Decision

Approval of Demand Management Innovation Allowance (DMIA) expenditures by distributors in 2017–18 and 2018

- **QLD, ACT, NSW, SA and Tasmania** in 2017–18 Financial Year
- **Victoria** in 2018 Calendar Year

September 2019

AUSTRALIAN ENERGY REGULATOR

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Shortened forms

Shortened form	Extended form
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARC	Australian Research Council
ARENA	Australian Renewable Energy Agency
augex	augmentation expenditure
capex	capital expenditure
CVR	conservation voltage reduction
DER	distributed energy resource
DM	demand management
DMIA	demand management innovation allowance
DMIS	demand management incentive scheme
DNSP	distribution network service provider
DUoS	distribution use of system
LV	low voltage
MW	megawatt
NEL	national electricity law
NEM	national electricity market
NEO	national electricity objective
NER	national electricity rules
NNA	non-network alternatives
NSP	network service provider
opex	operating expenditure
QUT	Queensland University of Technology
SWER	single wire earth return

1. Summary

The Demand Management Innovation Allowance (DMIA) aims to provide incentives for Distribution Network Service Providers (DNSPs) to conduct research and investigation into innovative techniques for managing demand. It also aims to enhance industry knowledge of practical demand management projects and programs through the publication of annual project summary and expenditure reports. The DMIA is a part of the previous Demand Management Incentive Scheme (DMIS), which has been applied to all DNSPs in the national electricity market (NEM) as part of the distribution determinations we made before June 2019.

This report presents our assessment and findings of DNSPs' annual expenditure claims under the previous scheme. All 13 electricity distributors provided DMIA reports to us as part of their 2017–18 and 2018 responses to our regulatory information notice (RIN).[1] The DNSPs sought approval of expenditure totalling approximately $6.1 million for 38 projects. The AER has assessed that the projects have met the DMIA expenditure criteria and have therefore approved the expenditure for all the projects.

DMIA is provided to each DNSP in the form of a fixed allowance for each regulatory period. We review and approve DNSPs' actual DMIA expenditures on demand management improvement projects each year. We will reject any DMIA expenditures that do not meet the requirements of the DMIA scheme.

If a DNSP has not spent its total DMIA allowance amount in the regulatory period, it will be required to return the underspent amount to customers in the form of a tariff reduction in the ensuing regulatory period. However, any overspent amount would be borne by the DNSP.

DNSPs are required to report their DMIA expenditures and activities to us each regulatory year. We approve or reject DNSPs' claims based on our assessment against the six criteria listed in section 3 of this paper. While descriptive, the criteria enable a wide range of demand management project options.

A new Demand Management Innovation Allowance Mechanism (DMIAM) was established in December 2017 to replace the current DMIA in the forthcoming regulatory control periods of all DNSPs. Details of the new DMIAM and DMIS are available from our web site at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/demand-management-incentive-scheme-and-innovation-allowance-mechanism.

The DMIA expenditures covered by this decision relate to the previous schemes that apply to all DNSPs, rather than under the new DMIAM scheme. They were part of the previous DMIS schemes that were published:

- in April 2009 (updated in November 2014) for Victorian DNSPs
- in October and November 2008 for the non-Victorian DNSPs.

[1] Victorian DNSPs reported on their 2018 financial year and non-Victorian DNSPs on their 2017–18 financial year.

How distributors used the DMIA

Distributors had different approaches for utilising the DMIA funding.

DNSPs stated that some of the projects were successful and that the projects would be implemented within its network. Examples of such projects were:

- Ergon Energy's Internet of Things (IoT) Load Control Project—this project validated the ability of the IoT to send control signals to devices across a wide area under varying installation circumstances. Ergon Energy stated that it will use the findings to develop long term investment in IoT infrastructure for its use in managing network risks.

- TasNetwork's Battery Storage on Bruny Island Project—the project delivered a demonstrable impact on peak demand on Bruny Island and demonstrated that demand response was a solution to network constraints. TasNetwork reported that it was looking for other areas on its network where it may apply the project learnings.

DNSPs also reported that some projects did not result in benefits such that the project would not be carried forward in practice. Examples of such projects were:

- Ausgrid's Cool Saver Maitland Program—While user satisfaction and retention was high for those customer took part in the trial, transaction costs and low take-up rates resulted in poor cost effectiveness as an alternate to other network and non-network solutions.

- SAPN's Residential Energy Storage Project—early financial analysis indicates this would not be cost effective unless the system was significantly subsidised or additional returns were available.

Figure 1 compares our total allowance with actual expenditure by distributors for their respective current regulatory periods.[2] Summaries of each DNSP's DMIA expenditures are shown in the tables 1- 4 below covering each of their respective regulatory periods, by jurisdiction.

The expenditure of the distributors, compared to their DMIA allowances, varied widely. This is set out in the tables below and illustrated in

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- SAPN's Residential Energy Storage Project—early financial analysis indicates this would not be cost effective unless the system was significantly subsidised or additional returns were available.

[2] We have approved all the DMIA expenditure claimed by the DNSPs, as the expenditures comply with the DMIA criteria.

Figure 1. While the allowance is for the whole of the regulatory period, the expenditure column gives expenditure to date in the relevant period. Therefore, the comparison is affected by the point in time—for example, first year versus the last year of a five-year period—where the DNSP is in its regulatory period, which differs between DNSPs.

Most distributors are three or four years into their five-year regulatory control period. Of the 13 distributors reviewed, TasNetworks, AusNet Services and SA Power Networks have claimed above their total DMIA allowance. Any overspend is met by the business from its existing budget or other external funding, rather than from the customers.

Overall, however, NSW/ACT distributors by their fourth year have spent an average of 52 per cent of their allowances, Queensland distributors by their third year have spent an average of 33 per cent of their allowances, SAPN by its third year spent more than 100 per cent of its allowance, and Victorian distributors by their third year spent an average of 53 per cent of their allowances.

CitiPower and Powercor have significantly underspent their allowance to date, spending only 3 per cent and 21 per cent respectively.

Further, the majority of these projects (72 per cent of expenditure in 2017–18 and 2018) were approved in previous years and are continuing into the current period, while 28 per cent of expenditure relates to new projects.

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- TasNetwork's Battery Storage on Bruny Island Project—the project delivered a demonstrable impact on peak demand on Bruny Island and demonstrated that demand response was a solution to network constraints. TasNetwork reported that it was looking for other areas on its network where it may apply the project learnings.

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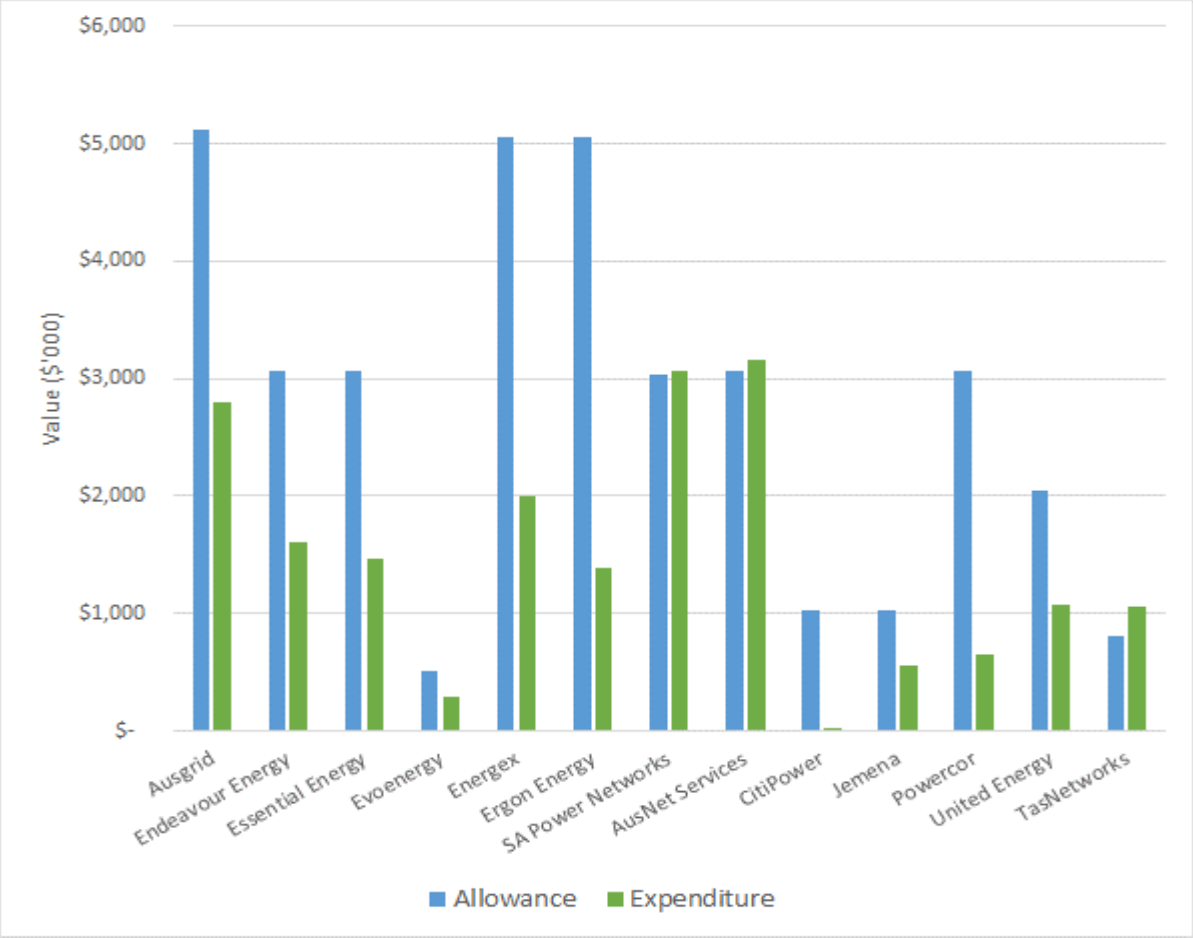
- SAPN's Residential Energy Storage Project—early financial analysis indicates this would not be cost effective unless the system was significantly subsidised or additional returns were available.

Figure 1 DMIA – comparison of regulatory period allowance vs expenditure to date



Source: AER analysis and DMIA reports submitted by DNSPs

Table 1 ACT and NSW DNSPs DMIA expenditure for the 2014–15 to 2018–19 regulatory control period ($'000, nominal)

DNSP	DMIA approved 2014–15	DMIA approved 2015–16	DMIA approved 2016-17	DMIA approved 2017-18	Total DMIA allowance for period	Total DMIA approved	DMIA remaining for period	Percent of DMIA spent
Ausgrid	1,363	600	373	456	5,113	2,792	2,321	55%
Endeavour Energy	379	31	319	877	3,068	1,606	1,462	52%
Essential Energy	503	267	301	393	3,068	1,464	1,604	48%
Evoenergy (formerly ActewAGL)	73	38	56	116	511	282	229	55%
TOTAL	**2,317**	**935**	**1,049**	**1,842**	**11,760**	**6,143**	**5,616**	**52%**

Source: AER analysis and DMIA reports submitted by DNSPs. Numbers may not add up due to rounding.

Table 1 QLD and SA DNSPs DMIA expenditures for the 2015–16 to 2019–20 regulatory control period ($'000, nominal)

DNSP	DMIA approved 2015–16	DMIA approved 2016-17	DMIA approved 2017-18	Total DMIA allowance for period	Total DMIA approved	DMIA remaining for period	Percent of DMIA spent
Energex	427	440	1,123	5,059	1,991	3,068	39%
Ergon Energy	338	795	262	5,059	1,394	3,665	28%
SA Power Networks	1,956	1,120	-13	3,036	3,063	-27	101%
TOTAL	**2,721**	**2,355**	**1,372**	**13,154**	**6,448**	**6,706**	**49%**

Source: AER analysis and DMIA reports submitted by DNSPs. Numbers may not add up due to rounding.

Table 2 TasNetworks DMIA expenditures for the 2017–18 to 2018–19 regulatory control period ($'000, nominal)

DNSP	DMIA approved for 2017-	Total DMIA allowanc	Total DMIA approved	DMIA remaining for period	Percent of DMIA spent
TasNetworks	1,059	808	1,059	-252	131%
TOTAL	**1,059**	**808**	**1,059**	**-252**	**131%**

Source: AER analysis and DMIA reports submitted by TasNetworks.

Table 3 VIC DNSPs DMIA expenditures for the 2016–2020 regulatory control period ($'000, nominal)

DNSP	DMIA approved for 2016	DMIA approved for 2017	DMIA approved for 2018	Total DMIA allowance for period	Total DMIA approved	DMIA remaining for period	Percent of DMIA spent
AusNet Services	1,499	861	794	3,064	3,154	-90	103%
CitiPower	-	28	-	1,021	28	993	3%
Jemena	111	200	239	1,021	550	471	54%
Powercor	-	28	624	3,064	652	2,411	21%
United Energy	505	350	211	2,042	1,066	976	52%
TOTAL	**2,115**	**1,468**	**1,868**	**10,212**	**5,451**	**4,762**	**53%**

Source: AER analysis and DMIA reports submitted by DNSPs. Numbers may not add up due to rounding.

Carryover adjustments under this report

To ensure that DNSPs appropriately utilise the DMIA funding, there is an overall expenditure true-up process in the second year of the next regulatory control period. A single adjustment will be made to return the amount of any underspent or unapproved DMIA amounts to customers. This ensures that the scheme remains neutral in terms of the expenditure profile which the DNSP adopts during the regulatory control period.

In 2018 no carryover adjustment amounts were required to be calculated for the DMIA expenditure determination.

DNSPs' DMIA expenditures by activity types

Figure 2 summarises the expenditure by types of projects provided under the DMIA. The projects undertaken vary considerably in both their nature and scale.

A large proportion of expenditure was related to projects exploring battery storage for commercial and residential demand response. Thirty per cent of all DMIA expenditure was for residential storage projects and 7.6 per cent for grid storage projects. Examples of projects include:

- Battery Energy Storage System Pilot – Energex (commercial BESS and solar PV located at the Energex Eagle Farm Distribution Centre)
- Bruny Island Customer Battery Trial – TasNetworks (aggregation of customer batteries to overcome network constraints)
- Residential Energy Storage Trial – Endeavour Energy (aggregation of residential batteries to reduce peak demand, improve power quality, defer/avoid capital investment)
- Grid Connected Battery Energy Storage System – Endeavour Energy (BESS at West Dapto Zone Station for peak shaving, reliability support, quality of supply improvement).

Other projects were directed towards air conditioning load control, including:

- Energy Partner (Demand response program) – Powercor.

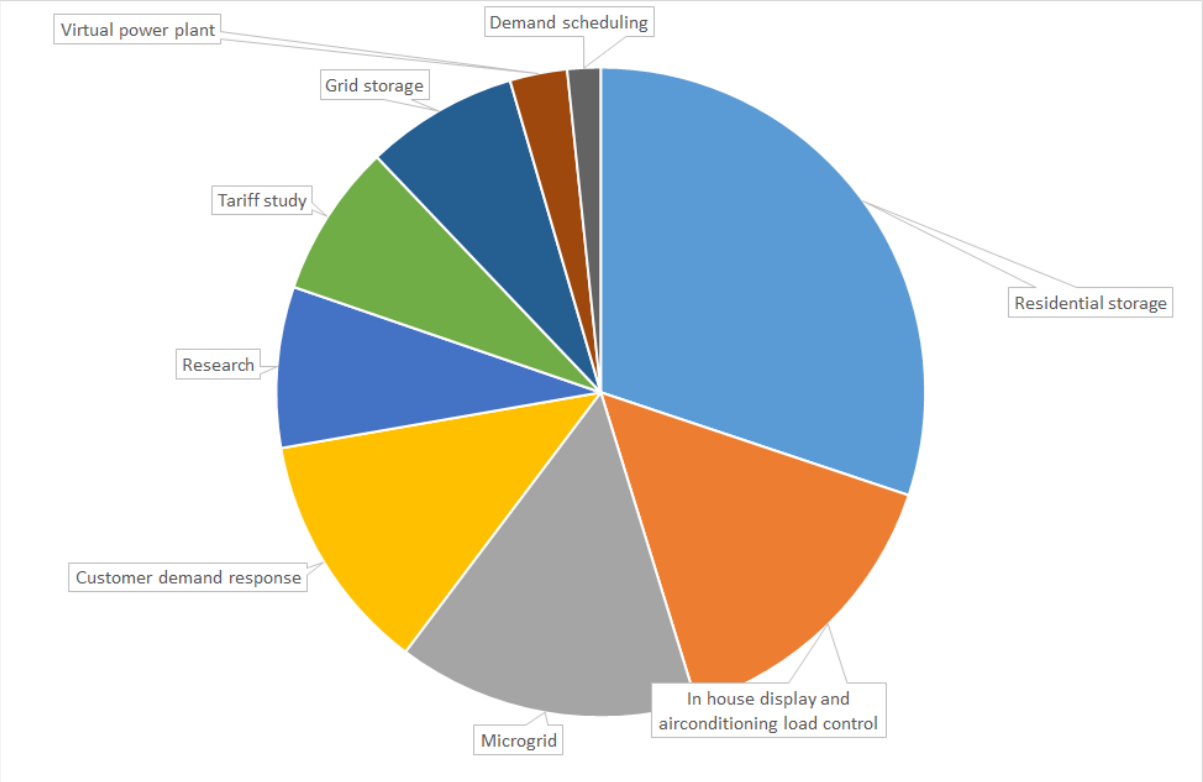
A large, ongoing project is exploring the use of new tariff designs to determine customers' response for demand response purposes:

- emPOWERing You Trial (Tariff Trial Project) – TasNetworks.

Other projects included:

- various trials of technologies with the potential to reduce and/or shift demand through equipment/device control
- studies to explore the use of energy trading and distributed energy platforms for demand management.

Figure 2 DMIA expenditure by project type, 2017–18 and 2018



Source: AER analysis and DMIA reports submitted by DNSPs

Table 4 DMIA expenditure by project type, 2017–18 and 2018

Project type	Expenditure ($ nominal)
Residential storage	1,850,313
In house display and air conditioning load control	927,777
Microgrid	923,852
Customer demand response	735,563
Research	491,466
Tariff study	468,457
Grid storage	466,716
Virtual power plant	175,659
Demand scheduling	101,630
TOTAL	6,141,433

Note: numbers may not add up due to rounding.

Structure of this report

The remainder of this report is structured as follows:

Chapter 2 provides background information on the DMIS and DMIA.

Chapter 3 provides the criteria contained in the DMIS, against which we are required to assess the service providers' claims for the DMIA each year.

Chapter 4 summarises the results of our compliance assessment of service providers' DMIA reports and supporting information.

Chapters 5 to 17 provide our detailed assessment of service providers' DMIA expenditure claims against the criteria contained in the DMIS.

2. Background

The Demand Management Innovation Allowance (DMIA) aims to provide incentives for Distribution Network Service Providers (DNSPs) to conduct research and investigation into innovative techniques for managing demand. It also aims to enhance industry knowledge of practical demand management projects and programs through the publication of annual project summary and expenditure reports. The DMIA is a part of the previous Demand Management Incentive Scheme (DMIS), which has been applied to all DNSPs in the national electricity market (NEM) as part of our current distribution determinations.

A key objective of the DMIA is to assist in enhancing industry knowledge of practical demand management projects through the annual publication of DMIA activity reports from DNSPs. As such, we set out annual reporting requirements for DNSPs for the regulatory control period. DNSPs are required to submit a report to the AER on their DMIA expenditure shortly after the end of each regulatory year, providing details of the initiatives they have introduced. We use the information provided in a DNSP's annual DMIA report in our assessment of a DNSP's compliance with the DMIA criteria and entitlement to recover expenditure under the DMIA. The DNSP's report also provides information to stakeholders more broadly on the nature of the DMIA projects that may ultimately be progressed to more mature investments. The information may also facilitate the participation of non-network providers for those projects that go beyond the research or testing phase.

A new and much improved Demand Management Innovation Allowance Mechanism (DMIAM) was established in December 2017 to replace the DMIA for regulatory control periods commencing after 30 June 2019. We also undertook a review of the DMIS and made significant enhancement to the scheme. Details of the new DMIAM and DMIS are available from our web site at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/demand-management-incentive-scheme-and-innovation-allowance-mechanism.

The DMIA schemes for the current regulatory control periods were published:

- in April 2009 (updated in November 2014) for Victorian DNSPs
- in October and November 2008 for the non-Victorian DNSPs.

This report relates to the operation of the existing DMIA scheme only.

To ensure that DNSPs appropriately utilise the DMIA funding, there is an overall expenditure true-up process in the second year of the next regulatory control period. After the results for the five years of the current regulatory control period are known, a single adjustment will be made to return the amount of any underspent or unapproved DMIA amounts to customers. This ensures that the scheme remains neutral in terms of the expenditure profile which the DNSP adopts during the regulatory control period.

3. Demand Management Incentive Scheme criteria

Each year we are required to assess claims for the DMIA against the criteria contained in the DMIS. The DMIA criteria are:

Criteria #1: Demand management projects or programs are measures undertaken by a DNSP to meet customer demand by shifting or reducing demand for standard control services through non-network alternatives, or the management of demand in some other way rather than increasing supply through network augmentation.

Criteria #2: Demand management projects or programs may be:

a. broad-based demand management projects or programs — which aim to reduce demand for standard control services across a DNSP's network, rather than at a specific point in the network. These may be projects targeted at particular network users, such as residential or commercial customers, and may include energy efficiency programs; and/or

b. peak demand management projects or programs — which aim to address specific network constraints by reducing demand on the network at the location and time of the constraint.

Criteria #3: Demand management projects or programs may be innovative, and designed to build demand management capability and capacity and explore potentially efficient demand management mechanisms including, but not limited to, new or original concepts.

Criteria #4: Recoverable projects and programs may be tariff or non-tariff based.

Criteria #5: Costs recovered under this scheme:

a. must not be recoverable under any other jurisdictional incentive scheme

b. must not be recoverable under any other state or Australian Government scheme

c. must not be included in forecast capital or operating expenditure approved in the distribution determination for the regulatory control period under which the scheme applies, or under any other incentive scheme in that determination.

Criteria #6: Expenditure under the DMIA can be in the nature of capex or opex.

4. DMIA assessment

4.1. Annual DMIA assessment

We conducted our DMIA compliance assessments based on the DMIA reports from the following DNSPs:

For the 2017–18 financial year:

- Ausgrid (year 4 of the regulatory period)
- Endeavour Energy (year 4 of the regulatory period)
- Energex (year 3 of the regulatory period)
- Ergon Energy (year 3 of the regulatory period)
- Essential Energy (year 4 of the regulatory period))
- Evoenergy (formerly ActewAGL) (year 4 of the regulatory period)
- SA Power Networks (year 3 of the regulatory period)
- TasNetworks (year 1 of the regulatory period).

For the 2018 calendar year:

- AusNet Services (year 3 of the regulatory period)
- CitiPower (year 3 of the regulatory period)
- Jemena (year 3 of the regulatory period)
- Powercor (year 3 of the regulatory period)
- United Energy (year 3 of the regulatory period).

Distributors had different approaches for utilising the DMIA funding. Summaries of each DNSP's DMIA expenditures are shown in the tables 6-8 below covering each of their respective regulatory periods, by jurisdiction.

While the allowance is for the whole of the regulatory period, the expenditure column gives expenditure to date in the relevant period. Therefore, the comparison is affected by the point in time—for example, first year versus the last year of a five-year period—where the DNSP is in its regulatory period, which differs between DNSPs.

Of the 13 distributors reviewed, TasNetworks, AusNet Services and SA Power Networks have claimed above their total DMIA allowance. CitiPower and Powercor have significantly underspend their allowance to date, spending only 3 per cent and 21 per cent respectively.

The NSW/ACT distributors by their fourth year have spent an average of 52 per cent of their allowances, Queensland distributors by their third year have spent an average of 33 per cent of their allowances, SAPN by its third year more than 100 per cent of its allowance, and Victorian distributors by their third year an average of 53 per cent of their allowances.

Table 5 ACT and NSW DNSPs DMIA expenditure for the 2014–15 to 2018–19 regulatory control period ($'000, nominal)

DNSP	DMIA approved 2014–15	DMIA approved 2015–16	DMIA approved 2016-17	DMIA approved 2017-18	Total DMIA allowance for period	Total DMIA approved	DMIA remaining for period	Percent of DMIA spent
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TOTAL	**2,317**	**935**	**1,049**	**1,842**	**11,760**	**6,143**	**5,616**	**52%**

Source: AER analysis and DMIA reports submitted by DNSPs. Numbers may not add up due to rounding.

Table 6 QLD and SA DNSPs DMIA expenditures for the 2015–16 to 2019–20 regulatory control period ($'000, nominal)

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TOTAL	**2,721**	**2,355**	**1,372**	**13,154**	**6,448**	**6,706**	**49%**

Source: AER analysis and DMIA reports submitted by DNSPs. Numbers may not add up due to rounding.

Table 7 TasNetworks DMIA expenditures for the 2017–18 to 2018–19 regulatory control period ($'000, nominal)

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TasNetworks	1,059	808	1,059	-252	131%
TOTAL	**1,059**	**808**	**1,059**	**-252**	**131%**

Source: AER analysis and DMIA reports submitted by TasNetworks.

Table 8 VIC DNSPs DMIA expenditures for the 2016–2020 regulatory control period ($'000, nominal)

DNSP	DMIA approved for 2016	DMIA approved for 2017	DMIA approved for 2018	Total DMIA allowance for period	Total DMIA approved	DMIA remaining for period	Percent of DMIA spent
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Source: AER analysis and DMIA reports submitted by DNSPs. Numbers may not add up due to rounding.

4.2. Carryover adjustment

4.2.1. Background

Under the DMIA scheme, distribution network businesses are given an allowance for demand management projects. The allowance forms part of their regulated revenue requirement for a regulatory control period.

The distribution network businesses do not have to spend the allowance they are given and may decide to only spend some, or none, of it. Factoring this in, the DMIA scheme provides that the AER must calculate a carryover adjustment. The purpose of the carryover adjustment is to return to customers the proportion of an electricity network distributor's DMIA allowance that has not been spent. It also returns to customers any expenditure incurred by an electricity network distributor, but not approved by the AER. In that regard, the carryover adjustment is a "true–up" between an electricity network distributor's ex ante DMIA allowance for a regulatory control period and the AER's ex post review of any under–expenditure, with the difference returned to customers.

Additionally, the carryover adjustment must be calculated in a way that distribution network businesses will be indifferent in net present value (NPV) terms to its DMIA expenditure profile over the regulatory control period. The purpose of this is to 'remove any incentive for distribution network businesses to defer or advance expenditure'.[3]

The carryover adjustment operates between regulatory periods.

4.2.2. Calculation of carryover adjustment

When calculating the carryover adjustment to be applied to the distributors revenues in their current regulatory control periods, we are required to use the formula set out in the DMIA scheme.

This formula calculates the carryover adjustment on a cumulative basis. That is, any under– or over–expenditure in one year is rolled over to the following year. It also includes a weighted average cost of capital (WACC) adjustment. By making this WACC adjustment, a

[3] AER, *Demand management incentive scheme for the ACT and NSW 2009 distribution determinations: Demand management innovation allowance scheme*, November 2008, p. 17.

distributor is indifferent in NPV terms to when it spends its DMIA allowance over a regulatory control period. The DMIA scheme carryover formula states:

$$C_t = C_{t-1} - \left[\frac{(R_t - A_t)}{(1+i)} \times (1+i)^n (1+i^*)^2\right]$$

Where:

C_t = cumulative carryover balance

R_t = ex–ante revenue allowance under the scheme for regulatory year "t"

A_t = ex–post expenditure approved under the scheme for the regulatory year "t"

i = nominal vanilla WACC as set in the distribution determination for the regulatory control period the expenditure is incurred

n = the number of years remaining in the regulatory control period in which the expenditure is incurred

i^* = nominal vanilla WACC as set in the distribution determination for the regulatory control period in which the carryover adjustment is made.

5. Ausgrid 2017–18

We approve DMIA expenditure of $455,826 in 2017–18 for five projects because these meet the DMIA criteria. These projects consist of one new project and four ongoing projects. The following section sets out our assessment of the individual projects. Detailed information about these projects is available in Ausgrid's 2017–18 DMIA report which is published separately on our website.

New Project

5.1. Battery Demand Response

5.1.1. Project overview

Ausgrid is proposing to investigate the use of residential solar battery systems for network support services. In particular Ausgrid will test whether customer battery systems offer a technically and commercially viable demand management option, test customer take-up of a network support offer, and test the integration of the battery management platform within Ausgrid's Advanced Distribution Management System.

The project consists of three phases:

- Phase 1 – Battery customer market research

This phase will involve collation and analysis of information of battery systems connected to Ausgrid's network and an exploration of possible offers and contractual arrangements with market providers such as battery suppliers, aggregators and energy service providers. Finally, Ausgrid will propose formal arrangements with one or more market providers to provide network support services.

- Phase 2 – Customer trial over 2 to 3 summer seasons

Under Phase 2 there will be customer battery system dispatch and further development of aggregator partnerships.

- Phase 3 – Distributed Energy Resource integration with the Advanced Distributed Management System (ADMS)—This phase will involve integration of network support dispatch and constraint management into the DER platform of Ausgrid's Advanced Distributed Management System (ADMS).

Ausgrid claimed DMIA expenditure of $66,871 for this project in 2017–18. Research to date found that over the 2016-17 and 2017-18 summer period for a sample of 6 customers the installation of a battery system lead to a 66 per cent or 2,796 kWh reduction in kWh imports and a 17 per cent or 1.36 kW decline in the 2-8pm kW demand.

5.1.2. Assessment against DMIA criteria

Criteria #1 This project is investigating the potential for network support contracts for demand management with customers with battery storage systems. It is also testing the integration of the battery management platform within Ausgrid's Advanced Distribution Management System.

Criteria #2 This is a broad-based demand management project which aims to reduce demand for standard control services across a DNSP's network, rather than at a specific point in the network. It is targeted at residential and commercial customers with battery storage systems.

Criteria #3 This project is designed to build demand management capability and capacity via the execution of contract arrangements between battery storage system owners and market providers, which will in turn provide network support to Ausgrid.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

Continuing Projects

5.2. Demand Management for Replacement Needs

5.2.1. Project overview

This project aims to test the viability of using non-network options to defer or manage the load at risk associated with network investments that involve retiring or replacing aged assets. The project proposes to leverage the capability of market participants, including electricity retailers, solar installers, energy efficiency providers and other key market participants.

The project consists of two independent project components to be conducted by market providers:

Part A – An incentives program to encourage permanent demand reductions (e.g. additional solar power systems and energy efficiency activity) in a defined geographical area(s).
Part B – Feasibility studies into the use of traditional demand response solutions for a network equipment failure scenario which can result in unserved customer demand (supply outage).

Ausgrid claimed DMIA expenditure of $264,883 for this project in 2017–18. Activities undertaken in 2017-18 were engagement with the market, development of the commercial arrangements required for the project and negotiation with co-funding partners (one of which is the City of Sydney) for the Part A incentives program.

5.2.2. Assessment against DMIA criteria

Criteria #1 Around 80 per cent of Ausgrid's capital investment expenditure over the next five to 10 years is related to the retirement or replacement of aged assets and this will be an important project in building demand management capability for this type of application.

Criteria #2 This is a peak demand management project that aims to address specific network constraints by reducing demand on the network at the location and time of the constraint.

Criteria #3 Using non-network solutions to manage risk from replacement driven investments differs markedly from typical overload risk and requires an innovative approach to build a portfolio of permanent and temporary load reductions across the daily profile.

Criteria #4 The project is non-tariff based**.**

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

5.3. Cool Saver Maitland Program

5.3.1. Project overview

This project sought to investigate an alternative approach to Ausgrid's Cool Saver trial program. It aims to leverage the initial purchase and installation of new AS4755-compliant air conditioners to lower the cost of customer acquisition and participation, whilst simplifying the process for customers.

This project was completed in 2017–18.

The Cool Saver Maitland project was an extension of Ausgrid's air conditioner load control trials which were developed to explore the potentially cost-effective method of controlling residential air conditioners using AS4755 compliant devices. Earlier phases of the trials confirmed the viability and reliability of the technology, verified the average demand reduction and identified high levels of customer satisfaction with the approach. The CoolSaver project activities in Maitland sought to explore a potentially lower cost customer acquisition model. This model involved partnering with appliance retailers and air conditioner installers to target new and existing installations.

A key finding from this phase was the difficulty in driving customer uptake for a local area through third party sales channels while adequately managing the risk and providing a least cost solution. It appears that the amount of money such a program can provide to third party facilitators (i.e. retailers and installers) is not sufficient for them to divert from their business as usual activities.

Similar to earlier phases of the CoolSaver trial, Ausgrid found that customers generally chose not to override Ausgrid's remotely initiated reduction command to decrease air conditioning power.[4] Ausgrid also found that those customers took part in the trial only reported a slight difference in cooling comfort during these periods and a high degree of satisfaction with the program.

Ausgrid claimed DMIA expenditure of $5,926 for this project in 2017–18. This was for finalising incentive payments to participants and decommissioning demand response equipment.

5.3.2. Assessment against DMIA criteria

[4] Ausgrid utilised the power saving mode on customer air conditioners, which limits electrical input power to 50% or 75% of rated capacity.

Criteria #1 The project explored whether a previously trialled low-cost method for obtaining residential customer/air conditioner participation is effective in a limited metropolitan area.

Criteria #2 This is a peak demand management project.

Criteria #3 This project satisfies this condition as it explores the market potential for a low-cost demand management mechanism which uses technology known to be effective.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

5.4. DMIA Stakeholder Engagement

5.4.1. Project overview

This project involved formal consultation with demand management (DM) stakeholders to identify new and innovative DM solutions for potential Ausgrid DMIA projects.

While informal discussions with electricity networks, key DM providers and stakeholders have provided important input into Ausgrid's DMIA program to date, there has been no formal engagement with DM stakeholders on the DMIA. To canvas the views of a broad range of stakeholders, Ausgrid proposed to engage with them through a formal consultation process.

Ausgrid claimed DMIA expenditure of $9,737 for this project in 2017–18. This project concluded in 2017-18. Ausgrid submitted that the project delivered identifiable benefits in terms of understanding what engagement techniques might be best for future and to help define the focus areas for DMIA projects for the 2019-24 regulatory period.

5.4.2. Assessment against DMIA criteria

Criteria #1 The project aims, through formal consultation with DM stakeholders, to discover new and innovative DM solutions which might form potential cost effective demand management solutions for deferral of network investment.

Criteria #2 This is a peak demand management project.

Criteria #3 This project satisfies this condition as it builds demand management capability.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

5.5. Solar and Battery Customer Research

5.5.1. Project overview

This project involved approaching a large sample (10,000 to 20,000) of Ausgrid customers to participate in a survey about solar and battery systems to understand the purchasing motivations and potential future uptake of solar and battery systems. Both residential and non-residential customers were invited to participate in the survey as well as existing solar and non-solar customers.

Ausgrid claimed DMIA expenditure of $108,408 for this project in 2017–18. This project was concluded in 2017-18. The main activity in 2017-18 was undertaking a Computer Aided Telephone Interview (CATI) and online survey of Ausgrid's solar and non-solar business customers. The survey focussed on large solar (>30kW) and non-solar customers (>160MWh pa). The survey findings related to customers investment in energy efficiency, characteristics of business' solar systems (cost, payback period, financing method, motivation for investment), satisfaction with solar system installer and interaction with Ausgrid.

The residential survey (Phase 1a) canvassed responses to: the motivations for purchasing solar; the solar installation experience; solar system performance and benefits gained; future intentions to purchase a battery; battery respondent profile and ownership; the motivations for purchasing batteries; battery system performance and benefits; and demand management for batteries.

The commercial survey (Phase 1b) canvassed responses to: business' energy use and energy efficiency; the experiences of and motivations for installing solar; investment in battery storage; intentions to invest in solar; customer views on Ausgrid' power outages and the solar connection process.

A further survey (Phase 2) targeting battery customers' attitudes towards a range of different demand management programs was carried out. Ausgrid found that:

- residential and SME customers strongly supported opt-in demand management programs (being voluntary, providing generous financial incentives, and providing a level of personal choice and behavioural control to customers.
- opt-in programs to modify behaviour at peak times and reduce network congestion were the most appealing of all demand management schemes.
- SME customers were less likely to participate in solar schemes due to barriers including leasing of business premises, not having adequate roof space and concerns about the uncertainty of future government solar policies.
- appliance replacement rebate programs were appealing but there was a lower likelihood of participation due partly to the initial capital outlay involved in replacing appliances.
- SME customers preference was for energy efficiency rather than solar programs primarily due to their more immediate benefits and perceived simplicity.

Outcomes from the residential and business surveys and battery focus groups have been used to inform the development and implementation of Ausgrid's Battery demand response and Demand management for replacement needs innovation trials.

5.5.2. Assessment against DMIA criteria

Criteria #1 The project investigates customer interest in and likely take up of battery systems. Installation of battery systems may help reduce summer peak demand, and hence the need for network augmentation.

Criteria #2 This is a peak demand management project that aims to address specific network constraints by reducing demand on the network at the location and time of the constraint.

Criteria #3 This project satisfies this condition as it explores the potential take-up of a technology that may be used as a demand management mechanism.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

6. AusNet Services 2018

AusNet Services is claiming DMIA expenditure for three demand management projects totalling $794,402 for 2018. We approve this expenditure as the projects meet the DMIA criteria. The following section sets out our assessment of the individual projects. For more detailed information about these projects, including any identifiable benefits derived from the projects, please refer to AusNet Services' 2018 DMIA report published separately on AER's website.

New Project

6.1. Peak Partners - Voluntary Residential Peak Demand Management

6.1.1. Project Overview

The project, which commenced in the summer of 2017-18, is a residential demand response (DR) project, targeting a 22kV distribution feeder in the urban growth corridor around Clyde North. It is a small scale, proof of concept project for different types of demand response:

- Behavioural response to a Critical Peak Rebate incentive, with AMI data portal (delayed data);
- Behavioural response to a Critical Peak Rebate incentive, with real-time data portal;
- Air conditioning load control (marketed as 'Autopilot) via Demand Response Enabling Device; and
- Supply Capacity Control (marketed as 'Essential Power') via the AMI smart meter.

In 2017-18 AusNet Services proposed three offers (Critical Peak Rebate offer, Air conditioning load control, and Supply Capacity Control) to customers on the CLN23 feeder that includes parts of the suburbs of Berwick, Clyde North and Narre Warren South. AusNet Services reported that the project was successful in proving both a strong level of customer demand response during events (40% reduction) and an overall positive customer experience (96% willing or very willing to recommend to friends and neighbours).

AusNet Services claimed DMIA expenditure in 2018 of $201,734 for this project. Further DMIA costs are expected in 2019. AusNet Services plans to continue technology innovation trials, further develop customer engagement capability, and identify a suitable network location and application in which to test the technique at scale.

6.1.2. Assessment against DMIA criteria

Criteria #1 Peak demand on AusNet Services network is driven primarily by residential customers, and in particular, residential summer air-conditioning. The residential demand management program is designed to reduce the network peak demand, thereby reducing the level of energy at risk on the network and/or defer network augmentation, reducing the network costs ultimately borne by customers, and, improving network reliability and quality of supply for customers.

Criteria #2 This is a peak demand management program.

Criteria #3 The project seeks to prove the concept of residential demand response in a live environment and real world conditions, and gain insights into the effectiveness and acceptability of a range of approaches (behavioural response and appliance load control), and price sensitivity of customer load to feed into considerations.

Criteria #4 The project is non-tariff based.

Criteria #5 This criteria is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of capex.

Continuing Projects

6.2. Mooroolbark Community Mini Grid Trial

6.2.1. Project Overview

The project encompasses the design, build and operation of an "18-house mini grid" in Mooroolbark that will be monitored and controlled by a cloud-based mini grid control system that can implement Distribution System Operator (DSO) control functions and algorithms. The project aims to:

- understand the full value potential of concentrated and controllable distributed energy resources (DER) in providing demand management and network support, as well as the techniques to achieve this
- develop strategies to manage an increasing level of customer-driven DER
- learn how to facilitate community driven energy initiatives such as renewable energy projects and micro grids in a way that is not only efficient, but is beneficial to the network.

The project will also test the performance of DER systems in providing backup supply to individual customers in case of network outage, and also the ability for the mini-grid as a whole to operate as an island (grid-separated mode) for short periods of time, with sharing of power between customers in order to maintain system stability and longevity.

In 2018 the Mooroolbark Community Minigrid trial progressed into Stage 2 that aims to focus on voltage control. The battery equipment for all the residential trialists were removed and decommissioned. Designs were explored for a new powerline communication (PLC) for the solar systems. The stabiliser functionality was upgraded to enhance its capability to better manage voltage on the network.

AusNet Services claimed DMIA expenditure in 2018 of $365,126 for this project. Further DMIA costs are expected in 2019 to finalise the project. The final phase will involve completing operational function development and trials, data analysis and reporting.

6.2.2. Assessment against DMIA criteria

Criteria #1 Coordinated distributed energy resources will reduce network peak demand, reduce energy at risk, potentially defer asset augmentation, and increase supply reliability by providing islanded supply to customers during outages.

Criteria #2 This is a peak demand management program.

Criteria #3 The trial project will test the technical viability of the mini-grid to demonstrate these benefits, test the customer appetite and acceptance, and evaluate the economic viability of different structures of mini-grids and community energy projects. The lessons from the project will ultimately help build AusNet Services' toolkit for delivery of non-network and demand-side solutions. However, if the services provided were unregulated at commercial scale, AusNet Services would need to provide these whilst complying with ring-fencing requirements.

Criteria #4 The project is non-tariff based.

Criteria #5 This criteria is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of capex.

6.3. Grid Energy Storage System (GESS) Trial

6.3.1. Project Overview

In 2012, AusNet Services initiated a Grid-scale Energy Storage System (GESS) project to trial the use of a large battery storage system to defer asset augmentation by managing peak demand and explore other benefits of storage systems to network management. The GESS will shift demand on a particular feeder from peak to off-peak times by discharging during feeder peaks and re-charging overnight when the feeder demand is low. In practice, the GESS is suited to addressing a specific network constraint and is containerised to allow portability to different locations as required.

During 2018 the GESS operation continued. The potential relocation of the GESS was also being developed. AusNet reports that confidence has been gained within the business regarding system operability and reliability. The project to relocate the facility has been initiated within the 'business as usual' environment and is now serving to embed the learning from the innovation trial into the network engineering and field engineering functions of the business.

AusNet Services claimed DMIA expenditure of $ 227,541 for this project in 2018, and stated that there will be further DMIA costs in 2019 for this project. Further costs are for completing system performance enhancements and potentially relocating the facility to an area of network need that can benefit AusNet Service's customers.

6.3.2. Assessment against DMIA criteria

Criteria #1 Using large-scale storage connected at grid-level enables AusNet Services to defer asset augmentation, reduce the risk of asset overloads, improve power quality and mitigate the risk of customer outages.

Criteria #2 This is a peak demand management program.

Criteria #3 The trial will provide AusNet Services practical experience to better understand and assess the level of network value of grid-scale energy storage. Further, this trial will help

to establish whether battery storage is a credible non-network solution to managing demand and to set the parameters around when it can be economically deployed for the benefit of energy consumers.

Criteria #4 The project is non-tariff based.

Criteria #5 This criteria is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

7. CitiPower 2018

CitiPower did not report any DMIA project nor claim an innovation allowance in 2018.

8. Endeavour Energy 2017–18

We approve DMIA expenditure of $877,449 for three projects in 2017-18 because it meets the DMIA criteria. The following section sets out our assessment of the project. For more detailed information about the project, please refer to Endeavour Energy's 2017-18 DMIA report which is published separately on the AER's website.

New Projects

8.1. Air Conditioner Control Trial using 3G Demand Response Enabling Device (DRED)

8.1.1. Project overview

This project will quantify the network demand reduction potential from controlling air conditioners using 3G Demand Response Enabling Device (DRED) technology and testing the performance of the DRED and the reliability of using 3G mobile communications in performing demand response functions. The project will also assess the willingness of customers to accept some level of external control of their air conditioner compared to previous trials and the possibility of implementing this technology as a cost effective broad-based program.

Parklea, Penrith 11kV and Kingswood Zone Substations were identified as target areas for the project. It is forecast that these zone substations will approach capacity limitations in the next two to five years.

The trial commenced on 1 September 2017 and will run for two summer periods. The Air Conditioning Trial using 3G DRED has an estimated cost of $700,000 for 2017-18 to 2018-19 to be funded under DMIA.

The post trial survey (May 2019) found a very strong overall satisfaction amongst the program participants with a rating of 8.1 (out of 10) and 94% of respondents stated their expectations had been met or exceeded. This was due to the lack of effect on cooling, money savings, reduction of energy consumption and clear communication.

Participants primarily signed up to the program to reduce or manage their energy consumption and costs, and to obtain an incentive while doing so. The positive effects to the household and community were great motivators and they considered it a no loss situation.

One of the recommended improvements from the survey was a CoolSaver app that could track progress (energy consumption and money savings) and provide push notifications for event days. Endeavour Energy submits that this will improve participant engagement, but also positively influence future energy consumption behaviour.

Endeavour Energy claimed $298,092 DMIA expenditure for this project in 2017–18.The expenditure covered the costs for the supply and installation of DREDs, DRMS enhancements, project management, marketing and customer engagement and customer incentives.

8.1.2. Assessment against DMIA criteria

Criteria #1 This project aims to quantify the reduction in network demand that is achievable by controlling air conditioners using 3G DRED technology in residential premises. It will also assess the willingness of customers to allow external control of their air conditioner.

Criteria #2 This project is a peak demand management project.

Criteria #3 This trial aims to understand energy storage technology and how Endeavour Energy can utilise it to understand peak demand reduction, power quality issues, and deferral of capital expenditure.

Criteria #4 The project is non-tariff based.

Criteria #5 This criteria is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex and capex.

8.2. Grid Connected Battery Energy Storage System

8.2.1. Project overview

This project is to test grid connected storage to explore the benefits of battery storage for peak shaving, reliability support, quality of supply improvement, and better understand the operational impacts of their application to the Endeavour Energy network.

West Dapto zone substation (ZS), planned for construction in 2022, has been identified as a suitable location for the pilot. Pending successful testing of the Battery Energy Storage System's peak lopping capability, the solution will remain onsite to alleviate demand growth in the West Lakes Illawarra development area and assist to defer West Dapto ZS construction.

The DMIA funded component of the Grid Connected Battery Energy Storage System trial has an estimated cost of $300,000 for 2017-18 to 2018-19. This is the cost for the engineering development and testing associated with deploying this new technology on the network. It is planned that the BESS will be onsite at West Dapto, connected and commissioned in time for Summer 2018-2019. The testing of the BESS functions will be completed by the end of the 2018/2019 financial year. An evaluation report will be completed by September 2019.

Endeavour Energy reported that the key learnings of the trial to date include:

- the integration of the battery system (inverter, batteries, transformer, protection) components into a functioning battery system capable of connection at high voltage is a significant task.
- existing internal and external standards are not designed with grid sized battery systems and requirements that are appropriate for household systems are less appropriate at grid scale

- protection and safety systems being implemented require considerable expertise from both battery, inverter and utility backgrounds to achieve an outcome that allows for safe and reliable connection to the grid
- site establishment and configuration costs are also significant and can vary considerably from location to location.

Endeavour Energy claimed $114,816 DMIA expenditure for this project in 2017–18. This was for the costs for engineering development works associated with the project.

8.2.2. Assessment against DMIA criteria

Criteria #1 This project aims to report on the feasibility of deferring zone substation construction by installing a battery energy storage system.

Criteria #2 This project is a peak demand management project.

Criteria #3 This trial aims to pilot grid connected storage to explore the potential benefits including peak shaving, reliability support, quality of supply improvement, and better understand the operational impacts of their application to our network.

Criteria #4 The project is non-tariff based.

Criteria #5 This criteria is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of capex.

Continuing Project

8.3. Residential Battery Energy Storage Trial

8.3.1. Project overview

This project is focused on investigating how Endeavour Energy can use small scale battery storage technology at residential level to reduce peak demand, improve power quality and defer or avoid capital investment in terms of technical viability and financial attractiveness to both the customer and the company.

Parklea Zone Substation has been chosen for the trial as the area has an existing high penetration of PV systems with the potential to maximise the energy storage benefits for customers. The site is also identified as a future network constraint due to the increased growth from re-zoning and developments along the North Wet Rail corridor.

Endeavour Energy planned to offer a fixed subsidy of 75% on the purchase price of the supplied battery system (based on the long-term cost of the battery energy storage system) to serve as an incentive to those participating in the trial. Forty one customers with existing PV systems are to be recruited to the trial.

The trial commenced on 1 December 2016 and is planned to run for three summer periods. The DMIA funded component of the Residential Battery Energy Storage Trial has an estimated cost of $1,174,000 for 2016-17 to 2018-19.

Endeavour Energy claimed $464,551 DMIA expenditure for this project in 2017–18. This was for the costs for battery system supply, installation and commissioning, DRMS system enhancements, customer recruitment and project management.

On nine hot days over the 2017-18 summer, Endeavour Energy executed a ‘peak demand event’ day. On the event days the batteries charge using excess solar generation throughout the day and discharge to the grid at a predefined period in the evening, generally from 4 to 8pm at 2.5kW rated power output. Initial analysis of data indicate batteries discharge at the requested power output for the first 2.5 hours and then taper off. Different discharge periods, ambient temperature and output levels have not resulted in improved output. Consultation with equipment manufacturers and technology providers has established that the losses from the battery and inverter were the main contributors to the systems losses affecting the result. Flaws in the control system were also identified as a possible contributing factor.

8.3.2. Assessment against DMIA criteria

Criteria #1 This project aims to report on the network demand reduction that can be reliably achieved by installing battery energy storage systems in residential premises and validating the average demand reduction per customer.

Criteria #2 This project is a peak demand management project.

Criteria #3 This trial aims to understand energy storage technology and how Endeavour Energy can utilise it to understand peak demand reduction, power quality issues, and deferral of capital expenditure.

Criteria #4 The project is non-tariff based.

Criteria #5 This criteria is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

9. Energex 2017–18

Energex is claiming DMIA expenditure of $1,123,434 in 2017–18 for three demand management projects. We approve this expenditure as the projects meet the DMIA criteria. The following section sets out our assessment of the individual projects. For more information about these projects, please refer to Energex's 2017–18 DMIA report published separately on AER's website.

Continuing Projects

9.1. Battery Energy Storage Systems (BESS) Pilot

9.1.1. Project overview

This project involves Energex conducting BESS trials over four years to better understand the impact of BESS on the network and how BESS can enable a higher penetration of solar PV. 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 three BESS installed at Rocklea were used for educational purposes and testing of load control capabilities and general operation. 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.

Energex claimed DMIA expenditure in 2017–18 of $1,021,803 for this project, broken down into opex ($381,816) and capex ($639,987).

9.1.2. Assessment against DMIA criteria

Criteria #1 This project aims to gain a better understanding of 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 will investigate how the BESS technology will integrate with the electricity network, which could potentially be used for peak load management.

Criteria #2 This is a broad-based demand management program.

Criteria #3 By testing the capabilities and characteristics of BESS, Energex can investigate its demand management effectiveness that may help avoid network augmentation.

Criteria #4 The project is not tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex and capex.

9.2. Low Voltage Network Power System Static-State Estimation

9.2.1. Project overview

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.

During 2017-18 Energex selected a trial LV network and generated a model of the network and established network simulation capabilities. It identified areas most likely to experience operational issues and developed measurement schemes for these. Installation of state influencing equipment is occurring in response to the measurement information being received.

Energex claimed DMIA expenditure in 2017-18 of $33,079 for this project.

9.2.2. Assessment against DMIA criteria

Criteria #1 The project aims to produce improved data and information through the application of an estimator, which can then be used to improve the benefits of demand management and coordination of Distributed Generation across the low voltage network.

Criteria #2 This is a broad-based demand management program.

Criteria #3 This project aimed to improve and increase the adoption of the demand tariff, which may help in peak load management and so avoid network augmentation.

Criteria #4 The project is not tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.[5]

Criteria #6 Expenditure is in the nature of opex

9.3. Solar Enablement Initiative

9.3.1. Project overview

This project proposes to develop, implement and test an innovative state estimation algorithm for monitoring high 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 the University of Queensland (UQ) in partnership with nine stakeholders including Energex.

[5] Energex, *2016–17 DMIA RIN Report - Demand management*, 31 August 2017, p. 11.

Three feeders in Energex network were selected for the trial and measurement devices installed. An additional feeder was included to support real-time application of the estimator. One feeder on Energex network was modelled. A semi-automated network analysis tool based on the State Estimation Algorithm to be used to improve the existing PV connection assessment process was developed. Desktop analysis of scope and costs to deploy State Estimation algorithm and Network Assessment Tool was performed.

The Proof of Concept for state estimation on medium voltage (11kV/22kV) feeders has been achieved across the three DNSP project participants. The prototype semi-automated network analysis tool has been developed and is running in a web-accessible "Dashboard" and near real-time state estimation is running in TOTEM in readiness for a trial of dynamic PV export limits and subsequent constraint and operating envelope calculations.

The remaining six months of the project will be focussed on:

- Near real-time Dynamic PV Export Limit Trials
- Scalability
- Testing a section of Ergon Network
- Documentation
- Handover, and
- Planning for Stage 2.

Energex claimed DMIA expenditure in 2017-18 of $68,551 for this project.

9.3.2. Assessment against DMIA criteria

Criteria #1 This project aims to help Energex to better manage the distribution networks, including the optimisation of Distributed Energy Resources with particular emphasis on maximising PV connection and export to the grid.

Criteria #2 This is a broad-based demand management program.

Criteria #3 The objectives of the project include: improving the dispatch of Distributed Energy Resources, improving the demand management response, and minimising future network investment.

Criteria #4 The project is not tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.[6]

Criteria #6 Expenditure is in the nature of opex.

[6] Energex, *2016–17 DMIA RIN Report - Demand management*, 31 August 2017, p. 11.

10. Ergon Energy 2017–18

Ergon Energy is claiming $262,000 DMIA expenditure for six demand management projects for 2017–18.

We approve these expenditures as the projects meet the DMIA criteria. Four projects were continuing from 2016-17 and two are new projects. The following section sets out our assessment of the individual projects. For detailed information about these projects, please refer to Ergon Energy's 2017-18 DMIA report which is published separately on the AER's website.

New Projects

10.1. Lakeland Solar & Storage

10.1.1. Project overview

This project seeks to explore the use of large scale solar PV and battery storage to service fringe-of-grid networks, to demonstrate PV supporting modes to improve power quality and manage demand, and to demonstrate microgrid function on MV distribution networks. 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.

Lakeland Solar & Storage was connected and exporting full power in early 2018. An active harmonic filter was implemented to address some connection non-compliance issues. Battery testing is expected to start in Sep/Oct 2018, following pre-test simulations.

Ergon Energy claimed combined DMIA expenditure of $11,000 in 2017-18 for this project.

10.1.2. Assessment against DMIA criteria

Criteria #1 For a fringe area of the network, the project will seek to demonstrate large scale solar PV and battery storage solutions to improve power quality and manage demand.

Criteria #2 This is a broad-based demand management program.

Criteria #3 The project (1) provides technical assistance for the Lakeland Solar & Storage project, and (2) facilitates a battery test plan, to demonstrate additional network services through the combination of solar and battery, in fringe of grid areas.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

10.2. Internet Protocol Demand Response Enabling Device (IPDRED)

10.2.1. Project overview

This project aims to develop a functional specification for a third-party delivered, internet protocol demand response enabling device. This is to enable management of network and end-customer loads – directly, or indirectly - via a third party platform.

The IPDRED functional specification is to cover the areas of two-way communication, individual addressability and consumption data, whilst also supporting demand management delivery using AS4755.3 suite of standards.

The final stage will involve releasing the Functional Specification and undertaking a review of solution provider responses.

During 2017-18 a second draft of the functional specification has been produced and is under peer-review with Energy Queensland. The specification has incorporated both AS4755.1 and AS4755.2 standards to broaden its scope to include demand response systems rather than only demand response enabling devices.

Ergon Energy claimed DMIA expenditure of $11,000 in 2017–18 for this project.

10.2.2. Assessment against DMIA criteria

Criteria #1 The project consists of (1) drafting a document that directs third party demand management solution providers, (2) identifying suitable third party demand management solution providers to develop a strategy for movement away from a non-AFLC demand management environment, and (3) seeking feedback, and potentially proposals, from third party demand management solution providers to establish a program that promotes solutions for customers.

Criteria #2 This is a broad-based demand management program.

Criteria #3 This project will allow network and end-customer management of customer loads – directly, or indirectly via a third party platform.

Criteria #4 This project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

Continuing Projects

10.3. Centralised Energy Storage System (CESS)

10.3.1. Project overview

This project 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. The system will be tested, trialled and integrated in a controlled, generation

test environment in the workshops to develop functionality and verify its effectiveness and reliability.

Work on this project during 2017-18 has involved development of control algorithms, simulation models and engagement with the original manufacturer to help expand device functionality.

Ergon Energy claimed DMIA expenditure of $25,000 in 2017-18 for this project.

10.3.2. Assessment against DMIA criteria

Criteria #1 This project enables higher penetrations of customer-owned renewable generation and also develops micro-gridding functionality.

Criteria #2 This is a broad-based demand management program.

Criteria #3 This project enables higher penetrations of PV on the network using centralised energy storage.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

10.4. Internet of Things (IoT) Load Control

10.4.1. Project overview

This project aims to evaluate the suitability and applicability of a Low Power Wide Area Wireless Network, belonging to the family of IoT, to provide transport services for signalling (i.e. controlling) and reporting of consumers' demand response enabling devices (DRED). It also aims to develop an end-to-end solution and evaluate it in a proof of concept deployment.

Ergon Energy claimed DMIA expenditure of $15,000 in 2017-18 for this project. This project was completed in 2017-18.

Ergon Energy reports that the project has established an IoT network and installed IoT load control devices in a sample of homes in Townsville. It has validated the ability of the IoT to send control signals to devices across a wide area under varying installation circumstances. Ergon Energy states that it will use the findings to develop long term investment in IoT infrastructure for its use in managing network risks.

10.4.2. Assessment against DMIA criteria

Criteria #1 This project will explore the emerging IoT technologies and validate the cost, operational and technical benefits for managing consumer side devices for reducing peak demand.

Criteria #2 This is a broad-based demand management program.

Criteria #3 This project will explore the emerging IoT technologies and validate the cost, operational and technical benefits for managing consumer side devices for reducing peak demand, which may lead to deferring network augmentation.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

10.5. Grid Advocacy

10.5.1. Project overview

This project tests in a real world environment the customer impacts of cost reflective tariffs with the addition of emerging technologies such as Battery Energy Storage Systems (BESS), Home Energy Management Systems (HEMS) and Solar PV systems.

The project aims to enable learnings that set directions that will inform BESS connection requirements, determine additional BESS operational opportunities with respect to demand management and determine levels of customer engagement and support for such devices.

Commercially available BESS, HEMS and solar PV systems are used in the field trial.

Ergon Energy claimed DMIA expenditure of $156,000 in 2017-18 for this project.

The project has deployed and tested in a real world environment a combination of solar PV generation, energy storage, home energy management systems and cost reflective tariffs (seasonal time of use demand). Ergon Energy is carrying out final analysis and reporting.

10.5.2. Assessment against DMIA criteria

Criteria #1 Testing the customer impacts of cost-reflective tariffs when combined with energy storage and solar PV systems would lead to better understanding of demand management.

Criteria #2 This is a broad-based demand management program.

Criteria #3 Cost-reflective tariffs and demand side technology can reduce peak demand and network risks, and it is important to gain a better understanding of this. The uptake or not of cost-reflective tariffs can alter the forward network risk profiles and change the need and types for demand management.

Criteria #4 The program is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

10.6. Australian Research Council (ARC) Customer Response and Risk Management

10.6.1. Project overview

This project, a collaboration between the Australian Research Council (ARC) and the Queensland University of Technology (QUT), will research the customer response and risks associated with demand management, direct control of appliances and tariff signals.

This project will perform detailed research in Townsville, Northern Territory with existing customers to research the customers' tolerance to changes in utility service levels, enablement of the utility to directly control appliances in the home, the application of essential services circuits and the utilisation of efficient technologies in rental properties. This research will provide a platform for Ergon Energy's future development of demand management products and the integration of tariffs with technology.

Ergon Energy claimed its share of cost contribution to this project of $ 89,125 in 2017-18. This project was completed in 2017-18.

10.6.2. Assessment against DMIA criteria

Criteria #1 This project will research the customer response and risks associated with demand management via direct control of appliances and tariff signals.

Criteria #2 This is a broad-based demand management program.

Criteria #3 This project will research the customer response and risks associated with demand management via direct control of appliances and tariff signals, which may lead to future network demand management and the defer of network augmentation.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because funding via the DMIA is complementary to ARC funding for the project. The distributor is claiming its own cost hence complying with this criterion.[7]

Criteria #6 Expenditure is in the nature of opex.

[7] Ergon Energy, *Demand Management Innovation Allowance Report 2016–17*, 31 October 2017, p. 7.

11. Essential Energy 2017–18

Essential Energy is claiming 2017–18 DMIA expenditure of $392,702 for four demand management projects. We approve this expenditure as the projects meet the DMIA criteria. The following section sets out our assessment of the individual projects. For detailed information about these projects, please refer to Essential Energy's 2017-18 DMIA report published separately on the AER's website.

New Projects

11.1. Peer to Peer Review

11.1.1. Project overview

This project is to explore Essential Energy's role in peer to peer (P2P) trading and distributed energy markets. Consumer uptake of rooftop solar PV, along with other distributed energy technologies such as home batteries, electric vehicles and demand response creates an opportunity for facilitating technologies such as peer-to-peer (P2P) energy trading and distribution level markets (DLM).

A workshop was held with Essential Energy's key stakeholders to develop an understanding of:

- The potential for P2P markets to benefit Essential Energy and its customers
- The framework and operation of P2P markets, including:
    - current and future technical challenges, e.g. data, customer connectivity
    - innovative products from P2P markets that Essential Energy might seek to develop
- Options for Essential Energy to participate in P2P markets as both a DNSP and in other capacities
- Impacts on Essential Energy's business with varying levels of engagement in P2P markets, including consideration of risks, rewards, timing, regulation and technological advancement.

The workshop resulted in the development of a high-level Distribution Level Market road map specific to Essential Energy's network, a better understanding of where further work through potential pilots and trials may help refine the road map, and the expansion of Essential Energy's knowledge on new and emerging technologies and technology usage trends relating to Distribution Level Markets that have the potential to influence future network peak demand requirements.

Essential Energy claimed DMIA expenditure in 2017-18 of $34,451 for this project.

11.1.2. Assessment against DMIA criteria

Criteria #1 The project will assess the potential of peer to peer trading and distributed energy markets for Essential Energy and its customers.

Criteria #2 This is a broad-based demand management project.

Criteria #3 Undertaking the project will facilitate the development of a roadmap for Essential Energy's involvement in peer to peer trading and distributed energy markets.

Criteria #4 The project is not tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period..

Criteria #6 Expenditure is in the nature of opex.

11.2. E-Grid

11.2.1. Project overview

The purpose of this project it to investigate the reliability performance and cost/ benefit analysis of standalone power system technology as a lower cost option compared to traditional network solutions at the fringe of grid. The project involves a prototype test of a Stand-Alone Power System (SPS) at Bulahdelah on the NSW Mid North Coast. The system comprises a solar PV array, battery bank, inverters, and a back-up diesel generator.

Essential Energy claimed DMIA expenditure in 2017-18 of $236,948 for this project.

11.2.2. Assessment against DMIA criteria

Criteria #1 The project will assess a network scale islanding solution to provide non-grid connected energy solutions. This could support a reduction in network charges overall, while maintaining or improving the electricity experience for customers on the fringe of the grid.

Criteria #2 This is a broad-based demand management project.

Criteria #3 Undertaking the project will facilitate the development of a set of guidelines for future uptake to ensure such technology is optimally integrated and does not result in costly network expenditure. The project will also permit exploration of the possible value such technology can provide on a least cost basis to address network constraints and as an alternative to traditional form of electricity supply.

Criteria #4 The project is not tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

Continuing Projects

11.3. Networks Renewed

11.3.1. Project overview

Networks Renewed is a joint industry project by the Institute of Sustainable Futures, Reposit Power, Fronius and Ausnet Services, and the New South Wales and Victorian Governments.

Aimed at connecting over 1MW of customer and network-owned solar systems and battery storage systems, it is part-funded by the Australian Renewable Energy Agency (ARENA). As part of the project, a combination of solar and energy storage will be installed at around 200 households or equivalent businesses. Electricity generated in excess of premises needs will be stored and subsequently used to reduce peak demand on the network. Potentially up to half of the specified premises and installed capacity may be connected to Essential Energy's network across two locations.

Essential Energy obtained access to the Virtual Power Plant (VPP) in late August 2017. Since then, several VPP notch tests have been undertaken to gauge the effectiveness of systems installed. The first round of EOIs and subsidy claims were received for the Bellingen trial. Installations were completed in mid-2018. Notch test results from the Collombatti pilot stage virtual power plant have demonstrated a voltage improvement of 1.73 percent. Inverter installations were completed in Bellingen. Tests similar to those performed within Collombatti will be conducted during the second half of 2018. Recent notch test results from the Collombatti market stage virtual power plant have demonstrated a voltage improvement of 3.07 percent from 23 systems active within the virtual power plant.

Essential Energy claimed its share of cost contribution to this project of $107,548 in 2017-18.

11.3.2. Assessment against DMIA criteria

Criteria #1 The project will assess the potential of battery storage systems and advanced solar inverters with eligible customers in a two-year trial to help better manage demand for network capacity.

Criteria #2 This is a peak demand management project.

Criteria #3 Undertaking the project will facilitate the development of a set of guidelines for future uptake to ensure such technology is optimally integrated and does not result in costly network expenditure. The project will also permit exploration of the possible value such technology can provide on a least cost basis to address network constraints.

Criteria #4 The project is not tariff based.

Criteria #5 This criterion is met because funding via the DMIA is complementary to ARENA and other stakeholders' funding for the project. The distributor is claiming its own cost hence complying with this criterion.

Criteria #6 Expenditure is in the nature of opex.

11.4. Switched Reactors

11.4.1. Project overview

This project has been developed to reduce reactive power demands in single wire earth return (SWER) systems thereby reducing the network voltage swing, reducing losses, reducing the need for larger isolation transformers, deferring or removing the need for augmentation and lowering the cost of supply to customers.

Optimisation of the switching routine and device longevity testing was undertaken throughout 2017-2018.

Essential Energy has found that:

- a single reactor can tighten the voltage envelope by 1% by switching on when network voltage is high and switching off when network voltage is low.
- the voltage improvements are as expected from early simulations, with the furthest switched reactor providing the greatest benefit to the network, reducing the network voltage along the entire feeder as shown in Figure 5 by approximately 1.5%. There was a modelled feeder voltage improvement of 5% with all 5 switched reactors connected to network.
- some applications across the network may benefit from larger reactors (25kVAr reactors we used at the trial sites) compared to the capacity of traditional fixed reactors or multiple reactors at each site with dual stage switching to limit voltage steps but increase the overall voltage envelope control whilst avoiding addition installation costs from multiple sites along the feeder.
- other project benefits included supporting the uptake of customer solar PV through dynamic management of network voltage, remote configuration of hysteresis control curves (i.e. setting reactor switch On/Off response), automated switch control based on sampled line voltage, improved power factor resulting in lower network losses, improved power quality and improved visibility of the network through remote monitoring of network voltage.

Essential Energy claimed DMIA expenditure in 2017-18 of $13,755 for this project.

11.4.2. Assessment against the DMIA criteria

Criteria #1 The development of switched reactors may allow Essential Energy to better manage voltage swings, which in turn can defer augmentation on SWER lines.

Criteria #2 The technology explored in this project can be used in broad-based demand management.

Criteria #3 This project will improve demand management capability and explore potentially efficient demand management mechanisms on SWER lines.

Criteria #4 The project is non–tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of capex.

12. Evoenergy (formerly ActewAGL) 2017–18

We have approved Evoenergy's DMIA expenditure of $115,996 for five projects in 2017–18. The projects meet the DMIA criteria. The following section sets out our assessment of the project. Detailed information on the project is available in Evoenergy's 2017–18 DMIA report which is published separately on our website.

New Projects

12.1. Load Curtailment Contracts

12.1.1. Project overview

This project proposes trialling the establishment and implementation of load curtailment contracts with the 20 major customers in the ACT. The aim was to establish a standard operating model and contract and develop a pricing mechanism for the different customer categories. The project was driven by local demand management requirements and preparing for AEMO declared Lack of Reserve (LoR) events with possible load shedding events.

Evoenergy claimed DMIA expenditure of $27,654 in 2017-18.

The 20 largest customers in the ACT were contacted about entering into a load curtailment contract.

Two contracts were signed with a number still under negotiation. The contracts were exercised during a simultaneous combined test with the SMS text trial and a VPP exercise. Both contracted parties responded as requested and provided demonstrable load reductions by the use of in-house generation and load reduction. Further contracts are expected to be executed for the 2018-19 summer. A large number of customers rejected participation because it did not suit their operations. Evoenergy found that many customers do not have operations and assets that suit the application of demand management. The trial also demonstrated the pricing complexities and price levels that need to be offered in order to be financially attractive and viable for a large range of customers with a wide range of DM options from load reduction to alternative generation.

12.1.2. Assessment against DMIA criteria

Criteria #1: The project assesses the impact on network load from customer and network management of load curtailment contracts. The project aims to quantify the reductions in demand that can be obtained through the timely use of curtailment contracts with large customers.

Criteria #2: This is a broad based demand management project that targets commercial and industrial consumers.

Criteria #3: This project will explore potentially efficient demand management through the use of load curtailment contracts with large customers.

Criteria #4: This project is non-tariff based.

Criteria #5: Evoenergy expenditure for this project is not recoverable under any other jurisdictional incentive scheme, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6: Expenditure on this project is opex.

12.2. SMS Trial

12.2.1. Project overview

This project recruited customers on the Weir feeder in the suburb of Belconnen in ACT to participate in an SMS program to reduce load based on messages from the Evoenergy. The trial involved approximately 1,000 customers in the Belconnen suburbs of Hawker, Scullin, Higgins and Weetangera. The trial plans to evaluate customer compliance with requests via SMS communication to reduce electricity use at home at short notice. The outcome would be to integrate the SMS participants into the peak demand reduction strategy in the event of any actual load shedding events. The trial is assessing customer's willingness to reduce load and whether that load reduction is noticeable on a feeder. A residential SMS demand response program has the potential to offer both network-wide and targeted (geographic area or feeder specific) peak load reductions.

Evoenergy claimed DMIA expenditure of $18,778 in 2017-18.

Evoenergy carried out two trials. From the study population, there was an 8% sign-up rate, and from those sign-ups for both trials there was a 75% response rate confirming that those consumers had performed some level of load reduction. The total response level equated to 6% of the customers on the feeder but the level of response for this 6% of customers is not known. There was no statistically significant impact on feeder load relative to the control feeders.

12.2.2. Assessment against DMIA criteria

Criteria #1 The project sought to incentivise customers to reduce their load during peak times. An SMS trial was devised to assess the willingness of customers to reduce their electricity load at short notice during peak times. The test would assess the effectiveness of SMS communications to reduce load on a feeder from Latham Zone Substation.

Criteria #2 This is a peak demand management project or program.

Criteria #3 The trial of residential demand management in a suburb of Canberra is innovative. While targeting it to a particular suburb, the incentive could be tailored for the residents and also provide localised data to understand the viability of non-network solutions for the management of that particular feeder. This project is designed to build demand management capability in Evoenergy's network and provide a new potentially efficient demand management mechanism.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of the opex.

12.3. University of Wollongong – PhD scholarship for demand management

12.3.1. Project overview

This project is a three year PhD scholarship worth $10,000 per year plus overhead costs for a student at the University of Wollongong in order to gain insight into how smart grid technologies will interact with the greater network on a local and precinct level. The project will develop and test optimal control system for smart residential house which optimises the consumption and storage of energy along with the operation of several controllable loads.

Through the course of the project the PhD student will develop a small network model (based on Evoenergy network data) for experimental simulation. The student will also explore the benefits of model predictive control at a precinct level (including prediction of the spot price and how this can benefit utilities/retailers). Evoenergy will use this information for understanding, at a residential development level, peak demand management solutions, including shaving peak demand, remote home usage control etc. It will also provide information on what possible services, at a residential development level, are able to be offered back to the Evoenergy network.

Evoenergy claimed DMIA expenditure of $13,000 in 2017-18.

12.3.2. Assessment against DMIA criteria

Criteria #1 This project involved Evoenergy funding a PhD student at University of Wollongong to study the optimal demand response strategies for home energy management systems in smart grid to achieve net zero energy.

Criteria #2 This is a broad based demand management project.

Criteria #3 This project is innovative as Evoenergy will be able to gain a greater understanding of how demand management strategies assist in deferring capital investment while also reducing peak demand within the network. This project is designed to build demand management capability in Evoenergy's network and provide a new potentially efficient demand management solution for future estate developments in the ACT.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of the opex.

12.4. Virtual Power Plant

12.4.1. Project overview

In this project Evoenergy has partnered with Reposit Power to trial residential batteries aggregated as a virtual power plant (VPP). The objectives were to:

1. Prove that a VPP can be used to help reduce peak demand on the distribution network

2. Test if the Reposit Power's VPP Fleet system is capable of coordinating residential batteries to provide grid support. The engagement of the VPPs allows Evoenergy to plan for demand response activities in the event of load shedding, giving consumer's added reliability in keeping the network running during such days.

3. Observe the practicality of third-party service engagement for network support.

Evoenergy claimed DMIA expenditure of $50,655 for 2017-18.

There was a 95% uptake rate from the battery unit owners. Evoenergy used the batteries to dispatch over 1 MW of power into the grid. Trials to understand the voltage and power factor control through the fleet system is also being progressed. Evoenergy is also using the data from the customer DERs to accurately predict the level of solar penetration and battery storage in the Evoenergy network at any given time. This is being incorporated into the ADMS platform to accurately plan and manage the network in the ACT.

12.4.2. Assessment against DMIA criteria

Criteria #1 The project attempts to control the capabilities of solar PV generation and battery storage to dispatch energy to meet demand requirements. Aggregating virtual power plant units (e.g. residential PV and batteries) will provide a system that can be dispatched to manage network capacity constraints.

Criteria #2 This is a peak demand management project.

Criteria #3 The project is an innovative trial where existing customer battery installations through the Reposit Power fleet are controlled by Evoenergy. It would act as a virtual power plant with the novelty of being targeted at specific areas within the Evoenergy network.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of the opex.

Continuing Project

12.5. Residential Battery Energy Storage

12.5.1. Project overview

This project involves the installation of 16 storage units in general public premises totalling 128kWh of available storage to explore potentially efficient demand management mechanisms through the use of distributed storage at a domestic scale. The project was implemented through a collaborative effort with the supplier and ActewAGL Retail. The technical phase of the project concluded in 2016–17.

Evoenergy claimed DMIA expenditure of $5,909 in 2017-18.

Evoenergy had control of up to approximately 30kW of dispatchable load/supply with capacity of up to approximately 128kWh, depending on battery state of charge at the time. Fifteen batteries were successfully installed and agreements to allow network access to the batteries for monitoring and testing purposes entered into with home owners. Network performance trials have demonstrated that the Panasonic battery storage unit was able to operate to provide benefits to householders as well as responding to network commands issued through Panasonic DRMS software. The DRMS interface allowed for control of individual batteries or groups of batteries. Evoenergy found that operation of batteries had either no impact or a detrimental impact on customer energy billing therefore compensation will be required for Evoenergy control of batteries.

12.5.2. Assessment against DMIA criteria

Criteria #1 This project assesses the impact on network load from customers and network management of battery storage distributed at a residential level. The project aims to quantify the shift in demand that can be obtained through the use of domestic batteries.

Criteria #2 This is a broad-based demand management project that targets domestic consumers.

Criteria #3 This project will explore potentially efficient demand management mechanisms through the use of distributed storage at a domestic scale.

Criteria #4 The project is non-tariff based.

Criteria #5 Expenditure for this project is not recoverable under any other jurisdictional incentive scheme, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 The expenditure is in the nature of capex.

13. Jemena 2018

Jemena is claiming DMIA expenditure of $239,279 for one demand management project in 2018. We approve this expenditure as the project meets the DMIA criteria, and our assessment of the project is set out below. For detailed information on this project, please refer to Jemena's 2018 DMIA report published separately on our website.

Continuing Project

13.1. Residential Demand Response

13.1.1. Project Overview

This project was proposed in response to emerging capacity constraints in Jemena's network and enable deferral or avoidance of augmentation capex in residential areas. The residential demand response trial was developed in 2016 and conducted over the 2017-18 summer period in constrained areas of the network (in six suburbs). The trial targeted recruitment of at least 600 households. The trial was designed to test the hypothesis that if customers are provided with easily actionable tips to reduce energy consumption, especially during times of network constraint, a fundamental shift in customer behaviour to the benefit of the network can be achieved. Jemena considered various options and recommended procuring a smart app with visual usage data, actionable tips and performance feedback to participants. The program was publicly branded as 'Power Changers'.

Jemena claimed DMIA expenditure in 2018 of $239,279 for this project. The field component of the trial ran from 1 December 2017 to 31 March 2018. Jemena called six DR Challenges (events) including one on Sunday 28 January 2018, when an extreme heat wave was experienced across the state. On average households were able to reduce their peak electricity consumption by between 26 and 35 per cent across the two optimal DR Challenges, that took place on hot days. Jemena also conducted a proof of concept study to use smart meter (AMI) wi-fi (using Zigbee) involving an IOT device and AMI RF Mesh to communicate with the peak smart units.

13.1.2. Assessment against DMIA criteria

Criteria #1 The project is aimed at developing Jemena's capabilities to reduce peak demand through customer controlled demand response projects, rather than increasing supply capacity through network augmentation.

Criteria #2 The project is a peak demand management initiative which aims to address specific network constraints by reducing demand on the network at the location and time of the constraint.

Criteria #3 The project deliverables are to prepare Jemena for various elements of customer controlled demand response programs as an effective and efficient demand management solution.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

14. Powercor 2018

Powercor is claiming DMIA expenditure of $623,768 for one demand management project in 2018. We approve the total expenditure as the project meets the DMIA criteria. Our assessment of the project is set out below. More details of this project can be found in Powercor's 2018 DMIA report published separately on our website.

New Project

14.1. Energy Partner (Demand response program)

14.1.1. Project Overview

Powercor identified highly variable load at risk on the Bellarine Peninsula on the high voltage feeder network and two zone substations. To address this, the Energy Partner program was designed to identify air conditions (AC) demand response (DR) initiatives to support the network or possibly defer future augmentation. The program incentivises customers for DR by directly controlling customer ACs for a short period of time (approximately 3hrs) using Sensibo Sky. This device allowed us to coordinate the temperature set points of more than 900 ACs in the Bellarine Peninsula.

During 2018 the program signed up almost 1,500 customers and installed more than 1,000 devices. For the four DR events called over the 2018-19 summer a participation rate of greater than 90% was achieved. Powercor was able to temporarily decrease customer demand by approximately 30% over the three hour event period.

Powercor claimed DMIA expenditure in 2018 of $623,768 for this project.

14.1.2. Assessment against DMIA criteria

Criteria #1 The project is aimed at reducing residential demand during demand response events on the Bellarine Peninsula where highly variable load at risk was identified. Customers are incentivised to allow Powercor to coordinate temperature set points on ACs for approximately 3 hours.

Criteria #2 This is a peak demand management project.

Criteria #3 The project is designed to reduce the peak load on the Bellarine Peninsula, thereby avoiding augmentation costs or increased load risk.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because the expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of capex.

15. SA Power Networks 2017–18

We approve DMIA expenditure of -$13,411 for two projects in 2017-18 because they meet the DMIA criteria. A negative amount of expenditure has been incurred in 2017-18 as a portion of costs accrued against the Grid Side Storage project in 2016-17 were re-assigned to the deployment of the battery, which is not part of the DMIA project. The following section sets out our assessment of the individual projects. For detailed information about these projects, please refer to SA Power Networks' 2017–18 DMIA report published separately on our website.

SAPN's projects form part of a package of investigations aimed at informing its approach to design, management and operation of the distribution network in response to increasing Distributed Energy Resource (DER) deployment on the network in order to cost-effectively manage the impacts and capture opportunities from DER.

Continuing Projects

15.1. Grid Side Storage

15.1.1. Project overview

This is a practical research study, partly funded by ARENA and other parties, into the performance of energy storage systems across the likely applications within the distribution network. With the increasing amount of energy storage system technologies and their applications, this project will produce a mobile testing environment to further develop these technologies and to understand their use in Australian conditions. The project will create a knowledge base for industry and system developers whilst also providing for advanced training facilities on an operational system.

Comprehensive factory testing was carried out in Bayswater, Melbourne and further acceptance testing was undertaken when the unit was relocated to the Adelaide University Campus in Thebarton in Q4 2017. In February 2018 the mobile testing unit was installed and operating on SA Power Networks' network at Cape Jervis. SAPN is planning for the unit to be on site until March 2019 and is considering a possible extension.

SAPN reported a cost reduction for this project of –$279,589 in 2017–18 to account for a portion of the costs accrued against the Grid Side Storage project in 2016-17, which were re-assigned to the deployment of the battery, which is not part of the DMIA project.

15.1.2. Assessment against DMIA criteria

Criteria #1 This project will provide insight into the suitability and performance of different storage technologies when utilised in the most likely scenarios for distribution network management and operation.

Criteria #2 This is a broad-based demand management program.

Criteria #3 This project provides a study into the performance of energy storage systems.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because funding via the DMIA is complementary to ARENA and other stakeholders' funding for the project. The distributor is claiming its own cost hence complying with this criterion.

Criteria #6 Expenditure is of the nature of opex.

15.2. Residential Energy Storage

15.2.1. Project overview

This project will deploy 100 energy storage systems within a selected trial area to study the performance of energy storage systems across the likely applications for this technology as part of efficient distribution network operation and management.

The Residential Energy Storage project (also known as the Salisbury battery trial) was designed as a 3-year trial beginning for each customer when their system was installed. Installations started in July 2016 and concluded in December 2016. SAPN identified the key learnings to date as:

- Residential energy storage has the potential to defer the building of new, or augmentation of existing, network infrastructure via the subscription of sufficient energy storage systems to create a virtual power plant that may be reliably dispatched. However, SAPN's early financial analysis indicates this would not be cost effective unless the system was significantly subsidised or received more value streams than simply network support.
- SAPN calculated a $500 guaranteed saving for involvement of a trial customer's battery system. This amount was achieved in the first year. In the second year the calculation changed when retailer feed-in tariffs increased by over 200 per cent. Further changes are expected from the availability of Government and third party batter subsidies. Analysis is also planned to account for the financial impact of reduced energy capacity of the batteries as they age.
- The impact of unmanaged, coordinated energy storage poses a significant threat to the reliability and efficient operation of the distribution network. The analysis and observed behaviour from the aggregated response of batteries in this trial supported the development of SAPN's Low Voltage Management Business Case to capture the opportunities and manage the risk of significant DER penetration on the distribution network.

SAPN claimed DMIA expenditure of $793,124 in 2017–18 for this project.

15.2.2. Assessment against DMIA criteria

Criteria #1 The trial tests the applicability of residential energy storage systems to defer the building of new, or augmentation of existing, network infrastructure. Another objective is to understand the broader benefits and attractiveness of residential energy storage to customers with a view to informing the likely timing of larger scale take-up and the levels of subsidy required to facilitate take-up for network purposes.

Criteria #2 This is a broad-based demand management program.

Criteria #3 This project tests the applicability of residential energy storage systems to defer the building of new, or augmentation of existing, network infrastructure.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is of the nature of opex.

16. TasNetworks 2017–18

TasNetworks is claiming $1,059,414 for DMIA expenditure in 2016–17 for three demand management projects. We approve this expenditure as the projects meet the DMIA criteria. The following section sets out our assessment of the individual projects. For more information about these projects, please refer to TasNetworks' 2017-18 DMIA report which is published separately on our website.

Continuing Projects

16.1. emPOWERing You Trial (Tariff Trial project)

16.1.1. Project overview

The scope of this project is to gather data on customer usage patterns to improve models and planning using advanced metering technology, and to determine customers' response to new tariff designs and the effect it has on the load placed on the networks.

TasNetworks reports that this project will assist it in modelling customer behaviour and the effect of new tariff designs on network demand. It states that the benefits include: the collection of high quality customer consumption data which has improved planning processes; the provision of network performance data to allow improved identification of problem areas in the network; the provision of metering data for the development of better tariff and demand response products; and testing customer response to cost reflective demand tariffs.

TasNetworks claimed a percentage of costs related to this project of $468,457 in 2017–18 with the balance funded from the distributor's own opex budget.

16.1.2. Assessment against DMIA criteria

Criteria #1. The purpose of this project is to both shift and reduce the demand for standard control services through a non-network alternative.

Criteria #2 This project is broad based and not targeted at particular network users.

Criteria #3 This project is designed to build demand management capability in TasNetworks and provide a new potentially efficient demand management mechanism.

Criteria #4 The project is tariff based.

Criteria #5 This criterion is met because funding via the DMIA is complementary to other funding for the project. The distributor is claiming a percentage of its own cost, hence complying with this criterion.[8]

Criteria #6 Expenditure is in the nature of opex.

[8] TasNetworks, *Distribution Annual Reporting RIN 2016–17 Basis of preparation*, p. 50.

16.2. Battery Storage on Bruny Island

16.2.1. Project overview

The purpose of this project is to prove that distributed energy storage can be used to defer network investment. It involves the installation of customer energy storage systems on Bruny Island to manage peak load on the cable and reduce the use of diesel. It will also provide validation on the parameters of distributed storage as a solution to network issues.

The trial also includes a significant research component that will provide information and strategies that can be used to improve future use of battery storage.

This project is in progress, due to finish in April 2019. The solar/battery systems have been installed and the response capability of the batteries have been proven through response to several network events. The project is delivering a demonstrable impact on peak demand on Bruny Island. The algorithms under development by The University of Sydney and The Australian National University are beginning to be tested and The University of Tasmania have completed their first round of interviews.

TasNetworks reports that this project has demonstrated that demand response can be a solution to network constraints. It has shown that customer batteries can be aggregated to resolve network issues. It is demonstrating innovative new customer-focussed methods of managing network issues. It is developing relationships between TasNetworks, service providers, and customers which can be used to provide lower cost solutions to network problems in the future, and is enabling the collection of data which TasNetworks is using to quantify the impact of customer batteries on the network in a winter-peaking region.

As the project draws to a close TasNetworks will focus on generating learnings that can be applied elsewhere in Tasmania as well as inform processes (such as the Open Energy Networks consultation) that are currently in progress.

TasNetworks claimed its share of cost contribution to this project of $558,726 in 2017–18. ARENA funding was also used.

16.2.2. Assessment against DMIA criteria

Criteria #1 This project meets the criteria because it seeks to better integrate non-network solutions to help address capacity constraints in the distribution network (rather than relying on network augmentation).

Criteria #2 This project is broad based and not targeted at a particular network user.

Criteria #3 This project is designed to build demand management capability in TasNetworks and provide a new potentially efficient demand management mechanism.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because funding via the DMIA is complementary to ARENA funding for the project. The distributor is claiming its own cost hence complying with this criterion.[9]

[9] TasNetworks, *Distribution Annual Reporting RIN 2016–17 Basis of preparation*, p. 50.

Criteria #6 Expenditure is in the nature of opex.

16.3. Demand Management Processes

16.3.1. Project overview

This project aims to develop the internal systems required to use demand management to solve network constraints. The aims of this work are to use network support to resolve network issues, determine the internal costs for using demand management, and investigate different levels of automation and type of network support.

To date draft processes have been developed. These processes have been used on the CONSORT trial to implement the demand management function.

TasNetworks reports that this project has enabled the development of processes that allow the operational management of network support and has enabled basic tools to be developed that allow TasNetworks to manage services from DER.

This project is complete.

TasNetworks claimed DMIA expenditure in 2017-18 of $32,231 for this project.

16.3.2. Assessment against DMIA criteria

Criteria #1 The purpose of this project is to both shift and reduce the demand for standard control services through a non-network alternative

Criteria #2 This project is a broad-based demand management project.

Criteria #3 This project is designed to build demand management capability in TasNetworks

Criteria #4 The project is not tariff based.

Criteria #5 This criterion is met because expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

17. United Energy 2018

United Energy (UE) is claiming DMIA expenditure of $210,574 for two demand management projects in 2018. We approve the total expenditure as the projects meet the DMIA criteria. Our assessment of the projects is set out below. More details of the projects can be found in United Energy's 2018 DMIA report published separately on our website.

Continuing Projects

17.1. Summer Saver (Demand Response) Trial

17.1.1. Project Overview

The project is an investigation of how effective and efficient customer demand response is as a non-network alternative at addressing demand at peak times. The trial investigated various demand management options. The outcomes of this trial have enabled UE to develop a demand management model that describes the best combination of mechanisms that will result in the biggest peak demand reduction at specific locations based on customer demographics and load profiles.

The majority of the costs incurred in 2018 were for the following improvement research projects:

- Monash Demand Management Study with ClimateWorks Australia to expand the Program to high-density and short-term rental environments;
- Summer Saver Digital Solution Improvement Study with Deakin University; and
- Summer Saver Study with CitySmart to Increase Customer Uptake.

United Energy claimed DMIA expenditure in 2017 of $193,118 for this project. During the period of December 2017 to March 2018, four events were called.

17.1.2. Assessment against DMIA criteria

Criteria #1 The project sought to incentivise customers to reduce their load during peak times.

Criteria #2 This is a peak demand management project.

Criteria #3 The trial of residential demand management in an urban area such as metropolitan Melbourne is innovative.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because United Energy is claiming its own expenditure for this project, which is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

Criteria #6 Expenditure is in the nature of opex.

17.2. Virtual Power Plant (VPP) Stage 1

17.2.1. Project Overview

With the falling prices of solar photovoltaic (PV) panels and battery storage systems, UE wanted to explore the use of PV and battery storage technology for addressing immediate capacity shortfalls, deferring traditional network augmentation solutions, and addressing the voltage issues on the UE network. By utilising the energy stored in batteries, UE can use VPP technology to shave peak load and defer augmentation projects in regions of the network where the future peak demand growth is uncertain and where the cost of adding capacity through traditional solutions is higher than average.

In 2018 UE wound down the pilot project to complete the transition of the pilot to business-as-usual, decommission the remaining VPP units, and re-deploy them as part of a new grid-side storage trial at UE's constrained distribution substations.

United Energy claimed DMIA expenditure in 2018 of $17,456 for this project. The costs were for the ongoing operational and decommissioning expenses associated with the pilot (such as sim cards to enable remote control and continuous live monitoring of the systems by UE and software maintenance).

17.2.2. Assessment against DMIA criteria

Criteria #1 The project attempts to combine the capabilities of solar PV generation and battery storage to flatten out the demand profile by charging the battery overnight from the network or from PV during the middle of the day when solar PV generation is at its maximum, and discharging the battery during the early evening when energy demand requirements on the UE network are at their maximum. Aggregating VPP units will provide a system that can be dispatched to manage network capacity constraints.

Criteria #2 This is a peak demand management project.

Criteria #3 The project offers a new solution for a constrained network area, particularly where load growth is low or uncertain. The ability to provide incremental amounts of capacity through combining renewable generation and storage to meet the demand as it materialises could be more efficient than a traditional network solution that provides significant step increases in capacity at higher cost.

Criteria #4 The project is non-tariff based.

Criteria #5 This criterion is met because the expenditure for this project is not being recovered through any other jurisdictional, state or Australian Government scheme, nor through any other part of the distribution determination for the current regulatory control period.

United Energy stated that the costs recovered under the DMIA include costs incurred in procuring consulting services, equipment and installation services, but exclude UE employees' labour costs allocated to the project.

Criteria #6 Expenditure is in the nature of opex.