RACE for 2030

RELIABLE
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N1 Project design consult

National Charge Link

Final report

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RACE for Network Program

National Charge Link

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What is RACE for 2030?

The Reliable Affordable Clean Energy for 2030 Cooperative Research Centre (RACE for 2030) is a 10-year, $350 million Australian research collaboration involving industry, research, government, and other stakeholders. Its mission is to drive innovation for a secure, affordable, clean energy future.

racefor2030.com.au

Executive summary

With the rapid rise of vehicle electrification globally, the development and deployment of public charging infrastructure globally has accelerated over the past few years. It has become clear that rapid deployment is bringing challenges in terms of efficient investment of public finances and then the system-wide benefits that come from a coordinated approach.

The World Electric Vehicle Journal recently pointed to global experience where sub-optimal planning and deployment of charging infrastructure has led to:

"Poor information about the location and availability of charging stations; An absence of information about tariffs and the total price of the session; different, non-compatible ways, tools, tokens, and apps to obtain access to charging stations; and non-transparent business models and a potentially high cost because of the complexity of the value chain[1]."

In 2021 both the Australian Renewable Energy Agency and NSW Government committed to significant funding rounds for electric vehicle charging infrastructure. At that time, Evenergi provided software and services to help to optimise the location and numbers of chargers required to optimise the availability of charging for the public. Similar software was then also used for the South Australian Government.

The National Charge Link (NCL) project emerged from this work as it was recognised that it would be critical to create a national capability and governance framework. The objective is to enable faster-planning capability for national strategies and platforms to ensure the optimisation of deployment and use of charging infrastructure.

By doing so, the NCL aims to address the challenges of meeting allocative efficiency and revenue adequacy in the roll-out of charging stations, by amalgamating charging behaviour related data.

These inefficiencies emerged, due to a lack of transparency and data sharing. Poor information about the location and availability of charging stations, lack of standardisation for access and an absence of information about tariffs and the total prices of each session have made using charging stations challenging for EV-drivers. Moreover, limited transparency of charging behaviour made it difficult for governments and distribution network service providers (DNSPs) to efficiently plan for network upgrades and policies.

[1] *World Electric Vehicle Journal 2018, 9, 50; doi:10.3390/wevj9040050*

Objectives of the National Charge Link

While the electric vehicle industry develops at pace, and there is a high degree of investment and innovation, there are some system-wide and public good requirements that will not be delivered by private industry - who by nature will focus more on individualistic competitive positioning.

The purpose of the NCL is to deliver common services and open-source data to all interested parties, consumers, and the community, in a way that minimises the costs and delivers the highest quality outcomes. This project is dedicated to avoiding replication within the broader set of national EV initiatives.

- Reduce the national cost of doing business for government, energy market participants and the electric vehicle industry through free and easily accessible charging infrastructure data
- Optimise the location, number and interconnectivity of charging infrastructure networks through a national data source that enables optimised inter-and intra-regional planning
- Create nationally significant infrastructure that is safe from cyber attack
- Create a platform that enhances efficiencies in the interaction between charging infrastructure and energy market distribution and retail businesses
- Create a funding model that is sustainable in perpetuity or as long as the other key objectives remain critical to the efficient adoption of electric vehicles
- Building customer trust by offering a live database with charger availability, type, and functionality across the nation

Objectives of RACE for 2030 funded design phase

RACE for 2030 supports research contributing to the establishment of basic infrastructure that enables clean energy and low carbon transitions. They commissioned Evenergi to complete a design phase for the project with the aim of firming the project's design, exploring funding and governance opportunities, and considering how to incorporate input from new and emerging datasets.

The project design aimed to provide further detail on design, costs and operations, giving the program every chance of relevance, utility and success over the long term. Project research was to consider existing stakeholder feedback, identify and mitigate risks, and leverage the experience and expertise from key stakeholders such as CSIRO.

The output of the work was to be instrumental in firming not only the project design, but also in confirming financial support from interested stakeholders and aid in seeking long term funding.

The outputs of the design phase were also to consider;

- Level of support indicated for each of the four key deliverable areas
- The feedback gathered through the stakeholder engagement process
- Additional potential partners, supporters, users and their requirements
- Directions for future expansion of scope and value-add
- Potential supplementary sources of funding
- Pathways for the long-term ownership and management of the NCL

Methodology

Evenergi followed a six-step methodology, starting with a comprehensive literature review. The literature review aims to provide an understanding of best practices domestically and globally, including profit and not-for-profit organisations across Norway, New Zealand, UK, US, Spain, and Germany.

The next step saw the formation of an industry reference group (IRG), followed by two workshops, utilising the literature review and leveraging the experience from the work that was already done for NSW and other Australian jurisdictions.

The first workshop focused on problem discovery and an interest in understanding the need for the NCL project across the electricity ecosystem. During the second workshop, we discussed the results of our additional stakeholder engagement, including our proposed governance and funding methods, as well as the interest from stakeholders in capturing data from private charging stations in addition to the initial proposal that focused on public charging stations only.

In between these two workshops, we undertook individual stakeholder consultations, including AEMO and consumer representatives to get a better view of existing work that is being undertaken and how to design the NCL to maximise its benefits for all users.

During these consultations, we tested the core hypotheses, to accelerate EV adoption (refer to section 02 for more details). The outcome of these stakeholder interviews, and workshops shaped the product definition and its proposed initiatives, as outlined in Table 1 below.

Outcome

The outcome of stakeholder interviews and the two workshops with the industry reference group (IRG), in addition to our own research shaped the initiatives that will guide the development of the NCL, as presented in Table 1 below.

These initiatives meet the expectations and requirements outlined by industry stakeholders, and consumer representatives in response to the above outlined project objectives.

#	Initiative
1	Create a standing database of public and private charging infrastructure
2	Create a data aggregation, collection layer for private charging data
3	Create a national charging infrastructure master planning resource similar to https://nswmaps.evenergi.com/
4	Select and implement key standards for charger interconnectivity, network aggregation
5	Create an open, standards driven application programming interface architecture to interface with standing data of EV chargers.
6	Syndicate and/or display key information to stakeholder groups including - general public, fleet managers, government project officers, DNSP network planners, DNSP network operators, EV application developers, CPOs.
7	Create a highly secure, highly available environment, in line with the Australian Energy Sector Cyber Security Framework (AESCSF)
8	Include private charging infrastructure, in line with stakeholders' expressed interest.

Table 1: Proposed initiatives to build the NCL platform

The final two steps of our methodology focus on the technical data sources and relevant IP requirements, budget estimates to build and maintain the NCL infrastructure as well as governance proposals and next steps to ensure it can be built and deployed.

1 Outcomes of the National Charge Link Project design consult

1.1 Core hypothesis for the project

The project was driven by several core hypotheses, which were then tested through the methodology.

1. An open nationally accessible database of standing data of public and private chargers is critical to delivering key services to ecosystem stakeholders and will therefore help accelerate EV adoption

2. An application layer that enables smart interaction with this data for the purpose of providing key market services is key to enabling key services to ecosystem stakeholders and will accelerate EV adoption

3. A nationally accessible platform for master planning future public charging infrastructure will create significant value in terms of best leverage of public funding, optimal siting and future energy infrastructure planning

1.2 Stakeholder engagement

A critical objective of the project was to ensure that it addressed the needs of key stakeholders, and did not replicate existing initiatives. Our initiation is to collaborate to enhance national or state policy workstreams. The following overview identifies the feedback from our industry reference group.

1.2.1 Who are the key regulatory and association-based stakeholders in the ecosystem

In the Australian context, the key stakeholders with an interest on the regulatory and policy design side include:

- Federal, jurisdictional and local governments,
- Australian Energy Market Operator (AEMO),
- Australian Energy Regulatory (AER),
- Australian Energy Market Commissions (AEMC),
- Energy Security Board
- Energy Networks Australia (ENA)

To date state governments have been pushing the most transport decarbonization and transition policies in Australia and have been either building (in the case of NSW) or demanding this type of functionality to enhance the speed up the mobility transition.

For state governments, access to data for planning and policy design is an immediate need to develop new, and improve existing programs. Evenergi has built this functionality for the Australian Renewable Energy Agency at a Federal level, and at a state level for NSW and SA governments along with the Australian Capital Territory (ACT).

Our Stakeholder consultations revealed an interest by energy market bodies (such as the AEMO, ESB) in the architecture of charging data. This functionality will enhance policy and market design reforms that are

currently in progress or are being in development to determine a framework for the transition to EVs across Australia in line with the National Electricity Objective (NEO)[2].

We undertook specific engagements with AEMO in relation to the DER register, ESB and relevant DEIP working groups[3], in addition to monitoring and documenting potentially overlapping workstreams. The objective is to ensure there is no overlap with the NCL project, and to achieve a collaborative approach to the development of the NCL in line with existing work programs.

On the consumer side, associations such as Electric Vehicle Council (EVC), Australian Electric Vehicle Association (AEVA), Australasian Fleet Manager Association (AFMA) also have strong views around the need for this type of platform and potential benefits for the groups they represent such as vehicle suppliers, end personal drivers and fleets.

The sorts of problems these groups are seeking to resolve, by developing a platform such as the NCL are outlined in table 2 and include:

Organisation	Key business problem of stakeholder group
Government - electric vehicle policy advisor	• Modelling and analysis for policy design • Forecasting size and composition of the EV fleet to estimate patterns of EV uptake and impacts • Support for the design of policies to roll out EVSEs equitably across urban and regional areas
AEMO	• Detailed understanding of EV and EVSE performance and their demand profile for more accurate system stability modelling, reducing the need for dispatch/procurement of costly services to maintain system security • Locational and timing forecast to undertake analytics, (e.g., improved accuracy for PASA outputs, ESOO, market insights, for market participants) • Enabling EVs to participate in energy and services markets
AER	
AEMC	
Industry representative bodies (e.g., CEFC, EVC etc)	• Usage patterns of EVSE to enable modelling and analysis • Understand where charging infrastructure is located and forecast to be located • Ensure industry has required tools and underlying infrastructure to thrive

Table 2: Description of problems by regulatory and industry associations

1.2.2 Who are the key end customers in the ecosystem

While there are a wide range of needs by stakeholders, the most are aligned around EV drivers and electricity consumers, who ultimately will be the beneficiaries of a well-functioning, economically and efficient network architecture.

There are different types of end-consumers:

[2] The National Electricity Objective as stated in the National Electricity Law (NEL) is: "to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:

- price, quality, safety and reliability and security of supply of electricity
- the reliability, safety and security of the national electricity system."

[3] The Distributed Energy Integration Program, is a collaboration of government agencies, market authorities, and consumer authorities aimed at maximising the value of DER. It is funded by ARENA.

- Consumers that are considering buying an Electric Vehicle,
- Consumers that have bought a vehicle and need infrastructure to ensure they can maximise enjoyment and practicality of the vehicle

On the other hand, there are also two groups of users - individual drivers and fleet operators. The key problems that these users are interested in resolving are fairly universal:

- Cost effective infrastructure
- Highly available infrastructure
- Appropriately sized infrastructure
- Convenient and integrated view on relevant information and functionality including:
    - Route planning, and costing (longer trips), location and functioning of EVSE, charging capability, type of EVSE
    - Prospective future deployment of EVSE
    - Awareness of charger availability, and if so for how long, estimate potential wait time (potentially in conjunction with route planner)
    - Information costs of charging and ideally costs in comparison to other options in real time

1.2.3 Who are the key suppliers or partners in the ecosystem

The electric vehicle industry combines traditional automotive industry with a number of new specialist manufacturers as well as bringing in new infrastructure investors, infrastructure providers, and energy companies.

Automotive companies need to understand the current and future potential location and numbers of public chargers. In addition, many seek to integrate charge planning into their vehicles and require access to real-time network information.

The new participants introduced by electric vehicles are charging infrastructure providers and charge point operators. They require visibility to planning information - the current and planned network of chargers that is emerging. They also need for their chargers to be “discovered” by consumers and to provide functionality around providing clarity in terms of availability, pricing and location. While CPOs do have their own “walled garden” applications, in general there is great support for ubiquitous information, which will improve user experience and therefore ultimately deliver more traffic to their charging infrastructure. For these providers - the less hassle it is to provide this information the better.

In terms of the energy market, we have network distributors (DNSP), retailers and providers of ancillary services such as demand response and other flexibility services. For DNSP’s, the key concern is information that provides planning certainty in terms of the location and load profile including the flexibility. Ideally this information will be provided for both network forecasting teams as well as network operations teams, who in a perfect world could use this information to drive real-time interventions in the system that can help to minimise over-build of the system.

Energy retailers and ancillary services providers provide services to charging infrastructure users - CPOs, fleets and private individuals. For them real time visibility, information and controllability, that can enable them to provide value-added services can lead to value-capture in the system that drives competitive advantage and ultimately lower costs for consumers.

The final group of users are future application developers who can leverage this data to build new and exciting innovations for end users.

1.3 Review to understand best practices globally in the domain space

We undertook domestic and international literature review, outlining global service provider, in the following three categories:

- Commercial entities - focus on EV-Driver experience
- Commercial entities - IT cloud based with a focus on EV charging data to market participants
- Non-commercial non-profit entities - EV driver input, self-regulation and updates

In summary, most service providers of these portals focus on the provision of information on EVSE locations, availability, status and tariff. Portals owned by not-for profit organisations, (such as EV Councils, in Norway, EV Roam in New Zealand or the National Chargepoint Registry in the UK) aim to provide a more comprehensive service, such as a single source of all publicly accessible charge points, distribution of real time data, and free data upload and access.

Privately owned portals connect with local partners only, not capturing all publicly accessible charging points, and it appears that access to data is costlier for EV-driver and market participants.

Note that there is no portal that offers a holistic view of all charging data, accessible by policy makers, market bodies, and participants, as well as EV-drivers. The NCL aims to fill this gap.

The following three sections present a summary of our research, including the platform provider, by country and outline their individual features.

1.3.1 Commercial entities - focus on EV-Driver experience

Table 3 provides an overview of domestic and international examples of commercial entities. Commercial entities include platforms that are developed by software developers and then sold to private businesses, or, it may include software platforms, directly owned by e-mobility service providers.

Software platform developers deploy their software through e-mobility providers, charging station providers and other EV industry participants.

Name	Features
Flo (US)	• Locate public charging station • Linked to Flo charging station network • Lists partner networks • Real-time information on station's status • Pay for charging session through the Flo-app • Track charging progress in real-time • Pair to HEMS and optimise charging
CIRRANTiC (Germany)	• Location and availability display, provides information if the car spot for charging is available • e-mobility information service provider • Information available for public charging stations • Connects with location partners • They own the chargers • Integrate this API into other providers' apps

Plug share (US)	• Real-time data access through an interactive web portal • Custom-built maps, tables, graphs, and charts • Advanced filtering, sorting, and drill-down features • Initial report setup consultation and ongoing support • Reporting and data analysis training
Zap-map (UK)	• Networks (ESB Energy, bp plus etc) • Location types (airport etc) • Payment (Free, debit/credit) • Access (24/7, Public no physical restriction, hide zap home points, hide zap work points) • Real Time availability of the charger (last time updated, operational or not)
EV Roam (New Zealand)	• Live database of NZ's public charging infrastructure • Provides information on the availability of private and public charging points and how to find them
Nobil (Norway)	• Developed and maintained by the Norwegian EV Association • Information is collected and continuously updated from EV-users, charging stations owners and operators • Receives and distributes real time data • Only for collecting and communicating data • Data is freely available through an API
EVSE Alternative Fuelling Stations Locator (Canada)	• Maintained and hosted by the Canadian Government • Provides alternative fuelling stations (e.g., gas) • Location display • Operational status is verified on a min. annual basis • Data on planned station locations • Open API
Electromaps (Spain)	• Available charging stations • Free and payment required • Route planning

Table 3: Overview of commercial entities

1.3.2 Commercial entities - IT cloud based

Table 4 provides an overview of domestic and international examples of commercial entities, based in the IT cloud with a focus on EV charging data provision to market participants.

Name	Features
gridX. (Germany)	• Data provider offering EV Charging Stations Data • Uses a cloud-based platform (XENON) go offer individualised energy applications for market participants
EVSE Insights (USA)	• Provides EV charging data for station utilization, with the objective to facilitate mass market adoption of EVs • services include: prediction, analysis, reporting
Eco-movement (Netherlands)	• Data provider to third parties • Data for navigation and Maps • Data for eMobility Service Providers & Fleets • Data for analysis

Table 4: Overview of commercial entities - that are IT cloud based

1.3.3 Non-commercial non-profit entities - EV driver input, self-regulation

Table 5 provides an overview of domestic and international examples of non-commercial and not-for profit entities that rely on EV drier input and self-regulation. These platforms are open to access data for EV-drivers and other market participants. They rely mainly on the good-will of consumers and other software developers to add information about charging stations and build new features.

Name	Features
Open Charge Map (international)	• Software is developed and hosted by volunteers • The data is crowdsourced and relies on sponsors • Location and availability display • e-mobility information service provider • Information available for public charging stations • Connects with international EV community • Open Charge Map is community operated and does NOT own the chargers • Open APIs to enhance development
National Chargepoint Registry (UK)	• Portal is managed by Next Green Car on behalf of the Department of Transport and Office for ZEV [10] • Aims to provide a single source of all publicly accessible charge points across the UK • Publicly accessible charge points only • CPOs are invited to load their charge point information onto the Registry

Table 5: Overview of non-commercial not-for profit entities

1.4 Overview of proposed initiatives

There are eight key initiatives proposed to deliver on the core business objectives of the NCL. These were proposed as part of the stakeholder engagement and tested and refined through that process. Table 6 provides an overview of these eight initiatives and an overview of the market problem that is addressed.

	Initiative	Overview
1	Create a standing database of public and private charging infrastructure	Currently there is no freely and easily accessible database of public charging infrastructure. The privately funded websites charge a significant fee to syndicate data and the platforms do not provide advanced functionality.
2	Create a data aggregation, collection layer and aggregated flexibility services for private charging data	While there are many initiatives in this area (such as DER register) to hold standing data, there is significant difficulty in collecting this data, and no initiatives around using this data to provide useful market functionality such as demand response schemes.
3	Create a national charging infrastructure master planning resource similar to https://nswmaps.evenergi.com/	Currently there is no database of public charging infrastructure available that enables stakeholders to capture and create value for policy making, planning and the

		development of innovative applications that will together drive efficiencies and decrease costs in the long run.
4	Select and implement key standards for charger interconnectivity, network aggregation	Optimise the location, number and interconnectivity of charging infrastructure networks nationally through a national data source that enables optimised national planning.
5	Create an open, standards driven application programming interface architecture to interface with standing data of EV chargers.	Capture and create value that can only be achieved through broad standardisation. Create a standing database of EV chargers and an open, standards driven application programming interface architecture to enable advanced charging network features including demand management interaction with the energy market.
6	Syndicate and/or display key information to stakeholder groups including - general public, fleet managers, government project officers, DNSP network planners, DNSP network operators, EV application developers, CPOs.	Reduce the national cost of doing business for government, energy market participants and the electric vehicle industry through free and easily accessible charging infrastructure data.
7	Create a highly secure, highly available environment, in line with the Australian Energy Sector Cyber Security Framework (AESCSF)	Create nationally significant infrastructure that is safe from cyber-attack.
8	Include private charging infrastructure, in line with stakeholders' expressed interest.	The share of private chargers compared to public chargers is expected to make up the majority of the total EVSEs, now and in the future.

Table 6: Overview of proposed initiatives

1.5 Benefits of initiatives to stakeholders

This section communicates the benefits of six of our eight proposed initiatives that will drive the development of the NCL. We describe the benefits by customer segment and provide a brief description of how the NCL will achieve these benefits.

Initiative #2 has not been described, because the benefits of flexibility and aggregation are outlined in the remaining six initiatives. The benefits of initiative #8, is aggregated in the description of initiative #1.

Initiative 1 - Create a standing database of public and private charging infrastructure

The NCL intends to initiate a standing, and where possible, real-time, database of public and proposed private charging infrastructure. The objective of this initiative is to make available a freely and easily accessible database, with advanced functionality.

Table 7 provides an overview of the customers and the respective benefits they receive from the creation of the proposed database of public and private charging infrastructure.

Customer	Benefits to customers
Federal and jurisdictional Gov., AEMO, AEMC, ESB, AER	Enables cost effective access to real life data information to improve planning, regulatory reform process and regulatory determinations.
DNSP in the NEM and SWIS	• Access to standing and real-time data around the location and use of existing public charging infrastructure enables better planning and network management • Usage patterns to inform operating envelope management and develop charging management programs. • Aggregation can provide impact of EVs at critical periods of high/low demand. • Size and composition to forecast EV uptake and impact. • Voltage measurements reveals voltage measurement and battery state of charge.
CPOs (i.e. Chargefox, EVIE, Ampol.)	A platform that enables advertising public charging infrastructure and access to network capacity information at minimal cost, enables forward planning for new charger locations, tariff optimisation depending on usage and network capacity, participation in flexibility markets.
EV Driver & Fleet Manager	Information on location, and availability of public chargers to make informed decisions before buying and running an EV. Information on location, and availability of public chargers when creating a transition plan and for fleet management.
Other key suppliers or partners	Energy retailers for new market offerings Start-ups need information to enter the market and develop new value-add applications for customers.

Table 7: Overview of the benefits by customer segment from the creation of the NCL database

In order to create such a database and deliver on the benefits to customers across the ecosystem, the NCL proposes to establish the following:

- a technical platform for securely storing data
- a process and interface (automated and manual) for adding data - primarily for CPOs
- a process an interface for accessing data in real-time or in bulk
- a governance and data sharing regime to provide comfort about the provision and use of data
- a highly secure database in line with the Australian Energy Sector Cyber Security Framework (AESCSF)

Initiative 2 - Create a national charging master planning platform

The NCL proposed to expand the NSW Government master planning platform established for the NSW Government by Evenergi. The data can be found at: https://nswmaps.evenergi.com/ and includes:

- projected electric vehicle adoption in the area
- traffic movements
- tourism data
- vehicle ownership
- local points of interest
- location of major cabling across NSW
- available substation capacities.

Table 8 provides an overview of the customers and the respective benefits that can be realised by creating a national charging master planning platform, such as the NCL.

Customer	Benefits to customers
Federal and jurisdictional Gov., AEMO, AEMC, ESB, AER	Improve policy design and support efficient funding decisions. Forecast EV uptake and impacts on planning decisions.
DNSP in the NEM and SWIS	Provide critical data for forecasting and capacity planning for EV adoption and integration as core enablers of the transition (i.e. EVSE and EV standing data)
CPOs (i.e., Tritium, Chargefox, ABB, Schneider Electric, etc.)	Identify sites for new EVSE, estimate return on investment, improve understanding of consumer behaviour Easier for customers to find charger
EV Driver	Understand current and planned charging infrastructure when making decisions about purchasing and using electric vehicles will drive adoption faster.
Other key suppliers or partners	New business models based on forward visibility of network roll-out more broadly

Table 8: Overview of the benefits by customer segment when creating a national master planning platform

Initiative 3 - Select and implement key standards

The NCL proposes to select and implement key standards for charger interconnectivity and enable network aggregation. In doing so, the NCL provides a single authoritative infrastructure that enables interaction between the public and private charging networks and potential data users (note, access and collection of private charging infrastructure is subject to regulatory change). Interface with standing data of EV chargers to be able to syndicate and/or display key information to stakeholder groups including - general public, fleet managers, government project officers, DNSP network planners, and operators, EV application developers and CPOs.

The NCL proposes to act as the national data source that enables optimised national planning and standardisation, by collecting the location, number and interconnectivity of the charging infrastructure. Offering this one 'Location of Truth', allows effective adaptation of international standards to the Australian context into a platform that then ensures all other parties implement and adhere to these open standards.

Table 9 provides an overview of the customers and the respective benefits of implementing key standards for charger interconnectivity and network aggregation.

Customer	Benefits to customers
Federal and jurisdictional Gov., AEMO, AEMC, ESB, AER	As an enabler of data access and syndication - this will drive whole of system beneficial outcomes. Standards are the backbone of efficient data transfer and access to core services.
DNSPs, every DNSP in the NEM and SWIS	Real-time data availability improves efficient network management such as *dynamic* operating envelopes, and more efficient tariff design.

CPOs (i.e., Tritium, Chargefox, ABB, Schneider Electric, etc.)	Interoperability and standardisation enable seamless data extraction and aggregation, facilitating the connection to other technology platforms to optimise the operation of all connected charge points in the network. Aggregation fosters innovative business models, new services and lower charge cost in the long-run.
EV Driver and Fleet manager	Seamless access to data and services across platforms improves experience and reduces costs through greater competition and service innovation.
Other key suppliers and partners	Ability to create new products and services that are otherwise not possible.

Table 9: Overview of the benefits by customer segment from selecting and implementing key standards

Initiative 4 - Create an open, standards driven programming architecture

The NCL proposes to create an open, standards driven programming architecture to interface with standing data of EV chargers. The objective is to capture and create value that can only be achieved through broad standardisation.

The NCL proposes to enable an Application Programming Interface (API) accessible architecture to enable the development of advanced features.

Table 10 provides an overview of the customers and the respective benefits of a standards drive programming architecture.

Customer	Benefits to customers
Federal and jurisdictional Gov., AEMO, AEMC, ESB, AER	Ability to access and build required functionality at a national level
DNSPs, every DNSP in the NEM and SWIS	Seamless communication between the DNSP's system, EVSEs, aggregation platforms and the energy and services markets to support efficient EV integration.
CPOs (i.e., Tritium, Chargefox, ABB, Schneider Electric, etc.)	Ability to access features and functionality that may assist in operations
EV Driver and Fleet managers	Better services from providers
Other key suppliers and partners	Core to delivering on new business models and features to end users

Table 10: Overview of the benefits by customer segment of a standards driven programming architecture

Initiative 5 - Syndicate and/or display key information to stakeholder groups

Although the core concept is to enable the wider commercial ecosystem to build on the foundational aspects of the system (i.e. secure and openly accessible data and services), the NCL should take responsibility for displaying core information to stakeholder groups.

Free access will reduce the national cost of doing business, for governments, energy market participants and the EV industry. This will enable cheaper innovation and adaptation to an ever-changing EV market. In the long run, energy customers will have access to new services at lower cost than what would have been achievable.

Table 10 provides an overview of the customer segments and the respective benefits from free charging data access.

Initiative 6 - Create a highly secure environment

The NCL proposes to create a highly secure, highly available environment, in line with standards such as the Australian Energy Sector Cyber Security Framework (AESCS), to ensure the data captured by the NCL is safe from cyber-attacks. Table 11 provides an overview of the customer segments that benefit from a highly secure, highly available environment by showing indicative implications of cyber-attacks by customer segment.

Customer	Benefits to customers
Federal and jurisdictional Gov., AEMO, AEMC, ESB, AER	Ensure public trust in charging infrastructure and deliver long term uptime guarantees.
DNSPs, every DNSP in the NEM and SWIS	Malicious attacks could be targeted at the link between the network and the platform. Hacking of charge point infrastructure via the NCL platform could directly affect DNSPs' customer privacy.
CPOs (i.e., Tritium, Chargefox, ABB, Schneider Electric, etc.)	Cyber-attacks impact CPOs financially, if not managed appropriately can result in a loss of customer trust and significant profits.
EV Drivers and fleet managers	Hacking of the billing system could result in the attacker charging its own car, but billing the victim EV driver.
Other partners and key suppliers	Fleet managers have most often data attached to their vehicles. A cyber-attack can have flow-on effects.

Table 11: Overview of the benefits by customer segment of data security in line with the AESCSF

1.6 High level architecture and technical requirements

As part of the scope of the project, a high-level conceptual software architecture was investigated so that a sense of the cost, complexity and time required for development could be obtained.

Like all complex systems, charging networks must first determine core system design concepts at an abstracted level before the detailed design principles can be implemented.

In the charging infrastructure this can be viewed as determination of the level of centralisation versus federation of services. Should services exist at the level of CPO aggregators only, or should they exist at a regional 'hub' or national level?

Left unchecked, international experience has seen a number of decentralised "hubs" of data and functionality centred around monopolistic CPOs at the expense of universal data access and network-wide services. The objective of NCL is to enable a national service that centralises the features that provide network benefits and optimise leverage of data.

The following diagram (2018)[4] captured the evolving market in Europe when it was at a similar stage to the current Australian market. Figure 1 below identifies the least optimal solution. Each service provider (CPO) is disconnected from others so users have different experiences and interfaces for each. The coloured lines denote different standards being deployed by proprietary systems.

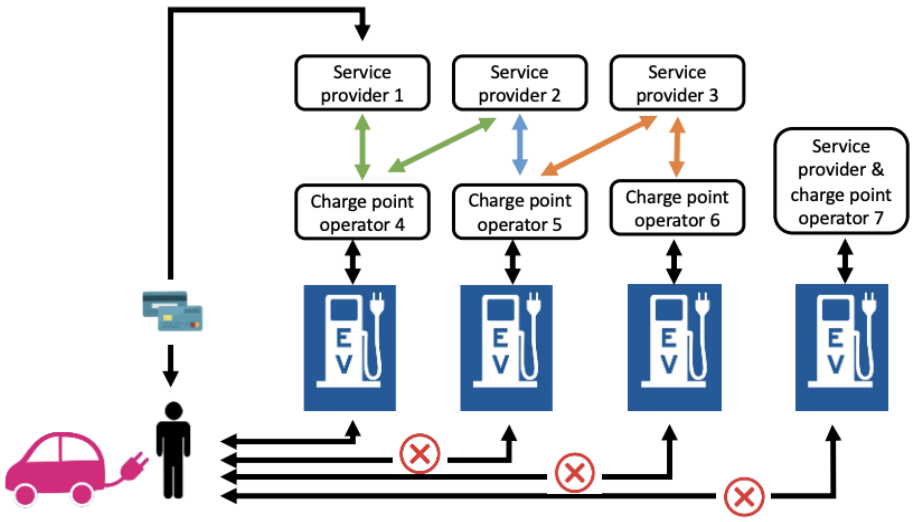

Figure 1: Least optimal solution for data provision (EU example)

Figure 2, below moves this to an optimal architecture options, where CPOs communicate via a HUB so that services are interoperable, there is a seamless experience for the consumer between services and new services and data aggregation can be implemented. The singular purple coloured lines denote that every part of the system has implemented agreed standards.

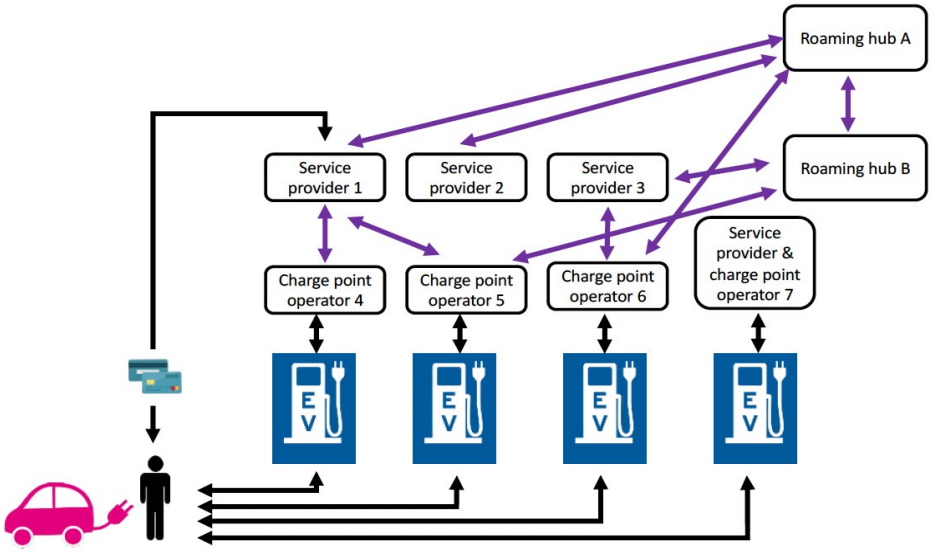

Figure 2: Optimal solution for data provision via a HUB for interoperability

[4] Advancing E-Roaming in Europe: Towards a Single "Language" for the European Charging Infrastructure

The types of standards that would be required were also considered as part of the project. Figure 3 offers a high-level overview of the options is depicted below.

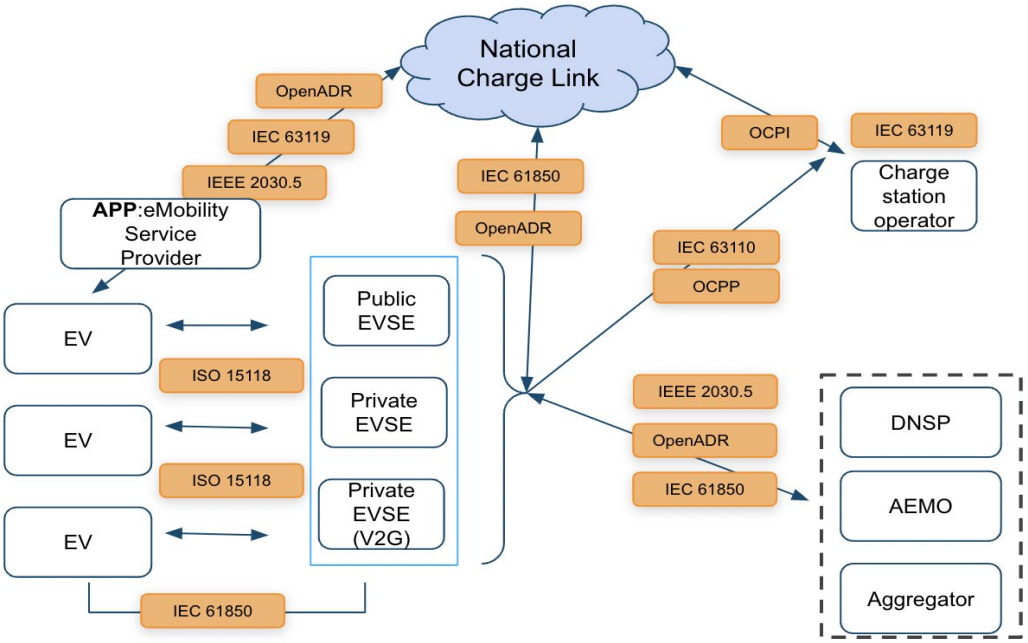

Figure 3: High level overview of standards required to build the NCL

2 Potential next steps for the development of the NCL

The NCL is an important proposal for the development of national infrastructure. The project should be delivered at a national level, and this will require implementation of strong governance and sustainable funding structure. The governance will include continual integration and collaboration with other initiatives such as AEMO's DER register.

2.1 How could the National Charge Link be governed?

Evenergi expects that the potential governance structure will adapt throughout the project life cycle. Evenergi proposes the following key attributes of the ideal governance structure:

1. Long term strategic vision based on rigorous analysis
2. Clear requirements leading to most efficient delivery mode selection
3. Flexible to changing circumstance
4. Fiscally sustainable
5. Aligned with other social, environmental and energy market policy objectives and with all levels of government
6. Transparent and effective stakeholder engagement, capital budgeting, procurement and risk allocation and generally evidence informed decision making
7. Methodologies and metrics to understand complex interdependencies and vulnerabilities across infrastructure systems and prioritise resilience efforts.

2.2 Alternative Governance options

Table 12 presents an overview of alternative governance options and their benefits to consumers and to the energy sector as a whole. It assesses how the ownership of the NCL by different institutions may impact the key attributes of a governance structure. The green boxes represent benefits, while the orange boxes depict no impact of the ownership structure on the key attributes, while a red box represents a risk.

	Example	Description	Strategic vision setting	Sustainable funding	Agile	Broader policy alignment	Transparency	Value for money
Regulatory agency	AEMO or ESB	The agency would host NCL with internal funding for on-going operations						
Federal Government Agency	DISER	The agency would obtain funding to build and host NCL						
State Government Agency	NSW OECC	Each state government would contribute to a national platform						
Private sector	PlugShare (international)	A business owns, hosts and operates the NCL, fee based data access		Depends on business model				
Private Public Partnership (PPP)	EV Roam (NZ)	Collaboration, led by Waka Kotahi, NZ Transport Agency and NZ energy industry						
Industry body/data provider for National Government Agency	Eco-Movement (EU)	Is privately held platform, exclusive provider of charging data go the European Commission, and other large scale applications		Depends on business model				

Table 12: Overview of alternative governance options

2.3 How could the National Charge Link be funded?

The success in delivering the NCL's benefits to consumers and the energy sector will depend on the underlying funding structure and the incentives that it creates. We have outlined the risks of different governance models, outlining the largest risks of not accomplishing its objectives when it is fully governed by the private sector. Similar risks are associated with a private funding structure. Table 13 contrasts the benefits and negatives of different funding models.

Funding model	Description	Benefits	Negatives
Government	Critical infrastructure funded as a public-good with broad economic and social benefits	• Long term funding commitment once key social and economic benefits were proven • Will maximise critical infrastructure risk management • Will maximise cross sectoral benefit realisation (i.e. energy and transport sector nexus) • Low and diminishing barriers for private data sharing	• May reduce drive for further development and innovation • May require a price premium for government level engagement levels
Commercial	Data access and services provided for a fee to stakeholders	• Drive further innovation • Could move quickly based on lower requirements for consultations and public buy-in • Risk sharing more efficiently allocated	• May de-focus from core public-good elements that do not have revenue streams • May lead to -sub-optimal critical infrastructure risk management • High regulatory barrier to sharing private data • Fee may deter using the platform, there are similar examples in the market
Hybrid funding - government underwritten with some revenue streams	Government underwriting with revenue from services where possible Fees attached to services that are leveraged by entities that receive a high commercial return from its usage	• Maximise long term sustainability through cost-neutral funding mechanisms with then all the benefits of government model • Fees for commercial services could remain low (i.e., capped by government, or due to low financing costs), incentivising the use of the platform to develop low-cost products for consumers	• Potential for fees to increase

Table 13: Overview of pros and cons of different funding models

3 Summary

The report outlines the need for the NCL to progress the transition to net zero transportation. It emerged from a similar software, developed by Evenergi in collaboration with ARENA and the NSW Government, which was subsequently extended to be used by the South Australian Government.

Consultations with stakeholders from the energy ecosystem, as well as jurisdictional and Federal Government officials expressed an interest in extending the NCL project into a national platform, with the objective to enable faster and more efficient charging infrastructure planning, and to ensure optimisation of the usage of charging infrastructure over time.

Stakeholders expressed an interest in extending the original scope that focused on public chargers only, to also include private chargers. This is because demand for private charging is significantly higher, compared to public charging. Hence, understanding private charging behaviour will contribute to more efficient network planning and policy development.

However, data capture from private chargers presents challenges due to privacy concerns. We understand that there is significant work across the policy sector to address these challenges, for example, the ESB is driving policy reform to develop a regulatory framework that would allow the collection of private charging data, while AEMO is drafting changes to existing regulations, to enable an extension of its DER register, including private chargers.

The development of the NCL should be based on a collaborative approach with AEMO, jurisdictional governments and the Federal Government to develop the NCL. Such an approach will avoid overlaps and guarantee that the consumers, as well as all other stakeholders in the energy ecosystem maximise the benefits from the project.

A not-for-profit based business model, allowing free access to data, rigorous governance structure that builds trust and ongoing finance of the platform are the cornerstones of success. Such an approach ensures continuous data capture to adapt to changing circumstances in the EV and electricity markets and an ongoing optimisation of data to meet changing market demands.

Given conversations conducted to date, the immediate and most likely home of the NCL would be with the Electric Vehicle Council, who is able to incubate the initial versions of the platform quickly, while longer term funding arrangements and structural changes are made.

The ultimate home would then be in collaboration with, or owned by the Federal government which would allow leveraging AEMO's existing ring fencing and privacy security framework as well as the Federal Government's existing security frameworks (i.e., private and cyber). It would also provide a trustworthy base for the electricity ecosystem and consumers and enable ongoing funding to maximise the NCL's benefits.

Key next steps to progress the development of the National Charge Link:

1. Develop an initial version of NCL – funding through Electric Vehicle Council
2. Finalise and agree with stakeholders on most effective governance structure, ultimate design and hosting structure
3. Finalise and agree with stakeholders on long term funding structure

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