Ergon Energy
DMIA Annual Report

31 October 2019

ERGON. ENERGY NETWORK

1 Introduction

1.1 Purpose and compliance

Ergon Energy is pleased to present the Demand Management Innovation Allowance (DMIA) Report for the 2018-19 regulatory year. The purpose of this report is to allow the Australian Energy Regulator (AER) to:

- assess Ergon Energy's 2018-19 DMIA initiatives and Ergon Energy's entitlement to recover the expenditure under the AER's Demand Management Incentive Scheme (DMIS)
- confirm Ergon Energy's compliance with the annual reporting requirements of the AER's Regulatory Information Notice (RIN).

This report has been completed in accordance with Schedule 1, paragraph 6 of the AER's RIN (refer figure 1), which requires a DNSP to which the DMIS applies to submit an annual report to the AER on its expenditure under the DMIA. This report, and the information contained in the report, is suitable for publication by the AER.

DMIA reporting requirements Schedule 1: Item 6 – Demand Management Incentive Allowance

6.1 Identify each demand management project or program for which Ergon Energy seeks approval.

6.2 For each demand management project or program identified in the response to paragraph 6.1:

Explain:

(i) how it complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme;
(ii) its nature and scope;
(iii) its aims and expected outcomes;
(iv) the process by which it was selected, including its business case and consideration of any alternatives;
(v) how it was/is to be implemented;
(vi) its implementation costs; and
(vii) any identifiable benefits that have arisen from it, including any off peak demand reductions.

b) confirm that its associated costs are not;
(i) recoverable under any other jurisdictional incentive scheme;
(ii) recoverable under any other Commonwealth or State Government scheme; and
(iii) included in the forecast capital or operating expenditure approved in the 2015-20 Distribution Determination or recoverable under any other incentive scheme in that determination; and:

c) state the total amount of the Demand Management Innovation Allowance spent in the relevant regulatory year and how this amount has been calculated.

6.3 Provide an overview of developments in relation to projects or programs completed in previous years of the regulatory control period, and any results to date.

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1.2 DMIA projects summary

In its Distribution Determination[1], the AER decided to apply Part A of the DMIS (i.e. the DMIA component) to Ergon Energy, approving an innovation allowance amount of $5 million over the 2015-20 regulatory control period.

The DMIA is provided to investigate opportunities that are not yet commercial, in addition to any business-as-usual capital and operating expenditure allowances for demand management and embedded generation projects approved in Ergon Energy's Distribution Determination. This provides a direct incentive for DNSPs to assess emerging opportunities for potentially efficient non-network alternatives, to manage the expected demand for standard control services in some other way or to enable more efficient connection of embedded generation other than through network augmentation.

Ergon Energy's 2018-19 DMIA program comprised seven projects, with two closed and five continuing projects. The total cost incurred for the DMIA initiatives during 2018-19 was $441,477. Table 2 summarises Ergon Energy's DMIA program expenditure recovery for the 2018-19 regulatory year.

Project	Total Project Budget	2018-19 expenditure ($) direct cost only			Status
		Capital	Operating	Total	
CESS Stage 2	$386,650		$159,208	$159,208	Continuing
Grid Advocacy	$365,000		$35,964	$35,964	Closed
Alternate Supply Bustard Head	$932,673		$88,392	$88,392	Continuing
Lakeland Solar Storage	$70,000		$4,244	$4,244	Continuing
IPDRED Development	$48,174		$5,305	$5,305	Closed
Solar Analytics Customer Devices Enabling	$232,912		$42,950	$42,950	Continuing
Western Grid Lab Testing & Product Development	$382,500		$105,410	$105,410	Continuing
Total	**$2,417,909**	**0**	**$441,477**	**$441,477**	

Energex confirms that the costs of the projects specified in this report are:

- not recoverable under any jurisdictional incentive scheme;
- not recoverable under any other Commonwealth or State Government scheme;
- not included as part of:
- the forecast Capital Expenditure or the forecast Operating Expenditure; or
- any other incentive scheme applied by the 2015-20 Distribution Determination

[1] AER (2015), *Final Decision, Ergon Energy determination 2016-17 to 2019-20, Attachment 12 – Demand management incentive scheme,* October 2015.

2 DMIA Project development and selection process

Ergon Energy considers DMIA investments an important component of its commitment to delivering customer value over the longer term. The DMIA program complements our demand management program, which is geared toward providing a more efficient solution to network augmentation. The DMIA initiatives have enabled Ergon Energy to investigate and test innovative approaches to a range of network issues, customer behaviours, renewable integration and tariff enablement.

For the 2018-19 DMIA program, all nominated DMIA projects are subject to a screening and feasibility processes, consistent with the AER's DMIS. This governance process was reviewed and enhanced during the year, in-line with the merger of Ergon Energy and Ergon Network and alignment of application of DMIA funding with the respective DNSP's. The general DMIA project development and assessment process applied in Ergon Energy involves:

- Promotion of DMIA funding and criteria to internal stakeholders to encourage project ideas to be submitted, as an EOI or more formal DMIA Project Scope;
- Review of EOI or DMIA Project Scope against DMIA criteria as a minimum, and against the Energy Queensland Future Grid Roadmap*;
- Project proponents are required to submit project ideas through the Ergon Network Innovation Framework, to ensure the idea is captured in the wider business innovation processes, which helps guide and refine the idea including through internal subject matter expert's and impacted groups in the idea assessment process;
- Projects that are deemed to meet the DMIA criteria are then formally submitted to the DMIA Program Manager for approval, or endorsement to the appropriate financial delegate.

*The Future Grid Roadmap is a document that outlines a range of themes and supporting activities and no-regret investments necessary for the Energy and Ergon Energy to achieve a transition to the intelligent grid of the future over the next 10-20 years. It is not essential to meet criteria other than the stated DMIA criteria, however project proponents within EQL should, where possible, ensure their project aligns with these existing EQL strategic network direction and priorities.

Budgets are prepared in accordance with Ergon Energy's standard project methodology, detailing information including project goals, deliverables, milestones and resources required. Cost estimations were developed for the requirements identified, for each phase of the project. These cost estimations drew upon various sources including the cost of similar projects undertaken by Ergon Energy, current preferred contractor panel contracts and market research.

3 DMIA Project updates

This section of the report details the status of Ergon Energy's DMIA projects in 2018-19 by describing each project, its objectives, progress and findings to date.

3.1 Centralised Energy Storage System (CESS) – Stage 2

The project aims to develop an integrated network control system and to test and validate those control systems for utilising network connected large scale energy storage integrated with renewable energy systems.

3.1.1 Compliance with DMIA Criteria

Energy storage and combined generation and storage are a promising demand management solution for reducing peak demand. As this technology develops, a key barrier for broader implementation will be the integration of the many control systems in a seamless manner.

3.1.2 Nature and Scope

Distributed storage could play a significant role on our electricity networks as energy storage technology improves and price continues to fall. Ergon Energy and Energex have a range of potential applications for larger-scale distributed energy storage, particularly for micro-grid applications, network support and also off-grid applications.

The Centralised Energy Storage System (CESS) is a joint Ergon-Energex project to develop and evaluate a 100kW/200kWh energy storage system. The CESS is a test platform to enable further control systems development around energy storage. The system will be tested, trialled and integrated in a controlled, test environment our workshop to develop functionality and verify its effectiveness and reliability. It is anticipated that the CESS project will seed other projects to develop advanced control systems to manage network demand, enable higher penetrations of customer-owned renewable generation and also develop micro-gridding functionality.

3.1.3 Aims and expected outcomes

The project aims to:

- develop integration strategies for traditional generation, energy storage and renewable energy,
- enable higher penetrations of renewable energy using centralised energy storage systems, and;
- understand the how to achieve seamless transitions between on-grid and off-grid, and the ability of centralised storage to support islanding (micro-grids).

3.1.4 The process by which it was selected, including its business case and consideration of any alternatives

All Ergon Energy DMIA projects are selected and scoped to respond to current and emerging network limitation drivers, and adhere to the standard governance framework. Accordingly, once projects are identified and nominated through the Ergon innovation environment, the eligibility-screening process is performed on nominated projects as a high level assessment, to determine whether the projects meet the objectives of the DMIA. Specifically, this tests whether each potential project is in accordance with paragraph 3.1.3 of the DMIS. Provided all the specified conditions are met, then the project proceeds to the feasibility assessment and approval stages, as per the governance framework and with internal subject matter expert review and feedback. Information from the development activities undertaken enables implementation scheduling, milestone planning and confirmation of resources.

3.1.5 how it was/is to be implemented (i.e. general project update)

A key area of interest lies in enabling effective integration of diesel generation and renewable energy, alongside inverter/battery technologies. Stage 1 of the CESS project involved the procurement of a 83kVA/200kWh energy storage system as a flexible test and development platform. This was successfully completed and commissioned in May 2016, at the Cairns, 308 Hartley Street depot, alongside 60kW of solar PV. Stage 2 is currently underway with development of control algorithms, protection systems, simulation models and engagement with the original manufacturer to help expand device functionality.

3.1.6 any identifiable benefits that have arisen from it, including any off peak or peak demand reductions

Significant maturation of stability management in connections and protection of networks has been developed through the design phase of this project.

3.2 Grid Advocacy

This project was a real world trial involving nine households in Townsville with residential battery, solar and a home energy management system.

3.2.1 Compliance with DMIA Criteria

It is critical to understand the extent to which cost reflective tariffs and demand side technology can reduce peak demand and network risks. The uptake or not of cost reflective tariffs can alter the forward network risk profiles and change the need and types for demand management.

3.2.2 Nature and Scope

The Grid Advocacy Project integrated residential solar PV, battery storage and a home energy management system (HEMS) in conjunction with a seasonal time-of-use demand tariff. The project aimed to explore the demand management opportunities, customer cost impacts, technology opportunities and support levels required for the equipment.

3.2.3 Aims and expected outcomes

The Grid Advocacy Project aimed to deliver the following:

- Demonstration of the value of increased enablement of BESS and HEMS for the network and our customers – providing significant learning for Ergon Energy, the BESS and HEMS industry and enable increased industry engagement;
- Demonstration of an integrated approach to customer connection management which can either utilise remote controllers for action, or have low impact connections of customers to the network;
- Demonstrate the ability of advanced control system to achieve a demand cap at distribution transformer
- Demonstrate that this integrated approach can provide a safe and high quality electricity supply whilst not detracting from the customer's lifestyle
- Investigate the key barriers to building increased control interfaces with retailers or aggregators
- Engage with project participants through thematic communication and community based social marketing, with a view of enhancing their understanding of the importance of the grid and the value the grid provides

3.2.4 The process by which it was selected, including its business case and consideration of any alternatives

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Specifically, this tests whether each potential project is in accordance with paragraph 3.1.3 of the DMIS. Provided all the specified conditions are met, then the project proceeds to the feasibility assessment and approval stages, as per the gated governance framework and with internal subject matter expert review and feedback. Information from the development activities undertaken enables implementation scheduling, milestone planning and confirmation of resources.

3.2.5 how it was/is to be implemented (i.e. general project update)

The project is completed and found the following:

- Demonstrated there is network value in enabling BESS and HEMS technology due to its ability to flatten load profiles, however this benefit is yet to be quantified. The customer value was also demonstrated through the savings a number of customers were able to achieve even though not sufficient to payback the equipment given current pricing.
- Provided conceptual testing of the ability to achieve a demand cap at the distribution transformer. The SwitchDin HEMS overarching control was used to communicate with the individual inverters and effectively control the output to support the network cap. To further this concept significant work would be required to refine the control and develop network systems for interacting with the HEMS aggregators.
- Demonstrated that the HEMS technology is capable of lowering the impact of individual customer connections; however given the reliability of the equipment further measures would be required before reductions in connection services, ADMDs etc. could be reduced.
- Demonstrated that the systems installed were largely capable of providing a safe and high quality electricity supply; however there were a number of reliability issues which did detract from this on occasion. Overall the customers reported that the systems did not detract from their lifestyle; however those who experienced the most noticeable faults did note the concern and that this caused them when trying to rectify the issue.
- Highlighted there are a number of barriers preventing the distribution business from utilising this technology for network support functionality. One of the most significant is the lack of interface between the network and aggregators of the individual systems. This issue of distributed energy resource orchestration and distributed energy source management systems has been identified in the Future Grid Roadmap.

3.2.6 any identifiable benefits that have arisen from it, including any off peak or peak demand reductions

The project identified that these technologies are capable of supporting the network if appropriate incentives and control capabilities are in place.

3.3 Lakeland Solar & Storage

Study in conjunction with end of grid solar and storage project to understand how large scale solar PV and battery storage can service fringe of grid regions.

3.3.1 Compliance with DMIA Criteria

Currently there is little knowledge sharing about how large scale solar PV and battery storage can service fringe-of-grid regions, in particular around demand management. It is expected that the

learnings of this project will present significant value to current and future potential issues faced by power network transmission and distribution operators, academic institutions, energy policy makers and regulators.

3.3.2 Nature and Scope

The Lakeland Solar & Storage (LSS) is a 10.8MW solar farm with 1.4MW/5.3MWh battery energy storage, located adjacent to 132/66/22kV Lakeland substation.

The project was developed with support from the Australian Renewable Energy Agency (ARENA), with $17.41m of the total project value $42.5m, funded by ARENA. As part of the ARENA funding requirements, a Knowledge Sharing Program (KSP) was created to demonstrate additional network services through the combination of solar and battery, in fringe of grid areas.

This project was purely funding Ergon Energy's ability to assist the project owner (Conergy) in enabling them to achieve and effective series of tests and knowledge sharing around using the battery to support novel applications in fringe of grid.

EQL is a key member of the KSP. This project is to facilitate the proposed battery test plan, and provide broader knowledge to the business and industry.

3.3.3 Aims and expected outcomes

This project aims to:

- Provide technical assistance for the Lakeland Solar & Storage project
- Facilitate the proposed battery test plan, in line with the KSP commitment by EQL

3.3.4 The process by which it was selected, including its business case and consideration of any alternatives

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3.3.5 how it was/is to be implemented (i.e. general project update)

Lakeland Solar & Storage was connected and exporting full power in early 2018. There has been some connection non-compliance issues, which has delayed the battery test plan. As a result of the issues, the active harmonic filter was implemented earlier than expected, which has been performing well. The proposed battery test plan was expected to start in Sep/Oct 2018, following pre-test simulations. As a result of Conergy buyout and structural changes, the project was passed to a new company that have not fulfilled the broader battery test plans under the ARENA agreement. As a result, the Ergon Energy DMIA project has been ended prematurely without achieving the final planned testing and knowledge sharing.

3.3.6 any identifiable benefits that have arisen from it, including any off peak or peak demand reductions

'Protection and connection studies have considered the challenges of implementing large scale solar and battery in micro-grid applications. Active harmonic filtering was implemented to better enable the system

3.4 Alternative Supply Bustard Heads

Replacement of a remote SWER line with stand-alone power supply system as a lower cost solution to network maintenance/replacement.

3.4.1 Compliance with DMIA Criteria

The Bustard Head SAPS project complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme as the project will enable the substitution of costly network components with alternative supply arrangements that provide improved power quality and reliability whilst enabling improved value to all customers. I

Improved data and information that can be achieved by application of an estimator can be used to improve the benefits of demand management and coordination of Distributed Generation across the low voltage network.

3.4.2 Nature and Scope

Replacement of a remote SWER line servicing a single customer in a remote coastal location, with a stand-alone power supply system as a lower cost solution to network maintenance/replacement.

3.4.3 Aims and expected outcomes

Direct outcomes and benefits:

- The customer outcomes will be a more reliable power supply.
- The network outcome will be a reduced operating cost and reduced network losses on their distribution system
- Indirect outcomes and benefits:
- Ergon will develop new tools in working with customers towards more cost effective supply solutions
- Ergon will develop new equivalent electricity supply standards for solar/battery hybrid systems
- Ergon will work with Standards Australia to update AS4509.2 SAPS design standard to improve the quality of SAPS design across Australia and provide design criteria comparable to existing network electricity supply for SAPS

3.4.4 The process by which it was selected, including its business case and consideration of any alternatives

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3.4.5 how it was/is to be implemented (i.e. general project update)

The project has already achieved customer engagement and approval, SAPS design fundamentals development and tendering for supply. Further work will be in installation of the SAPS and ongoing customer feedback, as well as finalisation of design philosophy and measures for equivalent supply.

This will lead into new work to enable appropriate life-time management of alternative supply dependent on the criteria set under the new AEMC rules for SAPS.

3.4.6 any identifiable benefits that have arisen from it, including any off peak or peak demand reductions

The project has already developed some criteria for equivalency in design that now need to be tested. Customer engagement has been positive for the project.

3.5 IPDRED Development

The purpose of this project was to undertake market discovery to establish a complete end-to-end energy management system that enables the Internet Protocol Demand Response Device (IPDRED) functionality.

3.5.1 Compliance with DMIA Criteria

The project aims to result in improved energy management which will reduce network augmentation requirements (peak lopping, valley filling, neutralise otherwise disruptive loads). The purpose of an IPDRED is to increase the amount of load under management (more appliances, improved geographic coverage), improved the ability have more granular / targeted load control; and to complement existing load control based around audio frequency based load control.

3.5.2 Nature and Scope

Undertake market discovery to establish a complete end-to-end energy management system that enables the IPDRED functionality already identified. Market discovery will enable improved costings for a Gate 3 Business Case. The scope covers engagement of potential service providers of solutions being sought for platform and communication pathway solutions.

3.5.3 Aims and Expectations

The aim is to identify suitable service providers for a complete energy management platform (platform server, communications pathway). The outcome will be a detailed business case to move forward with trial of an Internet Protocol Demand Response Enabling Device (IPDRED).

3.5.4 The process by which it was selected, including its business case and consideration of any alternatives

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3.5.5 how it was/is to be implemented (i.e. general project update)

The project was meant to operation through engagement of potential service providers of technology solutions being sought for platform and communication pathways. Over the life of the project, regulatory change regarding DNSP ability to own assets behind the customer meter has led to a EQL strategic change as to the securing of demand management/response direct with customer. The movement away from direct firm load control has shifted to market procurement.

3.5.6 any identifiable benefits that have arisen from it, including any off peak or peak demand reductions

Given the regulatory moves toward market procurement of load control, part of the original objective to have a better understanding of the cost to deliver an end to end control methodology has morphed to being that of formalising with the market, a DNSP's requirements of their vendor solutions to enact demand management/response on the DNSP's behalf.

3.6 Solar Analytics Customer Devices Enabling

Trailing HEMs device to test ability to delivery customer and network benefits (including outage notifications for load control, PV export limits, DM in isolated communications and increase LV visibility for the network).

3.6.1 Compliance with DMIA Criteria

The project is exploring the benefits and opportunities that smart customer side devices can deliver benefits for both customers and the network. Focus areas for the project include; outage notifications for irrigators, development of renewable energy value streams for irrigator customers that reduce strain on the network, PV and demand management in isolated communities and increasing LV visibility for the network using Solar Analytics customer data. Key deliverables from the project align with Energy Queensland’s Future Grid Roadmap strategic initiatives related to 'Managing two way energy flow'.

3.6.2 Nature and Scope

Project to work with Solar Analytics and explore the opportunities that additional product development of the the Solar Analytics device can provide Energy Queensland’s network and customers. Areas of opportunity that are to be examined include;

- Developing additional features to assist irrigators on trial QCA tariff structures
- Providing increased visibility and control of solar PV and customer block loads for the isolated communities
- Investigating how a limited deployment may provide greater accuracy for state estimation at a lower cost than some current data streams
- Explore general load and renewables control via a customer side device

3.6.3 Aims and Expectations

The Solar Analytics Customer Devices Enabling Renewables (SACDER) Project Scope has several aims:

- To drive development of additional capabilities within customer owned devices that provide network benefits for both niche and widespread uptake;
- To determine opportunities for Energy Queensland to improve LV visibility based on existing and growing Solar Analytics data sets that provide richer customer information without requiring network owned monitors;

- To participate actively in the development of customer side products that enable opportunities to improve network outcomes in enabling customer choice and increasing renewable energy;
- To trial new products and determine the value they can provide the community.

3.6.4 The process by which it was selected, including its business case and consideration of any alternatives

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3.6.5 how it was/is to be implemented (i.e. general project update)

To date 10 trial devices have been installed at irrigation customer pumping sites to meet the requirements of Milestone 1. This phase of the project targeted customers participating in the existing Agricultural Tariff Trial (T33) and aimed to develop the Solar Analytics product so that it is capable of providing Agricultural Tariff Trial customers with notifications about power supply outages at their irrigation points of connection following load control events. This was a voluntary program that seeks to understand how customer owned energy monitoring devices can provide benefits for both customers and Ergon Energy's network. Existing Agricultural Tariff Trial (Tariff 33 Group) customers were invited to participate in order to help Ergon Energy Network and Energex Network understand the benefits of knowing when a customer's supply is switched off under the load control tariff conditions.

Next steps for the project include procuring, analysing and deriving value for the network, from Solar Analytics existing customer data. The final milestone for the project is to utilise the Solar Analytics project in conjunction with CRC project partners technology to deliver a demand management solution for an Isolated Network the improves PV hosting capacity. This solution will require close collaboration with the IN team to ensure it can be integrated with the power station and provides a reliable benefit to the local network.

3.6.6 any identifiable benefits that have arisen from it, including any off peak or peak demand reductions

Assisted in network load control system fault identification and diagnosis, as part of Agricultural Tariff 33 trial. Reduced customer angst around changing from an uncontrolled electrical supply for water pumping to a controlled electricity supply that better manages network demand

3.7 Western Grid Lab Testing & Product Development

Lab trials of a number of devices with the potential to enable increased capacity and improved to quality of supply for fringe of grid customers.

3.7.1 Compliance with DMIA Criteria

'The project is developing and implementing demand management capability for SWER networks, by examining prototype technologies with the potential to reduce network costs through minimising SWER network augmentation.

3.7.2 Nature and Scope

The scope for the project has 3 key areas:

- SWER BESS:
  - BESS systems enabled specifically to provide benefit to both the SWER customer and the network enabling customer or DNSP owned RE and demand management
- Isolated transformer balancing:
  - Device for the SWER isolation transformer connection point to balance upstream issues from SWER network loads
- Customer side devices:
  - Enablement of customer generation and load management / control to the benefit of the customer without being to the detriment of the network

3.7.3 Aims and Expectations

The Western Grid – Laboratory Testing Project Scope has two aims:

- Trial some developing and early offering products that are available to assist in SWER capacity and power quality enhancement;
- 2. Engage with industry in the development of products that meet the growing needs of Energy Queensland to seek alternatives for SWER customers in both on-grid and off-grid scenarios.

The desired outcomes are:

- Ability to improve SWER capacity
- Ability to improve customer power quality
- Ability to be utilised in SWER environments

3.7.4 The process by which it was selected, including its business case and consideration of any alternatives

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3.7.5 how it was/is to be implemented (i.e. general project update)

Testing of the first prototype in the laboratory has been completed. Testing of the second prototype is underway with preparations underway for the following devices.

3.7.6 any identifiable benefits that have arisen from it, including any off peak or peak demand reductions

The trial is still in the early testing phase but has shown capability that has potential for products to go into the field and assist in SWER network demand management and renewable energy management.