not update their car.

There will be unintended consequences:

- The introduction of the requirements will be well signaled, so there will be a rush to import vehicles before they come into effect. These vehicles will probably be less efficient than the vehicles that would otherwise have been imported at a later date.

- Some owners will respond to higher prices by deferring the replacement of, say, a twenty-year-old vehicle with an eight-year-old vehicle that is more reliable and fuel-efficient. The effect will be to reduce fuel efficiency.

- The road toll could deteriorate. One of the factors behind the improvement in the New Zealand road toll over many years was a shift from motorcycles to cars. This trend could be partially reversed. The Commission acknowledges that there could be an impact on prices. *Introducing vehicle emission standards is likely to raise average vehicle prices over time. Yet the increase would be gradual given that the standards only effect new vehicles entering the fleet and most vehicles stay in the fleet for close to two decades.* This is wrong. Choking off the supply of used imports will quickly impact on prices through the second hand market.

On equity issues the Commission acknowledges that *the effect of any price increase would be felt particularly strongly amongst low-income householders.*

Their recommendation is that *'the government should monitor the effect over time'.* There is no suggestion that the equity effect should be a material consideration in the decision to introduce emission limits, or any suggestion of what the government should do to mitigate the equity impact.

The fee-bate scheme

A feebate scheme involves taxing high emitting vehicles and using the proceeds to subsidise low emitting vehicles. While the scheme applies to all vehicles (that meet the minimum emission standard), the primary intended effect will be to subsidise Electric vehicles (EV) imports, which the Commission wants to encourage, and to tax internal combustion engine (ICE) imports. Again it is argued that the scheme can be justified because it corrects for external costs generated by internal combustion engine vehicles.

A key rationale for providing incentives for EVs is that the actual cost of using EVs is currently greater than the wider social cost. Also consumers do not fully benefit from reducing social costs when switching from a fossil fuel vehicle due to currently lower emission price and the lack of pricing for air pollution.

In addition to the above C02 and air quality social costs, EV owners are also penalised because they do not pay the true social costs of electricity. They typically charge at night when the social cost is low, but incur the higher average cost applied to domestic consumers.

In response to the argument that the external cost issue can best be resolved by appropriate fuel pricing the response is that

Electricity pricing will take time to resolve. Some form of support is therefore likely to be required as a transitional measure.

There is already some form of support. EVs are exempt from road user charges. This could be continued, at an appropriate level, past the current expiry date of 2021. This subsidy does not precisely target the difference between private and social cost, as it is applied per vehicle, not by the amount of electricity used. In this respect it is close to identical to a fee-bate subsidy that similarly does not target actual usage. The road user charge subsidy will do as a 'transitional measure' until the electricity pricing issue can be addressed.

Are EVs already economically viable?

The Commission references analysis by Concept Consulting (CC) that suggests that EVs are already economically viable at current prices. *Concept Consulting 2017(a) demonstrate that with an emission price of just $9 EVs with a price premium of $12500 would be a viable option for consumes if the full public benefits of EVs were taken into account*.

We have, approximately, replicated the CC analysis, which looks at whole of vehicle

life costs and benefits including the costs of air and noise pollution. The critical assumption is the EV price premium. There is no explanation of where the $12500 (ex-GST) number comes from. It appears to be there just to make the numbers work.

Assessing the difference between EV and ICE prices in New Zealand has its difficulties, but the best comparison is the Nissan Leaf. New or near new Leafs are sold on Trademe (without a manufacturer's warranty). One could be obtained at around $48000 ex GST. A new Toyota Corolla ICE vehicle might be a suitable comparator (excluding any adjustment for the EVs much inferior range, and longer 'refueling' time) costs around $25000. That is a difference of around $23,000. Looking at BMWs, the cheapest 1 series is $47000, the cheapest EV, the i3 hatch is $86000. BMW's are not a common purchase, so we have based our assessment on the Leaf price premium, using $20,000 and $25,000 price difference assumptions.

Another key assumption is the distance travelled. The shorter the distance, the less attractive the EV, as there is lower fuel savings to compensate for the higher capital cost. CC present different estimates based on the distance travelled. At 50 percent of the New Zealand fleet average, the carbon price that equalises the costs and benefits is $415 compare to the $9 for an average distance assumption. The Commission, however, focused on the average distance result.

Because the limited range of EVs we think that a lower distance travelled is the better assumption than the average. There is some evidence on this in Trademe's used car advertisements. The odometer reading for 2011-2012 used Corollas was 85000 km. For Leafs of the same vintage it was 35,000 km. Assuming that EV average mileage will increase in the future, as EVs with a longer range come on stream, we have assumed, somewhat generously, that average EV kilometers travelled will be about 60 percent of the average. We have also assumed that EVs will have an average life of 12 years due to battery degradation.

Given these assumptions our estimate of the cost of C02 saved per ton is about $1000, assuming a $20000 price differential, and $1400 assuming $25000.

These are whole of life calculation. For new car buyers who keep the car for 3 or 4 years the figures are substantially higher – over $2000 per ton, because heavy depreciation costs overwhelm fuel and 'external' costs savings over a short holding period.

It is clear that on a lifetime basis EVs are not a cost effective way to reduce C02 emissions. However, all is not lost for those who want to see to see an early EV uptake. New Zealanders can, and do, purchase imported second hand EVs. Because of heavy depreciation rates over the first three or four years, the capital cost for the subsequent purchaser will be much lower than the new price, while the owner benefits from lower running costs.

The uptake of used EVs is already occurring. On July 15 2018 there were 777 Nissan Leafs for sale on Trademe. Over 700 were used, and the great bulk would have been imports. Used imports now account for about 80 percent of EV registrations. It is possible that some of these vehicles may have a short and uncertain life, which would ruin the cost effectiveness of the purchase decision, but that is a risk that some buyers are prepared to take. For some there is utility in doing their bit to fight global warming, which outweighs narrower financial considerations.

Future prospects look positive. The range of available vehicles will widen, battery longevity should become more reliable; effective range is improving as battery sizes grow; and costs are likely to fall. As the stock of more reliable and longer-range second hand vehicles in Japan and the UK grows, more will find their way to New Zealand. But it is not at all obvious that this process should be accelerated now by applying a subsidy. Why further encourage New Zealand's use as a 'dumping ground' for suspect and obsolete EVs? Why should the buyer of a second hand internal combustion engine have to pay more for a vehicle to the benefit of EV purchasers, who are already rewarded through a virtue premium for doing their bit for the planet? Given the small stock of suitable used EVs for sale in the UK and Japanese markets, part of the subsidy to New Zealand buyers will flow through to sellers in those markets as increased New Zealand demand pushes prices up.

The equity issue

It is fairly obvious that the feebate scheme will be regressive. Private early adopters will almost certainly have higher incomes than conventional car purchasers. Companies, who are in the virtue signaling game, are perfectly capable for paying for the public relations benefit of being seen as early EV adopters. Air New Zealand, who emits as much C02 as 1,000,000 cars, has committed to converting all of their light ground transport to EVs (where possible) by 2020. With a feebate scheme a struggling family in Porirura, who wants to upgrade a 20 year old car will have to help pay for an Air New Zealand' effort to deflect attention from their total C02 emissions.

The 'supporting' literature on feebates

The Commission cites three references to support their recommendation to introduce a feebate scheme.

In modeling pricing policies for vehicles in the United Kingdom Brand et al 2013 found feebates to be most cost effective in reducing emissions and accelerating the market share of EVs.

Brand et al. evaluated three policy options: feebates, road taxes and subsidised scrapping. They excluded a consideration of fuel pricing on the grounds that the public thought that these taxes were already too high. The assessment criteria were: which option delivered the greatest emissions reduction: revenue neutrality, and no adverse effects on car usage. There was no mention of economic efficiency. The scrapping scheme was assessed as relatively ineffective. The first two options were equally effective, but the tax option risked 'overburdening' the public with excessive taxes. Essentially their assessment was made more on political than economic grounds. If a tax can be hidden in a bundled proposal then it is more likely to be acceptable.

Element Energy recommended that the feebate should be explored.

A recommendation to 'explore' is not compelling support, or evidence.

Barton and Schulte identify feebates as a policy that has 'credibility' a proven record of success internationally, and is suitable for New Zealand. There is no economic analysis in this paper. In particular there is no assessment of the economic costs and benefits, or any comparison with the price based policy option.

Why the need to encourage a rapid increase in EVs now?

The Commission argues

The earlier the uptake accelerates the greater the proportion of EVs in the fleet by 2050

This doesn't follow. The vehicles that are imported now will not be around in 2050. Given the likely rapid evolution in EV capability, and possibly, costs, and the need to wait until the stock of better used vehicles in the UK and Japanese markets builds, it makes sense to wait, and to let normal market processes work. There is no reason to

believe that this waiting period would affect the stock of EVs in 2050. Indeed there is a risk to promoting the early adoption of what are immature technologies.

A second argument is that *Early adoption would promote technology leaning.* It is not explained what this technology learning is, but this appears to be a trivial point. In terms of the actual driving the transition from conventional cars to EVs is straightforward. Drivers will also have to learn how to manage the short range of EVs, but this will become less relevant as the range of EVs improves.

Treasury on subsidies

A report by Treasury is cited. Treasury argues that the Road User Charge subsidy for EVs is poorly targeted. EVs use the roads so it is appropriate that they pay the tax. Instead Treasury recommends a price subsidy that directly targets the price differential between EVs and ICEs It is difficult to understand the logic here. EV buyers benefit from their purchase, so there is no obvious reason why a driver should be subsidised just because they have chosen a more expensive vehicle.

The health cost of air pollution from transport emissions

CC has usefully translated aggregate estimates of the health costs of emissions into per litre costs. Their starting point was two studies of the health costs of transport emissions in New Zealand:

Updated Health and Air Pollution in New Zealand Study", March 2012. This study estimated the human health costs of transport emissions to be $950m per year. Surface Transport Costs and Charges Study, March 2005. This study estimated the human health costs of transport emissions in 2001/2 to be $600m per year.

If both estimates are updated to a 'present value', taking into account increases in population and CPI since the estimates were calculated, this gives rise to a 2015/16 estimate of $1.1bn and $1.3bn, respectively. For the purposes of this study, a central estimate of $1.2bn/year is used. This cost has been simply apportioned between petrol and diesel vehicles in proportion to their relative emissions of PM_{10}. According to Ministry of Transport data on median PM_{10} emissions from light vehicles in Auckland, diesel vehicles emit approx. 6.5 times more PM_{10} than petrol vehicles.

Using this factor, and reported land transport diesel and petrol consumption for 2015, this gives rise to a health cost of 7 c/litre for petrol, and 44 c/l for diesel.

The CC approach does not adjust for motor vehicles emissions costs due to heavy

vehicles, and so overstates the light vehicle costs. More importantly, there are some serious issues with the assumptions in the Health and Air Pollution study, which, in our view, potentially very substantially overstates the social cost of air pollution. This is a complicated issue, which will be the subject of a forthcoming paper, but two important issues are straightforward enough to be presented here. The first issue relates to the social costs of a premature death.

Almost all of the social costs in the Health and Air Pollution study relate to premature deaths.

These deaths are heavily concentrated amongst the elderly.

It is assumed that the social cost of a death (taken from the road fatality social cost estimate) is not a function of age. That is, avoiding the premature death of an elderly person who might otherwise have lived for, say another three years, has the same social value as avoiding the premature death of a 15 year old, who would otherwise have lived for another 70 years. This is not a judgment that we, and we believe most New Zealanders, would share. If the methodology were adjusted to a number of life years saved basis, then the estimate of the social cost of air pollution would fall by perhaps 80 percent.

Second, the New Zealand study appears to substantially overstate the number of premature deaths due to air pollution. Their estimate was 2,300 per year. A recent World Health Organisation report's[7] estimate for New Zealand is 20.

Our conclusion is that social costs of air pollution have been exaggerated and reducing the costs caused by vehicles is too trivial a 'co-benefit' to warrant consideration. Even if it were more material, a tax of a cent or two on fuel would address the issue.

Conclusion

The Commission has not made a case for the introduction of emission standards for imported vehicles and the introduction of a fee-bate scheme. There is no evidence of material dysfunction in the car market that would warrant intervention, or of material external costs that can be mitigated by these direct interventions. The proposals are regressive. Poorer car owners will have their access to affordable

[7] WHO 2016 Ambient Air Pollution: A global assessment of exposure and burden of disease

vehicles reduced, and they will be taxed to subsidise middle class and corporate virtue signalers.