6. DEMAND MANAGEMENT INCENTIVE ALLOWANCE

Requirement 6.1

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

Response

1	Panasonic Residential Battery Storage System (RSBS) - Pilot Trial	5,909
2	Load Curtailment Contracts	27,654
3	SMS Trial	18,778
4	University of Wollongong Scholarship – DM	13,000
5	Virtual Power Plant	50,655
	Total	**115,996**

Requirement 6.2

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

a. explain:
   I. how it complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme,·
   II. its nature and scope;
   III. its aims and expected outcomes;
   IV. the process by which it was selected, including its business case and consideration of any alternatives;
   V. how it was/is to be implemented;
   VI. its implementation costs; and
   VII. any identifiable benefits that have arisen from it, including any off peak or peak demand reductions;

b. confirm that its associated costs are not:
   I. recoverable under any other jurisdictional incentive scheme;
   II. recoverable under any other Commonwealth or State Government scheme; and
   III. included in the forecast capital or operating expenditure approved in the 2014-19 Distribution Determination or recoverable under any other incentive scheme in that determination; and:

c. state the total amount of the Demand Management Innovation Allowance spent in the Relevant Regulatory Year and how this amount has been calculated.

Requirement 6.2 Response

1. Panasonic Residential Battery Storage System (RSBS) - Pilot Trial

a. The project complies with the DMIA criteria as follows:

1. Criteria 1: The project assesses the impact on network load from customer 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.

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

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

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

5. 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.

6. Criteria 6: Expenditure on this project is capex.

II. The trial involves the installation of 16 Panasonic storage units in general public premises totalling 128kWh of available storage. Although effects of this storage will be seen on the LV level of the network this is a relatively insignificant amount of storage when observed from a distribution scale.

III. Aims and expected outcomes of the trial are as follows:

1. Test functions and capabilities of the Panasonic battery storage unit

2. Test functions and capabilities of the Panasonic DRMS software

3. Develop control regimes for the identified functions of battery storage unit in response to identified network conditions:

i. Network voltage regulation

ii. Real and Reactive power injection

iii. Tariff based load management

iv. available reticulation, feeder and zone capacity

4. *Installation of appropriate smart meters to provide sufficient visibility at the customer connection level*
5. *Investigate how Evoenergy's operation of the battery storage units impacts the customer's energy usage and their energy billing. Identify whether it is beneficial, both financially and practically, for a customer to allow Evoenergy control of their battery storage and what incentive is appropriate.*
6. *Investigate feasibility of metering at LV distribution substation level*
7. *Investigate ADMS load forecasting capabilities and options to use these forecasts for battery control*
8. *Engage with Reposit, Panasonic and others to identify possible control solutions*
9. *Develop project path relevant to the ACT NextGen program*
10. *Fact Finding/liaison meeting with the ACT Government and other stakeholders in the project schedule.*

IV. *As the project is an investigative project to determine the effect of new technology on our network the alternative was to simply not do the project, but then there would have been no associated learning. There is a strong push at the local government level for higher storage penetration within our network area, and retailers are promoting storage products at subsidised prices. This will lead to increasing penetration and to be prepared for this it is necessary that Evoenergy carry out studies to learn how the storage systems will and can affect the network.*

V. *The project is to be implemented through a collaborative effort with Panasonic and ActewAGL Retail.*

VI. *Costs of the project are $59,356 in 14/15, $37,568 in 15/16, $55,871 in 16/17 and $5,909 in 17/18.*

VII. *The technical phase of the project concluded in 16/17. In addition to the learning from the project during this phase 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.*

b.

I. *These costs are not recoverable under any other jurisdictional incentive scheme.*
II. *These costs are not recoverable under any other Commonwealth or State Government incentive scheme.*
III. *Evoenergy detailed this project within its 2014/19 regulatory proposal, under section 6.12.3.4 "Battery Storage Trial". Within this section it states that "ActewAGL Distribution proposes to fund this new initiative out of the DMIA for the 2015-19 regulatory period."*

c. The total amount of the DMI Allowance spent in the 17/18 financial year was $5909.

Requirement 6.2 Project Overview:

To date the 15 batteries for use during the Panasonic Battery Trial have been successfully installed and the agreements with home owners have been put in place to allow network access to the batteries for monitoring and testing purposes. The communication platform is installed and fully operational allowing two way communication with individual battery systems. 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. Battery operations could be programmed in advance but batteries were not responding autonomously to network conditions. It was possible to forecast approximate battery charge state by looking at historical data.

The DRMS interface allowed for control of individual batteries or groups of batteries. Evoenergy operation of batteries had either no impact or a detrimental impact on customer energy billing depending on the particular tariffs applicable to the customer and it can be seen that incentives adjusted to individual tariffs are appropriate to compensate Evoenergy customers for Evoenergy control of batteries.

2. Load Curtailment Contracts

I. *The project complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme as detailed below:*

II. *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.*

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

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

V. *Criteria 4: This project is non-tariff based.*

VI. *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.*

VII. *Criteria 6: Expenditure on this project is opex.*

VIII. *The project scope was to trial 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 NEM LOR events with possible load shedding events.*

IX. *The aims and expected outcomes of the trial were to establish an effective range of customer curtailment contracts that could be used for NEM LOR events and local DM requirements.*

X. *The establishment of commercial and voluntary load curtailment contracts was considered a better alternative to compulsory DM.*

XI. *The project was implemented by contacting all the 20 large customers in the ACT and engaging in detailed discussions on their interest and ability to provide a load curtailment contract. A standard contract, with an editable schedule, was developed.*

XII. *The 2017/18 implementation costs was $27,654.*

XIII. *The identifiable benefits were the successful placement after considerable negotiation with a number of large customers. The trial also highlighted that many customers do not have operations and assets that suit the application of demand management. The trial also demonstrated the price complexities and price levels that need to be offered in order to be financially attractive and viable for a large range of customers.*

Requirement 6.2 Project Overview:

The project scope was to trial the establishment and implementation of load curtailment contracts with the 20 major customers in the ACT. The project commenced by contacting all the 20 largest customers in the ACT and engaging in detailed discussions on their interest and ability to provide a load curtailment contract.

A standard contract, with an editable schedule, was developed in conjunction with the customers. The schedules can be tailored to individual customers.

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 NEM LOR events with possible load shedding events.

Only 2 contracts were signed before the summer with a number still under negotiation. A large number of customers rejected participation outright because it did not suit their operations. The exercise highlighted 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.

The contracts were exercised during a simultaneous combined test with the SMS text trial and a VPP exercise. Both contracted parties (Tidbinbilla Satellite Tracking Station and Bruce CIT) responded as requested and provided demonstrable load reductions by the use of in-house generation and load reduction. It is planned that additional parties will be available for the 18/19 summer.

3. SMS Trial

The project complies with the DMIA criteria as follows:

I. 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.

II. This is a peak demand management project or program.

III. 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.

IV. The project is non-tariff based.

V. 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.

VI. Expenditure is in the nature of the opex.

I. Nature and Scope

The trial involved sending letters to 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 network, Evoenergy. The trial involved approximately 1,000 customers in the Belconnen suburbs of Hawker, Scullin, Higgins and Weetangera.

II. Aims and outcomes

The trial will evaluate the effectiveness of SMS communication with our customers, asking them 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 first and foremost assessing customer's willingness to reduce load, and secondly 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.

III. Process of selection

Over 62% of the feeders in the Evoenergy distribution network are residential-dominated (i.e. >80% connections on the feeder supply a residential premise). To enable realistic and substantiated deferral of network augmentation through Demand Management Solutions (DMS) on these feeders, residential-based

demand management and demand response initiatives are required. Evoenergy decided to investigate the viability of such an option as part of the DM initiatives.

Other Options considered:

a) *Do nothing in this area: There are other demand management programs running but it is not clear how successful they will be. This is relatively low cost with the potential to give returns that have a significant effect on the network.*

b) *Carry out individual event advertising, skipping the SMS stage: The individual event advertising would be difficult to co-ordinate at short notice in response to weather conditions, would cost more per event and would not have the potential for geographic targeting that this presents.*

c) *Surge pricing: Needs smart metering, so currently has a high start-up cost, and still needs communication.*

Investigation of these options recommended that Evoenergy pursue the SMS trial option to understand its viability to scale up for demand response events.

IV. Implementation

Customers in suburbs of Belconnen were sent invitation letters from mid-August asking them to sign up to the program by 8th September. Customers who signed up received two texts in September asking them to reduce their electricity use at home. Customers were incentivised to sign up to the trial. They were entered into a draw to win a prize (dinner voucher). As part of this they were required to give Evoenergy (ActewAGL Distribution) their mobile phone number via an online form.

V. Implementation costs

The 2017-18 implementation cost for the SMS trial was $18,778.

VI. Identifiable benefits

The number of trials was limited to two due to concerns around reputation and public image. 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. The project received positive media coverage and positive feedback from the public.
b. Evoenergy confirms that these costs are not recoverable under any other jurisdictional incentive scheme and are not recoverable under any other Commonwealth or State Government incentive scheme. The SMS trial was considered a better alternative to compulsory DM. The total amount of the DMI Allowance spent in the 17/18 financial year was $18,778.

Overview of developments

It was recommended that a follow-up program targeting a larger discrete area (Belconnen or Gungahlin) be run over a one year period, with a multimedia advertising campaign at the start of the program and a number of discrete trials tailored around sign-up numbers to give statistically meaningful results. This trial would ideally be run in conjunction with a broader roll-out of a customer portal mobile app.

4. University of Wollongong – PhD scholarship

The project complies with the DMIA criteria as follows:

I. *Under this project, Evoenergy sponsored the funding of 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.*

II. *This is a broad based demand management project.*

III. *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.*

IV. *The project is non-tariff based.*

V. *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.*

VI. *Expenditure is in the nature of the opex.*

I. *Nature and Scope*

The project involves sponsoring a 3 year PhD of a student at University of Wollongong to gain insight to 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.

II. *Aims and outcomes*

The project will develop a network interactive home energy management that utilises model predictive control to optimise the consumption, generation and storage of energy within an individual household and subsequently the greater precinct to achieve net zero energy. This project will develop the software and hardware for a home energy management system (HEMS) for a net-zero energy home that is able to respond to demand response signals and provide support to the local network. The algorithm development to control the different equipment will also be tested and trialled as a result of this project

III. *Process of selection*

As the project is an investigative project to determine the effect of new technology on our network, the alternative was to simply not do the project, but then there would have been no associated learning. There is a strong push at the local government level for higher storage penetration within our network area, including new estate developments building 100% PV mandated suburbs. This will lead to increasing penetration and to be prepared for this, it is necessary that Evoenergy carry out studies to learn how the optimally designed residences will and can affect the network. Evoenergy engaged the sole supplier as the student has the necessary skills and qualifications to undertake this project. The project over 3 years will test the predictive model at a real house (Desert Rose House - DRH) designed by the student. The University of Wollongong is funding the construction of this house including the various equipment within this house.

IV. Implementation

The student will undertake the project through the University of Wollongong and provide progress updates through reports back to Evoenergy. The student will also provide briefings to Evoenergy representative on an ad-hoc basis in relation to updates and milestones.

V. Implementation costs

The 2017-18 implementation cost for the PhD scholarship was $13,000.

VI. Identifiable benefits

a. The research has resulted in the development of a fully functioning, smart, demand responsive net-positive energy house. The house has been designed with the following features that have the potential for further research and testing of demand response strategies:

• Fully controllable inverter/ energy storage unit that supports grid charging/ discharging during peak demand

• Controllable and deferrable EV charger

• Controllable and deferrable hot water system

• Controllable and deferrable HVAC system

• Fully integrated IoT energy management system.

The Desert Rose house can be used as a benchmark for what the future of demand responsive homes can look like. Helping pave the way for increased customer engagement with utilities and assist in the integration of distributed renewable resources throughout Australian electrical networks. The implementation of the software and hardware developed has shown to be an effective mechanism as a result of being deployed in the house. This could be a replicable model for future estate developments as the local electricity network can provide customers with value for the in-home equipment for being made available for network services. The customers in ACT will be able to take advantage of real time pricing to achieve maximum economic benefit if the solution can be deployed by responding to demand response signals from utility in real time and being able to forecast peak load.

b. Evoenergy confirms that these costs are not recoverable under any other jurisdictional incentive scheme and are not recoverable under any other Commonwealth or State Government incentive scheme. While this project was not identified in the Evoenergy 5 year regulatory submission, the progression of residential estate development in greenfield sites in conjunction with ACT Government's goal to transition to 100% renewables by 2020, this project was deemed an ideal test case to provide learnings back to Evoenergy.

c. The total amount of the DMI Allowance spent in the 17/18 financial year was $13,000.

Overview of developments

Through the course of the project the student will develop a small network model (based on Evoenergy network) for experimental simulation. The student will also explore the benefits of model predictive control at a precinct level (prediction of the spot price and how this can benefit utilities/retailers). The project will also develop precinct level demand response strategies that reduce peak demand while considering real time spot prices. As a result of the project Evoenergy will be able to use the learning from the software and hardware developed including the prediction model to control various home devices that can provide

demand management services to the network. Integrating the data and control requirements (APIs) from the homes to the Evoenergy control hub will be the next critical step for network wide uptake.

The future spend for this project is $10,000 (excluding overheads) for 18/19 financial year and $10,000 (excluding overheads) for $19/20 financial year.

5. Virtual Power Plant

The project complies with the DMIA criteria as follows:

I. *The project attempts to control the capabilities of solar PV generation and battery storage to dispatch when energy demand requirements on the Evoenergy network are at their maximum, typically on extremely hot or cold days. Aggregating VPP units will provide a system that can be dispatched to manage network capacity constraints. A virtual power plant (VPP) is a collection of distributed energy resources (DER's), such as residential PV and batteries (nodes), that can be aggregated and controlled in real time to help meet the demand needs of a distribution network.*

II. *This is a peak demand management project or program.*

III. *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.*

IV. *The project is non-tariff based.*

V. *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.*

VI. *Expenditure is in the nature of the opex.*

I. *Nature and Scope*

The project will be a trial to determine how much impact we can have on network performance through operating distributed energy resources and what size of market signal is required to cause system owners to allow us to control their systems.

II. *Aims and outcomes*

Evoenergy teamed up with Reposit Power to trial the world's largest residential battery stored virtual power plant (VPP). The objectives for Evoenergy's participation in the trials 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,

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

III. *Process of selection*

As part of the ACT Government's Next Gen program, suppliers were provided subsidies to install batteries at customer residences. As a result there were already in excess of 240 battery system at customer residences. Reposit put forward a proposal including pricing structure to allow Evoenergy to control all of those systems as well as having the option to control new systems as they come onto the network. Evoenergy made a strategic decision to engage with the Reposit as they had the largest fleet of batteries

under their portfolio and to test the capability of aggregating behind the meter devices for network benefits. The other option was to simply not engage with these DER systems, but as part of the Evoenergy's view to facilitate the uptake of DERs, it was imperative to understand the impact and capabilities of residential storage in the ACT network. Under ring-fencing guidelines, Evoenergy can only interact with behind the meter devices through third-party provider (retailers, aggregators etc.).

IV. Implementation

Reposit Power would provide the customers with 'Grid Credits' in response to each time Evoenergy utilised their battery systems. The customers agreed to give access to their devices as part of their agreement with their battery supplier/Reposit box purchase. Evoenergy would need to incorporate the data from the distributed energy resources (solar PV and batteries) through Evoenergy's platform called the Advanced Distribution Management System (ADMS). Evoenergy pays a service fee to Reposit as part of this engagement. Evoenergy can dispatch the fleet of batteries through a portal providing access to the entire fleet of batteries in Evoenergy's network. The battery fleet system provides data into the ADMS system through an Internet of Things (IoT) hub developed for connecting remote monitoring platforms back to Evoenergy's ADMS.

V. Implementation costs

The 2017-18 implementation cost for the VPP trial was $50,655.

VI. identifiable benefits

a. Initial trials were overwhelmingly successful with upwards of 95% response rates from the battery units. Evoenergy has also used the batteries to dispatch power into the grid during the 2017 heatwave conditions. This resulted in over 1 MW of power being dispatched into the grid. Additionally, trials to understand the voltage and power factor control through the fleet system is also being progressed. 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. 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.

b. Evoenergy confirms that these costs are not recoverable under any other jurisdictional incentive scheme and are not recoverable under any other Commonwealth or State Government incentive scheme. While this project was not identified in the Evoenergy 5 year regulatory submission, the progression of uptake of battery systems in ACT has been rapid and it was in Evoenergy's best interest to initiate this project. The total amount of the DMI Allowance spent in the 17/18 financial year was $50,655.

Overview of developments

Evoenergy has much to learn from the increasingly relevant DER and battery storage environment, and to this end, has purchased access to Reposit Power's Fleet management system and customer network data from their growing fleet of residential batteries. Evoenergy's transformation to a Distribution System Operator (DSO) is dependent on our ability to learn from and utilise internal and external data sources and make use of intelligent tools and techniques to create value for the wider network. Evoenergy will continue to analyse the data from the past and future trials and distribute relevant information throughout Evoenergy on a regular basis. Future work with Reposit Power include plans to develop a plan to test Reposit's additional services including Solar Curtailment, Load Control (including DRED AC control), Q control (Voltage Management), Microgrid connection point etc. Evoenergy aims to transition this

technology to business-as-usual and justify VPPs on its own economic merits against traditional augmentation.