ENERGY SECURITY BOARD

ELECTRIC VEHICLE SMART CHARGING ISSUES PAPER - FOR CONSULTATION

JULY 2022

Anna Collyer

Chair

Australian Energy Market Commission

Clare Savage

Chair

Australian Energy Regulator

Daniel Westerman

Chief Executive Officer

Australian Energy Market Operator

Table of Contents

Abbreviations and Technical Terms

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
CBA	Cost Benefit Analysis
CER	Customer Energy Resources
CPO	Charge Point Operator
DCA	Dedicated Connection Assets
DEIP	Distributed Energy Integration Program
DER	Distributed Energy Resources
DNA	Designated Network Assets
DNSP	Distributed Network Service Provider
ECA	Energy Consumers Australia
ESB	Energy Security Board
EVs	Electric Vehicles
EVSE	Electric Vehicle Supply Equipment
NEL	National Electricity Laws
NEM	National Electricity Market
NER	National Electricity Rules
NPV	Net present value
OCPP	Open Charge Point Protocol
OECD	Organisation for Economic Co-operation and Development
SEPA	Smart Electric Power Alliance (USA)
V2H	Vehicle-to-home
V2G	Vehicle-to-grid

Executive Summary

In October 2021, Ministers endorsed the Energy Security Board (ESB) Post-2025 Market Design recommendations and tasked the ESB with delivery of a DER Implementation Plan over the next three years to support the effective integration of DER and flexible demand.

As part of the DER Implementation Plan, the ESB outlined the immediate need to move towards mandates for technical standards for active DER, primarily due to the continued rapid uptake of rooftop solar. In parallel, the ESB was to progress the development of accompanying policies that can ensure these standards work in customers' best interests.

Standards to support the effective integration of charging devices for electric vehicles (EVs) were identified as a priority activity as part of delivering this plan.

Uptake of electric vehicles projected to increase

Australia is in the midst of a fast-paced energy transition. Changes in how households, businesses, and communities generate and consume energy are underway at both the large and small scale and require a reimagining of how consumer energy outcomes are met.

The sheer size of consumer-driven growth in rooftop solar PV, the projected growth of battery storage, and continued advances in digital technology, have the combined potential to revolutionise the way many consumers receive and use energy. These changes have already begun for many customers today, and the projected increase in EV ownership and eventual transition to a full EV fleet will be transformative on the energy supply chain. Planning for the transition and that longer-term future must commence today.

Although EV uptake in Australia has been slower than in offshore markets, with total EV sales of 20,665 over 2021 in Australia, this represents a threefold increase from the 6900 EVs sold in 2020, with growth continuing despite challenging supply chain issues in a post-Covid economy.[1]

Recent experience with the rapid uptake of domestic solar PV shows that Australian consumers are enthusiastic adopters of new technologies. Over the next few years EV uptake across Australia is projected to grow substantially and become a key form of Customer Energy Resources (CER). In its 2022 Integrated System Plan (ISP), AEMO projects scenarios including nearly five times the distributed solar PV capacity, and a substantial growth in distributed storage, with EV uptake projected across all scenarios.[2] This growth has implications for planning and forecasting of energy demand across the NEM, and in particular for the potential impact on future peak demand requirements.

Consumers will primarily buy EVs to meet their transportation needs. However, given the potential energy implications of a significant electrification of the transport fleet, it is relevant to consider how settings may be introduced in ways that can support and encourage convenient and efficient charging behaviour as well as drive efficient investment decisions and fairness between EV and non-EV consumers during the transition. In this context, it is relevant to consider how settings can help to unlock greater value for

---

[1] https://electricvehiclecouncil.com.au/ev-sales-boom-presents-chance-to-capture-serious-electric-benefits-if-government-acts-now/

[2] AEMO, 2022 Integrated System Plan (ISP), June 2022. All scenarios include EV uptake, and some Vehicle to Grid services are assumed in all scenarios, but notably in the Step Change and Hydrogen Superpower scenarios. These scenarios are informed by a range of DER and energy efficiency policies as well policies targeting uptake of EVs across NEM jurisdictions.

customers, with recent ARENA studies indicating the value of load flexibility to be in the range of $8-18bn NPV.[3]

Issues for stakeholder consideration

The ESB has been tasked with developing policy advice regarding what technical foundations are necessary to support the effective integration of smart charging for EVs into the NEM. The issues highlighted for consideration in this paper, are raised with the intention of enabling the EV charging needs of consumers, both in domestic and public settings.

The ESB recognises that these settings will need to work in step with other related EV policy developments also being carried out in parallel across jurisdictions and market bodies, and with related work on other forms of DER interoperability such as rooftop solar. EVs represent an opportunity to enable the electrification of transportation, supporting emissions reduction and a move towards the net zero goals of all jurisdictions. Overall, a key focus needs to be on how to deliver effective outcomes for all energy consumers (whether they have EVs or not). The fact that EV uptake to date in Australia lags other markets represents an opportunity to learn from international experience and adapt what might work best in an Australian context.

This paper seeks stakeholder views on a range of issues relating to the development of effective arrangements for EV smart charging in both domestic and public settings. These include the need for:

- Residential equipment standards and an intention, where possible, to promote alignment across jurisdictions
- Consideration of international experience / settings to consider how relevant settings could be developed / adapted in the NEM
- Interoperability standards – supporting residential interoperability and remotely managed smart charging capabilities
- Policy settings that allow for the growth of private investment in public charging.

Next steps

The ESB invites feedback from interested parties in response to the issues raised in this consultation paper by **19th August 2022**. This feedback will support the development of draft directions and advice to government relating to the adoption of minimum standards for EV smart charging.

The ESB intends to hold a workshop with stakeholders and interested parties on the material covered in this paper on **2nd August 2022.** Interested parties are invited to register their interest by email to info@esb.org.au.

[3] ARENA, Load Flexibility Study, April 2022. The technical summary for this study can be found here: https://arena.gov.au/assets/2022/02/load-flexibility-study-technical-summary.pdf

1. Introduction

The Energy Security Board (ESB) was tasked by the former COAG Energy Council to deliver a market design for the National Energy Market (NEM) to meet the needs of the energy transition beyond 2025. In its final advice to Ministers for Post-2025 Market Reforms, the ESB recommended a Distributed Energy Resources (DER) Implementation Plan to support the effective integration of DER, including flexible demand.[4]

In October 2021, Ministers endorsed ESB recommendations and tasked ESB with delivery of the DER Implementation Plan over the next three years. As part of the DER Implementation Plan, the ESB outlined the immediate need to move towards mandates for technical standards for active DER, primarily due to the continued rapid uptake of rooftop solar and, in parallel, to progress the development of accompanying policies that can ensure these standards work in customers' best interests.

Electric vehicles (EVs) will reshape consumers' energy needs and practices and have a transformative impact on the electricity grid. Development of a coordinated charging policy for EVs was identified as an area that would deliver significant long-term benefits for consumers through better user experience and system efficiencies. This work was highlighted as an activity for Horizon One of the DER Implementation Plan, in recognition that near term attention is needed to understand the consumer issues associated with EV charging and ensure readiness for the flow-on impacts of EV charging on the NEM. Access to effective data on EV charging was also identified as a priority within the supporting ESB Data Strategy, as critical to effective planning and policy given the scale of impact on the system.[5]

Work to identify relevant technical standards has been progressed via the Distributed Energy Integration Program (DEIP), facilitated by ARENA.[6] This work has included consideration of the technical and data requirements for smart charging of EVs and implications for effective integration of EVs at a significant scale into the NEM.

The purpose of this paper is to seek input from stakeholders on key issues for consideration as part of development of regulatory and market settings to support smart EV charging in the NEM.

This paper considers potential gaps, barriers and enablers in policy settings that may impact effective uptake of smart EV charging infrastructure for both domestic and public EV charging.

The ESB welcomes the work undertaken by the ARENA-facilitated DEIP forums and associated working groups as a key input into this process.

Based on thoughtful engagement from customer groups and interested stakeholders on the rapidly growing 'behind-the-meter' energy ecosystem, the ESB shall adopt the term 'customer energy resources' or CER, instead of 'distributed' energy resources, to better reflect the role, ownership and opportunities

---

[4] ESB, Post-2025 market design: Final advice to Energy Ministers – Part A. Available at: https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf.

[5] ESB Data Strategy. Available at: https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf

[6] The ARENA facilitated Distributed Energy Integration Program has established an industry led steering committee on technical standards, referred to as the Interoperability Steering Committee, with wide representation across the sector.

these devices represent for customers.[7] Where appropriate in this paper, and more generally, the ESB will seek to update its use of 'DER' to 'CER'.

1.1 Scope

Consumers will primarily buy EVs to meet their transportation needs. At the same time, uptake of consumers purchasing EVs represents a significant opportunity in how these 'batteries on wheels' operate and integrate into the NEM. As a key emerging form of CER, getting the settings right to support the integration of EVs is a priority activity within the ESB's 'DER' Implementation Plan.

The ESB has been tasked with developing policy advice on what technical foundations are necessary to support the effective integration of smart charging for EVs into the NEM. This is a broad objective which involves consideration of multiple policy settings to achieve the right outcomes for consumers.

The ESB recognises that these settings will need to work in step with other related EV policy developments being carried out in parallel. EVs represent an opportunity to enable electrification of transportation, supporting emissions reduction and move towards the net zero goals of all jurisdictions. Overall, a key focus needs to be on how to deliver effective outcomes for all energy consumers (whether they have EVs or not).

The ESB is seeking input on a broad range of inter-related issues. We recognise issues raised may relate to broader policy settings than initiatives within the DER Implementation Plan. The ESB notes that insights raised on these issues will inform considerations by ESB, together with colleagues from across the market bodies. Further, in developing this advice, stakeholder and customer insights gained will also be shared with state and federal government colleagues to support related considerations for EV policy settings, which could extend beyond the remit of Energy Ministers (such as planning laws or public transport parking arrangements).

This Issues Paper is intended to seek stakeholder engagement on the following topics:

- What mix of policy settings might be necessary to support benefits to all consumers from the electrification of transport, by:
    - Identifying potential gaps, barriers and enablers in policy settings that may impact effective uptake of smart EV charging and the adoption of charging frameworks that will provide long term benefits to consumers.
    - Highlighting potential implications of these gaps for customers, investors, the grid system and for market / regulatory arrangements.
    - Identifying current grey areas or gaps in regulatory policy or technical requirements relating to public and domestic charging.
    - Discussing where these areas may not be fit for purpose to support effective uptake and cost-minimised integration of EVs. For example: exploring minimum smart charging capabilities and consumer participation frameworks to ensure the EV transition provides both customer choice and whole-of-system consumer benefits.
    - Floating for industry consideration alternative policy approaches, tariff structures and technology-specific challenges arising from e-mobility and two-way energy services. For

[7] Energy Consumers Australia (ECA) have been strong advocates for a shift in language to better reflect this dynamic for consumers.

example: consideration of the two-way flow between EVs and the grid, ensuring fit for purpose consumer protections are in place.

- Outlining the importance of these policy approaches and technical requirements for the EV transition in balancing consumer outcomes in ensuring fairness between EV and non-EV owners.
- Highlighting the incremental barriers and enablers for new services that will arise, such as public charging, smart domestic charging, as well as vehicle-to-home (V2H) and vehicle-to-grid (V2G) scenarios.
- Identifying future challenges / risks for customers associated with interoperability related to EV charging. For example, switching providers with home chargers and roaming between public charge providers and consumer billing.
- Highlighting where existing lack of access to, or sharing of, relevant data may limit effective integration of smart EV charging into the NEM. The paper discusses and identifies where initiatives being undertaken as part of the ESB Data Strategy may help inform future policy development and enhance EV technology adoption.

1.2 Approach

The ESB held stakeholder workshops over April 2022. Stakeholder input from these sessions has informed the scope of issues highlighted for consideration in this paper. The objective of these sessions was to capture as many perspectives from industry practitioners and consumer representatives on the high priority reform areas that intersect with EV charging.

This engagement also built on work carried out by the DEIP EV reference group. The DEIP process established a strong industry working group, which also considered essential EV data to support longer term strategic planning.

The Future Fuels strategy announced by the Commonwealth Government last December is similarly working towards some nationally consistent frameworks around electric vehicle charging.[8] The ESB will continue to work with all jurisdictions to work towards national approaches where these can support better outcomes for customers.

1.3 Relationship to other activities

The development of policy advice for smart EV charging will be a key element to support the effective integration of CER into the NEM, including flexible demand. Development of this advice is identified as a priority for delivery the ESB's DER Implementation Plan.

The ESB notes that there is a number of other workstreams across the Post-2025 reform program that have close relationships with this work. In coordinating reform activities across the DER Implementation Plan, the ESB and market bodies are carefully considering the potential implications for adjacent bodies of work.

[8] Information can be found here: https://www.industry.gov.au/data-and-publications/future-fuels-and-vehicles-strategy

The issues highlighted in this paper have been informed by, and conducted in close collaboration with, a range of wider reform activities. Where insights from this consultation can also inform those processes, the ESB will collaborate with agencies to support this. Related reform activities taken into account include:

- **DEIP EV & Cyber Working Groups, and DEIP Interoperability Steering Group**: these groups are examining and providing advice on data, communications, cyber security, and interoperability standards across CERs, including solar, storage, electric vehicles, and flexible load.
- **Development of policy advice for interoperability technical standards for inverter based solar and storage**: The ESB will shortly be consulting on draft directions for how the CSIP-Aus[9] interoperability standard should be applied in the NEM. Insights from that consultation will be relevant considerations for approach issues on EV smart charging.[10]
- **AER tariff reform:** including consideration of how smart EV charging tariffs would be introduced in a timely manner by DNSPs
- **AEMC metering review:** including the requirement for smart chargers and interval metering for DER services.
- **AER Retailer Authorisation and Exemption Review**: which is considering potential risks and harms for customers engaging in new / emerging energy products and services. This could include EV aggregators and charge network providers responsibilities. The ESB is working closely with the AER on these issues. Where issues are highlighted relating to customer protections these will be relevant to considerations in the AER review process.
- **AEMC review of governance of technical standards**: this will also consider relevant roles and responsibilities for various actors from enablement through to operation.
- **National Measurement Institute consultation on metrology for AC and DC EV charging systems:** seeking to provide a pathway for pattern approval for international equipment vendors entering Australia.
- **DISER on regulatory barriers for EV grid integration**: the Commonwealth has commissioned a review into the various regulatory barriers that exist at a national level for EV grid integration.
- **Implementation of the ESB Data Strategy**: which will consider, among other important reforms, electric vehicle supply equipment (EVSE) data collection mechanisms and delivery options and related work being undertaken with the ARENA DEIP EV workstream.
- **State and Territory Government smart charging grants program**: which are setting out both minimum equipment standards as well as approaches on interoperability and communications.
- **Development of EV policies across Commonwealth and jurisdictional government departments**.

[9] CSIP-Aus (Common Smart Inverter Protocol) is the Australian derivation / implementation of the IEEE 2030.5 standard that has been mandated for inverter-based resources in California.

[10] The ESB notes that related work is also underway via DEIP to develop the interoperability standard 'CSIP-Aus', adapting an international standard applied in California to consider needs within the NEM. The CSIP-Aus relates to inverter settings within solar PV and battery storage devices. The ESB is currently developing draft directions for how this interoperability standard should be applied in the NEM. Insights from the upcoming stakeholder consultation will be relevant considerations for approach issues on EV smart charging.

2. Why an EV smart charging policy?

Australia is in the midst of a fast-paced energy transition. Changes in how households, businesses, and communities generate and consume energy are underway at both the large and small scale and require a reimagining of how consumer energy outcomes are met.

The sheer size of consumer-driven growth in rooftop solar PV, the projected growth of battery storage, and continued advances in digital technology, have the combined potential to revolutionise the way many consumers receive and use energy. These changes have already begun for many customers today, and the increase in EV ownership and eventual transition to a full EV fleet will be transformative on the energy supply chain. Planning for the transition and that longer-term future must commence today.

The ESB Post-2025 advice to Ministers set out a range of recommendations intended to meet the needs of the energy transition and beyond 2025. These reform pathways set out changes needed to existing market and regulatory frameworks, including reforms to enable the effective integration of CER including flexible demand.[11]

Although EV uptake in Australia has been slower than in offshore markets, with a total of 20,665 EV sales over 2021 in Australia[12], this still represents a threefold increase from the 6900 EVs sold in 2020.[13] Over the next few years EV uptake is projected to grow substantially and become a key form of CER. This growth has implications for planning and forecasting of energy demand across the NEM, and in particular for the potential impact on future peak demand requirements. However, with EV uptake to date in Australia lagging that seen in other markets, this represents an opportunity to learn from the range of policy settings that have been introduced in other markets and adapt what might work best in an Australian context.

The issues highlighted for consideration in this paper are raised with the intention of enabling the EV charging needs of consumers, both in domestic and public settings. Recent experience with the rapid uptake of domestic solar PV shows that Australian consumers are enthusiastic adopters of new technologies, particularly where government support may be in place to encourage uptake. Given the potential energy implications of a significant electrification of the transport fleet, it is relevant to consider how settings may be introduced in ways that can support and encourage convenient and efficient charging behaviour as well as drive efficient investment decisions and fairness between EV and non-EV consumers during the transition.

Consumer insights gathered by the ESB as part of the Customer Insights Collaboration[14] program illustrate the value in taking care to centre the experiences of customers in developing policy arrangements. It is useful in this respect to consider where barriers and enablers exist and may impact how consumers will adopt and engage in future EV energy related products and services. For example,

---

11 https://energyconsumersaustralia.com.au/news/death-to-der-why-we-need-to-change-the-language-we-use-for-the-energy-transition

12 This compares to figures in Europe where in 2020, EVs across Europe made up 11.5% of passenger cars sold, up from 3.5% in 2019. Further, in 2020, the size of the total vehicle parc in Europe was 326 million, of which just 1% was electric. By 2035, EY analysts calculate that the total EV parc will exceed 130 million vehicles (where 'parc' is a European term that refers to all the registered vehicles within a defined geographic region).
Source: Power sector accelerating eMobility – joint EY and Eurelectric report, 2022.

13 https://electricvehiclecouncil.com.au/ev-sales-boom-presents-chance-to-capture-serious-electric-benefits-if-government-acts-now/

14 The ESB will shortly be releasing a knowledge sharing report from Release One of the Collaboration. Information will be available here: https://esb-post2025-market-design.aemc.gov.au/reports-and-documents

key points of engagement with customers as part of their purchase process are likely to influence their experience and understanding of how to unlock potential value from their EV. It is useful to consider how we might we be able to improve customer outcomes with clear information from trusted sources at key points of engagement. Further, considering how different customers may respond to incentives and policy nudges can inform what this might mean for a mix of decisions relating to EV charging related infrastructure, tariff structures and standards.

Projections of EV uptake in the NEM

In its 2022 Integrated System Plan (ISP), AEMO projects scenarios including nearly five times the distributed PV capacity, and a substantial growth in distributed storage. These scenarios are informed by a range of DER and energy efficiency policies as well policies targeting uptake of EVs across NEM jurisdictions.

The anticipated increase in EVs is evident across each of the scenarios (all of which assume some Vehicle-to-Grid (V2G) scenarios), but particularly so in the Step Change and Hydrogen Superpower scenarios. While V2G opportunities may still be very nascent, it highlights significant potential for customers to unlock further value from their electric vehicle purchases in future – enabling potentially valuable flexibility to the grid and additional value streams directly to customers. This is illustrated in the following discussion and in Figure 1 below:

> *'As the price of EVs falls, for example, their share of the total vehicle fleet is expected to increase, rising in Step Change to 58% by 2040. This would account for approximately 37 TWh of electricity demand, with a demand profile that would ideally provide a sponge for solar supply but may exacerbate peak demands without proper infrastructure and consumer incentives to charge outside these periods.'*[15]

15 AEMO 2022 Integrated System Plan (p32), AEMO, June 2022

Figure 1 Scenario input assumptions, AEMO 2022 Integrated System Plan[16]

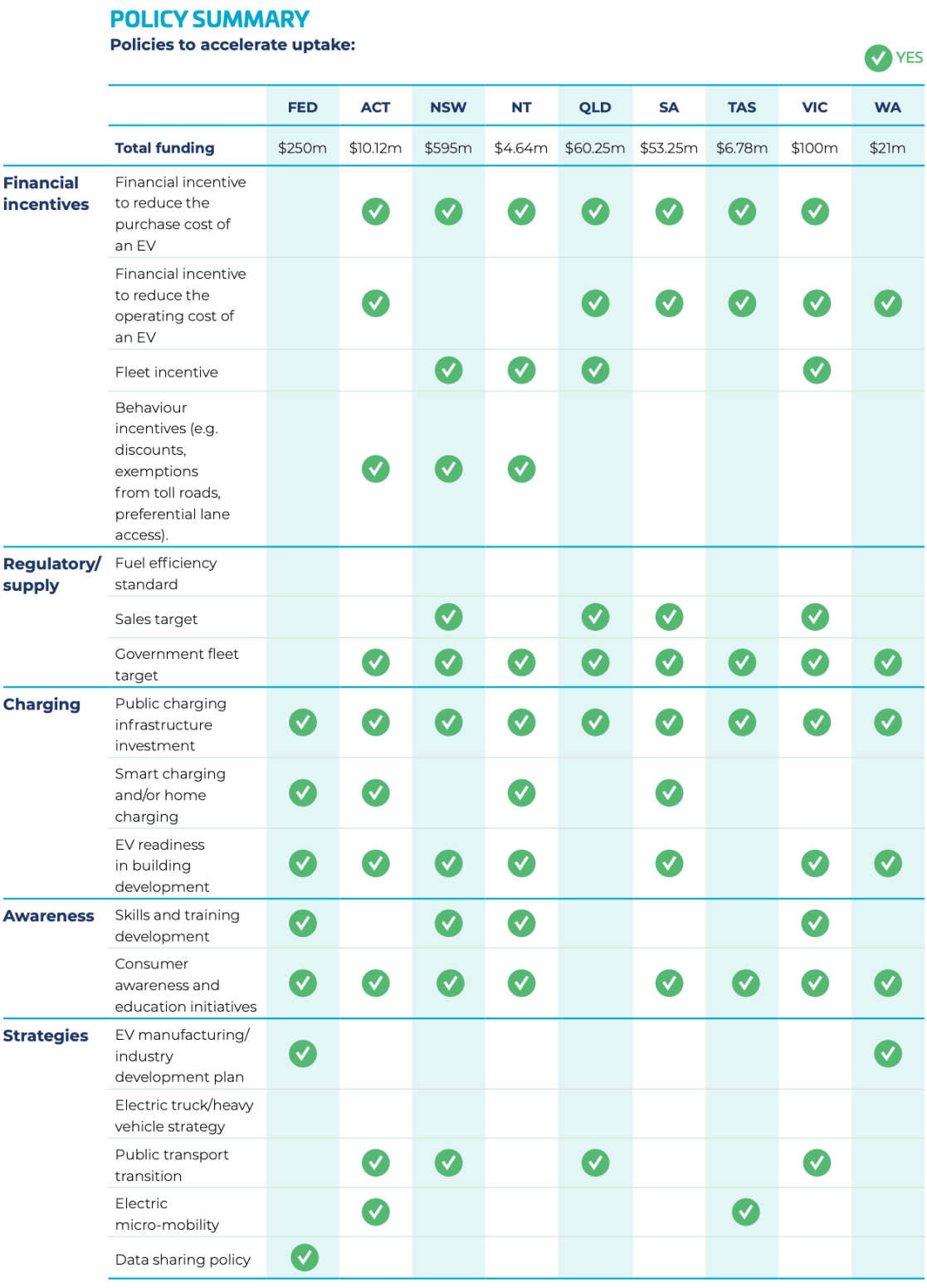
DEMAND	Slow Change		Progressive Change		Step Change		Hydrogen Superpower	
Electrification	2030	2050	2030	2050	2030	2050	2030	2050
- Road transport that is EV (%)	2	36	5	84	12	99	18	94
- Residential EVs still relying on convenience charging (%)	82	58	75	44	70	31	66	22
- Industrial Electrification (TWh)	-24	-21	4	92	27	54	37	64
- Residential Electrification (TWh)	0	0	0.2	15	4	13	2	4
- Energy efficiency savings (TWh)	8	19	14	40	22	55	22	56
Underlying Consumption								
- NEM Underlying Consumption (TWh)	163	213	201	394	222	336	243	330
- Hydrogen consumption - domestic (TWh)	0	0	0	32	0.1	58	2	132
- Hydrogen consumption - export, incl. green steel (TWh)	0	0	0	0	0	0	49	816
- Total underlying consumption (TWh)	**163**	**213**	**201**	**425**	**223**	**394**	**294**	**1,278**
SUPPLY								
Distributed PV Generation (TWh)	39	58	39	80	45	93	51	112
Household daily consumption potential stored in batteries (%)	3	5	5	22	12	38	13	39
Underlying consumption met by DER (%)	24	27	20	19	20	24	17	9
Coal generation (% of total electricity production)	32	5	38	2	21	0	6	0
NEM emissions (MT CO_2-e)	53.3	13.0	77.2	22.4	48.1	6.8	20.6	6.6
2020 NEM emissions (% of)	38	9	54	16	34	5	15	5

Figure 2 below provides a summary of current federal and jurisdictional policies intended to support the uptake of EVs in Australia (at March 2022).

While some of these policies are in early stages, we note there is clear support across jurisdictions to provide a range of incentives and support for EVs as part of government strategies to enable electrification and decarbonisation of transport and assisting net zero ambitions.

16 AEMO 2022 Integrated System Plan (p31), AEMO, June 2022

Figure 2 Australian federal and jurisdictional government policies relating to EV uptake[17]



POLICY SUMMARY

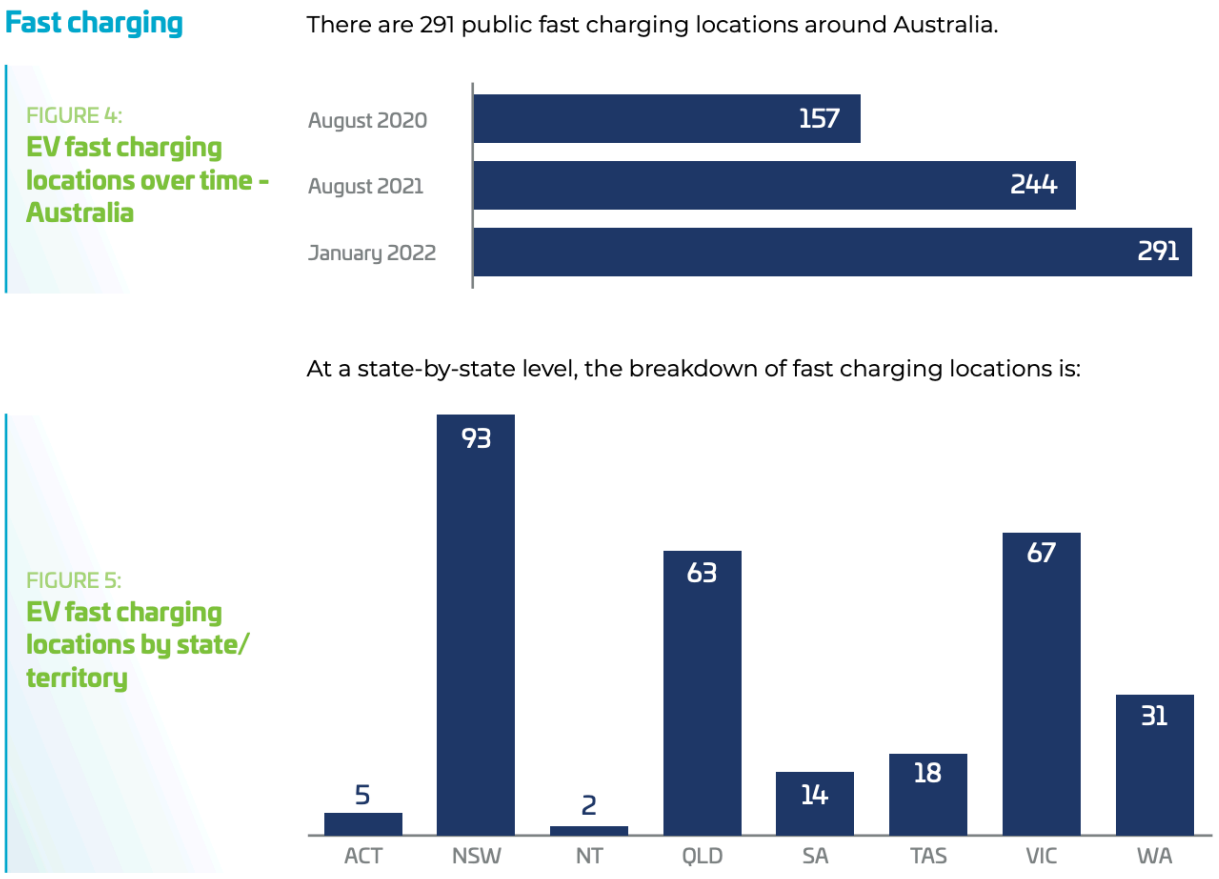
Policies to accelerate uptake:

✓ YES

		FED	ACT	NSW	NT	QLD	SA	TAS	VIC	WA
	Total funding	$250m	$10.12m	$595m	$4.64m	$60.25m	$53.25m	$6.78m	$100m	$21m
Financial incentives	Financial incentive to reduce the purchase cost of an EV		✓	✓	✓	✓	✓	✓	✓	
	Financial incentive to reduce the operating cost of an EV		✓			✓	✓	✓	✓	✓
	Fleet incentive			✓	✓	✓			✓	
	Behaviour incentives (e.g. discounts, exemptions from toll roads, preferential lane access).		✓	✓	✓					
Regulatory/ supply	Fuel efficiency standard									
	Sales target			✓		✓	✓		✓	
	Government fleet target		✓	✓	✓	✓	✓	✓	✓	✓
Charging	Public charging infrastructure investment	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Smart charging and/or home charging	✓	✓		✓		✓			
	EV readiness in building development	✓	✓	✓	✓		✓		✓	✓
Awareness	Skills and training development	✓		✓	✓				✓	
	Consumer awareness and education initiatives	✓	✓	✓	✓		✓	✓	✓	✓
Strategies	EV manufacturing/ industry development plan	✓								✓
	Electric truck/heavy vehicle strategy									
	Public transport transition		✓	✓		✓			✓	
	Electric micro-mobility		✓					✓		
	Data sharing policy	✓								

For the purpose of this paper, we note the focus on policies related to EV charging across jurisdictions and the Federal government. Figure 3 below provides a further illustration of the current state of existing public EV fast charging infrastructure across Australia. Consistent with trends of EV uptake, this shows that availability of EV fast charging infrastructure is growing in response to consumer needs.

Figure 3 Existing charging infrastructure[18]



Enabling interoperability of devices – supporting choice for customers

Customers will have access to a wide range of energy service providers and plans to enable choice in how they use their assets. For customers to get the most out of the technologies they are investing in, service providers will require the ability to communicate with and operate these devices. This refers to the 'interoperability' of devices. In the context of EVs, customers may wish to be able to charge their vehicle at different locations (e.g., at home and at work) and also via different charging stations (e.g., at public charging facilities close to main thoroughfares, which may be owned and operated by different service providers).

---

[17] State of Electric Vehicles (p19), EV Council, March 2022.
Note, WA has also announced policies and support relating to EV smart charging. Further information on the WA EV Action Plan can be found here: https://www.wa.gov.au/system/files/2021-08/EPWA-EVActionPlan_18Aug2021e.pdf

[18] State of Electric Vehicles (p12), EV Council, March 2022

In its final Post-2025 advice, the ESB identified principles relating to the interoperability of CER devices.[19] It is intended that these principles can be used to guide efforts on the creation of standards, and structures that incorporate active CER efficiently into the larger system. These include:

- *Consumers should be able to share data with service providers.* Interoperability should be standardised to allow data portability and sharing between consumer, aggregator, network, and market
- *Consumers' DER assets should have a level of portability between providers.* These standardised communications should enable consumers to move between providers (and technology) and promote competition between providers. These standards should be minimum levels of capability while allowing providers to layer additional functionality over the top so they can offer their own innovative products and services.
- *Control of and access to consumer devices should be limited to clear use cases.* Control of any consumer device by a network or system operator should be limited to a set of well documented use cases that can be updated from time to time as agreed by industry.
- *Consumers need to receive clear information about the compatibility of their DER assets.* Device manufacturers, installers, and service providers must be transparent about any proprie tary technology resulting in closed eco-systems and the consequences or limits of those closed eco-systems.

Note the ESB will shortly also be consulting on draft directions relating to interoperability of solar PV and batteries.[20]

[19] ESB, Post-2025 market design: Final advice to Energy Ministers – Part B. Available at: https://esb-post2025-market-design.aemc.gov.au/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

[20] Information on ESB reports can be found here: https://esb-post2025-market-design.aemc.gov.au/

3. Potential gaps and barriers in policy and regulatory settings

In considering the potential gaps and barriers in policy and regulatory settings, the ESB has set out discussion below in respect of:

- Domestic Electric Vehicle Charging
- Public Electric Vehicle Charging.

While there may be overlaps in some areas, there are also specific customer needs and considerations depending on which setting is being used for vehicle charging.

3.1 Domestic Electric Vehicle Charging

As highlighted in Chapter 2, uptake of EVs in Australia is currently not at the level of other OECD nations. There are a number of international jurisdictions where Australia can therefore benefit from considering the effectiveness of existing policies: e.g. the United Kingdom, Germany, Netherlands, Norway, and California.

This operating experience may be useful to inform key parameters of the policy, specifically in respect of minimum equipment standards. This could include considering the models and effectiveness of compliance, and the availability of government incentives alongside the policy introduction. It also could provide useful insights into consumer experiences, protections and risks associated with the policy implementation, and interactions with other home energy devices.

Based on data from comparable international jurisdictions, it is estimated that around 80% of electric vehicle charging will happen at home. EY recently reported that '*today, there are over 374,000 public charging points in Europe… the predicated 130 million EVs are going to need at least 65 million chargers – 9 million of which will be public and 56 million residential – by 2035 across Europe*'.[21]

Given AEMO's ISP Step Change scenarios (indicating 12% of electric transportation on the road across the NEM by 2030), this could introduce a significant increase in household electricity demand, with corresponding system implications if effective regulatory and market settings are not in place to encourage charging at efficient times of the day.

For example, consuming this additional electricity at peak times could require a significant additional investment in distribution networks to support the increased peak load. The costs of the required infrastructure would be shared across all network users via network tariffs. This has implications for those consumers that may not have the means or opportunity to purchase an EV or install a home charger (e.g., such as those consumers living in units or in rental accommodation).

Alternatively, the widespread take-up of EVs could also present a significant opportunity to unlock value associated with flexible EV resources (i.e., batteries on wheels) and in doing so, maximise benefits for all electricity users. Recent ARENA studies into load flexibility have indicated a range of $8-18bn NPV in benefits as potential opportunity that could be unlocked where a range of effective communications, incentives, charging, and tariff settings are introduced.[22]

---

[21] Power Sector accelerating e-mobility – Can utilities turn EVs into a grid asset?; EY and Eurelectric (2022)

[22] ARENA, Load Flexibility Study, April 2022. The technical summary for this study can be found here: https://arena.gov.au/assets/2022/02/load-flexibility-study-technical-summary.pdf

The discussion below highlights current international and domestic (Western Australian) experiences in respect of how smart charging capabilities and consumer participation frameworks are being implemented.

Great Britain

From 30 June 2022, any consumer charge point sold in Great Britain must come with minimum smart charging capabilities, supported by a consumer participation framework. The UK Government states "*The regulations ensure charge points have smart functionality, allowing the charging of an electric vehicle when there is less demand on the grid, or when more renewable electricity is available. The regulations also ensure that charge points meet certain device-level requirements, enabling a minimum level of access, security and information for consumers."*[23] The requirements include:[24]

- Chargers must come set to default to off-peak charging, which can be changed
- Chargers must have minimum functionality to be actively coordinated by an aggregator (CPO); with OCPP1.6 a minimum protocol to achieve this capability
- Default charge settings do not apply if the charger is sold with a 'demand-side response' agreement – that is the smart charger is being actively coordinated by an aggregator
- Cyber security capabilities consistent with the UK cybersecurity standard (ESTI EN 303 645)
- Electricity Retailer / aggregator / CPO interoperability, allowing the charge point to retain smart functionality even if the owner switches provider
- Continued charging even if the charge point ceases to be connected to a communications network
- Safety provisions, preventing the user carrying out an operation which could risk the health or safety of a person
- A measuring system, to measure or calculate the electricity imported or exported and the time the charging lasts, with visibility to the owner of this information

Charge points must also:

- Incorporate pre-set, off peak, default charging hours and allow the owner to accept, remove or change these upon first use, and subsequently;
- Allow for a randomised delay function.

United States

The Smart Electric Power Alliance (SEPA) is a membership organisation comprised of utilities, technology solution providers regulators, and other stakeholders. In 2021 SEPA surveyed 51 US distribution networks. Its findings included:

- "Universal" support for EV charging programs with all networks surveyed either having implemented or are planning to implement smart charging programs
- The networks noted the top 3 most important factors to facilitate EV smart charging as:

---

[23] https://www.gov.uk/guidance/regulations-electric-vehicle-smart-charge-points.

[24] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1078138/Guide-to-evscp-regulations-2021-V2.1.pdf

P 8-15

1. Industry consensus on a smart charging protocol
2. Smart charging program design, including sufficient incentives (around US$600 plus TOU tariffs) to encourage opt-in enrolments in the programs
3. Regulatory and policy support for smart charging projects.

Australian jurisdictional policies

The South Australian Government recently released minimum smart charging capabilities for EVSEs.[25] From 1 July 2024, SA requirements will include:

- EVSEs must meet one of the following communication protocols (OCPP1.6 V2 or ANSI/CTA 2045-B)
- A 'deemed to comply' option for EVSEs that do not meet these protocols. This option will enable suppliers to demonstrate that the EVSE has been tested and meets a set of demand response criteria.
- EVSEs need to meet some demand response functionality from the AS 4755 framework.

These protocols were found to be the most suitable for immediate adoption based on an evaluation against a range of criteria including maturity, market adoption and equivalence to the demand response capability within the AS 4755 framework.[26]

The Western Australian government has an EV strategy pointing to future work in standards development, via "developing and updating standards, guidelines, and planning approvals".[27]

The Queensland, Victorian and New South Wales Governments also have comprehensive EV Roadmaps and are each providing financial incentives reducing the up-front purchase cost of various zero emission vehicles.

Based on review of international policy initiatives, and workshops with market bodies, industry and consumer groups connected to the EV sector, two key policy areas are outlined for discussion. These include:

1. Minimum smart charging equipment standards to ensure the charging fleet is sufficiently capable of coordination, and
2. Arrangements to ensure active coordination of charging infrastructure must be used in the home and can be optimised by consumers and operators alike using over-ride capability, automation, and artificial intelligence (AI).

3.1.1 Minimum Smart Charging Equipment Standards

Given forecasts regarding the scale of EV uptake, potential network impacts and in light of international response to similar trends, it is useful to consider the value of building in optionality for future EV use

[25] Electric Vehicle Supply Equipment (EVSE) standards | Energy & Mining (energymining.sa.gov.au)

[26] The Department of Energy and Mining Consultant report found that 30 of 47 EVSE models investigated would currently meet OCPP1.6 V2 or ANSI/CTA 2045-B.

[27] https://www.wa.gov.au/service/environment/environment-information-services/electric-vehicle-strategy

cases. This means considering where potential opportunities for introducing standardisation may support delivery of value for consumers. Such requirements could include at a minimum:

- minimum functionality for domestic chargers to be installed with built-in scheduling, and
- remote management and consumer over-ride capabilities.

By setting minimum functionality in equipment standards to support interoperability of devices, this would support the introduction of EVSE coordination via remote communications now, or at a future time. EV consumers will benefit from being able to set or move their charge times to cheaper rates during different parts of the day or night, and by being able to move between EVSE service providers for no additional cost to capture more competitive market offers. Standardisation can also reduce complexity for consumers and simplify the user experience.

If a minimum communication protocol is possible with little / no upfront cost, this may be a cost-effective option to embed in equipment settings for the charge station fleet early on. However, should the upfront cost to upgrade to remote management be significant, it could diminish the value of the standard in allowing a retractive (not grandfathered) step up in standards to active management and remote communications.

Note that these minimum requirements would apply to 7-22kW (1-3 phase) equipment and higher that would be installed by a suitably qualified electrician. These requirements would not include wall plug chargers (< 7 kW, often referred to as 'trickle chargers').

STAKEHOLDER FEEDBACK

1. ESB welcome stakeholder views and input on smart charging equipment standards settings including any input to inform the likely costs.

2. ESB welcome stakeholder views on the introduction of minimum EVSE equipment standards without remote management, and whether this will provide future optionality for managing peak demand.

3. ESB understands that most EVSEs on the market today come with smart charging as a minimum functionality - is this the case or do stakeholders see this as still an emerging functionality?

Candidate Communication Protocols

Considerations of existing standards in Australia (such as AS.4755) and informed by experience from international markets, indicate a number of communication protocols could be considered for adoption in an Australian context. These include:

Communication Protocol	Description	Consideration
Open Charge Point Protocol (OCPP) 1.6 or higher	Specifically designed for Charge Point Operator to EVSE Communications	Strong industry support and broad uptake. Works with ISO 15118
OpenADR (IEC 62746-10-1)	Communication to demand response assets (including EVSE)	Defines a communications framework to interact with demand response assets Not a specific EVSE protocol

		Less EV sector application than OCPP
IEEE 2030.5	Communication between DER (including EVSE) and Aggregators/Network Service Providers/Market Operators Communication between devices on a Home Area Network (HAN)	Limited support in the EV market Primarily used to date for rooftop solar communications
IEC 63110	Communication between EVSE and the Charge Point Operator	Under development
ISO 15118	Communication between EVSE and EV	Enables EVSE to manage charging/discharging by communicating instructions over a conductive or wireless link to the EV Works with OCPP
ANSI/CTA 2045	Communication to demand response assets (including EVSE)	Defines a communications framework to interact with demand response assets Not a specific EVSE protocol Less EV sector application than OCPP

We note that given higher uptake of EVs in other international markets, it is likely that there are benefits for adopting existing international standards wherever possible for use in an Australian context.

There are some design considerations about how such standards would apply to in-car charging systems where the relevant charging capabilities are in the vehicle, and not in the EVSE. There have also been questions raised about how standards would interact with other devices in the home or with other standards. For some, these may include metering standards where built-in metering may be used for trade (e.g., secondary charging offers within the community).

Broader technical assessments for such 'behind-the-meter' coordination are currently being considered by the DEIP Interoperability Steering Committee. ESB will further consider policy requirements in this space once this work has progressed.

STAKEHOLDER FEEDBACK

4. What are stakeholder views regarding the adoption of these standards in the Australian context? Do stakeholders consider the OCCP1.6(J) the most appropriate international standard to adopt? Are there any additional standards or options that should be considered in the short term?

5. Is there a need for EV to EVSE communications (such as ISO 15118) to be minimum functionality, alongside the communications protocol from the Charge Point Operator to the EVSE (such as OCPP)? The ESB welcomes stakeholder views on why this might be necessary.

Default tariff configurations

Default charging configurations for EVs have been mandated in some jurisdictions (e.g., UK). This requires the factory defaults of charging systems to charge in off-peak times, either overnight or during solar peak periods. Note, to deliver greatest value to all customers, default EV configurations would align with tariffs charged to customers to encourage charging at times where the electricity system demand is not at peak and electricity supplies are plentiful and cheap. For example, charge point settings might be configured to encourage charging during the daytime where, in the NEM, there is an abundance of renewable solar energy.

Default settings may also simplify the user experience for consumers, aligning charging when electricity is the cheapest, without requiring the mental load of requiring manual updates every day.

This type of functionality is present in most "smart" EV chargers widely available in the market today, and likely that additional costs to implement are negligible. Some of the challenges with introducing default configurations include:

- Standardising on useful default tariffs that may vary considerably from state to state,
- Maintaining compliance with the settings, and
- The default settings may not align with the daily routines and needs of some consumers and may need to be overridden and/or reset by the consumer.
- Introduction of tariffs can induce secondary peaks where a large volume of chargers would switch on/off at the tariff boundary, causing localised network / system operations challenges.

This type of approach enables benefits of load to be shifted to times of the day where flexibility is needed (e.g., shifting away from the evening demand peaks). However, consideration needs to be given to how the settings can be maintained and enforced, and what this means for the overall customer experience. Effective communications with installers and consumers will be an important factor.

STAKEHOLDER FEEDBACK

6. The ESB welcome stakeholder views on requiring default tariffs at the point of installation of a charging system. Do stakeholders have views on the merits of using network specific windows of time, or are state-wide defaults more appropriate?

Timelines and compliance

The standards highlighted for consideration have been extensively adopted in overseas jurisdictions. The ESB therefore anticipate that the introduction of minimum equipment standards is unlikely to come with significant delays or costs to the industry. Notwithstanding, we note that requiring a higher grade of equipment may have implications for costs that are passed on to end consumers.

Regulators will need to consider the most viable timeframe to introduce compliance requirements for equipment standards. Relevant considerations include the time for equipment vendors to secure appropriate supply chains, and in some cases for upgrade and certification to the new standards. It is also appropriate to consider some of the cost implications associated with the speed in which the standard is introduced. Anecdotal evidence shared from stakeholder studies suggest that the impact of EV uptake on evening peak demand is unlikely to impact the electricity system for a number of years, which should also be factored to timing considerations. However, it should also be noted that setting out a lengthy period

for implementation may also lead to system challenges where uptake occurs at a faster rate than anticipated (e.g., as has occurred with domestic solar PV).

A further factor in setting timing for implementation is to consider the value in having a nationally consistent approach. Where early clarity can be provided regarding a national / NEM wide direction and timing, this is likely to support jurisdictions in setting policies regarding EV uptake in their own states or territories. There is opportunity for state and federal jurisdictions and market bodies to set down minimum technical standards, providing some flexibility on the implementation plan to support individual jurisdictional policy timings.

STAKEHOLDER FEEDBACK

7. The ESB welcomes stakeholder views on the appropriate timing considerations to enable a roll out of minimum technical standards for domestic EV charging systems. Do stakeholders see other considerations that need to be taken into account to facilitate jurisdictional policy settings?

3.1.2 EV Smart Charging: Consumer Participation

Domestic EV charging is forecast to have a significant impact as a new, and potentially very peaky, domestic load entering the system in the coming decade. In the absence of appropriate incentives and regulatory settings, this has the potential to increase costs for energy consumers.

The challenge for the future grid is to provide consumers with choice and control over their CER, at the same time as maintaining a secure and efficient system for all users. Smart coordination of EV charging, supported by market frameworks which provide for the basic communications functionality needed to enable active management of the chargers, can help to meet this challenge by helping consumers charge when electricity is cheapest, and when the grid is not under pressure.

Making smart charging easy and attractive for consumers will need to be at the heart of the design and implementation of smart charging policy. Given we are early in the rollout of smart chargers in Australia, engaging with current and prospective Australian EV owners will be helpful to understand their needs and preferences, to learn what works, and to get policy settings right. Insights from early Australian trials, as well as from other parts of the world where EV uptake is more advanced, can inform thinking about the principles that should guide our approach to smart charging.

A consumer-centric future grid would enable consumer choice, consumer control, access to technology choices so all consumers are able to maximise savings, and importantly, long term efficiency and equitable outcomes for all different types of consumers. These will be relevant considerations over both the transition period and for when the uptake of these new consumer assets are fully integrated. There are therefore merits in considering market frameworks that require household EV charge points to be actively coordinated, as such a design approach would support these consumer principles.

Firstly, smart management of EV load can help shift charging to avoid peak demand cost impacts. This enhances not only consumer and system wide efficiencies, but critically, also supports more equitable outcomes for non-EV consumers who would otherwise be significantly impacted by EV driven network costs required to manage increases in the peak. Consumer choice and control is provided with coordinated over-ride capabilities to ensure charging can still take place when required. Technology will enable charge time shifting for pricing offers between peak and off-peak periods, maximising consumer savings. As market offerings increase with new products and services offered to customers to unlock value from their flexible demand, customers will benefit from enhanced price and service competition. By establishing a market with minimum communication standards, consumers gain cost free, and easy, switching between smart charging service providers and in turn, more competitive market offers.

Embedding minimum communication capabilities in EVSEs does not mean the functionality will be utilised. Without this two-part structure to an EV smart charging policy framework (i.e., functionality and use), consumer and system wide benefits and peak demand cost mitigation cannot be assured. Moving towards such an approach later in the uptake of EVs likely creates significant inequities, costs, and fairness issues between different types of customers.

Analysis undertaken by EY shows that by 2035, in Europe, EVs are projected to create a peak demand increase of 45% in urban areas and 24% in rural.[28] Earlier adopters of EVs are likely those with the financial means to upgrade and may consist of a consumer group least impacted by increases in network costs and prices created by an uncoordinated approach to EV charging. A delayed implementation of smart charging coordination has the potential to create a two-tiered EV charging system, with those creating the problem exempt from its mitigation as their devices are not activated into coordination functionality. A retrospective application of requirements would generally be highly challenging due to logistics, cost impacts and contractual and fairness risks on applying new requirements post point of sale and network connection contracts.

Internationally, parties that carry out these coordination functions are identified as 'charge point operators' (CPO). Note, in an Australian context, the CPO is akin to the role of 'aggregator'.

The suggested benefits of having a CPO responsible for such signals, would be to optimise the charging to minimise the costs for consumers, and simultaneously minimise the impact on the grid. Whilst in theory these outcomes could be achieved via tariffs and optimised without remote management, to capture and schedule on behalf of multiple participants, and to respond to immediate system security issues, remote management is likely to deliver better outcomes in terms of cost and risk.

However, questions have also been raised about the details of such an arrangement. Consideration must be given to the rights and protections of consumers, the ongoing operating costs for the CPO and the communications support, and who bears this cost. Market and technical design will also need to ensure all participants understand who would manage the priority / authority between DNSP and Trader (retailer / aggregator) and customer, how system curtailment would be triggered and who is responsible, whether there are manual overrides for remote control behaviour, and what would happen in the situation of communications failure.

There are also potentially unintended consequences of using CPOs for limiting charge rates. For example, if 7kW EV chargers were to be rate limited, it is possible that users will elect to use their wall-plugs instead, which would be unconstrained and likely to draw around one third of the load (up to 2.4kW).

These are all important factors that would need to be considered as part of setting directions. Overall, we note there are trade-offs for the introduction of EVSE (Electric Vehicle Supply Equipment) coordination, which will come with some additional cost and complexity, but may deliver stronger system security benefits, support improved optimisation of infrastructure, and lower costs for consumers if designed in the right way.

STAKEHOLDER FEEDBACK

8. What are stakeholder views regarding the potential costs and benefits of requiring consumers to participate in remote coordination capabilities for smart EV charging?

[28] EY, 2022

Charge Point Operator Function: Roles and Responsibilities

If a policy was established for CPOs to manage the EV charge points on behalf of consumers, there would need to be considerations on the appropriate parties to take on this role. Note, there is potential for this function to be carried out by existing entities in the market, rather than establishing a new 'market participant' role.

While Traders (retailers/aggregators) are likely to be actively preparing to release products to the market, consideration would need to be given to the responsibilities of all parties with respect to managing system and network limits through dynamic operating envelope limits.[29] Further, while we note distribution networks are ringfenced from roles such as a CPO, there may be scope for such options to be pursued via non-regulated businesses.

We note that there may be merit in consideration of the role of DNSP as a 'service buyer'. This is a concept raised by DNSPs and other industry stakeholders over the Post-2025 reform development process. This reflects that the benefits of remote management of EV charging derive (at least in part) from reduced impact on infrastructure. Any such process should be flexible and allow for local services payments in network areas where it is economically efficient and in consumers interests to do so.

The ESB welcomes input from stakeholders to inform consideration of these future roles and responsibilities.

STAKEHOLDER FEEDBACK

9. What are stakeholder views in regard to the use of CPOs for residential charging? What are stakeholder views on which parties (Traders (retailers/aggregators), DNSPs, OEMs, other parties) should be able to take on the function of CPO? Should the requirement for a CPO be mandatory?

10. What are stakeholder views in respect of the relevant and appropriate responsibilities that should be taken on by a CPO: e.g., ensuring rate limits, customer support?

CPO Communications Protocol standards

Implementing consumer participation requirements for EV coordination capabilities would involve a more complete policy implementation of the minimum equipment standards and would place responsibilities on CPOs.

Consequently, consistent with discussion in (section 3.1.1) on minimum equipment standards, the standards OCPP1.6 (and to some extent IEC 15118) are most commonly cited as the most mature and have broad support from industry to adopt here in Australia. With a regulatory framework including roles and responsibilities in place, both of these standards would enable adoption of remote management capabilities as part of setting minimum EVSE interoperability standards.

There has been some support noted for co-existence with other standards, but we note that, unlike the OCPP equivalent, these are yet to demonstrate capabilities as a remote management layer.

Consistent with work currently being delivered as part of the DER Implementation Plan associated with the interoperability and communications and solar PV and storage devices; we note there are a number of questions raised about which standards to use to connect to EV charge stations, and which are used

[29] Note that work is underway through the DER Interoperability workstream to introduce dynamic export limits.

further up the chain to connect with DNSPs and Traders (retailers/aggregators). These discussions include suggestions of using both OCPP1.6 and IEEE 2030.5 together for separate legs of the communications from CPOs to the devices, and from DNSPs / others to CPOs.

STAKEHOLDER FEEDBACK

11. What functions would CPOs be required to perform on behalf of customers? e.g. off peak charging.

12. What obligations would be required by CPOs to ensure there are adequate protections for end consumers?

3.1.3 System Operations Requirements

Across any power system with any form of real-time energy coordination – at both large-scale power stations or for aggregated CER – interoperability at scale requires different types of minimum functionality. The minimum technical requirements for the large-scale fleet are mandated in the NER, as supply demand balancing and market operation require the response to be forecastable (such as data needs), visible (for real-time situational awareness) and reliable (to keep things in balance). The communications protocol discussed in this paper enables such aggregate forecastability, and visibility, with other important capabilities for EVSE coordination discussed below.

Commonwealth EVSE Performance Standard

In 2019, the then Commonwealth of Australian Governments (COAG) Energy Council mandated that appliance performance and testing standard AS 4755 shall be required in all new EVSE installations from July 2026, providing industry a 6-year preparation period.[30]

AS 4755 defines the *minimum physical performance* capabilities of an EVSE. That is, the actual capability for the device to physically change its energy demand up or down upon a request sent via a communications protocol. EVSEs are appliance grade products built by tens of different manufacturers with multiple products lines, all at varying levels of price and quality. AS 4755 details minimum performance capabilities and a test procedure to check and ensure the device is capable of the physical change in energy demand, and that the response actually works, providing the necessary minimum capability and reliability for system and network operations.

As such, consideration around a minimum EVSE communications protocol and the COAG EC mandate for AS 4755 are complimentary. Each is delivering different levels of minimum functionality for secure interoperability. One relates to c*ommunication*, the other for *performance*.

Randomisation

Ensuring the right settings are in place to support the effective uptake of EV smart chargers and at the same time maintain grid stability is a key policy objective. In the absence of effective incentive and regulatory settings, there is a risk that a large number of charge points could start charging or change their rate of charging simultaneously, e.g., when recovering from a power outage or in response to an external signal such as a time of use tariff signal. This could cause a spike or sudden drop in demand and

[30] www.energyrating.gov.au/document/regulation-impact-statement-decision-smart-demand-response-capabilities-selected-appliances#:~:text=On%2022%20November%202019%2C%20COAG%20Energy%20Council%20agreed,Decision%20RIS%20%28DRIS%29%20Option%203%20-%20Recommendations%201-15.

destabilise the grid. To mitigate this, requirements for randomised delay functionality should be considered as part of managed charging capabilities. Applying a randomised offset ensures grid stability by distributing demand placed on the grid, gradually ramping up the electricity demand over time in a way that is more manageable for the network.

Cyber-security standards

With the introduction of interoperability and communications protocols, and where remote management of EV charge stations becomes widespread, considerations need to be given to cyber-security implications such as redundancy, malicious control and what this means for vulnerabilities for the national system.

Consequently, we note that cyber-security is a critically important consideration before these standards are introduced widely across the system. The ARENA facilitated DEIP program has already formed a cybersecurity working group with experts from across the cybersecurity domain to design approaches and standards ahead of other interoperability standards work. This work is being conducted in parallel and its outputs should apply generically across all DER devices, including EV charging systems, leveraging the extensive work in the space being implemented by overseas jurisdictions.

The ESB and market bodies are engaging in these processes to ensure alignment of initiatives and key issues arising.

EVSE Standing Data

The DEIP 'Electric Vehicle Data Availability Taskforce' brought together a broad range of industry and government stakeholders to assess EV data availability and requirements to enable the effective integration of EVs into Australia's electricity grid. In its EV Data Availability report the group identified that:

"To coordinate the transition to electrified transportation, the energy sector needs access to detailed and relevant information to support decision-making processes. These data form direct inputs into the forecasting and planning processes of AEMO and distribution network service providers (DNSPs), and also feed into modelling and analytics work undertaken by research organisations and academia that, in turn, inform decision-making and regulatory processes within the energy sector and government. These processes all require access to accurate and comprehensive data to ensure decisions are made on an informed basis, as the decisions made during these early stages of EV uptake could have significant cost implications for EV owners and energy consumers more broadly".[31]

Based on input from the DEIP taskforce, ESB is progressing EVSE installation and uptake data as a priority dataset to resolve as part of delivering the ESB Data Strategy. AEMO is leading this work, in collaboration with ESB, and will be consulting with consumer groups, industry and interested stakeholders on potential EVSE data collection mechanisms and delivery options.

---

31 https://aemo.com.au/-/media/files/stakeholder_consultation/working_groups/der-program/deip-ev/2021/deip-ev-data-availability-taskforce-report.pdf?la=en P. 4.

STAKEHOLDER FEEDBACK

13. Should there be a minimum requirement to capture installation of EVSE, to assist with effective planning and operational management, similar to that already in place for solar?

14. Are there any other minimum technical requirements that should be considered for EVSE interoperability?

15. Do stakeholders have any views on aspects of cybersecurity for EV charging that are specific to Australia, or that would require a departure from European and/or US standards?

New business models

Many of the longer-term benefits from EV grid integration are likely to come from the introduction of more advanced services (e.g., Vehicle to Home (V2H), and Vehicle to Grid (V2G)). Market intelligence emerging from trials[32] suggests that this technology is still too early in the lifecycle, and unlikely to be cost effective at scale until later this decade. However, given the complexity of two-way energy flows, these services would likely benefit from regulatory reform and supporting government policies to encourage uptake. We note it will be important to ensure customer protections remain fit for purpose as these services develop, particularly where uptake occurs at faster rates than anticipated.

We note stakeholder suggestions regarding publication of a roadmap for EV related services, from the most basic to the most advanced, to give a clearer picture to purchasers of EVs on forward opportunities or value that might be achievable.

STAKEHOLDER FEEDBACK

16. The ESB welcomes stakeholder views on barriers in existing regulatory and legislative frameworks that may be acting to limit the introduction of more advanced EV services such as Vehicle-to-home (V2H), Vehicle-to-grid (V2G) and Vehicle-to-Anything (V2X)?

Related issues

In stakeholder workshops other related issues have been raised in respect of residential charging. In summary, these include:

- How might we think about how minimum equipment standards (as well as interoperability and communications requirements) applying to strata dwellings, and homes without off-street parking? Would these be considered domestic or public charging? What might be the relevant cost considerations?
- What might be implications for consumers with solar connected EV charging, or customers with battery storage? How might they choose to manage their systems in different ways that may be contrary to the remote management approaches?
- Landlords are less likely to install fast chargers for customers without the right incentives. What might this mean for integrating EVs into the system in a way that works for all consumers? How might such inequities be managed?

- If remote management policies are too onerous or aggressive, consumers may choose to use EVSE wall plugs and not use their 7-22kW charge points. How might we strike the right balance so not to push consumers away from 7-22kW charging?
- What business models could be impacted or "disabled" by introduction of any of the standards discussed in this chapter. Are these likely to have significant implications?
- How might the introduction of such technical standards best develop in alignment with government incentives. e.g., work underway in SA /ACT? Clear and consistent standards will be an important pillar that will support state and territory governments to adopt / introduce these policies.

STAKEHOLDER FEEDBACK

17. The ESB welcomes stakeholder views on the issues raised in respect of residential charging, including whether there are further issues that should be considered?

3.2 Public Electric Vehicle Charging

Public charging for EVs is one of the key enablers for Australia to overcome barriers to support uptake of EVs, such as range anxiety and convenience. Such facilities are starting to be developed in regions across the NEM and in doing so will provide communities with essential infrastructure for road transportation. In the early phases of EV adoption, this infrastructure is likely to operate at low utilisation and will consequently be an expensive method of charging when compared to domestic charging.

Regardless, this infrastructure is required to deliver an important service to consumers. Consequently, the ESB will explore how this can be delivered to serve the best interests of consumers whilst enabling new business models and private capital that is needed to build out this infrastructure. The ESB also notes that the AER is considering the question of whether EV charging services could be considered 'essential' as part of its Retailer Authorisation and Exemption Review.

Grid Connections

One of the biggest challenges facing public charging CPOs is the issue of grid connections and associated network tariffs.

In this respect, the ESB notes stakeholder concerns regarding the structure of the tariffs associated with high capacity and low volume loads from ultra-rapid DC charging (350kW ++). Feedback has indicated that demand-based tariffs are challenging for CPO business models whilst there is (currently) low energy volume.

There are a number of factors to take into consideration. Given that end-consumers are on-charged in kWh, it may be an option for networks to take the volume risk and provide a simple volume tariff to CPO sites. However, even when converted to kWh, these charges may be too high for consumers to bear, and risks damaging the (burgeoning) public charging business models.

Distribution networks develop tariffs in line with cost reflectivity, as is reflected through demand charges. Cost reflective tariffs ensure that additional costs imposed by customers are reflected in the prices those customers pay - and not smeared across all customers. For example, both time-of-use and demand network price signals incentivise charging stations to minimise their network bills by managing their load profiles through on-site storage, retail price structures, or customer incentives or other means.

Some DNSPs, particularly those coming into their next regulatory reset period are actively considering or working directly with EV industry representatives to develop tariffs that are cost reflective, while also considering some of the unique aspects of charging stations such as high capacity and low volume loads that might be associated with some EV charging stations in their early stages of operation. Other DNSPs have assignment policies that do not impose a demand tariff on business customers until their demand exceeds 160MWh/annum.[33]

However, there is also a stakeholder perspective of public charging as an essential service (now or in future), and affordability of charging options for those without off-street parking will become a growing public concern.

A key issue for the ESB to explore is whether there is a need for a degree of transitional cross subsidisation of network costs in respect of EV charging in the early days of Australian EV uptake. If this was introduced, for example, in the form of a specific tariff for EV charge points, this would be a departure from the current regulatory frameworks around tariff design and would require reforms to allow networks to offer such tariffs. The ESB notes this is currently being considered in the Western Australian context. Western Power (with support from the WA government) is reviewing their tariff structures to provide a "scalable" demand tariff that can support CPO business models during the early years of EV uptake. Alternatively, state and federal governments may be required to step into provide ongoing external subsidies during the transition period until sufficient scale of EVs are using the charge networks.

Other issues raised by stakeholders in relation to grid connections include:

- Some complaints that connection processes are too slow and not fit-for-purpose to support EV charging infrastructure connections
- Suggestions that public charging will not be economic until EV penetration is greater than 5% of cars on the road (compared to approximately 1% today).

Collectively, these insights suggest that Australia is likely to benefit from considering the experiences of international markets to better understand how public charging can be made commercially viable. Further, there are also likely to be challenging questions to consider in respect of how policy makers can appropriately balance the need for fair and efficient allocation of infrastructure costs in the context of building new important infrastructure that supports decarbonisation of the transport (and energy) systems.

STAKEHOLDER FEEDBACK

18. What are stakeholder views on the use of technology specific tariffs, approved by the regulator, but operating under different metrics? What might be any unintended consequences of introducing EV CPO specific tariffs?

19. What measures might be helpful to consider to streamline the connections process for public charging infrastructure?

[33] The AER's recent 2021-26 determinations for Victorian DNSPs may be of interest to readers wishing to further understand how DNSPs have considered and accommodated network tariffs for EV charging stations. This can be found here: https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements

Measurement

Measurement systems in public charging infrastructure are important to ensure customers are being appropriately charged for electricity during charge sessions. There have been some concerns expressed by stakeholders with regard to the lack of standards around metrology for AC and DC based public charging. This has been seen in other markets (e.g. German Eichrecht) and has been undertaken to ensuring adequate consumer protections for EV charging consumers.

In Australia, a pattern approval mechanism from the National Measurement Institute (NMI) is in development. This process commenced public consultation in January 2022 and is likely to take 24-36 months to implement. Given timing, some stakeholders have noted a risk of retrospective legislation that could require the new NMI standard for existing EV charge points. We note there is potential for existing arrangements to be grandfathered where new standards are introduced.

STAKEHOLDER FEEDBACK

20. Aside from the grandfathering issues noted for existing equipment, are there any other metrology issues concerning public EV charging that should be considered?

Pricing

The price charged for customers to use a charge facility is typically fixed by CPOs in c/kWh. However, we note that as the sector matures there may be a number of further innovations in pricing models, which might include a fixed fee per charge, or charge rates that fluctuate across the day, indicating the best times for customers to charge. In most cases, the details of the charge rate, and the overall session fee are conveyed to customers digitally through mobile smartphone applications. Internationally, subscription models are emerging to incentivise customers to charge at off-peak times.

To support the future renewable energy system in Australia where the abundance of solar energy will be cheap / free in the middle of the day and more expensive in evening peak periods, intra-day pricing is likely to encourage more efficient customer behaviour and outcomes for the electricity system. Some of these issues are being address through tariff reform, such as the midday solar soak tariff now available in SA.

However, there are currently no guidelines for pricing of public charging, such as display of pricing information, charge session data records, LED screens on chargers, or public signage of prices. To compare to requirements relating to charging for petrol or diesel, the visibility for customers wishing to access EV charging facilities is very opaque.

Whilst the sector is continuing to innovate and exploring different business models, regulations in this space may be seen as premature and have the potential to stifle investment. However, principles-based regulation and guidelines could provide stronger guidance for CPOs on how to best serve consumers, and to encourage longer term outcomes for the electricity system. It is appropriate to consider how best to balance fit for purpose consumer protections and settings to support rapid innovation and investment.

STAKEHOLDER FEEDBACK

21. What mix of arrangements might facilitate flexibility in charge point pricing to encourage more drivers to charge during times of excess renewable energy?

Payments and Charge Data Records

Payments for public charge sessions today are occurring largely through mobile apps. Such apps are used throughout the charge session and linked to an account with the CPO. However, it has been acknowledged that this model has some drawbacks. For example, where customers turn up to a CPO and are not members, there may be barriers to access what is being deemed as an essential service. Similarly, a customer may need to a member of each CPO, requiring use of different mobile applications for each different charge session for example, potentially leading to friction and poor consumer experiences.

Internationally, payments for public EV charging have largely been managed in this way in Europe and the US, but many jurisdictions are now moving towards new roaming standards that allow a customer to use one application, with fees and charges resolved behind the scenes – much like the banking ATM network in Australia. These are part of new global standards such as ISO 15118,[34] and support the use of the latest park and charge infrastructure capabilities, where cars with these new technology standards enabled (e.g., Porsche) can self-identify to the underground charge stations.

In NSW, the state government has mandated credit card readers on new ultra-fast charge stations, noting these capabilities were not being installed by default. We note there are differing views on the applicability of credit card readers; some stakeholders suggest that it is a simple and economic choice for Ultra-fast chargers (350kW+), but others in Australia and abroad consider that it is not economic for smaller 7-22kW kerbside charge points, and therefore should not become a blanket requirement.

Whilst credit cards are a useful payment fulfillment mechanism, these mechanisms themselves do not make charge session data available to the customer, such as the price per kWh and duration. This does suggest there will be a need for transparency on charge sessions, either through applications on smart phones, through roaming and/or charge data records. This information could be made accessible to the end user, the CPO, fleet operators, and potentially for regulators in the instances of dispute resolution.

In Germany, where there has been a rapid uptake of CPOs and a number of services for roaming between providers, the “Eichrecht” was a piece of legislation introduced by the German government to ensure fairness and protections in how people were charged for EV charge services. It introduces new regulations on payments, records and metrology that reduce risk for EV charge customers and acknowledges the necessary adjustments to ensure good outcomes for consumers.

STAKEHOLDER FEEDBACK

22. What do stakeholders view to be important considerations for ensuring protections are fit for purpose for consumers using public EV chargers with regard to payments and any associated disputes?

Roaming

Roaming relates the use of charge data records that are shared between providers, and allows seamless billing from one provider to another, and a better end user customer experience. That can be done either via point-to-point standards (e.g., via the OCPI standard[35]), or via a central clearing house function, such

[34] See https://www.iso.org/obp/ui/fr/#iso:std:iso:15118:-1:ed-2:v1:en

[35] See https://evroaming.org/app/uploads/2020/06/OCPI-2.2-d2.pdf

as that provided by Hubspect in Europe. With a point-to-point standard, this can be done incrementally via bi-lateral arrangements between CPOs. With a central function, the central clearing house is a requirement for all participants from its inception. Whilst the need for a decentralised model may not be clear at this time, stakeholders have indicated a preference towards a decentralised model that may start voluntary and be introduced more gradually over time.

In this context, stakeholders have expressed concerns regarding not being able to charge over significant distances (e.g., ACT to Sydney) due to incompatibility between CPO payments systems.

However, many stakeholders have highlighted that it is likely to be too early in the nascent Australian EV market for roaming to be a primary concern for EV drivers. The adoption of voluntary and decentralised standards could however add value as an early introduction of a voluntary standard for charge data records

We note that a small number of stakeholders noted concerns that standards are not currently mature enough for adoption in Australia. However, we note that these standards have already been adopted for over three years by several European countries, suggesting that the standards will be sufficiently mature by the time they are introduced into the NEM.

STAKEHOLDER FEEDBACK

23. The ESB welcomes stakeholder views on when they consider the issues associated with roaming might become a policy issue to address in Australia?

4. Questions for consultation

To inform development of policy advice to support effective integration of EV smart charging, the ESB welcomes stakeholder feedback on the following matters.

4.1 Questions related to domestic electric vehicle smart charging

1. ESB welcome stakeholder views and input on smart charging equipment standards settings including any input to inform the likely costs.
2. ESB welcome stakeholder views on the introduction of minimum EVSE equipment standards without remote management, and whether this will provide future optionality for managing peak demand.
3. ESB understands that most EVSEs on the market today come with smart charging as a minimum functionality – is this the case or do stakeholder see this as still an emerging functionality?
4. What are stakeholder views regarding the adoption of these standards in the Australian context? Do stakeholders consider the OCCP1.6(J) the most appropriate international standard to adopt? Are there any additional standards or options that should be considered in the short term?
5. Is there a need for EV to EVSE communications (such as ISO 15118) to be minimum functionality, alongside the communications protocol from the Charge Point Operator to the EVSE (such as OCPP)? The ESB welcomes stakeholder views on why this might be necessary.
6. The ESB welcome stakeholder views on requiring default tariffs at the point of installation of a charging system. Do stakeholders have views on the merits of using network specific windows of time, or are state-wide defaults more appropriate?
7. The ESB welcomes stakeholder views on the appropriate timing considerations to enable a roll out of minimum technical standards for domestic EV charging systems. Do stakeholders see other considerations that need to be taken into account to facilitate jurisdictional policy settings?
8. What are stakeholder views regarding the potential costs and benefits of requiring consumers to participate in remote coordination capabilities for smart EV charging?
9. What are stakeholder views in regard to the use of CPOs for residential charging? What are stakeholder views on which parties (Traders (retailers, aggregators), DNSPs, OEMs, other parties) should be able to take on the function of CPO? Should the requirement for a CPO be mandatory?
10. What are stakeholder views in respect of the relevant and appropriate responsibilities that should be taken on by CPO: e.g., ensuring rate limits, customer support, etc?
11. What functions would CPOs be required to perform on behalf of customers? e.g. off peak charging.
12. What obligations would be required by CPOs to ensures there are adequate protections for end consumers?
13. Should there be a minimum requirement to capture installation of EVSE, to assist with effective planning and operational management, similar to that already in place for solar?
14. Are there any minimum technical requirements that should be considered for EVSE interoperability?
15. Do stakeholders have any views on aspects of cybersecurity for EV charging that are specific to Australia, or that would require a departure from European and/or US standards?
16. The ESB welcomes stakeholder views on barriers in existing regulatory and legislative frameworks that may be acting to limit the introduction of more advanced EV services such as Vehicle-to-Home (V2H), Vehicle-to-Grid (V2G), and Vehicle-to-Anything (V2X)?
17. The ESB welcomes stakeholder views on the issues raised in respect of residential charging, including whether there are further issues that should be considered?

4.2 Questions related to public electric vehicle smart charging

18. What are stakeholder views on the use of technology specific tariffs, approved by the regulator, but operate under different metrics. Would there be any unintended consequences of introducing EV CPO specific tariffs?
19. What measures might be helpful to consider to streamline the connections process for public charging infrastructure?
20. Aside from the grandfathering issues for existing equipment, are there any other metrology issues concerning public charging that should be considered?
21. What mix of arrangements might facilitate flexibility in charge-point pricing to encourage more drivers to charge during times of excess renewable energy?
22. What do stakeholders view to be important considerations for ensuring protections are fit for purpose for consumers using public EV chargers with regard to payments and any associated disputes?
23. The ESB welcomes stakeholder views on when they consider the issues associated with roaming might become a policy issue to address in Australia?

5. Matters for consultation and next steps

The ESB invites comments from interested parties in response to this consultation paper by **19th August 2022**.

This feedback will support the development of draft directions and advice to government relating to the adoption of minimum standards for EV smart charging.

The ESB intends to hold a workshop with stakeholders and interested parties on the material covered in this paper on **2nd August 2022.**

Interested parties are invited to register their interest by email to info@esb.org.au.

5.1 How to make a submission

Submissions will be published on the COAG Energy Council's website, following a review for claims of confidentiality. All submissions should be sent to info@esb.org.au.

Submission information	
Submission close date	19 August 2022
Lodgement details	Email to: info@esb.org.au
Naming of submission document	[Company name] Response to Electric Vehicle Smart Charging - Issues Paper
Form of submission	Clearly indicate any confidentiality claims by noting "Confidential" in document name and in the body of the email.
Publication	Submissions will be published on the Energy Ministers website, following a review for claims of confidentiality.

Contact details:
Energy Security Board
Level 15, 60 Castlereagh St
Sydney NSW 2000
E: info@esb.org.au
W: https://energyministers.gov.au/market-bodies/energy-security-board