Energex Demand Management Innovation Allowance Report AER Submission 2017/18

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Introduction

Purpose and Compliance

Energex is pleased to present the Demand Management Innovation Allowance (DMIA) Report for the 2017-18 regulatory year. The purpose of this report is to allow the Australian Energy Regulator (AER) to:

- assess Energex's 2017-18 DMIA initiatives and Energex's entitlement to recover the expenditure under the AER's Demand Management Incentive Scheme (DMIS)1
- confirm Energex'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 to **Error! Reference source not found.**), 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.

Figure 1: DMIA reporting requirementsSchedule 1: Item 6 – Demand Management Incentive Allowance

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

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

a) 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.

Submission summary

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

Energex's 2017-18 DMIA program comprised four projects. The total cost incurred for the DMIA initiatives during 2017-18 was $1,123,434. Table 1 summarises Energex's DMIA program expenditure recovery for the 2017-18 regulatory year.

Table 1: Energex DMIA program 2017-18

Projects	Number	Expenditure
Closed	1	$0
Continuing	3	$1,123,434
Total	**4**	**$1,123,434**

Energex seeks the AER's approval to recover the costs for the full amount of DMIA spent in the 2017-18 regulatory year.

For the 2017-18 DMIA program, all nominated DMIA projects were subject to a screening and feasibility processes, consistent with the AER's DMIS. All projects underwent a formal DMIA assessment process in Energex.

- The business case for the projects were reviewed against the DMIA criteria by both Demand Management and Regulatory Departments.
- The projects were deemed to meet the DMIA criteria and costs confirmed to be not in any way recoverable from another source.
- The business cases were presented to the Energex Investment Review Committee which endorsed the projects for DMIA funding.

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

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1.0 Energex DMIA Program

Energex 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 towards providing a more efficient solution to network augmentation. The DMIA initiatives have enabled Energex to investigate and test innovative approaches to a range of network issues, customer behaviours, renewable integration and tariff enablement.

Selection Process

All nominated DMIA projects were subject to a screening and feasibility processes, consistent with the AER's DMIS. All projectsunderwent a formal DMIA assessment process in Energex.

- The business case for the projects were reviewed against the DMIA criteria by both Demand Management and Regulatory Departments.
- The projects were deemed to meet the DMIA criteria and costs confirmed to be not in any way recoverable from another source.
- The business cases were presented to the Energex Investment Review Committee which endorsed the projects for DMIA funding.

DMIA Projects 2017-18

The DMIA Program for 2017-18 is comprised of four projects endorsed by the Energex Investment Review Committee (IRC) and Executive General Manager, Asset Safety and Performance for DMIA funding:

- Battery Energy Storage Systems (BESS) Pilot
- Real Time Tariff Study
- Low Voltage Network Power System Static-State Estimation
- Solar Enablement Initiative

DMIA program expenditure

Energex's DMIA total expenditure for 2017-18 was $1,123,434. The costs incurred on the DMIA program for the year included operating ($483,446) and capital ($639,987) expenditure. Table 2 summarises the actual expenditure for the 2017-18 Energex DMIA program, along with the total approved budget costs

Energex seeks the AER's approval to recover the costs for the full amount detailed in the 2017-18 expenditure columns of **Error! Reference source not found.**. These costs are all Energex's contribution to the projects and are over and above any external funding received from industry or government grants.

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Table 2 Energex DMIA program expenditure 2017-18

Project	Budget ($)		2017-18 expenditure ($)		Comment
	Total Project budget	Energex project budget	Capital	Operating	
Battery energy storage system pilot	**2,722,700**	**2,722,700**	**639,987**	**381,816**	**continuing**
Real time tariff study	**449,553**	**449,553**	**0**	**0**	**closed**
Low Voltage Network Power System Static-State Estimation	**75,000**	**75,000**	**0**	**33,079**	**continuing**
Solar enablement initiative	**562,178**	**562,178**	**0**	**68,551**	**continuing**
Total	**3,809,431**	**3,809,431**	**639,987**	**483,446**	

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.

2.0 Project delivery progress 2017-18

An explanation of each demand management project for which approval is sought, demonstrating compliance with the Schedule 1: Item 6 – Demand Management Incentive Allowance, is detailed below:

2.1 Battery Energy Storage System (BESS) Pilot

2.1.1 DMIA Criteria

The BESS Pilot complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme. The BESS project focuses on an emerging technology that is anticipated to be taken up by customers at an increasing rate over the coming years. It is imperative that Energex gain early insights into how customers will take up BESS, how Energex can provide a direct demand load control value proposition, how the systems will be integrated into the network and what changes need to be made to the network to accommodate the technology.

2.1.2 Nature and Scope

Both awareness and intention to purchase Battery Energy Storage Systems (BESS) has increased significantly across Queensland with uptake likely to grow over the next five years. To better understand the impact of BESS on the network and how BESS can enable a higher penetration of solar PV, Energex is conducting BESS trials over four years. The data obtained from these trials will assist in developing systems to manage new technologies, including battery systems, and provide cost-effective outcomes for Queenslanders.

The trials are being conducted in two parts:

1. A targeted Market Based Battery Trial in cooperation with BESS manufacturers who are selling BESS to customers in South East Queensland. The Market Based Battery Trial is being run in two stages: currently with 15 staff sites and secondly with customers in selected areas of the network. The trial is focussing on the coordination of demand response capable BESS that are compliant with AS/NZS 4755.3.5. The trial will investigate the value to the network from coordinated and standardised BESS demand response, particularly during peak demand and peak export periods.
2. The Demonstrations Project will investigate options for integrating BESS into the network including opportunities to deliver advanced control. The key work packages (WP) are:

- WP1 – Residential BESS Pilot – Three residential single phase BESS at EsiTrain, Rocklea
- WP2 - Integration of BESS control with the Demand Management System (DMS) PowerOn
- WP3 - Small Commercial Customer Pilot – One three phase BESS at an Energex site
- WP4 - Large Commercial Customer Pilot – One large BESS at Eagle Farm Distribution Centre (DC)

2.1.3 Aims and Expectations

The aim of the project is to gain a better understanding on the customer value proposition and expectations from the electricity network in taking up BESS; how Energex can leverage off the existing load control system with direct load control and tariffs to benefit both Energex and the customer and investigate how the BESS technology will integrate with the electricity network.

2.1.5 Update summary

Targeted Market Based Battery Trial

The Energex Battery Trials Preliminary Findings Report was released on 1 November 2017 and is available on the battery trials page the Energex website. The report presented results from the Energex residential battery trials and formed the basis of engagement with key stakeholders on areas for further investigation. The feedback obtained is being used to scope the next phase of the Market Based Battery Trial.

Demonstrations Project

WP1 – Residential BESS Pilot

The three BESS installed at Rocklea continue to be used for educational purposes and testing of load control capabilities and general operation. Numerous demonstrations were given to industry stakeholders and staff throughout the year. This project is now complete.

WP2 - Integration of BESS control with the Demand Management System (DMS)

The Energex Battery Trials Preliminary Findings Report also included findings from the Residential BESS Pilot project, which focussed on how Energex's Distribution Management System could communicate with third party BESS applications. Feedback was sought from key stakeholders on coordinated and standardised demand response. The findings are feedback are being used to inform Energex's approach to a Distributed Energy Resource Management System and Advance Distribution Management System. This project is now complete.

WP3 - Small Commercial Customer Pilot

The project was scoped and this work package will not be progressing.

WP4 - Large Commercial Customer Pilot

The commercial BESS and solar PV located at the Energex Eagle Farm Distribution Centre has been constructed and is in the process of final commissioning to enable key project objectives to be tested.

2.1.7 Project Benefits

The findings of the pilots has assisted Energex in developing systems to manage new technologies, such as BESS, to provide cost-effective outcomes for Queenslanders. The trial has supported Energex to work towards a connected network of the future, to help facilitate customer choice whilst leveraging technology and data, so that Energex can continue to provide a reliable, safe and secure electricity supply.

2.2 Real Time Tariff Study

2.2.1 DMIA Criteria

The Real Time Tariff Study complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme as the project ultimately seeks to reduce network peak demand through customer response to demand based tariffs. The long term benefits through implementation of a demand and complimentary load control tariffs will provide savings for Energex through deferment of peak growth driven augmentation and improvement of network utilisation.

2.2.2 Nature and Scope

In response to the broader change in the electricity market, Energex prepared a comprehensive tariff reform program. The new electricity tariffs were introduced on 1 July 2016 and are a demand based, time of use structure which will enable emerging technologies such as battery storage to connect to the electricity network. These new electricity tariffs are:

- a primary tariff: NTC7000 – Residential Demand, and
- a secondary tariff: NTC7300 – Smart Control.

The complimentary secondary Smart Control tariff is designed to suit appliances on traditional Economy tariffs (e.g. electric storage hot water and pools pumps) and AS/NZS 4755 compliant appliances (e.g. PeakSmart air-conditioning units).

The Real Time Tariff Study's scope is to research the impact of the new demand tariff and complimentary Smart Control tariff on small, low voltage customers. This research will be conducted through partnerships with retailers, customer representatives, market participants and the Queensland government.

2.2.3 Aims and Expectations

The study aims to:

- examine customers comfort around and awareness of the new tariffs,
- understand which educational and promotional materials are successful in attracting and retaining customers on the new tariffs,
- understand which educational and promotional materials are successful in eliciting customer response to the new tariffs,
- monitor the cost, availability and delivery channels of the technologies and services that enable customer response,
- quantify the magnitude of customer response,
- observe and influence the market response and offerings that arise from the tariff offerings, and
- identify barriers to tariff adoption and assess and implement mitigation strategies.
- inform future communication strategies

2.2.5 Update Summary

Project findings have been incorporated into tariff reform work underway as part of the 2020-25 Tariff Structure Statement. This project is now closed .

2.2.7 Project Benefits

The project provided greater understanding on how to communicate with customers about demand, in order to enable demand tariff adoption. In particular, the project identified the communication channels best suited for this kind of education, which varies depending on the customer cohort

2.3 Low Voltage Network Power System Static-State Estimation

2.3.1 DMIA Criteria

The Low Voltage Network Power System Static-State Estimation complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme as the 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.

2.3.2 Nature and Scope

The proposed project is to develop, implement and test an innovative state estimation algorithm for monitoring low voltage electricity distribution networks. This algorithm will form the basis for coordinating demand and Distributed Generation with respect to operational limits of local network segments. A ‘static state estimator’ can provide a basis for an autonomous low-voltage network management and monitoring system. This project is a joint project between Energex, Ergon and The University of Queensland (UQ) for a period of three years.

2.3.3 Aims and Expectations

The objectives of the project are to support the University of Queensland to:

- Develop a Static State Estimation algorithm that can be applied to low voltage networks
- Provide timely control inputs to a number of low voltage connected devices to improve the efficiency of the network
- Provide trial networks for field trials of a prototype application
- Improve the dispatch of Distributed Energy Resource
- Improve the demand management response
- Minimise future network investment.

2.3.5 Summary update

The approach for UQ delivering this initiative is to:

- Nominate one LV network to serve as a trial and demonstration platform. A suitable trial network has been selected within Energex's network. A Single Wire Earth Return (SWER) feeder in the Ergon Energy Network is also planned for testing.
- Generate model of nominated LV network and establish network simulation capabilities. Completed.
- Identify network parts most likely at risk of operational issues and identify suitable measurement scheme for monitoring these sections. Completed.
- Install three additional measurement devices at strategic points on the selected LV network. Completed. Real-time measurement data is available to the estimator within the network's Operational Environment.
- Run State Estimation to identify best location and required size of state influencing equipment and install it. The estimator is running successfully using real-time and static data inputs. Installation of control equipment is in progress.
- Start closed loop control and record performance.
- Apply the State Estimation algorithm as part of a desktop study on additional network areas of interest.

This project will continue in the 2018-19 year.

2.3.7 Project Benefits

The project outcomes will help Energex to better manage the distribution network, including the optimisation of Distributed Energy Resources (including solar PV, demand side management, energy storage, and electric vehicles) and network loading during critical events.

2.4 Solar Enablement Initiative

2.4.1 DMIA Criteria

The Solar Enablement Initiative complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme as the improved data and information that can be achieved by application of an estimator on the Medium Voltage (MV) network level can be used to improve the benefits of demand management and coordination of Distributed Generation across the medium voltage network.

2.4.2 Nature and Scope

The proposed project is to further develop, implement and test an innovative state estimation algorithm for monitoring medium voltage electricity distribution networks by running a trial on seven feeders across three distribution network service providers. The aim is to provide an improved understanding of electricity network behaviour to maximise the capacity of new solar PV installations and their export into the Australian grid, thereby enabling an increase in the percentage of renewable energy connected to the grid.This two year project is run by University of Queensland (UQ) in partnership with nine stakeholders including Energex.

2.4.3 Aims and Expectations

The objectives of the project are to support the University of Queensland to:

- Further develop the Static State Estimation algorithm to be applied to the medium voltage networks
- Provide trial networks, including monitoring devices, for field trials of a prototype application
- Improve the PV connection assessment process and associated PV connection costs through the development of a network assessment tool
- Improve the dispatch of Distributed Energy Resource
- Improve the demand management response
- Minimise future network investment.

2.4.5 Project Implementation

The approach for UQ delivering this initiative is to:

- Nominate seven MV feeders across the three project partners' networks to serve as a trial and demonstration platform. The seven trial feeders have been selected including three feeders in Energex's network, two in TasNetworks and two in United Energy. A fourth Energex feeder has been included to support real-time application of the estimator on the MV network.
- Generate models of nominated MV feeders and establish network simulation capabilities. One feeder in each of the partner networks has been successfully modelled.
- Install suitable additional measurement devices on the trial feeders where required.

- Re-design LV State Estimation algorithm for MV network operation. Completed.
- Develop a semi-automated network analysis tool based on the State Estimation Algorithm to be used to improve the existing PV connection assessment process
- Perform desktop analysis of scope and costs to deploy State Estimation algorithm and Network Assessment Tool on entire MV network in each project partner network
- Perform a real-time demonstration using State Estimation to support the application of dynamic PV export limits for customer owned systems.

This project will continue in the 2018-19 year.

2.4.7 Project Benefits

The project outcomes will help Energex to better manage the distribution network, including the optimisation of Distributed Energy Resources with particular emphasis on maximising PV connection and export to the grid.