Energex 2016-17 DMIA RIN Report - Demand Management

AER Submission 2016/17

Energex Limited

31 August 2017

positive energy

Version Control

Version	Date	Description
1.0	10/08/2017	Initial

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DMIA Annual Report Requirements

This report has been prepared to address the Australian Energy Regulator's (AER) requirements as described below:

Schedule 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.

1.0 DMIA Program 2016-17

The DMIA Program for 2016-17 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

2.0 Initiated DMIA Projects 2016-17

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 with customers in selected areas of the network. The trial is focussing on the coordination of demand response capable

BESS that is 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 as well as investigate how the BESS technology will integrate with the electricity network.

2.1.4 Selection Process

The project underwent a formal DMIA assessment process in Energex.

- The business case for the project was reviewed against the DMIA criteria by both Demand Management and Regulatory Departments.
- The project was deemed to meet the DMIA criteria and costs confirmed to be not in any way recoverable from another source.
- The business case was presented to the Energex Investment Review Committee which endorsed the project for DMIA funding on 7 September 2015.

2.1.5 Project Implementation

Energex has entered into an agreement with a third party to own and operate the BESS (Market Based Trial and WP4 only) to ensure this project is compliant with section 1(b) of the Final Determination Electricity Distribution Ring-Fencing Guidelines.

The project implementation is progressing with two demonstration sites; one at Rocklea with three BESS installed; Tesla with Reposit and SolarEdge, Sunverge and Redback Technologies and a Tesla Commercial BESS (488kWh) and Solar PV (150kW) installed at Eagle Farm. Next stages will be to progress to a trial phase with testing of load control capabilities and general operation.

The Market Based Trial now has 15 lithium-ion BESS with six different brands installed at customers' homes across South East Queensland. Functional tests of demand response of each of the BESS has been undertaken. The next stage is consultation on the preliminary results and to begin scoping the second stage of the trial.

2.1.6 Project Costs

The cost of the project for 2016/17 was $352,634. The majority of these costs are operational fees of the third party that own the 15 BESS. These operational fees include staff costs for overseeing the installation of the BESS and managing issues post installation.

2.1.7 Project Benefits

It is anticipated that the findings of the pilots will assist Energex in developing systems to manage new technologies, including battery systems, and provide cost-effective outcomes for Queenslanders. The trial supports 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.
- identify barriers to tariff adoption and assess and implement mitigation strategies.
- inform future communication strategies.

2.2.4 Selection Process

The project underwent a formal DMIA assessment process in Energex.

- The business case for the project was reviewed against the DMIA criteria by both Demand Management and Regulatory Departments.
- The project was deemed to meet the DMIA criteria and costs were confirmed not to be in any way recoverable from another source.
- The business case was presented to the Energex Investment Review Committee which endorsed the project for DMIA funding on 2 November 2015.

2.2.5 Project Implementation

The project is initially targeting customers for tariff adoption and survey completion. These customers will be from a broad cross section of Energex's customer base, and include a limited number of Energex employees.

Customers who agree to participate in the study will be provided with a digital meter through a competitive metering provider, as negotiated with their retailer. Their retailer will then arrange for the adoption of a demand based primary tariff, and optionally, the Smart Control tariff. Customers are then billed on a monthly basis and paid incentives to complete surveys after their first, third and sixth bills.

Energex entered into a consortium partnership with CitySmart. This partnership assisted Energex in progressing tariff reform implementation activities by identifying the communication channels most suitable for different cohorts of customers. Modern communication channels, along with specifically tailored messages about demand and other tariff concepts and best practices for

exchange of information with customers for demand tariff adoption. Energex contributed the cost of customer segmentation, and accessed the research findings of the entire consortium.

Energex intends on extending its customer research into demand based tariffs through the 2017/18 year, with focus on approaches to enhance customer understanding of demand concepts, and how demand response options can be communicated in simple terms.

2.2.6 Project Costs

The cost of the project to date (2016/17) is $85,623. The majority of these costs were for the market research and marketing costs. The labour costs associated with all existing Energex staff who have provided input into the project have been absorbed into business-as-usual.

2.2.7 Project Benefits

The project is helping networks, retailers and customer representatives in understanding how to communicate with customers about demand, in order to enable demand tariff adoption. In particular, the project is identifying the communication channels best suited for this kind of education, which varies depending on the customer cohort. The study also contributes valuable insight about customer respond to demand signals that are delivered through electricity tariffs.

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 Energy 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.

2.3.4 Selection Process

The project underwent a formal DMIA assessment process in Energex.

- The business case for the project was reviewed against the DMIA criteria by both Demand Management and Regulatory Departments.
- The project was deemed to meet the DMIA criteria and costs were confirmed to be not in any way recoverable from another source.
- The business case was presented to the Energex Investment Review Committee which endorsed the project for DMIA funding on 6 December 2013 however was later deferred to the 2015-2020 regulatory period due to UQ not receiving project funding through the Australian Research Council.(subsequent application approved July 2015).

2.3.5 Project Implementation

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.
- Generate model of nominated LV network and establish network simulation capabilities.
- Identify network parts most likely at risk of operational issues and identify suitable measurement scheme for monitoring these sections.
- Install three additional measurement devices at strategic points on the selected LV network.
- Run State Estimation to identify best location and required size of state influencing equipment and install it.
- Start closed loop control and record performance.
- Apply the State Estimation algorithm as part of a desktop study on additional network areas of interest.

2.3.6 Project Costs

The cost of the project to date (2016/17) is $1,659 which is for internal labour costs and the Energex general overhead.

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.

2.4.4 Selection Process

The project underwent a formal DMIA assessment process in Energex.

- The project was reviewed against the DMIA criteria by the Demand Management Department and endorsed by the Asset Safety and Performance Executive General Manager for DMIA funding on 21 March 2017.

- The project was deemed to meet the DMIA criteria and costs were confirmed to be not in any way recoverable from another source.

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.
- Generate models of nominated MV feeders and establish network simulation capabilities.
- Install suitable additional measurement devices on the trial feeders where required.
- Re-design LV State Estimation algorithm for MV network operation.
- 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 of State Estimation on an LV feeder utilising inverter measurement data to test heirachical state estimation with MV and LV combined.

2.4.6 Project Costs

The cost of the project to date (2016/17) is $296 which is for project start up workshop costs and the Energex general overhead.

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.

3.0 Completed DMIA Projects 2015-16

3.1 Small Business Customer Load Profile Market Segmentation Project

3.1.1 DMIA Criteria

The Small Business Customer Load Profile Market Segmentation Project complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme because the project contributes to a larger tariff reform project that ultimately seeks to reduce network peak demand through customer response to demand based

tariffs. Information about load profiles that vary by customer segments assists in targeting those customers who have the greatest potential for demand reduction. This in turn improves the ability of the network to deliver demand reduction programs.

3.1.2 Nature and Scope

Energex was developing a demand tariff to be implemented by 2016/2017 and the project aimed to inform the development of the demand tariff and Network Pricing Strategy. The data was only available at a network element level and knowledge of the impacts of a demand tariff on different small business customer segments and load profiles was limited. Energex engaged an external service provider to formulate small business customer load profiles, collated into identified low voltage (LV) customer market segments.

3.1.3 Aims and Expectations

The project engaged an external service provider to conduct research and analysis utilising existing Energex customer data and research to build a business case which identifies the best solution/s for addressing the following:

- Provide customer load profiling energy consumption at a low, medium and high scenario collated into identified small business low voltage customer segments based on industry type.
- Identify the customer segments which are currently having the most impact on peak demand
- The proposed solution was designed to enable analysis to be undertaken to determine the impact a demand tariff will have on the network and on network peak demand by individual load profile, network area and market segmentation level.
- Provide sufficient customer profiling at an individual level and market segmentation level which provides a statistically valid sample that is representative of the Energex network area in South East Queensland.

3.1.4 Selection Process

The project underwent a formal DMIA assessment process in Energex.

- The business case for the project was reviewed against the DMIA criteria by both Demand Management and Regulatory Departments.
- The project was deemed to meet the DMIA criteria and costs confirmed to be not in any way recoverable from another source.
- The business case was presented to the Energex Investment Review Committee which endorsed the project for DMIA funding on 3rd August 2015.

3.1.5 Project Implementation

The proposed DMIA initiative was a two stage project:

1. The first stage was a study to scope and build a business case and recommended data acquisition and analysis approach before proceeding to stage two.
2. The second stage was the implementation of a data gathering exercise and formulation of detailed customer load profiles and modelling of demand impacts.

3.1.6 Project Costs

The cost of the completed project for AER approval was $250,833 including external contractor costs, meter probe data costs and the Energex general overhead. The labour costs associated with all existing Energex staff who from time to time have provided input into the project have been absorbed into business-as-usual.

3.1.7 Project Benefits

The long term benefit of the project was to inform the Network Pricing Strategy and the future demand tariff. Implementation of a demand tariff will provide savings for Energex through deferment of peak demand growth driven augmentation and improvement of network utilisation. The project identifies which industries are best placed to contribute to demand reductions and enables targeted implementation of demand tariffs.

4 Costs

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.

5 Total Expenditure 2016-2017

The total expenditure for the financial year 2016- 2017 regulatory period is $440,212 as indicated in the table below:

Name of project	Total amount of the DMIA spent in 2016-17		
	Operating expenditure	Capital expenditure	Total
	$0's, nominal		
Projects in 2016/17 (Not yet completed)			
Battery Energy Storage System Pilot	316,572	36,062	352,634
Real Time Tariff Study Project	85,623		85,623
LV System Static-State Estimation Project	1,659		1,659
Solar Enablement Initiative	296		296
Total	**404,150**	**36,062**	**440,212**
Completed Project in 2015/16			
Small Business Customer Load Profile Project	250,833		**250,833**