Submission by

to

Energy Efficiency & Conservation Authority

on the

Improving the performance of electric vehicle chargers green paper

5 September 2022

IMPROVING THE PERFORMANCE OF ELECTRIC VEHICLE CHARGERS GREEN PAPER – SUBMISSION BY BUSINESSNZ ENERGY COUNCIL

INTRODUCTION

1. BusinessNZ Energy Council[1] (BEC) welcomes the opportunity to provide feedback on the Energy Efficiency and Conservation Authority's Green Paper: *Improving the performance of electric vehicle chargers green paper* (referred to as 'the paper').

2. The paper outlines ways the energy performance of private electric vehicle chargers could potentially be improved. The paper identifies several interventions, most notably the introduction of smart charging standards.

3. In response to this paper, our submission explores the potential benefits and trade-offs associated with smart charging standards.

4. Overall, we think smart chargers are one important tool to help improve grid stability and reliability as we continue to electrify New Zealand's light vehicle fleet.

5. However, any possible regulations including standards must not be overly prescriptive. We voice the need for regulations to be simple and flexible. Yet such standards are not a 'silver bullet' in flattening peak demand and important trade-offs apply, such as losses to consumer freedom and additional barriers to EV uptake.

6. BEC Members have been consulted in preparing this submission. Given the diversity of our membership, some members have specific perspectives they wish to address in detail. We have encouraged our members to make their own submissions raising potential opportunities and concerns.

[1] The BusinessNZ Energy Council (BEC) is a group of New Zealand's peak energy sector organisations taking a leading role in creating a sustainable energy future. BEC is a division of BusinessNZ, New Zealand's largest business advocacy group. BEC is the New Zealand member committee of the World Energy Council (WEC). BEC members are a cross-section of leading energy sector businesses, government, and research organisations. Together with its members BEC is shaping the energy agenda for New Zealand.

GENERAL COMMENTS

TIMES-NZ Scenarios

7. Our TIMES-NZ model[2] shows that electrification – including the demand of EVs – could double network capacity requirements by 2050, if demand is not managed. EVs as a portion of all new vehicle sales have soared over the past year. The total number of EVs are expected to grow significantly over the next two decades – creating meaningful reductions in gross emissions from transportation.

8. Collaborating with our stakeholders across the energy sector, BEC together with EECA has developed a New Zealand specific model – TIMES-NZ – to explore two possible future energy scenarios: Kea and Tui. Under Kea, climate change is priortitsed as the most pressing issue facing New Zealand. Under Tui, climate change is one pressing issue among others.

Figure 1: Kea – Total electricity generation (PJ)

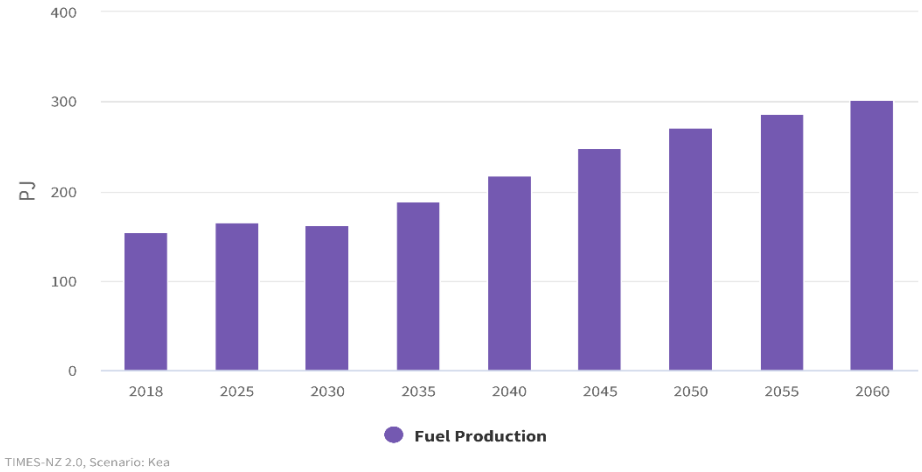
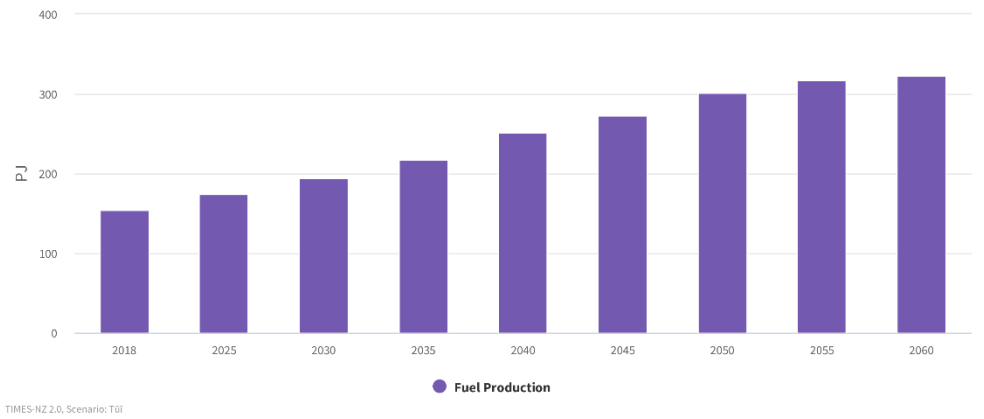


Figure 2: Tui – Total electricity generation (PJ)



9. In Tui, generation expands 108% by 2060. In Kea, generation expands 95% over the same period. Tui assumes charging technology remains basic, with motorists returning

[2] https://times.bec.org.nz/

home in the evening to plug in their EV using 'dumb' chargers. This increases the generation required to meet peak demand. Kea assumes a steady shift towards smart charging technology. Peak demand is flattened using controllable chargers. This reduces the need for building additional electricity infrastructure to meet the same number of BEVs.

10. Additional capacity requirements have been identified in other models. A scenario outlined in Transpower's Whakamana i Te Mauri report[3] shows electricity demand could be 90% higher in 2050 than in 2019, with 43% coming from vehicle electrification.

11. BEC members voice concern that EVs will increasingly place significant strain upon load balancing at home and upon the electricity grid. Furthermore, as the portion of BEVs with charging capabilities above 3.7kW rapidly increase in the future, the possibility of EV's overloading New Zealand's electricity system is increasingly likely if demand is not managed.

12. However, if standards are seriously considered by EECA, we believe that standards should be simple and limited.

13. As fast charging technology improves and becomes cheaper, the portion of EVs with such technology will increase in the future. Yet the distribution and electrical network was not designed to handle the relatively large electrical loads that come with widespread EV use. Without standards, chargers with basic characteristics could continue to be the most dominant charger in New Zealand.

14. Studies show that EV motorists plug in their charger once they return home, namely during peak-hours. Under the status quo scenario, with most EV owners using basic chargers without controllable and dynamic technology, the likelihood of consumers switching to off-peak hours due to basic price signals is possibly limited. Instead, chargers could be managed and controlled, automatically flexing depending on capacity, easing grid congestion, and reducing the likelihood of overload.

Smart charging standards: the benefits

15. Overall, we believe the widespread use of smart chargers will enhance New Zealand's energy trilemma: security, affordability, and sustainability. In the following, we voiced the benefits of smart charging standards around five main points, however, mention clear costs with intervening:

Flattening peak demand

16. Being dynamic, smart chargers flatten load, avoiding the expenditure needed to meet peak demand, improving the security and affordability of the entire power system. Smart chargers reduce the need for additional transmission, distribution, and generation infrastructure. The chargers' controllable technology enables moving EV charging to off-peak periods, reducing peak demand. In doing so, the need for significant infrastructure improvements.

[3] https://www.transpower.co.nz/resources/whakamana-i-te-mauri-hiko-empowering-our-energy-future

17. Data provided by smart chargers could aide long-term network planning, identifying where improvements need to be made, and to what extent such improvements are necessary. This strengthens grid stability in the medium to long term.

Security and reliability

18. Overall, BEC agrees that standards need to ensure relevant energy and location data is transmitted to electricity network operator to better manage the grid. Smart chargers will mean EVs can 'talk back to the grid.' This tool is key to helping electricity network operators flatten peak demand by delaying charging to off-peak hours. As well as modulating charging speed depending on load and the availability of renewable generation.

19. For EVs to be able to respond to real-time signals for system security, they need to have smart functionality. Smart chargers with open communication protocols provide valuable information to electricity network operators, allowing them to observe what is connected to the grid and where it is located, and crucially, its impacts upon the grid. Open protocols allow chargers to be used dynamically: changing depending upon aggregate charging throughout the network, the grid's capacity, and the availability of renewable generation.

20. Observing the chargers' power levels, the time of charging, and the location of charging will enhance the security of New Zealand's electricity system. For instance, networks operators will know the areas with high EV concentration and therefore be able to manage the charging externally, mitigating the impacts upon low voltage networks.

21. With the growing uptake of Decentralised Energy Resources (DER), including EV and connected charging infrastructure, more data and access to data will be required to increase visibility. In the future, data will need to be more granular to observe the increasingly dynamic power system in the future. Open communication protocols ensure data is accessible and transparent.

22. Moreover, to ensure the emergence of competitive markets for flexibility services and DER aggregators, monitoring and receiving accurate data about voltage, frequency, and electrical power flow are crucial for a reliable power supply. This will help better decision-making when balancing supply and demand, namely asset overloading and voltage control. As a result, ensuring New Zealand's power system operates within secure limits. Standards that provide the capabilities to modulate charging speed up and down – rather than just on and off – will provide network stability.

23. Additionally, smart chargers protect household networks. Most household mains are 60amps. EVs place considerable load upon households' electricity network. Smart charges can dynamically modulate charging speed automatically depending upon load within the household – for instance, while using heating and cooking appliances – removing the risk of overloading the household fuse. Standards could reduce the need for wiring upgrades within New Zealand homes. Smart chargers turn off or down if voltage frequency drops below a pre-set threshold and restores when the frequency or voltage recovers.

Sustainability

24. Smart chargers that could help shifting charging to off-peak hours will not only flatten peak demand, but also reduce the need of building additional thermal peaking plants. This will reduce emissions and costs to consumers.

Energy storage

25. Smart chargers will play an important role in developing flexibility services. They aide the potential of using EVs as DER. Depending on the model, EV batteries can store 5 – 40KWh of electricity. Households could use this stored electricity to power other appliances (V2H) or return the electricity back to the grid (VG2). With VH2, at the aggregate level, these batteries together could act like a virtual power plant, relieving generation constraints during periods of dry year risk.

26. Without the widespread use of smart controllable chargers, the development of using EV batteries as capacity would be stunted. At a systems perspective, the gains of a VH2 model would be lost. Overall, smart chargers are important to progress of VH2 models in the future.

Affordability

27. Overtime, smart chargers save consumers costs that would otherwise be spent on their electricity bills, meaning consumers would benefit in the medium term. Managed smart chargers that shift charging to off-peak hours will reduce the price consumers pay for electricity. Price is among the most influential factor in purchasing an electric vehicle. All things being equal, lower charging costs will balance the price difference between EVs and ICEs, improving the attractiveness of switching to an electric vehicle.

28. As mentioned, smart chargers reduce the likelihood of networks disturbances and failures. Demand responses like smart chargers ensures New Zealand's grid is not strained. Consumers benefit from a power system that is secure and reliable.

29. Our TIMES-NZ model shows electrification – driven by the demand for EVs – could double network capacity by 2050, if demand is not managed. Additional infrastructure and significant improvements to New Zealand's electricity network would be needed.

30. According to a report by KPMG[4], growing transmission, and distribution costs – driven mostly by peak demand – could cost $6.1 billion by 2050. This cost would fall upon consumers with higher prices regardless of whether they own an EV. Smart chargers would flatten peak demand, improve network utilisation, and reduce the need to build new electricity capacity. This would flow through to consumers in lower electricity prices.

31. However, it is important to understand that initially consumer would face higher prices when purchasing a charger for their EV. Nevertheless, consumers could pay less for electricity due to more charging flexibility. In other words, despite higher initial capital costs of a smart charger, the chargers' smartness delivers a net savings. Vector and Frontier Economics estimates that a smart residential EV charger adds around $300NZD in net value per annum through avoided costs across the energy system.[5]

[4] https://www.eeca.govt.nz/assets/EECA-Resources/Research-papers-guides/EV-Charging-NZ.pdf

[5] https://blob-static.vector.co.nz/blob/vector/media/vector2021/vector_transitioning_to_low-emissions_climate-resilient_future_submission.pdf

Smart charging standards: the trade-offs

32. Smart charging has significant potential, providing meaningful improvements to New Zealand's power system. However, standards will also come with some trade-offs that need to be considered. The following provides several side-effects that must be thoughtfully considered.

Barrier to EV uptake

33. Despite smart chargers saving consumers in the medium term, standards could create extra barrier to EV adoption as they increase the upfront capital cost of an EV.

34. Smart chargers vary in price, depending on several characteristics. The average smart charger costs are around $600 to $800 more than the average basic non-smart charger. Standards would introduce a hard ban on the sale of basic non-smart chargers would increase EV prices and decreasing the attractiveness of purchasing an EV. This could persuade some to purchase internal combustion engine vehicles instead.

35. Subsequently counteracting the purpose of the Clean Car Discount introduced in 2021 aimed at reducing the price of EVs. Putting aside the efficiency and equity concerns caused by the Clean Car Discount, a smart charging standard would reduce the effectiveness of such discount. Together, both policies are inconsistent: one policy encourages uptake, the other provides a barrier.

Costs of compulsion

36. EECA should ensure that regulations are not prescriptive. Regulations that are prescriptive may limit available technology, considering New Zealand is a technology 'taker.' Potential regulations will also come with considerable losses to dynamic efficiency and significant impacts upon innovation in this highly dynamic area of technological change. If standards are introduced, they should be limited, not rigorous and onerous. EECA should follow a light-touch approach.

37. Consumer choice is important. Any potential standards should be pragmatic, ensuring consumer choice is not largely sacrificed in the name of efficiency. Yet, such freedom and cost differentiation between 'dumb' and 'smart' chargers falls upon the network as a public externality, with higher electricity prices for consumers who may not own an EV.

38. Consumers' data privacy needs to be considered. Private information could be misused or possibly fall into the purview of unauthorised actors, most notably hackers. Consumers need reassurance that any potential information collected by operators is protected. Despite protocols that provide cyber security for smart charger users, consumers may not consent to operators controlling their charger externally. Currently, we do not know the portion of potential EV buyers or current EV owners who would inevitably consent to operators having the capability to control their smart charger externally. To the knowledge of BEC, no substantive surveys have been done to observe consumer hesitancy of controllable chargers. There is a possibility a large segment may not consent to open access protocols outlined in this paper. In this case, at a network level, this would significantly limit the benefits of smart chargers.

Counterfactual and caveats

39. Assuming no action is taken, smart chargers will continue to be developed dramatically overtime. Technological development will mean better chargers at lower prices. This could provide sufficient signals for consumers to switch and purchase smart chargers without intervention. The technology of both EVs and smart chargers have developed significantly over the past 10 years. Predicting what will happen with smart charging technology in the next 10 to 20 years is difficult, if not impossible (consider the remarkable development of smart phones since 2010). Technology develops fast, its highly unpredictable and dynamic. The counterfactual ensures dynamic efficiency, while protecting consumer freedom to purchase the chargers they want.

40. Price signals should not be underestimated as a tool to shift charging behaviour. Several retailers have introduced tailored plans that offer lower prices for off-peak electricity usage. These plans have been successful in reducing load.

41. The uptake of EVs might be slower in the short term than anticipated due to the rapid cost increases in manufacturing EVs. According to the IEA, from the start of January 2021 to May 2022, the price of lithium has increased sevenfold, with cobalt and nickel prices both doubling.[6] EECA should consider these contextual changes if standards are to be adopted.

42. There is a possibility that network strain caused by EVs might be less than anticipated. Models depicting significant EV uptake are only projections based on several assumptions. Such assumptions could be wrong or potentially less impactful than anticipated. For instance, the uptake of PHEVs over this decade as a transition solution might be higher than current outlooks forecast. PHEVs usually have a maximum AC charging capacity of 3.7kW, with motorists' trickle charging their vehicle overnight. Depending on the distance traveled, the charge is sufficient for 2-3 days. The load of PHEVs fit within the main capacity of most homes, while placing less strain on the grid compared to EVs. PHEVs provide sizeable emission reductions without the need for additional network capacity.

Beyond standards

43. The question now turns to what complimentary measures could be implemented that encourage the uptake of smart charging technology.

Information

44. Information that compares efficiency between different products, in this case smart chargers, is valuable. Providing information on EECAs website related to smart chargers would educate some consumers. This is a low-cost option and falls directly within the mandate of EECA. Information about smart chargers could influence the decision making of consumers, encouraging the purchase of a smart charger. However, this assumes that consumers make decisions based on efficiency, not price, convenience, privacy, and other factors.

[6] https://iea.blob.core.windows.net/assets/4eb8c252-76b1-4710-8f5e-867e751c8dda/GlobalSupplyChainsofEVBatteries.pdf

Incentives

45. We suggest incentives should be given by industry, rather than relying on further EV subsidies, in this case smart charger subsidies. Market solutions can encourage incentives. Meridian and Mercury already provide incentives through dedicated EV plans, with consumers paying less for charging outside of peak demand hours.

46. Subsidising smart chargers create significant equity concerns. EV purchasers are predominately high-income households. Subsidies for smart chargers would disproportionately benefit these households the most. Consumers who currently cannot feasibly purchase an EV – i.e., households in rural areas and low-income households, would not gain from this subsidy, and yet inevitably will contribute to this subsidy through general taxation.

47. Learning-by-doing and further technological developments will likely reduce the market price of smart-chargers overtime. Further subsidies will create unnecessary distortions, and notably higher costs upon general taxpayers.

Further considerations

48. If standards are introduced, EECA should align New Zealand's rules with key jurisdictions where charging innovation and development is largely occurring, namely the United States, Europe, the United Kingdom, China, and Japan. This will secure additional choices for New Zealand consumers. We should not 'chart-our-own-course' when drafting regulations, as New Zealand is primarily a 'technology taker.'

49. Smart chargers are just one part of the solution, they are not the solution. We still need to ensure smart charging integrates within a wider flexibility market.

50. EECA, wider government agencies and industry would benefit from greater coordination. Members voice the need for a possible industry-wide workshop. Coordination would ensure decision makers do not duplicate effort.

APPENDIX ONE – BACKGROUND INFORMATION ON THE BUSINESSNZ ENERGY COUNCIL

The BusinessNZ Energy Council (BEC) is a group of New Zealand's peak energy sector organisations taking a leading role in creating a sustainable energy future. BEC is a division of BusinessNZ, New Zealand's largest business advocacy group. BEC is a member of the World Energy Council (WEC). BEC members are a cross-section of leading energy sector businesses, government, and research organisations. Together with its members BEC is shaping the energy agenda for New Zealand.

Our vision is to support New Zealand's economic wellbeing through the active promotion of the sustainable development and use of energy, domestically and globally. With that goal in mind, BEC is shaping the debate through leadership, influence and advocacy.

BusinessNZ is New Zealand's largest business advocacy body, representing:

- Regional business groups EMA, Business Central, Canterbury Employers' Chamber of Commerce, and Employers Otago Southland
- Major Companies Group of New Zealand's largest businesses
- Gold Group of medium sized businesses
- Affiliated Industries Group of national industry associations
- ExportNZ representing New Zealand exporting enterprises
- ManufacturingNZ representing New Zealand manufacturing enterprises
- Sustainable Business Council of enterprises leading sustainable business practice
- BusinessNZ Energy Council of enterprises leading sustainable energy production and use
- Buy NZ Made representing producers, retailers and consumers of New Zealand-made goods

BusinessNZ is able to tap into the views of over 76,000 employers and businesses, ranging from the smallest to the largest and reflecting the make-up of the New Zealand economy.

In addition to advocacy and services for enterprise, BusinessNZ contributes to Government, tripartite working parties and international bodies including the International Labour Organisation (ILO), the International Organisation of Employers (IOE) and the Business and Industry Advisory Council (BIAC) to the Organisation for Economic Cooperation and Development (OECD).