Annual Regulatory Information Notice 2015

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April 2015

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Appendix H: Demand Management Incentive Scheme Report 2015

Note: See attached

Attachments outlined on page 13 of the Demand Management Incentive Scheme Report 2015 can be provided on request.

Demand Management Incentive Scheme Report - 2015

UNITED ENERGY

DMIS Report

This report details outcomes of projects supported by the Demand Management Incentive Scheme.

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1 Introduction

During the 2015 calendar year, United Energy (UE) continued two projects under the Demand Management Incentive Scheme (DMIS). These were:

- Virtual Power Plant (VPP) Project; and
- Summer Saver (Demand Response) Trial.

This report and its attachments deliver the annual reporting requirements of the DMIS for work undertaken on these projects during 2015 and documents the outcomes and learnings of each project. Further details of each project are presented below.

1.1 Virtual Power Plant (VPP) Project

In September 2013 UE submitted a request to the AER to seek indicative up-front approval to use part of the 2011-2015 allocation of Demand Management Incentive Scheme (DMIS) funding (part A) to support the development of UE's Virtual Power Plant (VPP) 50kW Residential Pilot Project.

With the price of solar photovoltaic (PV) falling dramatically and the price of battery storage forecast to decrease sharply in future years, UE was eager to explore the use of PV and battery storage technology for addressing immediate capacity shortfalls and deferring traditional network augmentation solutions on the UE network. By utilising the energy stored in batteries, VPP technology can be used by UE to shave peak load and defer augmentation projects in regions of the network where the future peak demand growth is uncertain or where peak demand is forecast to decline (potentially leading to under-utilised network assets). VPP can also be used to add capacity in regions of the network where the cost of adding capacity through traditional solutions is higher than average.

The aim of the project is to validate or otherwise, the use of a VPP to manage embedded generation and storage in a residential setting for the provision of efficient and prudent non-network augmentation.

The VPP integrates the operation of both supply and demand-side assets to meet customer demand for energy services in both the short and long-term. To match short-interval load fluctuations, the VPP is intended to make extensive and sophisticated use of information technology, advanced metering, automated control capabilities, and electricity storage.

In 2014 there was significant work completed as part of the stage 1 pilot. UE successfully installed a total of thirteen VPP units distributed across our network. The installations were completed in July 2014, and significant testing, refinement and learnings have been established through the operations of these units in 2015.

UE identified new manufacturers that had entered the Australian market whose battery technology could be controlled by UE to operate as a VPP asset. To keep at the forefront with the latest advances in battery technology, UE commenced a pilot project to assess the technical and operational suitability of the Tesla Powerwall hardware. UE has set up the Burwood field depot to replicate a standard residential solar and battery installation and installed 2x Tesla Solar Storage systems with different control architectures in a test environment. UE intends to use the Burwood Tesla pilot to firstly validate that the Tesla batteries can be controlled as required by UE to operate as a network asset and secondly to identify the most technically suitable and least cost architecture for the use of the Tesla batteries within residential customers' premises. Field testing of the Tesla batteries over the 2015/16 summer period will identify any issues/risks and will allow UE to put in place appropriate controls before the batteries are considered for installation within customers premises.

Ongoing operations and lessons learned across each of the phases will be used going forward on the continuing VPP demand management projects.

Refer to Appendix 1 for further details on this project.

1.2 Summer Saver (Demand Response) Trial

Demand response seeks to incentivise the end customer to reduce their demand on a small number of peak demand days through a variety of mechanisms. These mechanisms include voluntary load reduction, utility load control, supply capacity limiting and dynamic peak pricing. Sustained reliable demand response from residential and commercial/industrial customers has been proven to be effective and efficient at managing peak demand can be used to defer network augmentation.

The Summer Saver Trial[1] 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 investigates demand management options. The outcomes of this trial will enable 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.

UE launched the trial in February 2014 targeting 6,500 customers on four Bulleen zone substation feeders. Customers were offered $25 if they reduced their load during the UE nominated three hour event period. UE anticipated calling on average four events per summer with the customer having the opportunity to earn $100 for the summer if they participated in all events.

UE expanded the trial for summer 2014/15 to include 4,000 more customers in areas of the network that are likely to experience an interruption from electrical asset overload. Also, the trial introduced new demand management options to existing trial members: direct load control of pool pumps and supply capacity limiting.

The trial was expanded again this summer (2015/16) to include a total of 13,000 customers in areas of the network that are likely to experience an interruption from electrical asset overload. On top of the pool pump load control and supply capacity limiting options, the new option of load control of air-conditioners was added to this summer's service offerings.

The trial aimed to engage more closely with customers and help customers understand their electricity usage better while participating in demand response events. To this end customers were offered the Smart Energy app that provided individual usage information to customers. Selected customers offered an Energy Monitor device that provided more in depth and real-time energy data including appliance disaggregation information on electricity bills.

The majority of the costs incurred by the trial this year have been on technology to support the Smart Energy app and the registration website. Other costs include marketing, participation incentives and load control technology.

Refer to Appendix 2 for further details on this project.

2 Regulatory Requirement and Compliance

The AER, in its Demand Management Incentive Scheme applied to UE for the 2011-2015 regulatory period, sets certain criteria and reporting requirements for expenditure from the DMIA. These are detailed below along with a description of how UE complies with each of these requirements for each project.

2.1 VPP Project

"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."

[1] http://uemg.com.au/customers/your-electricity/summer-saver-trial.aspx

The VPP 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 residential demand is at its maximum. Aggregating VPP units will provide a system that can be dispatched to manage network capacity constraints.

"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 on 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."

The VPP aims to address specific network constraints by reducing demand on the network at the location and time of the constraint. If the VPP concept is proven, it is intended to locate such units in areas where there are identified network constraints. In the first instance, this is likely to be in areas where there are significant distribution transformer constraints by clustering the VPP units in localised areas. Ultimately the goal is to alleviate constraints higher up in the network such as at the distribution feeder or zone substation level.

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

The VPP offers a new solution for a constrained network area, particularly where load growth is low, uncertain or is expected to plateau in future. The ability to provide incremental amounts of capacity through combining renewable generation and storage to meet the demand as it materialises could be economic against a more traditional network solution that provides significant step increases in capacity at higher cost. The VPP is intended to test this concept.

"4. Recoverable projects and programs may be tariff or non-tariff based."

The VPP project is non-tariff based.

"5. Costs recovered under the DMIS:

(a) must not be recoverable under any other jurisdictional incentive scheme

(b) must not be recoverable under any other Commonwealth or State/Territory Government scheme and

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

Costs recovered under the DMIS for the VPP project are costs incurred by UE in procuring expert consulting services, equipment and installation services for the trial. These costs have not been recovered from any other scheme. The costs do not include labour for UE employees' time toward this project. This cost is absorbed by the organisation and is regarded as in-kind contribution towards the project.

"6. Expenditure under the DMIA can be in the nature of capital or operating expenditure. The AER considers that capex payments made under the DMIA could be treated as capital contributions under clause 6.21.1 of the NER and therefore not rolled into the regulatory asset base (RAB) at the start of the next regulatory control period. However the AER's decision in that regard will only be made as part of the next distribution determination."

All costs incurred by UE under the DMIS for the VPP project are classified as operating expenditure.

2.2 Summer Saver Trial

"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."

The Summer Saver Trial seeks to incentivise customers to reduce their load during peak times. Voluntary trial customers are rewarded $25 per event for reducing their load during the UE nominated three hour event period. Customers on the pool pump load control program were incentivised $40 per event for load reduction and Supply Capacity Limiting customers were incentivised $50 per event for load reduction.

5 event days were called in February and March 2015 although not on very hot days due to the mild summer weather. Event results are summarised in Appendix 2.

"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 on 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."

The Summer Saver Trial seeks to address specific network constraints and is therefore targeted at customers directly impacted by those constraints. The trial targeted approximately 6,000 customers on four Bulleen feeders that were close to capacity as well as about 4,000 customers in areas of the network which are likely to suffer an interruption this summer or had suffered an interruption in previous summers due to electrical plant overload. Through the trial, UE wishes to understand if sufficient numbers of customers participate in the trial with the right level of behaviour to reduce sufficient load to prevent an interruption.

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

Residential demand management as a concept is not new however trialling it in metropolitan Melbourne certainly is. Other DNSPs in Australia and internationally have found success with demand management in regional areas where communities display more social capital. Since UE's network is predominantly metropolitan, demand management such as demonstrated by this trial is a crucial option to be explored.

"4. Recoverable projects and programs may be tariff or non-tariff based."

The Summer Saver Trial is non-tariff based.

"5. Costs recovered under the DMIS:

(a) must not be recoverable under any other jurisdictional incentive scheme

(b) must not be recoverable under any other Commonwealth or State/Territory Government scheme and

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

Costs recovered under the DMIS for the Summer Saver project are costs incurred by UE in marketing the trial, creating a registration website, customer participation incentives, and procuring and installing technology. These costs have not been recovered from any other scheme. The costs do not include labour for UE employees' time toward this project. This cost is absorbed by the organisation and is regarded as in-kind contribution towards the project.

"6. Expenditure under the DMIA can be in the nature of capital or operating expenditure. The AER considers that capex payments made under the DMIA could be treated as capital contributions under clause 6.21.1 of the NER and therefore not rolled into the regulatory asset base (RAB) at the start of the next regulatory control period. However the AER's decision in that regard will only be made as part of the next distribution determination."

All costs incurred by UE under the DMIS for the Summer Saver Trial are classified as operating expenditure.

2.3 DMIS Reporting

The information contained in this report and its attachment appendices is suitable for public publication.

The AER requires that a DNSP's annual report must include the following for each project.

2.3.1 VPP Project

1. The total amount of the DMIA spent in the previous regulatory year, and how this amount has been calculated.

UE had $363,564 excl. GST of expenses during the 2015 calendar year on activities associated with the DMIA for VPP projects. The costs were associated with engaging external consultants, procurement, installation and maintenance of equipment and ongoing operational expenses associated with the pilot.

These costs can be categorised as follows:

- $177,880 excl. GST for the VPP Sunverge pilot project including hardware maintenance costs, retention of operational data, ongoing operational expenses associated with the pilot (such as sim cards to enable remote control and continuous live monitoring of the systems by UE etc.) and software maintenance.
- $99,746 excl. GST for the Burwood Tesla pilot including procurement costs for the solar, batteries and associated hardware, installation costs, audit of the installation by a licenced electrical inspector for compliance to standards, security assessment of the IT infrastructure, technical risk assessment, structural assessment for mounting the batteries and installation of communications infrastructure at the Burwood depot for enabling monitoring and control.
- $35,000 excl. GST for market research to understand customer demographics and likelihood of customers agreeing to host assets in constrained areas of the UE network.
- $50,938 excl. GST for project management services.

Accrued costs of $31,194 are included in the above breakdown.

UE has used the costs to assess the financial feasibility of implementing future VPP projects at scale on constrained distribution substations.

Further costs associated with the VPP pilot project are likely to be incurred by UE in the 2016 calendar year, drawn from the 2016-2020 DMIA allowance.

2. An explanation of each demand management project or program for which approval is sought, demonstrating compliance against the DMIA criteria in section 3.1.3 with reference to:

(a) the nature and scope of each demand management project or program

A VPP can be defined as a cluster of grid-connected distributed generation and storage plants that are monitored and controlled by an operator for energy trading and grid benefits. When combined, the cluster can then be treated as a single power plant. For UE's VPP project we intend to use solar PV and battery storage technologies which when combined can act to reduce peak electricity demand.

(b) the aims and expectations of each demand management project or program

The aim of stage 1 of the project is to test the VPP concept and its ability to control peak demand through the dispatch of battery storage optimised against solar PV generation.

Traditional network solutions usually result in sunk capital; the resulting augmented asset cannot be easily recovered and used elsewhere if future demand falls. This project's aim is to validate or otherwise, the use

of a VPP to manage embedded generation and storage in a residential setting for the provision of efficient and prudent network augmentation. The solution will be validated if it:

- Effectively avoids/defers CAPEX/OPEX requirements in a prudent and efficient manner.
- Is the most economic outcome when actual costs and benefits are known.
- Is a technically appropriate solution with appropriate mitigation of any risks.

The objectives of this project are to validate VPP as a suitable approach for managing augmentation on the UE distribution network with no adverse impacts to network reliability and safety. The VPP project aims are:

- To test the current state of the technology and its ability to scale.
- To identify the risks.
- To test and assess the level of control that can be achieved with commercially available devices currently on the market.
- To develop an understanding of the economics of the solution and validate the solution is a viable load management tool by exploring and then testing the business model(s), taking the generation, retail and distribution aspects into consideration.
- To explore and test the contractual and commercial agreements with 3rd parties and Residential Hosts (customers).

(c) the process by which each project or program was selected, including the business case for the project and consideration of any alternatives

This project proposes VPP as a solution to address peak demand issues in low voltage feeders when augmentation costs using traditional solutions are high. It is anticipated that in the future, distributed generation and storage will have application for the entire network as costs continue to fall.

(d) how each project or program was/is to be implemented

The overall VPP project has been broken into three key stages to ensure that appropriate governance over costs, risks and benefits and associated gating and review are applied at each stage, with each stage being subject to independent approval. Stage 1 (present stage) consists of a VPP system comprising between eight and fourteen installations at residential sites totalling 50kW. The installation sites have been limited to UE employees and VPP project team members' premises within the UE distribution area to manage identified risks. Stage 1 is being operated over a period of 12 to 15 months to test the economics and commercial models and understand the technology's capabilities, limitations and suitability for larger scale deployment. This stage will provide a full year of energy flow data through seasonal variations.

(e) the implementation costs of the project or program and

In September 2013 UE submitted a request to the AER to seek indicative up-front approval to use part of the 2011-2014 allocation of Demand Management Incentive Scheme (DMIS) funding (part A) to support the development of UE's Virtual Power Plant (VPP) 50kW Residential Pilot Project. This was endorsed by the AER on the 2nd October 2013. The overall VPP project stage 1 was estimated to cost $1.75M.

(f) any identifiable benefits that have arisen from the project or program, including any off peak or peak demand reductions.

We have identified a number of constrained locations around the UE network where deployment of VPP is able to achieve peak demand reductions economically. These sites will be targeted for Stage 2.

3. The costs of each demand management project or program:

(a) are not recoverable under any other jurisdictional incentive scheme,

(b) are not recoverable under any other state or Commonwealth government scheme, and

(c) are not included in the forecast capital or operating expenditure approved in the AER's distribution determination for the regulatory control period under which the DMIS applies, or under any other incentive scheme in that determination.

- Expenditure under the demand management incentive scheme is not eligible for recovery under any other jurisdictional incentive scheme
- Expenditure under the demand management incentive scheme is not eligible for recovery under any other state or Commonwealth government scheme
- Expenditure under the demand management incentive scheme has not been approved in the AER's distribution determination for the regulatory control period under which the scheme applies, or under any other incentive scheme in that determination.

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

Not applicable.

2.3.2 Summer Saver Project

1. The total amount of the DMIA spent in the previous regulatory year, and how this amount has been calculated.

UE had $527,170.34 excl. GST of expenses during the 2015 calendar year on activities associated with the DMIA for the Summer Saver Trial comprising of the following:

- $527,170.34 excl. GST for costs associated with marketing the summer saver trial, creating a registration website, paying customer participation incentives, procuring and installing technology and conducting market research.

2. An explanation of each demand management project or program for which approval is sought, demonstrating compliance against the DMIA criteria in section 3.1.3 with reference to:

(a) the nature and scope of each demand management project or program

This Summer Saver Trial is an investigation of how effective and efficient customer demand response is as a non-network alternative at addressing demand at peak times.

Different mechanisms of demand response can be utilised to motivate and/or incentivise customers to change their energy usage behaviour and reduce load during peak times. These include:

- Voluntary Demand Side Participation (DSP): incentivises customers to reduce/shift their load during peak times with a single-rate reward paid to those who reduce usage by any amount.
- Direct Load Control: gives the utility more certainty in managing load by allowing the utility to manage appliances (RCAC and/or pool pump) during peak times to a known and predictable maximum.
- Critical Peak Pricing: electricity is priced significantly more during peak times to induce customers to reduce load and save money on their bill.
- Supply Capacity Limiting: sets a limit on the customers supply during peak times. This mechanism targets high users by enforcing a reasonable limit on their supply during peak times. Signing up to this option is voluntary and it is envisioned that such customers are genuinely keen to save energy and be more comparable to their neighbours.

(b) the aims and expectations of each demand management project or program

The key objectives of this trial are to investigate and assess the benefit provided to the network through:

- demand management tools:
    - investigate the take-up and impact of the three demand management mechanisms on customer load at peak times
    - incentivise customers to reduce their load during peak times via one or more demand management tool
- Informing and empowering the consumer:
    - provide consumers with the tools and information they need to take an active role in managing their consumption and to reduce energy costs and environmental impact

To this end, the trial intends to:

- investigate the take up of the different demand management mechanisms and their
- attractiveness/value to the customers managing/reducing their load
- attractiveness/value to UE in managing peak load
- investigate the value of the different demand management mechanisms compared with network solutions
- identify risks with the technology in installation and operation
- develop UE knowledge and capability in leveraging AMI benefits
- develop relationships with UE customers
- explore and test contractual and commercial agreements with 3rd parties (retailers, contractors, suppliers)

The outcomes of this trial will enable 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.

This model will then be incorporated into business-as-usual activities to manage peak demand.

(c) the process by which each project or program was selected, including the business case for the project and consideration of any alternatives

Approximately 85% of UE's network services residential customers. This trial investigates various demand management options that can be employed by residential customers. The results of this trial will help UE define which demand management mechanisms have the biggest customer take-up and participation and yield the biggest load reductions at a given incentive value.

(d) how each project or program was/is to be implemented

UE undertakes analysis to identify trial areas that are likely to experience an interruption and could benefit from load reduction through demand management. Customers in these areas are sent letters informing them of the trial with a call for action to register via the UE website.

UE accepts registrations from customers within the trial area who have either a mobile phone or email account to receive UE event alerts.

UE sends SMS and/or email alerts to customers:

- 48 hours notification of an event day

- 24 hour notice of the event period
- And a reminder on the morning of the event day.

Following the event, UE analyses customer smart meter data to verify load reduction during the three hour event period. Successful customers are informed via email that they will be rewarded. Rewards are processed and sent following an event.

UE undertakes further analysis of customer data to evaluate individual customer and total load reduction achieved for the event.

(e) the implementation costs of the project or program and

In 2015 the DMIA costs were spent on marketing activities that included:

- Letters mailed to customers
- Flyers dropped in letter boxes
- Advertisements in local newspapers.

Funds were also spent on market research of customers within the trial area to understand the best channels to inform customers of the trial and motivations for signing up (or not) to the trial. Research was conducted on trial members to learn about their experience on the trial and find ways of improving the trial.

A large body of work was undertaken to create an automated registration website for customers that linked to the Smart Energy app as well as procuring and setting up the Smart Energy app.

Funds were spent on testing DRED technology before deploying it on a handful of customers over the summer.

(f) any identifiable benefits that have arisen from the project or program, including any off peak or peak demand reductions.

UE called five event days last summer.

Event data showed that:

- 25% of registered customers participated in all 5 events and 50% participated in 4 or 5 events. This is confirmed by post summer customer research that shows that a significant portion of customers tried to participate but data shows that they did not manage an energy reduction during the event.
- 96% of registered customers participated in at least 1 event. It may be that 100% of customers took actions to participate but those actions did not result in a saving during the event period
- 7 people turned (almost) everything off for all 5 events. Several customers turned (almost) everything off on several events.
- The most number of customers participated on the third event in one week (registrations were static in that week).

3. The costs of each demand management project or program:

(a) are not recoverable under any other jurisdictional incentive scheme,

(b) are not recoverable under any other state or Commonwealth government scheme, and

(c) are not included in the forecast capital or operating expenditure approved in the AER's distribution determination for the regulatory control period under which the DMIS applies, or under any other incentive scheme in that determination.

- Expenditure under the demand management incentive scheme is not eligible for recovery under any other jurisdictional incentive scheme

- Expenditure under the demand management incentive scheme is not eligible for recovery under any other state or Commonwealth government scheme
- Expenditure under the demand management incentive scheme has not been approved in the AER's distribution determination for the regulatory control period under which the scheme applies, or under any other incentive scheme in that determination.

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

Not applicable.

3 Attachments

3.1 Appendix 1 – VPP Pilot Project Stage 1 Report

- Background
- Virtual Power Plant Project - Stage 1
- Modelling
- Technology Selection
- Risk Management
- Peak Day Operation
- UE Burwood Tesla Pilot Project
- Market Research
- Future Initiatives

3.2 Appendix 2 - Summer Saver Project Report

- Customer Letter
- Customer Registration
- Frequently Asked Questions
- Promotional Flyer
- Terms and Conditions
- UE Website Content
- Trial Results