Submissions for Improving the performance of electric vehicle chargers pt. 1

A green paper seeking input on ways to improve the energy performance of electric vehicle chargers

EECA
TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY

Order of submissions

Individual

EDBs

Industry Bodies

Star

From:	Tony Oosten [redacted]
Sent:	Wednesday, 10 August 2022 10:29 am
To:	Star
Subject:	Submission on the EECA EV Charging green paper
Categories:	Green Category

To whom it may concern please find below my submission on the EECA EV Charging green paper.

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers? What would you add or take away? Is there anything you disagree with?

- I am concerned that the focus is not on the consumer first and in particular the use of integrated smart EV chargers to reduce cost or bring benefits to the consumer. Anything else is the government imposing restrictions on consumers to consume electricity when they want just for the benefit of generators and electricity lines companies both who can already benefit from expanded generation or increases to their regulated asset base in the case of EDB's. The only issue I currently feel needs EECA's support is on the current EA MDAG investigation into 100% RE market and the need for an advanced demand response market. The existing electricity market allows retailers (and EDB'S) to offer tariffs designed to encourage off peak electricity use, interruptible load aggregators can offer in demand response to the reserves market as well but this is an after the fact response and not a true demand response market.

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand? What do you see as most and least important? What functions would you add or exclude, if any, and why? What information could you supply to EECA to help inform our thinking about this issue?

- This should only cover hard wired chargers over 2kW.
- At minimum going forward EV chargers should have the ability for them to be remotely controlled by a standard open API protocol, this will allow integration into solar PV/battery systems, demand response aggregators, EDB's and electricity retailers.
- Next level for a consumer cost saving via a controlled load anytime tariff would be integration so that only during times of grid stress will the charger be ramped down to 1.5kW this will drop it below most domestic energy use levels and still allow for it to put about 8km's to 10km's of range per hour.
- Next level for a consumer cost saving via a controlled load default off peak only tariff with consumer override but exposure to peak or shoulder tariffs in this situation.
- All of the above can have randomised charging start delay by default.

Q3. Do you support EV charging being open access, and why/why not? What information could you supply to EECA to help inform our thinking about this issue? Do you think that 'smart' chargers should address issues of cyber security? How would you suggest this is done?

- As previously mentioned above I do support an open access communications protocol which takes into account cyber security risks. The model of existing Internet of Things has already shown how this can be done.

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided? Who should be able to access this information? In what form should it be transmitted? What processes should be in place to safeguard the data? Is there any other way this data might be captured?

- As long as it is very clear in the agreement to integrate with a consumer's EV charger (or other devices) what two way data is required , how that will be used and if third parties will be provided access to it then there should be no issue.

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner? What other information may be valuable to the EV owner? What format should be used for this information if this requirement is adopted?

- This is a good future proofing situation but do not force the EV charger manufacturers to meet a tariff level standard of metering as other countries like Canada have done resulting in a complete failure of the initiative as it is too expensive to comply and therefore they cannot charge consumers by $/kWh and instead have to use $/min with multiple kW levels to cover slower and fast charging EV's.

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

- I support this initiative as my current solar PV and battery system does this but going forward there should be compensation to consumers that purchase more advanced equipment that is effectively providing grid ancillary services.

Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers? What information could you supply to EECA to inform this issue? What challenges, if any, do you see in regulating in this area?

- As the majority of this energy inefficiency is in the vehicle onboard charger and systems there is no benefit in EECA focussing effort on this.

Q8. What are your thoughts on labelling aftermarket AC EV chargers?

- I do not see the value in this question, the home owner will know what their charger can and can't do and they don't need an ugly sticker on it. Now in the commercial away from home space the property owner can choose to label their unit with capacity and rules of use.

Q9. What are your thoughts on whether charging cables which contain a 'smart' charging enabling device should be in scope for intervention?

- No these chargers should be out of scope as they are only 2kW max and they can be used at multiple locations and therefore are no of value to EDB's, These EVSE's (please use their technical name not "charge cables") are designed with temperature sensors in the plug to detect overheating due to poor electrical socket condition as well as wiring irregularities.

Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand? Do you think the market can adequately address this issue without the need for government intervention? What information could you provide to EECA to inform this issue?

- I don't support the do nothing option, this will just create a messy multi approach solution that does not deliver the maximum benefit.

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers? What information could you provide to support your position?

- Next to useless if it costs more why should I buy it for no benefit.

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers? What incentives do you think would be effective and who should provide these? What other incentives might be valuable beyond financial incentives?

- I totally support the use of tariff incentives and other benefits like discounted or free smart chargers or installation rebates to make this happen that way the consumer benefits for making the right decision

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaken in the UK? What information could you provide to support your position?

- Yes, as the installation of an EV charger is regulated electrical work then the government should require smart EV unit installation and that EV charger vendors must over a certain timeframe only sell chargers that at minimum can respond to demand reduction requests.

Q1 4. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/incentives? What parts would you exclude or change? Does the PAS cover all the important issues? What other resources may be useful for New Zealand?

- EECA should work with standards Australia to come up with a AU/NZ standard for smart EV chargers a lot like the recent solar inverter standard which requires power quality control and grid support functionality as well as communication protocol to allow aggregator level control.

Thanks

Tony Oosten

Star

From: Jim Vause [redacted]
Sent: Wednesday, 10 August 2022 8:45 pm
To: Star
Subject: Feed back on Green paper on improving the performance of electric vehicle chargers

Categories: Green Category

Feed back on Green paper on improving the performance of electric vehicle chargers

Clearly smart chargers are essential. To allow any EV charging without a smart charger is madness.

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?

Re Re Vehicle-to-Grid (V2G) and Vehicle-to-Infrastructure (V2I)

The problem of battery degradation with repeated charging must be factored in to these two concepts

Q3. Do you support EV charging being open access, and why/why not?

Yes, but the challenge will be that Open Access will forever be behind the innovators in EV and AI and the latter will pose a huge problem given the difficulty of making standards for what are essentially "black boxes"

It is essential that smart chargers interface with solar systems and household appliances eg Hot Water systems.

Q4
What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?

This is already occurring from Teslas. The problem is that security of this info is unknown.

Q5 What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?

This data is already available for Tesla EV from Apps that pull data from the Tesla server and present it in a graphic manner. This enables the EV owner to understand how multiple variables influence power usage, charging and battery degradation, besides allowing the drive to verify their velocity when caught by a speed camera!!!
Jim Vause

SUBMISSION ON EECA GREEN PAPER

Q1 I would add into the Engagement Principles the item above in the optimisation approach, namely the alleviation of costs of decarbonisation on NZ households.

There is nothing I disagree with.

Background information in support of the above.

As a retired couple we are financially in a position to have spent a lot of our own savings, firstly by purchase of an EV which is beyond the $80,000 cap for assistance and having installed (again at our own cost) a smart wall charger at home. If the average household is to be able to afford such expenses, they will need incentivising.

Q2. It is important in my view for chargers to maintain a minimum level of current in order to ensure that the charge is complete.

The V2G/V2L enablement is the least concerning to me.

From our point of view as a retired couple, our charging is done only during off peak hours. Both the car itself and the charger will only operate between 9pm and 7am.

Q3. In terms of NZ's overall supply of electricity I would support open access technologies. However as we are not dependant daily on a full charge there needs to be provision for those who are dependant to ensure that whatever happens they have the necessary charge.

Cyber security is definitely an issue that smart chargers should address.

I'm insufficiently technical with regard to how a smart charger is protected but your document suggests the Open ADR and others already include this. It needs to be mandated in my view.

Q4. I believe that the data should only be known to those providing the electricity supply. However I have no problem with data going to where it is needed provided there are sufficient safe guards against cyber attack.

I'm not qualified to add to this. My query would be with regard to the future addition of solar power to the home involved. There needs to be provision of information to make this as easy as possible as the long term future of the electricity supply will need supplementation for this (and other) sources.

Q5. It would be useful for the EV owner to also have the current prices per unit (Kw) of electricity displayed on an app. Our current wall charger does this so it should be possible for all to so do.

The format should be an easily read App for smart phones.

Q6. I don't have any difficulty with the idea of mandated power quality and control settings on my charger but there must be a fair return when power for the EV or solar power exceeds the needs of the household. Currently the return offered is a disincentive to homeowners and given the potential savings to the system this needs to change in order that a realistic incentive is obvious.

Q7. As an EV owner I fall in the category of not being aware of the efficiency of the on board charger.

I definitely feel that this information is important to future purchasers of EVs. I do not know what the AWD Hyundai Ioniq5 loses in charging.

There is foreseeable resistance from some manufactures. However the customer should be the primary consideration.

Q8 Labelling after market AC chargers would make it easier in the decision making on behalf of home owners. I know from experience that there were many hours involved in informing myself about options and characteristics prior to deciding on a charger. Having a label would assist in the choosing.

Q9. We have the three pin option which has been useful on rare occasions. However the lack of charging speed means that it is charging all day and all night in houses we don't know. Heat build up and old wiring can pose problems that many are unaware of. In order to save possible problems a smart charging requirement in the cable would ensure a safer outcome for all concerned.

Q10 History in NZ is full of decisions that have had a "do nothing" approach all of which have led to less than desirable outcomes. Unrelated but relevant are the sights you see on the road with unsuitable vehicles towing loads for which they are unsuited. Leaving electrical issues to the uninformed would in my view be dangerous. I am definitely against a "do nothing " approach.

Q11. There is no doubt that information and education play a valuable part in a proportion of the population. The reality is however that if economic stress is a big factor the cheapest option will always win. That cheap option therefore needs to meet minimum safety standards. Whereas energy efficiency can play a part with refrigerators and dish washers e.t.c are smart chargers in the same category?

Q12 In my case, it was the power company offering an EV plan which encouraged use at lower peak periods that was important even though it required a new meter board to be installed. Ricing is important and needs to be very obvious. Beyond financial means more information about loading and the need to avoid costly infrastructure would be helpful. With regard to regulation, it is to be avoided if possible. However it was clearly found to be necessary in the UK and no doubt the same will happen here. I think myself that it should come when incentives have been shown to not work well enough and at that point the population's appetite for regulation would more easily be accepted. I fear a backlash if it is brought in too soon.

Q13. I'm not in a position to add a great deal except to say that regulation would ensure standards as long as any cost implications were signalled well in advance for customers.

Q14. I do not feel I have sufficient information to comment on this question.

Q15. As for Q14.

I would however prefer one authority to oversea the standards that may evolve.

Regards

John Hawker

Green paper seeking input on ways to improve the energy performance of electric vehicle chargers

Consultation Questions

1. What are your thoughts on EECA's suggested engagement principles for EV chargers?

    - What would you add or take away?
    - Is there anything you disagree with?

    I agree with the EECA's suggested engagement principles for EV chargers.

    However, as you say in the green paper, almost 80% of EV owners just use a cable at home without a charger. EECA has an uphill battle to show the value of chargers.

    For ourselves, we have 11 panels that generate more than sufficient power to trickle charging an EV over 4-5h. Most times the EV battery just needs topping up, as the battery is not emptied except on a long trip. If I need to charge fast, I can use one of three fast chargers that have been installed locally. My situation is probably similar to many other EV owners. The garage that sold me the EV basically advised against purchasing a charger, instead advising us to wait and see if I needed one before buying one.

2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?

    - What do you see as most and least important?
    - What functions would you add or exclude, if any, why?
    - What information could you supply to EECA to help inform our thinking about this issue?

    I think V2G/V2I should be first on the list, not last.

    The Smart charger must be able to direct electricity from solar PV or the grid to the EV safely and efficiently. At times it must also safely integrate those two with the demands of the house during times when power from the grid is unavailable.

    I therefore think that "Integration" of electricity flows should be a potential characteristic on your list: Solar/Grid/House.

    I think it is important that EECA raises the importance of including solar PV to EV owners.

3. Do you support EV charging being open access and why/why not?

    - What information could you supply to EECA to help inform our thinking about this issue?
    - Do you think that 'smart' chargers should address issues of cyber security?
    - How would you suggest this is done?

    Open communications is very important.

    There needs to be cybersecurity software on the device that can be updated online via wifi. Telsa systems are updatable by that company.

4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?

- Who should be able to access this information?
- In what form should it be transmitted?
- What processes should be in place to safeguard the data?
- Is there any other way this data might be captured?

I support information being provided and shared, provided it is kept securely and results in a benefit to the consumer. It could be encrypted to promote security. The data may be held by a third party that has the tools to protect it appropriately, but and information passed onto the electricity supply to provide a suitable demand-response.

5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?

- What other information may be valuable to the EV owner?
- What format should be used for this information if this requirement is adopted?

The EV owner MUST have access to the electricity being consumed (real time), actually consumed and/or exported during EV charging. The charger should show the amount consumed from the grid vs solar PV.

The information could be graphed as a picture tells the story, rather than having to read data points.

Other information should include if the charge was interrupted, and an alert sent to the owner's phone if the charge was interrupted. There is nothing worse than thinking the car is charging, and then leaving in the morning without the required charge!

6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

Yes, quality and control should be mandated, especially as V2I becomes more common.

7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?

- What information could you supply to EECA to inform this issue?
- What challenges, if any, do you see in regulating in this area?

The consumer is paying for a lot of energy (15-40%) that does not end up being used. I did not know that. It is very important that EV manufacturers display inefficiency information, as that will encourage more energy efficient onboard chargers to be developed.

EECA's regulation of that area might have a perverse outcome, in that it might dissuade EV manufacturers to ship to NZ. It's difficult enough to get EVs now, so EECA should not add one more barrier. However, if EECA were to signal well ahead that it would regulate onboard charger energy efficiency, then manufacturers would have time to address the issue. EECA could set the bar fairly low initially than raise it over time.

If I understand the process correctly, the inverters take DC from the panels and convert it to AC (loss #1) for the house. Then the house gives it to a smart charger that sends it to the car's onboard charger to convert back from AC to DC (loss #2). Would it be possible to connect the DC inverters → smart charger → DC in the car? It seems all this conversion to AC is not

needed for the EV. The smart charge technology could be part of the direct solution, rather than part of the indirect, loss-making solution.

8. What are your thoughts on labelling aftermarket AC EV chargers?

Yes, EECA could mandate labelling of the charger so that it shows to the consumer the benefits of installing one. Why not have a star system?

9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?

The charger and cable should both be suitable, safe and reliable. I did not know that the ones included in the EVs now are not designed for overnight charging. That needs to change.

10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

- Do you think the market can adequately address this issue without the need for government intervention?
- What information could you provide to EECA to inform this issue?

Doing nothing is rarely a good option. Learn from the UK and Norway who are way ahead of us.

Promote smart chargers to the consumer. Show the savings over time of using a smart charger rather than a 'dumb' one.

EECA should not stand on the side lines and watch EV uptake double the electricity demand if smart chargers can smooth out the transition.

11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?

- What information could you provide to support your position?

The options bulleted look OK, but they are unlikely to create the change needed. Most people are too busy to pay much attention to marketing campaigns, websites, and energy efficiency labelling. EECA needs to do much more.

"Consumer New Zealand" endorses certain products which makes it easier for consumers to choose the best option. I would support EECA endorsing some smart chargers that are better than others, because you would have to provide reasons (as a result of tests, for example) for choosing one product ahead of another.

12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?

- What incentives do you think would be effective and who should provide these?
- What other incentives might be valuable beyond financial incentives?

Financial incentives work pretty well. The government provided the incentives for consumers to buy EVs and hybrids, so it should work for smart chargers too.

The electrical supply companies could provide the financial incentive to the consumer by discounting the cost of the charger or making it free. Smart chargers allow them to control electricity and solve a problem for them.

There are precedents. Dutch retail electrical companies provided low energy bulbs for free, because electricity demand was reduced. I think California electricity supply companies did something similar to reduce black outs in that State. There are many other examples worldwide.

Electrical supply companies might also provide free kWh, so it does not have to be $.

13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?

    - What do you think of New Zealand adopting the approach being undertaken in the UK?
    - What information could you provide to support your position?

    As in the UK with the EVHS regulations, EECA in NZ should set standards for connectivity, off peaking charging capability, staggered charge times and cyber security. Yes, also link it to incentives, financial or otherwise.

    EECA should also investigated other countries approaches such as Norway. NZ is way behind most countries in adoption EV technology.

14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?

    - What parts would you exclude or change?
    - Does the PAS cover all the important issues?
    - What other resources may be useful for New Zealand?

    Voluntary guidelines in NZ never seem to work very well. Standards seem fairer as they level the playing field for smart charger manufacturers.

15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

    I support EECA using its legal mandate to regulate the energy performance of EV chargers, despite other businesses and authorities potentially being able to do the same.

Star

From: Olli Krollmann [redacted]
Sent: Thursday, 11 August 2022 6:06 pm
To: Star
Subject: Submission to "Improving the performance of electric vehicle chargers" green paper

Categories: Green Category

Kia ora EECA Team

Thank you for the opportunity to contribute to your "Improving the performance of electric vehicle chargers" green paper. I have been an EV owner since October 2017 and gathered experience with various 'dumb' and 'smart' three-pin-plug and wall EV chargers. Please find my submission below.

Best regards
Oliver Krollmann

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1. Sounds good, although I would like to see a larger amount of intervention and regulation, to ensure maximum support for the transition to a low-carbon economy. See further answers below.
2. I would not want to support a randomised delay function, since it is unpredictable and uncontrollable. Default charging modes are fine, but allowing the owner to override these should be disabled by default and require prior approval and enabling by the EDB, based on actual need to charge at peak times. Otherwise it is likely that many owners will override the default modes, for fear that their vehicle will not charge ('charge anxiety', similar to the 'range anxiety' phenomenon), which will undermine grid stability and demand management efforts. Smart EV chargers should also provide an option to 'harvest' excess PV (or other microgeneration) production that is exported to the grid, with an 'ECO' mode (use excess power but keep charging at minimum power level even if surplus is too low, subject to demand management by EDB) and an 'ECO+' mode (use excess power and pause charging if surplus is below minimum charging power level, not subject to demand management).
3. OpenADR has my full support. Also, all smart EV chargers have to be upgradeable to newer firmware/software versions, over the-air, through the home network, or via USB.
4. Data transmission to the EDB should be mandatory, and owners should be allowed to enable additional data connections or transfers to themselves (e.g. an app or home software) and service providers.
5. This is a must-have.
6. Again a must have, particularly to support V2G.
7. Energy efficiency of on-board EV chargers should have to be declared for every EV (new and used), similar to fuel-efficiency labels. It could be a star rating, depending on the amount of energy loss, or a precise percentage value (e.g. 85%) that shows how much charging power is available for traction. This is sorely missing at the moment, and it would help to identify 'e-guzzlers' with low roundtrip efficiency.
8. A system of standardised icons should be developed that would indicate the capabilities of the smart charger, e.g. power rating, PV support, V2G support etc. It might be prudent to also standardise some operating indicators / LED colours, e.g. green for ready, red for fault, blue for charging, flashing blue for demand managed etc.
9. Smart charging cables should be subject to the same rules and regulations as wall-mounted smart chargers.
10. Not an option, don't even think about it.
11. I would want to see this anyway, but it shouldn't end there.
12. I am supportive of incentives, but they alone won't achieve the required uptake. Kiwis are notoriously bad at thinking long-term and stubbornly focused on initial purchase price and convenience, so most of us will opt for cheaper 'dumb' chargers, to just plug in and forget, and not spend money investing in and time and effort on working with a smart charging system.
13. This is the way to go, but please exclude staggered or random charge times. Demand management and control should sit with the EDB.

14. I have no strong opinion here, maybe start with PAS (adapted to strong regulation) and keep the door open for upgrading it or widening its ambit later, when we've gathered data and experience with smart EV charging at scale.
15. I would really, really prefer that EECA took the lead on this.

Feedback for the "Green paper on improving the performance of electric vehicle chargers"

Author – Jonathan Beaver
Date – 18th August, 2022

Background - I have ~6-7 years and ~100,000km of experience with EV ownership, both in terms of large and small battery EVs. I have spent 10+ years working in the EV industry on wireless charging R&D (Halo IPT, Qualcomm Halo, now working for WiTricity) as well as designing wired DC fast charging systems. I am a long-time admin of the NZ Nissan Leaf Owners and NZ EV Owners Facebook Groups and have been active in the NZ EV owner community for many years.

Q1 - No particular feedback.

Q2 - Overall charging efficiency can vary significantly with charging rate. For vehicles capable of charging at 32A, slowing down to minimum rate (6A) will increase total energy consumption by a noteworthy amount. Any intervention that lowers charging efficiency should be avoided.
For an average ~30km/day user that plugs in every night, adjusting the rate of charge may not be an effective solution. Even at a minimum of 6A, the entire charging session will be over in around 3 hours.
Changing/delaying start times for individual EV charging stations seems to be a much more effective way to lower overall grid/generator load than a simpler approach of adjusting charging speed.

Q3 - I strongly agree with the approach that open protocols would be preferred. I am not familiar enough with OpenADR to comment further. Cyber security is an extremely important point with the rise of targeted attacks on infrastructure throughout the years.

Q4 - Any information gathered should be made clear and be auditable by the end user. Information should be available to the minimum number of parties required to offer the services, except in opt-in scenarios for wider spread data science purposes. Location and usage data is not inherently any different to existing data collected by smart meters, so there's an existing equivalent model to use.

Q5 - I don't see a need to provide any information in a form other than what the charging point providers are already doing. Information should be available about what interventions were taken in a 'smart' way, such as delayed start times or lowered charging rates.

Q6 - From my familiarity with EV charging hardware, I don't believe power quality issues are likely to be a huge factor to the EV charging process itself. This may be a complicated function to add for minimal individual gain and potential individual penalty if set in an overly sensitive fashion. Local load voltage should be part of the data monitored to provide local data regarding grid impact of charging events, however.

Q7 - I strongly disagree with any attempt to regulate the efficiency of on-board chargers. The NZ market is simply not important enough to exert leverage in this fashion. Requiring the manufacturers to disclose charging efficiency under specific conditions or requiring charger efficiency to be considered in terms of kWh/100km consumption numbers would be a reasonable alternative.
I also think that this question is worded poorly as it refers to 'an aftermarket (wall-mounted) charger' which is likely to be misunderstood by most respondents. Outside of a few very rare cases and future V2X systems that aren't widely deployed yet, a 'wall-mounted charger' is more likely to mean a charging point that takes no role in the conversion of energy for an EV and thus does not affect the efficiency.

Q8 - Again, this terminology in this question is misleading and should be corrected. Charging point is a better term than charger, as the term charger implies a level of conversion that does not occur in these units. I don't have any particular attitude other than that they should not be labelled as or called chargers, especially not within a consultation document.

Q9 - Mode-2 charging (mobile charging cables, supplied from the installation via a plug) should absolutely be included within the scope of this consultation. This is the dominant way that charging occurs currently and without some significant interventions, this is unlikely to change for a variety of reasons. On top of that, a mode-3 charging solution may not be available in situations such as rental housing or to people lacking the funds to install a more expensive charging solution, so including mode-2 options would ensure that any incentives are available equally to owners, regardless of situation.

Q10 - I believe the market will likely address some of these issues through things such as off-peak discounted energy rates etc., but it is unlikely to be done in a particularly satisfying or comprehensive fashion. It's already clear that many owners carefully manage their charging times to coincide with 'free' periods offered by their energy retailers, or to make lifestyle changes to make use of free fast charging infrastructure. This drive will likely lead the majority of people to charge off-peak anyway when there is a financial incentive and the technological ability to do so.

Q11 - Given that there is already a significant drive to minimize expenditure with minimal information available, this could be significantly improved with additional information and education. On the other hand, the perceived savings are likely higher than actual savings. A carefully worked example showing savings from a 'smart' device under existing conditions may not actually prove to be particularly convincing.

Q12 - Existing owners already appear willing to spend significant money and effort to save energy costs. This can be seen with people installing faster charging setups to make use of 'free' hours with their retailer, spending time at a free fast charger vs charging at home, investing in external timers and charging setups that allow controlling the time of use more accurately etc. I firmly believe that incentives are likely to be the single most effective way to encourage behavioural change surrounding charging. I

don't think other semi-financial (points/rewards) or non-financial incentives are likely to have anywhere near the same effect but can see value in evaluating them for cost effectiveness.

Q13 - I don't see that our market is large enough to create significant change through regulation alone. We already see plenty of imported or non-compliant charging setups despite the relatively light-touch existing regulatory framework of the DMRA definition. Regulation in the form of a set of requirements in order to make use of incentives would seem to be an acceptable compromise, but that seems to be more the purview of the incentive question, not regulation specifically.

Q14 - I strongly oppose the use of 'soft' regulation approaches like the PAS and WorkSafe EV Charging Guidelines. These documents have created significant confusion over what is legally required and what is being strongly encouraged. I have spoken to many people who feel they have been penalized financially due to an installer being unaware of what the actual legal requirements are. I know several people with Type-B RCDs installed for charging points that incorporate RDC-DD functionality, or who have been led to believe that they cannot legally use their mode-2 charging cable on an existing socket-outlet. This confusion and misinformation creates a very real roadblock to both EV adoption and the adoption of safer charging approaches.
I have no problem with legal requirements such as those that will eventually be cited within AS/NZS 3000:2018 but cannot overstate how vehemently I oppose these unclear 'voluntary' standards and guidelines.

Q15 - Off-peak energy prices or moving to a 'shoulder' pricing model as used in other parts of the world will likely provide a significant improvement in EV charging efficiency, regardless of EECA involvement.

Feedback on: "Improving the performance of electric vehicle chargers A green paper seeking input on ways to improve the energy performance of electric vehicle chargers"

Dear EECA,

I receive the EECA newsletters and was therefore invited to provide feedback on the green paper. If firstly provide my context and general thoughts, then responses to some of the specific questions in the paper.

Context

We have 2 EVs, and it was over 3.5 years ago we got our first EV. We live in rural NZ, have solar panels and are currently part of a PowerCo home fast charging study.

General feedback

My feedback relates to how rural consumers will have different needs to city dwellers. When we moved to NZ and bought a property 20 minutes out of town, we realised we needed to have an EV for commuting. I suspect more and more out of towners will eventually realise this. And lifestyle blocks continue to be popular for a tree change, but people may not be aware of some of the differences from the cities.

Being on a rural property, we have 3 phase power, which means only 20 amps per phase. As part of the study we are in, PowerCo provided us with a free home fast charger. But that is 32 amp single phase. So the first day we used it we blew a pole fuse (didn't even know they existed before then). PowerCo have become regular visitors replacing the pole fuses as they get switched around each time they need to do work on the lines.

Furthermore, as part of the PowerCo study, our charging is managed by PowerCo. There's a sim card in our fast charger which connects to a phone network to determine whether or not charging is permitted at that time. The purpose of the study is so they can turn on and off the chargers and see the effect it has on the network precisely the point of the green paper (so definitely get in touch with PowerCo about their study if you haven't yet). However, being rural, our charger frequently (mostly?) can't establish a connection and we are unable to use the fast charger. So, if you want to look at how to have smart chargers, managing network loads, making the most of off peak electricity, then you will need to consider how that could work effectively in places with unreliable phone network connections. Perhaps wifi as a backup to manage smart charging? Or offer programmable chargers? Or at least as I've suggested to PowerCo, logic that permits charging when there's no signal. Otherwise, there is a risk that people may wake up to find their EV car uncharged that will not encourage greater uptake!!

Specific responses (selected)

Q4. I don't think mandating this is a good idea. Incentivise it, yes. Would need good controls on the data. Potential for nefarious interest.

Q5. We already have that and I find it quite useless. Probably because the app usually reports that the charge is offline.

Q7. Great idea. Challenge is we are in NZ - inconsequential for the global car market really. This would be something to work on with other major countries and piggy back on their requirements

Q8. Great idea. Include is it city/rural suitable. Maximum current draw. Smart features. At max current, approx how many km of travelling are charged up per hour (need an average kWh/km for that).

Q9. Out of scope as it's no different to running an oil bar heater on all night at home.

Q10. Bad option. Markets are out to make as much money for themselves as possible. It's your job to help protect the country and our assets (in this instance, the power infrastructure).

Q11. The bare minimum intervention and could be rolled out on websites very quickly. People who are interested will look. Many (most) will just take what the salesman sells them.

Q12. I'm on Meridian's EV plan. Apart from sunny days, or when we need to charge for a big trip the next day, we only charge in those off-peak times. We save over 25% of our total bill this way.

Q13. I think it's needed. With allowance, as I said in my general feedback, for network connection options that won't leave people stranded. Leave space for innovation in the regulations - don't make them too strict, but tight enough that the country reaps the benefits. Sounds like the UK is on the right track.

Hope this provides some helpful feedback for future consideration.

Kind regards, Phil White
Maxwell, Whanganui

SUBMISSION to the Energy Efficiency and Conservation Authority

Home EV Charging

From: [redacted]
Peter Olorenshaw Architect
[redacted]

1.0 Comments not directly related to questions posed

1.1 Include V2G: I ask you to considering incorporating vehicle to grid charging right from the get-go with home charging. This could be really significant for the following reasons:
It appears that the Lithium batteries in EVs are significantly different than other battery chemistries in that the primary degradation is not number of cycles, but simple calendar ageing. In fact Flip the Fleet found that actually the cars with the best batteries for their age were the ones that had been driven (and therefore charged) the most. See appendix for quote on this. We need to look at the actual evidence on this that Flip the Fleet has found, rather than looking at erroneous assumptions (see appendix for quote on this inverse correlation of number of charges and battery health) So the thing is if your battery is quietly degrading anyway in your car from just from simple ageing, but you could buy power very cheaply from the grid in the dead of the night to charge it up and sell back some of that power to the grid at peak times and be paid handsomely for it, why wouldn't you? If you could store solar power from the middle of the day when there is a trough in demand and inject it back into the grid at night and likewise buy it cheaply and sell it dearly, why wouldn't you? This could have a massive positive effect on peak lopping and storing excess daytime solar power and so avoiding the need for some of the additional generation capacity needed.

Of course you would operate your battery in the sweet spot between 20 and 80% full so as not to suffer any additional degradation of the battery and of course you would always leave enough capacity in the car to always have enough for an emergency trip to th doctor or whatever.

Here is the link to an article on this Vehicle to Grid technology just come to Australia may help out as a grid and solar load balancing.
While of course we need to reduce our energy consumption and beware of just producing more energy to support our current lifestyles, the thing is that this uses what we've already got - these EVs sitting idle for 95% of the time.

The article laments that new EVs will have to be made compatible with V2G applications and that currently only Nissan Leafs and Misubishi Vehicles can do this - But we've got some 15,000 used Nissan Leafs here in NZ already (NZTA Vehicle Stats), let alone new ones! - the trick is to have them plugged in when we have a solar surplus. Some will be at home during the day, some will be at peoples work places. It would of course need these trick wallboxes wherever the EV is parked most - be that work or home.
And just how big is that battery capacity available? - if we assumed 10kWh* from 15,000 Nissan Leafs then that is 150MWh. In comparison the much celebrated big Tesla grid battery in South Australia (which doesn't use cars) is 200MWh - so its not much less than this celebrated big battery, just from our old Leafs already here in NZ.

Now just assuming the government wanted to buy a 150MWh battery, buying 1500 $10,000 wall chargers for people to use with their Nissan Leafs this would cost the government $150m. Is this cheap for this size battery? Or perhaps they could bulk buy and offer them not for free but at a subsidised rate.

* The First Nissan Leafs that came out had 24kWh batteries, next model had 30kWh, new shape ones have 40-62kWh so assuming 10kWh from every Leaf is surely not too far out for this back of an envelope calculation.

1.2 Price Signals rather than Smart Chargers?: If you aren't going to include V2G capability I'm not sure that I see the point of universal smart chargers. I have seen the impact of (Meridian's?)

free power from 9-12pm on two sets of relations and their power use. These people are not ardent environmentalists but there is something about getting something for free that they pretty religiously charge their cars up just during this time (they also save using their dishwashers, washing machines and dryers to this time too). This indicates to me that simple monetary incentives might be a much cheaper and simpler way to get the same effect as smart chargers. Both these families have Tesla model 3 EVs with pretty sophisticated charging options available - eg I think they can probably set the time in their car when to start and stop charging regardless of when they plugged it in. Whilst I can see the appeal for more people to not worry about when their car is charging, that might come at a considerable cost in fancy wallboxes.
I suggest you mandate that all power companies must bill people with variable charges depending on when the power is used and that this variability must reflect the actual average time of day, time of year costs of power. Whilst some people would be oblivious to this differential charging, I think the majority would take note of it and delay switching things on until off-peak times. (Allied to this would be mandated maximum charges for access to the grid (daily charges) - you want the price signals of time of use to be the predominant price signal. An additional and perhaps even more important benefit of mandating time of use charging rather than EV wallbox specifications is that you have this whole other cohort of appliances and power use that could and would be deployed to lop peaks of power use: Putting freezers on timers to only go on at night, delaying starting dishwashers and driers, perhaps even washing machines until people go to bed could have an additional significant effect on grid load levelling.
Additionally mandating price signals could have a useful effect on how people use hot water cylinders: anecdotally very few new HWC installations are connected up to ripple control because the power companies not longer offer sufficient monetary incentives to do so.

1.3 Necessity of high rates of charge overstated: It is a common suggestion that to be able to charge up a car with big battery you need to have a relatively fast charger to charge it up overnight. However in real life this is rarely an issue. How often to you come home with an EV battery almost completely drained and want to go on a long trip the following day? Almost never. So while cars with bigger batteries take longer to charge, even with a normal 8-10amp plug and 2kW charging you are almost always going to get enough charge into the car for 95% of daily use the following day, even if you are only charging in off peak times from 9pm to 6am. And if you are going to do a big trip the following day it is very easy to just jump not a fast charger to top up, while you enjoy a coffee on the way out of town. New cars with big batteries are still only be going to be driving 50 or so km per day that is the average motor vehicle use and so only need a fraction of their battery for that.

1.4 Need for Wallboxes to supply higher rates of charge valid in USA but not here: I think we need to be careful of being swept up in the wave of assumptions that everyone should have wallboxes to deliver higher charging power to their EVs over simply plugging into a domestic socket. In the US with their 110V system there charging rates are half of what ours are with our 240V systems: they really need higher capacity home charging than what a simple domestic socket could provide. Additionally many Americans commute distances that to us are huge, needing big overnight charges. Here in NZ with our shorter commutes being the norm and our double capacity normal domestic socket outlets compared to America, the advantages of special high powered wallboxes are less obvious. Here it is very rare for people with EVs to arrive home with an almost empty battery unless they have a small battery (in which case overnight charging at 2kW is sufficient to top it up (2kWx9off peak hours = 18kWh) or they have been on a long trip with a bigger battery car. It is rare to come home from a big trip and immediately want to do another big trip the following day, but if so they can do this on those rare occasions with a top up at a fast charger while they get a coffee on the way out of town.
Additionally we are unlike the British where not many people have a garage for their car. Here in NZ it's the reverse really: few people do not have a garage and almost all have a power point already in them. So whereas in the UK most people need to purchase a wallbox to charge their car as so few have garages pith power points in them, here we don't need to purchase a wallbox.

Putting all your eggs into the wallbox basket hoping for major changes in the way people charge their EVs, I suggest is completely misplaced. A) they aren't necessary here with most people having a garage with a 3 pin plug anyway and B) the incentives for using off-peak power are not necessarily there compared to mandating universe time of use billing.

2.0 Answers to Questions Posed

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers? What would you add or take away? Is there anything you disagree with?
I would add what I noted above that V2G capacity should actively be encouraged and accommodated right from day 1 of any smart charger recommendations.
And that mandatory time of day time of year billing for all power companies might be a faster and zero cost way to achieve this, particularly if V2G is not immediately available.

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?
I wonder whether this whole smart energy revolution with fridges talking to washing machines, talking to dishwashers and EVs is really a bit like waiting for fusion reactors or driverless cars. We might well be waiting some years or forever for this but we can immediately get a lot of the benefits from them simply by mandating that everyone is on time of use charges for their electricity bills. I suggest we do that electricity charging mandate immediately anyway. And at the same time bring is some smart charger guidelines but still allow people to do the zero infrastructure thing of just plugging into a 3 pin plug. With all things now we need to look at minimising embodied carbon in things like complicated wallboxes having no smart charger, but just variable power pricing might in fact be the smartest thing from a climate change perspective, certainly in terms of embodied carbon avoided by not having a wallbox and certainly in terms of immediate widespread implementation that mandated variable pricing would have.
What do you see as most and least important?
The most important thing is to quickly get people charging off peak rather than on peak and this might well be better done in the immediate term at least by simple mandating of variable power pricing for everyone.
The least important is making everyone buy an expensive wallbox when simple pricing and a 3 pin plug might do the same thing for a lot less money and embodied carbon in the wallbox.
Other than that V2G capability built in with every smart charger installed should be there from day one even if initially it is just the ability for this to be directly simply and cheaply added to the charger. This V2G functionality turns charging EVs from a problem to a massive resource (see above)
What functions would you add or exclude, if any, and why?
V2G functionality should be added as this transforms the system from being one that minimises loads at certain times to one that actively supports the grid with injections of power at peak times its a real step up in benefit and should not be constrained to the too hard basket: It should be incorporated from day one with the smart chargers. While at the moment my understanding its just Chademo cars that presently have this V2G capability, very shortly CCS cars will have this too.
What information could you supply to EECA to help inform our thinking about this issue?
Information from Flip the Fleet about on the ground experience here in NZ that number of charge/ recharge cycles is not the most significant battery degradation mode, in fact its the reverse the more charging the better for the battery condition. See also in the appendix battery condition/ degradation graphs of different models of Nissan Leafs from Flip the Fleet. If battery degradation was primarily due to km driven (ie amount of charging/discharging cycles), these graph points would be all over the place: Similar aged cars have massively different km on their clocks not so much difference in their battery health. There are some outliers: eg cars that have been kept charged to 100% all the time on dealers yards which is know (with these Leafs) to reduce battery life you should only charge up to 100% if you are about to immediately go on a trip). With home charging there is minimal battery heating as its just slow charging.

Q3. Do you support EV charging being open access, and why/why not?
I agree with open access as it could extend the benefits of variable charging at various times
What information could you supply to EECA to help inform our thinking about this issue?
None sorry
Do you think that 'smart' chargers should address issues of cyber security?
Yes as it might limit uptake if people thought their vehicle and appliances could be open to malicious attack
How would you suggest this is done?
Sorry I'm not and IT person

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?
Who should be able to access this information?
In what form should it be transmitted?
What processes should be in place to safeguard the data? Is there any other way this data might be captured?
This is sounding way too complex compared to simple pricing where people switching on and off with price signals or having their equipment turn off and on depending on price signals. Wouldn't it be better to do it this way give peoples smart chargers access to price signals rather than giving gentailers access to peoples smart charging profiles. See above how powerful that charging for time of use is in altering peoples electricity use.

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?
What other information may be valuable to the EV owner?
What format should be used for this information if this requirement is adopted?
Again unnecessary if you just use the market and have people or their smart charging responding to variable pricing signals.

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?
This is essential for V2G but I wonder if it's fair to make people responsible for grid voltage stability just from their car charging. The voltage instability could be because or a neighbour doing some welding or someone else cooking up a storm on their 7kW induction range and yet you aren't proposing limiting their consumption to maintain voltage. Again I think the variable power pricing would tend to push this in the right direction automatically: at times where the grid is struggling, the power price would be really high and a smart charger hooked into these power prices would delay charging automatically. And (some) people would delay their welding till off peak times, people would have their freezers on timers to only go on in off peak times, would delay using clothes dryers and dishwashers until they go to bed. Unleash the power of the market rather than tie yourself up in knots with regulation!

Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers? What information could you supply to EECA to inform this issue? What challenges, if any, do you see in regulating in this area?
Yes this could be really useful, however it could also be really counterproductive if the regulation is set at a level higher than the majority of vehicles coming into the country. I suggest it better that you mandate a star system to be displayed for charger efficiency rating, rather than mandating an actual efficiency standard. It would be so bad for the country if we could no longer import cheap EVs because of their low charger efficiency, when for the country and the planet. It is really better just to have more EVs.

You say "*aftermarket chargers are becoming increasingly popular in New Zealand" (p16).* Whilst this is probably the case for chargers in commercial situations (at work chargers) I know of no-one that has one installed in their home. I don't think. They are increasing popular at home at all as a slow overnight top up suits most people very well thank you. As noted above almost no one comes home with a completely depleted battery in a big battery car and expects it to be fully charged by the morning. Sure people with cars with small batteries might expect that, but then 10 or 12 hours at 2kW from a simple 3 pin plug will get them pretty 20 24kWh into their 24kWh. batteries. And the point is that it is rare to need more than 20kWh in a day if you need more a quick top up at a fast charger is all that is needed. Commercial vehicles are completely different they will be using a lot of kWh each day. But really if someone is using 20kWh in normal daily private motor vehicle usage I'd suggest they should live closer to where they work or work closer to where they live.

Q8. What are your thoughts on labelling aftermarket AC EV chargers?
Yes should have to have full disclosure in terms of efficiency and what sort of usage they are appropriate for.

Q9. What are your thoughts on whether charging cables which contain a 'smart' charging enabling device should be in scope for intervention?
No Comment

Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand? Do you think the market can adequately address this issue without the need for government intervention?
What information could you provide to EECA to inform this issue?
Doing nothing about EV chargers is completely an option and might in fact be the best option as long as you mandate everyone pay time of use for power. This time of use charging really is far and away the most important thing you at EECA can do. And while there would be be some people, perhaps even quite a few people who wouldn't bother with timing their EV charging, more importantly it would bring in a whole lot more demand response as people put their freezers on timers, got into the habit of putting on their dishwashers, clothes driers and perhaps washing machines when they went to bed instead of at 6pm, as well as only putting their cars onto charge during off peak times. And for those with V2G capability it would give them the incentive to actively feed back into the grid at high price times.

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?
What information could you provide to support your position?

Unless and until time of use billing for electricity is mandatory many EV owners won't bother to charge off peak if it costs them more to use power at peak times even if it costs less in off peak times, its more convenient for most people to just pay a flat rate regardless of whether its a peak power time or not. I suspect that simple discounts for off peak charging when you pay more for on peak power is simply not incentive enough for many people after all peak power times is by definition when people want to use power (if there are no disincentives and incentives). I think just offering smart chargers even incentivising them would be insufficient without universal time of use metering that really did reflect the average spot price off that time of day, time of year. I note that offers from Mercury are a 30% discount for off peak charging and electric Kiwi gives half price power at night (Meridian's rates are not clearly advertised). These offers are nothing like the actual price of off peak power which is very close to zero. So my point is that existing electricity companies are not offering anything like true costs average costs of power for time of use, that is why this needs to be mandated. Simply giving people incentives to put in these smart wall boxes when the benefits in power pricing do not reflect the wholesale rates will not engender the massive change to off peak charging of EVs and massive change to off peak usage of power for appliances that true pricing would give.

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?
What incentives do you think would be effective and who should provide these? What other incentives might be valuable beyond financial incentives?
Please see above answer

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaken in the UK?
What information could you provide to support your position?
I suggest that you need to be very careful of this that it doesn't turn people off buying any sort of smart charger and simply use a 3 pin plug like almost all of us do at present. If you are putting all your eggs into the smart charger basket and they have limited uptake, that is useless in terms of moving a considerable amount of the peak load off peak as well as ensuring the on peak loads don't increase anymore. Furthermore I'd suggest that any smart charger regulation should be to mandate that all smart chargers be easily extendable to give V2G capacity if not have it immediately. This is the end goal not simply moving EV charging loads off peak, but a complete

revolution in the power system where most of us are "prosumers" ie we produce electricity to sell to the grid as well as consume electricity from the grid be it with solar panels, stationary house batteries or vehicle batteries.

Q14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/incentives?
What parts would you exclude or change?
Does the PAS cover all the important issues?
What other resources may be useful for New Zealand?
As above I'm not at all sure having the right set of regulations will do what you aim to do which is move EV charging to off peak. To do this mandated time of use electricity charging for everyone that reflects the actual average spot price for that time of day, time of year, weather conditions. And once you've done that then pretty much all of the benefits are there through behavioural change and so the purchase of wallboxes of limited value.

Q15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?
Already answered above. If EECA can't mandate universal time of use electricity charging then whichever body that can do that should do so. This is far and away the most important thing. While having a smart wallcharger does offer some convenience benefits for consumers, the cost and limited benefits for the consumer over simple 10 amp 3 pin plug charging would I suggest limit it to the wealthy lazy. This would not be the step change in EV charging that you desire and furthermore would be a wasted opportunity to further flatten the load curve by moving a significant domestic appliances load to off peak. And if they did not have V2G capability or ready expandability it would be missing the third thing of using cars to feed back into the grid at peak times.

PTO for Appendix

APPENDIX

1. Flip the Fleet Email "(battery) cycling in real world conditions appeared to actually improve battery health"

From: [redacted]
Subject: Re: Flip The Fleet website enquiry
Date: 22 September 2020 at 2:57 PM
To
Cc: [redacted]

Kia ora Peter,

The main semi-official piece we have published around this is https://www.preprints.org/manuscript/201803.0122/v1. This showed that in real world conditions for 24 kWh Leafs, distance traveled (a good proxy for total equivalent number of cycles) was correlated with higher SoH when also considering age. So cycling in real world conditions appeared to actually improve battery health.

In reality it is going to be complex. If cycles are all from 0 100% and at high temperatures the battery will degrade quickly with cycling. If cycles are 20-80% and at a low temperature then they will hardly matter. So I'd agree with a statement that under gentle cycling conditions (don't go to low or high SoC, low temp), then calendar age is the primary ageing mechanism of concern.

Ngā mihi nui,

Daniel

On 22/09/20 9:28 AM, [redacted] wrote:

Hi Peter,

Thanks for your note. I'll ask [redacted] and/or [redacted] to chip in here, it's more their domain.

Kind regards,
[redacted]

-----Original Message-----
From: FlipTheFleet website <learn@website.flipthefleet.org>
Sent: Tuesday, 22 September 2020 7:41 am
[redacted]
Subject: Flip The Fleet website enquiry

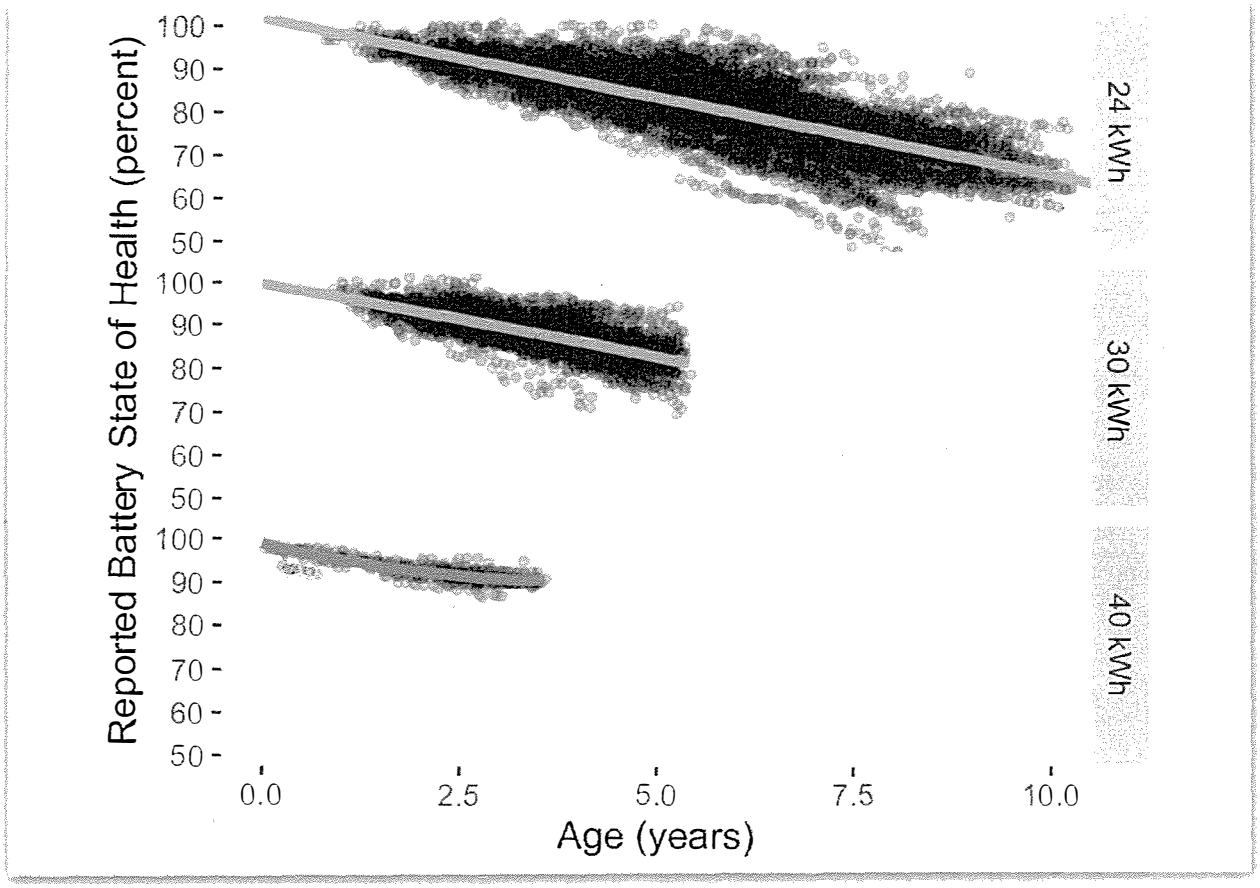
Dear Peter Olorenshaw Architect,

Thanks for writing to us!

Here is what you sent us - we'll aim to get back to you within 1 business day

Message Body:
Hi there, I am a Flip the Fleet data contributor and have a question regarding battery ageing for an MBIE submission.
Do you agree with this wording I am proposing:
"It needs to be noted here that Lithium Ion batteries used in Electric Vehicles today do not seem to be limited to number of cycles as other battery chemistries do, rather it is simple "calendar" aging of the batteries that sees the decline in capacity. Flip the Fleet has found that the heavily used EV taxis do not have significantly different battery degradation rates than similar but more lightly used EVs. If there is no downside in battery longevity from V2G applications then why wouldn't people use their EVs to absorb electricity from the grid when there is surplus in the middle of the night and feed some back into the grid in the early evening when the grid is under peak load, provided they could buy and sell electricity at the spot price"

2. Flip the Fleet Graphs showing Calendar Ageing predominant battery degradation
(The point being that if your battery is going to degrade over time anyway regardless of how many (gentle) cycles it has, why wouldn't you use it to put power back into the grid if you could buy it very cheaply in the dead of the night (or middle of a summer day) and sell it back at a handsome profit at peak times)



End of Submission

Submission on EECA paper on Improving the performance of electric vehicle chargers.

By Eaon Fitzwater

12 Harbour View Terrace, Cass Bay, Lyttelton.

24 August 2022

Appendix One: Consultation Questions

1. What are your thoughts on EECA's suggested engagement principles for EV chargers?

- What would you add or take away?

I would take away any control a network company may have over charging an electrical vehicle.

Reason if you come home and need to boost your car before going out in the evening or for an emergency situation you need to use your car, the last thing you want is for a company to have control and stop the charger from working. Some people work odd hours/shifts need their cars at different times. It has got to be the consumers choice otherwise there will be a big downturn in the purchase of electrical vehicles.

- Is there anything you disagree with?

The approach to the main issue is fundamentally wrong. We have a Electrical Market which should offer cheaper power (network connection and energy prices) to consumers when the demand is low and higher prices when the demand is high.

At present the rate between peak and off peak power is very little, and all energy companies have smart meters installed at consumers premises and could offer cheaper rates as Contact have started.

The Government should mandate all energy companies to offer cheaper rates between 10am and 3pm and 9pm and 6am, so people can program their EV chargers to work at the cheaper times if they choice.

2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?

- What do you see as most and least important?

A smart charger needs to be able to be programmed by the user and **needs to have an manual function so can allow a boost charge when required.**

- What functions would you add or exclude, if any, why?

Any control by an outside source.

- What information could you supply to EECA to help inform our thinking about this issue?

Transpower can supply times of the day when peak demand occurs.

3. Do you support EV charging being open access and why/why not?

No, it is private information of when you are home or not home offering thief's prefect opportunity to come over when your car is obviously not home or monitor your routines.

- What information could you supply to EECA to help inform our thinking about this issue?

Police crime statistics.

- Do you think that 'smart' chargers should address issues of cyber security?

Yes

- How would you suggest this is done?

Make sure all models can be programmed and work with no internet connection. Only allow them to be connected to the internet if the consumers choices to do so through a reputable New Zealand IT company.

4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?

Terrible idea.

- Who should be able to access this information?

Only the consumer and the company that makes and repairs the charger.

- In what form should it be transmitted?
- What processes should be in place to safeguard the data?

Laws banning the use, viewing or collecting of data by Energy / network companies.

- Is there any other way this data might be captured?

It is not required and waste of resources chasing something that should be illegal.

5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?

Information should be available to the owner and no one else.

- What other information may be valuable to the EV owner?

Instantaneous information on consumers smart meters so they can make choices to turn off appliances when the price is high (peak times).

- What format should be used for this information if this requirement is adopted?

Reducing peak demand.

6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

Not required

7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?

Not required

- What information could you supply to EECA to inform this issue?
- What challenges, if any, do you see in regulating in this area?

8. What are your thoughts on labelling aftermarket AC EV chargers?

Not required

9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?

Not required

10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

A good suggestion, this would save a lot of money and possible achieve a better outcome for the country.

25.Green paper on improving the performance of electric vehicle chargers

- Do you think the market can adequately address this issue without the need for government intervention?

Yes most certainly like Contact have already started offering cheap power during low demand periods.

- What information could you provide to EECA to inform this issue?

TV ads.

11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?

Not required

- What information could you provide to support your position?

12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?

- What incentives do you think would be effective and who should provide these?

Not required

- What other incentives might be valuable beyond financial incentives?

Not required

13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?

Regulation would stem the uptake and prevent New Zealand having the latest most efficient chargers on the market, as only some companies would produce something to meet our regulations for our small market.

- What do you think of New Zealand adopting the approach being undertaken in the UK?
- What information could you provide to support your position?

Look at any other products that have been regulated and you will see we fall behind in efficiencies gained from the latest products available.

14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?

What is a PAS?

- What parts would you exclude or change?
- Does the PAS cover all the important issues?
- What other resources may be useful for New Zealand?

15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

Installing of house batteries and solar so peak demand becomes a problem of the past.

Star

From: [redacted]
Sent: Sunday, 21 August 2022 10:13 pm
To: Star
Subject: Off peak power rates

Categories: Green Category

I understand that the loestest demand for power is somewhere around 1am.

Yet off peak starts at 9pm so that's when people use it for timer cotroled charging systems and appliances.

The govt should force demand shift to this time window by requiring the power company to set a lower off peak rate for this time.

Additional day time peak and shoulder rates can be used as they are overseas for load shifting

Sent from my phone

Star

From: James Currie [redacted]
Sent: Thursday, 18 August 2022 2:45 pm
To: Star
Cc: James Currie
Subject: Electric Vehicle charger submissions

Good afternoon,

I think Smart Chargers for electric cars are a great idea to level out the electrical demands especially as many people are considering electric cars.

I fully expect my next car will be electric. My main concern will be whether there is enough electricity to supply the needs of the country even if the loads were equalised. We already have times when we have to conserve power.

We also use gas. As this is phased out it will need to be replaced by electricity. In our business we have purchased energy efficient equipment to reduce the drain.

We would love to install solar, but the payback period is too long. If solar was subsidised so it had a 3 year payback for business it would contribute substantially to the power available and being localised would reduce the transmission loads and additional transmission infrastructure as well. We would be able to charge our electric cars at work during sunlight hours too.
We have overseas companies, and the subsidies mean that solar is widespread and must reduce peak loads.

We just need batteries to store it all!!

Kind Regards,

James Currie [redacted]

Star

From: andrew mcminn [redacted]
Sent: Tuesday, 9 August 2022 1:54 pm
To: Star
Subject: Submission on Car chargers

Categories: Green Category

Kia ora,
I wish to highlight a significant issue regarding fast chargers and their use as trying to get MP's to listen has fallen on deaf ears.

I have a health issue that has meant that I now require an ICD/Pacemaker. Whilst this provides a longer life it also comes with a cost as it is incompatible with a lot of environments that are frequently found in the wider world. Most of these can be avoided, which has led to my loss of ability to work and many other restrictions.

A great step forward is moving away from the internal combustion engine with electric cars being promoted as a great solution. Unfortunately the charging stations are not compatible with ICD devices thus eliminating these vehicles as a practible optione for our household. The only alternative is we continue to use undesirable technology and, under the current plans, will be punished for doing so.

A bigger issue is that chargers may be located in areas where foot traffic passes nearby thus preventing people who are already compromised from particpating in normal life. Perhaps there should be a clearway between charging stations and footpaths?

My question that I feel needs addressing is as follows.

What is being considered to ensure that vulnerable are not left behind in the electric vehicle push that is currently taking place? Have ICD users and other vulnerable peoples been considered and, if so, what is proposed to assist these people with this incompatible technology?

Regards
Andrew Peter McMinn

Sent from Mail for Windows

Star

From: David Packer [redacted]
Sent: Tuesday, 9 August 2022 7:43 pm
To: Star
Subject: EV Charging

Categories: Green Category

We recently bought an EV as felt it was a more responsible decision environmentally. We found that the cost was more than an internal combustion car yet it has significantly more moving parts. This most likely reflects retooling costs and lower volumes.
It was recommended that we buy a smart home charger and told that the cost including installation would be $3,500 to $4,000 which is on top of a more expensive vehicle. So far we have not done this and charge mainly at public stations.
The public stations all seem to have a flat rate and dont seem to encourage off peak charging which I do not understand.
If the Government and Electricity Industry want to encourage home charging it would make sense to incentivise smart home chargers to shift the load to off peak. Many power supply agreements have a good incentive to use off peak. The cost of a smart charger could be reduced by an incentive or removing GST. I think most people would find a cost of up to around $2,000 less of a barrier to installing a home charger on top of the vehicle cost.
If there is a significant uptake if EV,s it makes sense to shift the load to off peak to avoid overloading the network helping avoid expensive capital investment.

Regards
Dave Packer
BE

Star

From: Andrew herbert [redacted]
Sent: Wednesday, 10 August 2022 4:06 am
To: Star
Subject: At 1 percent

Categories: Green Category

Having read the article , i am at loss to understand what it is that you are requiring.....if only one percent of people that have converted to ev then from them there number is far too small.....i have been asking myself for a few years now how the electricity generators would be having open disscussion on what their plans to address the necessary increase to their capacity.....for at the moment it seems that they will have to be dragged out of a comatose state.....how many gigawatts of electricty to a given number of vehicles is the basis of the equasion on top the daily demands of all other electricity usages.....if this country had a gross excess of surplus electricity to day your need for disscussion would barely not exist

Star

From: Geoff Land [redacted]
Sent: Wednesday, 10 August 2022 4:56 pm
To: Star
Subject: Ev home charging

Categories: Green Category

We have 2 ev cars, a 2015 Nissan Leaf, owned 4 years, and a Tesla Midel 3 Performance, new 2020.

BOTH CARS HAVE SMART TECHNOLOGY BUILT IN as standard.

Even the basic early model Leaf, has on board computer options for charging over night, on lower cost rates, and it calculates itself when charging needs to start to be ready by 6am.

The Leaf is resident on Waiheke Island and plugs into an outdoor, 16 Amp caravan plug. A branded home Smart charger would be an expensive waste of money, promoted by industry to Govt agencies as a money making venture.

The Tesla lives in Auckland and has a Tesla Wall charger. The Tesla vehicle also has a charging overnight option, we set it ready for use at our preferred time, it charged st 32 Amp, requires expensive electrical re wiring, on top of the cost of the wall charger itself. The range of this model Tesla, 500km, requires a fast over night charge rate to be ready for the following day.

Govt control of overnight power delivery will be counter productive to the uptake of EVs, early adopters of EV technology will be averse to big brother interference in their lives.

Regards
Geoff Land

Star

From: Charlene and Geoff Waller [redacted]
Sent: Thursday, 11 August 2022 8:44 am
To: Star
Subject: Ev chargers

Categories: Green Category

My only comment as an EV owner, is that unless the commercial charging companies can reduce their charging prices to close to home prices, they will be seldom used except for long distance travellers.
This is not efficient use of a public-available charging network, especially for those who are unable to home-charge because of only having roadside parking.
This together with time to recharge and readily available charge stations will always be a disincentive to the take-up of electric vehicles.
Regards,
Geoff Waller.

Star

From: Kim Forbe[redacted]
Sent: Thursday, 11 August 2022 10:39 am
To: Star
Subject: Home EV charging installation feedback

Categories: Green Category

Hi
This is in response to the article in the EV Talk publication https://evsandbeyond.co.nz/eeca-seeks-submissions-on-home-ev-charging/.
I purchased an EV (Ioniq 5) in January of this year. Having travelled from Wellington to Cape Reinga, there are a few points relating to home charging I would like to bring to your attention as a result of my experience:

1. The education about amps vs volts vs kwh is confusing to a lay person. Is there any way this can be dumbed down? Especially when to comes to how this relates to the home electricity circuit? Currently, (no pun intended) I just plug into a 12 amp socket in my shed. I understand this is less than ideal in terms of cost and safety, however to install a home charging unit brings me to my next issue;
2. Capital cost if purchasing and installing a home charging station. Not much to say here other than prices vary greatly, and
3. The suppliers talk in language I do not understand (ref. point 1). There for a 'Consumer' type analysis of suppliers would be great, including a dumbing down of what they say (ref. point 1)
4. Some electricity companies do not offer cheaper rates over night so a analysis of what the Electricity suppliers can offer would be very helpful.

I think that's all.
Cheers
Kim

--
Kim Forbes
[redacted]

Star

From: Beverley Childs [redacted]
Sent: Thursday, 18 August 2022 3:45 pm
To: Star
Subject: EV Cars.

I bought a car 3 years ago and the lack of chargers was one of the main reasons I bought a petrol. I do not use much and it was quite relevant then.

Beverley Childs

Star

From: gmslappendel [redacted]
Sent: Thursday, 18 August 2022 6:15 pm
To: Star
Subject: Have your say on the future of home charging

Categories: Green Category

Hi,
No mention is made about the role the car can play in smart charging.
We have an 'old' Leaf (24kwh, 2015).
Our Leaf has a 'smart' setting ; we can set the end-time-of the-charge.
We have set this to 6am. We plug in the evening prior.
The charging happens in the small hours using a dumm charger.

Regards,
Gerard Slappendel Nelson
[redacted]

Star

From: Sarndra Flay [redacted]
Sent: Thursday, 25 August 2022 8:36 am
To: Star
Subject: Improving the performance of electric vehicle chargers

Kia ora

I am planning on two investments, neither of which stack up in traditional economic terms:
i) a plug in hybrid
ii) a set of solar panels on my NW facing roof.

Can you please ensure that whatever regulations you bring out do not interfere with my ability to charge up my car using my stored solar power at any time of the day.

Thank you

Sarndra Flay

Get Outlook for Android

Star

From: Michael Delceg [redacted]
Sent: Saturday, 27 August 2022 2:30 pm
To: Star
Subject: Electric vehicle chargers

A submission on this topic:

1. Chargers should have two cables for adjacent parking spaces. This reduces the amount of wiring needed.

2. Chargers should be reprogrammable. Already MIT researchers have demonstrated improved charging protocols. These should be immediately implementable once field tested.

3. Fees should include a post charging time element to encourage prompt vacating of stations upon charging completion.

4. Consumption data should be open access for the system but not include individual vehicle identification. This will be valuable for onward planning for system participants.

5. Credit card data should as usual belong to the card owner and not be available to system operators. This will provide users with consumption data.

6. Smart charging should be treated like water heating at the residence level; there should be a capacity to limit supply when there are more urgent system needs such as short supply.

7. The government should have control of these systems to ensure equity. While loans to suppliers may be approved to expedite rapid implementation, these should involve strict conditions such as placement and profit margins.

8. Any proposed system should be able to make maximum use of the coming smart grid to reduce ongoing costs. Covered photovoltaic charging courts with appropriately sized batteries in high use areas would reduce transmission costs.

9. The implementation of smart charging systems should not be limited to considering those in the UK. There are several systems such as the State of Maine in the US that are worthy of consideration.

Michael Delceg
[redacted]

TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY
EECA

Feedback on EV Charging Green Paper

Submitter

Martin Louw
[redacted]

1. What are your thoughts on EECA's suggested engagement principles for EV chargers?
   - What would you add or take away? - **Fully support the principles**
   - Is there anything you disagree with? - **Suggest that the way to manage the costs would be to treat them in a similar way to the rollout of smart meters over the last decade or two.**
   - **Another option (probably less palatable) to manage the costs of smart chargers would be to mandate their installation at the owner's expense for any vehicle purchased after the regulation is put in place. The existing EV fleet (<2%) is unlikely to make any difference to the grid if they were to be left as is, I.e., mostly 3 pin plug.**
2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?
   - What do you see as most and least important? - **The most important are those stated in the Basic Functions point. The ability to manually override is essential. Since peak load in the local distribution network is likely to be different from one transformer to another this needs some finesse to get the switch-on/off time managed at the local level**
   - What functions would you add or exclude, if any, why? – **Its not clear to me why V2G has been excluded. This is after all the end game so why put a whole lot of V1G smart chargers in place only to have to replace/upgrade them a decade later? The potential for V2G chargers to support the grid during peak times is significant and if the CCC are right in their prediction of a 53% increase in electricity usage by 2050, wouldn't it be sensible to mandate them now.**
   - What information could you supply to EECA to help inform our thinking about this issue? – **I would suggest applying the same logic to the DC fast charger network but use pricing signals to encourage users of fast chargers to plan their trips around charging at off-peak rates where possible.**
3. Do you support EV charging being open access and why/why not?
   - What information could you supply to EECA to help inform our thinking about this issue? – **Sorry I'm not an expert in this area but completely endorse the need for open standards. Ideally these should be international standards too as most smart chargers will be manufactured offshore and not exclusively for a small market like NZ**

     Another consideration is how EV charging and home solar charging hubs talk to one another to provide users with the ability to set charging goals and priorities to

determine the recipient of excess power generated (e.g. home battery, EV battery, hot water, grid) whilst maintaining the desired end state charging goal for the vehicle (e.g. 80% by 6am)

- Do you think that 'smart' chargers should address issues of cyber security? - **Yes**
- How would you suggest this is done?

4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?

   - Who should be able to access this information?

     Any organisation to whom the vehicle/homeowner is contracted (usually their electricity retailer) and in turn, their contracted organisations (network distribution operators, billing agents, charger monitoring agents etc) as disclosed to the vehicle/homeowner at the time the contract is signed with the retailer

   - In what form should it be transmitted?

     Encrypted, anonymised

   - What processes should be in place to safeguard the data?

     Similar to the way data is currently handled by the various players in the electricity market

   - Is there any other way this data might be captured?

5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?

   Yes, highly desirable to provide the data for people to make choices about when they consume electricity. I have found since owning an EV that I charge overnight, that I now pay more attention to moving other electricity consumption to off-peak periods

   - What other information may be valuable to the EV owner?

     Charger efficiency would be useful to highlight the point made

   - What format should be used for this information if this requirement is adopted?

     Mobile app

6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

   This would depend on the output power of the charger, wouldn't it? A 1.6kW charger is unlikely to affect the low voltage network but power control capability may be required for a 22kW 3-phase charger for example

7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?

   Yes, I support this if it is possible.

   - What information could you supply to EECA to inform this issue?

- What challenges, if any, do you see in regulating in this area?

  With NZ being a technology taker with a tiny market its hard to see how this could be implemented in practice. It might even have the effect of reducing EV choices. An initiative for down the track perhaps? A requirement to provide efficiency data on the charger would help to identify low efficiency vehicles so that might be a good idea

8. What are your thoughts on labelling aftermarket AC EV chargers?

   Charger manufacturers should quote efficiency specs on their labels to help to highlight poorly performing devices

9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?

   If the installation of a smart charger were to be mandated for every new vehicle purchase, these would likely be a thing of the past so it's probably not worth worrying about them

10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

    - Do you think the market can adequately address this issue without the need for government intervention?

      Intervention is definitely required. The market will probably get there but it might take many decades mostly due to the low level of maturity on the part of consumers. We only have to look at the length of time it took for the PC market to mature and develop at least to an acceptable stage of interoperability, in order to see the results of an unregulated market.

    - What information could you provide to EECA to inform this issue?

      As has correctly been said, government intervention should not stifle innovation especially as the technology is in its infancy. It should concentrate on setting minimum standards, enforcing appropriate labelling, aligning regulations with overseas standards and communication protocols.

11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?

    We are still at the start of the EV adoption curve. The all-consuming question on the mind of a current EV buyer is "how long will the battery last". Consumer maturity has not reached the point where the quality of a charger is even a consideration. So, although information, education and labelling cannot be forgotten, regulation is more important at this stage

    - What information could you provide to support your position?

12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?

    - What incentives do you think would be effective and who should provide these?

      Financial incentives on the purchase price would be the most effective. Chargers would need to fulfil certain requirements in order to qualify for the incentive. It would make most sense if they were administered nationally, probably by central

government even though the electricity industry (and therefore consumers) would be the biggest benefactors of fast charging.

In addition, it is important for time-of-charge incentives already offered for off-peak charging to remain in place and potentially increased as price signals drive behaviour for many people

- What other incentives might be valuable beyond financial incentives?

13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?

- What do you think of New Zealand adopting the approach being undertaken in the UK?

Yes, fully support this.

- What information could you provide to support your position?

14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?

Sorry I wasn't aware of PAS and don't feel I can comment

- What parts would you exclude or change?
- Does the PAS cover all the important issues?
- What other resources may be useful for New Zealand?

15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

[redacted]

From: john olssen [redacted]
Sent: Wednesday, 31 August 2022 12:31 pm
To: Star
Subject: Submission on Home Electric Chargers

Follow Up Flag: Follow up
Flag Status: Flagged

Hello there
My interest is in the use of electric vehicles to charge back into the grid [V2G], the home [V2H], or less importantly for me at least, to load [V2L], using Bi directional charging.

Whilst the report I'm responding to [evsandbeyond, Aug22 3] mentions this and solar power, and touches on bi-directional charging, it seems to overlook the reservoir of power that will exist in EV batteries.

You will no doubt have access to better numbers than me, but for the purpose of this discussion the precise numbers don't really matter that much.

Summary:
4.4million vehicles to become EVs by 2050?
NZ's current power consumption is about **40GW/year**
The EV fleet's batteries will hold a power capacity of some 176MW, or an annualised capacity of some **64GW**
A 3Kw household solar power system could produce some 3 to 20+Kw/day, so from 1.8m households between 5 and 36MW/day [range is largely the seasonal variation], or 2 to **13GW/year**
Community based solar and battery farms have great potential as storage and supply opportunities.
Bi directlional charging, hopefully in conjunction with solar power could at least mitigate, if not eliminate any perceived power supply deficit from charging EVs.

Discussion:
We have some 4.4million light vehicles in NZ, and most of them are generally parked somewhere close to, or in a house or building overnight, and many of them during much of every day too.

If we assume that at some point in the future [2050?] the vehicle fleet has largely converted to fu lly EV, with an average battery size of say 60Kw [current average is 40Kw, but already some are at well over 100] with 95% drawdown availability, then we'd have 57Kw/vehicle. Assuming the owner always wishes to have some 30% in reserve for immediate/emergency use, then the figure becomes 40Kw.

So, 4,400,000 x 40Kw = 176MW available at any given time. If one takes that as a daily availability, then x 365 = 64GW available annually, or 1.6 times the current national usage of some 40GW. [Kw = Kilowatt = !,000 watts, MW = Megawatt = 1,000,000 watts, GW = Gigawatt = 1,000,000,000 Watts]

Obviously it requires power to initially fill the vehicle fleet batteries to capacity, and to maintain it at that level, but there are choices for how to do that, and it will occur progressively, i.e. it won't all happen at once.

- **Worst case** - is a bit like the article's hypothesis, where the EV's take power for consumption and never feed anything back. They simply store it, or use it and **we see the 50% increase in power demand that is forecast, perhaps?**
- **Moderate case** is where the vehicle fleet batteries are charged to capacity during periods of lower power demand, but still draw it from the Grid through the house, at the choice of individuals. **Maybe 50%, but probably less, and if so then perhaps somewhat less of an issue.**

- **Best case** EVs are charged during off peak power supply periods controlled by the power companies, when overall demand for other purposes is low, but still drawing from the Grid through the house. **Unlikely to be 50%, and something less of an issue.**
- **Ultimate case** - There is of course a huge elephant trying to get into the room Solar Power! If houses and commercial buildings [or SolarPower farms] can be used to generate their own electricity and either store it in their vehicle batteries or separate freestanding batteries or battery farms, then the capacity might suddenly be being maintained without touching the national grid supply. Summer and winter obviously have very different scenarios, as do different latitudes, but separate freestanding batteries or community battery farms might largely resolve this. **Pure supposition, but maybe little to no increase in power demand, and might even be a reduction!**

The assumption of course is that one can utilise this power resource once it's loaded into the vehicle fleet, and this is where Bi-directional charging comes in. The UK already has it operationally available I believe. Australia is about to trial it, and I understand that Vector is already trialling it at Piha, north of Auckland. These trials are all for vehicle to house [V2H], and vehicle to grid [V2G] power supply.

Nissan is ahead of the game here. They some time ago recognised that the EV is essentially a power supply on wheels, and they have built in V2H, V2G, capability already! Mitsubishi have also recognised the potential, but other car manufacturers have to date been a bit slow to see the potential. VW have seen it now, and declared that all future EV's will have V2H, and V2G capability as does their newly released, ID4 model EV.

If the average vehicle holds 60Kw and 70% is available to draw down [leaving a 30% charge for emergency vehicle use], then the average vehicle will power the average house for a minimum of say nearly 1 day, but up to almost 3 days! I understand that averages are very dangerous things and that a 6foot tall man can drown wading across a river with an average 3foot depth. Solar power production will of course not be the same across the country either. Also, consumption levels will vary based on family configurations, climatic variances, building specifications [insulation, heating types, etc.] and people's commitment to managing their usage habits, but these are all challenges that can be largely overcome, or mitigated against in the case of climate.

Possible Solution Opportunities;

- **Encourage and promote the development of EVs with Bi-directional charging capability for V2H and V2G.** Currently only the Nissan Leaf, Mitsubishi Outlander & Eclipse, and the VW ID4 have that capability. The Hyundai Ioniq 5 and Kia EV6 have V2L capability but that is of limited value here unless it can be used to charge a separate freestanding battery? To date bi directional chargers are all using Chademo connectors but work is being done to add CCS capability.
- **Encourage and support the development of "smart" bi-directional home/business charging units.** To date Wall box Quasar, Wall box Quasar 2, Rectifier Technologies Highbury, Ford Station Pro, and the Emporia V2X home charger have this functionality, but they're not yet approved for installation in NZ.
- **Encourage and support the installation of solar power on roofs everywhere.** If one also has solar power, you can potentially charge the car free during the day, and run the house free at night! Simplistic, maybe but the theory works, even if in practice there's periodic/seasonal shortfalls. Nonetheless, it has the potential to reduce power consumption from the national grid quite dramatically, as opposed to the article's thesis of increasing it by 50%. Regardless of whether EVs are being charged though, solar power will reduce household consumption from the grid!
- **Support Power Companies in managing load.**
- **Increase the development of battery storage opportunities**
- **Investigate community based solar farms, and battery farms**

"In home" chargers need to be able to handle bi directional charging along the lines of the Quasar Wall-box2 charger. Then we could use V2H charging to run the owner's house as and when required, and also utilise V2G discharge to grid whenever possible.

The simplistic theory is that if one also has solar power, you can power your house and recharge your car "free" during the day, and power your house "free" over night! Simplistic, maybe but it has the potential to reduce power consumption, as opposed the thesis of increasing it by 50%.

Who knows whether EVs are the final stop in vehicle technology, but solar electricity seems like a no brainer no matter what else happens. So, whilst one might wish to move cautiously with serious expenditure in areas of rapidly changing technology, building solar power capability would seem to be worth pursuing under any scenario. EV producers and others will continue to pursue technology for charging, and any encouragement to help make the fleets power storage available to homes and the grid seems a pretty low cost opportunity to Government and their taxpaying consumers.

This is a very complex business, and so I wish you well in your deliberations, and look forward to the end conclusions and decisions in due course.

Yours sincerely
John Olssen

John P Olssen

[redacted]

From: Reg Dunlop [redacted]
Sent: Sunday, 4 September 2022 7:23 am
To: Star
Subject: EV charging and the grid.

Follow Up Flag: Follow up
Flag Status: Flagged

The future electricity grid limitations will be problematic without supply company regulation. At present, I change my EV anytime as the electricity supplier would hike it's prices (for the period when I need to use it in the house) should I select a cheeper overnight rate for EV charging.

In the absence of information about the energy supplied during the day, say at 30 minute intervals, it's not possible to make a sensible decision about overnight charging. It could also be aggregated for each time interval over the month. Hence the don't care approach to supply company problems.

There's also an issue with the solar energy buy back pricing. A nett energy charge approach would encourage further customer investment, in fact many countries actually regulate a higher buy back price to encourage solar installation.

There's a good article in September issue of the IEEE Spectrum : "A Road Test for Vehicle to-Grid Tech", pp20-25. I'd love to see a similar enlightened approach here in NZ.

Dr GR Dunlop
[redacted]

[redacted]

From: Graeme Wells [redacted]
Sent: Sunday, 4 September 2022 3:42 pm
To: Star
Subject: EVchargerSubmission

Follow Up Flag: Follow up
Flag Status: Flagged

Attention EECA re: feedback on ways to improve the energy performance of private electric vehicle (EV) chargers.

I have been following the development of EVs and the need to reduce greenhouse gases for some years. I have recently taken delivery of my EV (a Kia EX6 Earth AWD LongRange)

I hope most of my comments are relevant, and some might be useful.

Standards for private EV chargers:

Some things that would be helpful:

- there needs to be a reliable online website comparing available chargers, including the modes/functions each provides including whether or not they incorporate the required 32/35Watt TypeB RCD, whether they will be compatible with upcoming V2H and V2G standards in NZ, and the installed cost.
- there needs to be incentives for installing home PV panels to help power the EV chargers.
- the NZ standards for V2H and V2G must be expedited, and all home chargers sold in NZ required to be easily and economically adapted/updated to meet these standards.
- possibly a subsidy on home EV chargers
- there needs to be incentives for installing roadside/parking-area EV chargers in accommodation areas which do not have individual off-street parking.

ALSO:

Standards for public EV charging stations:

- All should have clear instructions on the charger.
- All should have TWO CCS2 charging plugs per station (and probably Chademo as well) that can be used simultaneously (with power sharing if the supply can't cope with the load otherwise!).
- All should accept several standard payment methods (including international cards).
- Maybe Tesla should be encouraged/required(?) to allow other brands to charge (as is starting to happen in a few countries)?
- All should be on ALL standard websites... at present the Takaka one is not on NZTA https://www.journeys.nzta.govt.nz/ev-chargers-list-view/ because of some technicality, but is on NZTA https://www.journeys.nzta.govt.nz/ev-chargers/regions/17 and AA https://www.journeys.nzta.govt.nz/ev-chargers-list-view/

Graeme Wells (& Robyn Trim)

Clark Thomborson
[redacted]

4 September 2022

Energy Efficiency and Conservation Authority
STAR@eeca.govt.nz

Dear EECA official,

I write this letter in my private capacity, in response to your *Green paper on improving the performance of electric vehicle chargers.*

I have no confidentiality concerns: you are welcome to publish this letter.

I am supportive of your approach and principles regarding your engagement with residential EV charging.

I am not fully supportive of your approach. In particular, I believe it to be infeasible and inappropriate for you to "ensure the costs and benefits of smart EV chargers are equally accredited to both electricity providers and consumers". My reasoning is that any one-dimensional metric of cost-benefit would, at least in principle, allow you to equalise the net costs and benefits of these two very broad classes of stakeholders. However any given one-dimensional cost-benefit metric would be appropriate for at most a few of the many distinct subclasses of these two broad classes of stakeholders. Some are highly sensitive to capex. Some are highly sensitive to opex. Some require a favourable ROI analysis before committing to any significant capex. Some are highly risk-adverse. Some aren't particularly constrained by financial considerations, but instead are primarily motivated by non-economic considerations. Some are prosumers, i.e. are both consumers and producers of electricity. Some (such as line companies) are primarily in the business of offering electricity services. For these reasons, I encourage you to substitute the word "equitable" for "equal" in this goal; and also to amend this goal so that your regulatory attention will be focussed on all of the classes of stakeholders who may pay significant costs or enjoy significant benefits, from future purchases, installations, and uses of residential EV charging equipment.

Here is a very-rough first draft of an amended goal for your engagement with residential EV charging which would be fully responsive to my concerns.

> "... ensure the potential costs and benefits of smart EV chargers are more equitably distributed among all of the major stakeholders in our nation's electricity grid, with particular attention to residential prosumers, lines companies, and low-income consumers of electrical energy."

I constructed my draft amendment above with the idea of encouraging you to be focussing your regulatory attention (with respect to your engagement with residential EV charging), primarily on the costs and benefits accruing to three classes of stakeholders:

1. Residential prosumers of electrical power who possess (or will soon possess) an EV as well as the resources to integrate its EVSE into a "smart" home. Such a home will have a control device which orchestrates the electrical activity of the EVSE (which may also eventually be intimately involved in the V2G connection

for this EV) with that of other highly-controllable devices such as an electrical hot water cylinder and the inverter(s) on the home's energy storage battery, photovoltaic array. The "smart" controller in such a home must be fully compatible with the "smart" control system(s) on its connection to the local low-voltage electrical distribution line.

2. Lines companies, who are capex-constrained and (for the most part) mostly profit-oriented, and who face significant financial risks if they become early-adopters of a technology (such as a power-control system which contains OCPP in its application layer) which may – or may not – have a high adoption rate among the residential customers on each of its low voltage distribution lines.
3. Residential consumers of electricity who are likely to lack either the means or the desire to purchase an EV in the next decade. In my opinion, such stakeholders should not be required to pay significant additional costs for their future electrical consumption except insofar are as these costs are unavoidable if the reliability of their electrical service is to be maintained at adequate levels.

Please note that I have not included any "whole of grid" considerations in my suggested amendment. I did this because I have formed the impression that the balancing of net national supply with net national demand is rarely (if ever!) the primary constraint on grid operation. I believe, instead, that the major challenge to grid reliability when (if!) there are vastly many more EVs our nation's private passenger fleet, is for our nation to have in place (before this increase occurs) a well accepted approach (following international standards) to how the "smartness" of our grid's low-voltage distribution lines should be increased; and furthermore to have developed a way to (collectively) pay the capex of the planned (gradual) "smartening" of the grid. This capex will include many components, including the purchase of

- compatible "smart" home equipment "behind the residential meter", notably including means to orchestrate the home's local electrical production and demand,
- the meter itself, and
- the control systems (at local, regional, and national level) required to locally balance supply and demand, and to locally regulate the power quality parameters (notably including the reactivity of loads, and the positioning of the loads and supplies on a long rural line) which can be strongly affected by "smart" residential devices such as the OCPP-enabled EVSEs which are the specific focus of regulatory interest in this green paper.

It is my considered opinion that it would be a highly questionable investment of capex, for most prosumers, if they were to incur any significant additional costs for any particular form of "smartness" in their mode-3 EVSEs (such as support for OCPP in the application layer of its networking stack).

I would happily revise my bearish opinion on mode-3 OCPP-compliant EVSEs if I were assured that this particular form of "smartness" is well-supported by the prosumer's lines company and electrical retailer. In the near term, I see no prospect of this occurring on any local line in New Zealand. Indeed, to the best of my knowledge, there have not yet been any significant uses of OCPP to control mode-3 EVSEs on *any* local line, anywhere in the world.

For the reasons outlined below, I see little or no net utility in New Zealand for any of the currently-feasible demand-consortia which could be offered by any of the

manufacturers of mode-3 EVSEs which qualify for the UK's "smart" EVSE subsidy. My reasoning is that these devices have incompatible network stacks (except across a single manufacturer), that I know of no family of mutually-compatible OCPP-enabled mode-3 EVSEs which is likely to dominate the market in New Zealand, and that I see little prospect of any of these potential demand-consortia (one per manufacturer) to meet the requirements of our grid operator to participate in its whole-of-grid control systems. At best these potential demand consortia could provide novel opportunities for an electricity retailer to differentiate its retail offerings in a way which would make it somewhat more convenient for a prosumer to program their home controller (or their "smart" EVSE) such that it will charge their EV preferentially at times of globally-low demand on the grid.

I have very limited expertise in power engineering as applied to EVSEs. Even so, I have formed the impression that OCPP is the *de facto* application-level standard for mode-4 (DC) charging in the Western world. And I have formed the impression that, sometime within the next five years, it will be possible to purchase low-cost low-power mode-4 OCPP-compliant EVSEs. Such devices, if they become commercially available, would be somewhat more expensive than similarly powerful mode-3 EVSEs; and they will merit this additional expense because they will offer very significant advantages in efficiency and controllability.

By contrast with (my envisioned low power OCPP-compliant mode-4 EVSEs), mode-3 EVSEs are inherently less controllable and less efficient for the following reasons. My reasoning is that mode-3 EVSEs require the use of an on-board inverter in the EV whose battery is being charged; and these onboard inverters (generally) have the following properties:

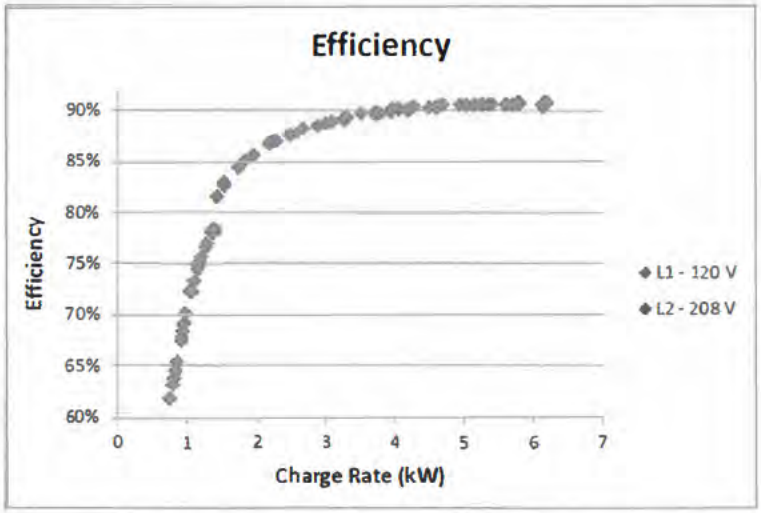
- They work most efficiently (typically slightly better than 90%) at their maximum charging power, but never charge an EV's battery as efficiently as a mode-4 EVSE (which has an inverter that is well-matched to its load, so can typically work at 95% efficiency);
- They are rather inefficient (with efficiencies dropping below 85%) when charging an EV's battery at rates below ¼ of their maximum power;
- They are very unlikely to be designed in a way which allows them to "resume" an AC charging session which had been "paused" (at zero power) for more than a few minutes. By contrast, mode-4 EVSEs have well-standardised "pause" states.

As far as I know, there is no "pause" state defined in any of the relevant standards (SAE J1772, IEC 61851, IEC 62196, etc.) for AC charging sessions. Until these standards are revised to support pausing of AC charge sessions, and until these revised standards are incorporated into next-generation EV chargers, I believe mode 3 EVSEs will continue to be poor candidates for demand-controllability.

I offer the following information in support of my (very rough) estimates of charging efficiencies in the bullet points above.

In my personal experience: a 3kW onboard charger (in a 24kWh 2013 Nissan Leaf and also in a 24kWh 2014 Nissan e-NV200) is noticeably less efficient on a 6A charging session (i.e. about 1400W) than on a charging session which offers 3kW. My measurements were with an uncalibrated "kill-o-watt" inline power meter, so are only indicative.

My personal experience with 3kW onboard chargers is in excellent alignment with a figure (reproduced below) in a publication from a highly reputable and independent testing laboratory (https://avt.inl.gov/sites/default/files/pdf/fsev/SteadyStateLoadCharacterization2015Leaf.pdf) This figure reflects their measurements of the efficiency of the 6.6kW charger in a 2015 Nissan Leaf, at various charge rates. I note that the lowest available charging rate for an AC charge at New Zealand's 230VAC supply is (nominally) 1.4kW, this being a charge at the 6A minimum setting of a mode-3 EVSE. The efficiency at such a slow charging rate is below 85%.



I would also like to draw the EECA's attention – in response to some of the questions in the green paper – to the onboard charger in a Renault Zoe. This model of EV has attracted attention, in the technical literature and also in the blogosphere, for its very low power factor at low charging rates. Low power factors do not affect a residential consumer's power bill (because their meters are required to measure consumption in kWh), but they increase the costs to a lines company because they cause its distribution transformers to run inefficiently. I see some evidence, in the technical literature, that the onboard chargers on EVs (and in particular the one in the Renault Zoe) have rather high harmonic and superharmonic emissions when they are run at rates significantly lower than their maximum power (which is 27 kW in the case of some models of the Renault Zoe). These emissions, and low power factors, may be considered "pollutants" which cause inefficiencies in the transformers of lines companies, and also in the inverters of domestic photovoltaic arrays. The total "pollution" may increase significantly, whenever a level-3 EVSE is throttled significantly by a demand-control system such as OCPP.

In partial support of my comments above regarding the Renault Zoe, below is some power-factor data for single-phase charges through the 27kW onboard charger in a particular Renault Zoe, as published by a blogger at https://canze.fisch.lu/charger-efficiency/.

Set point current (A)	Power battery (W) *)	Power AC (W)	Current AC (A)	Power efficiency (%)
32	6043	7070	31.6	85.5
28	5325	6300	28.1	84.5
24	4366	5230	23.4	83.5
20	3543	4270	19.6	81.1
16	2840	3560	16.2	80.7
13	1881	2540	11.8	74.1
10	1341	1940	9.3	69.0

This blogger has also published data indicating that three-phase charges are significantly more efficient than 1-phase charges on his Renault Zoe. See https://canze.fisch.lu/charger-efficiency-part-2-3-phase/:

Charger efficiency part 2 (3 phase)

JEROEN MEIJER - POSTED ON JULY 10, 2020 - POSTED IN ZOE - NO COMMENTS

Set point current (A)	Power battery (W) *)	Power AC (W)	Current AC (A)	Power efficiency (%)
32	19604	21507	31.52	91.2
28	17074	18681	27.40	91.4
24	14714	16080	23.59	91.5
20	12022	13060	19.26 **)	92.1
16	9231	10120	15.56	92.2
13	6970	7810	12.80	89.2
10	4448	5120	9.51	86.9

*) Battery power (DC) was derived from CanZE, voltage times current **) There was an obvious typo in the data I received for this value, 19.26 is most probably the correct value but I must note this could be wrong.

If only because of its low power factor on charging rates below 10A, and perhaps also because of its non-compliant levels of harmonic emissions when charging at this rate, a mode-3 EVSE that is charging a Renault Zoe should not be demand throttled to charge more slowly than at 2.3 kW. Thus, unless the Renault Zoe (and all other EVs with very high-powered onboard chargers) are treated (somehow!) as special cases, no mode-3 OCPP-compliant EVSE should ever offer less than 10A to an EV. This consideration will pretty much rule out the use of demand control (as may be

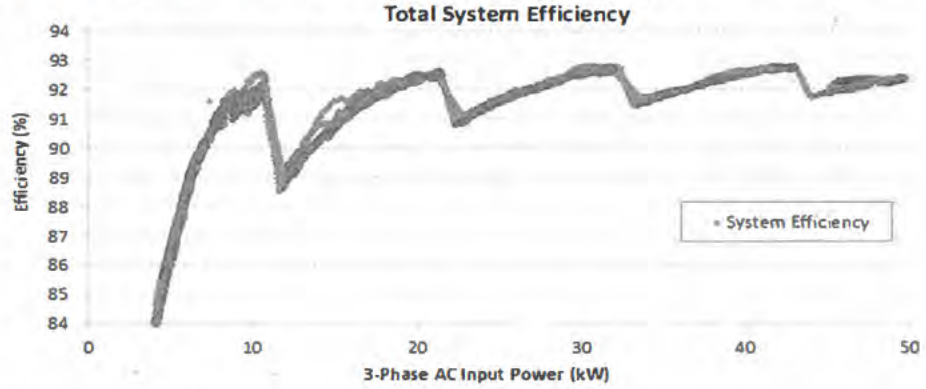
mediated by OCPP or any other application-level protocol) for mode-2 EVSEs. It also severely limits the load-shedding possibilities of a low-powered (3kW or 7kW) mode-3 EVSE.

In view of the above, if we restrict our attention to EVs with onboard chargers of 6.6kW or more: I'd expect to see a small but non-negligible efficiency gain (from 85% to about 90%) when charging at 6.6kW through a mode-3 EVSE, rather than charging it on 2kW mode-2 EVSE (aka "charging cable" or IC-CPD). I'd also expect to see a small but non-negligible *drop* in efficiency if there were ever any extensive use of demand-control features on OCPP-enabled mode-3 EVSEs in NZ. However as noted above, I think this an unlikely contingency due to the incompatibility at the network layer for home-based "smart" controllers, and among different manufacturers of mode-3 EVSEs. It is conceivable to construct a flexible demand service provider (FDSP) by remote-controlling one manufacturer's OCPP-enabled EVSEs; but I see little likelihood of any of these becoming large enough to have any significant effect on our nation's gross supply-demand for electricity; and I see absolutely no likelihood of these being anything other than mildly-deleterious for a lines company's management of supply-demand constraints on its local lines.

Here's my ideal outcome if we take your "do-nothing" option (as a way of avoiding the stranded-asset and ineffectual regulation defects of a premature encouragement, to consumers, on the demand-control type of "smartness" in mode-3 EVSEs):

- Whenever an EV is charged on AC power, it is charged as rapidly as its onboard charger will allow.
- Demand-control on EV charging will occur whenever the local line is overloaded, and whenever a region's power is curtailed.
- Demand-throttling would be implemented primarily by preventing any new EV charging session from starting, if the consumer has agreed to a low tariff for an interruptible supply of power, and if they haven't pushed a "damn the expense, charge at full speed" button on their EVSE's control panel.
- The most common residential EV charging system would incorporate an economical 3kW single-phase mode-4 (DC) EVSE, with OCPP in its networking stack. This EVSE could be demand-throttled over a wide range of charging currents, with high power factor and low harmonic emissions. Such EVSEs are not yet available; but I'm hopeful that the 7kW mode-4 EVSEs currently being manufactured will drop in price to NZD 2000 within the next few years; and that even less-expensive 3kW mode-4 EVSEs will soon become available. See e.g. the portable DC charger line from Guangzhou Electway Technology Co at http://www.electway.net/upload/file/1474962044.pdf; currently a 7kW model is available from the manufacturer via Alibaba, FOB Shanghai for an indicative price of USD 2000 to USD 2500. Also please see the figure below, reproduced from https://avt.inl.gov/sites/default/files/pdf/evse/ABBDCFCFactSheetJune2016.pdf, showing the charging efficiency of a high-powered mode-4 session on a Nissan Leaf:

DC Fast Charger Fact Sheet: ABB Terra 53 CJ charging a 2015 Nissan Leaf



- Most residential EV charging systems would be well-integrated with an appropriately-sized rooftop photovoltaic array. For example, if a home has a 3kW mode-4 EVSE which is "solar smart", and a 12-panel photovoltaic array capable of generating up to 3kW during summer months, then its owner would normally depress the EVSE's "charge only when my household has excess solar power" button. I note that a 3kW mode-4 EVSE would efficiently trickle-charge an EV even when it is supplied with less than 1kW of power. Furthermore, it would reliably resume a charging session which had been paused overnight, or during a cloudy period of the day. Neither of these feature-points are feasible with a current-generation "solar smart" mode-3 EVSE; although they would be (functionally) reachable in a home with a V2G EV, a photovoltaic array, a mode-3 EVSE with V2G features that are compatible with this particular V2G EV, and a home storage battery that is large enough to charge the EV's battery even on a cloudy day.
- Most NZ homes will have a "smart home" controller which is compatible with their "smart" EVSE. Unlike the desiderata listed above, this is a long-range vision, as there is currently huge competition in the smart-home marketplace – with multiple mutually-incompatible protocols for communication, controllability, and observability. Within a decade, I can hope that there'll be a clear "winner" for the standardisation of "smart home" systems in NZ; and at that point (but not before) I think it'd be appropriate for EECA to recommend these to consumers.

To summarise: I hope the EECA will decline to take the proposed option of recommending to consumers that they purchase a demand-controllable mode-3 EVSE. These devices are inadequately standardised to be interoperable. Furthermore, a mode-3 charging session on a contemporary EV has only a narrow range of power in which it is operating efficiently – so it is poorly suited to demand-control by any current version of OCPP -- or by any conceivable application-level demand-control protocol, until such time (if ever) that the onboard charge-controllers on EVs are compliant with this (as yet to be invented) interoperable protocol for demand-controlled AC charging sessions.

Thank you for your consideration of my submission.

Sincerely,
Clark Thomborson

Q1
I agree that the EECA should intervene to the minimum extent possible.

Q2

What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?

Most important would be benefits to the person charging, not the power companies.
V2G would be the least important as the technology is still being developed and is currently very expensive.
Minimum charge mode would be 6A

Q3. Do you support EV charging being open access, and why/why not?

Yes it needs to be standardised
Anything connected to the internet needs to have security built in.

Q4
I don't agree with transmitting this data on an individual level. Home load data should be from the main smart meter only.
It would push up the cost and complexity of the wall chargers.

Q5
This should be optional and up to the Charger manufacture.

Q6
This should not be mandated. Some rural users live at the end of a run and often have low voltage so would not be able to charge.

Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?

This could stop the import of older electric vehicles and decrease the take up of electric vehicles.
A vehicle with an inefficient charger is still better for the environment than a petrol vehicle.
An Energy Star rating would be a better way of defining efficiency

Q8

No there is no need.

Q9

Saying these chargers are not designed for constant overnight use is 100% false.
SNZ pas 60112021 says " *Mode 2 chargers These units are the least expensive and if the charging times are not an issue, or you simply prefer overnight charging then this is a good option*"

3 pin chargers are rated to a maximum of 8A and generally draw 7.8A maximum.
3 pin home chargers are designed for constant overnight use and have temperature sensors built in to the units as well as the plugs. Saying they are not designed for constant use has been spread by the large companies that sell wall mount ev chargers so they can push the more expensive wall chargers.
Portable chargers are often used in locations where there is no wifi or connectivity and are unable to be connected via a cat5 cable. Also, they typically draw less than 8 amps so they should be excluded from any intervention.

Q10

Yes the market will address the issue. Power companies can offer better off peak rates and encourage the use of smart chargers with timers build in plus incentives

Q11

All EV chargers are low energy devices and consume very little energy when not operating. They typically have not display are just waiting for a signal they have been plugged in.

An energy rating label would not be needed.

Q12
Incentives would encourage people to install smarter chargers

Smarter charging mostly benefits the power companies. Incentives should come from them.
Other incentives could include discounted rates for charging off peak.

Q13

Where possible regulation should be limited.
The majority of EV owners use the 3 pin wall charger that draws less than 8a.

Q14
Yes the PAS covers all the important issues and should be used instead of regulation.

Star

From: Chris Mitchell [redacted]
Sent: Thursday, 18 August 2022 3:06 pm
To: Star
Subject: green paper feedback

Follow Up Flag: Follow up
Flag Status: Flagged

Question 1. Regarding engagement principles:

I find the EECA's response completely overblown and selfserving. For example consider this quote" EECA Chief Executive Andrew Caseley says, "EV chargers will use the most energy of any appliance in the household, making this important to get right at what is still a relatively early stage of EV adoption." This is simply NOT correct.
By your own admission 78% of cars are sold with 3 pin chargers that are safe for up to 10amps. I actually think that you'll find that 100% of EV car owners have such a 3 pin cable.
10 amp circuits are Not actually using the most energy in the house, this is in fact still the electric hot water cylinder. It consumes far more power let alone 50% high current.
The issue here is that every house in NZ already has electricity so outlets are far more plentiful than petrol stations. The average commute is very short so the daily power usage is tiny and it is better for the infrastructure if everyone is only drawing 8 to 10amps.

Our household is part of a power co study and so we already have 2 Evnex smart chargers and therefore we have experience of two different EV and both smart and dumb charging. We also have extensive experience with caravan plug charging at 3.3kW.

My view is to ask you to leave it alone and just to focus on safety devices at the fuse board to safeguard circuits. Your commentary and intentions are over zealous.

Question 2. Smart Chargers

My view is that they are completely unnecessary. It is good to have charge timers, these can be in the car or in the smart charger. If as per above people are charging at 10amps then they don't need one. What is very important is to try and get people to charge away from the period of peak demand. So, the entire electricity market has to discount the price of off peak power and raise the price of on peak power in such a way to provide a great incentive to use charge timers to manage charging in the right way.

Rather than you proposed approach you'd better off if you looked in charge timers for HWC. Since the cars already have charge timers you don't need to poke your nose in, but the HWC is operating with only a simple thermostat. If EVERY HWC is NZ had the thermostat set to maximum and used a Smart timer to manage the HWC this would result in much lower power bills doing the majority of charging off peak. It would greatly reduce peak power usage. It would allow a margin between max permitted temperature and min permitted temperature to avoid peak grid demand and to avoid charging at peak $ rates.

Q3. By all means monitor the information but as discussed above it is bollocks and this monitoring will only prove it. Why not monitor HWC usage to make sure smart devices are charging those in a sensible way?

Q4. Waste of time asking me the same questions in different ways expecting a different response.

Q5. No more so than other parts of the power bill such as oven, HWC and so on. There is no reason to single out EV, just because you can.

Q6. Increasingly people want to use home solar. You need to be very wary about mandating for the majority where you might end up dis-incentivising what you should encourage the most.

Q7. I repeat stop meddling.

Q8. I don't believe you. Overblown claims are not acceptable from a quango.

Q9. It is often the case that NZ comes up with silly rules instead of following the world. Stop meddling.

Q10. The do nothing option is best for charging, charging cables, EVSE, Smart chargers.

However the DO SOMETHING option is important for each of the following:
The best route for EECA is to empower, force or mandate electricity suppliers to accept safe V2H power usage, supply of cheaper off peak power to remove demand peaks, mandate current leakage devices at the switchboard, better integrate distributed home solar (or wind), provide a cheap smart option for HWC management.

Q11. Don't meddle, you just give the far right more ammunition.

Q12. Holy smoke, you don't want feedback at all you're just pushing your agenda. This is covered already by my previous answers.

Q13. Do not regulate.

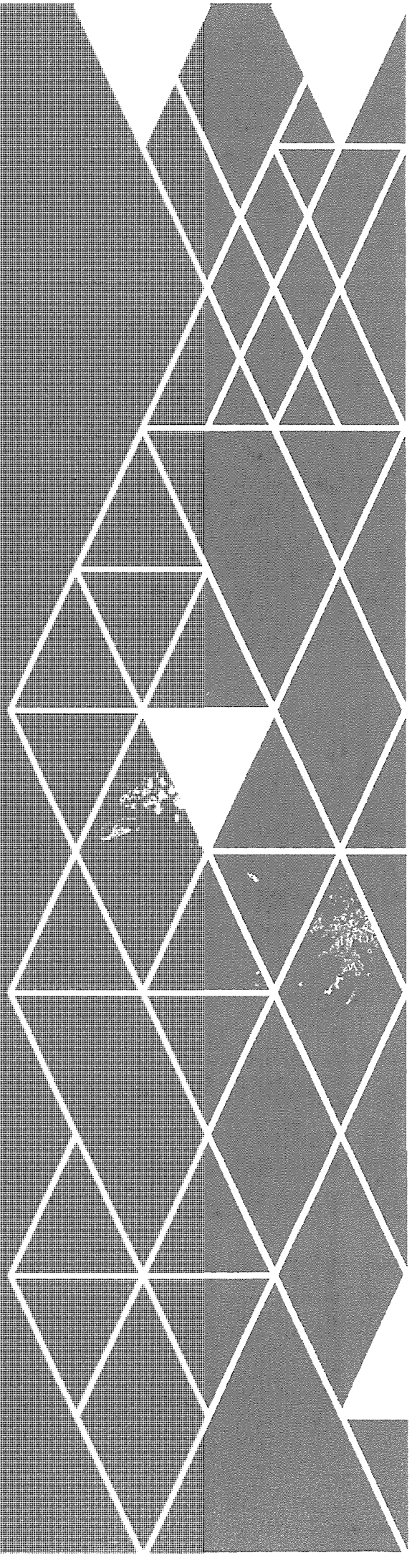
Q14. Cease and Desist.

Q15. You can find lots of ways to help without this smart charging crusade you are obviously intent on. The main ones would be providing every household with a smart meter, safe fuse board, smart HWC timer, mandate cheaper power rates off peak albeit more expensive during peak.

Chris Mitchell MRINA CMEngNZ ME(mech)
[redacted]

Improving the performance of electric vehicle chargers

A green paper seeking input on ways to improve the energy performance of electric vehicle chargers



TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY AND CONSERVATION AUTHORITY

Citation

This document may be cited as:

Energy Efficiency and Conservation Authority, (2022), *Improving the performance of electric vehicle chargers,* Wellington, New Zealand, a green paper by the Energy Efficiency and Conservation Authority.

Acknowledgements

The Energy Efficiency and Conservation Authority would like to acknowledge the various stakeholders that provided input to inform this green paper, including the input of officials from the Ministry of Business, Innovation and Employment and the Electricity Authority.

Contents

Submission process

The Energy Efficiency and Conservation Authority (EECA) seeks your feedback on the issues raised in this green paper. All relevant material made in submissions will be considered. You are welcome to provide additional information by directing feedback and enquiries to STAR@eeca.govt.nz.

Submissions on this green paper close on **05 September 2022**.

EECA will provide advice to the Minister of Energy and Resources following the consultation period. A summary of submissions and analysis will be sent to all submitters and posted on the EECA website.

Official Information Act requirements

Under the Official Information Act 1982 (OIA), information held by EECA is to be made available to requestors unless there are grounds for withholding it. The grounds for withholding information are outlined in the OIA.

If you are making a submission, you may wish to indicate any grounds for withholding information included in your submission. Reasons for withholding information could include information that is commercially sensitive or personal (such as names or contact details). An automatic confidentiality disclaimer from your IT system will not be considered as grounds for withholding information.

EECA will consider your preference when determining whether to release information. Any decision to withhold information requested under the OIA may be reviewed by the Ombudsman.

Purpose

This green paper seeks your views on ways to improve the energy performance of private electric vehicle (EV) chargers. This will inform our ongoing thinking on the issues and our role, if any, in addressing them.

Modern technology has the potential to improve energy outcomes in New Zealand. An increasing number of energy-using products are 'smart', or demand response capable – that is, they engage with the electricity system and respond to market signals by changing when and how they use electricity. These products are commonly referred to as controllable distributed energy resources (DER). Harnessing controllable DER will mean lower electricity bills at the household level, and at a system level, the impact can be even more significant[1].

Flexibility services, such as demand response, have a key role to play in the energy transition. It can help to manage intermittent renewable supply and manage peak demand, both of which are essential to the success of delivering energy security and affordability alongside decarbonisation.

Smart and energy-efficient electric vehicle (EV) charging holds the greatest potential to reduce peak electricity demand in New Zealand[2]. This is because we expect to see significant growth in electricity demand from EV charging, and most of the generation required to meet this growth in demand has not yet been installed. We stand the best chance of realising this potential if we start planning for an expected increase in EVs and EV chargers now, when we can influence the types of devices installed.

Note that this green paper does not contain specific proposals – rather, it seeks further information from industry and other interested stakeholders about the opportunities, barriers, and potential role for EECA in this space. If we decide to pursue any of the potential measures set out in this green paper, we will undertake further consultation on specific proposals.

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1 Unlocking the potential of DER was a core focus of the Electricity Authority's July 2021 discussion paper *Updating the Regulatory Settings for Distribution Networks*.

2 Concept Consulting (2021) *Shifting gear: How New Zealand can accelerate the uptake of low emission vehicles*, Report 2: Consumer electricity supply arrangements, September 2021

Context

EECA was established as a Crown entity under the Energy Efficiency and Conservation Act 2000 (the EEC Act) to encourage, promote and support energy efficiency, energy conservation and the use of renewable sources of energy. As part of its work, EECA regulates a range of energy-using products through three mechanisms:

- Minimum Energy Performance Standards (MEPS) which ensure appliances and products meet minimum levels of energy performance to be sold in New Zealand,
- Mandatory Energy Performance Labelling (MEPL) which ensures some appliances (e.g whiteware and TVs) must display an energy rating label to be legally sold in New Zealand, and
- Vehicle Emissions and Energy Economy Labelling which ensures all light vehicles display a fuel economy label when offered for sale by a registered motor vehicle trader.

EECA also provides information and financial incentives to encourage smart energy choices. Together, EECA's levers work to:

- address information gaps for consumers in purchasing energy efficiency products,
- remove inefficient products from the market,
- reduce appliance and product operating costs, and
- contribute towards reducing New Zealand's energy consumption and associated greenhouse gas emissions.

In 2021, MBIE sought submissions on proposals to enhance the regulatory regime for energy-efficient products and services. This covered a suite of changes to EECA's regime (e.g. the EEC Act and associated Regulations) to ensure it remains fit for purpose.

This package of proposals included clarifying that EECA's energy performance standards and labelling can include requirements related to demand response capability ('smartness') as an enabling first step[3]. The majority of submitters supported this proposal.

EECA understands that Cabinet will consider the package of proposals in late 2022. EECA will support the Minister of Energy and Resources and MBIE to implement any changes through the legislative process in 2022/23. Any move by EECA to regulate EV chargers for demand response capability would be subject to this proposal being adopted and implemented in our legislation. This green paper is an opportunity to commence investigation into the matter now to ensure we are well placed to regulate following Cabinet approval.

These proposals are complementary to the Electricity Authority's *Future security and resilience* workstream, which is focusing on ensuring a stable, secure and resilient electricity system given its role in New Zealand's transition to a low emissions economy. In 2021 the EA consulted on the future challenges and opportunities for the electricity network, which highlighted the benefit of demand response on the wider electricity system (discussed further in this paper).

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3 https://www.mbie.govt.nz/have-your-say/energy-efficient-products-and-services

Scope

Charger types

This green paper considers EV chargers that consumers will purchase and install in their homes.

82% of time spent charging occurs within residential homes[4][5]. With the projected uptake of EVs and the increasing number of people charging at home, it is important that the energy performance of private chargers is optimised, and that as much of this electricity demand as possible is controllable. This will help to ensure EV owners get the most out of their chargers, lower their electricity costs and manage the impacts of widespread EV charging on the wider electricity network.

The majority of home charging is done with a three-pin plug rather than with a wall charger. In 2019 78% of chargers sold were cables plugging into a three-pin plug. These plugs are relatively slow at charging and can present safety and accessibility issues, particularly within older homes[6]. However, there is little incentive for those who currently use the three-pin plug (often supplied with the vehicle) to shift to other charging methods.

EECA recognises that EV charging also occurs outside of residential homes, including private places of business and at public EV charging stations also known as journey or destination charging.

Performance factors

There are three key performance factors EECA has identified to maximise the benefits of these products while managing demand on the network. This includes:

a. Energy efficiency: using less energy to perform the same task or achieve the same result,

b. Interoperability: ensuring connected devices can operate on any electricity network and also communicate with other appliances and devices installed in the home, and

c. Connectivity of EV chargers: including functions to enable signals to be sent to, and received from an external party

EECA recognises that there are other issues associated with the performance of EV chargers, such as autonomous operation, integration with management systems, electrical safety, cyber security, data privacy and billing provisions. EECA will continue to engage with the relevant government agencies to ensure the approach to these areas supports the whole-of-government effort to facilitate increased EV uptake.

Vehicles

This green paper considers plug-in chargers for electric vehicles.

The type of vehicle being charged (whether it is a light or heavy vehicle) is not a key consideration. New Zealand's vehicle fleet is predominantly light passenger vehicles, the vast majority of private chargers (at least in the short to medium term) are expected to be used to charge these vehicles.

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4 EECA Charging Behaviour Survey, 2021

5 KPMG, 2019. *Electric Vehicle Charging Technology*. https://www.eeca.govt.nz/assets/EECA-Resources/Research-papers-guides/EV-Charging-New Zealand.pdf

6 https://www.aa.co.nz/cars/motoring-blog/charging-an-ev-safely-at-home/

EECA's approach to managing EV charging in New Zealand

To optimise the uptake of EVs and EV charging, EECA is looking to strike a balance between:

- minimising energy emissions and encouraging EV uptake;
- alleviating the costs of decarbonisation on NZ households;
- reducing electricity disruptions for consumers;
- maximising energy and electricity system security, reliability and stability; and
- minimising network investment using demand management

EECA has developed the following principles to guide its engagement with residential EV charging:

- Manage EV charging in a way that provides net positive societal outcomes;
- Identify and address the impacts of EV uptake on the energy system early on (where practical);
- EV owners should receive the utility they require from their EVs and EV chargers;
- EV chargers should have a level of smartness and energy efficiency that is cost-effective and provides the greatest net benefit; and
- Improvements to the energy performance of EV chargers should encourage the development of a robust, fair and effective demand flexibility market

To achieve this, EECA will:

- intervene to the minimum extent necessary;
- work with other regulators to identify interagency gaps and overlaps to avoid duplication and unnecessary complexity;
- encourage market innovation and avoid path dependency; and
- ensure the costs and benefits of smart EV chargers are equally accredited to both electricity providers and consumers

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers?

What would you add or take away?

Is there anything you disagree with?

A key principle missing is how you are publicising this engagement process. Few people know about it.

Potential characteristics of 'smart' EV chargers

EV chargers that have a common set of functions and means of communication, and that can be used by any potential operators of the device, are best placed to deliver maximum value to New Zealand.

This section outlines various aspects of the 'smart' charging system to help determine what a New Zealand 'smart' charger standard could encompass.

Basic functions

The ability to turn the charger on and off and adjust the charge rate of each EV charger would be valuable for managing stress on the network. For example, EV charging could be reduced during peak demand and increased at times of high renewable electricity supply (off-peak).

While making EV charging more efficient is a worthwhile aim there is no doubt that the entire power supply system needs an increase in capacity if we are to move to a higher proportion of EVs on the road.

Default minimum charge mode

There is evidence that some vehicles do not restart charging if the charger is switched off before charging is complete[17]. To address this, an EV charger could be required to maintain a minimum level of current or power when it is connected to the vehicle.

Randomised delay function

If large numbers of EVs either charge or commence charging at the same time (for example in response to a price signal) the peak in demand may cause grid stability issues. 'Smart' chargers with a 'randomised delay function' could reduce this impact, by randomly spreading the onset of charging for a group of EV chargers over a specified period (e.g. 10 minutes).

The key issue here is the 10 mins. If it is half and hour or more, charging of some vehicles could be delayed and not be charged for when it is required.

Default off-peak charging mode

Another option is to require 'smart' chargers to have a 'default off-peak charging mode' where charging is delayed to off-peak times. The owner would retain the ability to manually override the default mode.

OK provided the manual override works without interruption.

Default reduced charging at peak mode

A variation of the 'default off-peak charging mode' is a 'default reduced charging at peak mode'. Rather than delaying charging to off-peak, charging would occur during peak but at a slower rate. Again, the EV owner would be able to manually override this option.

OK provided the manual override works without interruption.

V2G/V2I enablement

Vehicle-to-Grid (V2G) and Vehicle-to-Infrastructure (V2I) solutions will deliver substantial benefits, but this green paper does not propose any requirements in this area beyond a general requirement that 'smart charging' does not prevent the discharging of EVs. Part 6 of the Electricity Industry Participation Code 2010 (Code) regulates V2G and V2I-capable chargers. Any requirement for chargers that operate in this mode would need to comply with both the Code and the Electricity Safety Regulations.

It is not clear how the financial side of this will work. If I pay to charge my EV, what happens when power is taken out of my EV and returned to the grid?

[17] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/817107/electric-vehicle-smart-charging.pdf

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?

What do you see as most and least important?

What functions would you add or exclude, if any, and why?

What information could you supply to EECA to help inform our thinking about this issue?

Communications capability

In terms of the ability to communicate, it is EECA's view that 'open access' EV chargers would deliver the greatest benefit for New Zealand. The use of open communication protocols, such as OpenADR, allows all approved parties to access the EV charging process and promotes greater connectivity between appliances (e.g. EV chargers and home energy management systems)[18]. Open communication protocols allow chargers and electricity operators to communicate signals to each other, and are a key tool to help manage peak demand through delaying or increasing charging rates depending on grid load and energy availability[19]. EECA notes that any communication capability incorporated into EV chargers should ideally be compatible with other appliances, smart home management systems and demand flexibility suppliers.

Open access EV charging supports the development of an effective and dynamic demand response market in New Zealand. Allowing access to products (with owners' permission) means demand flexibility supplier can compete for business on an equal footing. This would encourage new players, businesses and products into the market to offer increasingly sophisticated and innovative services. The development of a demand response market could also seamlessly allow EV owners to switch their demand flexibility supplier for best gain, without the need for a visit to the premises.

EECA recognises that the electricity system is a critical asset and that open communications capabilities present risks to cyber security. Therefore, appropriate protections need to be included. Artificial intelligence (AI) and cognitive technologies are becoming increasingly commonplace, along with a range of internet-connected everyday devices. Targeting the transport capability of the population could be an attractive target to cyber terrorists. However, communications protocols (such as OpenADR) include provisions for cyber security that align with international standards.

Q3. Do you support EV charging being open access, and why/why not?

What information could you supply to EECA to help inform our thinking about this issue?

Do you think that 'smart' chargers should address issues of cyber security?

How would you suggest this is done?

'Increasingly sophisticated and innovative services' are all very well. What's most important is absolute (not just 'appropriate') security from cyber threats even if it means less 'sophistication and innovation'.

Monitoring

For an effective demand response and flexibility system to operate, relevant parties must have sight of what is connected to the electricity network, where it is connected, and the impact the use of the appliance has on the wider electricity system. Knowing when to react and to what degree is critical information that electricity suppliers need to create a genuinely flexible system.

Who are these 'relevant parties'?

[18] The connection can be through Ethernet and/or 4G (or later) platforms, as well as being Wi-Fi capable to connect to household control systems.

[19] Open Charge Alliance (2021) *Using OpenADR with OCPP*, 2021

This section considers whether EV chargers should be required to transmit their location and energy data to approved parties e.g. a flexible demand service provider (FDSP), an EDB or grid operator. This would enable better planning to meet electricity demand, create a faster response, and ensure that financial reward (for making demand available) is maximised for flexible demand programme participants.

The development of Multiple Trader Relationships (MTRs) or Peer to Peer trading (P2P) would likely require each EV charger to contain its own electricity consumption and generation measurement, and on-demand remote reading capability. Placing these recommendations in a Standard (that is either widely trusted and/or regulated) would future-proof users' investment for potential electricity market development. What does this paragraph mean?

The required information must deliver the maximum benefit for New Zealand but with minimal risk, cost and inconvenience. EECA suggests monitoring for charger geographical location, installation date, maximum power rating, and live consumption data at a minimum. Any data provided would be at the explicit permission of the data owner for the purposes of demand response and flexibility and would be protected. However, we seek your input on whether there should be requirements and, if so, what information should be provided. The information could be anonymised to protect privacy. There would also be strong controls to ensure it is used only by approved agencies.

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?

Who should be able to access this information? You haven't provided enough information for a lay person to make any useful comment on these questions.

In what form should it be transmitted?

What processes should be in place to safeguard the data?

Is there any other way this data might be captured?

Electricity consumption

To encourage a greater level of EV owner engagement, EV chargers could be required to capture the electricity consumed and/or exported during a charging event, and the length of time the charging occurred for. This information would be made available to the EV owner (e.g. through an app), helping them to secure the best value from smart charging (e.g. by providing this information to a flexible demand service provider, or directly comparing smart charging deals).

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner? A practical, no unnecessary frills approach is all that's needed

What other information may be valuable to the EV owner? The cost of each charging session

What format should be used for this information if this requirement is adopted?

What does this question mean?

Mandated settings for power quality and control

To help support the resilience of networks and ensure grid stability, EV chargers could include mandated settings that automatically operate to protect both the customer's electrical installation and the network it is connected to.

At a basic level, this could include a setting where the EV charger automatically turns off or down if frequency or voltage drops below a pre-set threshold and restores when the frequency or voltage recovers. This situation can also occur if other types of DER are connected to the same residential network (e.g. solar PV). These requirements for solar PV inverters are currently covered in the Australian and New Zealand joint Standard, AS/NZS 4777.2:2000 *Grid connection of energy systems via inverters - Part 2: Inverter requirements.*

What's a DER?

Ensuring this power quality requirement is met could also allow more EV chargers to be hosted on an existing, low-voltage network reducing the likelihood of requiring network upgrades and investment.

Setting standards for quality is important but make no mistake, upgrades and investment are required.

EECA notes that settings can already be mandated by networks for distributed generation to increase the hosting capacity of networks, and this would operate in a similar, albeit opposite, manner. These requirements would apply to EV chargers also if they injected electricity back into the distribution network (e.g. through V2G).

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

Energy efficiency

The energy efficiency of private EV charging typically involves three components:

- The on-board charger in the EV –accepts AC electricity and converts it to DC electricity to store in the EV battery,
- An aftermarket (wall-mounted) charger (if present), and
- Charging cables – these are not chargers per se but control the flow of electricity to the EV.

On-board chargers

There is some evidence that the energy efficiency of onboard chargers can vary significantly. Danish research conducted in 2016 found energy losses of between 15-40% when charging three different vehicles[20]. This is much higher than the energy lost from high-quality power converters. As consumers have low awareness of charging losses, it is likely vehicle manufacturers do not prioritise the energy efficiency of onboard charging equipment. This leads to higher costs for EV owners and places an unnecessary load on the electricity network.

To date, research on the energy efficiency of onboard chargers has not been widely publicised. EECA is seeking more up-to-date research on this matter, to determine the importance of this issue for New Zealand and whether we might regulate in this area (e.g. require labelling).

Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?
What information could you supply to EECA to inform this issue?
What challenges, if any, do you see in regulating in this area?

This sounds like it would be useful and should be on a sticker on the windscreen.

[20] Kieldsen, A., Thingvad, A., Martinenas, S., & Sørensen, T. M. (2016) *Efficiency Test Method for Electric Vehicle Chargers* (In Proceedings of EVS29 - International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium)

Aftermarket (wall-mounted) chargers

Also called wall-mounted chargers, aftermarket chargers are becoming increasingly popular in New Zealand. They deliver faster charging rates than you get from a standard New Zealand electrical socket[21]. These chargers come with varying degrees of 'smartness', with some more sophisticated than others.

The vast majority of residential aftermarket EV chargers are alternating current (AC). AC chargers operate as a switch that opens to allow AC electricity into the EV, where the onboard charger converts it to direct current (DC) electricity.

Q8. What are your thoughts on labelling aftermarket AC EV chargers?

Isn't it the EV's onboard charger that should be labelled?

Charging cables

Many EVs are sold with a three-pin charging cable that can be used to connect the EV to an electricity supply. However, these cables are not designed for constant overnight use and can pose safety risks.

Although not chargers per se, some charging cables now come with a built-in device that enables 'smart' charging. We are seeking your view on whether these types of charging cables should be within scope of this paper. Cables without the ability to enable smart charging would be excluded.

Q9. What are your thoughts on whether charging cables which contain a 'smart' charging enabling device should be in scope for intervention?

I don't know enough about this.

Options to support 'smart' and energy-efficient chargers

The 'smart' charging market is in its early stages of development in New Zealand. The pace of innovation is quickening, and new products and business models are entering the market. In this environment, it is important that government right-sizes its effort to secure the greatest value from 'smart' charging without hindering innovation and market mechanisms.

This section considers mechanisms that might be applied to encourage EV chargers to be 'smart' and energy-efficient. It considers four key interventions of increasing stringency including doing nothing, providing information/education, offering incentives, or regulating. It seeks your views on what intervention, or combination of interventions, should be applied in New Zealand and why.

Option one: Do nothing

This section investigates the following trends that could emerge without government intervention.

Low uptake of 'smart' and energy-efficient chargers

EV owners may only consider a few factors (such as the upfront capital cost) when purchasing an EV charger, locking them out of the full value (including longer-term operational savings) they could

[21] Typically two to three times faster, given they use up to a 32A fuse, supporting charge rates over 7kW. Three phase chargers are also available which can deliver up to 22kW of power. In practice, the actual charge rate of an EV will often be less than the maximum possible. The battery management system in an EV adjusts the rate of charge to ensure ongoing battery health. Without these systems, EV batteries would fail prematurely and/or suffer an unnecessary reduction in capacity.

receive from a 'smart' EV charger. Purchasing decisions may be complicated by 'smart' charging being an emerging technology, which means there is a lack of awareness and/or uncertainty around the value of 'smart' charging.

At present, Open Charge Point Protocol (Version 1.6 and above) is currently the predominant global standard for 'smart' EV chargers. Global jurisdictions that are comparable to New Zealand's such as the United Kingdom (UK), European Union (EU), United States (US) and Australia have adopted EV charger Standards that align with this. However, despite the benefits of adopting 'smart' chargers, KPMG's research states that, without incentive to do otherwise, EV owners tend to opt for basic ('dumb') chargers[22].

New Zealand is unlikely to realise the full societal benefits of smart charging

The impacts of EV charging on the electricity network will go unmanaged. This means that EV charging will be controlled by the individual (e.g consumers will have control, and will charge when they like, with their preferred charger), and the network will be unable to reap the benefits of large-scale automated management. This will result in risks to electricity security, reliability, affordability and the environment.

As noted earlier, modelling by Vector estimates that EV uptake has the potential to double electricity network capacity requirements by 2050 if unmanaged.

Players in the 'smart' charger market may also be locked out of, or receive less value from their smart chargers, as firms use proprietary systems to prevent compatibility across products (to gain market power and establish themselves in the market). This could make the establishment of agreed technical standards very difficult.

In terms of energy efficiency, more information is needed to understand the type and scale of issues associated with the status quo. To fill this information gap, EECA is researching the energy efficiency of chargers currently available. Without visibility of this issue and its impact on users, manufacturers of chargers are unlikely to change their practices.

The market will correct itself

The functionality of aftermarket EV chargers and charging cables is improving, and there is increasing use of remote controllable plug-in timers. Home energy management systems (able to control a wide range of appliances) will become more common, and solar PV functionality is improving. These devices may deliver a natural improvement to EV charging functionality, without the need for any government involvement. Distribution prices are also becoming more cost-reflective. Cost reflective prices will send signals to consumers that may encourage behavioural changes to maximise savings. However, without some form of intervention, some EV owners can be expected to choose sub-optimal paths and the value of 'open access' communication would unlikely be realised.

Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

Do you think the market can adequately address this issue without the need for government intervention? No

What information could you provide to EECA to inform this issue?

[22] KPMG, 2019. *Electric Vehicle Charging Technology*. https://www.eeca.govt.nz/assets/EECA-Resources/Research-papers-guides/EV-Charging-New Zealand.pdf

Option Two: Information and education

There are a range of ways that information could be provided to the sector to encourage smart charging. These include:

- marketing campaigns,
- information on websites and best practice guides, and
- energy efficiency rating labelling.

EECA seeks your views on the likely effectiveness of these options, including whether they would create the degree of change needed and have an enduring effect.

Market research indicates that price, quality and brand are a key consideration in product purchase decisions[23]. Energy efficiency is a second-order issue but can be a deciding factor when consumers are considering products in-store that are otherwise similar. EECA is moving to require energy rating labels for products sold online, which will improve the overall effectiveness and outreach of rating labels. However, the use of labelling alone (without minimum energy performance standards) allows for the continued sale of poor performing devices. A key objective of information and education is to inform people of the potential benefits consumers reap from using a 'smart' charger (such as those mentioned earlier in the paper).

An energy rating label could be valuable for energy efficiency, but an endorsement label may be more appropriate for 'smartness', with only products that carry the minimum functionality and open communication protocols being eligible.

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?
What information could you provide to support your position? Better than do nothing but not enough.

Option Three: Incentives

The electricity market is already providing incentives for 'smart' EV charging. In 2019 the Electricity Authority published the distribution pricing principles, to set clear expectations for efficient distribution prices, which include price signals for congested periods of networks[24]. Electricity retailers (including Meridian Energy and Mercury Energy) pass on this network pricing by offering dedicated EV plans where owners pay less for charging their EV outside of peak demand hours (e.g between 10pm and 6am). As flexibility markets develop, EV owners could be offered financial incentives on a per-event basis. A FDSP may pay EV owners to not charge their vehicles when there is high system utilisation, supply constraints and/or high prices. In the future, as solar PV densities increase in New Zealand, there may be value in charging EVs at times of high export to manage grid voltage issues.

Beyond time-of-use tariffs, there are currently no financial incentives to encourage the purchase of 'smart' chargers in New Zealand. Under the UK's Electric Vehicle Homecharge Scheme (EVHS), which provides financial support for private chargers, chargers must be 'smart' and meet technical

[23] Colmar Brunton / Kantar (2020) *Market Research: ERL program for household appliances*, a report for the Department of Industry, Science, Energy and Resources, Canberra, Australia. This report evaluated the effectiveness of product labelling for the Equipment Energy Efficiency (E3) programme, operated jointly by Australia and New Zealand.
[24] https://www.ea.govt.nz/operations/distribution/pricing/

specifications (announced in 2019)[25] to be approved for funding. The EVHS has been effective at moving the market towards smart EV charging in the last few years as verified in a recent impact assessment[26], which showed that smart chargers have increased to represent 70% to 100% of total private charger installations in the first quarter of 2020. Given the limited time we have to deal with this, financial support really is the sensible option.

As discussed in this paper, EECA recognises that 'smart' charging largely benefits the electricity system, rather than the consumer. The benefits to consumers (such as the cost savings) may not be enough to encourage 'smart' charger uptake without incentives.

EECA seeks your thoughts on incentives as a means to encourage the uptake of 'smart' and energy-efficient EV chargers. We are particularly interested in whether they would bring about sufficient change for New Zealand and who might provide these incentives. We are keen to receive information on the effectiveness of this approach where it has been used internationally.

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?

What incentives do you think would be effective and who should provide these? The Govt

What other incentives might be valuable beyond financial incentives?

Option Four: Regulation

EECA is considering the costs and benefits of regulating the 'smartness' and energy efficiency of EV chargers through its MEPS regime. We seek your views on the relative merits and feasibility of regulation, compared to the other options discussed in this section.

The UK has offered subsidies for smart EV chargers since 2019 through the EVHS and has now moved to regulation. The Electric Vehicles (Smart Charge Points) Regulations 2021 were signed into law on 15 December 2021 and came into force on 30 June 2022[27]. This sets out minimum requirements for all chargers for use in homes and workplaces (where previously this was only a requirement for those seeking compensation through the EVHS). The key requirements include:

- data connectivity
- off-peak charging capabilities
- staggered charge times, and
- additional security.

Given the public and system-wide benefits of 'smart' charging, there is a strong case for the government to encourage the purchase of 'smart' chargers.

EECA seeks your thoughts on whether New Zealand should regulate in this area and/or link this approach to other mechanisms e.g. incentives. We are keen to get your thoughts on whether New Zealand should adopt a similar approach to that being employed in the UK.

[25] https://www.gov.uk/government/publications/electric-vehicle-homecharge-scheme-minimum-technical-specification

[26] The Electric Vehicles (Smart Charge Points) Regulations (publishing.service.gov.uk)

[27] The Electric Vehicles (Smart Charge Points) Regulations 2021 (legislation.gov.uk)

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?
What do you think of New Zealand adopting the approach being undertaken in the UK?
What information could you provide to support your position?

Regulate and provide financial incentives.

EECA already has voluntary guidance which could underpin regulation

EECA and Standards New Zealand (SNZ) have recently developed the publicly available specification (PAS) *SNZ PAS 6011:2021 Electric vehicle (EV) chargers for residential use*[28]. PAS are voluntary documents, designed to guide decision-making. SNZ PAS 6011:2021 includes an introduction to the topic for general readers, a checklist for the buyer, and a technical specification for energy performance.

EECA is considering using the PAS to underpin our engagement with EV chargers. The PAS has been through a robust development process, overseen by an expert advisory group. It represents the latest and best thinking in the area. As it was developed as a voluntary mechanism, some changes would be required if it were to be used for firmer interventions such as regulation (i.e only adopting a few key elements of the PAS).

Alternatively, a standard, such as the British Standard Institution (BSI) Standard that has been adopted in the UK, could be used. This has a wider ambit than just 'smartness' and energy efficiency, accommodating for aspects such as cyber security and safety. That sounds sensible.

The prescription of energy performance standards to improve energy efficiency outcomes is starting to be addressed by policy-makers around the globe. For example, the US Energy Star programme has set energy performance requirements for EV supply equipment for the US and Canada. The European Commission is also undertaking research and testing under real-use conditions. However, most countries are not explicitly addressing the energy performance of EV charging equipment in their policies[29], presenting an opportunity for New Zealand to lead the way.

Q14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/incentives?
What parts would you exclude or change?
Does the PAS cover all the important issues?
What other resources may be useful for New Zealand?

Sounds like comments on the PAS is beyond my pay scale.

Alternatives to EECA involvement

EECA has regulated the energy performance of products and appliances for over twenty years, and has the legal mandate and necessary infrastructure to regulate the energy performance of EV chargers as energy-using products.

[28] *SNZ PAS 6011:2021 Electric vehicle (EV) chargers for residential use* https://www.standards.govt.nz/shop/snz-pas-60112021. A commercial EV charger PAS has also been developed: *Standards New Zealand PAS 6010:2021 Electric vehicle (EV) chargers for commercial applications* https://www.standards.govt.nz/shop/snz-pas-60102021.

[29] https://www.iea-4e.org/wpcontent/uploads/2021/01/EVSE_Scoping_Study_for_4E_EDNA_v18_15_12_2017_-_FINAL.pdf

However, we are aware that a range of agencies have interests in this space, both within the public sector (i.e the Electricity Authority with their role in the wider electricity system) and private sector (i.e Electricity Distribution Businesses).

There may be alternative approaches to improving the performance of EV chargers in New Zealand that do not require EECA's involvement. We seek your views on what these could be.

Q15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

I'd say the EECA should continue to keep a close eye on things.

Next steps

We will provide updates on this green paper on our website: www.eeca.govt.nz. Following consultation, we will:

- consider the feedback received in submissions,
- discuss the feedback with other Regulators where feedback spans regulatory jurisdictions,
- post a summary of submissions on the EECA website and send this to all submitters,
- brief the Minister of Energy and Resources, and
- use the information received to inform our next steps.

We seek written feedback by 5 September 2022. Responses should be in electronic form, in either Microsoft Word or PDF format, and emailed to STAR@eeca.govt.nz.

Under the Official Information Act 1982 (OIA), information held by EECA is to be made available to requestors unless there are grounds for withholding it. The grounds for withholding information are outlined in the OIA.

If you are making a submission, you may wish to indicate any grounds for withholding information included in your submission. Reasons for withholding information could include information that is commercially sensitive or personal (such as names or contact details). An automatic confidentiality disclaimer from your IT system will not be considered as grounds for withholding information.

EECA will consider your preference when determining whether to release information. Any decision to withhold information requested under the OIA may be reviewed by the Ombudsman.

Glossary

AC	Alternating current
Act	Energy Efficiency and Conservation Act 2000
Charger	A device intended for charging a vehicle that is capable of being propelled by electrical power, or for discharging electricity stored in such a vehicle.
DER	Technologies used to generate, store, or manage energy are referred to as distributed energy resources (DER).
DC	Direct current
EDB	Electricity Distribution Business (lines company)
EECA	Energy Efficiency and Conservation Authority
EV	Electric vehicle
GHG	Greenhouse gas
kW	Kilowatt
kWh	Kilowatt hour
MEPS	Minimum Energy Performance Standards
MEPL	Mandatory Energy Performance Labelling
Minister	Minister of Energy and Resources
Product Regulations	Energy Efficiency (Energy Using Products) Regulations 2002
Vehicle Regulations	Energy Efficiency (Vehicle Fuel Economy Labelling) Regulations 2007
Solar PV	Solar photovoltaic
V2G	Vehicle to Grid
V2I	Vehicle to Infrastructure

Appendix One: Consultation Questions

1. What are your thoughts on EECA's suggested engagement principles for EV chargers?
    - What would you add or take away?
    - Is there anything you disagree with?
2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?
    - What do you see as most and least important?
    - What functions would you add or exclude, if any, why?
    - What information could you supply to EECA to help inform our thinking about this issue?
3. Do you support EV charging being open access and why/why not?
    - What information could you supply to EECA to help inform our thinking about this issue?
    - Do you think that 'smart' chargers should address issues of cyber security?
    - How would you suggest this is done?
4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?
    - Who should be able to access this information?
    - In what form should it be transmitted?
    - What processes should be in place to safeguard the data?
    - Is there any other way this data might be captured?
5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?
    - What other information may be valuable to the EV owner?
    - What format should be used for this information if this requirement is adopted?
6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?
7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?
    - What information could you supply to EECA to inform this issue?
    - What challenges, if any, do you see in regulating in this area?
8. What are your thoughts on labelling aftermarket AC EV chargers?
9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?
10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

- Do you think the market can adequately address this issue without the need for government intervention?
- What information could you provide to EECA to inform this issue?

11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?
    - What information could you provide to support your position?
12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?
    - What incentives do you think would be effective and who should provide these?
    - What other incentives might be valuable beyond financial incentives?
13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?
    - What do you think of New Zealand adopting the approach being undertaken in the UK?
    - What information could you provide to support your position?
14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?
    - What parts would you exclude or change?
    - Does the PAS cover all the important issues?
    - What other resources may be useful for New Zealand?
15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

Star

From: [redacted]
Sent:
To: Star
Subject: EV charging green paper

Categories: Green Category

Hi,

We own two EVs with a Polestar2 recently joining the Leaf we have owned for the past 8 years. With the arrival of the Polestar2 our 7kW (not smart) home charger can now supply its full 7kW capability as the Leaf restricted its own charge input previously.

We also have 5kW of grid tied PV which was sufficient to supply the charge rate of the Leaf but now comes up short when charging the Polestar. We therefore intend to upgrade our PV installation to 8.5kW in the near future to allow the Polestar2 to fully source its charging requirements from our PV generation. Both my partner and I work from home so charging can conveniently be done during daylight hours, though we schedule such charging to coincide with our power supplier (Ecotricity)'s off-peak tariff periods. Our situation also makes a storage facility (other than our EV batteries) for our PV not viable.

As we witness New Zealand's government providing a Clean Car Rebate to promote EV uptake and now EECA have moved towards introduction of regulating how and when EV charging is done as the national EV fleet increases it puzzles me as to why we aren't seeing any incentivisation for those installing PV generation on their properties.

The content of the EV charging green paper seems to be along the lines of a 'stick' approach to change EV charging by way of mandating charger design and/or regulation of EV charge scheduling to protect the electricity supplying companies. The Green paper mentions PV on a few occasions but usually as it being a further potential complication in the implementation of grid control measures.

How about the idea that our government incentivise PV installation as has been done in numerous other countries over the past years? Distributed PV generation can be very much part of the solution in regard to the added demands on our national grid by increased EV ownership. It can be as simple as directing that generation directly into the consumer's own EV which alleviates loading on grid supply and transmission, and if combined with battery storage (including by way of V2G functionality) the benefits can be spread beyond daylight hours. In the case of PV generation being exported to the grid this electricity is most likely used within a short distance from the property that the PV is located at therefore also reducing transmission requirements. In the wider view distibuted generation will usually offset electricity that must otherwise be generated by utility scale generating stations and as 80+% of New Zealand's power generation is by way of hydro that presents an opportunity to retain water that can then be used to generate at a later time, so effectively using our hydro capacity as a storage 'battery'.

My question therefore is why are our government sidestepping the opportunity to allow our population to contribute towards what is being portrayed as a generation shortfall? The cynic in me might suggest there is a conflict of interest by way of the government ownership and public shareholding of the big generators seeing 'competition' from distributed generation but surely their approach is not that corrupted?

--
Kind regards,

Star

From: Mark Swords [redacted]
Sent: Wednesday, 10 August 2022 9:54 pm
To: Star
Subject: EV Charging

Categories: Green Category

I am an EV owner. In fact we have two EVs one personal the other comercial.
We have Solar panels.

I think the government needs to encourage either by interest free loans or subsidies the uptake of smart solar ie. with batteries as this will increase the generation and storage of electricity at minimal cost to the taxpayer.

VTH or VTG should also be subsidised until it becomes affordable as it could greatly reduce peak demand on the grid.

There are smart vehicle chargers available that can be linked to a solar system to make it so the car is only charged with excess solar power instead of sending it to the grid. This can reduce solar grid overload on peak summer days. This will become very important as solar becomes more prominent so should be promoted now.

Education is an important aspect of Ev ownership, there is a lot of false information about BEVs and Hybrids. This needs to be addressed with education for prospective new vehicle owners.

Mark Swords
Mark Swords Electrical.

[redacted]

From: Ralph Sims [redacted]
Sent: Thursday, 1 September 2022 3:41 pm
To: Star
Subject: Submission on the Green Paper for domestic EV charging

Follow Up Flag: Follow up
Flag Status: Flagged

1) **Recharging of EVs linked with domestic solar PV systems.**
This option is poorly represented in the Green Paper.
My own system is used here to illustrate the potential.
I have a 2.85 kW PV system installed (and also a solar water heating system so surplus PV generation is exported to the grid and not used to heat water).
Trust Power currently pays me 8.5 c/kWh exported.
My EV is charged whenever possible using excess generation that I would otherwise have exported.
I have installed a British made EO Mini Pro 2 smart charger. EO Charging | Smart electric vehicle charging
Using the related cell phone app as a controller, this enables me to:
a) fast charge (up to 32 A); or
b) charge during off-peak periods; or
c) select the solar option - with a minimum charge rate of 6A (topped up by imported power when solar generation is insufficient) and that can also be increased when solar radiation levels are higher to maximise solar input.
If I return from a long journey and need a rapid full charge for another imminent journey, then I choose option a) or b) but this is rarely the case .
Virtually all charging at home is by option c) using excess solar electricity.
This is made possible since my EV is usually parked at home for much of the time during the day (our E bikes being our preferred commute travel mode).
Other makes of smart home-chargers (eg Zappi) offer a similar solar-priority option.

I have undertaken a cost/benefit analysis of my PV system a) initially with six 265 W_p panels in January 2017; b) when four more 315 W_p panels were added in 2019; c) after I purchased the EV in Oct 2020; and d) after I purchased the EO charger unit in Feb 2021.
The combination of PV with EV makes economic sense and avoids imposing additional load on the grid. The period of timing of the solar charging can be selected, depending on daylight length that varies with time of year and to support peak periods.
The constraint to managing a PV/EV system is the capital investment of around $1500-2000 to purchase and install a smart-charger.
A suitable government policy could be developed to encourage the purchase by EV owners of a charger unit that maximises solar charging (rather than simply using a standard 240 V cable to slow-charge from the grid).

2) **EECA's suggested engagement principles for EV chargers**
My system as outlined above also has a 1.2 kWh lithium ferrous ion battery, purchased 6 years ago mainly for research activities knowing it would be uneconomic.
The capital cost of $3100 gives a payback period of 38 years based on current electricity tariffs.
Battery prices have declined but not sufficiently to warrant a PV system storing some energy for later EV charging for situations where the EV is not parked at home during the day. (Although recharging during the weekends or either end of the day in summer would still enable a high share of solar PV to be utilised.
The costs and benefits of smart EV chargers can benefit both consumers and line companies when linked with domestic solar PV generation on-site. (Small wind turbines can offer similar benefits depending on the location).

3) **Proposed specifications for 'smart' chargers in New Zealand**

Some existing EV chargers already have the desired characteristics as outlined. A review of existing chargers should be conducted.

Linking a charger to a solar PV system should be encouraged in the specifications given the anticipated growing rate of solar PV installations.

V2G and V2I are likely to be more widely enabled by EV manufacturers in the short-term so should be evaluated.

4) **EV chargers transmitting information on their location and use**

Requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner.

My EO charger already stores a full charging history available on the app including date and time, length of charge, kWh supplied etc.

This is password protected and available only to the owner at any time. It proves particularly valuable when completing monthly submissions for "Flip-the-Fleet" Home page - FlipTheFleet

My Enphase solar PV system also records electricity generated, demand, export to grid, export to battery, import from grid, import from battery in 15 minute intervals and saves all data for later referral.

This data can be accessed remotely at any time and is also available to the installer for use if any technical problem might arise with the panels, inverters etc.

There is no benefit from transmitting the location of an EV to anyone that I can determine.

5) **Regulating the energy efficiency of on-board EV chargers**

It is doubtful whether EECA or any other New Zealand organisation could influence EV manufacturers to improve the energy efficiency of their charging system design.

For my 2016 BMW i3 (now at 35,000 km and a Japanese import at 10,000km) the reliability of the information relating to % charge, range remaining etc, is fairly poor.

Therefore it is not easy to assess and correlate the efficiency of the on-board charger even with having reasonably accurate data of the kWh input - from both the EO app and verifiable by the Enphase solar PV monitor.

6) **Option 2. Likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers**

EECA should undertake some form of home-charger evaluation along the lines of a NZ Consumer Association product test and reporting the comparative results.

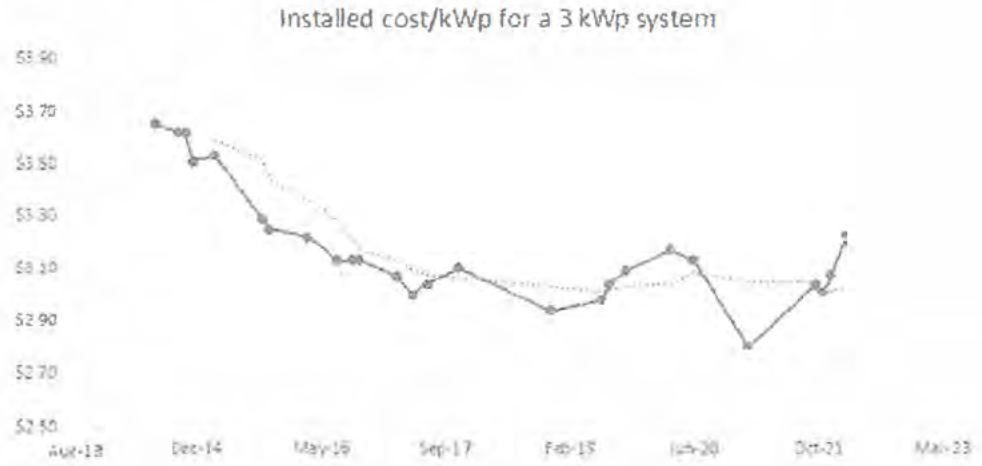
This would serve to promote the benefits and costs for an EV owner contemplating investing in a home charger.

It should include comments on linking it to a solar PV system.

7) **Use of incentives to encourage the uptake of 'smart' EV chargers**

Given the various benefits of linking domestic EV charging with a solar PV system that, as stated above, is poorly evaluated in the EECA Green Paper, some form of incentive to encourage investment in both EV and PV systems would be warranted given the potential co-benefits and declining capital costs of installed PV.

This recent cost data from solar installer McNae:



8) Regulating the 'smartness' of EV chargers in New Zealand

The UK regulation model has good intentions and could be replicated, but with the added requirement that a home charger sold in NZ must have potential to link to a solar PV system.

9) Energy performance of EV charging in New Zealand and EECA's involvement

It is imperative that EECA takes the overview for national standards and regulations.

Several of the line distribution companies, and consequently the EA, have baulked at having to change their business model with the advent of solar PV and increasing growth in numbers of installations and now also with EV charging.

Given the number of line companies and trusts involved (27 I think at last count), having an independent national regulated approach is critical.

I have little doubt that education and regulation will be required in one form or another to ensure that EV charging occurs in off-peak times and/ or during times of solar generation as much as is technically possible.

Ralph E. H. Sims

[redacted]

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?

What other information may be valuable to the EV owner?

What format should be used for this information if this requirement is adopted?

This would be useful. Many charge controllers already show the energy (kWh) used for charging the EV, but the accuracy is very poor. As an EV owner I took great interest in the energy consumptions and put a calibrated PQ meter and was surprised about the poor accuracy of energy meter in the provided In-Cable Control and Protection Device (IC-CPD).

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

Firstly, although power quality is mentioned only voltage magnitude and frequency issues are discussed. One size does not fit all. Control modes suggested are good but should not be applied to all charging infrastructure. It would cause unnecessary financial barrier for no significant gain. Should be used to higher power charging systems but not for the 7-8 A In-Cable Control and Protection Device. The major oversight is harmonics. The performance of on-board EV chargers varies widely. There are issues that when a number EVs of one type are connected to the same transformer MV/LV they will stop charging due to mutual inference due to the distortion they cause.

DC chargers already have limits on the frequency range they can cope with as well as ramp-rate. The one we tested will trip if the ramp-rate is greater than 2Hz/s and drop off at 47.5 Hz or 51.5 Hz. Hence will enhance grid stability by stopping charging when the grid frequency reaches 47.5 Hz, or sooner if the ramp rate is exceeded.

Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?

What information could you supply to EECA to inform this issue?

What challenges, if any, do you see in regulating in this area?

The efficiency of the on-board EV charger (AC to energy in the Battery) is only one aspect. What about the efficiency of conversion from battery to the motor and the efficiency of all the auxiliary circuits, which can be significant. Then there is the drag, rolling resistance, etc. As an EV owner I am concerned with the energy put into the car and the distance it allows me to travel under real-world condition (not on a race-track).

Also the testing probably does not capture the intermittent charge balancing mode that some EVs have.

More research is need on this before regulating the energy efficiency of on-board EV chargers, or EVs in general.

Q8. What are your thoughts on labelling aftermarket AC EV chargers?

This question is poorly worded. The so called "*after market AC EV charger*" is not a charger, it simply controls the EV's on-board charger. So is the question talking about the efficiency of this control device or the EV's on-board charger when controlled by this aftermarket control device. Also there is the losses while charging as well as standing losses.

Q9. What are your thoughts on whether charging cables which contain a 'smart' charging enabling device should be in scope for intervention?

So called "charging cables" should be out of scope based on their low power (often 7-8 A).

What is the basis for the statement "However, these cables are not designed for constant overnight use and can pose safety risks."? From my understanding they are designed to regular charging use. Their electronic protection is good and far superior to the mandated Type-B RCD protection. Some factory original IC-CPDs have thermal protection as well as electrical protection.

Q10. What are your thoughts on the 'do nothing', option for EV charging for EV chargers in New Zealand?

Do you think the market can adequately address this without the need for government intervention?

What information could you provide to EECA to inform this issue?

The "Do nothing" option is unlikely to produce the best outcome. The present pricing schedule from our retailer (on-peak/off-peak rates) gives a strong incentive to charge while off-peak. However, other users with a flat plan will not have this incentive.

From: Jensen, Kristian [redacted]
Sent: Monday, 5 September 2022 2:14 pm
To: Star
Subject: Submission - smart home chargers

Follow Up Flag: Follow up
Flag Status: Flagged

Good day

Some food for thought - There is a mental shift when changing to an EV from an ICE. Typically you leave home with a "full tank" and are not looking for a fuel station along the route to work. However, to control maximum demand and avoid system stress an electrical distribution network may like to "defer" charging - which is OK as long as you are fully charged before you need to leave.

So I would anticipate that smart chargers will have inputs such as "Start charging after," "Finishing charging by," and alert me at xx if abc."

Perhaps the government input should be around standards and safety and some watchdog to prevent the energy retailers and lines companies from penalizing early EV adopters?

Kristian Jensen
Technical Director - Industrial & Electrical.

[redacted]

[redacted]

wsp.com/nz

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Orion

5 September 2022

Submissions
Energy Efficiency and Conservation Authority (EECA)
STAR@eeca.govt.nz

RE: Submission to EECA on Green Paper on improving the performance of electric vehicle (EV) chargers

1. Orion New Zealand Limited (Orion) welcomes the opportunity to respond to **EECA's** consultation on smart EV charging.
2. We commend EECA for proactively engaging on requirements for smart EV charge points and considering a 'fast follow' approach to the UK smart EV charging regulations.

Orion's strategy

3. As Aotearoa transitions to a low-carbon economy, the energy sector has a critical part to play. Orion Group has established its Purpose, and developed its strategy, as shown below, to ensure it is a vital player in that transition for our community, our region and New Zealand.

Overarching comments

4. Once habits and expectations are established, they are difficult to change. It is important to encourage consumers to adopt good charging practices when they first transition to an EV, whether using an onboard or wall-mounted charge point.
5. A combination of regulation, incentives and education is needed to influence a broad range of consumers to smart charge and enable inclusive EV charging solutions, especially for the one-third of kiwis who rent and those in energy hardship.

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6. Regulation is an important part of a multifaceted approach. We strongly support regulating the 'smartness' of EV charge points in NZ that align with the UK regulations, as these will support net-positive social outcomes for customers without creating barriers to market.

7. The development of attractive customer value propositions for smart charging that reflect the overall value stack (wholesale, transmission, and distribution pricing) are needed to make investment in smart EV charge points worthwhile.

8. While the market for flexibility services is developing, an incentive to bridge the gap may be appropriate. However, any incentive should be carefully designed to maximise intended use of the smart charger (connected and responding to signals) and target the consumers who need it most.

9. Cross-sector innovation is needed to stimulate the development of effective and accessible incentives for flexibility (including smart charging) as well as demonstrate and de-risk solutions (such as communication protocols). There appears to be a gap in innovation funds available in NZ that focus on consumer desirability and commercial viability, in addition to technical feasibility.

10. We recognise the importance of the Commerce Commissions' review of the Electricity Distribution Input Methodologies and groups such as the FlexForum in supporting innovation and making the full value stack more accessible to consumers to incentivise flexibility.

Thank you for the opportunity to provide this submission. We do not consider any part of our submission to be confidential. If you have any questions, please reach out as we would be more than happy to discuss further via phone DDI 027 228 4426 or email evie.trolove@oriongroup.co.nz.

Yours sincerely

Evie Trolove
Energy Futures Programme Manager

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Appendix A: Submission by Orion Group on EECA EV Charging Green Paper

1. What are your thoughts on EECA's suggested engagement principles for EV chargers? • What would you add or take away? • Is there anything you disagree with?
We broadly support the engagement principles. We would suggest reviewing the wording of the points to clarify the difference between points A and D, and the intended role of EECA in points B and E. A. Manage EV charging in a way that provides net positive societal outcomes; B. Identify and address the impacts of EV uptake on the energy system early on (where practical); C. EV owners should receive the utility they require from their EVs and EV chargers; D. EV chargers should have a level of smartness and energy efficiency that is cost-effective and provides the greatest net benefit; and E. Improvements to the energy performance of EV chargers should encourage the development of a robust, fair and effective demand flexibility market As EECA recognises on page 7, most home charging is currently undertaken with a 3-pin charging cable. While smart wall-mounted chargers will gain popularity with time as the price declines and the value received from their use goes up, we expected that cable charging will continue to be part of the charging mix. With one-third of kiwi households renting, landlords may be financially reluctant to install smart wall-mounted chargers. For others, the speed of 3-pin charging may be considered sufficient. We encourage EECA to ensure the principles also apply to the significant proportion of consumers who choose to charge via a 3-pin plug and how to increase positive outcomes. For example, increased engagement with EV drivers who use 3-pin plugs for charging to communicate the ability to use technology already built into the electric vehicle itself to delay charging overnight.
2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand? • What do you see as most and least important? • What functions would you add or exclude, if any, why? • What information could you supply to EECA to help inform our thinking about this issue?
Most important • Basic functions • Randomised delay function • Default off-peak charging mode. From an electricity system perspective, the above three features in smart wall-mounted chargers would enable the majority of the benefits sought to be achieved from smart charging to become possible. We note this is why the UK has concentrated on these functions in its Electric Vehicles (Smart Charge Points) Regulations 2021.

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Recognising that the consumer should and needs to have ultimate control as to how their charging occurs, we support the inclusion of a manual override function on the default mode, which preferably resets daily but can be disabled if required. Research with 750 motorists in the UK conducted by Delta EE found more than 9 out of 10 rated being able to override the smart charging process as important[1]. However, trials with over 1000 consumers showed this function was only used for 16% of charging sessions[2]. Importantly, the use of this feature was significantly impacted by the design of the customer proposition and associated financial incentives.

As well as a randomised delay function, we would encourage government agencies and regulators to consider other ways to mitigate the risk of widespread coincident EV charging peaks. For example, mass-market retail tariffs that offer coincident periods of free electricity to consumers can lead to new or amplified peaks in local demand that could damage network equipment, disrupt service and increase the long-run cost to consumers. For instance, 'free hour of power' offers have led to considerable investment in local distribution systems around university campuses (as students have taken up this offer widely).

Support exploration

- V2G/V21 enablement

A great resource for V2G insights is the V2G Hub[3], a database of projects and influential reports from around the world. Lessons can be learnt from the UK where the connections process for V2G installation initially posed a barrier to adoption due to their size (typically 7.2kW) and as they were often installed at sites where consumers had solar PV. The overall export capacity from these sites was significant, and in several cases could have resulted in over-voltage on the LV network. As V2G chargers become more accessible, we should explore these challenges in a NZ context.

Suggest excluding

- Default reduced charging at peak mode
- Default minimum charge mode

Our preference would be to pursue default off-peak settings, rather than the above options. UK Power Networks Shift project found only 19% of the time spent plugged in was used for charging[4]. This indicates that the majority of EV charging could be shifted overnight with no impact on consumers.

Throttling EV charging can also impact energy efficiency due to losses[5]. A study of Renault Zoe chargers found charging efficiency dropped to 59% when charging at 2.3 kW (10A)[6]. We expect there are other solutions to address vehicles not starting if the charger has been switched off before the charging is complete e.g. accounting for vehicle model in managed EV charging schedule. We also note that technology will improve so what is an issue now may not be material in the future.

[1] https://innovation.ukpowernetworks.co.uk/wp-content/uploads/2020/05/Delta-EE-Survey-Report-for-Shift-UK-Power-Networks.pdf

[2] https://innovation.ukpowernetworks.co.uk/wp-content/uploads/2022/06/UKPN_Project-Shift_2022_Web-PDF-v2.pdf

[3] https://www.v2g-hub.com/

[4] https://innovation.ukpowernetworks.co.uk/wp-content/uploads/2022/06/UKPN_Project-Shift_2022_Web-PDF-v2.pdf

[5] SteadyStateLoadCharacterization2015Leaf.pdf (inl.gov)

[6] Renault Zoe charging time and efficiency - PushEVs

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3. Do you support EV charging being open access and why/why not? • What information could you supply to EECA to help inform our thinking about this issue? • Do you think that 'smart' chargers should address issues of cyber security? • How would you suggest this is done?	
	Orion supports the development of open and interoperable communications protocols and requirements for enabling hardware/software in homes and devices to enable flexibility. We presume EECA are considering which protocols are appropriate for the following use cases, noting these may be different: • Between flexibility suppliers and network operators e.g. OpenADR • Between flexibility suppliers and EV charge points e.g. OCPP A useful paper explaining the suitability of communications protocols for EV smart charging was published by Dr Myriam Neaimeh (Newcastle University, UK) in 2020[7]. A webinar series[8] on smart charging communications protocols and cyber security was also hosted by Dr Neaimeh, who has a wealth of applied expertise on these topics. We would be happy to make an introduction to Dr Neaimeh to explore how we can learn from developments in Europe. We strongly support the use of innovation projects to demonstrate the application of communications protocols. This will ensure any decisions around communications protocols are better understood, evidence-based and lower risk. Data and control security also need to be thought through and managed.
4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided? • Who should be able to access this information? • In what form should it be transmitted? • What processes should be in place to safeguard the data? • Is there any other way this data might be captured?	
	Data on EV charging is critical for Electricity Distribution Businesses (EDBs) to ensure capacity is available at the right time and in the right place, using the right solution. Therefore, the ICP of EV chargers is important information for EDB, and ideally, the power rating of the charge point would also be provided. There are a range of ways this could be provided e.g. installer or retailer. For maximum effectiveness, this needs to be as simple as possible and provided to EDBs as soon as reasonably practical to support the identification of EV clusters, so the deployment of LV network monitoring can be prioritised (enabler for flexibility). Networks and retailers currently handle personal data and have processes in place to safeguard this. An alternative way to identify EV chargers could be via smart meter data. However, this requires access to historic data from smart meters which we do not currently have. This would also be a slower and less accurate approach.

[7] https://energyinformatics.springeropen.com/articles/10.1186/s42162-020-0103-1
[8] https://www.ncl.ac.uk/cesi/events/webinars/v2gwebinars/

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Given that some customers will also charge via a 3-pin plug, data on where EVs are registered is also important, as this can help with the identification of EV clusters for network planning purposes. Access to all three sources of information (EV registration data, EV charger ICP and smart meter data) would enable triangulation and the best network planning outcomes.
5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner? • What other information may be valuable to the EV owner? • What format should be used for this information if this requirement is adopted?
Giving consumers insight and control over their charging is important to build trust with parties who manage their charging. We anticipate that there will be a preference for charge points which enable higher quality services with these features. However, we do not think it is currently necessary to require this functionality. This is an area which could be re-examined in say 3-5 years as the market evolves. As a note, flexibility services in the UK currently allow for validation of services via either EV charge point or smart meter data. This enables EV chargers to provide an aggregated response[9] via a range of metering solutions provided pre-qualification criteria are met. This can maximise participation in flexibility services, without unnecessarily imposing metering standards on all devices. The existing capability and accuracy of EV charger metering should be considered and weighed up against the risk that additional standards could introduce barriers to market entry for EV charge points.
6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?
We support the ENA's recommendation to require power quality and control settings for EV chargers (where the capacity of the charging unit makes it useful and to consider alignment with AS/NZS 4777.2:2000) provided this does not create barriers to technology entering the NZ market.
7. What are your thoughts on regulating the energy efficiency of onboard EV chargers? • What information could you supply to EECA to inform this issue? • What challenges, if any, do you see in regulating in this area?
We would support the usual practices of publishing information on vehicle charging efficiency to increase consumer awareness. Showing how the efficiency drops off at lower charging rates may prevent consumers from charging at lower rates. If manufacturers began to offer more efficient onboard EV chargers overseas, but less efficient onboard chargers in NZ, then there would be a benefit to such regulation. However, we aren't aware this is occurring, so we question the value of regulating efficiency standards now.
8. What are your thoughts on labelling aftermarket AC EV chargers?
Our position is the same as our response to question 7.

[9] https://www.current-news.co.uk/news/ukpn-to-create-ev-vpp-following-uks-largest-flexibility-tender

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9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?
We do not have a strong view on whether these should be in or out of scope. This decision would depend on whether the functionality is closer to those of onboard chargers or aftermarket AC EV charge points. We do support guidance and regulation to ensure that any charging cable sold or provided with a vehicle is used safely, including raising customer awareness of any risks, mitigations and precautions.
10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand? • Do you think the market can adequately address this issue without the need for government intervention? • What information could you provide to EECA to inform this issue?
We think there is a significant risk that leaving it to the market would lead to the development of charging habits that would be difficult to change and the installation of poor-quality 'dumb' wall-mounted chargers. While the market develops scalable incentives (such as flexibility markets), a least regrets option would be to improve customer education on good charging practices and to regulate technology requirements for smart wall-mounted chargers. Feedback on page 17 of Green Paper • This section gives an example that in this circumstance *"customers will have control and charge when they like with their preferred charger"* and that *"networks will be unable to reap the benefits of large-scale automated management."*. It is worth acknowledging that automated management also benefits the end consumer by allowing them to charge at the cheapest and cleanest time more easily, as opposed to manually setting or adjusting a timer. • While distribution pricing is becoming more cost-reflective, these signals are not being passed through by retailers in a way that achieves the desired outcome. More information on this is provided in our response to Q12.
11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers? • What information could you provide to support your position?
We support a stronger emphasis on consumer education and information. However, we do not expect this option to be sufficiently effective on its own due to the following reasons: • **The person purchasing the EV charger may not be the person receiving the benefits:** Therefore, the labelling and education are less effective. For example, a landlord may pay the upfront cost of an EV charge point, but it would be renters who pay the electricity bill that receive the benefit of a smarter/more efficient charger. Similarly, consumers who expect to move premises may not see the benefit of the additional upfront investment. With one-third of households renting[10], this presents a significant challenge.

[10] https://www.stats.govt.nz/infographics/renting-vs-owning-in-nz

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- **Even well-informed consumers find it difficult to make energy decisions:** UK flexibility supplier, Kaluza, surveyed 122 consumers on the Shift trial and found that the primary motivation for smart charging was cost (43% of respondents) followed by environmental reasons (34%)[11]. The survey also showed that 78% of respondents were able to correctly identify times of peak grid constraint, indicating that they have high energy literacy. Despite this, many of the same customers were on a flat rate tariff and therefore not accessing the financial benefits of smart charging. This highlights the complexity of smart charging and the difficulty consumers have in making energy decisions.
- **Solutions need to be seamless and reduce friction points for consumers:** We support the deployment of solutions that reduce complexity and friction points for consumers, such as the use of default off-peak charging times, provided these are implemented alongside information to help consumers understand why these are in place and how they can opt-out if required.

While we strongly support education and guidance on smart wall-mounted chargers, we recognise that these are still relatively expensive, and a proportion of consumers are unlikely to have access to them. In the Green Paper, it appears that EECA is tending to think more about education around the benefits of the purchase of a good quality smart wall-mounted charging, rather than about the principle of what good charging looks like. To maximise social benefit and good charging habits, education and guidance should be targeted at all EV drivers, including those who charge using a 3-pin plug.

We support information and education to ensure that consumers adopt desirable charging practices from when they first transition to an electric vehicle. EECA may also be interested in services like Right Charge[12], which helps consumers compare and select a suitable EV charge point and tariff.

12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?
    - What incentives do you think would be effective and who should provide these?
    - What other incentives might be valuable beyond financial incentives?

Incentives are complex and we support further consideration of how these could be implemented to ensure they achieve the desired outcomes.

- We support EECA and other relevant authorities in exploring incentives that stimulate the development of scalable market mechanisms and incentives/customer value propositions.
- The development of accessible customer value propositions that reflect the overall value stack (wholesale, transmission and distribution pricing), are needed to make investment in smart EV chargers worthwhile.
- While flexibility markets are nascent, signals may not reflect the full future value of flexibility and therefore these incentives may not be enough at present to justify the additional cost associated with smart EV chargers. Therefore, an incentive to bridge the gap until these are economically viable may be appropriate.
- Caution is needed to ensure that incentives are equitable and encourage the integration of smart chargers, to prevent the installation of chargers which are theoretically smart but not connected in a way that enables them to respond to market signals.

[11] https://innovation.ukpowernetworks.co.uk/wp-content/uploads/2022/06/UKPN_Project-Shift_2022_Web-PDF-v2.pdf
[12] https://rightcharge.co.uk/

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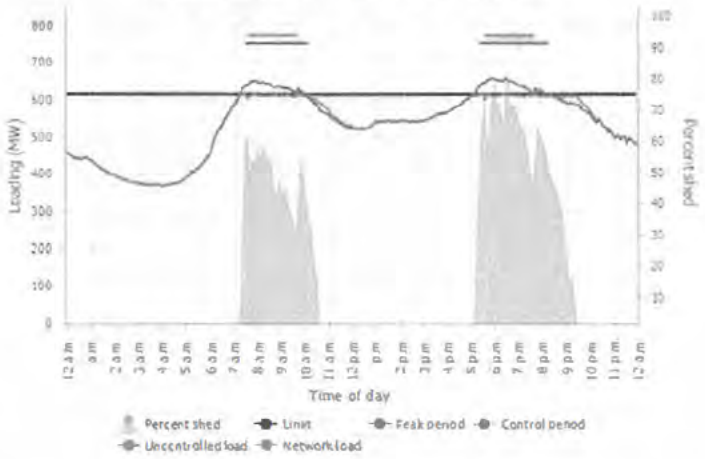
- The Shift project found that *"ongoing financial incentives increased the reliability of response compared to one-off incentives"*[13]. Therefore, a customer value proposition that enables this would be preferable e.g. upfront cost of EV charge point subsidised (possibly via a third party) provided charger is connected and respond.
- Funding for innovation projects that stimulate the development of flexibility markets and smart charging solutions would be extremely beneficial in developing effective and scalable incentives for consumers.[14]

Feedback on Green Paper:

- There are other methods to incentivise customers to respond at appropriate times to minimise peak system effects e.g. signalling customers who have the capacity to respond when peaks are developing
- Peak pricing incentives and the pass-through of Transmission Pricing have provided an effective form of flexibility to date and improved network utilisation. This is demonstrated by the flattening of network load (blue) compared to the uncontrolled (red) during peak periods (green & purple).[15]

Orion network load and load management



- The Green Paper indicates that *"smart charging largely benefits the electricity system, rather than the consumer."* However, lower electricity system costs ultimately lead to benefits for all consumers by lowering the cost-to-serve.
- The green papers states *"The electricity network is designed to meet peak demand that occurs on cold winter evenings (between 5pm and 9pm) when households use more electricity. When demand is higher than expected, power cuts and reduced power quality are more likely to occur."* While this may reflect national demand, this varies at the distribution level. For example, we have recently observed peaks on LV networks at 6am and midnight; and on zone substations at 8am and 10pm.

Developing effective market incentives

[13] https://innovation.ukpowernetworks.co.uk/wp-content/uploads/2022/06/UKPN_Project-Shift_2022_Web-PDF-v2.pdf

[14] https://www.current-news.co.uk/news/ukpn-to-create-ev-vpp-following-uks-largest-flexibility-tender

[15] https://online.oriongroup.co.nz/LoadManagement/Default.aspx?autorefresh=false&reportdate=2022-08-09

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- Orion sees an opportunity for more collaborative innovation between networks, retailers and flexibility providers to develop incentives that can be accessed and effectively adopted by consumers. We are working with other members of the FlexForum to plan innovation projects that will make the full value stack more accessible to incentivise flexibility.
- Given the optimal time to charge will change over time and by location, we support the development of EV charging services / 'type of use' tariffs[16][17] that leverage automation to manage the EV charging on behalf of consumers. These ensure consumers' needs are met while dynamically managing charging in response to energy system conditions in a way that static time of use tariffs (such as free power or off-peak rates) are unable to.

Insights from overseas

- A Delta EE White Paper on Smart Electric Vehicle Charging[18] states *"In order to successfully realise the benefits of smart EV charging, end customers must be incentivised through compelling energy propositions and a choice of the latest charging hardware that give them a rewarding and seamless digital experience."*.
- UKPN's Shift project highlighted that the impact of EV charging on the network is significantly impacted by the design of customer propositions (such as the structure of rewards or the tariff), as well as the underlying commercial mechanism (such as distribution pricing and wholesale price).

We would suggest the following be considered if EECA explores a subsidy for smart chargers:

- Early adopters of EVs benefit from the clean car discount and it is not clear whether a further subsidy for these consumers is justified or whether it will benefit consumers who need support most.
- A subsidy may not lead to the charge point being installed and used in a 'smart' way. A reward based incentive or incentive available via an EV smart charging service provider may be more effective.
- A subsidy now would result in the installation of some smart wall-mounted chargers, which would remain in the homes for many years (say 10-15 years). With technology rapidly evolving, EECA should consider the trade-off between subsidising existing technology vs emerging technologies, such as V2G.

13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?
    - What do you think of New Zealand adopting the approach being undertaken in the UK?
    - What information could you provide to support your position?

We strongly support regulating the 'smartness' of EV chargers in NZ and 'fast following' the approach implemented in the UK seems like a sensible approach. However, we acknowledge that such regulations are not a silver bullet.

- **Once habits and expectations are established, they are difficult to change.** It is important to encourage consumers to adopt desirable charging practices when they first transition to an EV.

[16] https://blog.spiritenergy.co.uk/homeowner/type-of-use-tariffs#:~:text=What%20is%20a%20type%20of,have%20an%20OVO%20EV%20charger).
[17] https://octopusev.com/ev-hub/intelligent-octopus-and-ohme-home-charger-working-together
[18] https://smarttransportpub.blob.core.windows.net/web/1/root/smart-charging-value-whitepaper-delta-ee-kaluza-ukpn.pdf

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- **A multi-faceted approach is needed to influence a broad range of consumers.** A combination of regulation, incentives and education is likely to be most effective. As noted by the UK Government, *"mandating the setting of a default charging mode will help mitigate the risk that some users do not engage with smart charging offers, and instead charge during peak times"*.
- **Default settings get consumers in the habit of charging overnight** and overriding when needed so that this becomes second nature. This makes the step to intelligent remote-controlled charging less daunting as incentives / more dynamic smart charging services come to market.

In parallel with smart charging regulations, the UK has also focused on:

- Real-world trials of smart charging incentives have enabled EVs to participate in flexibility markets[19]
- Building regulation in England for the installation of electric vehicle charge points or cable routes[20]
- Socialising the cost of LV common-network upgrades related to residential EV uptake[21]

There is a need to explore the above in a NZ context to ensure net positive outcomes avoid unintended consequences. For example:

- Consumers adopting 7kW smart chargers can take advantage of incentives such as tariffs with free power. When free periods are clustered, this can increase peak demand and result in poor utilisation of local networks, driving up costs for all consumers.
- Regulations could increase the cost of smart chargers, incentivising more consumers to charge via 3-pin charging cables, increasing safety risks.

While these aspects may fall outside the remit of EECA, there is an opportunity to call for more coordinated action from government agencies to ensure that we enable rapid decarbonisation and future proof investments.

14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?
    - What parts would you exclude or change?
    - Does the PAS cover all the important issues?
    - What other resources may be useful for New Zealand?

We do not have a strong view of where the regulations or incentives should be covered. However, the PAS would make a logical option for information provision and education aspects, alongside more accessible material for consumers.

15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

We hope our response has highlighted the need to focus on commercial viability and consumer desirability in addition to technical feasibility, which is the focus of these regulations. A greater focus on these is encouraged.

[19] https://www.current-news.co.uk/news/ukpn-to-create-ev-vpp-following-uks-largest-flexibility-tender
[20] https://www.gov.uk/government/publications/infrastructure-for-charging-electric-vehicles-approved-document-s
[21] https://www.ofgem.gov.uk/publications/distribution-connection-and-use-system-agreement-dcusa-dcp205-and-dcp205a-recovery-costs-due-load-and-generation-increases-existing-customers-riio-ed1

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There appears to be a gap in innovation funds available in NZ for projects that stimulate the development of flexibility markets and smart charging incentives, including the consumer engagement and exploration of commercial mechanisms required to enable this. In addition to EECA's role in addressing this, we acknowledge the following activities which are important in this space:

- The Commerce Commissions review of the Electricity Distribution Input Methodologies and the importance this plays in establishing more appropriate incentives to innovate and establish flexibility markets to make this component of the value stack more accessible.
- The FlexForum and the endorsement provided by MBIE, aim to identify the practical, scalable and least-regret actions to integrate distributed energy resources (DER) into the electricity system and markets to maximise the benefits for Aotearoa New Zealand.

We would also support consideration of building regulations to ensure the provision of EV charge points in homes and businesses (as implemented in the UK[22]) to enable rapid electrification of transport.

[22] https://www.gov.uk/government/publications/infrastructure-for-charging-electric-vehicles-approved-document-s

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PowerNet Limited response to EECA consultation on *Improving the performance of electric vehicle chargers*

5 September 2022

1. Introduction

1.1 EECA is seeking feedback on ways to improve the energy performance of private electric vehicle (EV) chargers. A green paper has been published, with submissions in response to the issues raised in the paper due by 5 September 2022.

1.2 PowerNet is an electricity management company with head offices based in Invercargill. We manage the non-exempt electricity distribution businesses (EDB's) of Electricity Invercargill Limited (EIL) and OtagoNet Joint Venture Limited (OJV), the exempt EDB of The Power Company Limited (TPCL) and the non-grid connected Stewart Island Electric Supply Authority (SIESA). PowerNet is a joint venture company, owned (50/50) by TPCL and EIL.

1.3 PowerNet manage an asset base and investments in excess of NZ$1 billion. It provides services to over 73,000 customers through more than 14,100 circuit kilometres and manage the fourth largest suite of EDB assets in New Zealand. TPCL operates in Southland and West Otago, EIL in Invercargill and Bluff, OJV in Frankton, Cromwell and Wanaka and the rural and coastal Otago region that surrounds Dunedin City and SIESA on Stewart Island.

1.4 This response is made by PowerNet on behalf of EIL, TPCL, and OJV. All reference in this submission to PowerNet reflect the networks we manage. Any feedback specific to an individual network are clearly identified.

2. Feedback

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers?

2.1 PowerNet see the proposed principles as appropriate.

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?

2.2 PowerNet see that the proposed EV charger features are likely to be beneficial however there is uncertainty around what mechanisms of control may add most value and how this may vary over time as the electricity sector and market evolve.

2.3 PowerNet see mandates for EV charger functionality as a potential solution to the inability of customers to see and react to long term costs of their electricity consumption patterns. However, it is not the only solution and may prove to be less efficient than other options. With this is mind we should be cautious not to over-mandate such that customers may pay incremental costs for features that may ultimately provide them little value.

2.4 It is the car itself that contains both the battery and charging system, the wall mounted charger is only a standardised connection system that includes power supply switch, vehicle communications and safety protection features that may utilise the communications link e.g. signal max charge rate to prevent supply overload. Many vehicles will have their own charging control features and may have wireless connectivity allowing for complex charging control that bypasses wall charger control features and makes any incorporated wall charger control systems redundant. However, the wall charger connector does provide a standardised communications connection to the vehicle charger and therefore provides a means to guarantee connectivity with all on-board vehicle chargers.

2.5 The wall charger therefore may be used as a communications relaying point provided this hardwired communications connection to the car can be interfaced with via standardised communication methods. PowerNet believe that this level of smartness should be mandated in EV wall chargers to prevent 'lockout' of EV charging controllability for the life span of a wall charger i.e. an enabling requirement to allow future controllability to be added/implemented.

2.6 While additional smart control is believed to be beneficial, exactly what control should be implemented is not yet understood (though would obviously make use of commands for ON, OFF, ramping or set points at different times). EVs should be considered one of many distributed energy resources (DER), and maximum benefit is likely to come from aggregating control into a wider DER coordination scheme. PowerNet believe mandating additional control features being built directly into wall chargers is a matter of incremental cost and benefits and PowerNet is uncertain of this trade-off so cannot take a definite position at this stage. We note a significant jump in prices between 'dumb' and 'smart' chargers on the market.

2.7 PowerNet consider that in the slightly longer term we are likely to see autonomous vehicles coming to market. This could lead to a further paradigm shift where transport as a service arises leading to a transition in vehicle ownership, potentially leaving home charging redundant.

2.8 Other smart control features could potentially be recommended and use mandatory labelling to raise awareness (and also therefore create some pressure for suppliers to include features).

2.9 If further features are to be mandated perhaps they should be protection features only to prevent damage or outages. Adding voltage response would be beneficial (similar to 4777 for solar inverters) as long as this is not unnecessarily limiting (some volt drop between point of supply and the charger location is acceptable but isn't measured at the charger location directly). Potentially there could be mandated control by a lines company to issue control to avoid blown fuses or voltage issues that manifest remote from the offending charger's location. This may be a last resort or contingency option that in a fully realised DSO may only be applicable for market (pricing signals) failure.

Q3. Do you support EV charging being open access and why/why not?

2.10 PowerNet support open access communications as an enabler of smart control and information sharing allowing any party that are given appropriate permission to interface with charging equipment to implement control. We believe this is important for flexibility as future requirements are not fully understood and ongoing support of any individual charger providers cannot be guaranteed.

2.11 PowerNet believe that control of EV charging within a wider scheme of DER coordination is a likely future outcome so this should be enabled independent of the chargers inbuilt control capabilities. We expect security concerns can be mitigated effectively however we don't have appropriate expertise to make recommendations regarding this.

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?

2.12 Mandating that EV chargers transmit information on their location and use may be a step too far in our view. An alternative means of information sharing is likely to be sufficient. An option may be to make the provision of information to register to participate in a market system or DSO scheme mandatory. This would naturally be linked to an ICP and address. Or it may be an enabling requirement to access a DER aggregator's services.

2.13 It is likely pricing signals should be sufficient to encourage DER (including EV) owners to share their information with those that require it. Appropriate operation of any DER that contributes to the net benefit of all electricity users should be linked to unlocking the value of DER and sharing appropriate information to facilitate this should naturally occur.

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?

2.14 For an EDB EV charging patterns would be useful information however, consumers should be free to choose if they wish to generate their own data and if they share it and select products as appropriate. As above it is likely they will share information as necessary to participate in value adding DER schemes. EDBs should have smart metering data at each customer connection so net electricity usage for each customer is known.

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

2.15 Quality mandates need to distinguish between EV on-board chargers, AC wall chargers and DC chargers that are at this stage likely to be far less common in a residential environment. An AC wall charger is effectively a switch with communications (and potentially features that request control of the car charger) and therefore are unlikely to create power quality issues.

2.16 DC chargers are more likely to generate harmonics and could consider regulations for minimum quality however EDB connection standards or ECP36 may be an appropriate control for quality.

2.17 Price incentives should be sufficient to manage large step changes in network load e.g. adding shoulder rates to day-night pricing or fully variable time of use pricing (although will be ineffective if some retailers continue repackaging line charges into flat rates). Voltage response characteristics may also be useful as mentioned above.

2.18 Vehicle to Grid (V2G) is another consideration for quality where the bi-directional charger is acting as an inverter and an appropriate control would be 4777 (updated as necessary). PowerNet note that for AC wall-chargers, a remote issued update to an existing installation may be all that is required to enable V2G capability so considering what mandates may be required for V2G chargers should be considered early.

Q7. What are your thoughts on regulating the energy efficiency of on-board EV chargers?

2.19 PowerNet believe it may be difficult for New Zealand to influence EV on-board charger specifications due to relative market size but could consider regulating out 'worst offenders' if necessary. Vehicle economy labelling should include the on-board charger efficiency either directly and/or metrics such as kWh supplied per km range.

Q8. What are your thoughts on labelling aftermarket AC EV chargers?

2.20 This depends on what regulations are implemented. Greater regulation have the potential to reduce options, however with lighter regulation it would be important for the customer to weigh up specifications and the outcomes they should anticipate.

2.21 It may be difficult to state anything too definitive about value of smart features in EV chargers. The benefits may not be fully realisable today and so charger smart features are somewhat future proofing for a time when greater value is realisable. Benefits today are very dependent on retailer pricing packages and therefore while incentives are likely to remain available they cannot be guaranteed or quantified making a useful label difficult to design. However, some information about capabilities may be useful in helping customers value a smarter charging unit. This visibility for customers may also influence suppliers to provide smarter chargers.

Q9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?

2.22 Again, if participating in a market scheme the value incentives should facilitate information sharing and control features to be made available. If incremental cost of smart functionality is low enough to justify mandates then it may make sense to include charging cables, although perhaps capacity limitations should apply (only above which mandates apply).

2.23 The portability of charging cables is an additional complication. This may mean effective control in one location might not be effective in another due to peak load occurring at different times. At worst it could even be counterproductive in an alternative location. We therefore consider that there would need to be flexibility to vary by location. However this would presumably require establishment of a communications link in each location of use to interpret effective control, or require manual updating.

Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

2.24 PowerNet believe the do-nothing approach is likely to be suboptimal. However we also need to be conscious to avoid over regulating.

2.25 We consider that a developed DSO or wider market scheme would deliver optimal value from DER in time. However, the development of the DSO future will be a chicken and egg issue to overcome and some regulation is likely required to ensure equipment installed today (with an expected lifetime of longer than a decade) does not lock out control possibilities for some customers.

2.26 Given most efficient control may occur outside the wall charger (i.e. by the cars own control functionality or wider control and coordination within a scheme of many DER), perhaps the wall charger should not be regulated to include smart features unless incremental costs are proven to be minimal. Nonetheless, an enabler mandating enough (standardised open access) communication capability to add future controllability may be seen as an appropriate no regrets approach.

2.27 It is noted that this open access communication capability alone may be considered to be 'smart' depending on definitions. It would also create incremental costs, above which addition of basic control features may add minimal costs (and therefore be justified). However, PowerNet does not have a detailed understanding of what contribution various features alone or in combination may have to any incremental costs.

2.28 PowerNet believe cost reflective pricing for electricity services is also a key enabler of a DSO and smart control of EV charging. Regulation may be required to create cost reflective pricing for customers e.g. preventing retailers repackaging of line charges where time-of-use rates and incentives to manage consumption patterns are removed. Pricing will need to signal the long-term costs of consumption behaviour to be effective so that customers choose options today that will lead to the best long-term outcomes for themselves.

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?

2.29 As mentioned above it will be difficult to state anything definitive about value of smart features in EV chargers due to dependence on retailer pricing packages. However, some information about capabilities and general concepts about pricing of charging at different times may be useful in helping customers value a smarter charging unit. This visibility for customers may also influence suppliers to provide smarter chargers. Ultimately customers need to see long term cost implications of their consumption patterns to make decisions in their best interests.

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?

2.30 Regulations may be more effective and efficient than incentives. Incentives will influence a proportion of installations whereas regulation is aimed at complete coverage. Subsidies around hardware may prove reasonably effective but there is a risk that it would be an inefficient use of funds that may be directed toward charger suppliers when regulation may achieve a better outcome.

2.31 Perhaps future electricity pricing intended to signal longer term implications of electricity consumption patterns could include a form of cross-subsidisation (i.e. not truly cost reflective with, for example, lower fixed rates and higher variable rates or weighting time-of-use variation in rates sufficiently to achieve the desired impact on behaviour) that reflects an appropriate incentive for customer tendency to under value long term benefits. Adverse effects would need to be carefully considered.

2.32 Environmental benefits are also useful in marketing value to customers however this may be complicated across a fast-moving decarbonisation transition and increasingly the Emissions Trading Scheme is likely to reflect environmental value in pricing.

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?

2.33 As mentioned above PowerNet support some regulation of chargers to futureproof participation in a value producing DSO market. However, this should be the minimum required regulation to prevent lock out for the lifetime of installations. DSO market design should perhaps lead the way in the chicken and egg development between DER capabilities and the market recognising value. Future aggregators may provide retrofit of control services similar to a telecommunication service providing a free modem to unlock services.

Q14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?

2.34 PowerNet believe technical standards are a useful tool to set requirements for hardware, however to be effective these should be sited in legislation similar to 4777 for solar inverters. Otherwise standards are only a guide and their application would likely be patchy creating an uneven playing field and uncertainty. It appears this PAS would need significantly altered for use around residential installations so perhaps is one reference that could be drawn on in creating a new standard if necessary.

Q15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

2.35 EV charging should not be considered in isolation but as part of a suite of DER technology. Cost reflective pricing and pricing that signal the long-term impacts of energy use patterns will be key to unlocking value of DER including EV charging. Regulation may be required to force cost reflective pricing for customers that recognises long term costs e.g. requiring retailers to pass through incentive based EDB line charges rather than repackaging into flat rates.

2.36 PowerNet also highlight that charging off peak is a more efficient use of energy. Network losses increase with the square of current or load on the network (I^2R losses) so the same energy taken from the network off peak requires less generation into the grid.

3. General Observation

3.1 We thank EECA for the work undertaken to prepare the green paper, and appreciate the opportunity to make a submission.

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Counties Energy

7 September 2022

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Re: Submission "Improving the performance of electric vehicle chargers"

Counties Energy Limited's submission is in regard to EECA's green paper *Improving the performance of electric vehicle chargers'* (the Paper).

Background

Counties Energy is an Electricity Distribution Business (EDB) in the south rural Auckland and upper north Waikato regions. As part of Counties Energy's goals to expand from a traditional EDB it developed an electric vehicle (EV) charging platform called OpenLoop that creates an ecosystem to make electric vehicle charging an easy, informative, and fun experience for customers. The aim is to enable smooth, cost-effective integration of e-transport with a connected journey experience across different EV charging locations such as public, destination or in-home locations. To date, a wide range of companies are using OpenLoop including petrol companies, EDBs and car fleet companies.

Residential EV chargers

Counties Energy is concerned that the green paper is only considering 3.7kW plug-in chargers and not residential wall-mounted chargers that are normally 7kW but are most likely to increase in capacity overtime. For the reasons stated in the Paper of relatively slow charging and safety, three-pin plug in chargers will not be the most common form of charging long-term. Counties Energy believes that over the next five years most households with an EV will install a wall-mounted 7kW EV charger, with popular EVs designed for 7kW AC or faster home AC charging[1].

Typically urban homes are designed with a maximum capacity of around 14.5kW, so most homes would be able to support a 7kW wall-mounted charger without changes to their switchboard or requiring an additional phase supply from their EDB[2]. However, if larger numbers of houses were to install wall-mounted

[1] Tesla Model 3 onboard AC charger is 11kW, Hyundai Ioniq 5 onboard charging is 11kW and the BYD Atto 3 onboard charge is 7kW.
[2] Rural homes often have a two-phase power supply (to balance load on the phases of a rural feeder) and so will have double the capacity available to support higher speed wall-mounted EV chargers.

EV chargers, then the impact on the power network would be significant because a household's average demand during peak demand periods is low at around 2kW[3].

Once a wall-mounted EV charger is installed it will likely not be replaced for ten or twenty years because it will have a long useful life and the cost to replace will be high. This compared to a plugin EV cable, which will be comparatively cheap to replace. Consequently, non-smart wall-mounted EV chargers represent a bigger issue than plugin chargers, so it is important for EECA to focus on wall-mounted EV chargers.

Answers to the Consultation Questions

1. *What are your thoughts on EECA's suggested engagement principles for EV chargers?*

   Counties Energy believes that the EECA EV engagement principles should also be forward looking so that they consider EV charging trends and in particular the issue noted above of faster EV chargers being installed within homes. In addition, Counties Energy would also request that EECA considers social equity in terms of the potential impact of EV charging driving higher network costs that are then recovered from all network consumers. It is likely that without being able to manage the EV charging load, EVs peak demand will result in increased peak network capacity investments with the costs recovered from all consumers. This will result in the wealthier demographic who are purchasing EVs having their electricity subsidised and households already in energy hardship seeing higher electricity power bills.

2. *What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?*

   Counties Energy agrees with all the proposed EV charger functions. The most important would be the ability for EDBs to turn off and on the EV charger. This is especially required for grid emergencies where there is insufficient generation to cover peak demand. As grid emergencies become more common with intermittent renewable generation, EDBs will increasingly need to have the ability to manage EV home chargers. As mentioned above, it is likely that the EV charging capacity will be significantly greater than expected with increasing EV onboard AC charging capacity and widespread installation of wall-mounted EV chargers.

3. *Do you support EV charging being open access and why/why not?*

   Counties Energy agrees that 'open access' EV chargers will deliver the greatest benefit for New Zealand. This is because it will allow a competitive market for the purchasing of interruptible EV charging load from homeowners by flexible demand service providers (FDSP), EDBs and electricity retailers. If there are proprietary communications used, then the homeowner will be limited in their ability to sign up to new FDSPs or retailers who are offering better rebates for interruptible of their EV charging demand.

[3] New Zealand peak electricity demand is during winter afternoon weekdays and data from Counties Energy's smart meters has found that at this time an average household demand is only around 2kW. This figure is low because it is an after-diversity average because of factors such as some houses using no power (e.g. will not have returned from work) and some houses relying on gas for heating and cooking.

4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?

Counties Energy believes that homeowners installing wall mounted EV chargers 7kW and greater should be required to notify their local EDB that they have installed an EV charger. Furthermore, that the EV charger should have the capability to transmit half hour data back to their local EDB.

Capturing the location of plug-in 3.7kW EV chargers would be problematic given that they could be plugged in anywhere where there is a standard power socket. Also the consumption data is less important because an EV charger plugin power demand is not much different from a lot of home heat-pumps currently being installed.

5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?

Counties Energy believes that homeowners installing wall mounted EV chargers 7kW and greater should be required to be monitored and the data exported and made available to EV owners. It would difficult, and of less value, to obtain data for an EV charging using a plug-in 3.7kW EV charging cable for the reasons mentioned above.

6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

EECA should mandate power quality standards for EV chargers especially around harmonics and power factor because in the future there will be a significant EV charging load that could create power quality problems if cheap poor quality EV chargers are installed. Network equipment to fix the resulting power quality issues would be very difficult and expensive to implement because it would be widespread across an EDB's low voltage network.

7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?

Counties Energy believes that given the small size of the New Zealand market, any regulations of onboard EV chargers would need to be limited to labelling under the Energy Star Rating scheme. Any additional New Zealand specific regulations would likely result in the EV manufacturer not selling their vehicles in New Zealand given the high potential compliance cost and the limited market for vehicle sales. Consequently, regulations impacting onboard EV chargers could have a negative impact on New Zealand's EV market. This aside, the onboard EV AC charger is bypassed if the EV is charged by a DC charger and residential wall-mounted DC chargers may become common in the future.

8. What are your thoughts on labelling aftermarket AC EV chargers?

Aftermarket AC EV chargers need to be regulated and their installation into homes needs to be regulated. This will already be occurring with wall-mounted chargers enabling vehicle to network transfer of power because the installer will need to obtain EDB approval through the regulated distributed generation process. A similar process should be required for all installed wall-mounted EV chargers 7kW or greater.

9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling

Yes, charging cables with smart charging enabled should be in the scope of the Paper. These charging cables are not suited for overnight charging but are required for emergency charging by EV owners. For instance, if they travel to a holiday batch or motel that do not have dedicated EV chargers.

10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

A 'do nothing' option will likely see an increasing uptake of low-cost wall-mounted 7kW, and even faster EV chargers, as the onboard AC charger capacity increases and the EV drive range/battery size increases. In addition, as EVs get cheaper the ownership demographics may become more cost focused, which in turn, could result in low-cost wall-mounted EV chargers being installed. This will create local low voltage quality issues followed by substantial network upgrades, with the costs being passed on to all consumers.

11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?

The effectiveness of information, education and labelling is likely to be limited as it takes a considerable amount of marketing funding to change customer behaviour. At the same time, there may be marketing by low-cost EV charger manufacturers to promote their EV chargers. Consequently, any such programmes must be undertaken alongside the introduction of EV charger regulations.

12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?

There are some fundamental facts in the Paper regarding distribution pricing that Counties Energy would dispute. Firstly, peak and off-peak pricing signals from distributors does not accurately reflect periods of network congestion. Distribution network congestion occurs on winter weekday mornings and peak when there is a particularly cold day. Distribution peak and off-peak pricing is weekdays throughout the year, with nearly all the peak time periods having no network congestion.

As distribution, and associated transmission and generation, peaks are driven by weather events, forecasting the peaks cannot be more accurate than forecasting the weather and most times an EDB or the System Operator will not know if the network is going to experience congestion until it occurs. This is getting compounded on the generation side by intermittent renewable wind generation. It is therefore not possible to pre-set congestion prices for a specific time and, consequently, it is unrealistic to expect customers to alter their activities when new congestion, or insufficient generation, occurs because they will have little or no warning.

Therefore, the proposed retailer and distributor pricing incentives send weak pricing signals. To manage the peak load for network congestion, or for insufficient generation, EDBs will need to reduce, or stop, home EV charging at short notice. EDBs have been managing, and pricing, this type of demand management for a long-time with home hot water heating using a controlled tariff and ripple relay control via their network Scada systems. A similar model would work for peak management of home EV chargers.

13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?

Counties Energy believes that EECA should follow the UK lead and regulate EV charger standards through its MEPS regime using international standards. This would be the simplest, and most effective, way of ensuring key EV charger standards as listed in the Paper: data connectivity, off-peak charging capabilities, staggered charging times and security.

14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?

EECA should not use the electric vehicle PAS to underpin regulations because this may deter international EV charger manufacturers from selling in the New Zealand market. Given the small size of the New Zealand EV charger market, 'going it alone' with New Zealand's own standards will result in significant development costs for EV manufacturers that they may not be willing to meet because they have to recover the costs over limited number of sales in a small market. EECA should, at a minimum, seek to align standards with Australia and regulate using the joint standard.

15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

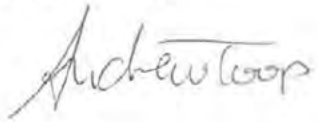
If EV charger standards are not introduced by EECA through the MEPS regime, then an alternative would be for the Electricity Authority to regulate through the Electricity Industry Participation Code (Code). This could enable EDBs to specify EV standards in their distribution code and for electricians to be required to seek EDB approval before installing an EV greater than or equal to 7kW in a home. However, like the metering rules in the Code, this would take years to implement and would result in a substantial base of inefficient wall-mounted EV chargers before regulations came into place.

Concluding points

Without regulations the impact of home EV chargers could be much more significant than expected because of the expected uptake of residential 7kW, and greater, wall-mounted EV chargers. Counties Energy has already been requested by a number of residential developers for pricing to enable a second phase to be reticulated into every house that would enable home EV chargers up to 14kW. Consequently, it seems inevitable that the average household wall-mounted EV charger capacity will increase and the resulting peak demand, and consequential national impact, will be greater than expected.

Counties Energy would be happy to discuss any aspect of this submission.

Yours sincerely



Andrew Toop
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7 September 2022

Andrew Caseley

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Dear Mr Caseley

Submission on Improving the performance of electric vehicle chargers

Introduction

Wellington Electricity Lines Limited (**WELL**) welcomes the opportunity to make a submission in response to the Energy Efficiency and Conservation Authority's (**EECA**) green paper "*Improving the performance of electric vehicle chargers*" (**Green Paper**) published on 8 August 2022.

As highlighted in the Green Paper, by the Electricity Authority in their ongoing '*Updating the Regulatory Settings for Distribution Networks*' review and by the Commerce Commission's Input Methodology review, the development of smarter DER which is visible and manageable by market participants, will enable the development of flexibility services. Flexibility Services will be essential for allowing New Zealand to achieve its carbon emission reduction targets.

Our own long term planning estimates that enabled DER will allow flexibility services to avoid ~$300m in distribution network reinforcement on the Wellington network. As important, orchestrating DER through flexibility services will smooth the Emissions Reduction Plan (**ERP**) related distribution network investment, providing the time to build the new capacity needed to shift the light transport fleet across to electricity from the Distribution network and to manage the transition away from natural gas (should a more renewable gas option not be forthcoming). Without managing EV demand away from peak congestion to improve the utilisation of the existing network, networks may struggle to provide current quality of supply and security requirements until new capacity is built, delaying EV adoption or worse, creating a poor customer vehicle charging experience.

The development of flexibility services requires the industry to create markets to trade services, regulators to introduce supporting regulation and participants to use common communication protocols. Customer DER must also be capable of being managed on their behalf so they can allow their DER to participate in the provision of flexibility services (i.e. the device is smart, registered and available to the market). Flexibility Services will not exist if DER are not smart, registered (connected) and available (permissioned) for market services.

Our long-term demand modelling shows electricity use from the move to electrification of light transport as being the largest driver of ERP related demand on the Wellington network. Our demand

modelling also shows that EV charging if registered and permissioned is well suited to participating in flexibility services there is discretion in when vehicles can be charged (charging demand is well suited to off peak periods "while you are sleeping" without impacting a person's quality of life and delivering benefits of both lower energy and network charges).

We have been developing a roadmap of the actions and steps needed to develop the adoption of smart EV charger orchestration to manage network peak demand. EV Connect is our industry wide work programme that focuses on how more energy can be delivered through the existing network. EV Connect is an EECA sponsored LEVCF project and WELL undertook this project with technology partner GreenSync. The EV Connect Roadmap (**Roadmap**) can be found on our website at: https://www.welectricity.co.nz/about-us/major-projects/ev-connect/. The Roadmap was developed using feedback from 50 different industry participants from two industry consultations and two industry workshops. Industry participants included representatives from each sector of the electricity supply chain, regulators and policy makers and Australian distribution businesses who have faced similar challenges albeit with solar DER.

Furthermore, we have learned from the experiences from our sister distribution networks in Australia that have introduced similar minimum standards and registration requirements for solar inverters so for they can participate in flexibility services and respond to Grid Emergency situations where curtailment secures the network (transmission & distribution) from cascade failure. Lessons included that it is cost prohibitive to retrofit non-smart DER. – Once devices like EV chargers have been installed, customer are not willing to upgrade their devices until they reach the end of their useful life and are naturally replaced. Hence installation needs to include registration of the device and communication/management checks. This will also require permission agreements between the parties.

Without changes to ensure new EV chargers being installed going forward are smart and connected to a managed service, customers and networks will not be able to participate in flexibility services or manage congestion periods which improve supply quality and security. It is estimated that managed services using DER could provide $6.9b[1] in benefits. From an Electricity Distribution Business (**EDB**) point of view, managed DER services will avoid Wellington customers needing to fund an additional ~$300m in additional peak demand capacity.

EV chargers must also be registered

It will be fundamental to ensure we have the correct standards and settings to enable managed Electric Vehicle (**EV**) charging as EV uptake increases. EV Connect highlighted another important prerequisite step that chargers must register from their ICP location and be availability for remote management.

EDB's need to understand where new loads are being added, the demand they will incur and timing of this demand so they can manage the network capacity requirements and supply quality outcomes for other network customers. Having a device registered and the connection and permission details made available would allow flexibility providers to develop and offer services to customers, EDB's and other flexibility buyers. Experience in Australia has shown it is difficult to retrospectively register who

[1] Cost-benefit analysis of distributed energy resources in New Zealand, Sapere, 13 September 2021

can participate in flexibility services that the effective development of services requires EV chargers to be registered at the same time they are installed.

Australia have adopted effective Distributed Energy Resource (DER) standards, ensuring all solar inverters have the ability to be controlled so they can stabilise the negative cumulative effect of high solar penetration as seen in South Australia. This crisis has developed a number of important learnings around DER management – the central lesson being that smart EV chargers also need to be registered. While this is not in the direct scope of the Green Paper, we ask that EECA promote the importance of EV registration and management permissions in the wider regulatory changes needed to support the development of future services for providers or utilities required to ensure their assets operate within quality of supply standards (in line with the '*work with other regulators to identify interagency gaps and overlaps to avoid duplication and unnecessary complexity*' principles proposed in the Green Paper.)

We support the Green Papers focus on ensuring EV chargers can participate in flexibility services. We believe the best, least regrets option presented, is to regulate a minimum standard for all EV chargers to ensure they are registered with communication capability so they can participate in flexibility services while maintaining a secure supply of electricity. The mandated minimum standard should be supported with incentives to assist those who may not be able to afford a smart charger and education to help customers understand how they can benefit from flexibility services.

Additional requirements for large EV chargers

The majority of EV charging is expected to be from residential ICPs. Residential customers will be able to match their daily commute (33km average) with an overnight top-up from a 10A socket outlet in their garage taking about 6 - 8 kWh of energy. While this new demand will be a significant increase to a household's average daily demand of 20kWh (our EV trials show an EV will increase household electricity use by 30%), networks should be able to manage the incremental impact through a combination of existing demand side management tools where charging is shifted outside of peak congestion times, or by building new capacity.

Other household owners may choose to change their house wiring to charge at 3.5kW to 7kW due to their EV having larger battery capacity, range requirements or a range anxiety of always having a full battery at the conclusion of an overnight charging session. The demand from these larger EV chargers is larger than network low voltage network design allowances. EDBs also have no visibility of what size charger EV owners choose to connect where a larger changer may be permitted subject to the ability to manage (register and connect) sometime in the future as EV penetration reaches a defined trigger level on the LV network. For example, a 30% penetration of EV's connecting to 7kW chargers in some suburbs will overload network capacity during winter peak demand periods and surrounding households may suffer a loss of power if the LV supply fuse at the transformer becomes overloaded. An EDB would have no visibility of the issue until the lights go out. For other DER, like solar, there is an application process to ensure the device can be connected securely and affordably as well as settings which manage hosting capacity so future solar connections have equitable access in future.

Additional standards and requirements are needed for connecting large EV chargers WELL would suggest EV chargers above 2.5kW - that in aggregate, have a load large enough to impact the security

of the low voltage network. Additional minimum standards in additional to the EV charger being smart should include:

- Application to connect a larger charger, providing an EDB with visibility of where they are connecting. This will allow an EDB to apply a connection process to assess whether a device can securely connect or to advise when there is not enough capacity to connect a large EV charger without reinforcing that part of the network. It also provides the ability to apply restrictions on how the charger is used. This could include minimum voltage settings or demand limits.
- A requirement for EV chargers above 2.5kW to be manageable and registered to response if required, or charging is restricted to 2.5kW or less. This will allow the chargers to operate without restrictions when a network has capacity, and to be turned down during congested periods, maintaining a secure supply to all customers.

The minimum requirements for large EV chargers may settle into a better diversity where flexibility responses become limited to a number of peak congestion periods through the year to ensure the capacity of the low voltage networks are not overwhelmed or the penetrations of EV's and larger chargers drive the requirement for network reinforcement because services to move congestion become ineffective.

Our EV Connect project highlighted the need for additional standards and requirements for larger EV chargers with loads larger than what the diversity of the low voltage network was designed for.

1. What are your thoughts on EECA's suggested engagement principles for EV chargers?

1.1. What would you add or take away?

Minimum standards alone will not enable EV Flexibility services

As highlighted in the introduction, minimum connection standards alone will not enable flexibility services and network security or maintenance of supply quality for EV chargers being applied to the distribution network. Along with registration of all chargers for network planning and management purposes, an application process for the secure connection of large chargers is also needed. Some of these changes maybe best placed with EECA and other changes might be with another regulatory agency. A joint approach is needed by the regulators to make sure all of the required changes are made otherwise there is a risk of EECA making all of the changes they are responsible for with little or no benefit because of the dots remain unjoined due to regulatory barriers occurring elsewhere.

For this reason, we have included other supporting changes in addition to the minimum EV charger standards in our submission response. These are summarised in our EV Connect Roadmap which has been submitted to EECA under separate cover. If those changes are outside of EECAs responsibility, we would encourage EECA to support the industry in lobbying for the other supporting changes with the other Policy and regulatory agencies, so we achieved a joined up solution.

Include all EV chargers

While EECA are forecasting that most vehicles will be charged at home (82%) there will be a material proportion of vehicles charged from business premises or from public charging stations. The proposed minimum standards should be applied to all chargers.

Network peaks for central business districts are generally work hours for both summer and winter, reflecting the respective air conditioning and heating demand (as opposed to the morning and evening winter residential peaks). Using flexibility services to managing charging within available capacity during peak periods or shifting demand to off-peak periods will still provide value from deferred network reinforcement.

Appling the standard to all chargers will ensure all of the value is captured. We also think this will simplify the application of the standards by avoiding the need to define whether a charger is for residential or business connections.

Consider minimum standards for hot water heating

As highlighted in the Green Paper and by Concept Consulting in their series of papers studying *'How New Zealand can accelerate the uptake of low emission vehicles'*, EV Charging and hot water heating provide the best opportunities to manage demand while having a minimal impact on a customer's quality of life. Because network capacity has been optimised around the control of hot water heating being shifted from the peak demand period, we also believe that consideration should be given to ensuring hot water heating devices can also participate in flexibility services provided the prerequisite of network security is factored in. This concept has been covered in 2013 where a set of principles for load control and the hierarchy of needs across the market participants was explored through ENA led industry working groups. Ripple control technology remains effective as seen with recent Grid Emergency Notices requiring demand side management from EDB's through the hot water ripple control to manage a shortfall of generation offers. We would support a parallel workstream to develop similar standards for a move to smart hot water heating devices, building on the existing ripple control capability.

2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?

We agree with the approach of mandating a minimum standard. As discussed above, minimum standards should also be accompanied with the registration of EV chargers or they risk remaining invisible to a future managed service. We also believe that additional minimum standards are needed for the connection of large chargers, reflecting the increased risk to network security of connecting these devices to the network. A minimum standard will also help:

a. reduce the risk of cost becoming a barrier to participation by avoiding the unnecessary expense of including capabilities that may not be needed
b. reduce the risk of requiring technology that may become redundant
c. reduce the risk of complex features that inadvertently restricts participation in different types of services.

2.1. What do you see as most and least important?

Minimum specifications are needed to ensure (1) an EV can be visible and permissioned to participate in flexibility services and (2) to ensure an EV can be connected safely and security to the electricity system.

1. The minimum specification to allow an EV charger to participate in flexibility services (the most important) are:

    a. **Capability and connection to receive and respond to dynamic system requirements**: this is the most important specification – without this an EV charger will not be able to participate in flexibility services. This requirement includes the permissions and ability to communicate with a flexibility provider and for the provider to manage the operation of the device to generate value (for example, managing demand away from network peaks in responds to a network constraint) and within customer preferences. The ability to respond to a dynamic system requirement will allow the flexibility provider to respond to changing requirements and consumer preferences – a static response will limit the types of flexibility responses that a charger could participate in (and therefore limit the value that could be provided).

    Practically, communicating with a flexibility provider will require communication with a flexibility providers charge management platform which recognises the "value stack" of market participants and the hierarchy of needs. This allows the sequence and scheduling the DER flexibility response so the best value is realised.

    b. **Common communications standards for charge management platforms**: We believe that common communication protocols are needed for charge management platforms to facilitate the flexibility operation and transaction process between flexibility providers and sellers.

    An EV charger may have proprietary software which limits open access. Charge management platforms will be able to manage the connection of EV Chargers using protocol conversion and then provide access to flexibility providers via their own common communication standards

    A customer should be able to physically switch to a new flexibility provider (there may still be contractual restrictions depending on what service a customer chooses) by finding a flexibility provider who can convert the EV charger protocol to connect with the charge management platform. Our EV Connect trial showed that change management platforms continuously developed the capability to connect new types of smart devises.

2. The minimum specification to allow an EV charger to connect safely and securely (the most important) are:
    a. **Registration of all EV chargers**: to provide EDBs viability of where EV chargers are connecting and so they can be incorporated into network planning and demand management.

b. **Capability and connection to receive and respond to network and grid emergency signals to reduce load:** The ability for an EV charger to be able to participate in a network or grid emergency response will be dependent on the ability to communicate and respond to instructions from a flexibility providers charge management platform. The instructions would be in response to an EDB signalling a network emergency or the System Operator signalling a grid emergency.

c. **Additional requirements for large EV chargers (over 2.5kW):** As discussed earlier, the current low voltage network was not designed to supply large appliances like EV chargers over 2.5kW. Minimum standards for the connection of EV chargers larger than 2.5kW should include:
    i. An EDB application and approval process to assess whether a larger EV charger can be securely connected. The connection process could include operational restrictions that reflect network constraints which require registration and communication requirements from a smart charger.
    ii. The registration of larger chargers to a flexibility provider so they can be managed in an emergency situation.

d. **Mandated power quality and control settings:** Mandatory voltage control settings are applied to PV inverters to protect distribution networks from increasing voltages levels on low voltage networks which would exceed regulatory limits and begin to damage connected party appliances. Distributions networks are also vulnerable from damage from low voltage caused by simultaneous EV chargers operating at the peak demand period. Low voltage control settings should be mandated for all EV chargers providing networks protection against high EV charging loads impacting published quality of supply thresholds.

    An EDB could apply specific control settings as part of the connection application process for large chargers over 2.5 kW. The specific settings could reflect a specific network constraint and the higher demand from the larger EV charger.

e. **Default off-peak charging:** This is a least regrets functionality that would avoid unconscious peak demand use. The technology costs to apply this minimum functionality would be low and it would not reduce a customer choice in how they want to use their EV – the settings are only default settings that can be changed in response to consumer preference or in response to flexibility service signals.

We believe that V2G/V2I enablement will become important in the future. However, this technology is still being developed and the equipment is very expensive. We believe it's too early to apply minimum standards.

2.2. What functions would you add or exclude, if any, why?

We believe default minimum charge requirements will be agreed in the commercial terms between the customer and flexibility provider (rather than a technical standard). Including minimum technical

standards could create barriers or restrict innovation of new services and products flexibility providers should be free to develop new products and services that reflect services customers want and create the most value for customers.

3. **Do you support EV charging being open access and why/why not?**

As we have highlighted in our response to question 2, we support open access in respect to ensuring there are no technical barriers to a customer choosing what flexibility provide to use and to connecting and registering their device to the flexibility providers charge management platforms. The charge management platform then provides open access to flexibility buyers ensuring an open market which manages the value stack and hierarchy of needs (i.e. emergency response requirements).

We also note the need for appropriate cyber security to ensure customers can safely and securely participate in flexibility services without putting their cyber security at risk, or the cyber security of other electricity system participants.

4. **What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided?**

For those participating in flexibility services

Flexibility services will require the transmission of location and use data for the operation of the service. The types of data, frequency provided etc will depend on the service being provided.

Mandatory transmission for all chargers

The location and capability of EV chargers is essential for an EDBs planning and load management functions. However we believe it would be more cost effective to provide this data via a registry.

Knowing the location, capability and use of an EV charger is essential for network planning and demand management. As highlighted in the Green Paper, an EV charger adds 30% to household electricity use and a large charger (i.e. 7kW) would increase demand up to three times that of a standard household demand (household being 3.5kW ADMD), becoming the largest single load at the ICP. Currently, networks have no visibility of their LV networks or EV Chargers connecting to the network they do not have visibility of where large new demand is being added to existing network demand. Network operators can retrospectively estimate where EV chargers are being connected by analysing consumption data provided from retailers. However, access to this data is difficult and historic, limiting its usefulness in supporting network planning functions.

EDBs require information to support their planning and demand management functions (including the development of further non-wire solutions However, it could be expensive to develop and maintain this capability. The data, including GIS data, would have to be stored and analysed.

We think it could be more cost effective to require EV owners to register the location and capacity of chargers when they are purchased or with the EDB as part of an application process for large charger installations. This would provide the data required while avoiding having to develop additional data storage and analytics functionality as this could be a feature of a registry field.

5. **What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?**

Flexibility providers will need to know how much energy an EV charger uses (or exports) so a charger will need to be able to provide consumption information to the charge management platform. The information is needed for the provision of flexibility services and for price calculations based on energy use. For example, a fast-charging flexibility service would need consumption data to aggregate with use data from other participating chargers, to modulate charging rates to ensure overall demand is within available capacity headroom.

Rather than the EV charger recording consumption data, it's likely that a flexibility providers charge management platform will record the information.

Smart devices will be able to provide real time performance data which will be needed for the provision of dynamic flexibility services (real time consultation data is not currently available via smart meters). Typically, this is available currently from solar inverters at 5min intervals.

We believe the owner should also have access to this information if they want it. This could be provided by the flexibility provider if the charger doesn't have the facility to provide the data directly. Commercial customers may want consumption data to support their own energy management activities.

5.1. What other information may be valuable to EV Owners

Large commercial customers may also want EV charging power quality data to understand the impact of charging on their wider power quality.

Residential customers would benefit from energy and line charge saving information being visible by shifting charging outside of the peak demand period, thereby avoiding the higher priced TOU period.

6. **What are your thoughts on requiring mandated power quality and control settings for EV chargers?**

As outlined in our response to question 2, mandated low voltage settings will provide important protection against high EV demand causing voltage excursions outside of the networks prescribed limits and/or to impact customer appliance performance. EDBs and retailers have a responsibility under the Consumers Guarantees Act to maintain an acceptable power quality to its customers both the connecting customer and other customers who may be impacted by a new connection. Similar settings are mandated for PV connecting to distribution networks.

10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?

We do not support a do-nothing option market signals may encourage some participation in flexibility services but not at the scale needed to provide a viable alternative to a non-wire solution. Without the supporting minimum standards, it would become difficult to maintain a secure supply. Minimum standards are needed to manage the rapid demand increase expected from EVs and the

large size of the devices connecting to networks (devices that are larger than what the networks were designed for).

If flexibility services are not developed to the scale needed to be used as a viable non-wire alternative, then investment in traditional distribution solutions will prevail. We agree with EECA that it's unlikely this "do nothing" solution would recognise the full benefits that a flexibility service could provide.

As highlighted in the introduction to this submission, most EV chargers currently being installed are not smart and cannot be used in the provision of flexibility services. This unmanaged approach also erodes the diversity of supply and ultimately makes the network less secure. Experience from Australia shows that its cost prohibitive for customers to retro fit non-smart devices. This means that flexibility services using EV chargers, the largest single load of a household, will not be able to be developed and utilised. Customers will face higher electricity costs and worsening security and reliability without EV charging being shifted through flexibility services to occur outside of network peak demand periods.

11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?

We do not believe that any of the options presented in questions 10 to 13 by themselves will provide flexibility services at the scale needed to deliver the social benefits described in the Green Paper. We support the regulation of a minimum EV Charger standard and EV registration, including additional requirements for chargers over 2.5kW, as the primary solution however information, education and labelling would also be needed, along with incentives to encourage customers to invest in EVs and smart chargers.

Information, education and labelling will be needed to ensure customers are aware of flexibility services, understand the value that it could provide them and how they can participate. Specifically, education would show the cost of network investment against the more cost-effective solution of using flexibility services to shift peak demand energy use and avoid or delay network reinforcement.

Education is also needed to support customers when they make a choice about a flexibility service and options that best suits their preferences.

12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?

Incentives will be needed to support minimum regulated standards. As highlighted in the Green Paper, financial incentives supporting regulation were very effective at ensuring chargers were smart in the United Kingdom.

We believe that a combination of incentives may be required:

- Direct financial assistance to assist those who may not be able to afford an electric vehicle or a smart charger. As highlighted in the ERP, EV affordability is a barrier to the electrification of light transportation.
- Changes to the distribution service price/quality regulation to ensure EDBs have funding to purchase flexibility services and to pay customers (indirectly via flexibility service providers) for participating in flexibility services.
- Continue to refine distribution service price signals to encourage off-peak energy use.

- Ensuring that customers receive the full 'value stack'[2] of benefits that flexibility services can provide – that there are no barriers blocking the value being passed down to customers.

13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?

We support the regulation of minimum EV charger standards, a registration and permissions process and an application process for large EV chargers, along with supporting information, education, labelling and incentives. As highlighted in the introduction to this submission, this will ensure the customers receive the full benefits from enabled DER to receive flexibility services and that the industry can deliver our part in New Zealand's ERP.

13.1. What do you think of New Zealand adopting the approach being undertaken in the UK?

We would support New Zealand adopting an approach that is similar to the United Kingdom, but with additional regulatory setting in line with those in Australia. The UK model also used a combination of regulation, incentives and education to successfully ensure all EV chargers that are now installed are smart and can participate in flexibility services.

14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?

We would support using PAS for residential EV chargers to underpin regulation. However, we note that this relates to residential chargers, and we believe regulation should capture all chargers. The PAS would need to also include the requirements of registration and permissions, so the smart chargers are activated and not installed and remain dormant.

We note the Green Paper commentary about cyber security relating to smart EV chargers. Could PAS be used to provide cyber security standards?

15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

EECA is the right agency to lead this aspect of the ERP light transport electrification programme in conjunction with regulatory and policy support from other agencies. The EV Connect Roadmap assists in outlining how this can be coordinated. We strongly support the intent of the Green Paper and we look forward to continuing to support the next steps.

As we highlighted in the EECA funded EV Connect programme, ensuring EV chargers are smart is just one step in the development of flexibility services. We ask that EECA support the wider regulatory changes highlighted in the EV Connect Roadmap. The three most important regulatory changes were (excluding changes addressed in the Green Paper):

- Providing streamlined access to consumption and power quality meter data to support the development of new flexibility services and to support EDB low voltage monitoring and management (essential for managing the secure connections of EV chargers and the incorporating flexibility services into an EDBs demand management response).

[2] Flexibility services provides customers with a range of benefits generated from different parts of the electricity system. In most cases the benefits can be aggregated or 'stacked', rather than traded-off.

- Providing the regulatory allowances for distribution service to develop the capability to incorporate flexibility services into their demand management responses and to purchase flexibility services.
- Requiring all EV chargers to be registered, including information on location and equipment specifications. EDBs need to know where new EV chargers are being connected onto their distribution networks to ensure they can be connected safely and securely.

Closing

WELL appreciates the opportunity to provide a submission on the Green Paper. Ensuring all EV chargers are smart is an essential step in the development of flexibility services – flexibility services will not exist at the scale needed to provide the benefits outlined in the Green Paper, if EV Chargers cannot participate in those services.

If you have any questions or there are aspects you would like to discuss, please don't hesitate to contact Scott Scrimgeour, Commercial and Regulatory Manager, at [redacted]

Yours sincerely

Greg Skelton

Chief Executive Officer

31 August 2022

The Energy Efficiency and Conservation Authority (EECA)
Level 8
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To the EECA

Improving the performance of electric vehicle charges

We appreciate the opportunity to submit our thoughts on the green paper *Improving the performance of electric vehide chargers*. Contact Energy Limited (Contact) have been considering the impacts a growing EV market in Aotearoa New Zealand will have and have been pursuing several initiatives in preparation for such growth.

Contact operates as both a generator and retailer in Aotearoa's electricity market, supplying 20% of NZ's residential electricity ICPs. We have hydro assets in the South Island, thermal assets in Taranaki, and geothermal assets in the Taupō region, all up supplying 20% of NZ's electricity generation.

Decarbonisation is at the heart of our strategy we are a founding member of the Climate Leader's Coalition and we are targeting 95% renewable generation by 2026. The path to decarbonising involves electrifying existing services that are otherwise supported by non renewable fuels, such as boilers and heavy transport. We are supporting this by investing in a renewable generation pipeline that includes expanding our geothermal capacity, and investigating wind and solar projects.

Recognising the impacts of peak-demand fluctuations, we have also invested in load shifting programs. Simply Energy, one of our subsidiaries, is working with commercial and industrial consumers to introduce demand flexibility, providing users with the ability to shift their consumption. Additionally, we have recently launched a residential time of-use product called Good Nights where off-peak periods are cheaper. Through Good Nights, we have gained insights around our ability to influence consumer patterns through incentives.

Contact supports the investment of EVs within Aotearoa as the country aims to achieve decarbonisation targets and realising the impact EVs will have on Aotearoa's electricity landscape, we'd like to discuss three matters:

1. Confidence in the market to meet demand
2. Our Good Nights insights
3. Support for changes enabling flexibility without adding barriers

1. Confidence in the market to meet demand

As EV uptake increases in Aotearoa, there will be sufficient generation capability to meet demand. Throughout the market we are seeing investment in new, renewable generation through solar, wind and geothermal investments. For our part, we have an ambitious development programme that would grow capacity in the market by ~4,500GWh (or an increase of total market capacity of more than 10%) by 2030. That means our investment programme on its own would provide 80% of the additional demand required to meet the Climate Change Commission's most recent demonstration path out to 2030.[1] So far, we have committed towards:

- development of 168MW geothermal generation in Tauhara by late 2023
- development of 51MW geothermal generation in Te Huka by late 2023
- retirement of our 44MW Te Rapa thermal plant in 2023
- retirement of our 377MW Stratford thermal plant in 2024

Through our partnership with Roaring40s, we are investigating development of windfarms in Northland and Southland that have the potential to supply 600MW across the two regions. On top of this, our joint venture with Lightsource bp is aiming to introduce a further 380GWh of electricity a year, enough to power 50,000 homes. We have plans for a further 133MW from our geothermal operations by 2030.

We also expect that there will be generation-level solutions in market to meet the peaks in demand, such as the 100/200MW battery that Meridian is currently tendering at Ruakākā Energy Park.[2] Although consumer-level demand flexibility will also play a role.

2. Our Good Nights insights

In August of last year, Contact released a time-of-use plan to the market that showed a behavioural shift in consumer consumption patterns. Available to residential customers only, the product provides users with free power from 9pm-12am.

[ ] of customers on this plan shifted some of their load from the paid period to the free period.[3] This shows that incentives are an effective method in influencing consumer behaviour. On that basis we are actively exploring other plans to encourage residential demand shifting and are conscious of other retailers doing the same.

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[1] The Climate Change Commission's demonstration path shows an increase in electricity demand of about 5,500 GWh by 2030, https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/nz-ets/our-advice-on-the-nz-ets/nz-ets-unit-limits-and-price-control-settings-for-2023-2027/technical-annexes-and-supplementary-documents-advice-on-nz-ets-unit-limits-and-price-control-settings-for-2023-2027/

[2] P51 of Meridian 2022 Integrated Report. https://meridian-production-media.s3.ap-southeast-2.amazonaws.com/public/Investors/Reports-and-presentations/Annual-results-and-reports/2022/Meridian-Integrated-Report-30-Jun-2022.pdf

[3] Based on August 2021 to May 2022 consumption of customers that were with Contact prior to joining Good Nights.

3. Support for improving flexibility without adding barriers

We are supportive of flexibility for consumers in how they charge their EVs. However, it is important that any new regulations or standards do not create barriers to EV uptake and slow Aotearoa's decarbonising transition.

We support the EECA in providing education to consumers around energy efficiency behaviour and believe it's a good pathway in reducing costs to consumers through reduced consumption. For example, energy efficiency ratings are an informative way of aiding consumers with their purchasing decisions and are already familiar to New Zealanders.

However, we are concerned that the high up-front costs of smart home equipment are already a barrier to uptake, and some of the proposals in the consultation may exacerbate these costs.

We, therefore, recommend that the EECA consider alongside this work options to increase uptake of smart home equipment. In some cases, consumers may purchase less of these devices than is socially desirable because of the up-front costs, and some of the load shifting benefits accrue to other parties, such as lines businesses, and generation, rather than the customer directly.

One solution may be a partnership between the government and retailers to help reduce the upfront costs to consumers of smart home equipment, by offering direct discounts, and/or offering attractive finance terms. We would be happy to work with EECA to further develop this proposal.

Overall, the electricity market has taken a proactive approach towards handling potential disruptions electrification will have on Aotearoa's supply security. There is a vast pipeline of renewable generation being added to the market, and investment from distributors will play a key role in ensuring generation is able to reach consumers. EVs represent a positive step towards the country's decarbonisation goals, and we anticipate their growth with optimism.

Yours sincerely

Brett Woods
Head of Regulatory and Government Relations

5 September 2022

The Energy Efficiency and Conservation Authority Green Paper: Improving the performance of electric vehicle chargers

Northern Energy Group submission

Who we are:

The Northern Energy Group formed in 2019 around a shared interest in delivering future-ready electricity services to communities and a common belief that consumer voices need to be stronger in industry and government decision-making.

The Group consists of Counties Energy, Northpower, The Lines Company, Top Energy, Waipa Networks and Vector.

As networks that are entirely or majority owned by customer trusts, we believe that customers' interests belong at the heart of our energy sector.

We see the sector as being on the brink of significant change and opportunity and are committed to leading a new energy future with the voices and interests of our communities at the centre. Together, nearly half of New Zealand's power connections (ICPs) are across our networks.

In driving an affordable and reliable energy transition, our approach is grounded in:

- Community ownership and participative governance. We are owned by communities and the future energy systems we are striving for are built for, and empower, customers.
- Start with the customer with our energy system design. While it would be easier for industry to meet future requirements through traditional investment approaches we see a more active role for networks and better future for customers.
- Enable greater involvement in emerging technologies and innovation from more market participants – accelerating the emergence of new markets and value streams.

Our response:

To manage the accelerated electrification of key sectors of the economy, we must accelerate the integration of the right technologies – including smart EV charging

The Emissions Reduction Plan includes a target to increase zero emissions vehicles to 30 percent of the light vehicle fleet by 2035. This will increase demand for electricity significantly and quickly.

The impact of electrification will be concentrated on the network – which connects homes and businesses to power. The ability to dynamically shift load from EVs to smooth peak demand on the network will be critical to avoiding unnecessary costs helping to keep electricity bills down. This includes for all electricity consumers – whether or not they own an EV.

Smart EV charging can reduce consumer costs

Unmanaged peak demand translates into consumer cost by increasing the need to invest in new network capacity to accommodate peaks. Much of this network capacity would be underutilised most of the time – making this 'build to the peak' approach inefficient. An alternative approach – of leveraging demand management to smooth demand – is efficient because it enables us to make the most of existing infrastructure. This is particularly true for networks – where the impact of EVs will be concentrated – however this is also true for infrastructure across our electricity system.

The whole system impact of smart EV charging is demonstrated by the Whole Energy System Cost Metric (**WESC**).

The whole energy system cost metric expresses the impact of an asset on the electricity system as it would be felt on a consumer's electricity bill. It does this by accounting for the cost or saving that the asset has on the whole energy systems including:

- The impact that an asset has on system balancing (whether the asset incurs additional cost through volatile output requiring other actions to keep electricity demand in line with supply, or, if it adds value by stabilising this);
- displaced generation (reduced costs of running other generators during the periods that the technology is producing power);
- network impact (the distribution reinforcement costs that the technology may avoid or incur);
- capacity adequacy impact (whether or not the technology allows existing capacity to be retired, or new capacity to be forgone, while maintaining the same level of security of supply); and,
- the cost incurred by building and running the technology itself.

Taking into account these factors, the WESC produces the cost of electricity on a per MWh basis, attributable to a technology. That is, it shows the cost or saving that is incurred by an asset that has a lifetime output of 1 MWh (and the rest of the system adjusts accordingly).

This illustrative metric estimates that a smart EV charger delivers a net benefit to the electricity system of $174 per MWh (or a 'negative cost' of $174 per MWh) - which is much more cost effective than building new generation (or indeed, installing passive chargers – even accounting for their lower capital cost)[1]. Applying the same inputs of the WESC to produce a per annum estimation finds that a residential smart EV charger adds $274 p.a.

This is $274 per annum that consumers do not need to pay in their electricity bill in a year as the result of a single residential smart EV charger. This accounts for the higher upfront cost of a smart vs a passive EV charger (Frontier Economics estimated this difference in up front capital cost to be $300NZD).

Much like insulation which comes with a higher capital cost, the overall savings for consumers from the investment outweighs the up-front cost. However, in the case of investing in a smart EV charger this up-front capital cost hurdle is much less than is the case for insulation. As we explain further this up-front cost could be further reduced through an incentive for smart EV chargers.

Smart EV charging can defeat the peak enabling a secure transition to greater renewables

[1] https://blob-static.vector.co.nz/blob/vector/media/vector2021/annex-1-frontier-whole-system-costs-in-nz.pdf

We agree with EECA that:

Smart and energy efficient electric vehicle (EV) charging holds the greatest potential to reduce peak electricity demand in New Zealand. This is because we expect to see significant growth in electricity demand from EV charging, and most of the generation required to meet this growth in demand has not yet been installed. We stand the best chance of realising this potential if we start planning for an expected increase in EVs and EV chargers now, when we can influence the types of devices installed.

As we transition to greater renewables, increasing the levers to manage a more volatile system for system security – as well as using smart ways to manage peaks for affordability – will be critical for maintaining a secure, reliable and affordable electricity system that both keeps the lights on for all consumers and keeps EV owners moving.

We agree with the findings from MBIE's investigation into the August 9th grid emergency:

"The increasing use of EVs will either be part of the solution or contribute to the problem. We can avoid unnecessary future increases in peak demand if EV charging is managed to shift load. The network has the capacity to deal with mass off-peak EV charging, and load shifting can help avoid events like those of 9 August... While pricing signals that reach consumers are necessary, they are unlikely to be sufficient to avoid EVs increasing peak demand. Regulation is likely to be needed, but it needs to provide for flexibility given the uncertainty."[2]

We believe regulation is indeed needed to enable EV load management to play this role in system security and reliability in a more complex future energy system. This future is just around the corner.

Implementing settings for smart EV charging – as with wider demand response capability – can unlock new competitive markets and consumer services

We support EECA's acknowledgement that:

Flexibility services, such as demand response, have a key role to play in the energy transition. It can help to manage intermittent renewable supply and manage peak demand, both of which are essential to the success of delivering energy security and affordability alongside decarbonisation.

In addition to these outcomes, the emergence of demand response and flexibility services can create new markets for more competition and consumer products. This requires devices having the right capabilities – to enable EV optimisation and system security.

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers? What would you add or take away? Is there anything you disagree with?

EECA has developed the following principles to guide its engagement with residential EV charging:

- *Manage EV charging in a way that provides net positive societal outcomes;*
- *Identify and address the impacts of EV uptake on the energy system early on (where practical);*
- *EV owners should receive the utility they require from their EVs and EV chargers;*
- *EV chargers should have a level of smartness and energy efficiency that is cost-effective and provides the greatest net benefit; and*

[2] Page 32. https://www.mbie.govt.nz/dmsdocument/17988-investigation-into-electricity-supply-interruptions-of-9-august-2021;

- *Improvements to the energy performance of EV chargers should encourage the development of a robust, fair and effective demand flexibility market*

We support these principles but believe that "consumer equity" should be added to principle 1 above.

> *"Manage EV charging in a way that provides net positive societal outcomes* ***and achieves equity between consumers****;"*

Networks are typically long life capital intensive investments – the cost of which is recovered across an entire customer base. Essentially, when a capacity upgrade is needed to accommodate new demand this cost is socialised across every electricity consumer. It is important to avoid a situation where the costs incurred by the first to uptake EVs are subsidised by the last. At a foundational level a key way to achieve this is to avoid the cost as much as possible in the first place. Smart EV charging may incur a higher upfront cost on an EV owning customer (compared to the cost of a passive charger) – however its widespread use will help reduce costs for all electricity consumers.

The potential impacts of demand management for network optimisation is demonstrated by hot water load control. However the potential benefits of widespread smart EV charging would be far greater.

Indeed the parallels between smart EV charging and hot water load control as a form of demand management are recognised by EECA – and also made clear by MBIE's investigation into the August 9th grid emergency which found:

"The increasing use of EVs will either be part of the solution or contribute to the problem. We can avoid unnecessary future increases in peak demand if EV charging is managed to shift load. The network has the capacity to deal with mass off-peak EV charging, and load shifting can help avoid events like those of 9 August… While pricing signals that reach consumers are necessary, they are unlikely to be sufficient to avoid EVs increasing peak demand. Regulation is likely to be needed, but it needs to provide for flexibility given the uncertainty."[3]

EECA recognises "maximising energy and electricity system security, reliability and stability", as an objective, and, as noted by the Independent Investigation into Electricity Supply Interruptions of 9 August (referred above) "load shifting can help avoid events like those of 9 August". We agree. Just as some networks were able to utilise hot water load control to shed load in response to system operator requests during the 9 August grid emergency (without resorting to consumer outages), connected EVs offer an opportunity for distribution system operators or networks in the future to also shed load during an emergency event, or, to stabilise the system, preventing such an event from occurring. This appears to be contemplated by EECA: *"They [smart EV chargers] may even be able to respond to real-time signals from external parties such as a network operator or a load aggregator".*

To enable the demand response contemplated above, EV chargers must be responsive to such an aggregator protecting system security or responding to an emergency. This includes the ability for a distribution system operator or network to manage EV load to maintain system security in spite of the ability of the consumer to override BAU peak management settings. Such a lever – an override of the override – should be seen as the 'ambulance at the bottom of the cliff'. Whilst the ambulance is important, prevention is optimal. In this case, prevention is widespread participation in dynamic demand management. The greater the proactive peak management that can be achieved through such services the less the ambulance would need to be deployed.

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[3] Page 32. https://www.mbie.govt.nz/dmsdocument/17988-investigation-into-electricity-supply-interruptions-of-9-august-2021;

We recommend that EECA consider this carefully in contemplating the scope of consumer override in an EV charging standard.

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand? What do you see as most and least important? What functions would you add or exclude, if any, and why? What information could you supply to EECA to help inform our thinking about this issue?

We agree that EV chargers that have a common set of functions and means of communication, and can be used by any potential operators of a device, are best placed to deliver maximum value to NZ.

It is crucial that the ability to be dynamically and remotely managed is regulated for and we support the inclusion of an open communications protocol to enable a range of new market actors or aggregators to offer smart EV charging services (that is, that the chargers are interoperable).

We also support the inclusion of off-peak default charging mode to be included in the standard as contemplated by EECA. This will be a positive 'first step' to help manage peaks while EV uptake is still relatively low and whilst the market for dynamic EV charging services is emerging.

We strongly support requiring mandated power quality and control settings for EV chargers.

These requirements for DG inverters (including V2G) are currently covered in the Australian and NZ joint Standard AS/NZS 4777.2.2020. They should also be included in a standard for EVs. As below volt watt control is currently missing from the Publicly Available Specification – this is an area where the PAS would need to be amended to form the basis of a mandatory smart EV charging standard.

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided? Who should be able to access this information? In what form should it be transmitted? What processes should be in place to safeguard the data? Is there any other way this data might be captured?

Understanding where EVs charge and when is critical for efficient network planning. This is heightened by the fact that this technology is new, largely unknown and the uptake pathways are still unclear. The important thing in providing this visibility is that the EVs are registered to an ICP at the time of installation (and that networks have consistent access to half hourly rate consumption data).

If the location of EVs chargers were provided as GPS data, this would need to be separately mapped against ICPs, which adds additional complexity to gain the benefit of understanding where the device is connected to the network. There are alternative pathways to achieve visibility of EVs which would not require EV chargers to transmit their location to a third party. We support for example the expansion of the EA's existing registry for distributed generation (DG) to be widened to include EV registrations. We do not recommend that the whole application process for DG as it is set out in Part 6 in the Code be applied to EVs – but that the requirement in Section 9A 3) does as below:

Section 9A

3) The distributed generator must also give the distributor the following information as soon as it is available, but no later than 10 business days after the approval of the application:

(a) a copy of the Certificate of Compliance issued under the Electricity (Safety) Regulations 2010 that relates to the distributed generation:
(b) the ICP identifier of the ICP at which the distributed generation is connected or is proposed to be connected, if one exists.

This is executed through a Certificate of Compliance being completed by an electrician and provided to a network. Whilst Part 6 applies to distributed generation (including V2G technology – which is captured by Part 6 as it injects power into the network, making it 'distributed generation') this pathway could be expanded to include the registration of all EV charging installations. This option would be virtually zero cost.

We appreciate that Part 6 is designed to apply to distributed generation – and indeed that the Code can only apply to those who are an industry participant as defined in the Electricity Industry Act 2010. Changing the Code is also the role of the Electricity Authority, rather than EECA, but we understand that the various Crown entities will be working together to determine the best means by which to achieve these outcomes.

Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand? Do you think the market can adequately address this issue without the need for government intervention? What information could you provide to EECA to inform this issue?

The relative risks between 'do nothing' and making an intervention (i.e., regulating smart EV chargers) are drastically asymmetric. The downside of regulating – potentially a modest increase in the price of EV charging units – is vastly outweighed by the missed opportunity of much more efficient and effective use of the electricity system, which in turn will help to limit increases in the price of electricity to end consumers.

This was summarised by the UK's regulatory impact assessment which said:

"The technology and business models for electric vehicle smart charging are still in their infancy – both in the UK and internationally - and there are a variety of different technical approaches to delivering it. The diversity in business models and practices of this early market, whilst important for innovation, also risks a proliferation of smart chargepoint (CP) systems developing with varying standards and functionality. Without clear requirements and standards set for the industry, it's unlikely that the market will deliver smart CPs that provide sufficient grid and consumer protection, at least in the short term"[4].

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers? What information could you provide to support your position?

We support the provision of education to consumers on demand response technologies and labelling can be a useful signal to consumers. In particular, consumers should be made aware of the danger posed by overloading standard plugs with a 3kW - 4kW EV plugin charger (and we think that there should be a requirement under the Wiring Rules that EV plugin charging cables within the home need to be connected to a dedicated higher capacity circuit back to the home circuit board).

.However, much like EECA's existing approach to for energy efficiency this is an 'and' for regulations rather than an 'or'.

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015290/electric-vehicles-smart-charge-points-regulations-2021-impact-assessment.pdf

Consumers have a crucial role in an energy system that unlocks the benefits of the demand side – but we are also of the view that it is up to industry and the regulator to 'internalise complexity' – delivering the most cost effective and consumer centric energy services without imposing a high consumer burden. EV charging regulations are a key and bare minimum step in ensuring this happens.

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers? What incentives do you think would be effective and who should provide these? What other incentives might be valuable beyond financial incentives?

Much like education, we see the provision of incentives as an 'and' rather than an 'or' for smart EV charging and demand response services.

Whilst some incentive options are currently being offered by retailers (which we support) these are relatively few and it is unlikely that they are adequate in tilting consumer purchasing decisions in favour of smart charging currently in the absence of regulations. Once a passive charger is installed a consumer is unable to subscribe to a smart EV charging pricing product or incentive (unless they retrofit the charger) potentially restricting the market for such incentive products. Smart EV charging regulations and incentives are not mutually exclusive – they hinge on one another.

Overall, it is important that wider levers are considered alongside regulating the specifications for smart EV chargers to ensure that using a charger at all (which further to regulation would carry smart functionality) is favoured by consumers (as opposed to using no charging device – i.e., using a three pin plug).

Incentives or subsidies to install a smart EV charger could be an effective way to do this and to overcome the higher capital cost of a smart as opposed to a passive charger. We consider this a lever to support the implementation of smart EV charging regulations and to ensure that this does not increase the cost burden on consumers – a salient concern in the context of energy affordability; a just transition; and the cost of living generally.

We note that the UK provides an EV CP grant for 75% of the cost of a EV CP (or £350) for landlords, businesses, or apartment block owners (because of the UK's parallel regulation every CP sold or installed in the UK must already be smart). This is a good example of an incentive working alongside regulation to help tilt consumer behaviour in favour of efficient charging and of reducing the cost burden on consumers. We also note however that the Electric Vehicle Homecharge Scheme – which preceded the CP Grant and which also offered a 75% or £350 subsidy for any compliant smart charger – was in place well before regulations for smart chargers were implemented. This signals that the incentive was not by itself adequate in driving smart EV charging. The narrowed eligibility of the CP Grant also reflects a rapid reduction in cost for the price of a residential smart EV charger. Both of these learnings are salient and supportive of smart charging regulations in New Zealand.

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaken in the UK? What information could you provide to support your position?

We support this strongly. As we noted at the beginning of the submission smart EV charging can:

- Reduce consumer cost;
- defeat the peak enabling a secure transition to greater renewables; and
- unlock new competitive markets and innovative consumer services.

All of these outcomes are critical to delivering future ready electricity services that can meet consumer needs as we enable the convergence of our transport and electricity services.

Northpower

EECA Consultation - Improving the Performance of Electric Vehicle Chargers

Q1 What are your thoughts on EECA's suggested engagement principles for EV chargers? What would you add or take away? Is there anything else you disagree with?

We agree with the proposed principles for EV charger engagement. We support the Northern Energy Group submission which proposes the addition of a consumer equity principle, to recognise that EV charging by some consumers can drive network investments in capacity which are socialised across all consumers.

> *"Manage EV charging in a way that provides net positive societal outcomes and achieves equity between consumers;"*

Q2 What are your thoughts on the proposed specification for 'smart' chargers in New Zealand? What do you see as most and least important? What functions would you add or exclude, if any and why? What information could supply to EECA to help inform our thinking about this issue?

Overall, we broadly support the proposed specification and comment specifically:

> **Basic functions**: This is essential characteristic, and perhaps the most important.
>
> **Default minimum charge mode**: This is an important characteristic from a customer experience perspective. To overcome the issue where some EVs don't restart after an interruption to the charging session the "default minimum" could be incorporated into the 'basic function'. Note the minimum AC charging setting under the J1772 standard is 6Amps.
>
> **Randomised delay** will ramp the onset of charging session (for example at the start of the off-peak time band) and is expected to have significant benefit for the high voltage (HV) network by allowing time for the on-load tap changers to respond. On the LV network, to achieve significant benefits the load needs to be spread through off-peak hours, rather than starting at the start of the off-peak time band. Smart charging capability is required to select a random start and stop time during the off-peak band which still results in the car reaching the desired level of charge overnight.

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'Default off-peak' and 'default reduced charging at peak'. These modes have merit, however further consideration is required to how this 'off peak' is determined and set. The use of electricity will increase as we decarbonise our energy in all sectors, not just transport. Therefore, overall load patterns are likely to change and what is an "off peak" period for some users now, may be a peak in the future. Ability for the network, retailer, or other stakeholders to interface with the charger would enable these time bands to be changed over time, and also for constraints to be digitally signalled *when* they occur, rather than using a pre-determined time band which could result in throttling at time where there is no congestion.

V2G / V2I This functionality is likely still sometime away for residential use, partly due to cost and that the CCS port which is now the pseudo standard in New Zealand is not bi-directional. This may be a future option that needs to be taken into account.

In addition:

- The ability to dynamically and remotely manage EV charging will be essential in the future to optimise network use. We support the inclusion of an open communications protocol to enable a range of new market actors or aggregators to offer smart EV charging services (that is, that the chargers are interoperable and able to be managed via API over the home's Wifi connection, or the car's cellular connection).
- We also support requiring mandated power quality and control settings for EV chargers.
- Probably what is missing in regard to functions is measuring and data specifications. Information about EV charging patterns would be useful to EDBs for planning and forecasting.

Q3 Do you support EV charging being open access and why / why not? What information could you supply to EECA to help inform thinking about this issue? Do you think that 'smart' chargers should address issues of cyber security? How would you suggest this is done?

Yes, we support open access as a principle as it potentially reduces barriers for participants to provide flexibility services. There are benefits to shifting load to both the distributor in terms of managing network congestion (thereby reducing investment costs), the grid, and the retailer through spot prices. Maximising value from dynamic load requires all parties to be able to contract for these services, not just one party. However, it is essential that networks have priority in order to maintain whole of system network stability.

This requirement shouldn't preclude EV chargers having additional non open communication protocols such as IEEE 2030.5.

We agree cyber security is an important consideration and aligning with international standards will help to address this issue.

Q4 What are your thought on EV chargers having to transmit information on their location and is and the suggested scope of information to be provided? Who should be able to access this information? In what form should it is transmitted? What process should it be transmitted in? What process should be in place to safeguard the data? Is there any other way this data might be captured?

Understanding the location and likely charging impacts of EV is going to be critical for network planning. However, the transmitting of location will only add additional complexity, and need to be managed through another system.

Instead, we support linking the EV charger to the ICP. For network planning and management purposes, we are primarily concerned with fixed wire mode 3 charging and therefore the location of these chargers would be useful (see our comment on Q9 about IC-CPD (mode 2)).

The other key site information that should be collected would be the charger capacity and the phases or phases that the charger is connected to.

Distribution networks already keep location data about distributed generation (DG) and loads on ripple control. A similar process to recording and storing information about DGs could be used, with this information being held through the Registry. Those systems have proven to be secure.

Q5 What are your thought on a requirement for EV chargers to monitor and record electricity consumed and / or exported during EV charging and for this information to be made available to the EV owner? What other information may be valuable to the EV owner? What format should be used for this information if this is adopted?

In our experience, many consumers are interested in this functionality, and many EV chargers already come with specialised apps or functionality which provides this information.

Q6 What are your thoughts on requiring mandated power quality and control settings for EV chargers?

In principle yes. We support incorporating these requirements into a standard such as AS/NZS 4777.2 and making this mandatory through regulation. We recognise there is a considerable period of time needed to update a standard, then update the regulations. EV and EV charging technology is changing rapidly, and the concern is that regulatory processes will not keep pace.

As New Zealand is a taker of EV technology, we need to ensure that our regulations reflect the international trends, so we are not an outlier and continue to be able to access the latest in EV technology.

Under frequency response of EV chargers could be especially useful to ensure grid stability for unplanned events on the grid, as it would enable charging load to be shed or reduced rapidly for such an event. This technology current exists in ripple controllers, enabling an under-frequency event to be identified at the connection point, resulting in hot water load being shed more rapidly than a ripple signal can be sent. Voltage limits would also have benefit for managing Voltage issues on the LV network. AS/NZS 4777.2 has trigger levels for frequency and Voltage events however they would need to be set at a different level for a load versus a DG. Networks generally have no visibility of the data collected by smart meters (unless they own the meters) and therefore if a smart meter encounters a voltage issue, it would be useful if it could communicate that to the EDB to investigate and resolve.

It is unclear if harmonics is to be included in power quality. If harmonics are to be included, it should be noted that harmonics are more related to the on-board charger not the EV charger unit that is typically mounted on the wall of the installation.

Q7 What are your thoughts on regulating the energy efficiency of on-board chargers? What information could you supply to EECA to inform this issue? What challenges, if any, do you see in regulating in this area?

We support more research into the efficiency of the on-board chargers to determine if this study reflects a widespread issue.

The charging efficiency of EV charging is as much to do with the battery chemistry i.e., churn losses, (charging and discharging the battery) as the losses on-board charger. Northpower has some data on the energy supplied to recharge an EV compared with the energy supplied to the electric motor under test driving conditions. However, the studies measured both the losses in the on-board charge and battery churn. It is unclear whether this question is making a distinction between the on-board charger losses and the battery churn losses.

If New Zealand is going to require an efficiency rating for on-charging of EVs then it should be based on an international standard or recognised test methodology (like what is used for testing the range of an EV). Also, the focus should not just be on the on-board charger efficiency but the battery churn losses as well.

If the standard is set too high, then it may stop or reduce the supply of EVs into New Zealand both new and used imports.

Technology is changing rapidly. The wireless charging standard SAE J2954 has been released, which means half the charger (transmitting part) is external and

the other half (receiving part) is on-board the EV. Therefore, such a regulation would only cover half the charger, which does not seem practical.

Q8 What are your thoughts on labelling aftermarket AC EV chargers?

Yes, but we note that the losses in the EV charge unit while charging will be relatively minor compared with the on –board charger and the battery churn as it is just contactor with some smart controls. However, it is not clear if the proposed labelling of losses is while charging or the standing losses as like any 'smart' appliance with embedded smarts and communication system there will be standing losses. Labelling standing losses should be consistent with labelling other home appliances.

Q9 What are your thoughts on whether charging cables which contain a 'smart' enabling device should be in scope for intervention?

Mode 2 charging with an IC-CPD should be out of scope, as these are lower capacity compared with the mode 3 fixed wall charger units. Importantly, mode 2 charging is becoming less common for home charging as EV battery sizes have become larger and this trend likely to continue. Some makes and models of new EVs are now being supplied without IC-CPD.

We support a focus on the growing number higher capacity mode 3 EV charging (and incentivising use of these chargers), not the reducing amount of mode 2 charging using an IC-CPD.

Q10 What are your thoughts on the 'do nothing', option for EV charging for EV chargers in New Zealand? Do you think the market can adequately address this without the need for government intervention? What information could you provide to EECA to inform this issue?

In our view, a do-nothing approach would not achieve EECA's EV charger engagement principles, which would be a missed opportunity for New Zealand, and ultimately drive additional costs to end consumers.

The market will shift some load into off peak periods through pricing signals, however this still requires a degree of effort from consumers. With the right foundations, EV smart chargers can provide the basis for future flexibility services and ensure a more efficient and effective use of the electricity system. This in turn will help to limit increases in the price of electricity to end consumers.

Consideration also needs to be given to whether the smarts should be in the car, or in the charger. For example, Tesla Model 3 does not include a smart charger, but there are smart functions built into the software and controllable through the app. These can be upgraded by Tesla relatively easily using an over the air upgrade. This can achieve the same outcome at a lower cost than building smarts into a physical device, and as such any regulation should consider this as an alternative which achieves the same outcome at lower cost.

We strongly support targeted action in New Zealand to address the potential impacts from EV chargers and to harness the ability for these loads to provide important flexibility services in the future. A regulatory framework however would need to ensure that it is responsive to technology changes and that it aligns with international standards and practices, given EVs and EV charging equipment is made for the international market.

Q11 What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?

We see education as being important, but not completely effective based on our experience with electrical safety messaging campaigns. In other words, this could be additional to the more targeted actions outlined in this consultation.

To help consumers understand the complexities of EV charging, and different options, we support well co-ordinated, targeted and helpful information in plain English that consumers can access.

Q12 What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers? What incentives do you think would be effective and who should provide these? What other incentives might be available beyond financial incentives?

We acknowledge currently there is a material cost to consumers in purchasing a smart EV chargers. However, given the benefits they can deliver to the whole electricity system (ultimately reducing costs for all consumers), we consider there is a strong basis to provide incentives to encourage their uptake. We recommend looking at overseas experience to see what has worked well; for example, the UK's incentive of offering subsidies on EV smart chargers.

Q13 What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaking in the UK? What information could you provide to support your position?

We support regulating the 'smartness' of EV chargers in principle, provided the regulatory process keeps up with EV charging technology (see Q6).

Looking at the wider issues however, a high proportion of New Zealand homes use electricity for water heating, space heating and cooking - all high energy and high demand applications. Home EV charging while potential significant may not be to the same degree as the situation in the UK.

While not directly relevant to this consultation, we also note a concern around the wider trend in the loss of controllable load through the displacement of ripple control in hot water heating. Home charging of EVs uses a similar amount of energy as water heating, and many PV installations are being configured with the hot water cylinder being shifted from the controlled to the uncontrolled circuit (to

maximise the value of the PV output), which results in this previously controlled load being lost. This raises the question about the effort being put into managing the demand of EVs through 'smart' charging, being undone by the equally rapid uptake of home installed PVs shifting hot water cylinder from the controlled to uncontrolled circuit.

Q14 What your thoughts on using the PAS for residential EV chargers to underpin regulation / incentives? What parts would you exclude or change? Does the PAS cover all the important issues? What other resources may be useful for New Zealand?

Yes, this is one option. PAS 6011 could be updated in a relatively short time frame compared with a standard and kept up to date with regular reviews

PAS 6010 (commercial applications) & 6011 (residential applications) were written for guidance for charging EVs and therefore not intended to be cited in regulations. These PASs were written with the view that this technology is changing rapidly, and sections 3.4.2 to 3.4.6 were kept generic knowing smart charging was still evolving. OCPP 1.6 was cited as well a need to for data capture and the ability to adjust the rate of charging or discharging. Note that PAS 6010 and 6011 were written intentionally to be relatively short document and kept to the basics. The industry has a lot more material available, so adding more technical detail would not be difficult.

We recommend considering the adoption of the UK IET Standards Code of Practice for Electric Vehicle Charging Equipment Installation, which is comprehensive and well written.

Q15 In what other ways might the energy performance of EV charging in New Zealand be improved that do not require EECA's involvement?

No comment.

If you have any queries on our submission please contact Shane Ruxton, Commercial & Regulatory Manager [redacted]

5 September 2022

Energy Efficiency and Conservation Authority
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By email: STAR@eeca.govt.nz

Submission on Green Paper - Improving the Performance of Electric Vehicle Chargers

WEL Networks Limited (WEL) appreciates the opportunity to make this submission on the Energy Efficiency and Conservation Authority's (EECA) green paper on improving the performance of electric vehicle chargers.

WEL agrees with EECA that it is the right time to review and improve the regulatory settings for electric vehicle (EV) chargers and we strongly support mandating smart EV charging.

WEL agrees that the *"majority of charging activity for the light vehicle fleet will continue to be residential".*[1] Our own analysis revealed uncontrolled electric vehicle charging had the potential to require very significant new network infrastructure investment between now and 2040 – equivalent to 1.3 times our current asset base. WEL is community owned and committed to ensuring our services to our customers remain affordable. It is not realistic nor desirable to recover this quantum of investment from our customer base.

While this green paper focuses on the uptake and connection of EVs, WEL believes that it is equally important to ensure there is sufficient energy to supply these EVs. WEL is also focused on fairly priced energy for our consumers and we suggest EECA has a role to play in promoting new investment in renewable energy capacity.

In our view there are three distinct components of EV charging that require consideration and different protocols:

1. charger to cable
2. charger manufacturer to charger
3. service provider and requester

WEL suggests EECA consider the type of regulatory intervention needed for each of these 3 different activities.

1. *Charger to cable*

The green paper has not focused on the 'charger to cable' segment which is an important oversight. The size of the onboard chargers has increased markedly - from 16 amps three years ago to now being commonly 32 amps with Tesla's at 64 amps. There are safety issues if the cable is not sized appropriately for the charger size – especially as the green paper reveals *"in 2019 79% of chargers sold were cables plugging into a three pin plug".* [2]

[1] Page 8 of Green Paper
[2] Page 7 of Green Paper

2. *Charger manufacturer to charger*

New Zealand relies wholly on importing light vehicle fleet EVs. It is important to consider the capabilities installed in the charger when manufactured before regulating the information provided by an EV charger. The value of this information needs to exceed the value of limiting access to vehicles that cannot meet these regulations.

3. *Service provider and requester*

EECA refers to the market model and platform for demand response that can be successful between Transpower and retailers at the Grid Exit Point (GXP). In our view, Transpower and retailers are not directly impacted by the specific location of any demand response beyond a GXP. WEL is prepared to work with anyone that meets our service requirements at a GXP to manage demand.

However, the location of increased load and demand response within the distribution network is the principal concern for distribution companies such as WEL – it is at the distribution transformer at a street level where constraints first occur in the Low Voltage feeder network.

WEL has installed over 67,000 smart meters that generate 5 minute visibility of electricity consumption. This information improves network management, highlighting the occurrence and timing of constraints. It enables real-time decision making to alleviate a constraint and maintain reliable power supply to all connected customers (including initiating or contracting demand response).

Most other distribution companies do not have this visibility. WEL agrees with EECA's proposal (Q4) that it would be useful for EV chargers to transmit information on their location and electricity consumption. It is timely to discuss the issues raised in Q4 and we suggest the responses EECA receive will form a good basis for a more detailed piece of work to consult on and finalise appropriate ongoing data arrangements.

Our preference is for a central registry/depository of consumption data that is available to relevant parties (provided data privacy and security protocols are met). Australia is a model NZ could replicate. The central registry should also provide equipment and installation data, likes of system capacity, charger brand, integration protocol version, etc. WEL can work with EECA on this if required.

WEL strongly supports regulation of 'smart' EV chargers. Incentives for 'doing the right thing' are preferred over penalties and could stimulate the use of 'smart' EV chargers while regulatory measures are developed. Opportunities to automate processes / information flows should also be encouraged. WEL looks forward to engaging with EECA on the next steps and welcomes the opportunity to discuss our experiences with increasing uptake of EVs on our network.

We have included longform responses to EECA's questions in Appendix 1.

Yours sincerely

[redacted]

Michelle Allfrey
GM Commercial Engagement

APPENDIX 1: WEL's response to EECA questions

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers? What would you add or take away? Is there anything you disagree with?

WEL suggests principles should be technology agnostic and not pick winners.

We query whether the word 'equally' in the following means crediting 50 / 50 or equitably benefits to both electricity providers and consumers?

- *"ensure the costs and benefits of smart EV chargers are equally accredited to both electricity providers and consumers"*

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand? What do you see as most and least important? What functions would you add or exclude, if any, and why? What information could you supply to EECA to help inform our thinking about this issue?

Basic functions: this should be clear that the ability is to remotely reduce the flow of electricity to the charger. Our experience is that the charging cannot be restarted if the electricity supply is cut off as some charge types and EVs requires a hard reset by disconnecting the connectors before a new session can be restarted.

V2G /V2I: When the EV is a generator it is like any other inverter-based generator and should be regulated by the generator inverter standards.

Inverter standards have other types of remote indication and management protocols specified so there will need to be alignment between the current EV charger control protocol and the inverter control protocol.

Q3. Do you support EV charging being open access, and why/why not? What information could you supply to EECA to help inform our thinking about this issue? Do you think that 'smart' chargers should address issues of cyber security? How would you suggest this is done?

WEL supports open access communications around EV charging. Having EV chargers able to communicate to other systems, and not just locked into a platform provided by the manufacturer, will allow a much better uptake of smart systems and ability to remotely manage peak demand in the future.

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner? What other information may be valuable to the EV owner? What format should be used for this information if this requirement is adopted?

WEL queries whether it is the EV charger that monitors and records electricity consumed or the meter the EV charger is connected to? It is hard to require an EV charger to monitor and report on full supply this is really the domain of the smart meter

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

WEL supports mandating power quality and control settings for EV chargers.

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers? What incentives do you think would be effective and who should provide these? What other incentives might be valuable beyond financial incentives?

WEL supports the use of incentives to encourage uptake of 'smart' EV chargers. Consumers are unlikely to have sufficient information when purchasing an EV to differentiate between a smart or unsmart charger. This could be a shorter term measure until decisions are made on what to regulate and the regulations are implemented.

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaken in the UK? What information could you provide to support your position?

WEL strongly supports regulating the 'smartness' of EV chargers. We are aware there are system-wide benefits which ultimately benefits consumers. NZ officials should investigate if the UK Electric Vehicles (Smart Charge Points) Regulations 2021 can be easily adopted in NZ. WEL understands the UK's open data connectivity is working well. An open platform is critical for visibility of data and voltage / current information. EV manufacturers selling in the UK market must be used to being compliant with these open platform requirements instead of deliberately locking their own systems so that the EV cannot use another platform.

5 September 2022

The Energy Efficiency and Conservation Authority Green Paper: Improving the performance of electric vehicle chargers

Submission

Who we are:

We are a group of the six largest price-quality regulated electricity distribution businesses (EDBs) in New Zealand - Aurora, Orion, PowerCo, Unison, Vector and Wellington Electricity. We formed in 2021 around a shared interest in delivering future-ready electricity services to communities and a common belief that decarbonisation needs to be integral to the regulatory framework.

We see the sector as being on the brink of significant change and opportunity and are committed to driving an affordable and reliable energy transition.

Our response:

To manage the accelerated electrification of key sectors of the economy, we must accelerate the integration of the right technologies – including smart EV charging

The Emissions Reduction Plan includes a target to increase zero emissions vehicles to 30 percent of the light vehicle fleet by 2035. This will increase demand for electricity significantly and quickly.

The impact of electrification will become concentrated on the distribution network – which connects homes and businesses to power. The ability to dynamically shift load from EVs to smooth peak demand on the network will be critical to avoiding unnecessary costs helping to keep electricity bills down. This includes for all electricity consumers – whether or not they own an EV.

Smart EV charging can reduce consumer costs

Unmanaged peak demand will require lines companies to build additional capacity to accommodate these peaks. This will translate into consumer cost increasing due to the additional capacity investment. Much of this network capacity would be underutilised most of the time – making this 'build to the peak' approach inefficient. An alternative approach is to leverage demand flexibility by incentivising consumers to smooth demand. This is efficient because it enables us to maximise the use of network infrastructure. In addition to this benefit, smart charging will help to enable networks to manage fast growth in peak demand. This growth risk management is slightly distinct from the overall cost vs benefit analysis of smart charging in that it is concerned not just with capacity upgrades that are needed – but ensuring the time to make such upgrades.

Distribution deferral – the delay or avoidance of unnecessary upgrades – is as much about timing of new demand and the ability to manage it, as it is about providing the right capacity.

The infrastructure efficiencies from smart EV charging however extend beyond the network impact. The whole system impact of smart EV charging is demonstrated by the Whole Energy System Cost (WESC) Metric.

The WESC metric expresses the impact of an asset on the electricity system and how it would impact a consumer's electricity bill. It does this by accounting for the cost or saving that the asset has on the whole energy system including:

- The impact that an asset has on system balancing (whether the asset incurs additional cost through volatile output requiring other actions to keep electricity demand in line with supply, or, if it adds value by stabilising this);
- displaced generation (reduced costs of running other generators during the periods that the technology is producing power);
- network impact (the distribution reinforcement costs that the technology may avoid or incur);
- capacity adequacy impact (whether or not the technology allows existing capacity to be retired, or new capacity to be forgone, while maintaining the same or appropriate level of security of supply); and,
- the cost incurred by building and running the technology itself.

Taking into account these factors, the WESC produces the cost of electricity on a per MWh basis, attributable to a technology. That is, it shows the cost that is incurred or saving that is realised by an asset that has a lifetime output of 1 MWh and the rest of the system adjusts accordingly.

This illustrative metric estimates that a smart EV charger delivers a net benefit to the electricity system of $174 per MWh (or a saving of $174 per MWh). This is much more cost effective than building new generation or installing passive chargers – even accounting for their lower capital cost. Applying the same principles of the WESC to produce a per annum estimation means that a residential smart EV charger adds $274 p.a. by way of avoided system investment[1].

Smart EV charging can mitigate increases in peak demand, enabling a secure transition to greater renewables

We agree with EECA that:

"Smart and energy-efficient electric vehicle (EV) charging holds the greatest potential to reduce peak electricity demand in New Zealand. This is because we expect to see significant growth in electricity demand from EV charging, and most of the generation required to meet this growth in demand has not yet been installed. We stand the best chance of realising this potential if we start planning for an expected increase in EVs and EV chargers now, when we can influence the types of devices installed."

This will be critical for maintaining a secure, reliable and affordable electricity system that both keeps the lights on for all consumers and keeps EV owners moving.

We agree with the findings from MBIE's investigation into the August 9th grid emergency:

"The increasing use of EVs will either be part of the solution or contribute to the problem. We can avoid unnecessary future increases in peak demand if EV charging is managed to shift load. The network has the capacity to deal with mass off-peak EV charging, and load shifting can help avoid events like those of 9 August... While pricing signals that reach consumers are necessary, they

[1] https://blob-static.vector.co.nz/blob/vector/media/vector2021/annex-1-frontier-whole-system-costs-in-nz.pdf

are unlikely to be sufficient to avoid EVs increasing peak demand. Regulation is likely to be needed, but it needs to provide for flexibility given the uncertainty."[2]

We believe regulation is needed to enable EV charging flexibility to play a role in system security and reliability in a more complex future energy system. We commend EECA for engaging the topic of EV smart charging regulations now.

Implementing settings for smart EV charging, similar to wider flexibility capability can enable the development of new energy markets

We support EECA's acknowledgement that:

"Flexibility services, such as demand response, have a key role to play in the energy transition. It can help to manage intermittent renewable supply and manage peak demand, both of which are essential to the success of delivering energy security and affordability alongside decarbonisation."

In addition to these outcomes, the emergence of demand response and flexibility services can create new markets for more competition and consumer products. This requires devices having the right capabilities to enable EV optimisation and system security.

We do not have comment on every question posed by EECA but outline our collective response to key aspects of consultation below.

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand? What do you see as most and least important? What functions would you add or exclude, if any, and why? What information could you supply to EECA to help inform our thinking about this issue?

We agree that EV chargers that have a common set of functions and means of communication, that can be used by any potential operators of a device who are best placed to deliver maximum value to NZ.

It is crucial that the ability to be dynamically and remotely managed is regulated.

We also support the inclusion of an "off-peak default charging mode" in the standard as contemplated by EECA. This will be a positive 'behavioural nudge' to help manage peaks while EV uptake is still relatively low and whilst the market for flexibility services is emerging.

We strongly support EECA's proposal for mandated power quality and control settings for EV chargers, where the EV charger automatically turns off or reduces if frequency of voltage drops below a pre-set threshold and restores when the frequency or voltage recovers. Such provisions need to be balanced with a consumer's ability to travel as well as a need to avoid unnecessary barriers to new technologies entering New Zealand's market. Ideally voltage management would depend on the network's capability and would leverage reduced charging rather than being a binary "on" or "off".

These requirements for DG inverters (including V2G) are currently covered in the Australian and NZ joint Standard AS/NZS 4777.2.2020. They should also be included in a standard for EVs. As described below, volt/watt control is currently missing from the Publicly Available Specification (PAS), this is an area where the PAS would need to be amended to form the basis of a smart EV charging standard.

[2] Page 32. https://www.mbie.govt.nz/dmsdocument/17988-investigation-into-electricity-supply-interruptions-of-9-august-2021;

Q3. Do you support EV charging being open access and why/why not? What information could you supply to EECA to help inform our thinking about this issue? Do you think that 'smart' chargers should address issues of cyber security? How would you suggest this is done?

We support the inclusion of an open communications protocol to enable a range of market participants or aggregators to offer smart EV charging services. The communication systems and protocols for controlling EV chargers will need to be very secure from a cyber standpoint and also operable in the event of a power outage. We support a national cyber standard for Smart EV Chargers – as well as a standard to ensure that smart charging service providers in the future meet minimum standards to protect consumers and whole system reliability.

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided? Who should be able to access this information? In what form should it be transmitted? What processes should be in place to safeguard the data? Is there any other way this data might be captured?

Understanding where and when EVs charge is critical for efficient network planning. This is heightened by the fact that this technology is new, largely unknown and the uptake pathways are still unclear. It will be important to provide this visibility of where EVs chargers are registered to an ICP at the time of installation.

We also recommend that the maximum potential demand should also be notified to a network. Experience with applying Part 6 for DG installations indicates that there will need to be some expression of minimum capabilities (beyond electrical registration) amongst the installers.

If the location of EVs chargers were provided as GPS data, this would need to be separately mapped against ICPs, which adds additional complexity to gain the benefit of understanding where the device is connected to the network. There are alternative pathways to achieve visibility of EVs which would not require EV chargers to transmit their location to a third party. We support, for example the expansion of the Electricity Authority's existing registry for distributed generation (DG) to include EV charge point registrations. We do not recommend that the whole application process for DG, as it is set out in Part 6 in the Code, be applied to EV charge points. But we recommend that that the requirement in Section 9A 3) does apply:

Section 9A

3) The distributed generator must also give the distributor the following information as soon as it is available, but no later than 10 business days after the approval of the application:

(a) a copy of the Certificate of Compliance issued under the Electricity (Safety) Regulations 2010 that relates to the distributed generation:

(b) the ICP identifier of the ICP at which the distributed generation is connected or is proposed to be connected, if one exists.

This is executed through a Certificate of Compliance being completed by an electrician and provided to a network operator. Whilst Part 6 applies to distributed generation, (including V2G technology which is captured by Part 6 as it injects power into the network, making it 'distributed generation') this pathway could be expanded to include the registration of all EV charging installations. This option would incur minimal cost.

We appreciate that Part 6 is designed to apply to distributed generation and that the Code can only apply to those who are an industry participant as defined in the Electricity Industry Act 2010. Changing the Code is also the role of the Electricity Authority, rather than EECA, but we understand

that the various Crown entities will be working together to determine the best means by which to achieve these outcomes.

Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand? Do you think the market can adequately address this issue without the need for government intervention? What information could you provide to EECA to inform this issue?

The relative risks between 'do nothing' and making an intervention (i.e., regulating smart EV chargers) are asymmetric. The downside of regulating is a potential modest increase in price of EV charging units. This is vastly outweighed by the missed opportunity of much more efficient and effective use of the electricity system, which in turn will help to limit increases in the price of electricity.

This was summarised by the UK's regulatory impact assessment[3] which said:

"The technology and business models for electric vehicle smart charging are still in their infancy – both in the UK and internationally - and there are a variety of different technical approaches to delivering it. The diversity in business models and practices of this early market, whilst important for innovation, also risks a proliferation of smart charge-point (CP) systems developing with varying standards and functionality. Without clear requirements and standards set for the industry, it's unlikely that the market will deliver smart CPs that provide sufficient grid and consumer protection, at least in the short term".

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers? What information could you provide to support your position?

We support educating consumers on demand response technologies and labelling can be a useful signal to consumers. However, much like EECA's existing approach to energy efficiency, this is an 'and' for regulations rather than an 'or'.

Consumers have a crucial role to play in an energy system that supports them accessing benefits from demand side flexibility where they have it. We are of the view that it is up to industry and the regulator to 'internalise complexity' in delivering the most cost effective and consumer centric energy services without imposing a high cost on consumers. EV charging regulations are a key and bare minimum step in ensuring this happens. Essentially, the regulations will provide value by standardising the platform over which competition and customer choice can engage.

We also support information and education to ensure that consumers adopt desirable charging practices from when they first transition to an electric vehicle. This includes guidance for those consumers unable to access a small wall charger (due to cost or renting) who will continue to use a 3-pin plug, such as guidance on the use of manual timers to shift demand away from peaks.

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers? What incentives do you think would be effective and who should provide these? What other incentives might be valuable beyond financial incentives?

Much like education, we see the provision of incentives as an 'and' rather than an 'or' for smart EV charging and demand response services.

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[3]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015290/electric-vehicles-smart-charge-points-regulations-2021-impact-assessment.pdf

Whilst some incentive options are currently being offered by retailers (which we support) these are relatively few and it is unlikely that they are adequate in tilting consumer purchasing decisions in favour of smart charging in the absence of regulations. Once a passive charger is installed, a consumer is unable to subscribe to a smart EV charging pricing product or incentive (unless they retrofit the charger) potentially restricting the market for such incentivised products. Smart EV charging regulations and incentives are not mutually exclusive and hinge on one another.

Overall, it is important that wider levers are considered alongside regulating the specifications for smart EV chargers to ensure that using this type of charger (which further to regulation would carry smart functionality) is favoured by consumers, as opposed to using no charging device like a three pin plug.

We consider any incentive for a smart EV charger would be acting as a lever to support the implementation of smart EV charging regulations and to ensure that this does not increase the cost burden on consumers. This would not be a replacement for smart charging regulations. Consumer cost burden is a salient concern in the context of energy affordability; a just transition and the cost of living generally. A smart-subsidy may alleviate this but we recommend that this be appropriately targeted and recommend further careful analysis here.

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaken in the UK? What information could you provide to support your position?

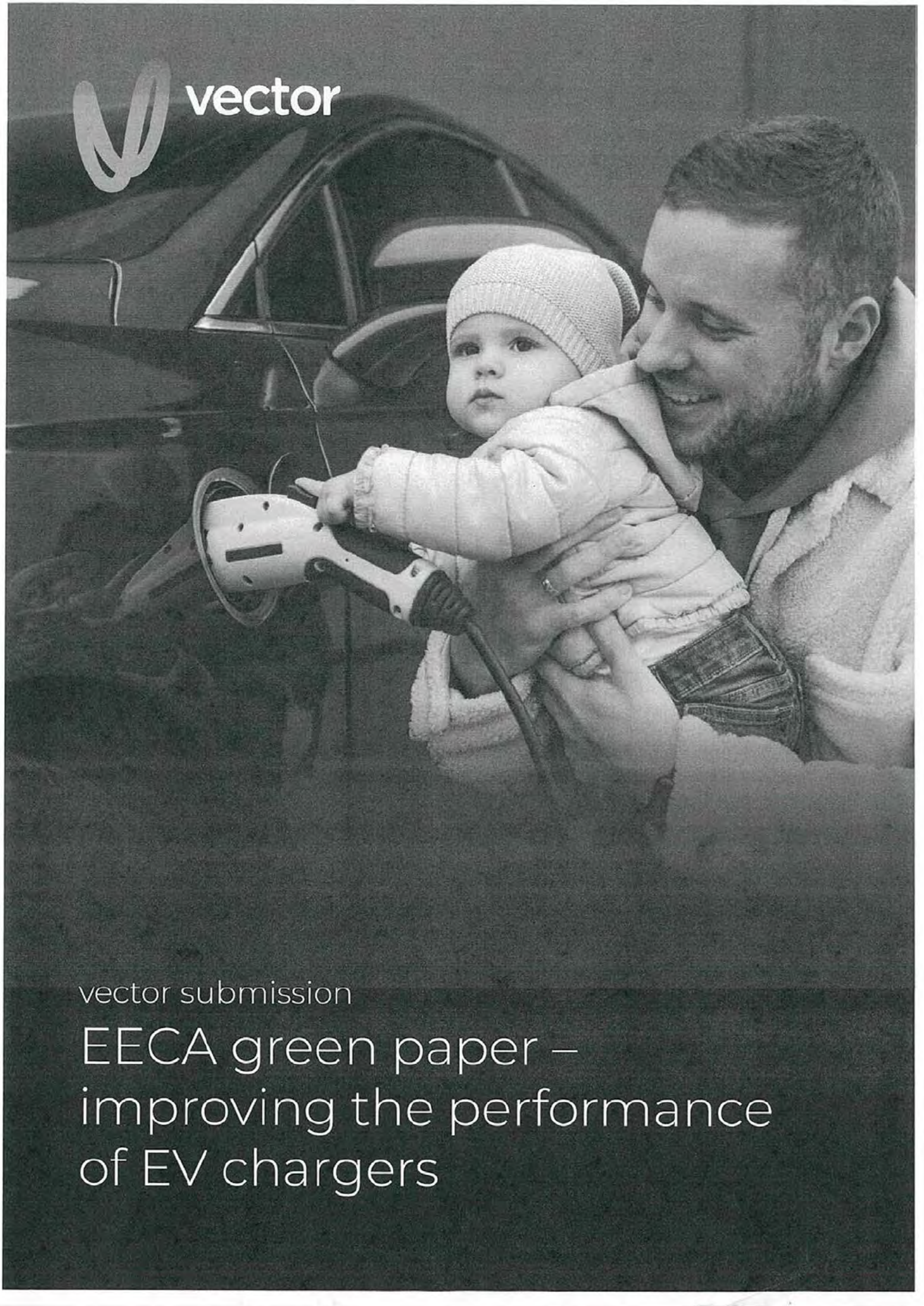
We support this strongly. We noted at the beginning of the submission that smart EV charging can:

- reduce consumer cost;
- mitigate increases in peak demand as transport is electrified, enabling a secure transition to greater renewables; and
- stimulate new competitive markets and innovative consumer services.

All of these outcomes are critical to delivering future ready electricity services that can meet consumer needs as we enable the convergence of our electric transport needs and electricity services.

Q15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?

We support EECA's work to navigate the affordable uptake of EVs and the implementation of the right standards to achieve this. In addition to these standards, there is an urgent need to re align our wider regulatory framework to enable the network growth and change that will be critical for the convergence of electrified transport and electricity services. This includes the alignment of the Commerce Commission's price quality framework which effectively sets the investment allowances of network businesses. Just as the accelerated integration of technologies which can *avoid consumer cost* through the system are needed (such as smart EV charging) so too are the right investment settings to enable network operators to make the right investments at the right time. This will serve to enable a secure and reliable EV integration efficiently. Investments in network technologies which can unlock consumer value from distributed assets, including smart EV chargers, can effectively manage peaks and maximise the utilisation of existing assets. The challenges and opportunities facing the sector are different to those experienced in the past due to decarbonisation. To continue to deliver the core objectives of a secure, reliable, and competitive electricity system requires a different regulatory approach. This will need to recognise the role of new technologies and investments going forward.



vector submission

EECA green paper – improving the performance of EV chargers

contents

vector

executive summary

We welcome the opportunity to submit in response to EECA's EV charging green paper and we welcome further opportunities to meet with and engage with EECA to inform and support continued work for efficient electrification. As identified by EECA smart EV charging is a significant opportunity for New Zealand consumers and the affordable electrification of transport.

This is because, by managing EV-driven peak demand, smart EV charging can help make the most of our existing infrastructure and avoid unnecessary capital investment – the cost of which is recovered from consumers in their electricity bill. The impact of EV uptake will be concentrated on our electricity networks. Complex and granular, networks are like the capillaries of our electricity system and play a crucial role in the system as a whole achieving its mission in connecting consumers to electricity.

The benefits of network optimisation driven by smart EV charging will be significant. Our modelling estimates that new demand could increase the peak demand experienced on the network by around 150% if this new demand isn't managed. When demand management such as smart EV charging is utilised – this peak demand increase could be reduced by two thirds. With a higher peak demand comes a need to invest in more network capacity. Inefficient capital investment increases electricity bills for every electricity consumer.

This is true for inefficient investment across our electricity system – all of which flows through into a consumer's electricity bill. Smart EV charging however can also increase utilisation of infrastructure across the system for instance by aligning demand to the times when more renewable generation is available, offsetting the need to invest in peaking generation. By helping to 'defeat the peak' smart EV charging can enable a secure transition to greater renewables. Implementing the settings for smart EV charging and demand response capability can also unlock new competitive markets and flexibility services.

We support regulating for a standard for smart EV charging to enable this. In defining the scope of this standard, necessary functionalities need to be included without unnecessarily constraining emerging markets and services. Defining what is in scope of a regulated standard and what is not, will be important in maintaining this balance. Functionalities which enable dynamic and remote charging; default off-peak charging; voltage control and open communications protocols are important functionalities which should be included in a regulated standard.

Whilst a necessary first step, regulating for a smart EV charging standard will not by itself unlock the full benefits of smart EV charging. Chargers ultimately need to be connected to a demand management platform for dynamic management, and consumers need to choose to use a charging device. We consequently recommend that regulation is partnered with an incentive or subsidy to tilt consumers in favour of using a charging device (which further to regulation would include smart functionalities).

Incentives have a further role to play in supporting participation in demand management platforms – and we recognise and support that some retailers are already offering pricing to incentivise EV driven peak management. However, for consumers to choose such services they need to have a smart charger. Overall we do not see incentives and regulations as being mutually exclusive – rather, they are mutually reinforcing. We further recommend pathways that can encourage enrolment in demand management at a process level. As a bare minimum first step, processes also need to be in place to ensure that an EV is registered to an ICP with a local network. This is crucial for efficient network planning and could be achieved at virtually zero cost today.

the burning platform

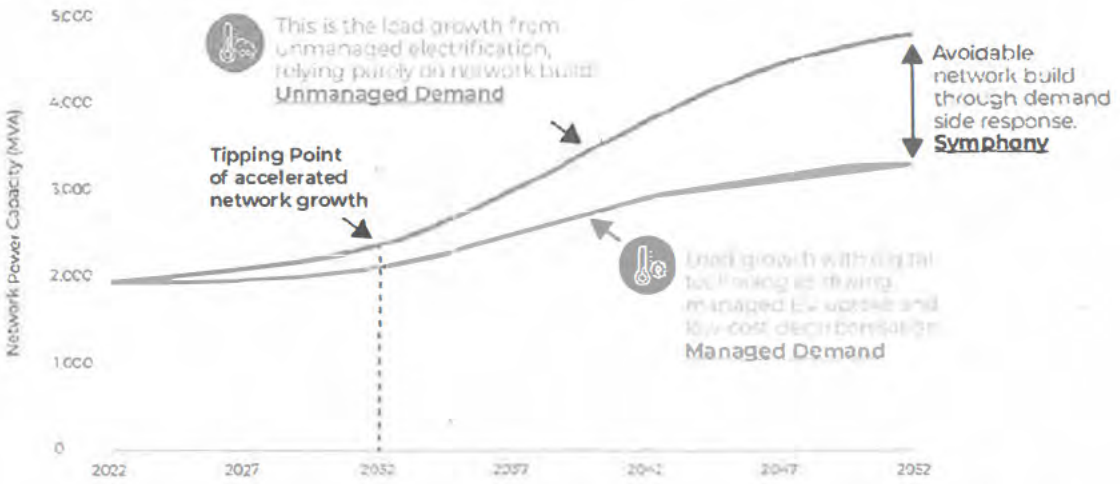
Widespread smart EV charging is make or break for affordable electrification – the critical hurdle in achieving New Zealand's emissions reduction targets. Twenty percent of emissions come from transport – making it the second biggest driver of emissions after agriculture[1].

Whilst electrifying transport is at the forefront of our fight against emissions, below the surface is our electricity infrastructure that makes this possible. Increasingly complex and interconnected, this enabling system must be digitalised to affordably rise to the EV challenge.

To avoid infrastructure regression we must choose progression – for consumers of today and for future generations. This is about embracing and driving innovation that can deliver the step change needed in Aotearoa's infrastructure. This will not happen by accident.

New Zealand's EV charging infrastructure includes both the provision of EV chargers themselves – as well as our electricity infrastructure. Ensuring the right settings are in place to enable connectivity between these two layers will be critical for affordable and secure EV uptake. This is about ensuring that chargers have the functionality to be connected to a system for management. The cost of the counterfactual is significant.

Smart EV charging reduces consumer cost



The above graph shows the difference in network capacity required to meet demand when demand management (such as smart EV charging) is utilised, vs when it is not. This shows that the peak experienced by the network more than doubles by 2050, in the absence of smart EV charging. This is shown in the y axis by the increase from 2000 MVA today to well over 4500 MVA by 2052. With this higher peak demand comes a need to invest in more network capacity – and much more. Inefficient capital investment increases electricity bills for every electricity consumer.

This increase in peak demand however is reduced significantly by demand management (such as smart EV charging) – the impact of which is represented by the difference between the blue and green lines. This brings the peak demand on the network down from ~4500 to 3000 MVA by 2050 – a significant reduction in the increase in peak demand growth forecast under the counterfactual. This graph and further analysis related to the challenges and opportunities associated with our transition to net zero is also reported in Vector's Taskforce on Climate-related Financial Disclosures (TCFD).[2]

[1] *Accelerated Electrification. April 2019. https://www.iccc.mfe.govt.nz/assets/PDF_Library/daed426432/FINAL_ICCC_Electricity-report.pdf;*
[2] *https://blob-static.vector.co.nz/blob/vector/media/vector-2022/6_vector-2022-tcfd-report.pdf;*

The above modelling is also supported by wider sector analysis led by the Business Energy Council (BEC). The TIMES-NZ 2.0 modelling shows electrification driven by the demand for EVs – could double required network capacity by 2050, if demand is not managed. Additional infrastructure and significant improvements to New Zealand's electricity network would be needed. Analysis undertaken by Concept Consulting estimates the growth in transmission and distribution network costs (which are largely driven by peak demand) will be in the range of $160-220/kW/year (an additional $6.1bn cost using passive charging compared to smart charging by 2050)[3]. Higher prices will be felt by all consumers regardless of whether they own a BEV. Smart chargers would flatten peak demand, improve network utilisation, and reduce the need to build new electricity capacity.

We agree with EECA and the EA that:

Harnessing controllable DER will mean lower electricity bills at the household level, and at a system level, the impact can be even more significant.

Both the system impact and household bill are inextricably linked as demonstrated by the Whole Energy System Metric of Cost (WESC).

The WESC expresses the impact of an asset on the electricity system as it would be felt on a consumer's electricity bill. It does this by accounting for the cost or saving that the asset has on the whole energy systems including:

- The impact that an asset has on system balancing (whether the asset incurs additional cost through volatile output requiring other actions to keep electricity demand in line with supply, or, if it adds value by stabilising this);
- displaced generation (reduced costs of running other generators during the periods that the technology is producing power);
- network impact (the distribution reinforcement costs that the technology may avoid or incur);
- capacity adequacy impact (whether or not the technology allows existing capacity to be retired, or new capacity to be forgone, while maintaining the same level of security of supply); and,
- the cost incurred by building and running the technology itself.

Taking into account these factors the WESC produces the cost of electricity on a per MWh basis, attributable to a technology. That is, it shows the cost or saving that is incurred by an asset that has a lifetime output of 1 MWh (and the rest of the system adjusts accordingly).

This illustrative metric estimates that a smart EV charger delivers a net benefit to the electricity system of $174 per MWh (or a 'negative cost' of $174 per MWh) - which is much more cost effective than building new generation (or indeed, installing passive chargers – even accounting for their lower capital cost).[4] Applying the same inputs of the WESC to produce a per annum estimation finds that a residential smart EV charger adds $274 p.a.

This is $274 per annum that consumers do not need to pay in their electricity bill in a year as the result of a single residential smart EV charger. This accounts for the higher upfront cost of a smart vs a passive EV charger (Frontier Economics estimated this difference in up front capital cost to be $300NZD). Much like insulation which comes with a higher capital cost, the overall savings for consumers from the investment outweighs the up-front cost. However, in the case of investing in a smart EV charger this up-front capital cost hurdle is much less than

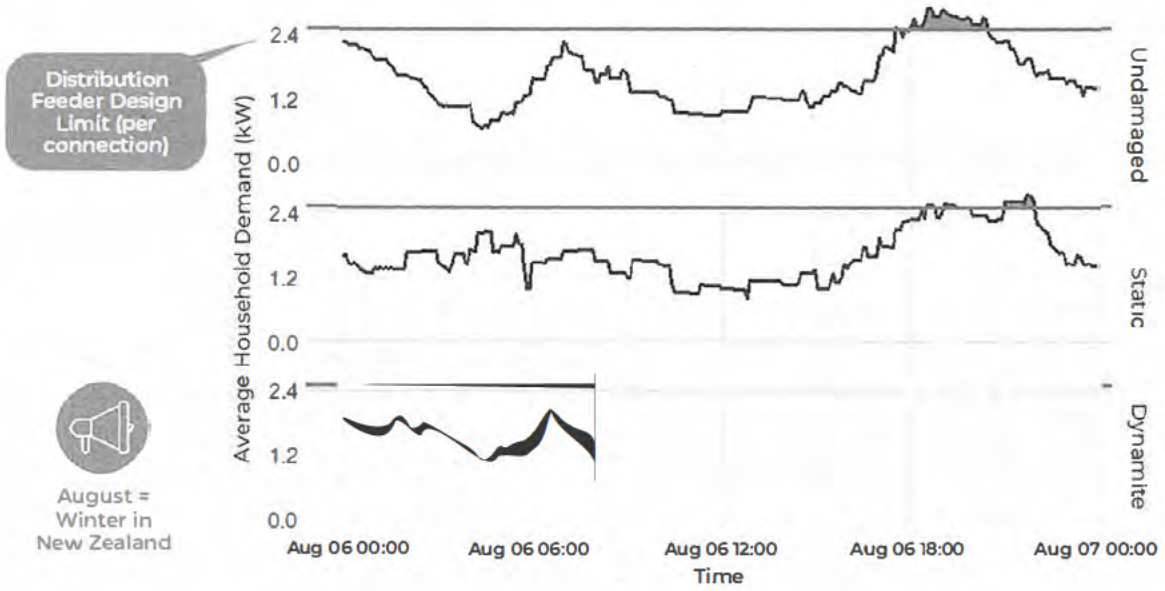
[3] *https://www.concept.co.nz/uploads/1/2/8/3/128396759/ev_study_v1.0.pdf;*
[4] *https://blob static.vector.co.nz/blob/vector/media/vector2021/annex-1-frontier whole system-costs-in-nz.pdf;*

is the case for insulation. As we explain further this up-front cost could be further reduced through an incentive for smart EV chargers.

Whilst the WESC is illustrative, the impact of smart EV charging on the network alone is significant (as represented by the graphs above).

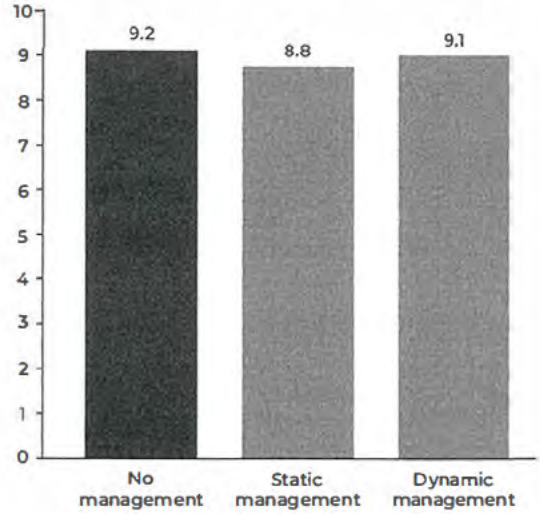
Vector undertook a trial of smart EV chargers to answer the question of whether smart EV charging could both manage network peaks as well as meet consumer needs. The trial of around ~200 participants found that it could.

Smart charging algorithms in action



This shows that the dynamic management of EV charging was successful in bringing peak demand within existing network capacity limits.

Smart EV charging delivers consumer confidence



"The trial has been essentially invisible, as we have not noticed any changes in service while monitoring was happening, or alterations to charger parameters made." (Nissan Leaf owner)

90% of customers rated the speed of charging, ease of usage, and overall satisfaction with dynamic charging as positive, providing a score between 8 10 for these aspects.

"Don't think I could get any better or more convenient option. Seems to work perfectly." (BMW i3 owner)

The above shows consumer satisfaction with the dynamic management of EVs.

Our smart EV charger trial has found that dynamic management of EV charging (smart EV charging) can deliver network benefits driving down cost, as well as ensure customer satisfaction.

Smart EV charging can defeat the peak enabling a secure transition to greater renewables

We agree with EECA that:

Smart and energy efficient electric vehicle (EV) charging holds the greatest potential to reduce peak electricity demand in New Zealand. This is because we expect to see significant growth in electricity demand from EV charging, and most of the generation required to meet this growth in demand has not yet been installed. We stand the best chance of realising this potential if we start planning for an expected increase in EVs and EV chargers now, when we can influence the types of devices installed.

We agree with the findings from MBIE's investigation into the August 9th grid emergency:

"The increasing use of EVs will either be part of the solution or contribute to the problem. We can avoid unnecessary future increases in peak demand if EV charging is managed to shift load. The network has the capacity to deal with mass off-peak EV charging, and load shifting can help avoid events like those of 9 August... While pricing signals that reach consumers are necessary, they are unlikely to be sufficient to avoid EVs increasing peak demand. Regulation is likely to be needed, but it needs to provide for flexibility given the uncertainty."[5]

As we transition to greater renewables, both increasing the levers to manage a more volatile system (driven by greater reliance on more intermittent generation) for system security as well as using smart ways to manage peaks (and not just overbuilding largely underutilised and expensive infrastructure) for affordability – will be critical for maintaining a secure, reliable and affordable electricity system that both keeps the lights on for all consumers and keeps EV owners moving.

Implementing settings for smart EV charging – as with wider demand response capability – can unlock new competitive markets and consumer services

We support EECA's acknowledgement that:

Flexibility services, such as demand response, have a key role to play in the energy transition. It can help to manage intermittent renewable supply and manage peak demand, both of which are essential to the success of delivering energy security and affordability alongside decarbonisation.

In addition to these outcomes, the emergence of demand response and flexibility services can create new markets for more competition and consumer products. These will deliver value and enhance energy affordability both to those consumers who participate, but also to those who do not. This requires devices having the right capabilities – to enable EV optimisation and system security.

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers? What would you add or take away? Is there anything you disagree with?

We support the principles set out by EECA to guide its engagement with residential EV charging, and we note EECA's commitment to: "intervene to the minimum extent necessary" to achieve its objectives.

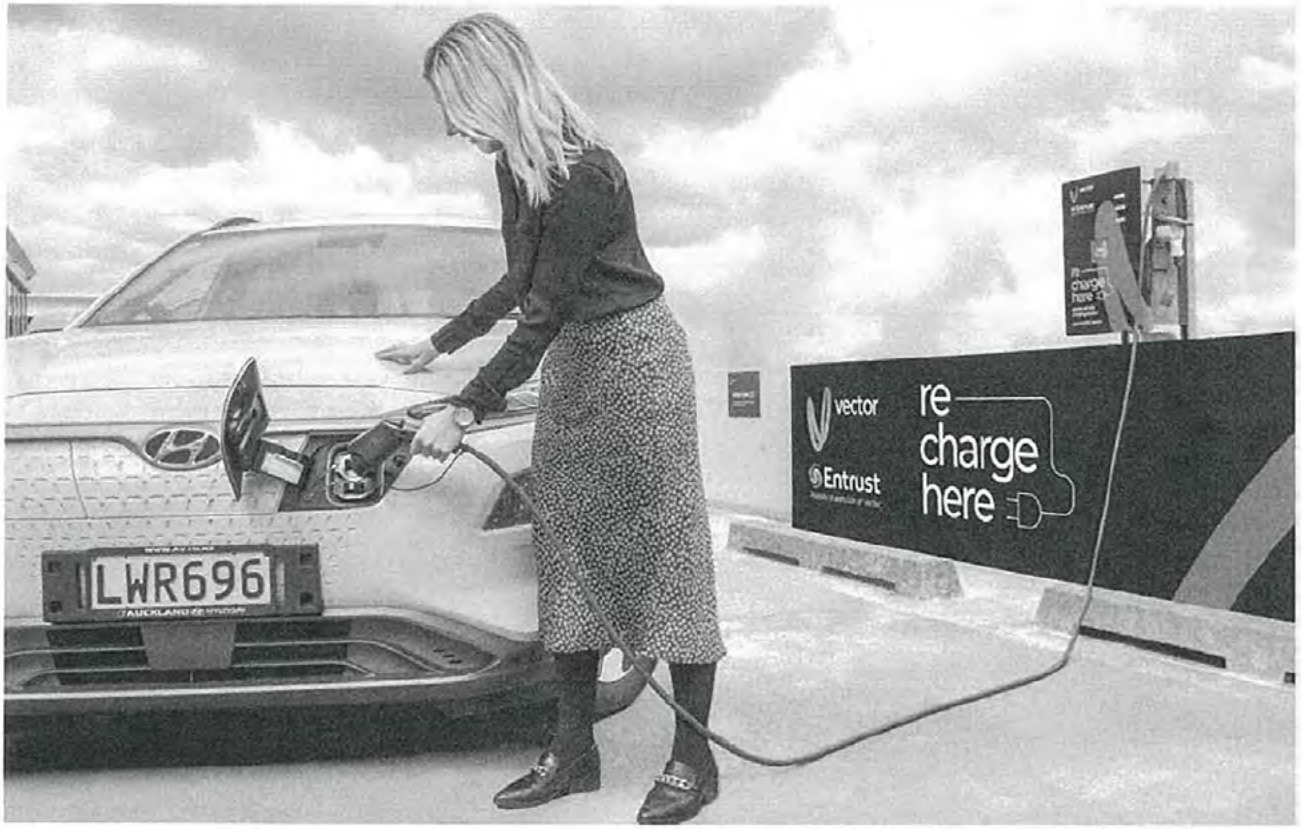
[5] *Page 32. https://www.mbie.govt.nz/dmsdocument/17988 investigation into electricity-supply-interruptions-of-9-august-2021;*

the burning platform (cont)

We support this commitment and for the avoidance of doubt:

Regulating for a standard for smart EV charging is the minimum intervention necessary to enable the affordable uptake of EVs and a reliable and secure power system.

However, ensuring that this regulation opens the door for EV optimisation services and future markets and innovation (rather than constraining these emerging markets) depends to an extent on what is included in the standard and what is included and what is excluded. We propose the below principles are key considerations in defining this scope.



standard scope – an overview

At a principles level there are two important considerations in determining the scope of a smart EV charging standard:

1. **Ensuring the right no regrets functions are regulated for today, whilst ensuring that the market for EV chargers is not unnecessarily constrained, is important for the ultimate goal of affordable EV uptake and efficiencies driven by new competitive markets and flexibility services.**

   EV chargers are likely to have lifespans of around ten years. As such this first iteration of a standard should be considered just that – the first iteration.

   Where there are potential services and functions which a smart EV charging standard could enable – but which are yet to emerge – there is scope to regulate for these in the future when there is further information. In some cases, there are multiple pathways through which new consumer services or markets could emerge. Whilst enabling optimised EV charging is certainly something that requires EV connectivity (which should be regulated for yesterday) there are a number of pathways through which these services and other services, such as multiple trading-relationships could be delivered. We believe that it is important to allow technology and consumer behaviours to take a leading role in shaping the optimal market pathway for New Zealand – not regulation. Given the size of New Zealand's market and our role in many cases as a technology taker rather than a technology maker, there is also a risk that pre-emptively regulating for markets and technologies could put us out of step with other markets. We recommend EECA resist the temptation to pre emptively regulate for services and markets where technological and market pathways are not yet settled and where this is not yet necessary to maintain optionality by way of a smart EV charging standard.

2. **Smart EV charging is necessary for consumer choice and freedom.**

   It is in the absence of proactive peak management and the right settings in place to enable this, consumers will experience less choice and control.

   This could be because of more unplanned outages driven by a lack of voltage management, cost prohibitive prices for energy, or the reactive deployment of levers to manage consumer demand to avoid a system failure. What may seem like a trade-off between consumer choice and system optimisation today must be carefully assessed in the context of new pressures that will be faced by our power system and the impact of failing to manage these pressures. That is we must consider the counterfactual as it would occur in the near future, not the past as that will be the parameters within which consumer experience occurs.

We believe functionalities for inclusion in a standard are:

- Capability to connect with an aggregator or service provider, for dynamic and remote management;
- default off peak charging mode and randomised delay functions for off-peak charging particularly for the earlier stages of EV uptake;
- open communications protocols;
- power quality and control settings;

standard scope – an overview (cont)

We note that the consultation does not propose any requirements related to V2G technology specifically apart from a general requirement that EV chargers do not prevent power exports. We agree with this positioning.

We believe that this – in conjunction with the existing standard for V2G chargers (ASNZS4777.2:2020) – is adequate in enabling the future role of V2G technologies.

There are additional functions EECA mentions which we query as needing to be included in a regulated standard at this time:

- Requirements for EV chargers to transmit data on their location and use;
- requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner; and,
- energy efficiency for on-board EV chargers.

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand? What do you see as most and least important? What functions would you add or exclude, if any, and why? What information could you supply to EECA to help inform our thinking about this issue?

We agree that EV chargers that have a common set of functions and means of communication, and can be used by any potential operators of a device, are best placed to deliver maximum value to NZ. Specifically, we support the following specifications be included in a regulated standard for smart EV chargers (listed in order of importance) to enable peak management:

- Functionality for dynamic and remote management

  Specifications for smart EV chargers must include functions which enable near real-time *dynamic* load shifting by an aggregator. This is so demand (or export) management can respond to dynamic factors relevant to the system's performance such as: the charging of other proximate vehicles (or demand of other energy-using devices) and available network capacity. These functions can also enable load shifting which responds to temporal factors through the system – such as the availability of cheaper, renewable generation. With the right settings – such as to ensure dynamic and remote management – an aggregator could have a view of these factors and optimise charging in response to them.

  This is recognised by one of EECA's three key performance factors for smart EV chargers - *Connectivity of EV chargers: including functions to enable signals to be sent to, and received from, an external party. We support this strongly.*

- Default off-peak charging mode

  This would mean that EV chargers would be capable of charging off-peak by default and would be pre set to do this. Whilst the emergence of flexibility aggregators / markets for optimised charging services are still in the early stages, ensuring that chargers are set to off peak by default is a positive step to manage demand from EVs. This is particularly true whilst most consumers still do not have an EV. The UK includes a pre setting to off peak charge mode by default as part of their regulations.

- Randomised delay function

  A randomised delay function could help to smooth any secondary peaks when used in conjunction with default off-peak charging mode. The risk of a static intervention (such as default off peak charging) rather than a dynamic one – is that a secondary peak is created. That is, by simply shifting rather than staggering charging, a peak still occurs on the network (especially the LV network) – just at a different time. This was demonstrated by our smart EV charger trial which found that consumers' use of manual scheduled charging tended to result in most consumers scheduling to the same time. If enough consumers were to do this, a secondary peak would be created. However, by starting the charging of vehicles at different times, randomised delay function can help smooth the ramp up to secondary peaks somewhat. This needs to be staggered appropriately (randomised delay of up to half an hour). As noted above however, unlocking the potential of EV optimisation is ultimately about the provision of dynamic and remote management. Default off-peak charging mode, in partnership with randomised delay functionality, are valuable requirements for EV charging management – particularly as markets for dynamic management services are emerging and EV uptake is still relatively low. However these functions are no replacement for dynamic management capability.

We note that for the proposed specifications of default off peak charging and reduced charging at peak mode, EECA holds that:

"The owner would retain the ability to manually override the default mode". As noted above our smart EV charger trial found that consumers rate smart EV charging services highly, and that managed EV charging (that is – which does not include a consumer override) can both meet network requirements and consumer preferences and needs.

There are some important considerations around consumer override.

Consumer override and system security

EECA recognises "maximising energy and electricity system security, reliability and stability", as an objective, and, as noted by the Independent Investigation into Electricity Supply Interruptions of 9 August "load shifting can help avoid events like those of 9 August". We agree. Just as some networks were able to utilise hot water load control to shed load in response to system operator requests during the 9 August grid emergency (without resorting to consumer outages), connected EVs offer an opportunity for distribution system operators or networks in the future to also shed load during an emergency event, or, to stabilise the system, preventing such an event from occurring. This appears to be contemplated by EECA: "They [smart EV chargers] may even be able to respond to real-time signals from external parties such as a network operator or a load aggregator".

To enable the demand response contemplated above, EV chargers must be responsive to such an aggregator protecting system security or responding to an emergency - in spite of the ability for consumers to override an off-peak charging setting in a business-as-usual scenario. This is particularly important as there may be circumstances which trigger widespread simultaneous consumer override such as an external weather event prompting consumers to want to 'fill up' the EV all at the same time (particularly with vehicle-to-home technology, whereby a full EV battery is an attractive way to continue using electrical appliances even during a storm induced outage). Whilst understandable, it is important that levers are in place to ensure that such behaviours – occurring "en masse" – don't have the perverse effect of compromising network security and deepening the impact of an extreme weather event. This could happen, if, for instance every consumer leverages their override to fill their EV in response to a forecast storm event, creating more demand than supply, destabilising the system and causing a widespread outage. Such events of widespread simultaneous consumer override would be very low probability but could be very high impact – and it is important that the provisions are in place to mitigate this risk. This includes the ability for a distribution system operator or network to manage EV load to maintain system security in spite of the ability of the consumer to override BAU peak management settings. Such a lever – an override of the override – should be seen as the 'ambulance at the bottom of the cliff'. Whilst the ambulance is important, prevention is optimal. In this case, prevention is widespread participation in dynamic demand management. The greater the proactive peak management that can be achieved through such services the less the ambulance would need to be deployed.

Consumer override and planning certainty

Another important consideration around the inclusion of consumer override is uncertainty for those planning and operating the network. This is particularly true for networks with more efficiently designed After Diversity Maximum Demand (ADMD) – that is, less network capacity, or 'headroom', to accommodate unanticipated peaks. For such networks, without certainty that consumers' EV charging can be managed, the engineering solution will favour an immediate increase to designed ADMD – an expensive capacity upgrade. The network cost

efficiencies driven by smart EV charging (which accounts for a significant portion of the cost efficiencies driven by smart EV charging for the system overall) are derived by the avoidance of such upgrades. Part of the value of smart EV charging would therefore be lost if upgrades were made anyway, given the absence of certainty of charging outcomes and lower existing network capacity. Furthermore, when V2G becomes more prevalent – likely reducing the peak – planners that invested to accommodate consumer opt out may be considered to have 'gold plated' the network.

We appreciate that consumer override may be important for consumers to accept EV smart charging regulations as a matter of principle – however our message is that the higher the certainty that can be provided to network planners and engineers, the lower the cost for every electricity consumer.

This is also true of consumer 'opt out' – that is, if, in the future a large number of consumers 'opt out' of EV management services this would reduce the ability to manage and plan for new demand and size the network optimally. This would in turn reduce much of the value proposition of smart EV charging. As we discuss further, smart EV charging rests on the chargers being smart – but also connected to a platform for management. We propose below on page 10 a potential pathway to support the enrolment of a smart EV charger with a demand management provider.

Connectivity failure

The value of smart EV charging also depends of course on the reliability of the connectivity between EV chargers and an aggregator or DER manager. That is – systems and processes which connect an EV charger to a management system, enabling the smart charging, need to be robust enough to deliver a high degree of certainty that the demand will be managed. There are a number of ways that this connectivity could be provided (via a cellular network, fixed-line broadband, radio mesh or another IoT solution) – and of primary concern is ensuring that the systems are robust and interdependency with other infrastructure – such as the WiFi network – is considered. An important secondary consideration to ensuring connectivity is maintained through robust infrastructure and technologies, is what happens when connectivity is not maintained.

Q3. Do you support EV charging being open access, and why/why not? What information could you supply to EECA to help inform our thinking about this issue? Do you think that 'smart' chargers should address issues of cyber security? How would you suggest this is done?

We support open communication protocols. Interoperability is important for consumer experience, future proofing technology, and competition in future flexibility markets. We also believe that a 'smart' EV charging standard should address cyber security.

Open access protocols are distinct from open communications protocols and have significant implications for cyber security. As the proliferation of smart EV charging services increases this also increases the ways that malicious actors could disrupt consumer services or reliability.

We recommend two actions to ensure cyber security is maintained as smart EV charging is enabled. One is concerned with the cyber security credentials of an aggregator managing smart EV chargers in the future and the other is concerned with the standard for the EV chargers themselves.

what should be regulated for? (cont)

Establish a process through which flexibility providers / aggregators are authorised to offer EV management services. This should include a minimum cyber security standard that an aggregator has to be complaint with. This is to ensure that the platform that they use for smart EV charging doesn't put consumer assets or the whole electricity system at risk.

Include a cyber security standard alongside the open communications protocols for smart EV chargers. There are different open communications protocols that could be used – OCPP or OpenADR. There are pros and cons to both and we recommend that overseas jurisdictions are reviewed and the sector consulted to make a determination on this. We note that the PAS currently includes OCPP. However, whatever open communications protocol is used there also need to be a cyber security standard included.

Whilst we acknowledge that EECA is seeking to address cyber security separately, we recommend that a framework is considered now and include the above actions as bare minimum steps to maintain continued system security and reliability as our electricity system becomes more digitalised – and the 'points of access' to it increase. This is ultimately consistent with the goal of interoperability.

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided? Who should be able to access this information? In what form should it be transmitted? What processes should be in place to safeguard the data? Is there any other way this data might be captured?

EV locational data requirements

Understanding where EVs charge and when is critical for efficient network planning. This is heightened by the fact that this technology is new, largely unknown and the uptake pathways are still unclear. The important thing in providing this visibility is that the EVs are registered to an ICP at the time of installation.

If the location of EVs chargers were provided as GPS data, this would need to be separately mapped against ICPs, which adds additional complexity to gain the benefit of understanding where the device is connected to the network. There are alternative pathways to achieve visibility of EVs which would not require EV chargers to transmit their location to a third party. These pathways should be used to provide networks with the ICP associated with an EV as well as its maximum potential demand. These are as follows:

The Certificate of Compliance pathway

When a solar system or V2G is installed a requirement exists under Part 6 of the Code to register this installation with a network business:

Section 9A

3) The distributed generator must also give the distributor the following information as soon as it is available, but no later than 10 business days after the approval of the application:
   (a) a copy of the Certificate of Compliance issued under the Electricity (Safety) Regulations 2010 that relates to the distributed generation:
   (b) the ICP identifier of the ICP at which the distributed generation is connected or is proposed to be connected, if one exists.

This is executed through a Certificate of Compliance being completed by an electrician and provided to a network. Whilst Part 6 applies to distributed generation (including V2G technology – which is captured by Part 6 as it injects power into the network, making it 'distributed generation') this pathway could be expanded to include the registration of all EV charging installations. Indeed, including EV charging installations on the existing registry administered by the Electricity Authority is something we have been seeking for some time. This option to ensure network visibility of EV chargers by ICP is virtually zero cost. This option does not propose that the application process in its entirety as set out in Part 6 be applied to all EV charging installations – but that the requirement in Section 9A 3) does.

There are also some important changes that would need to be made to ensure that this process is viable to provide locational data of EV chargers to networks:

1. The requirement to register the installation should be placed on the installer rather than the customer. The Code currently imposes an obligation on a consumer (understood as a distributed generator for the purposes of Part 6 and thus an industry participant for the purposes of the Act) to provide the location of the installation. However, as above, this is generally performed in practice by an electrician or installer and when this data is not provided (as is true for around 14% of installations), following up with the installer rather than the consumer is more fruitful. We recommend that the Code is aligned so that the

obligation to register the installation with the network rests with the installer. Having this clarity could increase consistency across installer practices and introducing this responsibility for installers now would be timely alongside the introduction of an EV charger standard for chargers sold and installed in New Zealand.

2. Introducing penalties for non compliance. Currently the only recourse available to a network in the instances of non compliance with this registration requirement is cutting the asset off from the network. This is not consumer centric, to the point where we virtually never do this. This also penalises a consumer when, as above, we believe that the responsibility should rest with the installer. In addition to 1 there is a need for a viable non compliance penalty on installers to enforce registration requirements. The burden of registering an installation for Code compliance is much less than the burden on a network business following up 14% of installations to gain the registration data. This burden on networks would only increase if the registration requirement were widened without the right enforcement levers.
3. The EA's registry needs to be amended so that registered assets can be 'tagged' as an EV. This currently does not exist, even for V2G – for which the registration requirement already exists. As a result these assets are 'seen' as the same as distributed generation – even though their power injection behaviour is likely to have some differences which are relevant to network management purposes. For this process to be viable in providing networks with data on the location of EVs these additional categories would need to be added (that is for 'V2G' and 'EV charger') so that the type of asset is identified with its registration.

We appreciate that Part 6 is designed to apply to distributed generation – and indeed that the Code can only apply to those who are an industry participant as defined in the Electricity Industry Act 2010. Changing the Code is also the role of the Electricity Authority, rather than EECA, but we understand that the various Crown entities will be working together to determine the best means by which to achieve these outcomes.

Qualified installer programme pathway

The UK's Office of Zero Emissions Vehicles (OZEV) administers a scheme through which people can become a registered installer for EV chargepoints (CPs). This is alongside regulations to ensure that the CPs sold and installed have smart functionality, and a subsidy for compliant EV CPs which is claimed back by installers for customers.

To become accredited, installers must: be registered with a Competent Persons Scheme (which is also a requirement to become a registered electrician); have completed an EV charging course (these typically have pass rates of 100% and cost around £350); and, have completed the course of a manufacturer and registered with them to install their EV CPs.

Depending on the manufacturer and home requirements a home installation takes around two hours. The EV CP typically costs between £300 £1000. Depending on the manufacturer, installers connect a smart CP with a platform for management as part of the installation process. There are separate qualification channels outside of the OZEV registered installer scheme through which someone can install an EV charger although these pathways are not eligible for the subsidy.

For the full value of smart EV charging to be realised, chargers need to both have the right functionality and be connected to a platform or third party aggregator for management. Whilst this consultation is concerned with ensuring the former (that the devices carry the right 'smartness') – there is a need to subsequently consider pathways beyond a regulated standard to drive connectivity. A qualified installer programme (or process – which leverages existing

electrician qualifications in NZ) or a widened CoC process could provide this. As is the case in the UK, the installation process could ensure that the EV charger is connected to a demand management platform at the time of installation. Unlike the provision of EV registration data by ICP, this outcome does not need to be delivered now, but it will need to be soon.

As we discuss further in our response to Question 12 on incentives on page 15, there is a need to ensure that regulations are accompanied by the right incentives, processes and market solutions, to avoid a situation where every EV charger is smart but continues to behave in a non-smart way.

What this means for the standard

The ability of an EV charger to capture and transmit data on its location may be a valuable way of future proofing pathways for EV chargers to add the most system value in the future (i.e., this data may be valuable for planners or local government). However, for networks the key thing is that the EV is registered to an ICP.

Rather than require EVs to collect and transmit location data, we recommend that the existing CoC process is improved and widened as above to ensure that EV registration data which is imperative for network planning immediately is provided with some certainty. We also recommend the exploration of a qualified installer programme as an option – noting that such a pathway may also be valuable in enrolling EVs into valuable demand management services in the future. These two steps could be considered together in developing a pathway for EV registration and connection. This supports our recommendation that registration requirements rest with an installer rather than a consumer.

Consumption data requirements:

When it comes to the provision of data it is important that the pathways and processes exist for this data to be shared in interests of the most consumer value. Towards this end, the multi-year process which ensued for networks to gain access to consumption data from retailers is a blue-print of what not to do.

A valuable consideration when it comes to the provision of consumption data for consumers is ensuring that the data is captured in a similar format (i.e., through a data standard) so that it can be easily used by a range of services and providers to offer consumers this visibility in valuable and innovative ways.

However, we consider such processes for data access (the terms on which data is provided and how) to be distinct from provisions for data capture (which is what a device standard is concerned with).

We do not see a need for EV chargers to be regulated so as to capture meter settlement quality consumption data (but – as we say in response to Question 5 on the provision of data to consumers, our view is that consumers own their own data. As such any data that is captured by an EV charger should be made available to them).

We note EECA's recognition that the right consumption data capture could be important for future multiple trader relationships:

"The development of Multiple Trader Relationships (MTRs) or Peer to Peer trading (P2P) would likely require each EV charger to contain its own electricity consumption and generation measurement, and on-demand remote reading capability. Placing these recommendations in a Standard (that is either widely trusted and/or regulated) would future proof users' investment for potential electricity market development".

Indeed, opening the door for different and multiple providers to serve consumers is an exciting opportunity to increase competition and innovation in our electricity market, and many smart EV chargers already carry sophisticated data capture capabilities.

However requiring this capability at a market settlement standard by way of a regulated EV charging standard would impose a significant additional requirement – and cost – on EV chargers in New Zealand, at a time when the market and technological pathways for MTR are still uncertain.

MTR turns on the ability for the market to reconcile bills across devices and there are a number of ways that this could be performed – for instance through the right smart metering provisions. We are of the view that requiring multiple meters or ICPs per household for MTR could increase complexity and cost for consumers which may not be necessary (and indeed we have recommended that the Government address existing requirements which limit one retailer per ICP to broaden market access to independent renewable generation). There are platforms available now capable of deriving consumption data by device from metering profiles – even without sophisticated consumption data capture capabilities of devices. Such metering platforms are importantly distinct from DER management platforms.

However, the multi-meter pathway would be tacitly favoured by a regulated requirement for EV chargers to carry market settlement metering quality data capture capabilities, effectively turning them into meters. This is not required for EV driven peak management and any standardisation necessary for MTR does not need to be determined through this EV charger standard workstream – the goal of which is affordable EV uptake. We support the Ara Ake trial of MTR – and any EV charger requirements needed to support the emergence of MTR in New Zealand could be integrated into a 'second generation' iteration of an EV charger standard.

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner? What other information may be valuable to the EV owner? What format should be used for this information if this requirement is adopted?

We support the goal of encouraging greater EV owner engagement and agree that transparency is important for consumers to become informed about their consumption.

However, we are also aware that such services (i.e., which offer consumption data to consumers in a meaningful way) are at an early stage and our view is that requirements should not become a barrier to new EV charger provider entering the market or to innovation – but instead should 'future proof' the provision of such services. As above, we do not believe that sophisticated data capture capabilities need to be included in an EV charger standard at this time – but we also recognise that some consumption data capture may well be valuable for consumers.

If the charger does have data capture then this should be provided to consumers as is consistent with the principle that consumers should own their own data.

mandated settings for power quality and control

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

We support this strongly and we support EECA's proposal for a setting where the EV charger automatically turns off or down if frequency of voltage drops below a pre-set threshold and restores when the frequency or voltage recovers.

These requirements for DG inverters (including V2G) are currently covered in the Australian and NZ joint Standard AS/NZS 4777.2.2020. They should also be included in a standard for EVs. As below volt watt control is currently missing from the Publicly Available Specification (PAS) which EECA refers to. This is an area where the PAS would need to be amended to form the basis of a smart EV charging standard.

energy efficiency

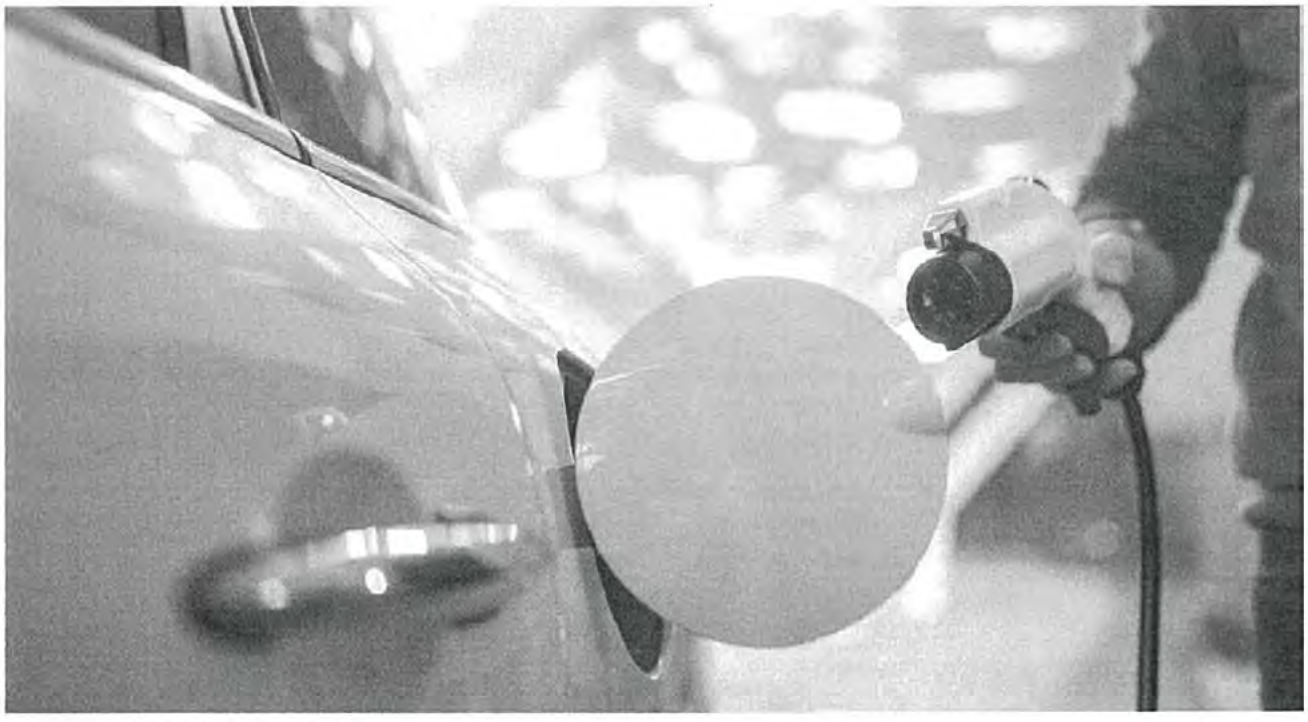
Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers? What information could you supply to EECA to inform this issue? What challenges, if any, do you see in regulating in this area?

As we have noted in previous submissions we are unsure how restrictions on vehicle manufacturers would be implemented in practice and we caution against regulations that would restrict EV imports.

charging cables

Q9. What are your thoughts on whether charging cables which contain a 'smart' charging enabling device should be in scope for intervention?

We support a range of technologies that enable optimised charging but note that charging cables have natural limitations in their functionality. The UK regulates specifications for smart cables but excludes them for non-smart cables. We support this approach.



Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand? Do you think the market can adequately address this issue without the need for government intervention? What information could you provide to EECA to inform this issue?

The relative risks between 'do nothing' and making an intervention (i.e., regulating smart EV chargers) are drastically asymmetric. The downside of regulating – potentially a modest increase in price of EV charging units – is vastly outweighed by the risk of missed opportunity of much more efficient and effective use of the electricity system, which in turn will help to limit increases in the price of electricity.

This was summarised by the UK's regulatory impact assessment which said:

"The technology and business models for electric vehicle smart charging are still in their infancy – both in the UK and internationally – and there are a variety of different technical approaches to delivering it. The diversity in business models and practices of this early market, whilst important for innovation, also risks a proliferation of smart chargepoint (CP) systems developing with varying standards and functionality. Without clear requirements and standards set for the industry, it's unlikely that the market will deliver smart CPs that provide sufficient grid and consumer protection, at least in the short term".[6]

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers? What information could you provide to support your position?

We support the provision of education to consumers on demand response technologies – however, much like EECA's existing approach to for energy efficiency this is an 'and' for regulations rather than an 'or'. We commend the Genless campaign of EECA and recommend a demand response focused educational campaign on demand response technologies as the next frontier. Labelling can be a useful signal to consumers – however, we caution against over relying on this. Having the right product regulations in place (by way of a regulated smart EV charging standard) can ensure the bare minimum functionalities for EV charging technologies are in the market without requiring a high degree of consumer engagement or research at the time of product purchase decisions.

Consumers have a crucial role in an energy system that unlocks the benefits of the demand side – but we are also of the view that it is up to industry and the regulator to 'internalise complexity' – delivering the most cost effective and consumer centric energy services without imposing a high consumer burden. EV charging regulations are a key and bare minimum step in ensuring this happens.

As we have mentioned it is also important to strike the balance between ensuring the right bare minimum functionalities are in place without tilting the market in favour of one provider or technology over another – particularly while new functionalities and products are emerging. We see regulating for a smart EV charging standard with the specifications we have set out as being the 'first cab off the rank' alongside consumer education on demand response technology.

[6] *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015290/electric vehicles smart charge points regulations 2021 impact assessment.pdf*

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers? What incentives do you think would be effective and who should provide these? What other incentives might be valuable beyond financial incentives?

Much like education, we see the provision of incentives as an 'and' rather than an 'or' for smart EV charging and demand response services. The biggest prize from a smart EV charging future is a lower electricity bill than would be delivered to consumers in the absence of smart EV charging. By gaining efficiencies at a systems level smart EV charging will deliver cost reductions for all electricity consumers as compared to a future of passive charging – whether or not a consumer themselves uses an EV. This is also why smart EV charging regulations are important for an equitable energy transition. These cost reductions could be increased and conveyed to consumers by way of incentives – such as lower energy as a service contracts for smart EV charging, smart EV charging tariffs, or TOU tariffs. Whilst such innovative pricing schemes have a key role to play in a consumer centric, efficient, and competitive market they are no substitute for regulating a smart EV charging standard. This is because incentives for smart EV charging pricing schemes require smart charging functionality. Whilst some incentive options are currently being offered by retailers (which we support) these are relatively few and it is unlikely that they are adequate in tilting consumer purchasing decisions in favour of smart charging currently in the absence of regulations. Once a passive charger is installed a consumer is unable to subscribe to a smart EV charging pricing product or incentive (unless they retrofit the charger) potentially restricting the market for such incentive products. Smart EV charging regulations and incentives are not mutually exclusive – they hinge on one another.

Incentives to install a smart EV charger could be an effective way to overcome the higher capital cost of a smart as opposed to a passive charger. We consider this a lever to support the implementation of smart EV charging regulations and to ensure that this does not increase the cost burden on consumers an important concern in the context of energy affordability; a just transition; and the cost of living generally Overall, it is important that wider levers are considered alongside regulating the specifications for smart EV chargers to ensure that using a charger at all (which further to regulation would carry smart functionality) is favoured by consumers (as opposed to using no charging device – i.e., using a three pin plug).

However, this is a step for consideration alongside regulations, rather than instead of regulations. We note that the UK provides an EV CP grant for 75% of the cost of a EV CP (or £350) for landlords, businesses, or apartment block owners (because of the UK's parallel regulation every CP sold or installed in the UK must already be smart). This is a good example of an incentive working alongside regulation to help tilt consumer behaviour in favour of efficient charging and of reducing the cost burden on consumers. We also note however that the Electric Vehicle Homecharge Scheme – which preceded the CP Grant and which also offered a 75% or £350 subsidy for any compliant smart charger – was in place well before regulations for smart chargers were implemented. This signals that the incentive was not by itself adequate in driving smart EV charging. The narrowed eligibility of the CP Grant also reflects a rapid reduction in cost for the price of a residential smart EV charger. Both of these learnings are salient and supportive of smart charging regulations in New Zealand.

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaken in the UK? What information could you provide to support your position?

We support regulating for smart EV chargers strongly. As we noted at the beginning of the submission smart EV charging can:

- Reduce consumer cost;
- defeat the peak enabling a secure transition to greater renewables;
- unlock new competitive markets and innovative consumer services; and,
- deliver a high degree of consumer satisfaction as demonstrated by our own EV smart charger trial.

As above the benefits of smart EV charging will be significant. Ensuring that the charging devices have smart capability will not by itself unlock these benefits – but it is still a crucial and necessary step. We look forward to continuing to engage with the EECA, the EA, and the Ministry of Transport to enable the efficient and reliable uptake of EVs. We look forward to the release of the National EV Charging Strategy led by the Ministry of Transport as another important step in driving the provision of future ready EV charging infrastructure. We commend EECA for advancing this work to determine the case for, and scope of, a regulated standard for EV chargers.

As above, we think that the approach of the UK has many benefits and we support the implementation of that approach here. In particular we support:

- Regulating for the inclusion of 'smart' functionality in EV chargers as well as default off peak charge mode. This is in addition to the wider specifications we support above.
- The accompanying incentive / subsidy to help tilt consumers in favour of smart charging (and helping to avoid the perverse outcome of consumers defaulting to the use of no charging device i.e., a wall plug). By overcoming the up-front cost barrier to EV smart chargers this can also support an affordable transition.
- The qualified installer programme. This should be adapted for the New Zealand context to avoid burdening our already pressured labour market with further qualification requirements which may not be necessary. However, such a programme could also offer an important pathway to ensure that EV chargers are both registered to an ICP with a network, and are connected to a demand management platform. This could be further supported by widening the existing DER registration pathway as well as shifting the onus from consumers to installers in meeting these requirements.

In addition to the UK, we note that South Australia has recently implemented smart EV charging regulation meaning that electric vehicle supply equipment (EVSEs) in the state must include demand response functionality and an open communications protocol by July 2024.

In addition to looking to overseas jurisdictions we support EECA in undertaking this thorough consultation to define the scope of a regulated EV charging standard that is appropriate for the New Zealand context, should this regulatory step be taken. We believe strongly that it should be and defer to our comments above in helping to determine the scope of NZ's first iteration of an EV charging standard. As we noted at the outset of this submission there are many aspects of future markets and services which are yet to be determined and the lifespan of an EV charger is about ten years. We recommend that this standard (which is a key step to enable the emergence of new competitive markets and services) be considered the first

generation – allowing more information to emerge before decisions which will impact future markets and innovation are made. As above we believe that consumer preferences and technologies should lead the emergence of these markets – not regulators.

Q14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/incentives? What parts would you exclude or change? Does the PAS cover all the important issues? What other resources may be useful for New Zealand

We broadly support the specifications in the PAS to underpin a future regulated standard for smart EV charging. As above, we also support inclusion of provisions for voltage management within a smart EV charging standard and in particular volt watt control. This is currently missing from the PAS referred so we recommend that a provision for volt watt control (which already exists in the V2G standard ASNZS4777.2:2020) be included.

5 September 2022

Te Tari Tiaki Pūngao
Energy Efficiency and Conservation Authority
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Via email: star@eeca.govt.nz

SUBMISSION ON IMPROVING THE PERFORMANCE OF ELECTRIC VEHICLE CHARGERS

The Electricity Retailers' Association of New Zealand ('ERANZ') welcomes the opportunity to provide feedback on EECA's green paper 'Improving the performance of electric vehicle chargers' from August 2022.

ERANZ is an industry association representing companies that sell electricity to kiwi households and businesses. Our members supply over 90 per cent of New Zealand's electricity. We work for a competitive, fair, and sustainable electricity market that benefits consumers.

Electricity retailers support the Government's emissions reduction objectives and strategic approach to electrifying transport. We want to do our part to help ensure our energy system is sustainable and makes the most of the quickly evolving technology to improve the performance of our networks.

The paper's commentary on the importance of smart and energy efficient electric vehicle chargers is well made. ERANZ agrees with forecasts of New Zealand's electricity demand increasing substantially, with the uptake of electric vehicles leading the way. In turn, this will put pressure on peak electricity demand requiring greater use of 'smart' technologies to manage this peak.

ERANZ strongly endorses the opportunities presented by 'smart' products and services to help manage loads on our electricity networks as distributed energy resources ('DER'). DER and the flexibility services they unlock are still an emerging technology. However, their potential is enormous and will underpin the future electricity market.

EECA's desire to examine the challenges and potential upside in aiming for widespread deployment of smart EV chargers in New Zealand is the correct one. The size of the impact on both smoothing peak demand and optimising distributors' need to invest in capacity upgrades of their networks is significant.

Educating consumers about the features and capabilities of new smart chargers is essential. EECA is well placed to undertake this role, given the organisation's successful implementation of mandatory energy performance labelling for existing appliances in New Zealand. This labelling system is widely recognised by consumers and trusted. It could be adapted and applied to smart chargers.

The paper points out that three-pin plug cables supplied by vehicle manufacturers account for most in home charging, yet there is little incentive to upgrade. This underlines the value of EECA, or a similarly trusted organisation, to undertake consumer education so that EV owners can get more out of their chargers, access lower electricity costs, and improve the impact of EV charging on their community's electricity networks.

'Smart' and energy-efficient chargers are a vital tool the electricity system can use to help manage demand peaks. However, EV chargers are not the only smart system that can respond to demand for flexibility in response to network communications or price signals. EV chargers must be able to slot into a smart whole of-home system if a homeowner chooses. ERANZ considers EECA should consider the broader ecosystem of residential flexibility products when setting standards and minimum requirements for smart chargers.

An essential tool to manage peak demand will be price signals sent by many market participants, including generators, transmission providers, distributors, retailers and flexibility traders. All participants will combine in the market of the future, whereby consumers have a choice about how they engage and what they want to achieve from the market. This market will value smart systems and appliances which can interpret and respond to these price signals. When constraints appear, whether through a lack of generation or congestion on a local network, these can be priced accordingly for those consumers who wish to participate in a more dynamic and volatile market.

Answers to consultation questions

Improving the performance of electric vehicle chargers	
Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers?	ERANZ agrees with this set of principles, including the factors EECA seeks to balance and guidance over EECA's actions. One issue not canvassed here is the issue of who will own the data generated from the smart chargers? Thought should go into managing this because such data is valuable for consumers and market participants, including retailers, distributors, and flexibility traders.
Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?	ERANZ agrees with the requirement for a common set of communication standards. These are currently being developed by the industry and should be integrated into EECA's work. Default charging modes are a helpful way of nudging consumer behaviour towards the desired outcome; however, homeowners must always be able to override these defaults easily. Otherwise, consumers will quickly lose trust in how these products are managed and this will, in turn, slow uptake. The 'Basic functions' described by EECA are the most critical specifications for smart chargers.
Q3. Do you support EV charging being open access, and why/why not?	Yes. Open access allows for greater consumer choice.
Q4. What are your thoughts on EV chargers having to	Yes, as long as user permission is required first.

transmit information on their location and use, and the suggested scope of information to be provided?	
Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?	This is potentially useful and interesting but a lower priority than the factors discussed above.
Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?	This is potentially useful but a lower-level priority for EECA's work compared to the factors mentioned above.
Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers?	This is potentially useful, but more evidence is required to support the problem definition work.
Q8. What are your thoughts on labelling aftermarket AC EV chargers?	Support EECA's inclusion of aftermarket chargers in this overall work programme on EV chargers.
Q9. What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?	Cables should definitely be included within the scope of EECA's overall work programme on EV chargers, particularly the education of consumers on how such cables are different from full-featured chargers.
Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand?	ERANZ does not support the 'do nothing' option.
Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?	ERANZ supports EECA informing and educating consumers on smart chargers, including marketing campaigns, best practice guides, and rating labelling. ERANZ supports investigating both an energy efficiency rating label and an endorsement label for products reaching the threshold of 'smart'. We assume the threshold for 'smart' will continually increase over time as technology and consumer expectations develop.
Q12. What are your thoughts on the use of incentives to encourage the	There are already financial benefits to consumers of purchasing a smart charger and taking advantage of dedicated off-peak rates available from retailers. Over time, further innovations in retail products will provide greater financial benefits to consumers together

uptake of 'smart' EV chargers?	with the development of flexibility services. These systems and services will provide rewards to those engaged consumers who wish to take advantage of them. Combined with the informing and educating from Q11, we anticipate this will move the market towards smart chargers. The question is whether this movement will be as quick and as significant as required. New Zealand should be ambitious for adopting this technology, so ERANZ would recommend a short assessment time before reaching for the stronger policy interventions of subsidies or regulations if required.
Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand?	Regulation is not ERANZ's preferred option at this stage. There is the ability for New Zealand to learn from the experience of the UK having recently regulated changes to their market a couple of months ago. However, as stated above, any assessment period should be short.
Q14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives?	New Zealand's market is not large enough for our regulations to lead international product development, but we can take advantage as a fast follower.
Q15. In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?	Smart chargers should be able to be set up as part of an integrated whole-of-home smart system. We would encourage standards that allow such systems to work well with EV chargers.

Conclusion

ERANZ thanks the Authority for its work on this issue and is happy to provide any further information on this submission as required.

Yours sincerely

Kenny Clark
Policy Consultant

TE PŪ NGAO, TE PŪ WARO
CARBON AND ENERGY PROFESSIONALS NEW ZEALAND
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5th September 2022

Submitted via email

Submission on:

Improving the performance of electric vehicle chargers

By Carbon and Energy Professionals New Zealand

INTRODUCTION

CEP welcomes the opportunity to comment on EECA's thinking on introducing regulations or recommendations supporting the uptake of smart EV chargers. Vehicle registration trends and projections all suggest a significant increase in the levels of EVs in the New Zealand fleet, most of the charging for which will be done at home. The emergence of a relatively new product market – that for chargers – represents an excellent opportunity to introduce market conditions that will benefit consumers and New Zealand as a whole by enabling an earlier transition to a 100% renewable electricity industry.

For context, CEP is the professional body that represents energy efficiency and carbon professionals in New Zealand. We train and certify individuals in a wide array of energy efficiency and carbon management techniques.

CEP is affiliated with Engineering New Zealand as a Collaborating Technical Society. The CEP membership comprises expert level practitioners in energy efficiency and carbon management, the people who will deliver carbon reductions across the New Zealand business environment.

CEP is a not-for-profit Incorporated Society. Supporting effective energy, carbon and sustainability management is embedded in our constitution.

RESPONSES TO QUESTIONS

Our comments on the questions raised by the green paper are:

1. **What are your thoughts on EECA's suggested engagement principles for EV chargers?**

   The principles appear sound.

   We recommend an additional principle relating to future-proofing. While perfect future-proofing related to technologies is impossible, the market could be provided some stability by, for example, providing minimum notice periods for regulatory or labelling changes.

   We further recommend an additional principle around price transparency. This may sit outside the scope of defining charger functionality but is not outside the scope of switch-on/switch-off decision making. In several places the document refers to reactions to price signals. While many of these may be retailer controlled under pre-arranged packages, consumer overrides will (presumably) be available and smart chargers should allow consumers to pick price/charging combinations. To facilitate this, real-time consumer prices, whether set by time of day under retailer packages or through spot prices should, ideally, be available or, at the very least, historic intra-day price patterns should be available. Understanding and reacting to price signals will be a critical aspect of maximising the benefits of smart EV chargers and so regulations should include ensuring price transparency.

2. **What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand?**

   The proposed specifications appear reasonable, although it is quite noticeable they seem to have been written from the perspective of network efficiency rather than consumer choice or sense of security. They should be reviewed from the consumer perspective.

   At the very least, smart chargers should be able to be set to a minimum charge level of the battery. This would enable consumers to set chargers to achieve a level of minimum comfort, i.e. x% of battery capacity. With that setting, chargers could switch on or off based on price signals or for V2G and V2I applications while retaining a level of comfort for consumers. Similarly, it should be at the discretion of consumers to balance this level of reserve against price signals, for example charging up to 100% if prices fall below a pre-selected threshold, only to 60% if they do not.

   Override of AI algorithms should also be a characteristic. For example, a consumer may be planning an unusual, longer journey. An algorithm may not pick up that intended change in usage pattern and leave a vehicle under-charged.

3. **Do you support EV charging being open access and why/why not?**

CEP favours open access to assist efficiency and multiple trader relationships, subject to normal considerations of privacy and data security.

4. **What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided**?

The transmission of data is essential to enable the national efficiency benefits of smart chargers. This should be subject to normal considerations of privacy and data security.

5. **What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner?**

It is essential this information is available to EV owners so that they are able to verify bills and make informed decisions if engaged in multiple trading relationships or peer to peer trading relationships.

6. **What are your thoughts on requiring mandated power quality and control settings for EV chargers?**:

The functionality to maintain power quality is important, although the ability to switch off or turn down chargers remotely should not be used in avoidance of proper investment in network infrastructure.

7. **What are your thoughts on regulating the energy efficiency of onboard EV chargers?**

CEP is generally supportive of regulating the efficiency of onboard chargers, although not to the detriment of an active import market for EVs. We would be interested to see the conclusions of the research referred to in the green paper before commenting further.

8. **What are your thoughts on labelling aftermarket AC EV chargers?**

CEP is supportive of efficiency labelling on aftermarket chargers.

9. **What are your thoughts on whether charging cables which contain a 'smart' charging-enabling device should be in scope for intervention?**

All charging cables should be in scope for intervention. There is limited benefit in including only cables "which contain a smart charging enabling device". Labelling is a

comparative tool and, therefore, only has real value if all options being considered are included in the comparison. A consumer is only capable of assessing the added value of a smart-enabled cable if it is compared against another labelled cable. Efficiency improvements from using a smart enabled cable need a benchmark of a dumb cable for useful comparison as well as alternative smart-enabled brands.

10. **What are your thoughts on the 'do nothing' option for EV chargers in New Zealand**?

CEP does not support the "do nothing" option. Ordinarily, this will lead to the (short-term) cheapest, rather than best (long-term) solution.

11. **What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers?**

Information and education are important, however, reliance solely on information and education will likely lead to a sub-optimal, long-term solution.

Marketing campaigns commonly have indeterminate (probably light) impact and website and guidance information is influential only to those that seek it out. Ratings labels allow direct comparison, are more informative and valuable and should be the cornerstone of education and information programmes.

12. **What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers?**

CEP does not support incentives to encourage the uptake of smart chargers. Such an approach will likely simply subsidise those that least need subsidies. Less affluent consumers will still pursue a least (short-term) cost solution. A subsidy for premium products will just make them cheaper for those who may well have purchased them anyway and not necessarily drive mass uptake.

13. **What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand**?

CEP supports setting minimum performance standards for all EV chargers. This is the only way to ensure mass uptake of efficient technologies. Doing nothing, education and incentives provide little reassurance of mass uptake, which is the outcome required.

14. **What are your thoughts on using the PAS for residential EV chargers to underpin regulation/ incentives**?

CEP sees merit in widening the regulation of chargers to include cyber security and safety, although acknowledges these aspects can be separately covered. It is essential,

however, that minimum energy performance standards are enacted and the consumer benefits of efficiency are well communicated.

15. **In what other ways might the energy performance of EV charging in New Zealand be improved, that do not require EECA's involvement?**

EV charging will become a critical contributor to New Zealand's transition to a low emissions economy. Open competition and consumer knowledge in selecting superior and more efficient products is important and many agencies have roles to play. For example, markets need to be open and accessible to new entrants, there needs to be a sufficient number of qualified installers, network distribution companies need to be able to invest in upgrading infrastructure and electricity markets need to facilitate distributed energy generation, multiple trading relationships and localised grids.

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September 2022

FLEXFORUM

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FlexForum feedback to EECA on smart EV charging

The FlexForum is a cross-industry group

The FlexForum is a cross-industry group established in February 2022 to identify the practical, scalable and least-regret actions needed to integrate distributed energy resources (DER) into the electricity system and markets to maximise the benefits for Aotearoa New Zealand [1].

Standards for smart EV charging, and for flexible DER more generally, are very relevant to the FlexForum's key objectives:

1. identify the minimum specifications of the services that DER can provide, to who, when, where, how, and for how much;

2. identify the practical, scalable, and no regrets steps to use the services that DER can provide; and

3. support ongoing learning and collaboration across the electricity sector on real-world deployment of solutions to realise the benefits of DER, including identifying and resolving barriers.

More information on the FlexForum, its goal, objectives and work to date, is available at: https://www.araake.co.nz/services-projects/flexforum/

Standards are a foundation to harnessing flexibility

Flexibility is a critical feature of the future electricity system. In particular, smart EV charging and, in time, vehicle-to-grid (V2G), have huge potential to provide a range of services, from balancing renewables on the grid to managing localised constraints on distribution networks.

The challenge is that coordination and collaboration are hard. A multi-year effort will be needed across the electricity value chain to deliver the investments, the changes to planning and operational practices, the changes to regulatory settings and the engagement with consumers required to leverage the capability of their DER.

In this context, the FlexForum welcomes the opportunity to submit to the Energy Efficiency and Conservation Authority (EECA) on its green paper, *Improving the performance of electric vehicle chargers*.

The FlexForum has four main points of submission to EECA:

- Standards provide a critical foundation to the delivery of the system-wide benefits from DER flexibility, and we support the option to regulate for a smart EV charger standard. Interoperability, open communications, registration/visibility and appropriate minimum standards are key building blocks to enabling that flexibility and ensuring individual consumers' resources can provide system-wide benefits in the future.
- Any standards set should be developed through wide and transparent consultation, including with suppliers of software/equipment and aggregators, to ensure that they are fit for purpose for all parties. In setting standards, efforts should be made to align with international standards and approaches to limit the potential barriers to adoption of technology in New Zealand.
- EECA should avoid technology-specificity where possible, and consider parallels with other household appliances with similar benefits to the electricity system - for example smart water heating.
- While technology standards provide the foundation for harnessing flexibility, it is likely the value proposition for consumers will require further enhancement in order for uptake to be accelerated. Consumer education about, and buy-in to, the benefits of charging flexibility are going to be critical.

Each of these four points is expanded in turn in the remainder of this submission.

Common standards and terminology are critical

Appropriate minimum standards are key building blocks to enabling flexibility and ensuring the resources can provide system-wide benefits.

For the case of EV chargers, such minimum standards should include:

- **Capability and connection to receive and respond to dynamic system requirements**

  This is the most important of the minimum standards. Without this capability, while EV chargers could still operate to timed profiles (for example, preferred charging times entered by the consumer), the ability for chargers to respond to dynamic system requirements would be considerably limited. In order to provide the benefits noted by EECA on p12, that "*EV charging could be reduced during peak demand and increased at times of high renewable electricity supply (off-peak)*", chargers need to be able to receive requests to respond to those dynamic conditions in accordance with the consumer's preferences.

  Similarly, without connection to a back-end platform designed to provide flexibility services, an EV charger may be capable of being "smart" but have no means of receiving information relating to changes in system conditions. Connection to such a platform is critical to enabling the full value of flexibility from a smart charger, especially once V2G injection becomes more prevalent.

  As noted from p14 in EECA's paper, response from EV chargers can also play a key role in maintaining network and system stability in an emergency situation - an extreme case of a dynamic system requirement. This could be achieved through various means - for example through mandatory settings in the charger itself (as referred to by EECA at the top of p15), and/or through signals passed by the network operator to the party managing the charger on the consumer's behalf. There are clear analogies and precedents on the transmission network for both approaches, including generator governor response, instructions from the system operator during grid emergencies, and, as a last resort, automatic under-frequency load shedding (AUFLS).

- **Interoperability**

  An EV charger should not be locked in to a specific operator. This allows the consumer to switch between different parties who may manage the device on the consumer's behalf (subject to contractual conditions), and to change *how* the device is managed for them. As with electricity retailing in general, in order to develop thriving competition between these parties, and flourishing innovation, barriers to switching must be low.

- **Open communications protocols**

  Relatedly, EV chargers must be able to be remotely accessed without the need for proprietary interfaces or gateways. Note this is distinct from open *access*; there should still be a requirement for the consumer to approve which party, or parties, are authorised to communicate with their charger.

- **Off-peak charging, by default**

  Levels of engagement with the energy market by consumers have traditionally been very low. While the operation of consumers' DER in future will most likely be by third parties, rather than consumers themselves, this still requires consumers to engage with those third parties to initiate the relationship.

  As noted by the UK Government, "*mandating the setting of a default charging mode will help mitigate the risk that some users do not engage with smart charging offers, and instead charge during peak times*"[2]. While FlexForum members would like to see as much use made of dynamic flexibility as possible, an off-peak minimum standard will provide a useful first step for some consumers, and potentially a permanent backstop for others.

  It would be useful for chargers to be able to easily revert back to these default settings if (for example) the consumer opts out of a smart-charging offer, or another consumer moves into the premises.

- **Randomised delay**

  We note the appeal of this setting as a means of mitigating the risk of unmanageable secondary peaks on electricity networks caused by synchronised behaviour from default timers (i.e. all chargers begin charging simultaneously at the end of a peak period). However it is worth noting that a material proportion of today's EV owners have invested in smart chargers to take advantage of retail offerings that change hour-by-hour (such as Electric Kiwi's Hour of Power). Restricting consumers' ability to take advantage of the full hour could lead to consumer pushback, harming the industry's efforts to earn the social licence required for widespread uptake of managed charging. Instead, randomised delay could be a default setting to go hand-in-hand with default off-peak charging. This could be a useful long-term setting for many consumers, but could be overridden by a more dynamic smart-charging offering.

While not a standard per se, we consider registration and visibility of the presence of a smart EV charger to be critical to enabling third parties the ability to assess the full potential benefits of that charger. In particular, it is essential that network operators have visibility of where a charger is, and the characteristics of that charger. Charging behaviour can then be inferred from the half-hourly consumption data the distributor has (or soon should have) access to.

Adding new fields and flags to the existing electricity registry could be a straightforward means of storing and sharing this information within the industry. We encourage EECA to work with the Electricity Authority on such a solution. As EECA notes on p12, a V2G-enabled charger would already need to be recorded in the registry under the rules of Part 6 of the Code.

Any standards set should be developed in wide and transparent consultation

EECA's green paper is an excellent means of coalescing the multiple ongoing conversations relating to EV charging, and ultimately to advance regulation for a standard on smart EV charging. Further to this necessary immediate action, this should be the start of a single, combined conversation on standards, including wide consultation on their development. We applaud EECA for taking a lead in this area.

Any standards set should be developed in wide and transparent consultation, including with suppliers of software/equipment and aggregators, to ensure that they are fit for purpose for all affected parties. The flexibility value chain requires multiple different links to work together, each involving a wide range of actors. All of them have an interest in making sure the benefits of flexibility to consumers are maximised, and all will add useful perspectives.

In setting standards, efforts should be made to align with international standards and approaches wherever possible, to leverage learnings and avoid barriers to adoption of overseas technology. Other countries are further ahead than New Zealand in the uptake and use of DER. This includes in relation to open communications protocols. We note that OpenADR is mentioned specifically by EECA, but the development and application of IEEE 2030.5 in Australia should also be considered closely.

EECA should avoid technology-specificity where possible

The future energy ecosystem, and flexibility resources more specifically, will be characterised by an extremely wide range of DER providing a number of different services. It is too soon at this point to be able to say which DER will materialise the fastest and which will provide the most useful services.

In relation to smart EV chargers, this means there will likely be a range of options for consumers to choose from, meeting a range of different needs. For some consumers, a smart EV charger on the wall of their house or garage will make the most sense. For others, smart capabilities may best be provided in the charging cable (to the extent possible). Onboard smarts within the EV may make sense for others. In-home charging will be part of a broader, national charging system including a wide variety of public charging options. Having a range of charging options available to consumers provides a further source of flexibility.

It is too early to say at this point how consumers will choose to make use of public and in-home charging, and which technologies consumers will invest in. EECA should avoid picking winners in the future technology mix, and ensure that the benefits of flexibility will be realised no matter which technologies and behaviours prevail.

Similarly, much of the paper's content could apply equally to other connected consumer technologies, such as smart, individualised management of water heating (an evolution of the ripple system), which have the potential to provide significant quantities of flexibility [3]. The FlexForum would be interested to see EECA proactively take a lead in ensuring these resources also deliver long-term benefits to consumers.

The consumer value proposition may require enhancement to accelerate uptake of smart chargers

As expressed above, technology standards are a critical enabler for unlocking value from the flexibility in EV charging. However, standards alone cannot unlock the value for consumers, and it will be consumers who ultimately decide whether to take up smart chargers for their homes. Consumer education about, and buy-in to, the benefits of charging flexibility will be critical. EECA needs to play leading roles in providing consumers with information to inform the choices they make, and building widespread support for smart charging. Given consumers are making investment decisions today, the earlier this education begins, the better.

Value from flexibility in smart chargers accrues from avoiding costs in multiple parts of the electricity value chain, from generation and ancillary services through transmission and distribution. The FlexForum has worked since the start of the year to identify actions that can help unlock that value, enable that value to be 'stacked' and thereby enhance the proposition for the consumer considering installing a smart charger.

The end state foreseen by the FlexForum is a series of flourishing interconnected national and local markets for flexibility, delivering direct value for consumers who own DER and indirect benefits to those who do not. However, it will take some time, and a great deal of hard work and patience, for that vision to be realised. EECA should consider incentives that stimulate the development of sustainable and scalable market mechanisms to bridge the gap until these are economically viable.

FlexForum members are collaborating together and across the wider sector to develop projects that enable value stacking, to strengthen investment in DER and flexibility. However, there appears to be a gap in innovation funding available in New Zealand for projects that stimulate the development of flexibility markets and smart charging incentives. Innovation funding that enables a greater focus on customer desirability and commercial viability, in addition to technical feasibility, is required to develop scalable solutions. We would encourage EECA to consider and advocate for sufficient funding to enable the potential benefits to consumers to be realised.

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[1] The benefits available to households and businesses from DER and flexibility over time should include lower energy costs, a more resilient power supply, and more rapid decarbonisation

[2] UK Government. *Electric Vehicle Smart Charging: Government Response to the 2019 Consultation on Electric Vehicle Smart Charging*, July 2021

[3] Concept Consulting's 2021 report, *Shifting gear: How New Zealand can accelerate the uptake of low emission vehicles - Report 2: Consumer electricity supply arrangements*, showed that management of electric water heating provided the second-largest potential source of flexibility after EV charging. While 'ripple control' of hot water heating in return for a discounted electricity rate is a particularly mature use of flexibility, the FlexForum has noted that the evolution of a flexibility market requires distributors transitioning away from direct control of household hot water.