

# Electric vehicles: promoting improvements in transport

Barry Barton, University of Waikato, and

Peter Schütte, of BBG und Partner, Rechtsanwälte, Germany.

Electric vehicles are attracting a lot of interest as a desirable alternative to conventional internal combustion vehicles. What adjustments can we make to legal and policy settings to encourage their entry into the New Zealand vehicle fleet? This article draws on a growing base of international research about policies in different countries for electric vehicles (EVs, ie passenger on-road cars that derive all or some of their power from the electricity grid). It shows that EV policy cannot be made in isolation from policy concerning the internal combustion engine vehicles (ICVs) of the conventional vehicle fleet. EV policy measures should not labour against a head wind produced by a lack of policy pressure on the adverse effects of ICVs, and we should put at least as much effort into improving the quality of the ICVs that we use as we do into EVs. The high capital cost of EVs cannot be ignored by policymakers seeking to increase their uptake. An innovative policy called a 'feebate' would suit New Zealand well, accompanied by measures to improve public understanding of EVs, improvements to the Emissions Trading Scheme, and legislation that would promote policy clarity and make it easier to develop a network of public charging stations.

## 1 THE POLICY RATIONALE FOR ENCOURAGING ELECTRIC VEHICLES

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The first public policy rationale for action on EVs is climate change. After the UNFCCC agreement in Paris in December 2015, New Zealand is looking for ways to deliver reductions in the emission of greenhouse gases (GHGs). It cannot overlook transport, because it is one of the country's fastest-growing contributors to GHGs; between 1990 and 2013 its emissions went up 69.4 per cent compared to the increase in total emissions over that time of 21.4 per cent: Ministry for the Environment, *New Zealand's Greenhouse Gas Inventory 1990-2013*

(2015) at 70. Transport fuels are in the Emissions Trading Scheme (ETS), but for each litre of fuel sold, the ETS charge is only about 0.6 cents per litre. This is remarkably little and probably exerts no price pressure at all on fuel choices or vehicle choices.

Secondly, vehicle efficiency as to GHG emissions is directly linked to energy efficiency which reduces energy costs and reduces the adverse effects of energy supply activities and infrastructure. Petroleum is New Zealand's largest import, and is notorious for its price volatility. From an economic point of view it is advantageous to reduce risk and to protect oneself against the combination of a sinking New Zealand dollar and an escalating oil price – an entirely foreseeable combination.

The third way that EVs are better than ICVs is that they produce no air pollution from fuel combustion. Pollution from on-road vehicles in New Zealand causes premature mortality, extra hospital admissions, and restricted activity, with an estimated total social cost of \$942 million per year: G Kuschel et al., *Updated Health and Air Pollution in New Zealand Study*, Vol 1: Summary Report (2012) pp iv-v. Traffic noise is a related harm. The Land Transport Rule: Vehicle Exhaust Emissions 2007, under the Land Transport Act 1988, regulates vehicle pollution. The present policy is to follow the Australian Design Rules, which in turn follow the European Union, with a lag of four or five years.

Overall, we see here that there are clear public policy rationales for action to encourage EVs in New Zealand. A new study from the Energy Efficiency and Conservation Authority confirms that EVs have significant whole-of-life environmental advantages over ICVs, including GHG emissions and pollution, without any special difficulties in respect of resource depletion: Arup and Verdant Vision, *Life Cycle Assessment of Electric Vehicles* (2015).

Renewable energy sources dominate New Zealand's electricity supply; their proportion is increasing, approaching 80 per cent. This makes a switch of transport fuel from petroleum to electricity an attractive one. The electricity system can manage EVs: even if they were 80 per cent of the vehicles entering the fleet by 2040, EV charging is likely to be no more than 8 per cent of total electricity demand: New Zealand Centre for Advanced Engineering, *Electric Vehicles: Impacts on New Zealand's Electricity System* (Technical Report, 2010). More than 90 per cent of light vehicles in New Zealand are parked at home overnight, many of them in a garage or carport with a single-phase outlet that allows 2 kW charging. Home-based EV charging times can be managed as interruptible load using smart chargers, smart meters, or ripple control. Fortunately most New Zealand electricity retailers are already offering time-of-use pricing plans, which may be enough to manage peak demand without regulation.

At the same time we must accept that EVs do not solve all problems. EVs are still motor vehicles. They need highway infrastructure and cause congestion, and promoting them will not reduce travel times or solve problems of urban form. They are not public transport, and they may perpetuate old transport policies and practices: D Rees, 'Could Electric Cars be Bad for the Environment?' (5 November 2014) blog post, [www.energycultures.org.nz](http://www.energycultures.org.nz). Nor are EVs likely to appear in the heavy vehicle fleet except for special purposes such as waste collection. Nonetheless, even though they are not the 'one big solution' to all transport issues, EVs have a role to play in a sustainable transport system.

EV sales are growing, but the numbers are still minute. In New Zealand, by August 2015 the light electric fleet had reached 773 vehicles, but that is still only one car in four and a half thousand: Ministry of Transport, *Monthly Light Vehicle Registrations, August 2015*. The picture is similar globally. Even if EV sales take off, they will be slow in changing the character of the vehicle fleet in New Zealand; the average vehicle age is 14 years: Ministry of Transport, *Annual Fleet Statistics 2014* at 13. So even if EVs are the coming thing, they have a long way to go.

The *New Zealand Energy Efficiency and Conservation Strategy 2011-2016* at 19 declares a target that by 2016 'The efficiency of light vehicles entering the fleet has further improved from 2010 levels' and that the Government will encourage the entry of alternative transport fuels and electric vehicles in the New Zealand market. This target is extraordinarily unambitious – even the slightest

improvement would meet the target – and the *Strategy* does not identify policy actions beyond mere encouragement. (A decision on a replacement *Strategy*, under the Energy Efficiency and Conservation Act 2000, is due this year.) More than mere encouragement is required.

## 2 THE MAIN OPTIONS

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Why is the uptake of EVs slow? The main barriers are that they are expensive; their benefits are not valued if the adverse effects of ICVs (GHGs, pollution, inefficiency) are not well enough controlled; their driving range, charging times, and charging infrastructure are concerns to prospective purchasers; and consumer awareness and acceptance is low. It is clear that an increased uptake of EVs will depend on real policy action. Let us consider the main options.

### 2.1 PRICE SUPPORT TO ADDRESS THE COST OF ELECTRIC VEHICLES

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The first and most obvious form of policy action is price support of some kind to tackle the fact that EVs are expensive to buy. Their prices are coming down, and the total cost of ownership over the lifetime of the vehicle is often less than that of an ICV. But the higher capital cost of EVs in comparison with ICVs is a significant deterrent. The size of the price differential is hard to put specific numbers on, because it is in motion, and because there are few models on the market to compare with. (For more details, see the authors' study *Electric Vehicle Policy: New Zealand in a Comparative Context* (2015) available [www.waikato.ac.nz/cerel](http://www.waikato.ac.nz/cerel).) A recent American study concludes that the decline in EV production costs is likely to occur gradually, and may not be sufficient by itself to ensure widespread adoption of EVs: National Research Council Committee on Overcoming Barriers to Electric-Vehicle Deployment, *Overcoming Barriers to Deployment of Plug-In Electric Vehicles* (2015) at 113. The Energy Efficiency and Conservation Authority has included EVs in a web tool that shows that their whole-of-life costs over time can be lower than for ICVs; but the up-front capital cost is still a deterrent to many purchasers.

The response of many governments internationally has been to institute schemes for subsidies, incentives or value support. They are regarded as important, if not essential, to produce a significant uptake of EVs. A British estimate is that value support of the order of £2,500 per EV is required for the period 2020-

2030: Element Energy, *Pathways to High Penetration of Electric Vehicles* (Report for Committee on Climate Change, 2013) at 124-127. To be effective, subsidies need to be large enough to make a difference, available immediately at the time of sale, and put in place for long enough to send a clear signal to automakers and importers: N Lutsey, *Transition to a Global Zero-Emission Vehicle Fleet: A Collaborative Agenda for Governments* (International Council on Clean Transportation [ICCT], 2015) at 23; National Research Council, Committee on Overcoming Barriers to Electric-Vehicle Deployment, *Overcoming Barriers to Deployment of Plug-In Electric Vehicles* (2015) at 119. In some countries the subsidies are massive; Norway offered €11,500 per battery EV (about 55 per cent of the vehicle base price), and the Netherlands €38,000 per plug-in hybrid EV (about 75 per cent). Unsurprisingly these actions produced rapid growth in the EV share of vehicle sales. The United States offers a federal income tax credit for purchasers of EVs, ranging between \$2,500 and \$7,500: 26 USC § 30D. The credit is not refundable, so it is little benefit to people who have low tax liabilities – an example of the shortcomings in social equity that can be part of subsidies. Germany offers tax reductions and exemptions but there is no real subsidy or direct aid for EV purchasers, (ss 3b and 9 para 2 of the federal motor vehicle tax law / Kraftfahrzeugsteuergesetz), which is thought to be the reason for the small uptake of EVs there. More surprisingly, in Sweden and the United Kingdom, with incentives of 35 per cent and 50 per cent of vehicle base price respectively, EV sales barely budged from zero. It appears therefore that fiscal incentives are effective and essential but not the only factor that influence EV market growth: Element Energy, above, at 127. Overall, policymakers have a good deal of evidence that the question of vehicle price cannot be ignored, and that price support measures are essential and effective.

In New Zealand, a moderate subsidy for EVs exists in the form of an exemption from road user charges, which lasts until 30 June 2020: Road User Charges (Exemption Period for Light Electric RUC Vehicles) Order 2012. Road user charges are normally paid by users of non-petrol vehicles such as diesel-engine vehicles in order to fund road building and maintenance. For a typical car driver driving 14,000 km in a year, the charge is \$812. The exemption may have its origins in a wish to avoid double-charging the users of plug-in hybrid EVs, who pay the fuel excise tax on the petrol that they buy. As a price incentive, this exemption from road user charges is a light one; it does not help with the up-front cost; and it fails to send a long-term signal. It is also a problem in exempting EV owners from something that they

can reasonably be expected to pay for – the construction and maintenance of the road system. When EV users reach significant numbers, this will need to be revisited: see K Jordan, ‘The Legal Framework for Energy Efficiency in Road Transport: A Critique of Legislation, Regulation, and Policy in New Zealand’ (LLM thesis, University of Waikato, 2013) at 97.

Taxation can also affect effective costs. One issue here is that the fringe benefit tax payable on benefits received by an employee is calculated for a vehicle on its cost price or market value: Income Tax Act 2007 Schedule 5. The tax will generally be higher for EVs; it does not take into account the lower operating cost of an EV. Reform seems desirable.

The New Zealand policy environment is cool to subsidies. However the span of evidence internationally is that price is important, and that policy measures to address price barriers are orthodox and successful. The importance of vehicle price is an uncomfortable truth for New Zealand EV policymaking. If vehicle prices are not to be supported by subsidies and incentives, then perhaps all the more effort is needed with other policy measures.

## 2.2 EFFICIENCY STANDARDS: FUEL EFFICIENCY OR GHG EMISSIONS REGULATION

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The second kind of policy option is fuel efficiency standards or GHG emissions standards for motor vehicles. These standards, which now cover motor vehicle sales in most countries, address market failures in relation to energy efficiency and climate change. Their significance for EVs is that they put pressure on the adverse effects of ICVs, and that is important for the relative attractiveness of EVs. But they are also important for the quality of the vehicle fleet as a whole. Unfortunately New Zealand has not put policy effort into this kind of measure.

Some of the oldest efficiency standards are the American ‘CAFE’ standards – corporate average fuel efficiency standards – introduced to tackle air pollution and increase energy self-sufficiency. The standards under the Energy Policy Conservation Act initially covered passenger cars only, but minivans, pickup trucks and sports utility vehicles were included in 2009. After much struggle, including the proceedings in *Massachusetts v Environmental Protection Agency*, 549 US 497 (2007), the system was extended to GHG emissions: J Freeman, ‘The Obama Administration’s National Auto Policy:

Lessons from the “Car Deal” (2011) 35 *Harvard Env L Rev* 343. In 2012 a national standard was agreed to simplify the carmakers’ duties, but with progressively more ambitious targets: OECD, *Climate Change Mitigation Policies and Progress* (2015) at 76. CAFE standards have worked well, reducing dependence on foreign oil, and mitigating local air pollution: 42 USC § 32902 et seq, 49 CFR § 501 et seq; J S Martel and K K White, ‘Motor Vehicles and Transportation’ at at 325 in M B Gerrard, ed, *Law of Clean Energy* (American Bar Association, 2011).

In the European Union, the equivalent is the CO<sub>2</sub> standards that set an overall fleet average target for 2015 of 130 g/km, and accelerated reductions considerably; in 2006 the average was about 160 g/km. (International Council on Clean Transportation, ‘EU CO<sub>2</sub> Emission Standards for Passenger Cars and Light-Commercial Vehicles’ (Policy Update January 2014); Regulation (EC) 443/2009 setting emission performance standards for new passenger cars as part of the Community’s integrated approach to reduce CO<sub>2</sub> emissions from light-duty vehicles, [2009] OJ L140/1, as amended by Regulation (EU) 333/2014 to define the modalities for reaching the 2020 target to reduce CO<sub>2</sub> emissions from new passenger cars, [2014] OJ L103/15.) It is expected that the standards taking effect in 2020 will produce a 25 per cent reduction in fuel consumption, and at a negative abatement cost for CO<sub>2</sub>; that is, the fuel savings will actually be larger than the cost of compliance, resulting in net savings of between €80 and €295 per ton of CO<sub>2</sub> avoided. Energy efficiency can often produce massive benefits even before taking climate change into account. The Volkswagen scandal, which concerned nitrogen oxides emissions from diesels, is likely to result in tighter testing to reduce non-compliance and to reduce the more general gap that has opened up between company-reported results under controlled test conditions and under actual on-road conditions.

Globally, fuel efficiency standards are regarded as very cost-effective in putting pressure on ICVs, and are regarded as important to the deployment of EVs: D. Kodjak, *Policies to Reduce Fuel Consumption, Air Pollution, and Carbon Emissions from Vehicles in G20 Nations* (ICCT, 2015) at 19. They are now the global norm, and cover more than 80 per cent of the sales of passenger cars: J D Miller and C Façanha, *The State of Clean Transport Policy: A 2014 Synthesis of Vehicle and Fuel Policy Developments* (ICCT, 2014) pp 22-23, 50-52. (The US, Canada, China and Japan also have standards for heavy duty vehicles.) They have improved new vehicle fuel efficiency by 20 per cent in OECD countries between 2000 and 2010.

However, Australia and New Zealand do not have fuel efficiency standards, and are outliers, not only behind the EU and North America, but also behind Brazil, India, and China. Even Saudi Arabia is adopting a CAFE standard. In New Zealand, a fuel economy standard was considered in 2008, but it was dropped in August 2009 after the change of government. The reasons given the Cabinet papers were that the standard would be complex, that its costs would outweigh its benefits, that transport was in the ETS, and that there was a voluntary trend towards more efficient vehicles: Office of the Minister of Transport, ‘Vehicle Fuel Economy Standard - Report Back’ Report to Cabinet Economic Growth and Infrastructure Committee, August 2009; Cabinet Economic Growth and Infrastructure Committee, Minute of Decision, 19 August 2009, EGI min (09) 17/13.

In fact, the evidence from abroad is that the costs of fuel efficiency standards do not outweigh the benefits; the gain in fuel efficiency is economically worthwhile even without the GHG abatement. As for the ETS, carbon pricing as a policy on its own is rarely enough to overcome the barriers to cost-effective energy use actions: L. Ryan, S. Moarif, E. Levina, R. Baron, *Energy Efficiency Policy and Carbon Pricing* (IEA, 2011). In any event the New Zealand ETS has a long way to go with its price pressure on ICVs of a mere \$0.006 per litre.

Nor can New Zealand rely on other countries’ standards. In most countries, those standards regulate the average of each company’s fleet; they are not absolute prohibitions of low-efficiency vehicles. In New Zealand a company can sell as many low-efficiency cars as it likes, without having to meet an average standard. However, the complexity of efficiency standards may be greater in New Zealand in comparison with other countries, because many of the motor vehicles coming into the country are used ones, imported by large numbers of small importer companies. The figures for light vehicle registrations (when a vehicle is first brought on road in New Zealand) show that slightly more than half of them are used vehicles, almost all imports. For light passenger vehicles (cars and SUVs) the used vehicles are about 60 per cent of the total: Ministry of Transport, *Monthly Light Vehicle Registrations August 2015* at 2. The consequence for lawmaking is that averaging may be impracticable if numerous small companies have to average the fuel efficiency performance of the mere handfuls of vehicles that they import.

The fuel economy or efficiency standards that have taken hold worldwide put regulatory pressure on the negative external effects of the ICV fleet, which makes EVs more a more attractive option for suppliers and for purchasers. GHG emissions legislation is thought to be ‘decisive’ and a ‘key driver’ for the uptake of EVs in Britain: Element Energy, above, at 81 and 124-27. In the United States, the Congressional Budget Office came to the startling conclusion that the federal tax credits for the purchase of EVs may have zero effect because of the pressure that CAFE standards put on vehicle suppliers: Congressional Budget Office, *Effects of Federal Tax Credits for the Purchase of Electric Vehicles* (September 2012) at 12. This is an important insight about the value of fuel efficiency standards. Very few countries are trying to promote EVs without also using efficiency standards to shape the composition of the vehicle fleet. If Australia and New Zealand try to promote EVs without action on fuel efficiency, they will be doing something quite different from everyone else, and it may not work. EV policy-making cannot overlook efficiency standards.

### 2.3 FEEBATES

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What seems ideal for New Zealand, given the absence of fuel efficiency standards and the political unattractiveness of subsidies, is a feebate system. It is a very promising means of bringing about change in the motor vehicle fleet, and promoting EVs in particular. In a feebate or bonus / malus system, each model of vehicle is rated for its GHG emissions or efficiency performance, so that better vehicles get rebates and worse ones are assessed fees: see J. German and D. Meszler, *Best Practices for Feebate Program Design and Implementation* (ICCT, 2010). A feebate can be applied to the initial import or manufacture of a vehicle on a one-off basis, or can be part of an annual licence. A true feebate is revenue-neutral and self-financing; fees received from above the ‘pivot point’ are balanced by the rebates paid below it. (The pivot must be reset periodically as technology and behaviour change.) A feebate can therefore be distinguished from a subsidy. Furthermore, a feebate is technology-neutral; it influences the purchase of ICVs and EVs alike. EVs can have feebate ratings that estimate the emissions produced indirectly from the use of electricity, and in New Zealand they would be at the extreme favourable end of the scale. A feebate system is likely to be attractive in terms of social equity; it is less likely than most systems to put good quality vehicles out of the reach of poor families.

The best example of a feebate scheme is the bonus-malus system that applies to initial vehicle registration in France from 2008. The fee side ranges from €150 to €8,000, and the rebate from €150 to €6,300. EVs qualify for the highest bonus. The bonus-malus scheme produced an immediate reduction of 6 per cent in CO<sub>2</sub> emissions in new cars, almost twice that in the rest of the EU, and significant reductions have continued.

In New Zealand, a feebate solves many of the problems that have been identified in international research. It puts in place a form of fuel efficiency standard for the whole vehicle fleet, and provides price support for EVs. It makes it unnecessary to pursue less effective and less attractive regulatory options. It suits the large number of small importers bringing vehicles into New Zealand. Its primary effect is on the decisions of importers about the all-up cost of bringing different kinds of cars into the country. The size of benefit or charge per unit of emissions would be set so as to provide a real influence on the selection of vehicles in the New Zealand market, and the pivot point would be re-set regularly to produce revenue neutrality. It would be implemented by changes to the Land Transport (Motor Vehicle Registration and Licensing) Regulations 2011, with changes to the authorizing provisions of the Land Transport Act 1998 probably required as well.

### 2.4 CHARGING FACILITIES

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Some countries have been promoting EVs with measures to support the development of EV charging facilities that can give a rapid charge. There is a need for regulation or standard-setting of charger plug and communication protocols. However many commuters will be able to rely on their ordinary garage electrical outlets for overnight charging, as we have noted. It is likely that private enterprise can lead the introduction of the new technology, and meet the needs of vehicle owners if serious numbers of EVs start to appear. There is an agenda for law reform to authorize standard-setting for chargers, and to ensure that local government and other road controlling authorities have the necessary direction and powers to manage and promote EV charging facilities. Recent German legislation provides an example.

### 2.5 PUBLIC AWARENESS AND ANCILLARY REGULATION

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Research shows that a number of factors contribute to consumer uncertainty and doubt about EVs. A recent study of public perceptions in New Zealand shows

that the chief barriers in the minds of potential purchasers are the upfront costs and the range and charging time of EVs: R. Ford, J. Stephenson, M. Scott, J. Williams, D. Rees and B Wooliscroft, *Keen on EVs: Kiwi Perspectives on Electric Vehicles, and Opportunities to Stimulate Uptake* (2015, Centre for Sustainability, University of Otago). However, the study also shows that many potential purchasers in New Zealand feel positive about driving an EV, more than in the United Kingdom.

Educational and information measures are therefore essential alongside price and fuel efficiency measures. In Norway, special number plates improve public awareness, identifying EVs and giving them preferential rights to bus lanes, parking, road charges and ferries. Such benefits, mainly non-financial ‘perks,’ are likely to encourage EVs, and do not impose obvious fiscal costs. They are measures that a municipality can implement. An existing public awareness measure applying to all vehicles in New Zealand is the Energy Efficiency (Vehicle Fuel Economy Labelling) Regulations 2007.

## 2.6 STATUTE, MANDATE, AND INSTITUTIONS

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Finally, it should be noted that legislation – a statute – can play a vital part in encouraging EVs. A statute crystallizes social norms and expectations in ways that are important even if it does not greatly change the law in the sense of rights and duties. A statute can also confer a mandate on an agency that is then clearly designated as the champion for the policy. Statute can also regularize the process for making strategies or policies. At present, the main instrument is the Government Policy Statement on Land Transport (2015) under the Land Transport Management Act 2003, but its primary focus is funding and investment in roads and public transport, without entering into questions about EVs or the character of the vehicle fleet. The making of national land transport strategies under a previous version of the Act proved to be difficult: Jordan at 37. Giving policy for EVs a statutory form would confer on it a degree of clarity, pervasiveness, and permanence that it would not otherwise have.

Legislation can provide clarification even where changes to the law may not be absolutely necessary. Statutory amendments seem desirable to clarify the functions and powers of road controlling authorities, and the setting of standards for charging equipment. Fuel efficiency standards are already possible under the Energy Efficiency and Conservation Act 2000, but fleet average standards would require new

authority. A feebate scheme probably requires an amendment of the Land Transport Act 1998.

## 3 POLICY FOR NEW ZEALAND

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It is clear that in making EV policy, conventional ICVs cannot be put to one side; good policies should apply to the entire vehicle fleet. EV policy necessarily includes ICV policy; promoting EVs shines a light on our management of the adverse effects of ICVs. This is particularly so where, as in New Zealand, there are none of the fuel efficiency requirements that are the global norm, and where vehicle air pollution is not as strictly controlled as in many countries.

Indeed, EV measures cannot be considered in isolation. Interest in EVs does not occur in a vacuum; it arises in comparison with ICVs, by asking how EVs are better for individuals and society than ICVs. There would be no need to encourage EVs if they were the only means of transport available apart from horses and bicycles. The EV policy exercise therefore requires accurate comparisons that include a full range of social costs, and in particular the non-internalized costs of pollution, climate and inefficiency.

Policy for EVs needs to be part of an overall mobility strategy that takes an ‘avoid, shift, improve’ approach that includes urban and rural settlement form, public transport, enhanced pedestrian and cycle access, and emerging forms of ‘mobility services.’ EV policy in California is part of a comprehensive energy policy framework the centrepiece of which is the *Integrated Energy Policy Report* (a statutory responsibility of the California Energy Commission) and the California Global Warming Solutions Act of 2006, California Health and Safety Code § 38500 et al (AB 32, 2006), 17 CCR § 95801. Transportation fuels were brought under that Act in 2015. Similarly Germany has a *National Electromobility Development Plan* which is linked to the *Energy Concept* policy statement of 2010.

The Minister of Energy and Transport, Simon Bridges, is enthusiastic about EVs, and says a policy package is on the way, with an emphasis on coordinating charging points and improving public awareness, and with a warning not to expect subsidies or government funding of charging points. (S Bridges, ‘Opportunities to Cut NZ’s Road Transport Emissions’ press release, 21 October 2015; ‘Electric Vehicles Must Make Own Way in NZ, says Government’ 23 October 2015, [www.stuff.co.nz](http://www.stuff.co.nz).)

However, the international experience and research show that vehicle price cannot be ignored, nor can the lack of fuel efficiency standards. By way of summary, we can identify the suite of mutually-supporting policy measures that would be effective and suitable in New Zealand conditions is as follows.

- (i) A feebate scheme, applying to the whole of the light motor vehicle fleet, on the occasion of the initial registration of a vehicle in New Zealand, providing a price benefit or charge on the basis of the CO<sub>2</sub> emissions of the vehicle.
- (ii) Awareness measures to improve public awareness, perceptions, and knowledge of EVs as a viable option when buying a vehicle. The measures need to be carefully directed at different audiences, and designed in the light of research on perceptions and behaviour.
- (iii) Measures to encourage the growth of a public charging infrastructure; standard-setting for charger plugs and communication protocols, and powers for road controlling authorities to manage street activity.
- (iv) Legislation to provide clarity and permanence of policy intention, improving the investment climate, removing barriers, and clarifying points of uncertainty.
- (v) Price pressure on the use of hydrocarbon fuels through the ETS, at a level high enough to bring about changes in vehicle use.

This leaves some questions for the future, such as the fringe benefit tax and the contribution that EVs should make towards road construction and maintenance. But the listed measures would encourage EVs, tackling the question of price, but without resorting to subsidies. These measures would promote the energy efficiency of the motor vehicle fleet as a whole. The results would be reductions in GHG emissions from the sector where they are growing fastest, reductions in air pollution, protection from fluctuating oil prices, and improved economic performance.