Evoenergy's Demand Management Innovation Allowance (DMIA) Compliance Report

Regulatory year 2023-2024

October 2024

evoenergy

TABLE OF CONTENTS

1. INTRODUCTION AND PURPOSE

This compliance report has been prepared by Evoenergy for reporting to the Australian Energy Regulator (AER) under the Demand Management Innovation Allowance Mechanism (DMIAM).

This report for the 2023-24 regulatory year is considered suitable for publication (with confidential information redacted).

As specified in Section 2.3 (3) of the DMIAM Guidelines, this annual DMIAM compliance report includes the following required information in the sections indicated in Table 1:

Table 1: Required information under DMIAM Guidelines and references to sections in this report

DMIAM Compliance Reporting 2.3 (3)	Information Requirement	Reference to Sections in this Report
(a)	the amount of the allowance spent by the distributor	**Section 2.3**
(b)	a list and description of each eligible project on which the allowance was spent	**Section 2.2**
(c)	a summary of how and why each eligible project complies with the project criteria	**Section 2.2**
(d)	for each eligible project on which the allowance was spent, and in a form that is capable of being published separately for each individual eligible project, a project specific report that identifies and describes: i) the nature and scope of each demand management project or program, ii) the aims and expectations of each demand management project or program, iii) how and why the eligible project complies with the project criteria; iv) the distributor's implementation approach for the eligible project; v) the distributor's outcome measurement and evaluation approach for the eligible project; vi) the costs of the project or program: 1. incurred by the distributor to date as at the end of that regulatory year; 2. incurred by the distributor in that regulatory year; and 3. expected to be incurred by the distributor in total over the duration of the eligible project. vii) for ongoing eligible projects: 1. a summary of project activity to date; 2. an update of any material changes to the project in that regulatory year; and 3. reporting of collected results (where available). viii) for eligible projects completed in that regulatory year: 1. reporting of the quantitative results of the project; 2. an analysis of the results; and 3. a description of how the results of the eligible project will inform future demand management projects, including any	**Sections 3-5**

	lessons learnt about what demand management projects or techniques (either generally or in specific circumstances) are unlikely to form technically or economically viable non-network options. ix) any other information required to enable an informed reader to understand, evaluate, and potentially reproduce the demand management approach of the eligible project.	
(e)	Where an eligible project has extended across more than one regulatory year of the regulatory control period, details of the actual expenditure on each such project or program in each regulatory year of the regulatory control period to date.	**Section 2.3**
(f)	A statement declaration signed by an officer of the distributor delegated by the chief executive officer of the distributor certifying that the costs being claimed by each demand management project: i. are not recoverable under any other jurisdictional incentive scheme, ii. are not recoverable under any other state or Australian Government scheme, and iii. are not otherwise included in forecast capital expenditure (capex) or operating expenditure (opex) approved in the AER's distribution determination for the regulatory control period under which the mechanism applies, or under any other incentive scheme in that distribution determination.	**Section 2.4**

2. DMIA PROJECT SUMMARIES

This section provides a summary of the projects and project costs over the 2023-2024 regulatory year for which DMIAM expenditure was incurred.

2.1 Project Criteria

For ease of reference, project criteria for eligibility under DMIAM Guidelines Section 2.2.1(1) is included below:

An eligible project must:

(a) be a project or program for researching, developing or implementing demand management capability or capacity; and

(b) be innovative, in that the project or program:

i) is based on new or original concepts; or

ii) involves technology or techniques that differ from those previously implemented or used in the relevant market; or

iii) is focused on customers in a market segment that significantly differs, from those previously targeted by implementations of the relevant technology, in relevant geographic or demographic characteristics that are likely to affect demand; and

(c) have the potential, if proved viable, to reduce long term network costs.

2.2 Project Summaries

As required in Sections 2.3(3)(b) and 2.3(3)(c) of the AER DMIAM Guidelines, Table 2 provides a list, description and summarises how and why each eligible project complies with the DMIAM Project Criteria.

Table 2: Project list, description and compliance with the DMIAM project criteria

Project	Description	How and Why Project meets DMIAM Criteria
Project Converge	Project Converge aims to demonstrate new distributed energy resources (DER) orchestration capabilities known as 'Shaped Operating Envelopes' which will allow Distribution Network Service Providers (DNSPs) to improve network congestion management,	This project showcases how Evoenergy, and by extensions other DNSPs, can implement Demand Management with potential to reduce long-term network costs by increasing the efficient use of existing network infrastructure. It does through an

	minimise network expenditure and improve DER market bidding into energy and ancillary service markets. It is a joint project with ANU, Zepben, ARENA, ACT Government and ARENA as well as associated Aggregators.	innovative mechanism called SOE (Shaped Operating Envelopes) where network data gathered from aggregators and the DNSP are used to calculate the most efficient use of the existing network allowing customers to maximise their financial returns and minimise network costs. See Section 4.3 for details on how the project meets the DMIAM criteria.
Ginninderry Residential Battery Trial	This project aimed to provide battery subsidies to 75 households connected to a single distribution substation in Ginninderry which is a fully electric development with mandated solar for all dwellings. Through this project, Evoenergy collaborated with battery owners to alleviate network congestion during peak demand periods, with the purpose to test a combination of manual interventions through smart devices and through the trial of a new cost-reflective tariff that smart devices automatically respond to. The project would have been the first of its kind in Australia, allowing each household to own the battery with shared management from Evoenergy for DM services.	The project aim was to develop and implement demand management capability for managing demand in fully electric developments and areas with high rooftop solar uptake. These learnings have played an important role in helping evolve the way we manage network demand and ensure our energy network continues to be resilient, reliable, and cost efficient. See Section 4.3 for details on how the project meets the DMIAM criteria.
Network Visibility and Analytics Trial	The Network Visibility and Analytics Trial seeks to improve Evoenergy's visibility in the low voltage (LV) network to improve Demand Management (DM), network planning and performance and connections. The scope of the 12-month trial was to establish data analytics tools utilising existing network information and procure power quality data from smart meters with 10% penetration to enable further use cases. One of the key capabilities enables is monitoring load, utilisation and network performance of the distribution LV network including consumer behaviour insights related to critical demand drivers such as Consumer Energy Resources (CER), EV charging and other large loads.	The Network Visibility and Analytics Trial researches, develops and implements an innovative tool that can enhance Evoenergy's demand management capability. By increasing visibility into the LV network, the trial enables Evoenergy to accurately pinpoint the location and scale of CER, EV chargers and large loads within the ACT network. This enhanced visibility allows Evoenergy to leverage CER and EV chargers to manage peak demand on the network with DM solutions. See Section 5.3 for details on how the project meets the DMIAM criteria.

2.3 Project Cost Summary

Total DMIA expenditure for regulatory year 2023/24 is $976,537. All costs are net of any project partner contribution.

Table 3: Project Cost Summary

Project	Project Status at June 2024	Costs in 2020-2021 Regulatory Year	Costs in 2021-2022 Regulatory Year	Costs in 2022-2023 Regulatory Year	Costs in 2023-2024 Regulatory Year	Total Costs till end of 2023-24 Regulatory Year
Project Converge	**Concluded**	N/A	[redacted]	[redacted]	[redacted]	[redacted]
Ginninderry Residential Battery Trial	**Concluded**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Network Visibility and Analytics Trial	**Concluded**	N/A	N/A	N/A	[redacted]	[redacted]
EV Grid Trial (Dynamic EV Charging)	**Concluded**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Project Converge is an ARENA funded project and the ARENA revenues (milestone payments) for 22/23 and 23/24 years were both received in 23/24 and as such shows a positive recovery in 23/24.

*The EV Grid Project is an ARENA funded project and additional milestone payments recovered in the 22/23 and 23/24 has led to positive recovery for this project for these financial years even though the project was completed in 2022-23. The totals are only documented here for completeness.

2.4 Statement on costs

In submitting this compliance report, Evoenergy confirms that the costs being claimed by each demand management project:

i) are not recoverable under any other jurisdictional incentive scheme,

ii) are not recoverable under any other state or Australian Government scheme, and

iii) are not otherwise included in forecast capital expenditure (capex) or operating expenditure (opex) approved in the AER's distribution determination for the regulatory control period under which the mechanism applies, or under any other incentive scheme in that distribution determination.

3. PROJECT CONVERGE

Project Converge is a DMIA project that started in in August 2021 and has recently reached its completion in March 2024. The following project report provides details of the project activities up until the end of the 2023-2024 regulatory year. The overall project costed at around $8.49 million with ARENA contributing $2.85 million and Evoenergy's DMIA contribution around [redacted] percent of the overall funding.

3.1 Project nature and scope

This project was a three-year research and development project (Aug 2021- March 2024). Project Converge demonstrated new distributed energy resources (DER) orchestration capabilities known as 'Shaped Operating Envelopes' which will allow Distribution Network Service Providers (DNSPs) to improve network congestion management, minimise network expenditure and improve DER market bidding into energy and ancillary service markets. Learnings of this project has been shared internally and externally to the organisation providing a pathway to future DER development.

3.2 Project aims and expectations

Project Converge acknowledges that a network operating at its physical or operational limits is said to be congested because it cannot accommodate additional flows of energy. When congestion occurs within the distribution network, the ability to incorporate DER while also supporting energy reliability and energy security is diminished. New technology capabilities, regulations and market mechanisms are necessary to support the integration and participation of DER in markets for energy and ancillary services without risking congestion.

Project Converge demonstrated how DER can provide network ancillary services while also bidding into energy markets. These capabilities are expected to allow DER to alleviate grid constraints caused by power quality or physical network constraints and thereby unlock further network capacity without the need for additional network investment.

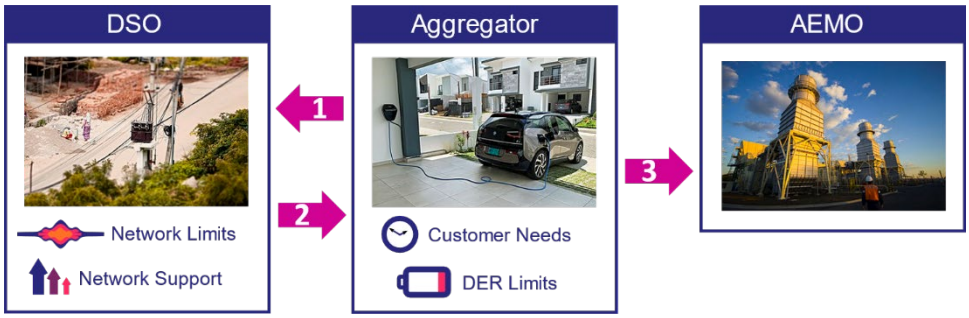
Project Converge achieved the following:

- design and developed a system to support the integration of higher penetrations of DER into the ACT distribution network;
- deployed a new software systems to demonstrate the Shaped Operating Envelope concept for DER;
- integrated hardware, software and systems to pilot capabilities with over 1,000 existing customer-owned DER assets;
- delivered open-source, royalty free designs and models which can be adopted by other Australian DNSPs;
- delivered a range of knowledge sharing reports and webinars to share lessons with industry.

Project Converge :

- demonstrated that Shaped Operating Envelopes can extend dynamic operating envelopes to incorporate locally delivered network services, by use of non-network DER solutions, procured through a real-time investment decision making process
- demonstrated that dynamic network services procured from DER assets can potentially minimise or defer network augmentation costs

- demonstrated that network capacity can be maximised to enable DER to participate in energy and ancillary services markets
- identified an approach for DER congestion management and market bidding to inform future regulatory and market changes.



CONVERGE /SOE framework (steps 1,2,3):	**DOE framework (steps 2,3):**
1. Aggregators send their bids and network support availability to the DSO. 2. SOEs and network support requests are calculated and sent back to Aggregators. 3. Aggregators readjust their bids based on SOEs and submit bids to the wholesale market.	1. DOE's do not participate in this initial step and are less efficient consequently. 2. DOEs are calculated and sent to the Aggregators. 3. Aggregators compute their bids constrained by DOEs and submit them to the wholesale market.

Figure 1: SOE Framework in Comparison to DOE's.

The Converge framework computes SOEs knowing aggregators' bids and network support availability (power and price for both), which allows it to better allocate network capacity to customers. In contrast, DOEs are computed based on "fairness metrics" or "maximum throughput considerations", i.e., without considering the aggregators' intentions/plans.

3.3 How and why project complies with the project criteria

This project showcases how Evoenergy, and by extensions other DNSPs, can implement Demand Management with potential to reduce long-term network costs by increasing the efficient use of existing network infrastructure. It does through an innovative mechanism called SOE (Shaped Operating Envelopes) where network data gathered from aggregators and the DNSP are used to calculate the most efficient use of the existing network, allowing customers to maximise their financial returns and minimise network costs.

DMIA Criteria	**Project Relevance**
Be a project or program for researching, developing or implementing demand management capability or capacity	The project researched and demonstrated Shaped Operating Envelopes (SOE) and their ability to provide demand management capabilities such as: **1. Reducing peak demand** **2. Deferring asset augmentation using non-network options** **3. Maintain supply reliability**

	4. Maximise integration of renewable generation in LV network through managing operating envelopes. This project showcased how Evoenergy, and by extensions other DNSPs, can implement DM with potential to reduce long-term network costs caused by increased DER through SOE's. The project provided Evoenergy with **learnings** into the **technical and commercial capabilities required from platforms to integrate DER in the ACT network**. The project is innovative in that this project is based on new and original concepts and this project used a well evolved platform (Evolve) to evolve it to the Converge Platform to demonstrate a coordinated approach to utilising a fleet of DERs within technical (network limits) and commercial (market prices) boundaries. These **SOE's** in real-time have not been researched and deployed in such manner and is unique and innovative in their approach. The project researched and developed demand management capability for Evoenergy and other DNSPs to manage network peak demand and increase hosting capacity.
Be innovative, in that the project or program: **i. is based on new or original concepts; or** **ii. involves technology or techniques that differ from those previously implemented or used in the relevant market; or** **iii. is focused on customers in a market segment that significantly differs from those previously targeted by implementations of the relevant technology in the relevant geographic or demographic characteristics that are likely to affect demand**	The project increased the visibility, predictability, and control of DER for networks service providers (NSPs) and other relevant entities to optimise power system operation within secure technical limits. Project Converge's delivered as part of this trial reductions in demand on the grid and tested the viability of the SOE's as an evolution on Dynamic Operating Envelopes (DOE). By shaping demand to the full potential of the networks capabilities SOE's have the potential to help avoid or defer network investment. The project showed **how dynamic signalling to customers based upon full network and market conditions can defer network augmentation costs and increase customer DER export capabilities and in turn increase customer profit.** It did this by using the Demand Management capabilities provided by DER in the LV network through aggregator channels. The DER customers that provide the response to the demand management with the best price can monetise their asset. The project involved Evoenergy coordinating the integration of a DER management platform, namely Converge – which is different to an aggregator or DOE platform with a market cognizant and network aware platform. This integration with a market capable platform

	has not been completed by any other DNSP within Australia as this is not a simple Dynamic Operating Envelope engine but rather a platform that can provide assets in the network with financial benefits for responding to **real time signals from the network to alleviate constraints**. *This addresses criteria (i) and (ii) of the DMIA requirements*. Project Converge allowed LV network real time management based upon market and network conditions. This **is unprecedented and is innovative in all aspects. Such a trial has not been previously conducted in the ACT or the NEM**. With this project, DNSPs can deploy or license this platform and provide value to the DER customers within their jurisdictions without having to go through additional trials. The project made public the integrations and lessons learnt from the project through ARENA and project website channels. ***This addresses criteria (iii) of the DMIA requirements.***
Have the potential, if proved viable, to reduce long term network costs.	Project Converge not only reduced further augmentation work on the network but also opened greater opportunity for the customer to export to the network and increase their financial return on investment. Project Converge explored DM opportunities and the interplay between financial and technical drivers for DER assets in an increasingly decentralised energy ecosystem. This results in a **harmonised and standardised approach for demand management, load constraints alleviation and increasing hosting capacity** for other DNSPs thereby reducing the potential long-term cost of innovations and network expenditure to conduct more trials and pilots.

3.4 Implementation approach

Operating envelopes represent the technical limits within which a customer or connection point can import and export electricity to the distribution network. These are agreed between networks, customers and AER as part of the customer connection or regulatory process. Dynamic operating envelopes vary the import and export limits based on the available capacity of the local network at different times and locations.

Shaped Operating Envelopes build on the foundation of 'dynamic operating envelopes' but are optimised to unlock more value from the distribution network than dynamic operating envelopes by minimising or deferring network expenditure.

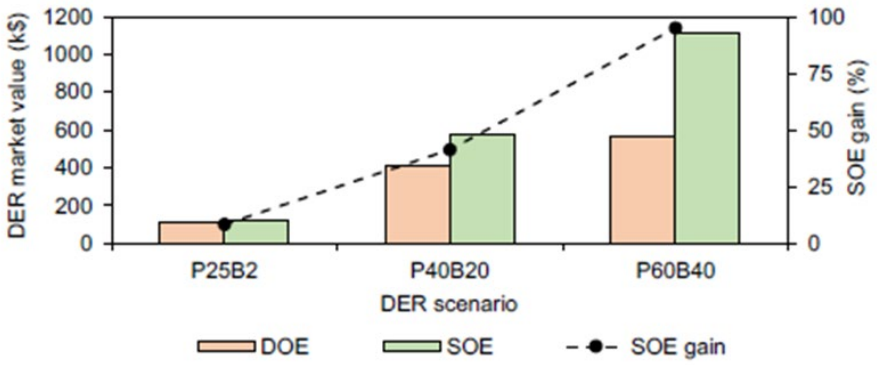


Figure 25. Unlocked DER value under SOEs and DOEs.

Figure 2: Results from the Project Converge Trial showing the increased effeciency of SOE over DOE based upon PV (P) and Battery (B) ratios and uptakes.

A key feature of Shaped Operating Envelopes is the ability for DER to provide network services to improve network congestion management. Shaped Operating Envelopes access 'real-time' dynamic network services to manage network congestion as well as support more DER market bidding into energy and ancillary service markets. Shaped Operating Envelopes involve several steps of interactions between the network, DER and aggregator:

1. DER set a price to provide real and reactive power network services. This allows network services to be procured via an aggregator to unlock additional network capacity.
2. The available network capacity is dynamically distributed using operating envelopes among aggregators based on their respective customer DER pools. Shaped Operating Envelopes are then sent to the Aggregator / DER via the IEEE 2030.5 protocol.
3. Market bids for energy and ancillary services are then made within the Shaped Operating Envelopes into AEMO Market Systems. It is important to note that real power network services procured in Step 1 must also be appropriately bid into AEMO systems in Step 3 to ensure consistency.

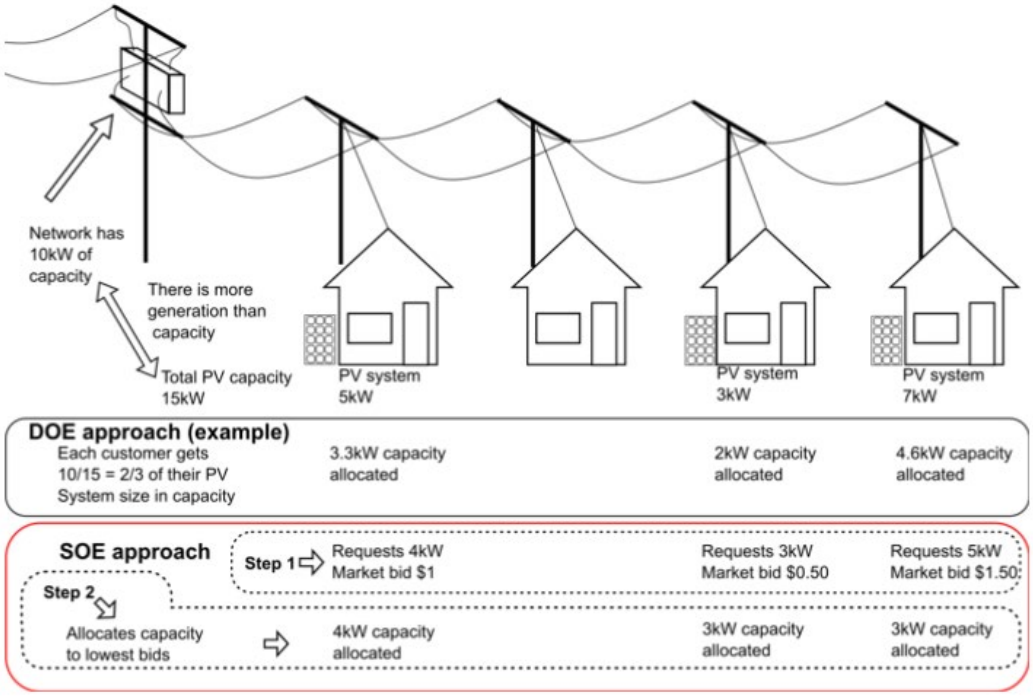


Figure 3: Shaped Operating Envelop have an extra step to Dynamic Operating Envelopes

3.5 Outcome measurement and evaluation approach

The project outcome measurement was assessed by evaluating the extent to which the aims and objectives are met as well as meeting the project delivery milestones. The project had 5 milestones as agreed with ARENA and these were continuously reported during the project lifecycle.

Description	Evoenergy Deliverables
Milestone 1 – Initiate and setup	1. Negotiate and sign bilateral supply agreements with consortium 2. Establish a work plan and costings, negotiate and allocate internal budgets 3. Establish early framework of sandbox development including: a. Data architecture and Design b. 2030.5 Server Order Evidence
Milestone 2 – Development and Integration	1. Begin integration of the Evolve Framework with aggregator(s) and the Recipient's operational technology environment. 2. Provision of evidence of Shaped Operating Envelope. 3. Begin social science work: a. Social science research design and literature review b. Ethics approval 4. Progress customer enrolment.
Milestone 3 – Workshop and Testing	1. Further refine Shaped Operating Envelope algorithm 2. Commencement of congestion management offline simulation and testing. 3. Commencement of householder interviews and deliberative workshop. 4. Progress customer enrolment.
Milestone 4 – Demonstration and Knowledge Sharing	1. Submission of Knowledge Sharing Documents. 2. Completion of householder social science study. 3. Completion of 1000 customer enrolment. 4. Further refinement of progressed congestion management offline simulation and testing.
Milestone 5 – Communication and Commercialisation	1. Completion of Knowledge Sharing document. 2. Completion of testing with 1000 customers. 3. Provision of completed Shaped Operating Envelopes. 4. Shaped Operating Envelope source code is available on a public software repository and available for use freely under an open source licence.

The project learning have been evaluated against the milestones and the objective to understand the data that DNSPs collect, and the financial and electrical flows that may underpin future market models, and validate the performance of the SOE model to be able to support the dynamic operation of the network, involving markets.

The overall learning and evaluations against the expected aims have been discussed further in the ARENA Knowledge sharing report available here: Project Converge ACT Distributed Energy Resources Demonstration Pilot - Australian Renewable Energy Agency (ARENA)

3.6 Project Activity and Results

Project Converge is currently Australia's largest Operating Envelope Trial with over 1000 customers in the ACT. Evoenergy engaged two aggregators into the project, Reposit Energy and Evergen to facilitate this customer base.

Evoenergy has been actively involved in several ARENA DEIP Dives where we have had chances to discuss SOE's with our industry peers and made learnings from our similar DOE projects such as, Project EDGE, Symphony, and Edith. These learning have also been shared further with a webinar and associated Knowledge Sharing Reports. Evoenergy also shared early-stage results and learning with successive Future Network Forums, sponsored by the ENA while engaging on further work and validations with the peer projects.

One of the key Social Science learnings, at this stage, is how nascent Operating Envelopes are and how intermediaries such as Aggregators and other DNSP's are still in a mode of learning. Operating Envelopes are a key technology that will be implemented throughout the Australian electricity network and that much effort needs to go into education of all parties. This initial learning stage has meant it has taken time to get Aggregators and internal stakeholders to understand Operating Envelopes and its implications. Further investigation of these Social Science learnings were elaborated upon in the final report in March 2024 as will Evoenergy's understanding of the response from our customers.

In terms of technical results, the trial brought forward some interesting points and include:

- Aggregators are limited, by their design, in how much market data they can share and this has caused Project Converge to evolve its algorithm to facilitate this limitation.
- The current way the market is driven from a regulatory perspective does not facilitate the extra step of requesting market bids from the customer. This is a distinct feature of SOE's.
- There is currently not a critical mass of aggregating participating customers to make Operating Envelopes work. In a lot of instances as part of the Project Converge trial we only had a handful of customers participating on our most popular feeders. We had to rely upon simulation to make the trial work.
- LV Visibility is a large concern and we need real time data to make Operating Envelope works.
- The market does note have the maturity from a technical perspective to bring about SOE's in force and it would be better to focus on DOE as an interim step.

A Real time RIT-D Module was also developed as part of Project Converge which has received positive feedback from stakeholders. A Real Time RIT-D enables Network Planners to look at constraints in the network and compare via a NPV comparison possible of network and non-network solutions.

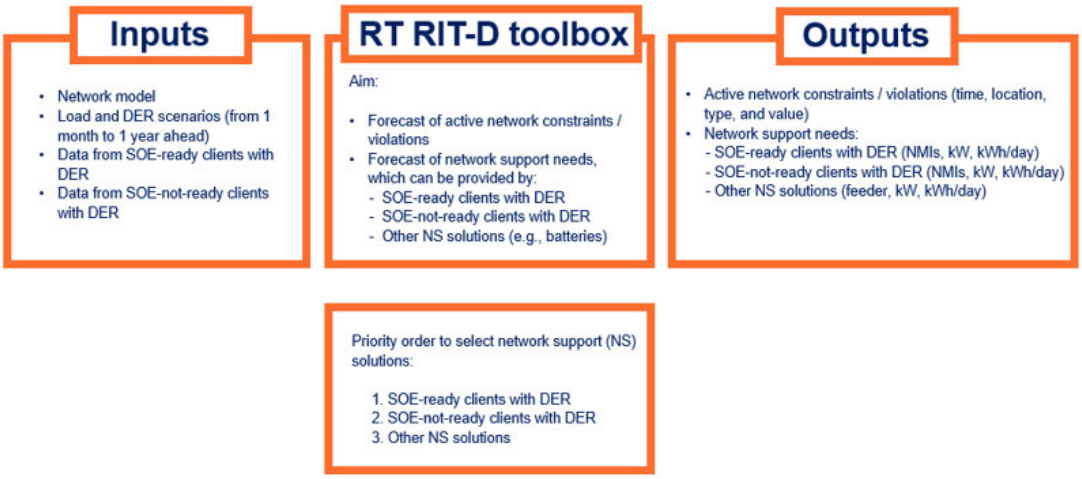


Figure 4: Real Time RIT-D Module

3.7 Other Information

General information about the project can be found on the:

- Project website: Project Converge - Evoenergy
- Project page on the ARENA website Project Converge ACT Distributed Energy Resources Demonstration Pilot - Australian Renewable Energy Agency (ARENA)

If you have a specific information request to assist in understanding or evaluating this project please contact demandmanagement@evoenergy.com.au.

4. GINNINDERRY RESIDENTIAL BATTERY TRIAL

The Ginninderry REIF Residential Battery Trial is a project in the developing Ginninderry region run by Evoenergy, in collaboration with the Ginninderry Joint Venture (JV) and with assistance from the ACT Government under the Renewable Energy Innovation Fund (REIF). Ginninderry is a new greenfield development in West Belconnen, expected to be home to at least 30,000 residents over the next 40 years. As part of its sustainable vision, the Ginninderry JV aims to reduce greenhouse gas emissions, electricity demand to the grid, and energy costs to residents. This is achieved through minimum requirements for mandatory solar panels, home energy management systems (HEMS), hybrid (or battery ready) inverters and energy efficient appliances.

To this end, Evoenergy was successful in securing a $250,000 Renewable Energy Innovation Fund (REIF) grant from the ACT Government[1] which is primarily being used to subsidise battery systems for 75 customers. In exchange for the subsidy, trial participants are allowing Evoenergy to manage their batteries' operations for the duration of the trial. Existing commercial arrangements with Distributed Energy Resources (DER) aggregators are being leveraged for real-time data and control of these batteries, both directly through control signals and indirectly using price signals through cost reflective tariff trial. In addition to the REIF grant, [redacted] were being contributed for the Trial by the Ginninderry JV.

4.1 Project nature and scope

The project involved the subsidisation of customer batteries connected to a distribution substation with a high penetration of Consumer energy resources (CER) in the Ginninderry region. The subsidisation of customer batteries from this project would supplement the existing subsidisation offered by the Next Generation Energy Storage grants (NextGen), combined, these subsidies would greatly reduce the out-of-pocket costs from customers. In exchange, the customers would agree to sharing the management of the battery with Evoenergy for 24 months. To ensure that there are sufficient batteries installed, the trial sought to provide 75 residential batteries to households connected to a single padmount substation in Ginninderry. Later project stages would expand this offering out to wider areas, shown in Figure 1, and offer more batteries. The trial was the first of its kind in Australia, allowing each household to own the battery with shared management from Evoenergy for grid management services.

The shared management of customer batteries would allow Evoenergy to perform tests to benchmark different battery OEMs, determine their ability to reduce peak demand and assess the impact that batteries have on local network power quality and peak demand. A key outcome of this trial was to improve Evoenergy's understanding of customer batteries, with the possibly to use them as an alternative to network augmentation. The trial was intended to run for 24 months (providing two summer and winter cycles) and specifically, the aims of the project were to:

- Use CER to assist with quality of supply management to alleviate cost of infrastructure upgrades (which affect all ACT residential customers), and
- Obtain valuable data about battery integration with the grid at a smaller scale, to inform future strategic policies.

Further, if proved viable to the customers and Evoenergy, the project was to be leveraged to trial a new electricity network tariff which may be introduced to Evoenergy's suite of network electricity

[1] https://www.evoenergy.com.au/about-us/media-centre/2020-09-11-ginninderry-battery-trial-builds-on-our-future-focus

tariffs in the 2024-29 regulatory period. The tariff (or tariffs) would enable Evoenergy to apply advanced pricing techniques to improve network utilisation and enable for efficient integration of CER with clear pricing signals.

4.2 Project aims and expectations

The project aimed to achieve a range of demand management outcomes. The key objective was to gain a better understanding of the way in which future energy customers equipped with solar, battery, energy efficient appliances and HEMS devices will interact with the network. This in turn would enable Evoenergy to potentially achieve the following:

- **Automating demand management using price signals**: Tariff based DER orchestration for improved network utilisation through response of HEMS and other smart devices to price signals (sent via the trialled tariff).
- **DER data in the ADMS**: Validation of data acquisition capability of the ADMS from multiple DER aggregators for operational and planning purposes.
- **Tariff optimisation**: Improved understanding of the way in which HEMS respond to network price signals which could then potentially be used to refine the electricity tariff structure.
- **Reduced or deferred network augmentation**: Improvements in network utilisation through manual and automated orchestration of DER within the Evoenergy network, especially in areas with high electrification and/or high solar PV uptake.
- **Model estate development framework**: A viable non-network option for developers and a framework for close collaboration with developers and the ACT Government for carbon neutral developments supporting the Territory's aim for net-zero carbon emissions by 2045.
- **Customer value proposition for demand management**: Experience in recruiting domestic customers in demand management programs and devising incentive structures to maximise participation.

Secondary objectives included increasing benefits to the customers to increase participation in DM programs, such as:

- Access to a highly cost reflective tariff that their HEMS ingest and automatically optimise battery operation for. This will enable them to save on their network electricity bills and maximise returns from their solar and storage assets with minimal requirement for behaviour change.
- An additional battery subsidy with the flexibility to choose any battery, inverter, and provider in the ACT Government's Next Generation Energy Storage Program (Next Gen).
- Access to data and tools to make more informed decisions regarding their energy use.
- Efficient management of their battery system, both through active intervention and through tariffs, which may otherwise be standing idle while also providing demand management services to the network with no or minimal cost to them.

4.3 How and why project complies with the project criteria

DMIA Criteria	Project Relevance
Be a project or program for researching, developing or implementing demand management capability or capacity	The project aimed to develop and implement demand management capability for managing demand in fully electric developments and/or areas with high solar PV uptake. Through this project, Evoenergy is collaborated with battery owners with the aim to alleviate network

	congestion during peak demand periods. The goal was to achieve this with a combination of manual intervention through HEMS devices and through the trial of a new cost-reflective tariff that HEMS devices automatically respond to. The tariff would be designed to support the local electricity grid and provide customers with more control over their electricity bills. This project aimed to play an important role in helping evolve the way we manage network demand and ensure our energy network continues to be resilient, reliable, and cost efficient.
Be innovative, in that the project or program: **i.** is based on new or original concepts; or **ii.** involves technology or techniques that differ from those previously implemented or used in the relevant market; or **iii.** is focused on customers in a market segment that significantly differs from those previously targeted by implementations of the relevant technology in the relevant geographic or demographic characteristics that are likely to affect demand	Ginninderry, being a fully electric development with no gas connections and having a 100% solar PV uptake, brings future DM challenges of decarbonisation through electrification and high penetration of solar in the network forward in time. This provides Evoenergy a unique opportunity to trial innovative DM programs that will help optimise network investment in the future. Thus, the project meets criteria (iii) of being an innovative project. The project served as a trial to ensure effective utilisation of Demand Management Opex approved for the Strathnairn Zone Substation deferral[2] as part of Evoenergy's 2019-2024 regulatory determination. The main concept that was being trialled was to procure demand management at no or minimal cost to the customer by throttling the discharge of their battery during the evening peak. Theoretically this may be done initially through manual intervention through the HEMS platform and later automatically by sending price signals to the HEMS device through the trial tariff. Similarly, the charging of the battery during the day could also be throttled to manage peak export on the network. As the concept of using residential batteries for capex deferral is new and both the techniques being utilised are different from those previously implemented in orchestrating DER, the project meets criteria (i) and (ii) of being an innovative project.
Have the potential, if proved viable, to reduce long term network costs.	The ACT Government has set a target to reach net-zero carbon emissions by 2045. In the Parliamentary and Governing Agreement of the 10th Legislative Assembly for the ACT[3] the Territory has also committed to - Legislate to prevent new gas mains network connections to future stages of greenfield residential development in the ACT. Future stages of Jacka and Whitlam suburbs will be all-electric.

[2] https://www.aer.gov.au/system/files/Evoenergy%20-%20Operating%20Expenditure%20-%20Appendices%206.1-6.2%20-%20Updated%20April%202018%20v2.zip

[3] https://www.cmtedd.act.gov.au/__data/assets/pdf_file/0003/1654077/Parliamentary-Agreement-for-the-10th-Legislative-Assembly.pdf

	- Commence a transition project to advance all-electric infill developments, with a goal of no new gas mains network connections to future infill developments from 2023. The ACT Government is also offering incentives for customers to install rooftop solar, including $15,000 interest free loans[4]. In the absence of innovative DM programs to manage peak demand, both fully electric developments and developments with mandated solar PV, will drive network investment that will raise costs for all customers. By bringing and addressing these challenges forward in time, this project, if proved viable, will reduce long term costs for all customers by providing credible non-network options for managing network congestion due to decarbonisation through electrification and high solar PV penetration. This will help co-optimise costs of DM and investment in the network while supporting the Territory's net-zero by 2045 goal.

4.4 Implementation approach

The project was implemented in close collaboration with the Ginninderry JV. Eligible customers had the option to participate in the trials either by

- registering their existing smart battery energy storage systems; or
- purchasing a new subsidised battery energy storage system from any of the Next Gen providers.

For the first option, the customer receives the rebate directly from Evoenergy. Under the second option, the Next Gen provider offers the Evoenergy subsidy to the customer and subsequently claims the rebate from Evoenergy.

Following the customer onboarding, the intent of the project was for the customer to provide Evoenergy with the right to manage the operation of their system through their HEMS device or platform. Evoenergy would then manage the battery to avoid congestion on the network. The intention was to operate the battery such that charging is throttled during the day to alleviate peak exports on the network and discharging is throttled during the evening peak to manage peak demand on the network. It would be expected that in most instances this operation of the battery will introduce no or negligible additional cost for the customer. Either way the cost incurred would be miniscule compared to the battery subsidy.

Second stage of the trial would offer the customer a chance to participate in Evoenergy's residential battery tariff trial[5]. In this stage, the same DM outcome (described above) would be achieved through the HEMS automatically optimising the battery's operation to minimise cost for the customer and as a result providing DM services to the network.

[4] https://www.climatechoices.act.gov.au/policy-programs/sustainable-household-scheme

[5] https://www.evoenergy.com.au/Future-energy/Initiatives

4.5 Outcome measurement and evaluation approach

As described in Section 4.4, the techniques intended to have been trialled were aimed at achieving the ultimate outcome of avoiding congestion on the network. Figure 6 is a simple illustration of the comparison between operation of an uncontrolled battery and the ideal operation aimed to be achieved through this project.

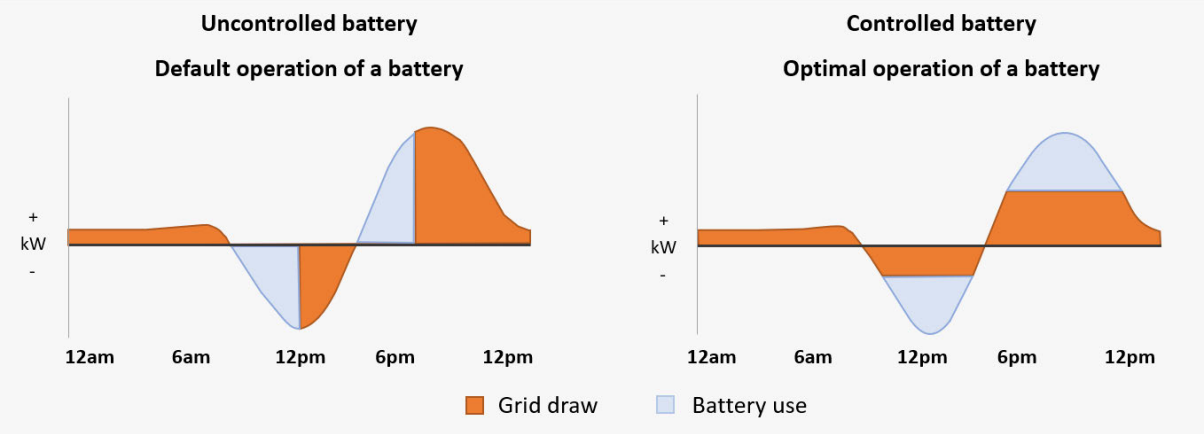


Figure 5: Grid import and export of uncontrolled and controlled battery

In the figures above, the uncontrolled battery charges at maximum capacity in the early morning and reaches 100% state of charge (SoC) before peak solar generation. Even if all solar customers have batteries, most will reach 100% SoC before midday and thus batteries contribute little in the way of alleviating peak coincident exports on the network. Similarly, in the evening, uncontrolled batteries discharge at their full capacity (as required) to meet the house load, again minimally contributing to peak demand on the network, if at all.

Evoenergy currently procures granular data of more than 1000 batteries in the ACT from DER aggregators/HEMS providers. Data from both battery management techniques (active intervention and tariff orchestration) would be compared against uncontrolled batteries on the network to assess viability of these DM approaches as credible non-network options for capex deferral by evaluating effectiveness in managing demand and congestion on the network. The ideal DM outcome will also help alleviate expenditure required to manage quality of supply in future fully electric, 100% PV uptake parts of the network.

4.6 Project Activity and Results

Evoenergy concluded the project over the 2023/24 year. Despite significant assistance from the Ginninderry JV, enthusiasm from project partners and the wider collaborative stakeholders (solar installers), as well as the generous rebates on offer for battery installations, the project was unable to recruit sufficient customers to achieve the originally stated outcomes. This was the primary challenge that the project faced, and without sufficient customer recruitment, shared battery management, tariff reform and the bulk of the data analysis did not occur.

The financial incentive to purchase a residential battery to accompany a solar PV system is well understood by customers. The benefit gained from the solar PV feed-in tariff is much lower than the peak energy rate in the evening when solar PV is not generating. With a battery, customers can store their excess energy generated in the day to offset their peak usage in the evening. This effectively values their excess solar PV generation at the higher peak rate, rather than the lower feed-in rate. However, while the concept is easy to understand, the capital outlay of batteries remains stubbornly

high. The upfront cost, coupled with their comparatively short lifespan, mean that an investment into residential batteries rarely yields a positive NPV. Further, batteries, unlike solar PV which has become well established in Australian households, are still viewed as 'bleeding-edge' technology, where acceptance is correlated with interest in technology and environmentalism. Customers still viewed them as suitable for enthusiasts, rather than the general public.

To alleviate the cost pressure, the project aimed to subsidise this initial upfront cost to make the investment more attractive. This subsidisation was coupled with the ACT Government's NextGen battery rebate, significantly reducing the capital outlay for customers. However, while a $3,000-$4,000 investment is significantly less than a $14,000 investment, it is still a large investment for many customers. Additionally, the investment also came with an obligation to allow Evoenergy to control the battery for two years, perhaps further diminishing the attractiveness of the offer. During this period the COVID-19 pandemic occurred, hindering the project progress and any potential for continued on-the-ground advertisement for the offer. Finally, partway through the project and when the COVID-19 pandemic was starting to wind down, the ACT Government's NextGen subsidy finished, which effectively doubled to capital outlay that customers were required to pay. The end result was that very few customers were recruited into the trial, and the project could not proceed to any later stages to achieve the originally scoped outcomes.

Results

While the project yielded no outcomes from testing, operational data from the batteries was still collected, allowing limited analysis to be performed. The analysis focussed on how customer owned batteries can affect Quality of supply (QOS) and peak demand.

The following conclusions were drawn from initial analysis of the battery usage data:

- Customer batteries generally improve voltage compliance. That is, they appear to lower voltage in solar peaks and reduce undervoltage in the evening peak.
- Customer batteries are operated with a financial motive and are highly tariff responsive.
- Batteries tend to all charge using grid power at approximately 3am, corresponding to the off-peak period of the Evoenergy TOU tariff. This is due to the battery controller (e.g. Reposit) that controls the battery charging to maximise revenue. At small numbers this behaviour is not significant, but a sufficient penetration of batteries may cause new load peaks to be created during this time.
- Without specific encouragement from Evoenergy, Customer batteries act to reduce peak demand in summer.
- The capability of Customer batteries to peak shave is limited in the winter months.
- The benefits that Customer batteries offer may diminish at greater numbers, unless they are larger sized compared to the aggregate solar PV.
- It is both administratively burdensome and ineffective, due to customer willingness, for a DNSP to provide equipment to customers. Alternative options, such as Dynamic Operating Envelopes (DOE) should be investigated.

4.7 Other Information

General information about the project can be found on the Evoenergy website:
https://www.evoenergy.com.au/emerging-technology/initiatives

If you have a specific information request to assist in understanding or evaluating this project please contact demandmanagement@evoenergy.com.au .

5. NETWORK VISIBILITY AND ANALYTICS TRIAL

The Network Visibility and Analytics Trials project commenced in Q3 2023 and involved the procuring of a new advanced analytics platform that utilises advanced meter data, and the trialling of how the results can be implemented in business as usual operations.

5.1 Project nature and scope

The Network Visibility and Analytics Trial seeks to improve Evoenergy's visibility in LV network to improve network planning and performance, network connections and the feasibility of DM in the ACT network. The scope of the 12-month trial was to establish data analytics tools to utilise existing network information, combined with power quality data from smart meters (at 10% penetration) to enable further use cases. Load monitoring, which is a key capability of the platform, was uplifted significantly from the availability of smart meter data and enabled further analysis of asset utilisation and network performance of the distribution LV network, such as insights in to consumer behaviour related to critical demand drivers from CER, EV charging and other large loads. Additional features being trialled include CER compliance, loss of neutral detection and PV performance. The insights and lessons learned from the trial will assist demand management options in planning process and deploy this capability at scale during the 2024-29 regulatory period.

5.2 Project aims and expectations

This trial involves the procurement and implementation of a network visibility and analytics platform (Gridsight) to utilise operational data from the network, including energy data from billing information, power quality data from advanced meters, transformer monitor data, and the CER register. The trial will enhance Evoenergy's data-driven decision-making for demand management options, network planning and performance and connections.

The Network Visibility and Analytics Trial aims to:

- Detect loads in the LV network, such as large loads and residential EV charging
- Monitor reverse power flows due to the growing number of CER

The Network Visibility and Analytics Trial is expected to:

- Improve visibility in the LV network
- Provide reliable network data to support Evoenergy's DM strategy and options in planning processes.

5.3 How and why project complies with the project criteria

DMIA Criteria	Project Relevance
Be a project or program for researching, developing or implementing demand management capability or capacity	The Network Visibility and Analytics Trial researches, develops and implements an innovative tool that can enhance Evoenergy's demand management capability. Evoenergy currently lacks data, tools, and capability to effectively detect and monitor loads in most of our LV network. Poor visibility in the LV network is limiting Evoenergy's ability to strategically plan and integrate DM opportunities in planning.

	By increasing visibility into the LV network, the trial enables Evoenergy to accurately pinpoint the location and scale of CER, EV chargers and large loads within the ACT network. This enhanced visibility allows Evoenergy to leverage CER and EV chargers to manage peak demand on the network with DM solutions.
Be innovative, in that the project or program: **i. is based on new or original concepts; or** **ii. involves technology or techniques that differ from those previously implemented or used in the relevant market; or** **iii. is focused on customers in a market segment that significantly differs from those previously targeted by implementations of the relevant technology in the relevant geographic or demographic characteristics that are likely to affect demand**	**New Visibility Tool for LV Network** Prior to this project, Evoenergy's network had comprehensive visibility at 132 kV and 11kV network levels, with little visibility at the LV level. Network visibility at LV was primarily focussed for operational use and was limited in use for network performance and planning. This project introduces new tools for network performance and planning by deploying a visibility and analytics tool and consolidating new data points (advanced meters), which represents an advancement over existing methods used by Evoenergy to monitor load, utilisation and network performance in the LV network. **Focus on Future Demand Drivers** Traditionally, population growth has been a primary driver of electricity demand. However, the rapid adoption of CER, EV charging, consumer behaviour and broader electrification are now reshaping demand dynamics. This project provides greater insight in understanding these emerging demand drivers. By effectively detecting and monitoring these future demand drivers, the platform can assist Evoenergy to develop strategies that remain relevant and effective in the face of evolving demand patterns and DM solutions.
Have the potential, if proved viable, to reduce long term network costs.	By enhancing visibility and advancing Evoenergy's analytical capability in the LV network, the project enables Evoenergy to conduct more comprehensive DM studies and increase the probability of DM solutions managing future network constraints. Effective use of DM, as described in Evoenergy's DM strategy, can help Evoenergy avoid or defer additional investments in network infrastructure, directly contributing to downward pressure on electricity prices for customers.

5.4 Implementation approach

This 12-month trial commenced in July 2023 and concluded in June 2024. The implementation plan included the development and evaluation of the network analytics tool.

Milestones delivered in the trial were:

Milestone	Deliverables

Milestone 1	Procurement of the network analytics platform
Milestone 2	Integration of network model and SCADA data into the analytics platform
Milestone 3	Acquisition of smart meter data from MDPs and upload to the analytics platform
Milestone 4	Configuration of applications for monitoring CER, EV chargers and large loads.
Milestone 5	User testing and training for the analytics platform

5.5 Outcome measurement and evaluation approach

The project outcome measurement is assessed by evaluating the extent to which the aims and objectives are met as well as meeting the project delivery milestones. User testing within Evoenergy has evaluated the platform's functionalities and validated the data analytics provided.

Key outcomes of the project and evaluation approach is summarised as:

- Level of Visibility: assessment of the visibility offered by the platform into the LV network
- Data Completeness and Reliability: evaluation of the completeness and reliability of the data available on the platform
- Usability for Decision-Making: examination of how effectively the platform's data supported decision-making processes related to demand management and network planning

5.6 Project Activity and Results

Network Analytics Platform & Data Ingestion

During the trial, the network visibility and analytics platform (Gridsight) was established providing Evoenergy users access to LV network insights. Key information ingested and updated daily in the platform includes:

- Evoenergy electrical network model from the GIS (one time load during trial)
- Energy data from 40,000 smart meters (5 min intervals)
- Energy data from 140,000 non-smart meters (lumped 3-month intervals)
- Power quality data from 5,100 smart meters from two MDPs (5 min intervals)
- Power quality data from 1,000 3rd party IoT devices (5 min intervals)

Users had access to the platform and user training from January 2024. In January, some applications weren't enabled due to very limited voltage data available in the platform. From April 2024, additional power quality data was added to the platform enabling the remaining applications within the tool.

Seven primary applications were trialled from April to June 2024, including voltage performance, PV performance, transformer capacity, PV detection, battery detection, EV charger detection, large load detection, high impedance detection and customer to substation mapping.

Key implementation challenges during the trial were establishing contracts for power quality data from smart meters and extracting accurate and reliable SCADA data from Evoenergy's systems. The first batch of power quality data from smart meters was received from April 2024 and was later than planned due to challenges establishing contracts for these data services. Challenges acquiring this data continue and as a result power quality data from smart meters only reached 60% of the project

goal during the trail. Evoenergy is on-track to deliver greater visibility from power quality data after the tail. Extracting reliable and accurate data from Evoenergy SCADA systems was technically challenging, and the project team is continuing to resolve defects in this data source.

EV chargers and large loads

Behind the meter loads are evolving and present new challenges when planning and operating the network. With improved visibility, Evoenergy has insights where EV chargers and large loads are connected and adding to network demand. In the trial period, the analytics platform has detected 1,500 EV chargers and an additional 20 sites with relatively large loads of more than 15kW from 40,000 sites. Knowledge of the location, capacity and consumer behaviour of these loads is essential for Evoenergy in developing future DM options for constraints.

The increased visibility provided by the analytics platform enables Evoenergy to consider controlling EV charging as one potential strategy for DM. By gaining a clearer understanding of residential EV charger locations and usage patterns, Evoenergy can consider coordinating charging times to align with periods of high solar export and/or avoiding peak demand where practicable. This capability not only enhances the management of grid demand but also supports the integration of CER, contributing to a more sustainable energy system.

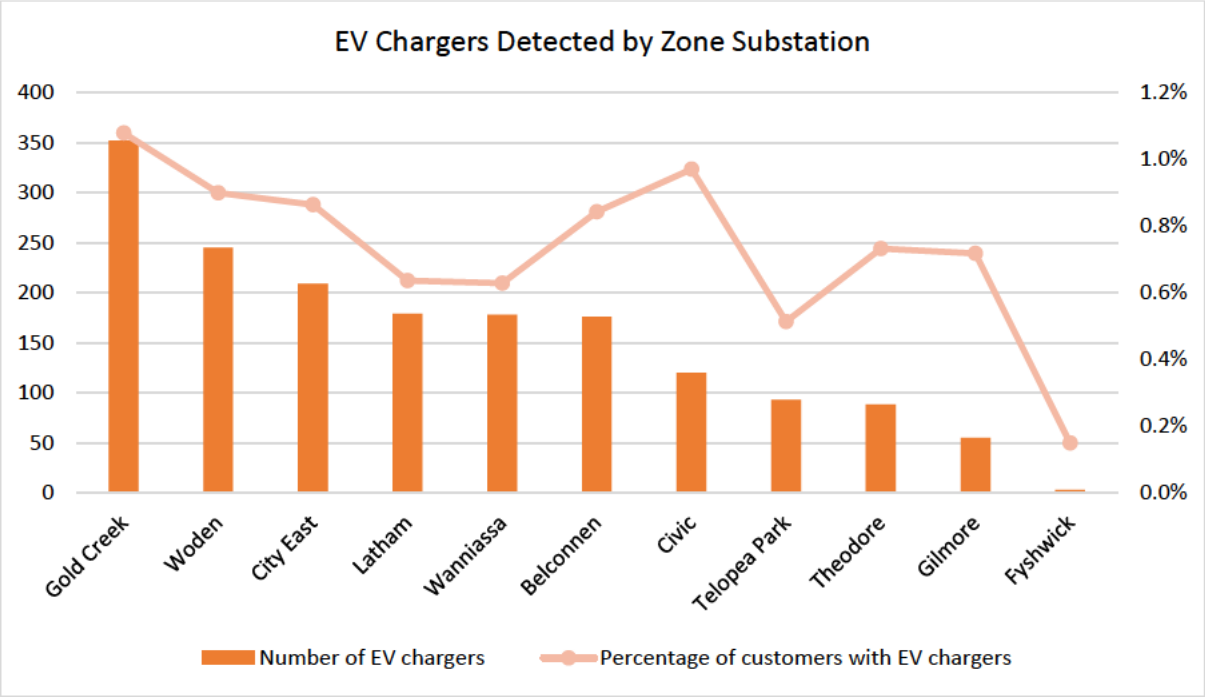


Figure 9: EV chargers detected by zone substation in platform

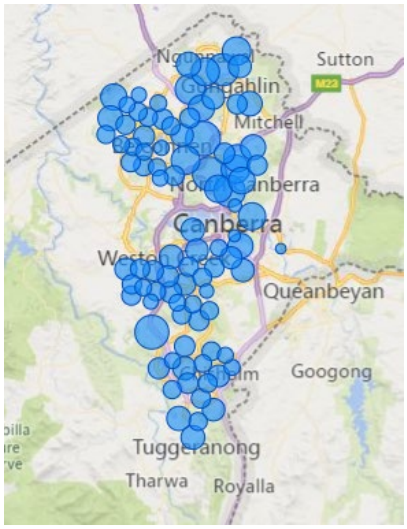


Figure 10: EV chargers detected in the ACT network

Consumer Energy Resources

Prior to this project, Evoenergy lacked the necessary tools to efficiently monitor two-way power flows within the network. However, with the deployment of Gridsight, Evoenergy now has greater CER performance insights. Gridsight also identifies non-compliant and un-approved CER in the network, ensuring they are not overlooked in future planning and DM strategies.

Evoenergy had anecdotal evidence of unapproved and non-compliant CER on the network but was initially unaware of the scale. During the short trial period, around 700 unapproved systems were detected on the network and nearly 100 systems, exceeding the approved export limits from 40,000 sites. Unapproved CER pose safety risks to Evoenergy staff working on the network and hinder Evoenergy's ability to accurately plan and operate the network. In response, Evoenergy is currently collaborating with multiple stakeholders, including CER owners and the ACT Government, to enhance CER compliance.