



Australian Government

Department of Climate Change, Energy,
the Environment and Water

Data sharing arrangements to inform planning and enable future markets

Consultation Paper to progress M2 workstream of
the National CER Roadmap

Consumer Energy Resources Taskforce





Australian Government

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Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past and present.



1. Summary

As energy transforms from being a resource to becoming a technology, data fuels the future digitalised power system and energy market.

With the growing penetration of Consumer Energy Resources (CER) across Australia, effective data access and sharing arrangements among network and system operators, market participants and consumers is critical to support system security and emergency management, network visibility and the effective orchestration of CER. Australia has not yet implemented an integrated and common set of arrangements for data availability, access, sharing, and the standards applicable to CER-related devices and coordination. Divergent approaches risk leading to higher costs, creating barriers to the development of future services, and increased data security concerns than would otherwise be necessary.

To tackle the challenges of effectively integrating CER into the power system and energy markets, the Energy and Climate Change Ministerial Council (ECCMC) released its **National CER Roadmap** in July 2024, outlining national reform priorities. This project - *Data sharing arrangements to inform planning and enable future markets* [Priority M.2] – worked closely with the *Redefine roles for market and power systems operations* workstream [Priorities M.3 and P.5] to align with, and identify the key capabilities and associated gaps, in relation to data and data sharing across the power system and energy markets.

This paper highlights key data and data sharing gaps that may exist today or are envisaged to emerge in the future and proposes some immediate actions to resolve priority gaps.

The project team applied a detailed analytical framework to comprehensively document an **industry capability model** for effective CER integration. This model informed **315 current and emerging use cases** across various roles involving data and data sharing. A thorough gap analysis identified over **70 distinct data and data sharing capability gaps** that impact the effective integration of CER now and into the future.¹ Assessment criteria informed by the National Electricity Objective and guided by the Vision, Outcomes and Principles of the CER Roadmap, was used to prioritise these distinct gaps.

As part of its approach, the project team reviewed international data sharing approaches, past strategies and recent initiatives, and consulted subject matter experts to validate the analytical framework and the findings presented in this paper.

¹ Please refer to **Table 2: Use cases subject to Data Categorisation analysis** for a breakdown of the total 315 use cases identified for detailed data categorisation and gap analysis (i.e. 232 use cases via capability mapping plus an additional 83 subset of child use cases with different Information objects).



The project team has identified **six (6) distinct data sharing gap categories** that impact the **three (3) major outcomes**, identified by the *M.3/P.5* workstream, of system security and emergency management, visibility and predictability, and effective orchestration of CER. A series of actions have been proposed for consideration² that address priority gap categories, including:

- Development of a **National CER Data Strategy and Coordination Plan** to drive coordinated activity:
 - Stakeholder feedback is sought with respect to which organisation might be best placed to develop and implement the Data Strategy and Coordination Plan.
- Design and implementation of a **Data Sharing Arrangements Minimum Viable Product ('MVP')** comprising:
 - the development of **Transmission-Distribution (T-D) Coordination and Interfaces**.
 - the implementation of a **CER Asset Registration and Commissioning Strategy**.
 - extending the detailed design and implementation of a **CER Data Exchange**.

Further, other CER Roadmap workstreams are considering several priority gaps identified by the project, namely:

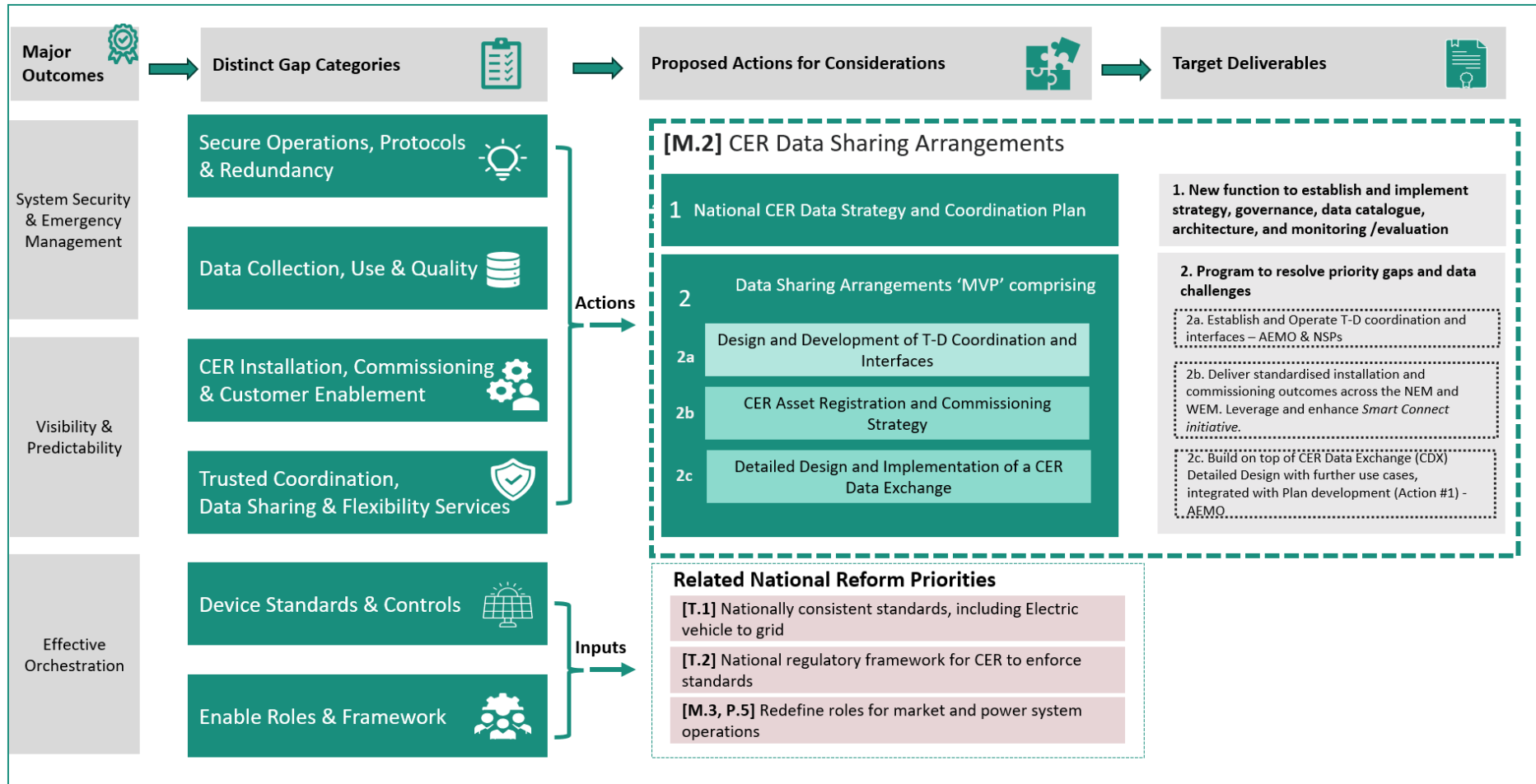
- **Developing and implementing key device and control standards:** being considered by the *Nationally consistent standards, including electric vehicle to grid (T.1)* workstream.
- **Enabling key roles and associated frameworks for conformance and compliance:** being considered by the *National regulatory framework for CER to enforce standards (T.2)* workstream.

A summary overview of the project's identified gap categories and proposed actions to resolve these priorities is shown in the figure below.

² Proposed actions influenced by the reality that much of the Energy Security Board's (ESB) Data Strategy, available at <https://www.datocms-assets.com/32572/1657767015-esb-data-strategy-final-reccomendations-july-2021.pdf> remains outstanding, and there exists limited or no coordination of a wide diversity of activity across the sector targeting energy data and its sharing arrangements (or digitalisation)



Figure 1: Distinct Gap Categories and Proposed Actions for Consideration



This paper seeks feedback on the analytical approach used, distinct gaps identified, and the proposed actions that seek to resolve those gaps. Specific consultation questions have been outlined in relevant sections for stakeholders' review and response.



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2. Introduction

Summary

A future energy system with a high penetration of CER is critically dependent upon data and communications. This paper progresses Priority M.2 of the National CER Roadmap, *Data sharing arrangements to inform planning and enable future markets*. It has worked closely with other workstreams of the CER Roadmap – in particular, the *Redefine roles for market and power systems operations workstream [M.3/P.5]* – to identify the key elements of a data sharing approach required to make end-to-end CER coordination and orchestration across organisations and devices a reality.

In a future energy system with a high penetration of Consumer Energy Resources (CER), data and communications are critical to enabling the effective orchestration of CER by consumers or their agents such as retailers and product and technology providers. Data and communications are also critical to enabling the coordination needed across distribution networks, power system operators, and market actors to ensure the secure, reliable and safe delivery of electricity supply for all users.

While many projects have investigated elements surrounding CER data and data sharing, an integrated and common set of arrangements for data availability, access, sharing and standards applicable to CER-related devices and coordination has not been implemented for Australia's electricity markets - the National Electricity Market (NEM) and the Wholesale Electricity Market (WEM).

In the absence of this common set of data sharing arrangements, emerging data models and approaches being undertaken or proposed by various actors risk divergent approaches being implemented, potentially creating barriers to the development of future market services, increasing data security concerns, as well as potentially leading to higher costs for all participants.

To effectively integrate CER into the power system and enable it to support a reliable, secure, and efficient transition to a clean energy future, it is necessary for appropriate data collection, management and exchange infrastructure and capabilities to be in place. These capabilities and infrastructure are not trivial, and although existing components and projects are available to be leveraged, there remains significant investment to be made across the industry to ensure effective data sharing is enabled, while avoiding the potential for costly duplications or inefficient integrations.

This paper is intended to progress National Reform Priority M.2 - *Data sharing arrangements to inform planning and enable future markets* – which underpins a sustainable, future ready, and world leading energy ecosystem through its enablement of coordinated operations, CER service markets and consumer choice to maximise their participation, which lowers system costs for all energy consumers.



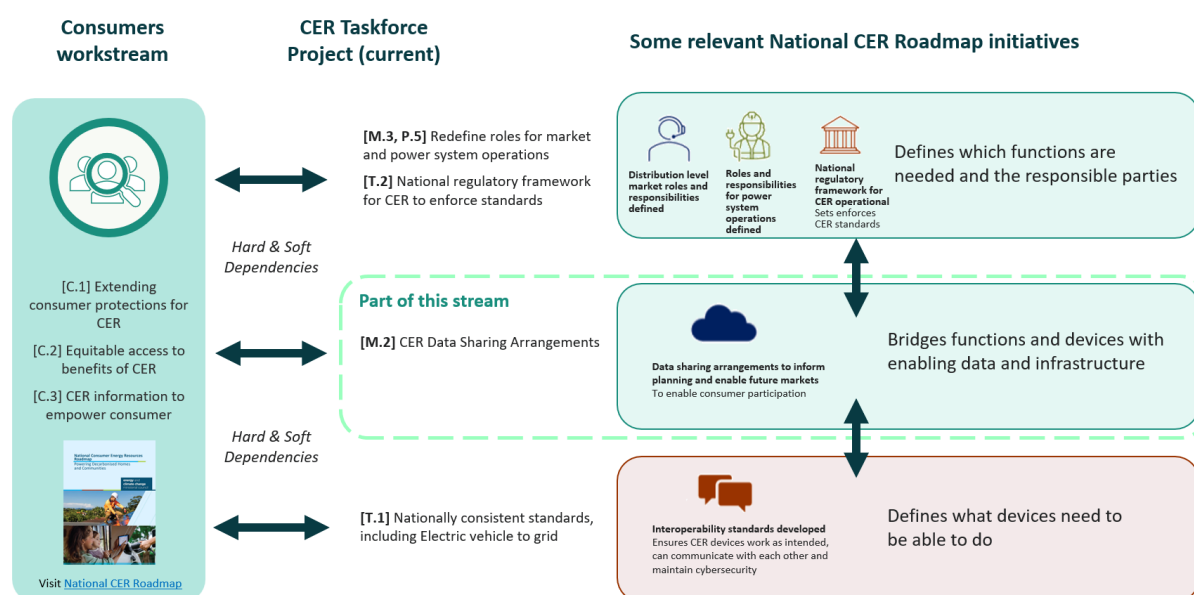
As a key investigation forming part of the National CER Roadmap (“CER Roadmap”)³, this project has worked directly with other CER Roadmap initiatives to derive an outline of the data sharing requirements across the NEM and WEM that would support a high CER future.

Specifically, the project has closely collaborated with the team leading the M.3 [Redefine roles for market operations] and the P.5 [Redefine roles for power system operations] workstreams – collectively referred to as the **Redefine roles for market and power systems operations workstream** [M.3/P.5].

The M.3/P.5 project has focused upon **what capabilities** are required to integrate CER into the power system and market, **who is responsible** for certain capabilities, and **how the capabilities can be improved**. Underpinning this investigation are concerns regarding what data is required to support these capabilities, and how might it best be shared, the focus of this project (M.2) and consultation paper.

In addition to the M.3/P.5 collaboration, this project has also engaged with the team leading the CER Roadmap workstream focused upon *Nationally consistent standards, including electric vehicle to grid* (Priority T.1). The relationship between these key workstreams is shown in the figure below.

Figure 2: Relationship between key CER workstreams



³ Available at <https://www.energy.gov.au/sites/default/files/2024-07/national-consumer-energy-resources-roadmap.pdf>

The intent of this paper is to seek feedback on the analytical approach used, and the associated proposed actions, which target the delivery of enabling data access, availability and sharing arrangements that support current and future market and system roles and responsibilities.

The structure of this paper is as follows:

- **The Challenge (Chapter 3 and 4):** identifying the data sharing challenges associated with the effective integration of CER into power system operations and markets, and highlighting the problems that need solving;
- **Scope (Chapter 5):** outlining the scope of the workstream investigating Data Sharing Arrangements, including those elements not considered by the project;
- **Research and Stakeholders (Chapter 6):** identifying key related areas of research or prior investigations leveraged by the project team, as well as those stakeholders engaged to provide direct input and feedback into the draft artefacts and proposed actions for consideration;
- **Analytical Framework (Chapter 7):** providing an overview of the framework and approach used to derive the project team's insights and proposed actions for consideration (a detailed outline of the framework is available in the appendices);
- **Findings (Chapter 8):** detailing the key insights surfaced through the team's analysis;
- **Proposed Actions for Consideration (Chapter 9):** a series of proposed initiatives for stakeholder feedback that would enable Australian jurisdictions to effectively integrate CER into the power system and energy markets, including initial data sharing infrastructure and capabilities - a 'Minimum Viable Product' ("MVP").

USER PROFILE SIDEBAR:

AN EXAMPLE

Throughout the paper, various Sidebars appear outlining different Roles who engage with our power system and markets.

They show a small but diverse sample of personas and their varying data and data sharing requirements, now and into the future.

The Sidebars do not necessarily relate to the content alongside which they have been placed.



3. The Data Sharing Challenge

Summary

The energy system is being transformed. Millions of decentralised CER connected to various distribution networks, a highly weather-dependent renewable energy system and extremely rapid response capabilities from storage systems means the dynamism of future operations will be instrumental in ensuring the safe, reliable and resilient supply of energy for all Australians. Correspondingly, the future energy system needs a highly dynamic capability to access, interrogate, aggregate and share data.

The benefits of effective data sharing arrangements include lower costs, achieving decarbonisation goals, a stable and resilient system, and a platform for innovation.

The energy sector is undergoing transformational change as it decarbonises and transitions to a system with large and dominant volumes of low-carbon and renewable generation. As outlined in the Australian Energy Market Operator's (AEMO) Integrated System Plan (ISP)⁴ for the National Electricity Market, Australia's coal-fired generators are retiring, and renewables accounted for almost 40% of the total electricity delivered through the NEM in 2023. In parallel with this, in Western Australia, over a decade ago, 90% of the electricity through the South West Interconnected System (SWIS) was supplied by fossil fuels, whereas approximately one-third of the WEM's current day supply is sourced from wind and solar generation, including peak periods where it reaches over 85%⁵.

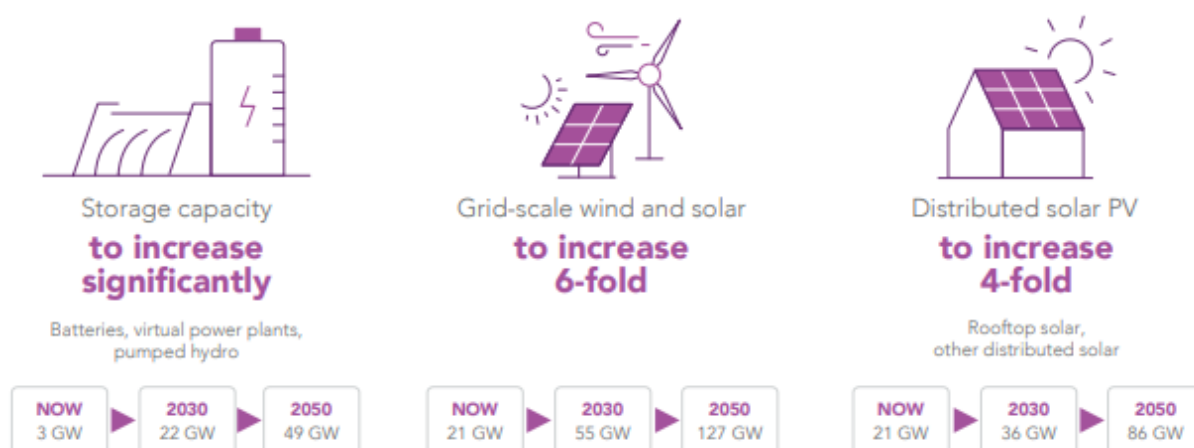
As the ISP outlines, CER such as rooftop solar, batteries, and electric vehicles (EVs) will play a valuable role in the energy transition. By 2050, under the ISP's Step Change scenario, storage capacity – batteries, virtual power plants, and pumped hydro – will grow by more than 15 times, with distributed solar photovoltaic (solar PV) systems capacity estimated to increase by 400%.

⁴ Available at <https://aemo.com.au/-/media/files/major-publications/isp/2024/2024-integrated-system-plan-isp.pdf?la=en>

⁵ See <https://aemo.com.au/-/media/files/learn/fact-sheets/2025/wem-fact-sheet.pdf?la=en&hash=EF3490371F77A48CAAEC7FC6078C5017>



Figure 3: Key facts and figures, AEMO's 2024 ISP 'Step Change' scenario



In the WEM, the most recent Electricity Statement of Opportunities highlights that solar PV is expected to grow to approximately 6.5 gigawatts (GW) of capacity in the SWIS by 2033-34⁶.

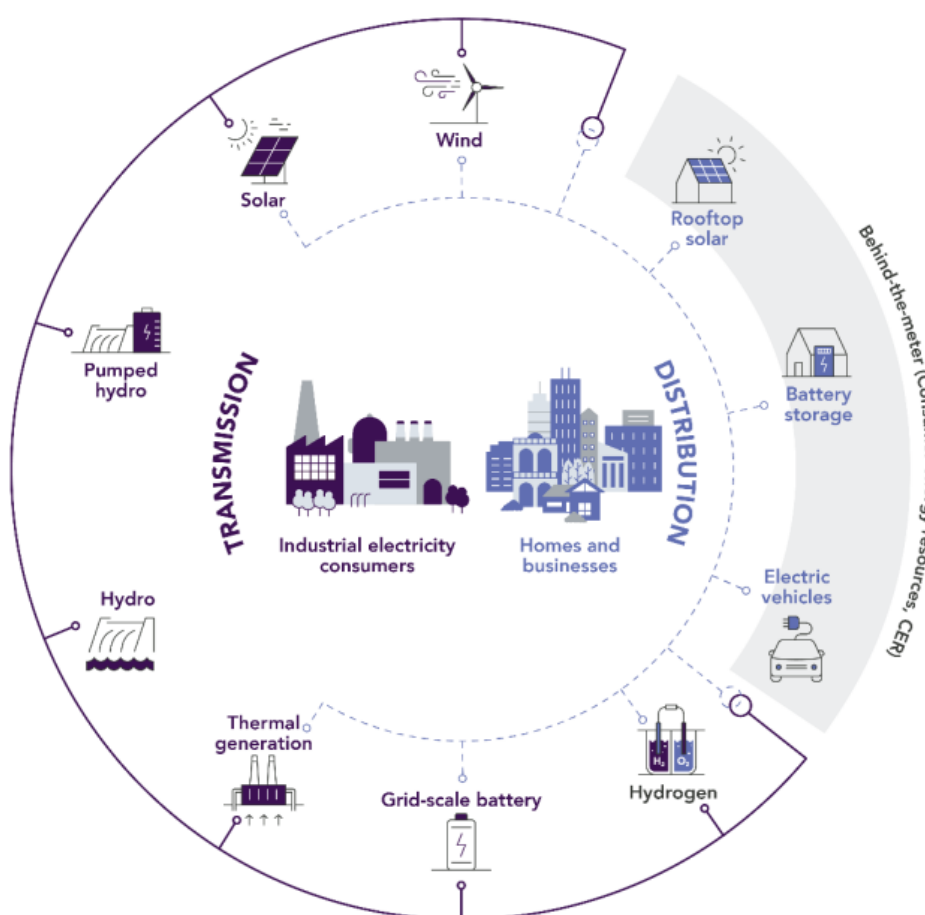
Much of the forecast increases across both markets will come through households installing solar PV and batteries, as well as participating with their CER assets in Virtual Power Plants (VPPs). This uptake by consumers of CER is unprecedented.

This never-before-experienced transformation of Australia's energy system means the nature of the way electricity is delivered to homes and businesses will dramatically change. Our traditional power system relied on large, grid-connected generators delivering high-voltage electricity along lengthy transmission lines, before being distributed at low voltage to where it was consumed by our households and businesses. The future – currently emerging – power system will continue to have this transmission grid-connected generation. However, it will also have large quantities of energy supply being generated “behind-the-meter”, within a household or business facility.

⁶ See the full ESOO here: https://aemo.com.au/-/media/files/electricity/wem/planning_and_forecasting/esoo/2024/2024-wem-electricity-statement-of-opportunities.pdf?la=en&hash=6B9DD8B889C7EE8B280475DEC8F655FA. Key facts and figures are available here: https://aemo.com.au/-/media/files/electricity/wem/planning_and_forecasting/esoo/2024/2024-wem-esoo-visual-overview.pdf?la=en&hash=2F328E61F58383D552BAE31E10DC8293



Figure 4: A power system with both grid and behind-the-meter energy supply



Source: AEMO, 2024 ISP

As the future energy system emerges, the challenge facing the NEM and WEM – and power systems the world over – is to integrate significant volumes of behind-the-meter devices, or CER. Integration means these CER devices must be able to identify themselves, communicate, co-ordinate, and respond to and with other devices and system operators to ensure our electricity system remains secure, safe and reliable.

Moreover, as the CER Roadmap points out, the effective integration of CER into our energy system and markets has the potential to deliver a combined economic benefit for Australia of more than \$19 billion by 2040⁷.

⁷ Inclusive of \$11 billion in avoided network costs and \$8 billion in reduced generation and storage costs. See Section 2.2 of the Roadmap: [national-consumer-energy-resources-roadmap.pdf](https://www.aemo.com.au/energy-systems/consumer-energy-resources/roadmap)

All energy systems and markets have strong and critical data underpinnings – without the ability to visualise and predict energy flows across a system, operators cannot effectively balance electricity supply with demand as it is needed - in real-time. This risks the stability⁸ and reliability of the entire system, leading to higher costs for all consumers as larger quantities of contingency ('reserve') arrangements must be purchased to reduce these risks.

As energy transforms from being a commodity – extracted, concentrated in certain geographies, finite and with a highly volatile cost structure – towards being a technology – generated, widely although variably available, infinite and with a learning curve that sees costs dropping (often significantly) over time – the *digital dimension* to managing our power systems and markets is increasingly dominating and transforming their operation. Data, and data sharing, is the fuel for this digital transformation.

The emerging energy future of:

- millions of decentralised CER connected to various distribution networks;
- a highly weather-dependent renewable energy system; and
- extremely rapid response capabilities being available from both large and small-scale storage systems, including EVs (which are also mobile);

indicates an exceptionally dynamic capability is needed from future market and system operations to ensure the safe, reliable and resilient supply of energy for all Australian households and businesses.

USER PROFILE SIDEBAR:

CUSTOMER AGENT

I've aggregated a portfolio of consumer energy assets which are contracted to provide support to various large generators to reduce demand or increase CER generation as they may require.

I want standardised and easy data access and device control so I can more efficiently and effectively manage my fleet, including onboarding new customers.

Improved data quality and sharing would help me grow my portfolio more efficiently and better support my customers.

⁸ As the Geoff Eldridge has highlighted, *stability is not the absence of change, but the capacity to adapt to it*. See https://nemlog.substack.com/p/when-the-grid-slipped-reading-the?utm_source=post-email-title&publication_id=3389290&post_id=163879780&utm_campaign=email-post-title&isFreemail=true&r=avOdi&triedRedirect=true&utm_medium=email



The dynamism of the future energy system will only be enabled with a correspondingly capable configuration of data access and sharing arrangements. For CER devices to effectively integrate, they must share data – with their owners, manufacturers, installers, other devices, as well as system and market operators (to name just a few interactions).

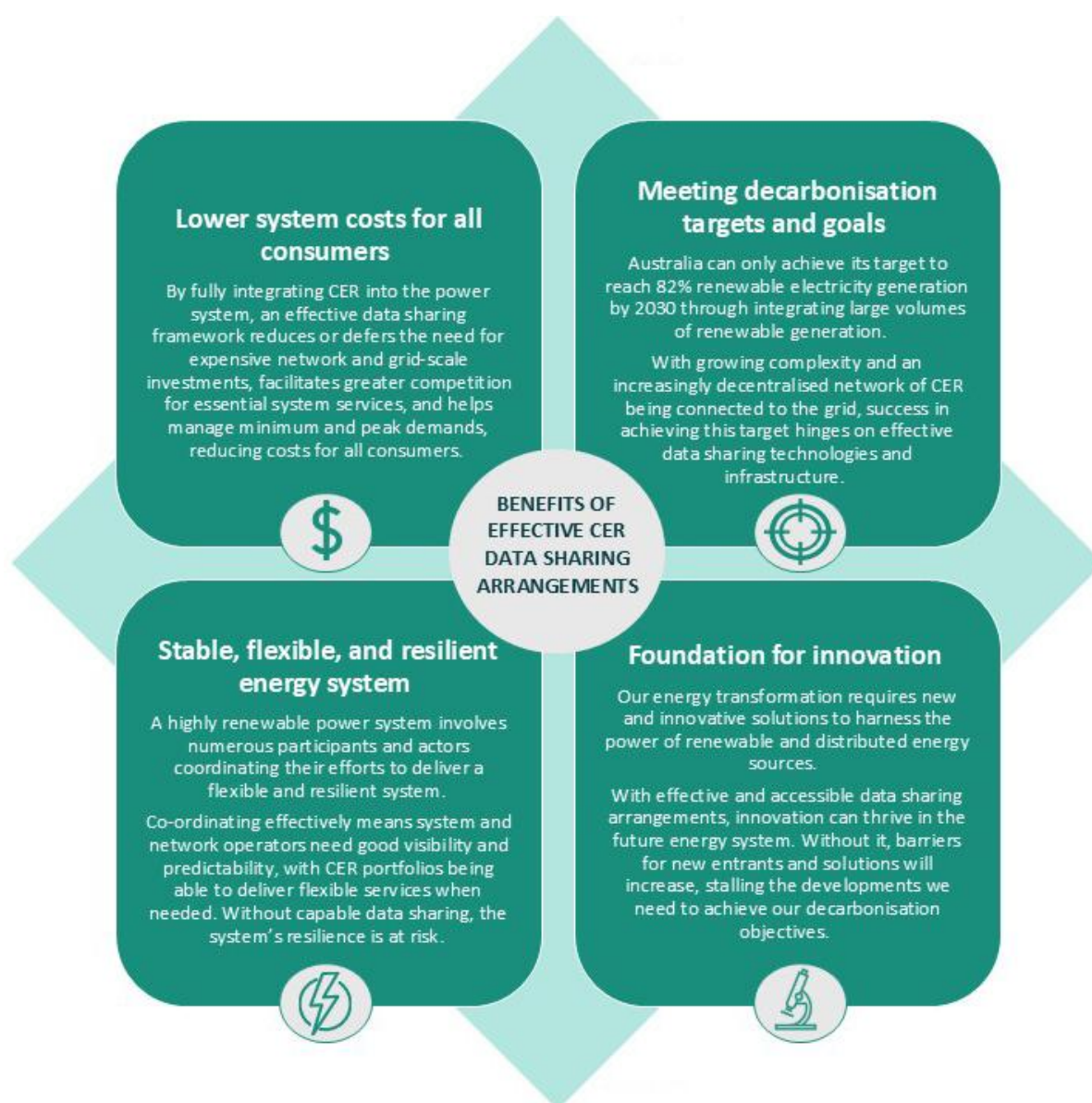
The increasing complexity of an energy system with vast amounts of integrated CER means a robust and capable framework for data sharing is needed.

In addition, implementing this capable framework would establish a significant capability for the energy system to innovate and design key solutions that leverage the flexibility CER can provide:

- Boosting the **pace of innovation**, with many organisations, within and external to the energy sector, able to collaborate and build high impact products and services that meet critical energy transition challenges;
- Enabling the system operator to secure real-time, granular information that contributes to **improved optimisation of whole-system operations**;
- Ensuring market and distribution system operators are able to define, design and establish new cost reflective service requirements that provide **incentives for CER portfolios to contribute** to system balancing and other needs;
- Growing the market for flexibility service providers, such as VPP operators and other parties securing consumers' interest and devices to provide the (often) automated services that **meet the sophisticated needs of market and system opportunities**;
- The ability for key stakeholders, including policy makers, to investigate potential market and system scenarios that **drive decision-making in a data-rich and highly dynamic environment**.



Figure 5: Benefits of effective CER Data Sharing Arrangements



4. Data Sharing Problems

Summary

Our approach to data and data sharing has been uncoordinated, leading to various problems including poor interoperability and data quality, and a lack of data availability and common sharing practices. By fixing these issues, we help solve problems relating to system security and emergency management, visibility and predictability of CER, the effective orchestration of CER, and operational co-ordination.

Much of the nation's approach to integrating CER has evolved organically, with differing jurisdictional support arrangements implemented to boost CER penetration, and various organisations deploying data and data sharing solutions without consideration towards a consistent sector-wide architecture (which has not been specified). The lack of a structured approach to integrating and co-ordinating CER into the NEM was the basis for the development of the CER Roadmap⁹ (following the WEM's DER Roadmap launched in 2019¹⁰).

This historical evolution means key data and data sharing problems remain:

- **Poor CER data interoperability:** interoperability ensures devices are capable of interacting with other devices and actors from different manufacturers and suppliers, so consumers are not locked into data sharing relationships with a single supplier. With millions of devices and many different manufacturers, CER aggregated data sets can be voluminous and difficult to compare and combine, often requiring manual and time-consuming methods and processes to do so. The result are data silos, with duplication and mismatched data being available in various formats or standards. With poor data interoperability, information becomes difficult to access and use when it is needed.

USER PROFILE SIDEBAR:

CER DEVICE SUPPLIER

I sell and install a suite of consumer energy devices and applications.

I want a standard installation and commissioning system that enables me to maintain and reconfigure devices as well as provide device metadata and associated capabilities with ease.

Improved data access and sharing arrangements would boost the quality of device data provided about my devices during installation, commissioning, and their ongoing operation, helping customers and system operators alike.

⁹ Available at <https://www.energy.gov.au/sites/default/files/2024-07/national-consumer-energy-resources-roadmap.pdf>

¹⁰ Available at <https://www.wa.gov.au/government/distributed-energy-resources-roadmap>



- **Data quality:** there are many and varied sources of data and contextual information for CER devices installed within households and businesses. Without a consistent and clear approach to the ownership and governance of this data, significant issues relating to its quality have surfaced over time, which makes the usability and reliability of the data questionable (especially for critical system operational processes);
- **Data availability:** much of the data associated with the volume of CER connected to distribution networks, their type, capacities, consumption or generation profiles and other behaviour (such as whether they form a part of a larger portfolio) is not readily available or easily available outside of distribution network Energy Management Systems (EMS). This poor visibility and predictability impacts the forecasting capabilities of system and market operators and their ability to efficiently balance electricity supply and demand, which can lead to higher contingency costs being incurred as operators must ensure secure supply at all times;
- **Lack of common CER Data sharing practices:** sharing CER data across the energy sector is often carried out between organisations on a bilateral basis. Therefore, various approaches are used and a scalable, common set of practices is currently lacking, which may lead to higher costs in the long run associated with managing these multiple approaches;
- **CER Data sharing infrastructure and capabilities:** while significant developments have been undertaken in recent times with respect to a CER Data Exchange¹¹, much of the energy sector's data sharing infrastructure and capability has not been designed to support the sheer scale, coordination, and rapidly evolving needs associated with CER data. This can make it difficult for new and innovative organisations to enter the market, and impacts operational capabilities to manage the system dynamically, potentially leading to higher costs for existing participants and consumers.

4.1. Problems we are seeking to solve

The commentary in the previous section highlights current data sharing challenges across the power system and energy market. While it accurately outlines the difficulties faced today, it does not specify the problems it aims to address if these shortcomings were resolved. In particular, it does not clearly identify the key issues that must be tackled to enable the effective integration of Consumer Energy Resources (CER) into the power system and energy market.

¹¹ Information about CER data exchange Industry Co-design initiative available at <https://aemo.com.au/initiatives/major-programs/nem-distributed-energy-resources-der-program/markets-and-framework/cer-data-exchange-industry-codesign>



The consultation paper¹² produced by the *M.3/P.5* project team - *Redefine roles for market and power systems operations* - outlines key capability gaps associated with realising the potential benefits of CER for all consumers, whether they are owners of CER devices or not. That paper summarises the key challenges of CER integration into the power system and energy markets:

- **System security and emergency management:** in aggregate, CER has sufficient scale to impact the secure operation of the system. For example, solar PV collectively is by far the largest source of generation¹³ across the NEM and WEM, and across the next decade or so, distributed storage capacity is forecast to be greater than the size of the largest individual generator in each mainland NEM region¹⁴. How CER collectively responds to system disturbances and their default uncoordinated operation (such as exporting generation into distribution networks throughout the day) is therefore crucial to maintaining system security. Determining the required data and data sharing arrangements that will enable CER to be sufficiently co-ordinated, controllable and integrated into existing system security processes is a critical problem to be solved.
- **Visibility and predictability of CER:** an energy market's capability to deliver the most cost-effective arrangements for consumers is dependent upon its ability to accurately match supply and demand in real-time. Being able to see what resources are where within grids, understand their patterns and behaviours, and being able to model them effectively, all contribute to the market's outcomes. Without visibility or predictability of CER, the challenges of delivering optimal power system and market outcomes are acute. Determining the most effective method of enabling access to, and the sharing of, data that delivers CER visibility and predictability is a critical problem to be solved.
- **Effective Orchestration of CER:** batteries, rooftop solar and EVs have inherent flexibility – when (and for whom) they generate or store energy is open to change. This flexibility can be triggered by tariffs (time-of-use or potentially dynamic ones). However, significantly more value may be secured when CER is actively managed and is responding as part of a VPP, operations that orchestrate portfolios of CER devices to deliver a service and financial outcome to device owners and a counter-party who has solicited the effect of the flexibility they can provide. Orchestrating CER – device data and data sharing arrangements that facilitate the co-ordination and control of

¹² Made available at consult.dcccew.gov.au

¹³ In the NEM, solar PV can, at times, supply more than half the underlying demand in the NEM, as outlined here: <https://aemo.com.au/-/media/files/initiatives/der/managing-minimum-system-load/supporting-secure-operation-with-high-levels-of-distributed-resources-q4-2024.pdf?la=en>, p. 15. Solar PV is the largest generator in the SWIS, installed in more than one-in-three households as outlined here: <https://aemo.com.au/-/media/files/learn/fact-sheets/2025/wem-fact-sheet.pdf?la=en&hash=EF3490371F77A48CAAEC7FC6078C5017>

¹⁴ See AEMO's *Draft 2025 IASR Inputs and assumptions workbook*, Step change scenario here: <https://aemo.com.au/-/media/files/major-publications/isp/2025/draft-2025-stage-1-inputs-and-assumptions-workbook.xlsx?la=en>



portfolios of distributed CER – both drives financial benefits for the owners of these devices, as well as all consumers when they deliver lower cost solutions than would otherwise be required. Determining the most effective approach to enabling CER orchestration, for potentially many and varied reasons (or use cases), is a critical problem to be solved.

Interconnected with these critical problems to be solved is the challenge of **operational co-ordination**. With potentially billions of devices spread across millions of households and businesses in the future, seeing, predicting, and orchestrating CER, as well as responding to system emergencies involves a huge coordination effort across operators managing system, transmission, and distribution zones working closely with consumers and their agents who own and control CER devices. This coordination can only operate effectively with accurate data being available and shared dynamically amongst many roles and actors across the power system.



5. Scope and Context

Summary

This consultation paper is part of Priority M.2 of the National CER Roadmap, *Data sharing arrangements to inform planning and enable future markets*. The scope of this paper is to identify key data and data sharing gaps that may exist today or are envisaged to emerge in the future and propose some immediate actions for stakeholder feedback. This feedback will inform an effective data sharing framework that can enable CER flexibility that supports informed consumer choices, efficient market interactions, the entry of new and innovative products and service providers, scalability and integration of future CER, and reliable and secure system operation.

In response to the opportunities and challenges presented by CER as part of Australia's energy transition, the Energy and Climate Change Ministerial Council (ECCMC) released a National CER Roadmap in July 2024¹⁵. The CER Roadmap sets reform priorities to build national consistency and support a harmonised approach to unleashing the full potential of CER. It sets out a vision and work plan to deliver a future where:

Consumer Energy Resources are an integral part of Australia's secure, affordable and sustainable future electricity systems, delivering benefits and equitable outcomes to all consumers through efficient use which smooths the transition, rewards participation and lowers emissions¹⁶

The CER Roadmap identified the following core National Reform Priorities:

- T.1 Nationally consistent standards including electric vehicle to grid
- T.2 National regulatory framework for CER to enforce standards
- M.2 Data sharing arrangements to inform planning and enable future markets
- M.3 Redefine roles for market operations
- P.5 Redefine roles for power system operations.

This paper seeks to address Priority M.2 highlighted above.

¹⁵ Available at <https://www.energy.gov.au/sites/default/files/2024-07/national-consumer-energy-resources-roadmap.pdf>

¹⁶ See section 1.1 in National CER Roadmap available at <https://www.energy.gov.au/sites/default/files/2024-07/national-consumer-energy-resources-roadmap.pdf>



Further, this project has collaborated closely with the team leading the *Redefine roles for market and power systems operations workstream [M.3/P.5 priorities]*, and this paper has sought to structure its findings and proposed actions for consideration in alignment with those produced by that workstream¹⁷.

The scope of this paper is to identify key data and data sharing gaps that may exist today or are envisaged to emerge in the future and propose some immediate actions for stakeholder feedback. This feedback will inform an effective data sharing framework that can enable the flexibility to support:

- Informed consumer choices
- Efficient market interactions
- Entry of new and innovative products and service providers
- The integration of future CER at scale
- Reliable and secure system operation and planning.

This paper has considered, at a national level, the end-to-end data sharing arrangements that may best enable the effective integration of CER into the power system and energy markets.

The data sharing approach and proposed actions for consideration outlined in this paper seek to support organisation-to-organisation, organisation-to-device and device-to-device interactions, accounting for both emergency and business-as-usual scenarios, as shown in Figure 6 below.

USER PROFILE SIDEBAR:

NETWORK OPERATOR

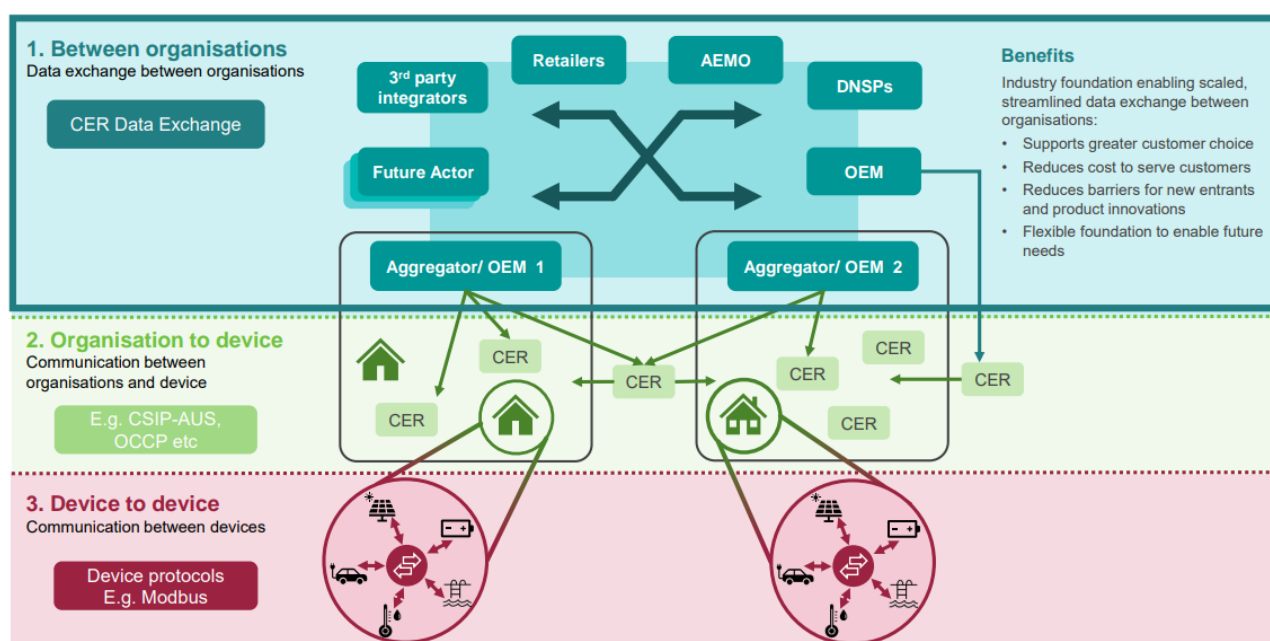
I manage a network distribution system.

I want to be able to build demand and generation forecasts for those households and businesses served by my system, and contract with distributed resource owners and operators to help me manage constraints across my system as they arise.

Improved data quality and sharing arrangements would enhance my system planning and enable me to contract CER portfolios to manage key network constraints.

¹⁷ See Chapter 3 of the M.3/P.5 Redefine roles for market and power systems operations consultation paper

Figure 6: Interactions supported by data sharing approach and proposed actions



Source: AEMO¹⁸

As part of its output, the project team has sought to assess which roles might be needed for which data and for what purpose, as well as on what timescale and frequency considering the usability of data once received. In particular, this has required close consideration of the information required to perform the full range of functions identified as part of the *M.3/P.5* project, as well as aligning its approach to the capability gaps and near-term opportunities identified by that project¹⁹.

The intent of the approach outlined within this paper is to seek stakeholder feedback on key proposed actions for consideration that might guide the policy decisions required to implement a nationally consistent set of CER Data Sharing Arrangements.

Moreover, the potential actions for consideration outlined within this paper have sought to take the form of identifying further work that may need to be undertaken and which seeks to build upon or uplift the required components with supporting rationale and evidence. The scope of this, at a high level, includes:

¹⁸ AEMO, CER Data Exchange Industry Co-design Project accessed May 2025, available at: <https://aemo.com.au/initiatives/major-programs/nem-distributed-energy-resources-der-program/markets-and-framework/cer-data-exchange-industry-codesign>

¹⁹ See Chapter 3 of the *M.3/P.5* Redefine roles for market and power systems operations consultation paper



- Considering particular standards or components thereof, such as communication protocols or data transfer mechanisms to enable an interoperable ecosystem of CER devices and data sharing arrangements;
- Regulatory reform pathways where required;
- Improving existing infrastructure or proposing the construction of new infrastructure;
- Processes for better data management;
- Potential funding options to be further investigated.

It is expected that further work beyond this paper will be required to complete the detailed design of any prospective solution pathways as well as investigate the associated funding options for these pathways.

5.1. Out of Scope

The following requirements were considered out of scope for this paper:

- The power system and market operation functions that various industry roles and actors will be responsible for undertaking – this requirement is being undertaken by *Redefine roles for market and power systems operations* workstream²⁰ (M.3/P.5);
- The design of any potential data sharing platform, database for storing data, or digital component that may be identified as being required to facilitate data sharing. These detailed considerations relating to data architecture will be undertaken in subsequent stages, or informed through existing activities which may warrant it;
- The specific standards and communication protocols required for communicating with CER devices. This requirement is being considered as part of the *Nationally consistent standards, including electric vehicle to grid* (priority T.1) workstream of the CER Roadmap;
- The development of the roles and responsibilities for CER technical regulation, including considerations such as a conformance monitoring framework. The potential for this function has been raised by the M.3/P.5 workstream, and will be addressed by the *National regulatory framework for CER to enforce standards* (Priority T.2) workstream;
- The design of a CSIP-AUS Public Key Infrastructure framework, with this work being led by the Energy Networks Association (ENA) in collaboration with industry²¹;

²⁰ Made available at consult.dcceew.gov.au

²¹ Available at <https://www.energynetworks.com.au/news/energy-insider/2023-energy-insider/the-modern-day-guard/>



- Consumer protections and obligations. With consumers central to CER, much of the data considered within this paper is likely to belong or relate to consumers. The consideration of the nature and implementation of appropriate CER consumer protections and obligations on service providers is being undertaken by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) through the Better Energy Customer Experiences (BECE) project. It is also being considered under the *Extending consumer protections for CER* (C.1) and C.2 workstream of the CER Taskforce. The BECE work will provide a directions paper to ECMC at the end of 2025 setting out recommended directions for policy reform;
- Other National Energy Transformation Partnership (NETP) working groups are also undertaking work that might interact with this project –any significant interactions of other NETP work will be first handled through the relevant CER Working Group (CERWG).
- Approaches to managing cybersecurity risks. These must be integrated into considerations during the conception, design, development and operation of any physical system, energy or otherwise, to mitigate or even eliminate avenues for cyber-enabled attacks. Government will continue working with market bodies and industry to mitigate cyber security risks.

While the above items are not within the scope of this paper, the findings and proposed actions for consideration within this paper has sought to be aligned with the activities and approaches being undertaken by other CER Roadmap workstreams. They have also sought to recognise and align with other separate efforts which may have CER-relevant items within their scope or seek to inform and identify key requirements with respect to data and data sharing that may be relevant to those efforts.



6. Research and Stakeholder Input

Summary

Extensive background reading and research, across local and international investigations and activities, has been undertaken as part of this project's effort. A select group of key stakeholders have been engaged to assist and provide feedback on the project's approach, framework, and findings to inform this Consultation Paper.

While Australia has not yet determined a consistent framework for data sharing arrangements that effectively integrate CER into the power system and markets, there has been research and prior investigations undertaken within and across the sector that has touched upon or influenced thinking around these required arrangements.

Moreover, international markets and energy systems have seen some significant developments and research activity on issues such as energy sector digitalisation, distributed energy resource (DER) communications and protocols, as well as data sharing arrangements within highly renewable systems.

This project has reviewed an extensive range of research and materials associated with CER (or DER) data sharing, with the specific publications and references reviewed outlined in detail in Section 11.

A high-level summary of the topics associated with the research material is provided here, which include:

- **Recent and former investigations into energy data, data services, data visibility, and/or data collection:** this includes the Energy Security Board's (ESB) Data Strategy²², its subsequent publication on a Data services delivery model²³, follow-on activity conducted by the Australian Energy Regulator (AER) via its Network Visibility project, the recent Statutes Amendment (*National Energy Laws*) (*Data Access*) Act 2025²⁴, and the Australian Energy Market Operator's

²²Available at <https://www.datocms-assets.com/32572/1657767015-esb-data-strategy-final-recommendations-july-2021.pdf>

²³ Available at [1671059508-esb-data-services-delivery-model-consultation-paper-december-2022.pdf](https://www.datocms-assets.com/1671059508-esb-data-services-delivery-model-consultation-paper-december-2022.pdf)

²⁴ Available at [https://www.legislation.sa.gov.au/lz/v/a/2025/statutes%20amendment%20\(national%20energy%20laws\)%20\(data%20access\)%20act%202025_7/2025.7.un.pdf](https://www.legislation.sa.gov.au/lz/v/a/2025/statutes%20amendment%20(national%20energy%20laws)%20(data%20access)%20act%202025_7/2025.7.un.pdf)



(AEMO) recent investigation and consultation regarding the collection of *electric vehicle (EV) data*²⁵;

- **Rule changes and technical reviews associated with data:** including the Australian Energy Market Commission's (AEMC) *Review of the regulatory framework for metering services*²⁶, as well as their *Real-time data for Consumers* rule change²⁷, the recently proposed change by Energy Consumers Australia on *Integrated distribution system planning*²⁸, AEMO's consultation paper relating to the *Technical Requirements for 200kW – 5MW Distributed Energy Resources (DER)*²⁹, Solar Analytics' *DER Visibility and Monitoring Best Practice Guide*³⁰, and the *National Energy Workforce Strategy* developed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW)³¹;
- **Project trials and collaborations:** including the extensive activity and research conducted as part of *Project EDGE*, *Project Symphony*, and *Project EDITH*, as well as AEMO's *Smart Meter Backstop Mechanism Capability Trial*³², together with the comprehensive *Open Energy Networks project (OpEN)* collaboration between Energy Networks Australia and AEMO³³;
- **International studies and publications:** including those published by the UK's *Energy Data Strategy taskforce* covering a Digital Spine and Data sharing arrangements, the EU's *Common*

²⁵ Available at <https://aemo.com.au/-/media/files/initiatives/electric-vehicles/electric-vehicle-data-recommendations-paper.pdf?la=en>

²⁶ Available at <https://www.aemc.gov.au/market-reviews-advice/review-regulatory-framework-metering-services>

²⁷ Available at <https://www.aemc.gov.au/rule-changes/real-time-data-consumers#:~:text=On%2030%20January%202025,%20the%20Australian%20Energy%20Market,would%20access%20real-time%20data%20from%20their%20smart%20meters.>

²⁸ Available at <https://www.aemc.gov.au/rule-changes/integrated-distribution-system-planning>

²⁹ Available at [aemo technical-requirements-for-200kw-to-5mw-der-connections_sept-2024_final .pdf](#)

³⁰ Available at https://static.solaranalytics.com/der-monitoring-guide/DER+BP+Guide+Data+Use+Case+Summary+and+Context_f.pdf

³¹ See What we Heard summary, available at <https://dcceew2.sharepoint.com/sites/DCCEEW-EnergyStrategicPolicy/Shared Documents/General/Workforce/National Energy Workforce Strategy/Comms Strategy & Website/Website Updates/What we heard summary>

³² Available at <https://aemo.com.au/-/media/files/initiatives/der/2022/smart-meter-backstop-mechanism-capability-trial-report-phase-2.pdf?la=en>

³³ Available at https://www.energynetworks.com.au/assets/uploads/open_energy_networks_-_required_capabilities_and_recommended_actions_report_22_july_2019.pdf



European Energy Data Space report³⁴, insights and approaches developed by *Open energy UK*³⁵ to modernise access to energy data, together with authoritative technical reviews into potential mitigations available for *inverter-based cyber risks*³⁶.

6.1. Stakeholder Input

Prior to the release of this consultation paper, the development of much of its framework and associated artefacts involved the engagement of various stakeholders to solicit their expertise, test conceptual approaches, review detailed artefacts and assess the coherence of the approach undertaken to devise proposed actions for consideration.

Key stakeholders engaged as part of the development of this paper include:

- Members of the **Distribution System and Market Operations (DSMO) working group**: selected members of the working group supporting the *M.3/P.5* workstream were engaged to review the framework and artefacts produced by the project team, including teams from the following organisations:
 - Queensland Treasury
 - SA Power Networks (SAPN)
 - Ausgrid
 - Energy Queensland
- **Australian Energy Market Operator (AEMO)**: a broad cross-section of subject matter experts from AEMO were engaged for various contributions including the:

³⁴ Available at https://energy.ec.europa.eu/publications/common-european-energy-data-space_en

³⁵ Available at https://docs.openenergy.org.uk/1.0.0/ops_guidelines/introduction.html#what-is-open-energy-how-was-it-made-and-who-is-it-for

³⁶ Available at https://api.solarpowereurope.org/uploads/SPE_2025_Solutions_for_PV_Cyber_Risks_to_Grid_Stability_032dc2ae5a.pdf



- development of the Industry Capability Model
 - identification and review of nominated Use Cases outlined in Use case diagrams
 - mapping of use case process flows as outlined in Activity Diagrams
 - identification of relevant information objects associated with use cases
 - data categorisation and gap analysis
 - formation of prospective approaches and actions to closing gaps and compiling potential pathways towards effective Data Sharing Arrangements for a high CER power system.
- **Industry representatives:** various industry representatives covering technology providers, retailers, original equipment manufacturers, and demand side aggregation providers, including:
 - SwitchDin
 - Kraken
 - AGL
 - Tesla
 - SMA
 - Enel X
 - Rheem
 - Distributed Energy Services
 - Ready energy

USER PROFILE SIDEBAR:

DATA PRODUCT DEVELOPER

I build consumer and commercial products by leveraging and combining rich, diverse and accessible data pools.

I want to be able to discover data about the energy sector, like consumption and generation information, distributed asset capacities, and electric vehicle charging locations, to compile aggregated insights for businesses and system operators alike.

Improved data quality and sharing arrangements would enhance my capability to innovate and produce new offerings for consumers and businesses.

The project team is highly appreciative of the engagement and contributions of these individuals and organisations; however, it alone accepts the responsibility for the content and approach outlined within this paper, including any errors, omissions, or inaccuracies.



7. Data Sharing Arrangements: Analytical Framework

Summary

Through the development of a CER lifecycle, a comprehensive Industry Capability Model was constructed. This allowed for a detailed list of use cases – a series of activities and functions needed now and likely in the future for the effective integration of CER into the power system and markets. Select use cases were further detailed in Activity Diagrams that outlined process flows, varying information objects (products), and discrete responsibilities across different roles.

Over 300 use cases – activities involving the sharing of information objects - were then subjected to detailed data categorisation analysis. The information objects were reviewed according to their producers and consumers (initiators and receivers), how data is transferred (interfaces), data frequency and latency, and its sensitivity and quality. Each use case was then reviewed to assess whether the current capability exists to satisfy the case, or whether an existing capability would need to be augmented, or a new one established altogether, for it to be fulfilled.

The project team welcome responses to the following consultation question:

- *Have you identified any significant use cases, roles, data and data-sharing dimensions, or lines of inquiry that the analytical framework has missed?*

Prior to defining and implementing the required data and data sharing arrangements that will support the effective integration of CER into Australia’s power systems and markets – the data architecture, models, systems, governance arrangements, tools and framework of policies, standards and rules – it was critical to identify and define the “business needs” for data sharing in a high CER power system. By understanding these business needs – the data sharing functional requirements – subsequent efforts to define the arrangements that will support these requirements will be able to clearly assess and align against these needs.

A detailed outline of the framework constructed to determine the data sharing requirements for a high CER power system has been provided in the Overview of Analytical Framework & Industry Capability Model artefact (see Section 14 for details).

This section provides a summary overview of the analytical framework used by the project to assist stakeholders in understanding subsequent sections, including references to the framework and various components used within it.

The close collaboration between this project and the workstream considering the roles and responsibilities for a high CER future - *Redefine roles for market and power systems operations workstream (M.3/P.5)* – has included the utilisation of key elements of the framework discussed in



this section. Common across both workstreams has been the application of the Capability Model, together with the associated outputs of use case group diagrams and activity diagrams.

The components which comprise the framework used to surface data and data sharing needs in a high CER system has been documented in the table below.



Table 1: Identifying Data Sharing Needs in a high CER System: Overview of Analytical Framework Components

Step	Component	What was done	What it delivered
1	CER Lifecycle	Map the lifecycle of a consumer energy resource as it is integrated into the energy system and markets	Highlighted 5 key stages in the lifecycle of CER as it becomes integrated into the power system and markets: Oversee, Plan, Connect, Operate, and Trade.
2	Capability Model	For each stage (or domain) of the CER lifecycle, identify the capabilities across the sector required to ensure the CER is effectively integrated into the power system and energy markets	A top-down view identifying all the capabilities that would need to be satisfied to effectively integrate CER. In addition to the Lifecycle stages (Level 1), two further levels of capabilities (Level 2 and 3) were documented to cover the landscape of requirements for integrating CER. This helped ensure enough detail was identified across the capabilities.
3	Use Case Groups	Build out 'CER journeys' as it integrates into the power system and markets.	Four (4) journeys or Use Case Groups were compiled: Plan and Oversight, Connect and Integrate, Operate and Trade in normal conditions, and Operate and Trade in emergency conditions. This step helped identify related interactions between each stage of a CER's lifecycle.
4	Use Case Group Diagrams	For each journey, identify the activities and functions – use cases – that would need to take place as part of the journey.	For each Use Case Group or journey, the Level 3 capabilities (step #2) were mapped to a designated Role (as opposed to Actors who are named organisations). In some instances, capabilities needed more than one activity or function to be completed so the capability would be fulfilled. This meant different data was being shared to complete them. Combining related stages of the Lifecycle into discrete journeys helped identify all the activities and functions that might need to happen within each journey. This 'bottom-up' approach to working through capabilities and data sharing helped provide comprehensive detail about the needs underpinning effective CER integration.
5	Activity Diagrams	Build out process flows for some key capabilities (activities / functions) where multiple data objects may be shared or roles engaged to deliver a composite data product	Process flows for some use cases (activities) were drafted to expand investigation into relevant responsibilities of different roles and the composition of the information being produced through the use case. This approach helped highlight critical interactions and flows between different roles, helping clarify their potential responsibilities, and identifying their discrete contributions to a combined data product that fulfilled the use case.



Data sharing arrangements to inform planning and enable future markets

Step	Component	What was done	What it delivered
6	Data Categorisation	For every use case identified in prior steps, identify and then categorise the relevant information object(s) being shared	<p>Each use case involved the sharing of an information object. Each object was then mapped across the following:</p> <ul style="list-style-type: none"> • Information Category: the type of data the object is • Initiator: which role produces or “owns” the data and would initiate its sharing; • Receiver: which role(s) might consume or receive the data being shared • Interfaces: how the data might be received - system to system, system to person, person to person, or person to system • Minimum Frequency: the frequency of the data being received (mins through to ‘on demand’) • Latency: how fast the data is received (mins through to years) • Sensitivity: whether the data is confidential and what the impact would be if it wasn’t available: public, restricted, and whether it is Critical • Quality: whether the data is currently available, accurate and timely to facilitate the use case
7	Gap analysis	Review the data categorisation and assess whether the infrastructure, capabilities, or regulatory arrangements are in place to support the required data sharing	<p>Each use case was determined as having existing capability, or if not, whether the existing capability required some augmentation to satisfy the case, or new capability would be needed.</p> <p>If augmentation or new capability was identified, a rationale was documented to support the classification.</p> <p>This approach helped various team members and engaged stakeholders to review gaps and confirm or discuss assessments. It allowed for distinct gaps - gaps that appeared across one or more use cases – to be identified and described.</p>
8	Options and Priority Use Cases	Consider options available to overcome identified gaps, highlighting Priority use cases	<p>By reviewing each distinct gap, key gap categories were compiled, allowing interrelated gaps to be brought together for review and assessment</p> <p>This helped to highlight specific gap categories that, when subjected to an agreed approach on prioritisation, would allow distinct priority gaps to be surfaced.</p>
9	Key Initiatives	Reviewing options, group them into logical work efforts that seek to enable a “data sharing minimum viable product (MVP)”, a key initial outcome towards the future state Data Sharing infrastructure	<p>The prioritisation and categorisation of data and data sharing gaps highlighted in the previous step enabled an initial set of proposed actions to be outlined for consideration</p>



7.1. Framework Limitations

The analytical framework outlined in this paper is underpinned by a “process model” – the lifecycle of CER. From this process underpinning, a detailed set of capabilities, associated use cases and information objects have been identified, classified and analysed to arrive at a host of identifiable gaps in data, data quality, and data sharing that will likely impact the nation’s ability to effectively integrate CER into the power system and energy market.

The value of undertaking this approach includes obtaining a thorough understanding of the likely data and data sharing requirements of a high CER power system. Without infallible foresight, it cannot represent the totality of data sharing use cases that will emerge as our markets reach “CER maturity”, however, its comprehensiveness is likely to have identified a level of detail and diversity of eventual real-world use cases to gain sufficient confidence that arrangements put in place to satisfy the use cases surfaced will also support others not foreseen or as yet emerging.

It is also acknowledged that a number of use cases (activities) emanating from the analysis do not necessarily have a clear or any actual information object associated with them – they are a decision or action, or perhaps an asset being maintained (like a connections portal). While these activities are the result of information shared and consumed at an earlier stage of the process (or the platform upon which such information may be generated and shared in the future), they do not ordinarily have data initiated and received as part of their activity. Nevertheless, information objects have been assigned to these use cases, and the assigned objects relate to an earlier or subsequent activity directly related to the use case.

USER PROFILE SIDEBAR:

CONSUMER (ACTIVE)

I signed up with a VPP operator who offered me high payments for using my battery and promised it would always have enough charge for my own use.

I want to be able to switch service providers easily, so when they don’t meet their promises (my battery hasn’t been available when I needed it), I can find a better provider.

Improved data sharing arrangements would allow me to seamlessly switch between energy service providers when I want to.



8. Findings

Summary

An extensive list of current and prospective use cases have been subject to detailed data categorisation analysis. Key general findings include:

- Eight (8) roles are key data producers and consumers (responsible for over 60% of data interactions)
- “Near-real time” frequency and latency (within minutes) is a dominant feature across use cases
- Almost half of the data was identified as having quality issues
- The analysis indicates a strong need for data storage and sharing infrastructure to be highly secure along with standardised processes and coordination between multiple parties
- Information categories requiring the greatest capability uplift include those associated with compliance, conformance, commissioning and locational services (network ‘flexibility services’ arrangements).

Detailed gap analysis has found 71 distinct data and data sharing gaps across six categories including, in prioritised order: (a) Secure Operations, Protocols and Redundancy, (b) Device Standards and Control, (c) CER Installation, Commissioning and Customer Enablement, (d) Enabling Roles and Frameworks, (e) Data Collection, Use and Quality, and (f) Trusted Coordination, Data Sharing and Flexibility Services. Important Consumer-related gaps were also found such as those to do with Education and support, Customer protections, and CER customer switching.

Also highlighted are critical strategic gaps relating to a lack of coordination regarding data and data sharing-related initiatives across the sector, and outstanding initiatives stemming from the ESB’s Data Strategy (2021).

The project team welcome responses to the following consultation questions:

- *Do you believe there are any significant gaps relating to data roles, access, availability, governance or sharing that this paper has not highlighted? What is the impact of this gap on the Major Outcomes?*
- *Do you agree with the prioritisation of the distinct gaps identified within this paper? If not, what would you change and how would this better deliver the vision, outcomes and principles of the National CER Roadmap?*
- *Are there specific elements of data and data-sharing that you believe are crucial gaps or essential for resolving the gaps identified in this paper? Why are they important?*

This section outlines the key results from the project team’s data categorisation and analytical effort. The structure of the section is as follows:

- **Use case analysis:** an outline of the volume of use cases subject to detailed analysis
- **General findings:** some key characteristics of data and data sharing highlighted across all use cases analysed
- **Detailed gap analysis:** identifying the volume and categories of discrete gaps identified;
- **Priority data and data sharing gaps:** outlining an assessment approach that surfaced priority gaps across all categories;



- **Consumer information gaps:** identifying shortfalls that impact consumers' capability to safely and confidently purchase CER and voluntarily engage in flexibility services;
- **Strategic gaps:** highlighting issues surrounding coordination of multiple data-related initiatives as well as the status of measures recommended as part of the ESB's Data Strategy (2021).

8.1. Use Case Analysis

The documentation of use case group diagrams identified an original set of 232 discrete use cases available for data categorisation and gap analysis ('Parent' use cases). Each of these discrete Parent use cases had an information object assigned to them which reflected the data being produced and consumed as part of the use case function (or series of activities).

As highlighted previously, part of the analytical framework utilised included the development of Activity Diagrams. These diagrams expanded upon some Parent use cases to build process flows for key capabilities where multiple data objects may be shared or various roles engaged to deliver a composite data product (or series of products) for the case. For these situations, Parent use cases were broken down further into more granular 'Child' use cases.

These Child use cases also had information objects assigned to them, however, in some instances the information object differed from that assigned to the Parent use case. For example, when mapping the Compliance activity diagram, the Parent use case "Accreditation and registration process" had an information object "Accreditation data" assigned to it. Further breakdown of this Parent case revealed an additional Child case, "Accredit CER installer", that had an information object - "Accreditation notice" – associated with it.

Detailed data characterisation analysis was undertaken for those Child use cases where the information objects associated with them were distinct from those of their Parent use case. Where the Child use case did not result in a new and distinct information object, no further data categorisation analysis of that Child use case was undertaken.

This approach resulted in 315 use cases being identified for detailed data categorisation and gap analysis. All analysis and findings outlined in this section relate to these 315 use cases only.

The table below clarifies how the set of use cases subject to detailed data categorisation was established.



Table 2: Use cases subject to Data Categorisation analysis

Use Case Class and Description	Number of Use Cases
Use cases identified via capability mapping in Use Case Group Diagrams ('Parent use cases')	232
Additional 'Child' use cases identified as part of detailed Activity Diagrams ('Child use cases')	213
The subset of 'Child use cases' with different information objects from their Parent use case (Child use cases with different IOs)	83
Subjected to detailed Data Categorisation analysis: Parent use cases + Child use cases with different IOs	315

8.2. General Findings

Through detailed data categorisation and gap analysis of use cases, key summary findings include:

- **Eight (8) roles** – System Operator (Tx), Distributed Network Owner, Customer Agent, CER Customer, Transmission Network Owner, System Operator (Dx), CER Regulator, and the CER Data Exchange Co-ordinator - **are responsible for 60% of total data interactions**, as producer (or source) and consumer (or recipient) of information objects;
- The categorisation confirms that “near-real time” frequency and latency (within minutes) is required for many use cases, indicating the need to accommodate **a high volume of real-time data sharing needs**. High frequency information objects were predominately sourced from key operational roles in the Distribution Operating zone (Distribution Network Owner and Customer Agent roles), with a materially smaller volume coming from Energy Supplier, CER Regulator, and the prospective CER Conformance Assessor roles.
- Almost half (48%) of the data was identified as having quality issues, indicating a strong need for investment in **data quality management and governance**, especially as some data are relied on as fundamental for generating aggregated data sets whereas others can be inferred;
- Across all use cases categorised, data was identified as Critical (20%) and Restricted (58%), indicating the need for **data storage and sharing infrastructure, and associated processes, to be highly secure by design**;
- Data and data sharing arrangements which require the most uplift in capability include use cases associated with the following information categories (see the Data Categorisation worksheet artefact – Information Category tab - for detailed analysis):
 - **Compliance**: data associated with CER device installation and its adherence to technical and regulatory standards, such as product certifications, or information providing guidance for installers;



- **Conformance:** data associated with the monitoring and assessment of CER adhering to established technical and operational frameworks;
- **Commissioning:** data which is produced or consumed as part of the processes for installing, testing, and activating CER devices to ensure operational readiness;
- **Locational services:** information relating to the procurement and management of off-market services to address specific network needs. These are services between networks and other parties that are not conducted as part of the wholesale energy market (e.g. network 'flexibility services' arrangements).

The analysis discussed above and other general findings can be reviewed within the Data Categorisation Worksheet that has been made available with other additional artefacts generated by this project. These artefacts, a description of their contents, and their location for access is outlined in Section **Error! Reference source not found.14**.

8.3. Detailed Gap Analysis

As part of the data categorisation analysis, each use case was assessed for a series of potential gaps. From this activity, and across the 315 use cases analysed, a total of 71 distinct gaps – data and data sharing gaps which appeared in one or more use cases - were identified and categorised as shown in the table below.

Table 3: Distinct Gaps by Category

Data Gap Category	Description	Example (Gap ID shown)	No. of Distinct Gaps
Secure Operations, Protocols & Redundancy	Power system operational data, processes and protocols are insufficient, or redundant pathways are needed to facilitate the relevant use case	(GS22) Signal flexibility not available to choose between broadcast, one-to-one and narrowcast to achieve more targeted emergency and flexibility service outcomes with individuals or discrete groups of devices or counterparties	11
Device Standards & Control	CER device standards and/or control arrangements are not available or require augmentation to support the relevant use case	(GS09) Capability to withhold CER from re-connecting to the grid once power is restored for system restart (power system black)	7
CER Installation, Commissioning & Customer Enablement	Gaps associated with installation and commissioning processes for CER and enabling customer benefits are hindering the delivery of the relevant use case	(GS35) Lack of standardised process or system interfaces to streamline/manage coordination between CER Customer, Installer, DNSP and Customer Agent during CER installation, commissioning or maintenance across various Distribution Network regions	8
Enabling Roles & Frameworks	Existing roles or frameworks require improvement or new roles and frameworks require data, processes or interfaces to facilitate the relevant use case	(GVP02) CER ownership obligations and compliance obligations are not easily available for consumers to make opt-in/opt-out decisions about offered CER services & deals	19



Data Gap Category	Description	Example (Gap ID shown)	No. of Distinct Gaps
Data Collection, Use & Quality	Gaps in relation to the existence, use or quality of data hinder the delivery of the relevant use case	(GS06) Accuracy, completeness and accessibility of CER Standing Data Repository (includes asset metadata). Various parties supporting CER operations do not have access to CER standing data, with the frequency and accuracy of data updates requiring significant uplift.	15
Trusted Coordination, Data Sharing & Flexibility Services	Data is not being shared effectively to facilitate the relevant use case	(GS04) Some roles (e.g. Customer Agent and Communication Manager) are not registered or recognised within trusted regulatory or data sharing environments, limiting their visibility and reliability to initiate, receive or act on data that can contribute to system security and the effective orchestration of CER.	11
Total			71

The detailed list of these distinct gaps, together with the use case IDs for which they have been identified, is provided within the Data Categorisation worksheet artefact (see Section 14 for details regarding the location of this artefact)

This project has worked closely with the *Redefine roles for market and power systems operations (M.3/P.5)* workstream, leveraging the same industry capability model and associated use case group and activity diagrams. The M.3/P.5 team has identified key activities and capabilities that are not being performed in a way that best integrates CER into the power system and market. Within their consultation paper³⁷, the M.3/P.5 team have discussed how delivery of these capabilities might be improved and highlighted gaps that would likely hinder or prevent this improvement. This assessment defined current capability shortfalls across three (3) **Major Outcomes** needed for the safe and efficient operation of the power system and energy market in the future:

- CER plays a central role in **system security and emergency management** frameworks and processes
- CER is **visible, observable and predictable** and can be effectively used as part of power system operations.
- CER is **orchestrated effectively** to deliver value for consumers and the power system

This project has sought to outline its detailed findings under the same key outcomes, given their alignment with the problems this paper is seeking to solve (as outlined in section 4.1). This is intended to provide stakeholders and policymakers with an integrated set of actions for

³⁷ See Chapter 3 of the M.3/P.5 Redefine roles for market and power systems operations consultation paper



consideration and a clear pathway forward for the effective integration of CER into the power system and energy markets.

It is important to note, however, that some data objects and sharing arrangements support more than one Major Outcome (or application within the power system and energy markets). Enabling the data and data sharing arrangements to facilitate CER device controls, for example, supports both the desired outcomes of system security and CER being orchestrated effectively.

Given this, it is acknowledged that the assignment of some distinct gaps to one (or more) of the three Major Outcomes might be argued as more properly assigned or related to another of the Major Outcomes (or all three). From the project team's perspective, this speaks only to the need for undertaking the required activities to close these gaps (and open opportunities) in a highly coordinated fashion, which is addressed as part of the proposed actions for consideration in the following section (0).

In the table below, each of the 71 distinct gaps have been assigned to one or more of the Major Outcomes.

Table 4: Distinct Data and Data Sharing Gaps by Major Outcome

Data Gap Category	Count of Distinct Gaps		
	System Security & Emergency Management	Visibility & Predictability	Effective orchestration of CER
Secure Operations, Protocols & Redundancy	11	1	6
Device Standards & Control	6	2	2
CER Installation, Commissioning & Customer Enablement	4	6	2
Enabling Roles & Frameworks	5	16	4
Data Collection, Use & Quality	7	11	7
Trusted Coordination, Data Sharing & Flexibility Services	3	9	8

A detailed list of all distinct gaps identified as part of this investigation and mapped across the three (3) Major Outcomes, is provided within the Data Categorisation worksheet artefact (see Section 14 for details). This detailed listing identifies each distinct gap and identifies the relevant use cases (by their Use Case IDs) containing these gaps across each Major Outcome.



8.4. Priority Data and Data Sharing Gaps

As highlighted previously, this Data Sharing Arrangements project was established to complement other CER Roadmap workstreams - *Redefine roles for market and power systems operations (M.3/P.5)* and *Nationally consistent standards, including electric vehicle to grid (T.1)*. Collaborating closely with these workstreams, this project's focus is on identifying the data, processes and infrastructure to enable Roles and CER devices to fulfill their required capabilities. Gaps identified as part of this analysis therefore relate to data sharing between roles, between roles and devices, and between devices.

The following insights underpinned many of the gaps identified:

- The majority of capabilities comprising the use case group, Operate and Trade in normal conditions, require new or augmented data sharing arrangements which underlines the fact that much of our current power system and energy markets were not originally designed to accommodate CER;
- Various industry initiatives undertaken over recent years seeking to close data gaps haven't led to their full benefits being realised due to the absence of an integrated strategy and associated design arrangements, with limited coordination around CER-focused initiatives being undertaken;
- Some identified gaps, properly resolved, would likely support each of the three (3) Major Outcomes identified by the *M.3/P.5* workstream. This highlights the opportunity where targeting a solution for a gap that may initially be considered relevant to a specific Major Outcome may also resolve or lay the foundation for solutions to gaps that support improvements in other Major Outcomes.

The prioritisation of identified gaps in this paper was informed by the National Electricity Objective³⁸ as well as the Vision, Outcomes and Principles detailed as part of the CER Roadmap³⁹, and was made using the following criteria:

- Does solving the gap benefit all consumers or only those who own CER devices?

³⁸ Available at <https://www.aemc.gov.au/regulation/neo>

³⁹ Available at <https://www.energy.gov.au/sites/default/files/2024-07/national-consumer-energy-resources-roadmap.pdf>



- Does solving the gap support the System Security and Emergency Management outcome, which is a prerequisite for other Major Outcomes?
- Does solving the gap enable and support one or more of the other Major Outcomes?

The analysis and prioritisation of gaps highlight the complexity of the digital dimension of the clean energy transition, where “*data is the fuel of the energy future*”.

Recognising this reality is important when reviewing the gaps outlined below. It is acknowledged that the gaps described may not initially appear as shortcomings in data or data sharing, as often they have been expressed as capabilities (or a lack thereof). However, when reviewing the use cases this investigation has compiled, the capabilities and functions necessary to satisfy and facilitate the use case fulfilment are underpinned by the data and data sharing integral to all outcomes associated with CER. To assist with highlighting this data and data sharing relationship, sample data considerations associated with each gap category have been shown in the table below.

The distinct gaps identified as priorities for resolution are outlined in the table below. Gap identifiers (Gap IDs) have been included to assist stakeholders in understanding the relationship of the gaps shown here with the detailed gap analysis shown in the Data Categorisation worksheet artefact (see Section 14 for details).

USER PROFILE SIDEBAR:

COMMUNITY LEADER

I attended a community forum about renewable energy which helped me build my skills and confidence to run similar sessions within my own migrant community.

I want access to knowledgeable, accurate and trustworthy data and information about consumer energy resources to help my community consider and invest in solar, batteries and electric vehicles.

Improved data access would help me to research the benefits and costs of CER for my community.



Table 5: Priority Data and Data Sharing Gaps for resolution (by Category)

#	Gap Category	Description and Prioritisation Rationale	Priority Gaps	Sample Data Considerations
1	Secure Operations, Protocols and Redundancy	<p>The security of the power system underpins a reliable energy supply for all Australian consumers who depend upon it for their economic and social wellbeing.</p> <p>In recent years, the growing penetration of CER has led to emerging operational risks, requiring new capabilities and mechanisms to maintain system security in emergency situations⁴⁰.</p> <p>Keeping the lights on remains the basic prerequisite to support other objectives that may be enabled by CER.</p>	<ul style="list-style-type: none"> • (GS08) Robust emergency commands not in place across all regions: emergency commands need consistent definition, with standardised processes, interfaces, and testing and conformance regimes to ensure integrity. Various CER device actions are required to address system security risks (via emergency commands), with these covered further in Priority #2 below. • (GS17) Versatility in Interventions and Emergency Commands: utilising controllable load and/or controllable generation of CER as separate levers enables targeted responses and limits the impact on consumers' essential electrical services. • (GS22) Broadcast emergency signals: device emergency signals are generally only broadcast, targeting all 'connected' inverters simultaneously as a blunt response, limiting operational flexibility to manage individual devices or device groups which may be providing valuable system support services (e.g. FCAS services); • (GS23) Control hierarchy: device activation signals can be conflicted / overridden by various actors (e.g. via internet access). There is no control hierarchy applying to different coordination signals for CER or CER management systems defined or in place. • (GS11, GS12) Lack of alternate, independent mechanisms for CER monitoring and control: Device, monitoring data and control signals occur using internet pathways, making them vulnerable. Independent verification, and support for emergency commands to be actioned during cyber-compromise are inhibited without alternate pathways. • (GS18) Poor latency: cyber incident detection and top-down response times may not be able to contain mass CER compromise events. Automated capabilities are needed. • (GS10) Compensatory controls: no default behaviours or redundancy requirements for CER during communications outages or in emergencies have been defined or implemented (or accessible to relevant Roles). Designs of CER and interactions with them need fallbacks when complexity fails. 	<p>Versatile emergency commands:</p> <ul style="list-style-type: none"> • Under Frequency (UFLS) = automatic, controlled load disconnection based on local frequency detection • Over Frequency (OFGS) = automatic, controlled generation disconnect based on local frequency detection • Emergency CER disconnection (e.g. Distributed PV Contingency): manual, controlled CER generation disconnection if required for system security • Minimum System Load (MSL) = curtail or disconnect controlled generation and/or ramp-controlled load • Lack of Reserve (LOR) = curtail or disconnect controlled load and/or ramp-controlled generation <p>Alternate independent mechanisms:</p> <ul style="list-style-type: none"> • Onsite devices that do not communicate via the internet <p>Compensatory controls:</p> <ul style="list-style-type: none"> • Common understanding and visibility of CER default behaviour settings • Default limits (e.g. Static and/or dynamic (DOE)) • Automated detection and response mechanisms embedded in the CER devices, sites or network



Data sharing arrangements to inform planning and enable future markets

#	Gap Category	Description and Prioritisation Rationale	Priority Gaps	Sample Data Considerations
2	Device Standards and Control	<p>CER device capabilities underpin how they might contribute to power system security, market operations and effective orchestration for consumer benefit.</p> <p>Poor availability or reliability of device actions leads to:</p> <ul style="list-style-type: none"> difficulties in restoring power after outages reduced customer choice and value, as well as stranded CER investments latency concerns cyber vulnerabilities limited compliance with emergency commands (see Priority #1 gaps) Limited activation instructions for flexibility services (CER orchestration). 	<ul style="list-style-type: none"> (GS01, GS02, GS07, GS09) Device requirement gaps: CER device standards do not comprehensively cover requirements for physical performance (autonomous and remote initiation), communications protocols, enabling information models, or for monitoring and testing device capabilities. Key capabilities not specified include: <ul style="list-style-type: none"> Isolation of devices from the grid (rather than the connection point) Isolation of device generation and/or load from the grid (rather than curtail) Withholding of device reconnection during system restart events⁴¹ (GS26, GS27) Interoperability: actor-to-device and device-to-device interoperability standards have not been defined including the physical performance specifications, communications protocols, common information model (and associated mapping between these elements) 	<ul style="list-style-type: none"> Coverage of all CER types (e.g. Solar, Batteries, Electric Vehicles, Electric Vehicle Supply Equipment (EVSE), controlled loads) <p>Refer to CER Taskforce Workstream: Interoperability Standards for Consumer Energy Resources (CER) Consultation Paper⁴² for all requirements ("R-X") , some include:</p> <ul style="list-style-type: none"> R-5 Disconnect R-6 Modulate power in response to grid conditions R-8 Modulate power, device-level signal R-12 Remote updating of device settings R-17 Uniquely identifiable

⁴⁰ For example, see here for details on Victoria's backstop mechanism: <https://www.energy.vic.gov.au/households/victorias-emergency-backstop-mechanism-for-solar>

⁴¹ The project team acknowledge that there is capability to organise restart behaviour in CER through CSIP-AUS in addition to what is given in the reconnection procedure in AS/NZ4777. Devices could be configured to generate at 0 or export at 0 where the requirement is for solar PV to back off from grid connection. There is also the potential to let solar PV generate freely where they might assist with re-forming blocks during restart (depending upon the generation mix in a high CER future). However, the system restart use case remains to be defined and built in CSIP-Aus from the underlying IEEE 2030.5 functions and AS/NZ4777 connection and reconnection physical capabilities.

⁴² Made available at consult.dccew.gov.au, with a plan to be published in Q3 2025.



Data sharing arrangements to inform planning and enable future markets

#	Gap Category	Description and Prioritisation Rationale	Priority Gaps	Sample Data Considerations
3	CER Installation, Commissioning and Customer Enablement	<p>How CER physically and digitally “enters” the power system and prospective energy market(s) is a critical enabler for all three (3) Major Outcomes of system security and emergency management, visibility and predictability, and CER orchestration.</p> <p>The compliance of CER with appropriate standards boosts system security, with properly enabled device settings and communications channels (identified within Priority Category #1 and Category #2 gaps) being essential for emergency management.</p> <p>The quality of CER metadata captured and maintained (identified within Priority Category #5 gaps) is essential for operational and market purposes, supporting:</p> <ul style="list-style-type: none"> • network visibility • the management of hosting capacity • forecasting • cyber incident reporting and response • Virtual Power Plant (VPP) portfolio management that seeks to secure value for consumers and CER asset owners. 	<ul style="list-style-type: none"> • (GS03) Installation and Commissioning Standards: CER device installations, maintenance and disconnections do not comprehensively cover system and network requirements. • (GS34) Installer accreditation: the framework for installer accreditation and education requires considerable uplift to align with standards and prospective changes to configuration and commissioning arrangements. • (GS35) Standardised process outcomes: poor consistency of installation and commissioning outcomes across the sector for assets owners / consumers, installers, DNSPs and customer agents. 	<p>Considerations should include-</p> <ul style="list-style-type: none"> • testing and compliance regimes • control hierarchies • compensatory controls • cyber security • communication pathways for operational and emergency use • standing data (metadata) capture • commissioning and de-commissioning • disposal and recycling processes • reporting requirements • Monitoring equipment specifications and data sharing arrangements • Regulation of the above



Data sharing arrangements to inform planning and enable future markets

#	Gap Category	Description and Prioritisation Rationale	Priority Gaps	Sample Data Considerations
4	Enabling Roles and Frameworks	<p>Cyber secure devices and control arrangements, as well as conformance to agreed standards and compliance frameworks, are all integral components for the effective integration of CER into the power system and energy markets.</p> <p>Designed well, they can remove and enable effective responses to digital vulnerabilities, build trust in CER portfolios as capable options to manage network constraints, and encourage innovative new services through their support of performance arrangements for devices, the management of hosting capacity, and other prospective services.</p> <p>Key roles and appropriate frameworks for cyber security and conformance, including standards, data requirements, process and interface definitions do not exist, neither do relevant accreditation, compliance and reporting requirements.</p> <p>Both the <i>M.3/P.5</i> workstream as well as the workstream related to <i>Nationally regulatory framework for CER to enforce standards</i> (T.2) are considering the critical frameworks relating to CER cyber security, compliance, and conformance.</p>	<ul style="list-style-type: none"> • (GS13) CER Cyber Coordinator: containing CER cyber risks as they arise, notifying incidents to relevant parties, assigning security identities, and building monitoring capabilities to detect cyber compromise. This role's scope would include Roles and Actors that are not registered market participants and risks that are behind the meter or adjacent to the power system. Working with AEMO and other government agencies this role would contribute to Priority #1 gaps and will need enablement with appropriate data, defined messages, processes, standards and interfaces. • (GS36) CER Technical Regulator: CER regulatory oversight gaps exist for cyber and limit-related (e.g. dynamic operating envelopes) corrective measures, defining and authorising CER product certification and testing requirements, detailing CER device and installation technical requirements, and developing and maintaining mandatory training on CER standards. Resolving these gaps would also contribute to Priority #2 and #3 gaps. • (GS14) CER Conformance Framework: assessing, reporting and correcting conformance across device installations, CER distribution limits, and CER portfolio operations and emergency commands. Data definitions, device standards, alternate monitoring pathways and automated responses are key considerations, including the constituent roles identified as part of the collaboration with the <i>M.3/P.5</i> workstream: <ul style="list-style-type: none"> ○ <i>CER Conformance Monitor:</i> collects data to verify adherence to operational and regulatory requirements and works with the Conformance Assessor. ○ <i>CER Conformance Assessor:</i> assesses CER performance against relevant standards, CER portfolios against operating envelope parameters and emergency command requirements, verifies installation compliance and reports breaches. ○ <i>Enforcement Manager:</i> enacts corrective action(s) for non-conformance, and installing, accessing and maintaining equipment for corrective measures (e.g. financial penalties, participant de-registration, temporary device disconnection from the grid). 	<p>Support Roles with:</p> <ul style="list-style-type: none"> • Data dictionaries • Standards • Data requirements • Formalised collection processes • Formalised monitoring processes and specifications • Formalised assessment processes, criteria • Formalised enforcement processes, permissible enforcement actions and delegations • Interface definitions including autonomous actions



Data sharing arrangements to inform planning and enable future markets

#	Gap Category	Description and Prioritisation Rationale	Priority Gaps	Sample Data Considerations
5	Data Collection, Use and Quality	<p>The quality of CER data and metadata is a key input to many operational and market capabilities. Presently, much is poor or insufficient.</p> <p>The development of reliable CER metadata and its ability to enhance Transmission – Distribution coordination and interface capabilities represents an opportunity to support system security while laying the foundations for better outcomes for visibility and predictability as well as the effective orchestration of CER, minimising the need for and utilisation of emergency arrangements.</p> <p>The <i>M.3/P.5</i> workstream’s consultation paper discusses the critical interactions between distribution and transmission networks needed to manage a high CER system. It outlines the current and potential allocations of responsibilities between AEMO, Transmission Network Service Providers (TNSPs) and Distribution Network Service Providers (DNSPs) to coordinate and share information for operational considerations.</p> <p>The discussion in the <i>M.3/P.5</i> consultation paper highlights key gaps surrounding modelling frameworks, as well as limitations regarding demand forecasts and the understanding of local constraints (via operating envelope information) and their potential upstream (transmission) impacts.</p>	<ul style="list-style-type: none"> • (GS06) CER data coverage and quality: the accuracy, completeness and accessibility of CER metadata and associated Standing Data is poor. Various parties supporting CER operations such as Customer Agents and Energy Suppliers do not have access to CER standing data, with the frequency and accuracy of data updates requiring significant uplift (which would be boosted by resolving gaps highlighted in Priority Gap # 3 above). • (GS20) Distribution network visibility: Monitoring data from network elements, along with CER standing and performance data, are essential inputs for key capabilities such as calculating dynamic limits and forecasting network states. • (GS24) CER operating limits (e.g. dynamic operating envelopes) are not standardised and in place across all regions: components such as message definitions, processes, interfaces, and receipt permissions have not been standardised, are not in place across all regions, or discoverable by relevant stakeholders (such as Customer Agents, Retailers, and other roles). • (GS37, GS05, GS19) Sharing of constraints, CER operational data and curtailment quantities: aggregate CER operating limits across distribution networks that support Transmission-Distribution (T-D) operations have not been defined or standardised. This includes calculation methodologies, data definitions, reporting and sharing requirements, as well as procedures and interfaces. Sharing of CER performance data and forecasts (passive and CER portfolios) to inform operations and planning are also a gap. There are also no standardised processes or interfaces to share available CER curtailment quantities between T-D system operators to inform operational planning for use of emergency commands (see Priority #1 gaps). 	<p>Additional CER standing data elements captured could include:</p> <ul style="list-style-type: none"> • inverter settings, device configurations (assisting conformance), • device status (connection/energised/fault) • All CER types (e.g. Solar, Batteries, Electric Vehicles, Electric Vehicle Supply Equipment (EVSE), controlled loads • Device-specific identifier • T-D interface & CER operating limits: Definition (Gross or Net) • Level of allocation (device, site, network node, TNI) • Consider network mapping to allocation point and network reconfigurations • Frequency of provision required for operational planning • Interface secure and system-to-system for reliability • High speed monitoring data • Automated data collection following incidents



Data sharing arrangements to inform planning and enable future markets

#	Gap Category	Description and Prioritisation Rationale	Priority Gaps	Sample Data Considerations
6	Trusted Coordination, Data Sharing and Flexibility Services	<p>The ability to identify and trust other parties and actors, and therefore the data they may be sending, is foundational to effective, coordinated operations as well as the development of flexibility services (both on and off-market).</p> <p>CER has introduced many new parties to the 'energy ecosystem'. To operate effectively, these new commercial actors need to produce forecasts, generate performance data, and maintain control signals, which may be undertaken directly or in partnership with other actors.</p> <p>Many of these new parties and actors are not expressly recognised or acknowledged within current regulatory frameworks or market systems. This makes it challenging to coordinate with established market participants and system operators to achieve system security, visibility and predictability, or CER orchestration outcomes.</p> <p>Data sharing integrations with these new entities has not been done in a standardisation fashion, which can increase costs with limited scalability, restricting the opportunity to fulfill the potential of CER. Conversely, by enabling these entities to deliver scalable and effective orchestration of CER, the utilisation of emergency arrangements (as per Priority #1 gaps) can be significantly minimised.</p>	<ul style="list-style-type: none"> • (GO10) Trusted data sharing: access to scalable capabilities for trust-based sending, receiving and accessing CER data and services and counterparties. • (GS04) Unrecognised participants: some roles (Customer Agent and Communication Manager) are not registered or recognised within trusted regulatory or data sharing environments, limiting their visibility and reliability to initiate, receive or act on data that can contribute to system security and the effective orchestration of CER. • (GO08) Portfolio data quality: customer agents and VPP operators have significant difficulty and complexity in registering and maintaining accurate CER portfolio information for participation in market or off-market services, with portfolio composition changing regularly (or frequently) due to customer churn. With various counterparties also involved in portfolio management, this results in duplicated portfolios, higher costs, and poor data quality for all participants (registered or otherwise). 	<p>Trusted data sharing:</p> <ul style="list-style-type: none"> • Registered and verified identities of Actors within data exchange ecosystems for use by all parties • Access permissions, multiple parties may need information to support their capabilities and service procurement • Standard data dictionary and payload definitions • Asset is 'active' in VPP or DOE enabled <p>Portfolio:</p> <ul style="list-style-type: none"> • Frequency of updates may need to be daily as CER portfolio composition can frequently change (system to system interface) • Identifier fields may be different across users (E.g. Device ID, NMI, Portfolio ID, Network location) • Related roles may be discoverable to facilitate capabilities and service discovery (e.g. Energy Suppliers, Customer Agent, Communication Managers) • Synchronisation with metadata registry systems (e.g. DER Register update requirement is 20 days)



8.5. Consumer Information Gaps

The priority gaps identified above focus on ensuring power system security for all consumers through the energy transition and establishing a foundation for safely purchasing and maximising the benefits of CER. To enable informed consumers who feel safe and confident in purchasing CER and voluntarily engaging in flexibility services (and thus underpinning the effective orchestration of CER), key gaps identified by the project relating to consumers and the information available to them include:

- **(GVP23) Education and support:** Education and support for customers to understand and compare CER products, flexibility services and deals are not available or easily accessible.
- **(GS30) Customer protections:** Customer protections for CER and flexibility services to be introduced, maintained and regulated. These could include data protection and training, clarity of customer flexibility product contracts, ability for customers to monitor product performance to ensure they are better off overall and regulatory monitoring of product delivery against stated benefits.
- **(GVP04) CER customer switching:** Capability to seamlessly facilitate CER Customers switching between Customer Agents (and VPPs) is lacking. This diminishes consumer choice and potential benefits from their CER. Customer protections, CER interoperability standards, and the recognition of other prospective actors by market rules are requirements that need to be considered, as well as scenarios where a Customer Agent may become insolvent or otherwise exit the market.

USER PROFILE SIDEBAR:

CONSUMER (ELECTRICITY)

We've had the same electricity retailer since we moved into our property over ten years ago. We have never been able to afford solar panels or even these batteries I've read about.

I want to be able to understand this new electricity offer our retailer has suggested we move on to, as it comes with solar panels. Will it be cheaper than our current deal? Will we be better off in the long run if we take this up?

Improved data access and sharing arrangements would allow me to find out the best deal for my family and whether this new offer can save us money and boost our use of renewable energy.

Several CER Roadmap projects are related to the above gaps *C.1.1 Extending consumer protections for CER, C.3.1 CER information to empower consumers, T.1.1 Nationally consistent standards, including electric vehicle to grid*. In addition to regulatory solutions to the above gaps, much progress could be made in the design of simple products and data made available to consumers and CER customers by Customer Agents.



8.6. Strategic Gaps

Currently across the NEM and WEM, there are various initiatives considering data access, its availability and quality, and how it might be shared, including:

- The AEMC's recent Review of the regulatory framework for metering services, recommending the deployment of smart meters be accelerated to reach all small customers by 2030;
- The AER's Network Visibility project seeking to facilitate the provision of critical CER information needed for planning decisions and managing network risks;
- AEMO's Recommendations paper on Electric Vehicle Data⁴³, outlining an approach for the non-regulatory collection, sharing and analysis of electric vehicle (EV) data;
- The AEMC's final determination for Integrating price-responsive resources into the NEM set out data-sharing arrangements between AEMO and DNSPs⁴⁴, with AEMO's High-Level Implementation Assessment⁴⁵ outlining the proposed system(s), data exchange, process and operational changes necessary to implement the rule change;
- Energy Consumers Australia's proposed Integrated distribution system planning rule change⁴⁶, proposing that DNSPs be required to make more appropriate use of their data, and build a roadmap to collect more granular data.
- The collaboration between AEMO and Ausnet Services on a CER Data Exchange Industry Co-Design process, focused on the development of a national consumer energy resources data exchange.
- Project Jupiter, a collaboration between Western Power, Synergy, Energy Policy WA, and AEMO⁴⁷, seeking to develop the functionality needed to integrate CER at scale across the WEM.

⁴³ Available at <https://aemo.com.au/-/media/files/initiatives/electric-vehicles/electric-vehicle-data-recommendations-paper.pdf?la=en>

⁴⁴ Clause 3.10A.3(b) of the National Electricity Rules (NER), available at <https://www.aemc.gov.au/regulation/energy-rules/national-electricity-rules>

⁴⁵ Available at <https://aemo.com.au/initiatives/major-programs/nem-reform-program/nem-reform-program-initiatives/integrating-price-responsive-resources-into-the-nem>

⁴⁶ Available at <https://www.aemc.gov.au/rule-changes/integrated-distribution-system-planning>

⁴⁷ Available at <https://arena.gov.au/news/unlocking-a-future-energy-market-in-western-australia/>



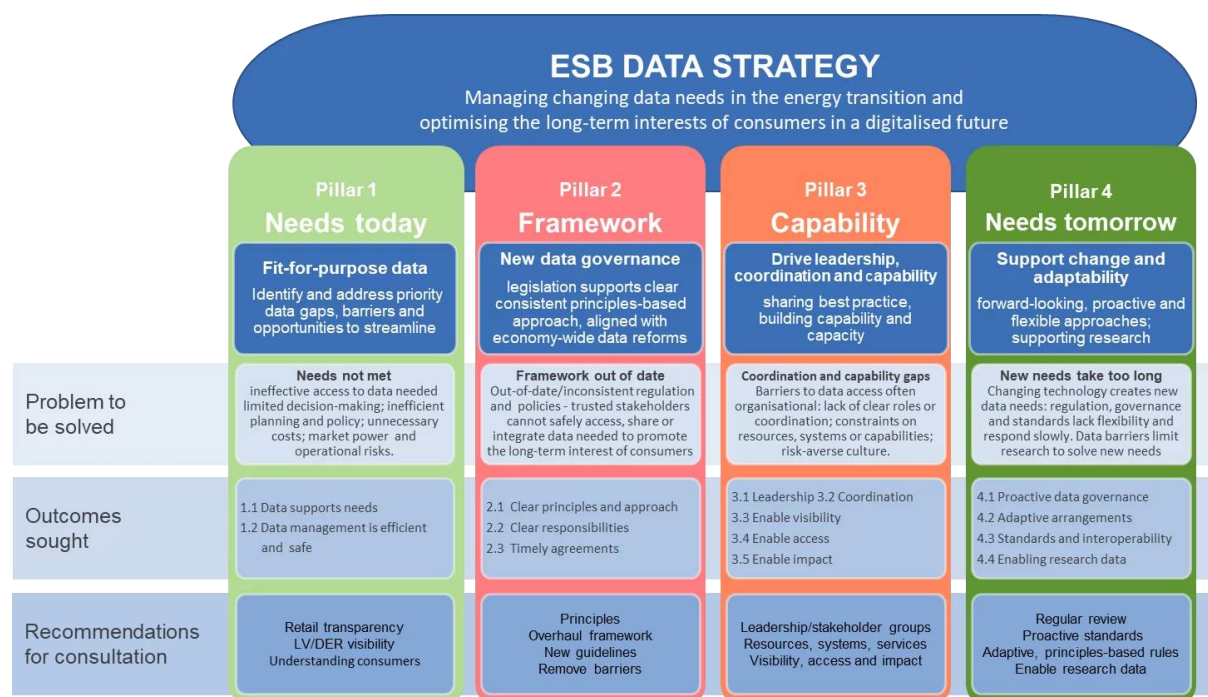
- The recent consultation conducted by AEMO on behalf of the Information Exchange Committee (IEC), looking at B2B changes relating to the Accelerating Smart Meter Deployment rule change and, specifically, the provision of Power Quality Data to DNSPs⁴⁸.

The initiatives listed above are not exhaustive of the diverse activity across the sector focused upon the core fuel for energy digitalisation, data.

However, there is little or no coordination across these initiatives and their likely impact on, or need for, data access, availability, ongoing governance and the management of data quality, or sharing arrangements. Indeed, there are no guiding principles or governing arrangements for the sector that might require any initiative that has data or data sharing impacts to align its proposed effort to meet certain arrangements that accord with an industry-wide approach to data access, availability, and quality management.

When the ESB released its Data Strategy in 2021⁴⁹, it sought to manage the changing data needs of the power system and energy markets across four (4) key pillars, as shown in the figure below.

Figure 7: Energy Security Board, Data Strategy Overview (2021)



⁴⁸ See here: <https://aemo.com.au/consultations/current-and-closed-consultations/iec-basic-power-quality-data-consultation>

⁴⁹ Available here: [1657767015-esb-data-strategy-final-reccomendations-july-2021.pdf](https://aemo.com.au/consultations/current-and-closed-consultations/iec-basic-power-quality-data-consultation)



Outlined within the ESB's report were a series of measures to implement the Data Strategy, with the progress of these measures detailed in the table below.

Table 6: Progress of Measures proposed by the ESB's Data Strategy (2021)

Time	Measures Proposed	Notes on Progress
Immediate	Initiate a new Data Leadership and Coordination working group (DataLAC) to be led by ESB and market bodies	Not implemented
	Implement energy data principles and core capabilities to drive the Strategy over time, including an expert Data Reference Group	Not implemented
	Develop the first stage of legislative reforms and support common guidelines and options for a new data services model to unlock value from existing data sets, to support policy and planning for the future NEM.	Legislation passed enabling AEMO to share protected energy data with certain trusted bodies
Initial	Design and cost options to address the top five priority data gaps: Network transparency, Overvoltage, electric vehicle (EV) transparency, Updating consumer research, and Bill transparency.	<ul style="list-style-type: none"> • Network transparency pursued by AER • AEMO pursuing EV data transparency
	Identify additional priorities warranting near term action based on their importance to customers in the evolving NEM and the need for a coordinated effort to resolve them.	Not implemented
Longer-term	Design a new legislative framework which is fit-for-purpose and adaptable in rapidly evolving digitalised future.	Not implemented
	Establish regular forward reviews to ensure a proactive, responsive approach to changing data needs, including in engagement on advance research data needs.	Not implemented

While key elements of the ESB's Data Strategy have not been implemented, the underlying and emerging digitalisation influences that led to the rationale for its recommendations have only accelerated.



9. Proposed Actions for Consideration

Summary

Proposed actions for consideration include:

- developing a National CER Data Strategy and Coordination Plan to drive coordinated activity;
- design and Implement a Data Sharing Arrangements Minimum Viable Product comprising:
- *the development of Transmission-Distribution (T-D) Coordination and Interfaces*
- *implementing a CER Asset Registration and Commissioning Strategy*
- *extending the detailed design and implementation of a CER Data Exchange*
- Other CER Roadmap workstreams are considering proposed actions to resolve key priority gaps of developing and implementing key device and control standards (undertaken by T.1 workstream) and enabling key roles and associated frameworks for conformance and compliance (undertaken by T.2 workstream).

The project team welcome responses to the following consultation questions:

- *Do you agree with the proposed actions in this paper? What considerations, advice or reflections (positive and negative) would you offer for each? Please specify which actions your responses relate to.*
- *In relation to Proposed Action #1, which organisation might best be placed to complete and implement the Data Strategy and Coordination Plan in line with the outlined assessment criteria? Do you have any alternative approaches to resolving the gaps highlighted in this paper? What are the relative advantages, disadvantages and implementation considerations Taskforce should be aware of?*

The proposed actions outlined here have been designed in alignment, and should be read in conjunction, with the proposed actions detailed within the consultation paper produced by the M.3/P.5 project, *Redefine roles for market and power systems operations*⁵⁰. This workstream has sought to identify roles and responsibilities that may require establishment, enhancement, or greater clarity to meet the capabilities required to effectively integrate CER into the power system and energy markets.

As part of its investigation, the M.3/P.5 team has highlighted gaps across the three major outcomes of system security and emergency management, CER visibility and predictability, and the effective

⁵⁰ Made available at consult.dcceew.gov.au



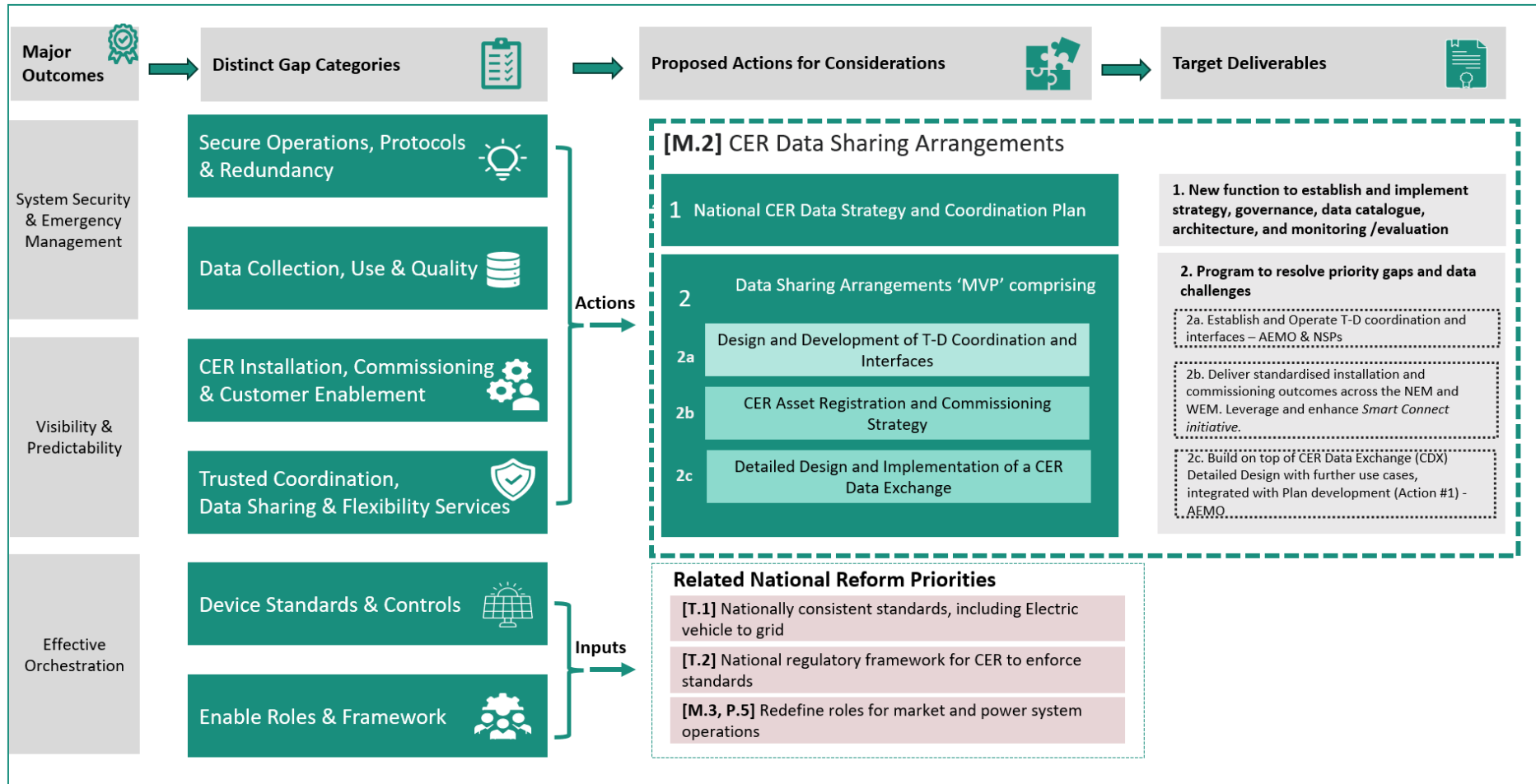
orchestration of CER. Some of the proposed actions discussed within the *M.3/P.5* consultation paper to close those identified gaps cover similar considerations to those discussed in the remainder of this section.

The detailed gap analysis undertaken by the project team, together with the strategic gaps highlighted in the previous section, has informed and underpins the proposed actions for consideration that are outlined in this section.

The relationship between the distinct gaps identified by this project and the proposed actions outlined in this section to resolve them is shown in the figure below.



Figure 8: Distinct Gap Categories and Proposed Actions for Consideration



Some key priority gaps identified by this project that require resolution are being considered in detail by other CER Roadmap workstreams. The proposed actions to resolve these specific priority gaps include:

9.1. Develop and implement key device and control standards

Much of the discussion in this consultation paper, as well as that published by the *M.3/P.5* project, surrounds standardisation, whether of processes, interfaces or device performance and installation requirements. Standardisation supports interoperability, allowing devices and systems manufactured by multiple suppliers to easily communicate, exchange data, and understand control or configuration mechanisms. Greater interoperability across the power system will enable greater choice of CER products for consumers, and facilitate ease of switching between service providers, fostering competition for new services and offerings.

Moreover, the *M.3/P.5* project has identified that interoperability requirements are necessary for some existing standards and protocols, including:

- Augmenting existing standards and protocols to enable interoperability that supports behind the meter device communications;
- Introducing common communications protocols for intelligent household appliances that are not currently captured;
- Investigating how existing devices might be retrofitted to boost behind-the-meter and customer agent interoperability.

It is also acknowledged that Standards Australia is considering new, or the augmentation of existing, standards to support the interconnection and interoperability of distributed energy resources with the power system, as well as potentially⁵¹ the technical performance requirements for 200kW – 5MW distributed resources.

The CER Roadmap recognised from the outset the need to pursue greater standards development to effectively integrate CER into the power system and energy markets. This proposed action is being considered by the workstream focused upon *Nationally consistent standards, including electric vehicle to grid (T.1)*.

⁵¹ As recommended by AEMO's review into the Technical Requirements for 200kW – 5MW Distributed Energy Resources (DER), available at [aemo technical-requirements-for-200kw-to-5mw-der-connections_sept-2024_final_.pdf](#)



9.2. Enable key roles and associated frameworks for their operation

Key gaps identified as part of this project relate to roles engaged in conformance and/or compliance activities which do not currently exist, together with their associated frameworks covering standards, data requirements, process and interface definitions, accreditation, compliance and reporting requirements.

By introducing these roles and frameworks, Australia's power systems and markets stand to benefit from being able to have effective compliance arrangements, utilising CER portfolios to manage network constraints, and encouraging innovative new services.

This proposed action relating to the absence of specific roles and frameworks is being considered by the workstream focused upon *Nationally regulatory framework for CER to enforce standards* (T.2).

Proposed Actions

This section outlines a set of proposed approaches to build out industry-wide capability and opportunity to effectively integrate CER into the power system and energy markets. The proposals should be considered as preliminary actions for consideration, and stakeholder feedback and suggestions for potential alternative approaches are sought and welcome.

The proposed actions seek to address the gaps identified in the Findings chapter. In addition to the Strategic gaps identified, the actions for consideration address the data gap categories as shown in the table below.

Table 7: Proposed Actions for Consideration to resolve Data Gap Categories

Data Gap Category	Relevant Actions for Consideration
Data Collection, Use & Quality	1
Trusted Coordination, Data Sharing & Flexibility Services	1-2
Secure Operations, Protocols & Redundancy	2
CER Installation, Commissioning & Customer Enablement	2
Device Standards & Control	T.1 workstream
Enabling Roles & Frameworks	T.2 workstream

The proposed actions have been outlined as an integrated package of initiatives that, in combination, would significantly boost the sector's capabilities and management of data and data sharing arrangements. While each initiative could be implemented individually, in combination, or via a



staged approach, it is crucial that their development and execution are well-coordinated to avoid unintended or misaligned outcomes.

9.3. Develop a National CER Data Strategy and Coordination Plan

The key strategic concern highlighted in the project's findings is the lack of coordination and clear sector-wide strategy covering all initiatives involving CER-related data. The underpinning resource of CER's impact - data and its associated sharing arrangements - has not been managed in a coordinated way across the sector, and the former ESB's identification of the need for a clear energy data management and governance framework, supported by a fit-for-purpose legislative framework, remains a strategic gap of the highest order.

Considerations surrounding data definitions, availability, access, governance and sharing arrangements all require active coordination across the power system and energy markets to realise the outcomes outlined in the National CER Roadmap – benefits for all consumers, maximise economic opportunities, reliable and secure systems, and sustainable, future-ready and world-leading.

With the increasing adoption of CER, a comprehensive Data Strategy and Coordination Plan is required by the CER Taskforce. This plan will support and guide ongoing efforts in relation to resourcing, process development, role and responsibility assignments, and investments in relevant technologies to build out the dynamic data management and sharing capabilities required in a high CER future.

The proposed components (deliverables) associated with the Data Strategy and Coordination Plan have been outlined in the table below, together with an assessment their current status.

Table 8: Data Strategy and Coordination Plan: Components and Current Status

Strategy Element	Description	Current State
Objectives and Goals	Clearly articulated system and market goals for data and data sharing	National CER Roadmap Outcomes and Principles
Use Cases	Specific use cases for data and data sharing across the industry	Comprehensively detailed as part of this project (iterative development over time)
Current State Assessment	Identifying and assessing the current state of existing data assets, processes, and capabilities, including an understanding of data quality, security, and availability.	Completed as part of this project



Data sharing arrangements to inform planning and enable future markets

Strategy Element	Description	Current State
CER Data Catalogue	<p>Detailed inventory of CER data assets currently available or required across the power system and energy markets, including those that may come from other industries.</p> <p>Provides visibility of standardised metadata and should propose capabilities for collecting and continually enriching CER metadata.</p> <p>Access to data assets and tools which enable users to search, discover and use the data in accordance with relevant rules and regulations is to be specified.</p>	<p>Together with prior enquiries and recent reports, this project has identified sufficient prospective data assets that comprise an initial Energy Data Catalogue.</p> <p>Mandates for industry participation in the ongoing development and management of the Catalogue should be considered.</p> <p>Tools, access arrangements, and capabilities for ongoing enrichment to be reviewed and proposed⁵².</p>
Data Governance	Mechanisms, policies and procedures for data access, storage and use of all relevant data domains, together with definitions and governing arrangements to ensure quality and accuracy	To be completed
Data Architecture⁵³	Determining the appropriate scalable and flexible design and structure for the infrastructure required to support effective data collection, storage, sharing, and governance.	To be completed
Security and Privacy	Approach to identity, security and privacy requirements and determine the measures needed to implement them and protect data as required	To be completed
Data Processes	Define, establish or re-engineer processes for data collection, sharing, storage, processing, and disposal, for an effective data services model and lifecycle management	To be completed (per use case set or group being targeted for implementation)
Analytical use cases and strategies	Define options for data sets and data services that can unlock value for consumers, as well as support policy and planning for the future NEM. Design and make available tools and techniques to support these options.	To be completed (per use case set or group being targeted for implementation)

⁵² See the UK's <https://esc-production-2021.s3.eu-west-2.amazonaws.com/2021/09/EDTF-Report-Appendix-2-Data-Catalogue.pdf>

⁵³ This could include considerations around Data Mesh architecture, as pioneered by Zhamak Dehghani, in Data Mesh: Delivering Data-Driven Value at Scale. A solid overview of the approach is discussed here: <https://www.datamesh-architecture.com/>.



Strategy Element	Description	Current State
Data Literacy	Develop and deploy education and training programs for various audiences to boost data awareness and capabilities across the NEM and connected industries	To be completed
Monitoring and Evaluation	Design and implement monitoring arrangements to enable regular evaluation of the Data Strategy and Coordination Plan, including altering existing arrangements	To be completed

The Data Strategy and Coordination Plan, with its associated elements, will be a dynamic artefact, requiring continuous iteration and evolution as the digitalisation of the power system and energy markets change over time. As such, the creation, governance and implementation of this plan represents a new data-related function and will require an entity (or authority) to be mandated to fulfill this responsibility.

Consideration needs to be given to the appropriate body or organisation that might best be placed to manage the evolving nature of the Data Strategy and Coordination Plan. The *M.3/P.5* workstream, when considering role and actor assignments, established assessment criteria to help guide the choice of appropriate organisation for any given function. Leveraging this criterion for the proposed new data-related function would represent the following considerations:

- **Expertise:** in data management and industry coordination
- **Incentives and accountability:** does the organisation have the appropriate governance, operating incentives and accountabilities that would support the iteration and governance of the Plan in line with the CER Roadmap?
- **Holistic design considerations:** would the new responsibility be complementary to existing responsibilities across industry?
- **Implementation considerations:** does the organisation have existing systems and/or frameworks in place to support the function? Is the organisation an enduring entity, sustainable throughout the energy transition? Can the organisation help ensure alignment of initiatives and roles across the NEM and WEM?

Further considerations with respect to the effective operation and governance of this role and function might also include:

- **Transparency:** of decisions and the decision-making process;
- **Decision-making process:** able to contemplate the relative impact on participants and evaluate against criteria that serves all consumers (e.g. the National Electricity Objective);
- **Representation:** from industry organisations and stakeholders for whom decisions will have an operational impact.

Stakeholders are asked to consider the defined Data Strategy and Coordination Plan functional role, as well as the prospective assessment criteria, and provide their views about which organisation or entity might best be placed to undertake this strategic requirement. Stakeholders are also requested



to comment on how their nominated organisation might arrange sufficient collaboration across industry to ensure the Plan receives ongoing support and is implemented effectively.

This proposed initiative supports the resolution of priority gaps GS08, GS23, GS11, GS12, GS10, GS02, GS07, GS09, GS26, GS27, GS13, GS36, GS14, GS06, GS24, GS37, GS05, GS19, GO10, GS04, GO08.

This proposed initiative supports the M.3/P.5 consultation paper's proposed actions #1, #2 and #3.

9.4. Design and Implement a Data Sharing Arrangements Minimum Viable Product

A key priority for the power system and energy markets should be to the development of infrastructure and associated processes to enable an initial industry-wide scalable and flexible data sharing capability.

This project has identified an extensive landscape of data and data sharing gaps and highlighted priority gaps for resolution. The M.3/P.5 workstream has further identified current capabilities that require improvement and proposed role assignments to enable those responsibilities to be actively fulfilled. Together, these efforts represent an initial step towards developing and implementing effective CER data sharing arrangements that address priority gaps.

It is proposed that the detailed design and implementation of a **Data Sharing Arrangements Minimum Viable Product ('MVP')** commence in 2026, comprising select, independent initiatives and deliverables that will address the priority gaps identified in this paper. While independent, these initiatives will require effective coordination between them to enhance outcomes. The proposed initiatives should include:

9.4.1. Development of Transmission-Distribution (T-D) Coordination and Interfaces

An initiative requiring a project team from AEMO, Transmission networks and Distribution networks, together with third parties that are closely connected to CER devices and customers as required, to define T-D interface and data requirements (with associated standards and schemas), draft operational processes, and identify any required rule and/or procedure changes that may be required to support effective CER operational capability, including measures that resolve highlighted Priority #1 gaps, *Secure Operations, Protocols and Redundancy*. The initiative should collaborate with the AER with regards to any proposed infrastructure requirements.



Given CER's impact on, and the essential importance of, system security and emergency management, the development of T-D interface and coordination capability to overcome highlighted gaps is a critical effort that must be addressed and progressed immediately.

A key element to be resolved as part of this critical requirement for effective T-D coordination capabilities is sufficient observability of CER within the distribution operating zone in transmission system operations, as well as supporting roles as highlighted by the *M.3/P.5* workstream⁵⁴. This capability is supported by:

- high speed monitoring at strategic locations within distribution networks and automated data collection following disturbances, for incident analysis and model validation;
- data and inputs that enable aggregate representation of CER in network and forecasting models, including location of CER within network topologies and zonal groupings;
- operational forecasting that includes the impact of DNSP activities on net load at the transmission-distribution interface (such as dynamic operating envelopes, community batteries, network support arrangements)⁵⁵.

This proposed initiative supports the resolution of priority gaps GS17, GS22, GS23, GS10, GS24, GS37, GS05, GS19.

This proposed initiative supports the M.3/P.5 consultation paper's proposed actions #2 and #5.

9.4.2. Implement a CER Asset Registration and Commissioning Strategy

An initiative requiring a project team from DNSPs, Consumers, Installers, AEMO and CER Product suppliers to drive the development of standardised installation and commissioning outcomes that effectively enable CER to integrate into the power system and energy markets.

How CER physically and digitally "enters" the power system and prospective energy markets is a critical enabler for all three Major Outcomes. Priority gaps identified include those related to Installation and Commissioning Standards, Installer accreditation, and Standardised process outcomes, as well as measures that support solutions to the Priority #1 gaps, *Secure Operations, Protocols and Redundancy*.

⁵⁴ Made available at consult.dcceew.gov.au

⁵⁵ This effort should leverage work undertaken as part of C4Net's Enhanced System Planning program, explained in detail here: <https://c4net.com.au/projects/enhanced-system-planning-project/>



The M.3/P.5 workstream’s consultation paper also highlights that inconsistent connections processes across DNSPs impact the entire CER supply chain and customers, with connection delays and extra costs. Moreover, were efforts made to improve the consistency of connections frameworks across distribution networks, including focusing upon capabilities that support CER orchestration, significant system-wide benefits would result and allow individual consumers to take more advantage of opportunities to secure value from their CER assets.

Through closing the identified gaps associated with the foundational frameworks, processes and interfaces relating to connections and commissioning – the way CER enters the system – Australia’s power system and energy markets stands to gain significant benefits and value across all Major Outcomes.

This initiative should seek to build upon and leverage recent activity in relation to ‘Smart Connect’⁵⁶ that has begun to drive effort that supports standardised installation and commissioning outcomes. Work is underway across NSW and ACT DNSPs seeking to harmonise their installation and commissioning processes, with the effort informed by best practices established in SA and supported by the NSW Government’s initiative to establish and operate a common installer portal. In addition, Synergy has been involved to align arrangements that may operate across the WEM.

This proposed initiative supports the resolution of priority gaps GS08, GS23, GS11, GS12, GS18, GS10, GS01, GS07, GS09, GS03, GS34, GS35, GS36, GS14, GS20, GS24.

This proposed initiative supports the M.3/P.5 consultation paper’s proposed actions #4 and #6.

9.4.3. Extend the detailed design and implementation of a CER Data Exchange

Significant work has already been undertaken with respect to a CER Data Exchange, with an industry co-design initiative, led by AEMO and Ausnet and funded by ARENA, completed its final report and High-Level Design in April 2025⁵⁷.

The next stage for a CER Data Exchange as envisaged and recommended by the industry co-design project is to undertake a detailed design effort for the initial infrastructure. Consistent with a stakeholder approach to ‘start small and grow’, this initial capability will focus upon some basic

⁵⁶ Smart Connect is a national initiative that includes the ENA, ANU, AEMO, CEC and ARENA. Its aim is to promote and provide coordination support for national activities in CER integration. As an example, it has helped secure ARENA funding for a national CSIP-AUS testing and certification project led by the ANU.

⁵⁷ Summary report and High-Level Design available at <https://aemo.com.au/initiatives/major-programs/nem-distributed-energy-resources-der-program/markets-and-framework/cer-data-exchange-industry-codesign>



foundations of the CER Data Exchange that are likely to assist with other reforms such as the *Integrating Price Responsive Resources* rule change⁵⁸ (which is an initial market approach to drive the Effective Orchestration of CER). The base elements proposed for the next stage of work include:

- a secure data exchange infrastructure that establishes standardised sharing patterns;
- an access management framework supporting authentication and authorisation for various market participants;
- a data standardisation that enables consistent data structures and validation protocols; and
- Priority use cases of Broader Access to CER Standing Data Access and Efficient Sharing of Network Limits (DOEs) for delivery in 2027 with a tentative implementation date for the Network Support and Flexibility Capability Discovery use case.

The CER Taskforce should task AEMO, in collaboration with industry stakeholders, to extend the detailed design scope of the CER Data Exchange by identifying key use cases that support addressing priority data gaps identified in this project. Further, an assessment framework should be constructed that will enable the prioritisation of possible use cases that might be supported by the CER Data Exchange over time.

The following requirements should be included to extend and enhance the CER Data Exchange's ability to address data, data sharing, and role gaps identified in this project as well as the *M.3/P.5* workstream:

- Entities that are regulated or have a cost-recovery business model such as AEMO and Network Service Providers receive regulatory support to fund and sustain operational participation;
- Incorporate unrecognised participant roles (such as Customer Agents and Communication Managers) into the Identity and Access Management system to facilitate wider trusted data sharing, coordination and customer choice (supports resolution of priority gaps GS04, GS10, GS08);
- Enhance the Standing Data registry to support coordination and flexibility service proliferation by including all CER types with unique device identifiers and configurations, and considering where data is better shared in a federated manner (supports resolution of priority gaps GS03, GS36, GS06, GS10, GS08);
- Progress the framework for coordinating the procurement of CER-based flexibility services to manage local network congestion. This use case - Network Support and Flexibility Capability Discovery - aims to provide ease of operation across multiple networks for support service providers, like Customer Agents and supports *M.3/P.5's* proposed action #3;

⁵⁸ Available at <https://www.aemc.gov.au/rule-changes/integrating-price-responsive-resources-nem>



- Uplift Portfolio management systems to support frequent, multi-party updates, discoverability of related roles and services including whether CER is 'active' in Customer Agent portfolios (supports resolution of priority gaps GS17, GS22, GS13, GS36, GS14, GS08). This could also support customer switching processes for CER among VPPs (GS30 and GVP04).

This proposed initiative supports the M.3/P.5 consultation paper's proposed action #3.



10. Consultation Questions

The project team responsible for investigating the requirements for data sharing arrangements welcomes stakeholder review of this paper and seeks feedback and comments on its approach and proposed actions prior to finalising advice to jurisdictions and Ministers in late 2025. Specifically, responses to the following questions are most welcome:

Analytical Framework

- Have you identified any significant use cases, roles, data and data-sharing dimensions, or lines of inquiry that the analytical framework has missed?

Data Gaps

- Do you believe there are any significant gaps relating to data roles, access, availability, governance or sharing that this paper has not highlighted? What is the impact of this gap on the Major Outcomes?
- Do you agree with the prioritisation of the distinct gaps identified within this paper? If not, what would you change and how would this better deliver the vision, outcomes and principles of the National CER Roadmap?
- Are there specific elements of data and data-sharing that you believe are crucial gaps or essential for resolving the gaps identified in this paper? Why are they important?

Proposed Actions for Consideration

- Do you agree with the proposed actions in this paper? What considerations, advice or reflections (positive and negative) would you offer for each? Please specify which actions your responses relate to.
- In relation to the proposed action for developing a national CER Data Strategy and Coordination Plan, which organisation might best be placed to complete and implement the Plan in line with the outlined assessment criteria?
- Do you have any alternative approaches to resolving the gaps highlighted in this paper? What are the relative advantages, disadvantages and implementation considerations Taskforce should be aware of?



11. Research

This project has reviewed research and materials associated with CER (or DER) data sharing, including the following information and publications:

- The Energy Security Board's (ESB) **Data Strategy Final Recommendations**⁵⁹, released in July 2021, and seeking to address the challenges of the increasing digitalisation of the energy sector by providing data management direction to manage the transition's changing data needs, as well as optimise the long-term interests of energy consumers in a digitalised economy. The Data Strategy outlined by the ESB comprised four key pillars:
 - New Framework: guiding policy principles and regulatory reforms targeting better consumer outcomes, safer data management, and seeking to be fit-for-purpose for the energy market of the future;
 - Capability building: Building leadership, coordination and capability across agencies and stakeholders, to better manage data growth, grow value from analytics and support the data services the market need;
 - Priority data gaps: Filling gaps in current data sets, critical to support the needs of today with better planning, evolving services and robust consumer protections.
 - Forward planning and adaptability: Introducing regular proactive review and planning to meet the needs of tomorrow, timely standards, flexibility in data arrangements, and facilitating early needs for research and innovation.
- The ESB's subsequent publication to its Data Strategy, the **Data services delivery model Consultation paper**⁶⁰, which focused upon AEMO's data and sought to answer how data services should be provided and governed in the energy sector to meet stakeholder needs both now and into the future (see commentary on Statutes Amendment Act below);
- The Australian Energy Regulator's (AER) **Network Visibility project** which seeks to optimise the benefits of CER and network assets by facilitating the provision of critical CER information needed for planning decisions and managing network risks. The project has involved three (3) phases, including:

⁵⁹ Available at <https://www.datocms-assets.com/32572/1657767015-esb-data-strategy-final-recommendations-july-2021.pdf>

⁶⁰ Available at [1671059508-esb-data-services-delivery-model-consultation-paper-december-2022.pdf](https://www.datocms-assets.com/1671059508-esb-data-services-delivery-model-consultation-paper-december-2022.pdf)



- A public consultation paper by the **ESB, Benefits of increased visibility of networks** Consultation paper, released in June 2023, which focused upon on defining use cases and datasets required for the market⁶¹;
- A trial involving data provision to support the **Victorian Neighbourhood Battery Initiative** (NBI), with a summary paper⁶² released in October 2024;
- A report, released in March 2025⁶³ and leveraging the findings of earlier phases, outlining the actions the AER is seeking to take to ensure third parties have sufficient visibility of distribution network data.
- The Australian Energy Market Commission's (AEMC) **Review of the regulatory framework for metering services**⁶⁴, which recommended that the deployment of smart meters be accelerated to reach all small customers by 2030, together with a series of supporting recommendations seeking to streamline the smart meter installation process, unlock smart meter data and services benefits, and create a more positive customer experience;
- The recent **Statutes Amendment (National Energy Laws) (Data Access) Act 2025**⁶⁵, assented to in February 2025, which was designed to remove regulatory barriers to facilitate better access to energy data by allowing AEMO to share protected data with certain trusted bodies such as the Clean Energy Finance Corporation and the Australian Renewable Energy Agency;
- The Australian Energy Market Operator's (AEMO) **Recommendations paper on Electric Vehicle (EV) Data**⁶⁶, published in April 2025 for public consultation and outlining recommendations for the non-regulatory collection, sharing and analysis of EV data;

⁶¹ Available at <https://www.aer.gov.au/system/files/ESB%20-%20Network%20Visibility%20-%20July%202023.pdf>

⁶² The AER's Low voltage Network Visibility Summary of neighbourhood battery trials report, available at <https://www.aer.gov.au/system/files/2024-10/AER%20-%20Low-voltage%20Network%20Visibility%20-%20Summary%20of%20neighbourhood%20battery%20trials%20-%20October%202024.pdf>

⁶³ The AER's Low Voltage Network Visibility Phase 3 report, available at <https://www.aer.gov.au/system/files/2025-03/Low-voltage%20Network%20Visibility%20-%20Phase%203%20Final%20Report.pdf>

⁶⁴ Available at <https://www.aemc.gov.au/market-reviews-advice/review-regulatory-framework-metering-services>

⁶⁵ Available at [https://www.legislation.sa.gov.au/_/legislation/lz/v/a/2025/statutes%20amendment%20\(national%20energy%20laws\)%20\(data%20access\)%20act%202025_7/2025.7.un.pdf](https://www.legislation.sa.gov.au/_/legislation/lz/v/a/2025/statutes%20amendment%20(national%20energy%20laws)%20(data%20access)%20act%202025_7/2025.7.un.pdf)

⁶⁶ Available at <https://aemo.com.au/-/media/files/initiatives/electric-vehicles/electric-vehicle-data-recommendations-paper.pdf?la=en>



- AEMO's Consultation paper relating to the **Technical Requirements for 200kW – 5MW Distributed Energy Resources (DER)**⁶⁷ identifying an approach to harmonise performance requirements across the NEM for this segment of DER, including the requirement for data monitoring of these systems;
- Energy Consumers Australia's recently proposed **Integrated distribution system planning rule change**⁶⁸, outlining the problem of asymmetry of information between distribution networks and third-party participants, leading to sub-optimal outcomes for consumers, and proposing a rule change requiring DNSPs to make more appropriate use of their data, build a roadmap to collect more granular data, and boost their planning arrangements to be more comprehensive and forward looking;
- The AEMC's **Real-time data for Consumers rule change**⁶⁹, which includes the AEMC's directions paper, published in late January 2025, proposing a framework to enable consumer access to their real-time smart meter data;
- The **National Energy Workforce Strategy**, being developed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), and which undertook a consultation on its discussion paper (August / September 2024). The resulting feedback was compiled into a What We Heard summary⁷⁰, which included some key insights relating to data such as ANSZCO codes being too generic, the need for more granular workforce data on a regional level, together with data needed on project pipeline, locations and workforce needs;
- The **Open Energy Networks project** (OpEN), launched in 2018 as a collaboration between the Energy Networks Australia and AEMO, sought stakeholder engagement on how best to integrate Distributed Energy Resources (DER) into Australia's electricity system. The collaboration released a Required Capabilities and Recommended Actions Report in July 2019⁷¹ outlining the key functions and capabilities needed by distribution network service providers (DNSPs) that would

⁶⁷ Available at [aemo technical-requirements-for-200kw-to-5mw-der-connections_sept-2024_final .pdf](#)

⁶⁸ Available at <https://www.aemc.gov.au/rule-changes/integrated-distribution-system-planning>

⁶⁹ Available at <https://www.aemc.gov.au/rule-changes/real-time-data-consumers#:~:text=On%2030%20January%202025,%20the%20Australian%20Energy%20Market,would%20access%20real-time%20data%20from%20their%20smart%20meters.>

⁷⁰ Available at <https://dcceew2.sharepoint.com/sites/DCCEEW-EnergyStrategicPolicy/Shared Documents/General/Workforce/National Energy Workforce Strategy/Comms Strategy & Website/Website Updates/What we heard summary>

⁷¹ Available at https://www.energynetworks.com.au/assets/uploads/open_energy_networks_-_required_capabilities_and_recommended_actions_report_22_july_2019.pdf



support the optimal integration of CER with the electricity system that would benefit all consumers;

- Solar Analytics' **DER Visibility and Monitoring Best Practice Guide**⁷², compiled to address the key barrier of DER operational visibility being made available to appropriate stakeholders;
- AEMO, AusNet Service and Mondo Power's **Project EDGE** (Energy Demand and Generation Exchange), a three-year research trial on the integration of CER into the NEM. Funded by the Australian Renewable Energy Agency (ARENA), its final report⁷³ provided insights and recommendations across a broad spectrum of relevant topics including customer needs and experience, dynamic operating envelopes (DOEs), market visibility and performance of CER, efficient and scalable data exchange, compensatory controls, and roles and responsibilities;
- Western Power, AEMO and Synergy's **Project Symphony**, an ARENA-funded pilot program generating insights to inform the implementation of CER integration initiatives under the West Australian DER Roadmap⁷⁴. Project Symphony's final report⁷⁵ presents recommendations assessing the viability of CER orchestration in the SWIS, across four key 'pillars'- Technical, Customer, Value, and Policy & Regulation;
- AusGrid's **Project EDITH**, trialling a dynamic network tariff pricing model that is responsive to local grid conditions. The project identified Dynamic Network Prices (DNP)⁷⁶ as a potential future data transaction that Customer Agents could interact with to benefit consumers.
- AEMO's **Smart Meter Backstop Mechanism Capability Trial**⁷⁷ tested the technical capabilities of South Australian smart meters and how these can contribute to consumer benefits and be utilised in maintaining power system security. The report provides insight on gaining visibility of CER separately from customer essential electrical loads.

A series of studies and publications from the UK and Europe, including:

⁷² Available at https://static.solaranalytics.com/der-monitoring-guide/DER+BP+Guide+Data+Use+Case+Summary+and+Context_f.pdf

⁷³ Available at <https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-final-report.pdf?la=en>

⁷⁴ Available at <https://www.wa.gov.au/government/distributed-energy-resources-roadmap>

⁷⁵ Available at <https://arena.gov.au/assets/2024/06/Western-Power-Project-Symphony-Pilot-Results-and-Recommendations.pdf>

⁷⁶ Available at <https://www.ausgrid.com.au/-/media/Documents/Reports-and-Research/Project-Edith/Project-Edith-2022.pdf?rev=42030a3921274632910a9fbf6ff1e2ac>

⁷⁷ Available at <https://aemo.com.au/-/media/files/initiatives/der/2022/smart-meter-backstop-mechanism-capability-trial-report-phase-2.pdf?la=en>



- the **Strategy for a Modern Digitalised Energy System** report⁷⁸ produced by the UK's Energy Data Strategy taskforce;
- The UK's **Digital Spine feasibility study**⁷⁹ produced by the consortium of Arup, Energy Systems Catapult and the University of Bath, after extensive stakeholder consultation about the creation of data sharing infrastructure for the UK's energy sector;
- **Open energy UK**⁸⁰, a non-profit project collaborating with industry, government and regulators to modernise access to energy data and facilitate improved data sharing, making it easier to discover, share, access and use energy and related datasets;
- The EU's **Common European Energy Data Space report**⁸¹, detailing its approach to establishing an advanced digital ecosystem for the communication between organisations and devices, and the constituent components of an energy Data Space to facilitate a host of CER-based flexibility services;
- SolarPower Europe's **Solutions for PV Cyber Risks to Grid Stability Report**⁸² provides technical and non-technical recommendations to mitigate residual cyber and energy security risks for inverters including improving resilience and back up contingency plans;

⁷⁸ Available at <https://esc-production-2021.s3.eu-west-2.amazonaws.com/2021/07/Catapult-Energy-Data-Taskforce-Report-A4-v4AW-Digital.pdf>

⁷⁹ Available at <https://assets.publishing.service.gov.uk/media/66bcbc523cc0741b92314644/digital-spine-feasibility-study-summary-report.pdf>

⁸⁰ Available at https://docs.openenergy.org.uk/1.0.0/ops_guidelines/introduction.html#what-is-open-energy-how-was-it-made-and-who-is-it-for

⁸¹ Available at https://energy.ec.europa.eu/publications/common-european-energy-data-space_en

⁸² Available at https://api.solarpowereurope.org/uploads/SPE_2025_Solutions_for_PV_Cyber_Risks_to_Grid_Stability_032dc2ae5a.pdf



12. Glossary

Terms used within this paper and throughout the project are defined below.

Term	Definition ⁸³
Activity	Workflows of stepwise activities decomposable down to atomic actions. Level 4 within the Taskforce Capability Model
Activity Diagram	Include processes, activities and interactions between roles identified using existing industry knowledge base and subject matter experts. Can reflect many layers of detail as required.
Actor	A person, organisation, or system that has a role that initiates or interacts with activities
Capability	An ability that an organisation, person, or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organisation, people, processes, and technology to achieve. Level 3 within the Taskforce Capability Model.
Capability Group	A logical organisation of Capabilities to enable traceability from Domains. Level 2 within the Taskforce Capability Model
Compensatory controls	Default behaviours or redundancy requirements for CER during communications outages or in emergencies These may be embedded within CER, involve other devices or exist within other layers and interactions in the power system.
Data Entity	An encapsulation of data that is recognized by a business domain expert as a thing.
Domain	A representation of an end-to-end collection of value-adding capabilities and associated activities along the electricity industry value chain that create an overall result for a customer, stakeholder, or end-user. Level 1 within the Taskforce Capability Model.
Function	Delivers business capabilities closely aligned to an organisation, but not necessarily explicitly governed by the organisation.
Information Objects	A stored, structured or simple article or piece of information or data that can serve as a work object being produced and shared as part of an activity (use case) or function associated with the industry capability model
Interfaces	A defined point of interaction between different entities, components or subsystems, facilitating communication, coordination, and data exchange.
Off-market	Services between parties that are not conducted as part of the wholesale energy market (e.g. network 'flex services' arrangements, retail hedging arrangements)
Processes	Processes represent a sequence of activities that together achieve a specified outcome, can be decomposed into sub-processes
Role	The usual or expected function of an actor, or the part somebody or something plays in a particular action or event. An Actor may have a number of roles.
Taskforce Capability Model	A structured, 4 level taxonomy that organises key concepts and capabilities using a common language, aligning with industry standard definitions to enable shared understanding, systematic analysis and coordinated design for effective CER data integration across stakeholders, supporting traceability, interoperability and adaptability for evolving energy system needs.

⁸³ Definitions have been adapted from sources such as The Open Group Architecture Framework (TOGAF), Unified Modelling Language (UML) and Global Power System Transformation Consortium (G-PST / CSIRO / AEMO).



Term	Definition ⁸³
Use Case	A use case is a list of actions or event steps typically defining the interactions between a role and a system to achieve a goal, often representing missions or stakeholder goals.
Use Case Group	A collection of use cases with varying degrees of detail that involve many actors and roles utilising their capabilities to undertake activities and collectively deliver a valued outcome for all consumers.
Use Case Group Diagram	Identifies all the use cases within a Use Case Group and the roles (not actors), relationships and capabilities required



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14. Additional Artefacts

In the table below, the list of artefacts produced by the project, referenced within this paper, and available for review by stakeholders is shown.

Table 9: M.2 Project Artefacts and their Location

#	Document Title	Description	Document Links
1	Overview of Analytical Framework and Industry Capability Model	<p>The five CER lifecycle stages (Domains: Level 1) are detailed into level 2 and level 3 industry capabilities. The linkages between L1, L2 & L3 capabilities along with their definitions are provided.</p> <p>These industry capabilities are then utilised as part of a comprehensive analytical framework adopted by the project to investigate data and data sharing requirements for a high CER future. This framework is detailed for stakeholders.</p>	Made available at consult.dcccew.gov.au
2	Use Case Group Diagrams	<p>This document shows the visual representation of use cases that are assigned to the roles under four use case groups</p> <ul style="list-style-type: none"> • Operate and Trade under normal conditions (OTN) • Operate and Trade under emergency conditions (OTE) • Plan & Oversight (PO) • Connect and Integrate CER (CI) <p>The Level 3 capabilities are also visually represented on the use cases in these diagrams</p>	
3	Capability, Use Case and Role-Actor assignment worksheet	This document is a tabular representation of the above-mentioned Use Case group diagrams including extra information such as proposed actors against each use case and which use cases are included in activity diagrams	
4	Activity Diagrams	These diagrams were created to further document and illustrate discrete capabilities, specific data attributes and highlight the potential for shared responsibilities across roles for fulfilling the capability. Only select use cases were documented in this way, and these diagrams should not be considered exhaustive of all CER required capabilities.	
5	Data Categorization Worksheet	This file is a detailed analysis of potential data sharing needs for a high CER future. It reviews Use Cases with associated information objects and assesses various other data characteristics and their sharing arrangements to identify current capabilities and gaps.	
6	Role and Actor Glossary	The existing and potential Roles available to undertake a specific operational or market function within a high CER future. Definitions for each Role have been provided.	

