Australian Government
Australian Renewable Energy Agency

ARENA

24 August 2022

Energy Security Board
info@esb.org.au

GPO Box 643
Canberra ACT 2601
Tel: +61 2 9243 7773
ABN: 35 931 927 899
www.arena.gov.auhttp://www.arena.gov.au/

ARENA submission on the ESB EV Smart Charging Issues Paper

This submission provides information and insight relevant to the ESB's issues paper on EV Smart Charging. The electrification of land transport is expected to significantly increase the demand for energy, both in total and at peak times of the day. Without careful management, this could materially strain existing network capacity. Smart charging will allow EVs to improve capacity utilisation through load flexibility and potentially provide energy back to the grid as a distributed energy resource (DER). Fully understanding these impacts will be important to efficient integration of EVs into the grid.

ARENA's focus on EVs has predominantly been on accelerating the deployment of public charging infrastructure as well as supporting the effective integration of EVs into Australia's electricity system. To date, we have committed $57.6 million towards 16 projects directly addressing EV uptake, integration and innovation. Further information on relevant ARENA projects is provided in the Appendix. We will continue to support the sector through existing funding initiatives (such as the funding round of $127.9 million allowing fleets to transition to new vehicle technologies) and contemplated initiatives under the Government's 'Driving the Nation' policy.

We continue to support the Distributed Energy Integration Program (DEIP) to collaborate on industry needs and reforms in this area. ARENA leads the DEIP EV Grid Integration Working Stream, which in 2022 has a key focus on international and domestic knowledge sharing for smart charging initiatives. We support the DEIP Interoperability Steering Committee, which is exploring national standardisation of EV managed and vehicle to grid (V2G) integration and interoperability standards and protocols.

ARENA acknowledges the important role that policy and regulation can play in facilitating the uptake of EVs and supporting effective grid integration. In summary:

- Additional policy measures may be required to support residential smart charging costs and installation
- Streamlining DNSP tariffs can support public EV fast charging roll-out

- Flexible charging of EVs can enable increased load flexibility and there are opportunities for reduced costs to consumers

Consumers are willing to participate in managed charging but equipment cost is currently a significant barrier.

Smart chargers are approximately $2000-3000 per installed charger, creating a cost barrier that impedes consumer uptake. Smart charging also requires installation by trained parties with specific technical knowledge and not all sites can currently be connected with smart chargers. For example, on the AGL EV Orchestration project, AGL found that issues like trenching and existing infrastructure can make installation cost prohibitive, and that strata-title properties required body corporate approval for the charger, creating additional administrative barriers to uptake.[1] Further, the Origin EV Smart Charging Trial also noted that decisions need to be made as to appropriate internet connection, i.e. 4G or Wi-Fi or ethernet connection. There are a breadth of installation costs and benefits associated with the various connectivity options. For example, while 4G is expensive it also relies on telecommunication network coverage and is subject to blackspots. Ethernet has a stable connection, however, relies on consumer home security and there are additional costs associated with threading cables from router to charger. Wi-fi is currently seen as the cheapest and easiest approach, although it is subject to consumer coverage and security to driveway/carport.

In the context of these cost and installation barriers to smart charging, additional policy measures may be required to support residential smart charging installations. Early findings from ARENA-funded projects demonstrate that once smart charging is installed, EV owners demonstrate increased willingness to adopt smart charging behaviours. This includes shifting charging to off-peak periods and allowing for control of their charging, in response to tariffs or other incentives. In the Origin EV Smart Charging Trial, Origin implemented a fixed and variable reward mechanism to incentivise control. Origin found that participants responded strongly to the incentives. For example, charging during the peak periods reduced by 24% when compared to baseline charging patterns.

Insights from ARENA's smart charging trials are in their infancy, and further trials of alternative incentive models are underway and can inform future market reforms (e.g. tariff reforms, flexible trading arrangements, scheduled lite) and smart charging product development.

[1] See for example: https://www.sciencedirect.com/science/article/abs/pii/0360544283900944?via%3Dihub

Streamlining DNSP connection processes and tariff structures can support public EV fast charging roll-out

The deployment of public charging infrastructure will play a critical role in facilitating the electrification of Australia's transport. ARENA funded demonstrations suggest that streamlining connection processes and implementing tariffs appropriate for low-use charging sites could further support the deployment of public fast charging infrastructure. Distribution network tariffs that are not cost-reflective of Australia's low EV penetration can disproportionately increase the cost of installing EV charging infrastructure. Small business tariffs are applied by DNSPs based on MWh per annum thresholds, with some having a threshold of 160MWh per annum, but some running as low as a 40MWh per annum threshold. These inconsistencies add complexity, time and cost to chargepoint operators.

In Evie's National Ultra-fast EV Charging Infrastructure Network project, Evie's charging stations operated in accordance with small business thresholds. This is shown in Figure 1, below. However DNSPs would often seek to assign EV charging stations with a medium business tariff. This is because DNSPs assume a high capacity connection will result in high usage. This imposes a demand charge on charging operators despite the fact that EV charging utilises site capacity for a small portion of time. While Evie has been able to work with most DNSPs to ensure sites are initially assigned a small business tariff, absent a standard approach for EV charging, this process has been unique and bespoke for each DNSP.

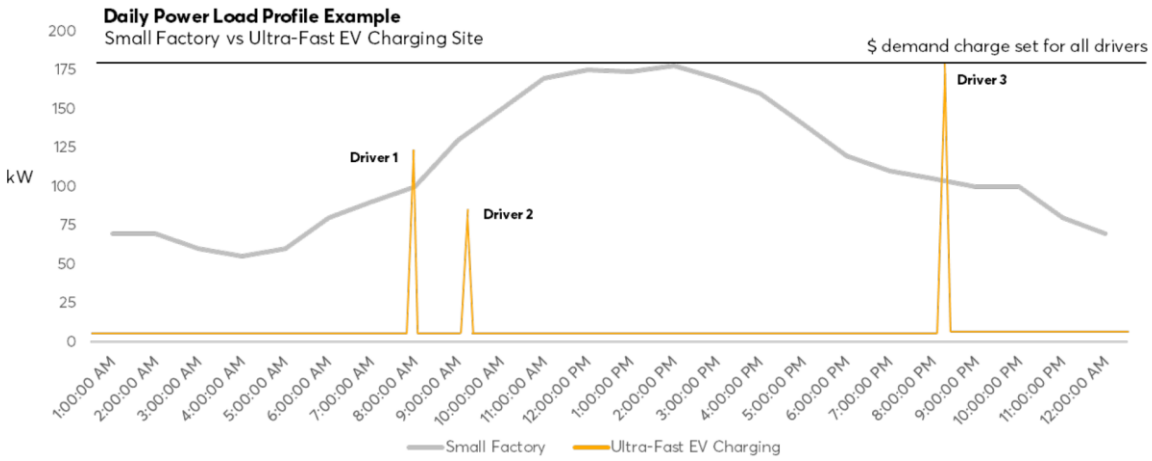

Figure 1 - illustrative daily load profile of a small factory versus EV ultrafast charging
(Source: Evie Lessons Learnt Report October 2021)

EV charging profiles are different to many other loads and network tariffs should reflect the cost associated with networks being able to meet peak loads. While demand charges for EV charge points may be appropriate, a short duration peak in demand should contribute less to overall network peaks compared to a flatter load, when considered at a network planning level (where individual customer demand is considered in aggregate). However, the coincidence of high loads with peak demand may require costly network upgrades and this is a particular concern if large numbers of consumers charge at a high capacity after work during very hot or cold weather when networks are often strained.

Flexible charging of EVs can enable load flexibility and there are opportunities for reduced costs to consumers

While EV uptake in Australia has been comparatively slower than across the globe, the expected growth of EV sales in Australia will have implications on distributed energy resources and demand flexibility. This has been witnessed by the rapid deployment of consumer-driven growth in rooftop solar PV.

ARENA's Load Flex Study examined what impacts the flexible charging of EVs could have on load flexibility in the network. The study modelled the potential value of flexible demand in the electricity transition. Flexible charging of EVs, whether through deferred charging or vehicle to grid (V2G) services, was found to be the most utilised source of load flexibility under any scenario. This is due to the very low marginal cost of delayed charging compared to other forms of load shifting or load curtailment.

The study further found rapid EV uptake substantially increases requirements for wind, solar and grid storage investment and, in the absence of flexibility, this places upward pressure on consumer electricity prices. However, more flexible EV charging can deliver savings to consumers between $3 to 5 billion (on a net present value basis in 2021). If captured, these savings fully mitigate the potential increases in electricity prices meaning that a rapid uptake of EVs with effectively managed charging can reduce costs for all customers, not just those with EVs.

About ARENA

The Australian Renewable Energy Agency (ARENA) was established in 2012 by the Australian Government. ARENA's function and objectives are set out in the *Australian Renewable Energy Agency Act 2011.*

ARENA provides financial assistance to support innovation and the commercialisation of renewable energy and enabling technologies by helping to overcome technical and commercial barriers. A key part of ARENA's role is to collect, store and disseminate knowledge gained from the projects and activities it supports for use by the wider industry and Australia's energy market institutions.

Please contact Monika Lelaird, Knowledge Sharing Manager (monika.leliard@arena.gov.au) if you would like to discuss any aspect of ARENA's submission.

Yours sincerely

Rachele Williams
General Manager - Project Delivery, ARENA

Appendix. Relevant ARENA-funded projects

Project	Funding	Information
Fast Charging		
Chargefox Ultrafast EV Charging Infrastructure Network (2018)	$6.00M	This project will deploy 21 ultra-fast EV charging sites across Australia.
Evie Ultrafast EV Charging Infrastructure Network (2019)	$15.00M	This project will deploy ultra-fast charging infrastructure across Australia.
JOLT Metro Advertising Revenue Funded EV Charging Trial (2020)	$0.98M	This project will deploy 21 EV charging and advertising panels in car parks and public spaces.
Evie Networks Future Fuels Public Fast Charging (2021)	$8.85M	This project will deliver 158 public fast-charging stations across eight regions in Australia, awarded under ARENA's Future Fuels Funding Round 1.
Ampol Addressing Blackspots Fast Charging (2021)	$7.05M	This project will deliver 121 public fast-charging stations across four regions in Australia, awarded under ARENA's Future Fuels Funding Round 1.
ENGIE Future Fuels Public Fast Charging (2021)	$6.85M	This project will deliver 103 public fast-charging stations across four regions in Australia, awarded under ARENA's Future Fuels Funding Round 1.
Chargefox Future Fuels Public Fast Charging (2021)	$1.40M	This project will deliver 16 public fast-charging stations across two regions in Australia, awarded under ARENA's Future Fuels Funding Round 1.
Hobart Electric Highway Tasmania Fast Charger Network (2021)	$0.40M	This project will deliver 5 public fast-charging stations across Tasmania, awarded under ARENA's Future Fuels Funding Round 1.
Smart Charging		

Jemena Smart Charging (2020)	$1.55M	This project explores the role of DNSPs in co-ordinating EV charging by using technology to manage charging with real-time information of network capacity.
Origin Smart Charging (2020)	$0.84M	This project is trialling smart charging programs for residential and commercial fleets.
AGL EV Orchestration Trial (2020)	$2.89M	This project is a large-scale EV charging orchestration trial comprising 300 EVs across Queensland, New South Wales, Victoria and South Australia. It also contains an aspect of V2G.
Realising Electric V2G Services Project (2020)	$2.73M	This project seeks to unlock economic and grid benefits of V2G services by installing V2G chargers at various fleet depots in ACT government
Studies		
Monash University and ClimateWorks Low Carbon Study (2016)	$0.39M	This project undertook modelling into pathways to deep decarbonisation through EVs and renewable energy technologies.
Evenergi SA Strategic Regional EV Adoption Program (2018)	$0.17M	This project investigated behavioural barriers to adoption and how EVs can best integrate with local solar generation and the wider grid in South Australia.
Evenergi Charge Together Phase 2 (2019)	$0.47M	This project developed an online platform to help businesses and consumers make informed choices about EVs and assists electricity networks to plan for the potential impact of EVs.
Other		
Applied Electric Vehicles Solar Electric Vehicle Pilot (2019)	$2.0M	The project will produce a lightweight, energy efficient, autonomous EV that will incorporate a solar PV roof and lithium-ion battery system.