DMIA Annual Report 2018-19

October 2019

Demand Management Innovation Allowance Submission

October 2019

Contents

1 Introduction

This submission has been prepared under the Demand Management Innovation Allowance (DMIA) scheme applied to Ausgrid by the Australian Energy Regulator (AER).

Under Section 3.1.4.1 of the AER's final determination for The Demand Management Incentive Scheme for the ACT & NSW 2009, Ausgrid is required to submit an annual report on expenditure under the DMIA for each regulatory year. The annual report must include:

1. The total amount of the DMIA spent in the previous regulatory year, and how this amount has been calculated.
2. An explanation of each demand management project or program for which approval is sought, demonstrating compliance with the DMIA criteria detailed at section 3.1.3 with reference to:
    a) the nature and scope of each demand management project or program,
    b) the aims and expectations of each demand management project or program,
    c) the process by which each project or program was selected, including the business case for the project and consideration of any alternatives,
    d) how each project or program was/is to be implemented,
    e) the implementation costs of the project or program, and
    f) any identifiable benefits that have arisen from the project or program, including any off peak or peak demand reductions.
3. A statement signed by a director of the DNSP certifying that the costs of the demand management 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 expenditure (capex) or operating expenditure (opex) approved in the AER's distribution determination for the next regulatory control period, or under any other incentive scheme in that determination (such as the D–factor scheme for NSW).
4. An overview of developments in relation to projects or programs completed in previous years of the next regulatory control period, and any results to date.

Accordingly, this submission details DMIA projects undertaken by Ausgrid in the 2018/19 financial year.

2 Governance

2.1 DMIA spending in 2018/19

There were seven (7) new projects and two (2) ongoing DMIA projects under implementation or development for which Ausgrid incurred costs in 2018/19. Ausgrid's submission identifies claimable costs incurred totaling $926,368. All costs incurred were a part of operating expenditure (opex) budget.

Actual costs incurred are collected from project codes in Ausgrid's SAP reporting system. The amounts claimed are those booked to each project in the applicable year. Costs include research and development of projects, implementation costs, project management and other directly related costs.

2.2 Compliance with DMIA criteria

Information addressing items 2 a, b, d, e and f from Section 3.1.4.1 of the AER's final determination for The Demand Management Incentive Scheme for the ACT & NSW 2009 are found in the progress update for each individual project detailed in Section 4 and 5. Item 2c of Section 3.1.4.1 is addressed in Section 2.2.1 below.

2.2.1 Project selection process

Ausgrid has developed templates & guidelines for the development and implementation of projects or programs under the DMIA allowance that seek to investigate non-network alternatives to reduce demand and defer network investment. When opportunities are identified for new projects, Ausgrid uses the following methodology when assessing projects for funding under the DMIA allowance:

1. **Concept Stage**: For new concepts, approval for project research and development is carried out by the Manager – Demand Management & Forecasting who ensures that the proposed project meets the funding criteria specified under the DMIA Scheme. This component of the project is defined as a Concept Stage 1 project.
2. **Development Stage**: Where early stage research and development indicates a potential viable demand reduction solution, the project is approved to proceed to the Development Stage 2 where a project proposal for a full trial is prepared. Approval to proceed to Stage 2 is by the Manager – Demand Management & Forecasting. The project proposal is prepared according to the Ausgrid DMIA template and guidelines, including additional criteria specified by Ausgrid (repeatability, suitability to geographically specific network constraints, and potential to be cost effective ($/kVA)).
3. **Delivery Stage**: The project proposal is reviewed by the Manager – Demand Management & Forecasting to ensure it meets the funding criteria specified under the DMIA Scheme and checks are also made to ensure that budget projects costs are within the DMIA allowance. After consideration of the available DMIA budget, proposed projects will be selected for inclusion in the DMIA program and recommended for authorisation at the appropriate delegation level. Projects approved to proceed to a full trial are defined as Stage 3 projects.

2.3 Statement on costs

In submitting this program for inclusion in the DMIA Scheme, Ausgrid confirms that the program costs:

- are not recoverable under any other jurisdictional incentive scheme;
- are not recoverable under any other State or Commonwealth Government scheme;
- are not included in the forecast capex or opex approved in the AER's distribution determination for the next regulatory control period; and
- are not eligible for recovery under the D-Factor Scheme.

3 DMIA project summary

Project	2018/19 Actual Cost (excl GST)	Year initiated
New projects (initiated in 2018/19)		
DTAPR Mapping Platform	$ 6,844	2018/19
Peak Time Rebate (Retailer Demand Response)	$19,087	2018/19
Stand Alone Power Systems	$51,893	2018/19
Electric Vehicle Demand Research	$99,244	2018/19
Digital Energy Futures	$13,042	2018/19
Cost Reflective Network Pricing Research	$58,671	2018/19
Community Battery Feasibility Study	$158,977	2018/19
New projects sub-total	**$407,757**	
Existing projects (expenditure in 2018/19 and initiated prior to 2018/19)		
Power2U (Demand management for replacement needs)	$370,323	2016/17
Battery Demand Response (VPP) Trial	$148,288	2016/17
Existing projects sub-total	**$518,611**	
TOTAL	**$926,368**	

4 New projects

4.1 DTAPR Mapping Platform

4.1.1 Project nature and scope

Ausgrid publishes a Distribution and Transmission Annual Planning Report (DTAPR) on an annual basis intended to assist non-network proponents in proposing alternative solutions to defer network upgrades and to inform interested parties. The DTAPR and its predecessor documents have progressively grown in size and scope over the years and while containing all the required information, stakeholders have commented that the information is not readily accessible.

4.1.2 Project aims and objectives

The primary objective of the project is to improve the accessibility, quality and timeliness of published planning information through consideration of online mapping content. The primary purpose of this would be to improve the transparency and provision of network investment and constraint information to non-network market providers and other market participants.

4.1.3 Implementation plan

The project was to be implemented in two phases:

Phase 1 – Initial 2018 development

Phase 1 of the project involved initial investigation of mapping platforms, selecting a preferred approach and uploading/displaying information contained in the 2018 DTAPR.

Phase 2 – Refinement of mapping tool

Phase 2 will consider options for improvements including:

- Information accessibility;
- Including additional information layers such as generator hosting capacity; and
- Including/enhancing other information based on stakeholder feedback.

4.1.4 Results

In Phase 1, the investigations into the various mapping platforms yielded 2 potentially viable options:

Option 1: Ausgrid-specific mapping tool

This option considered a 3rd party mapping tool that could be tailored to Ausgrid's specific needs. This mapping tool is currently used by several other DNSPs.

Option 2: Industry standard mapping tool

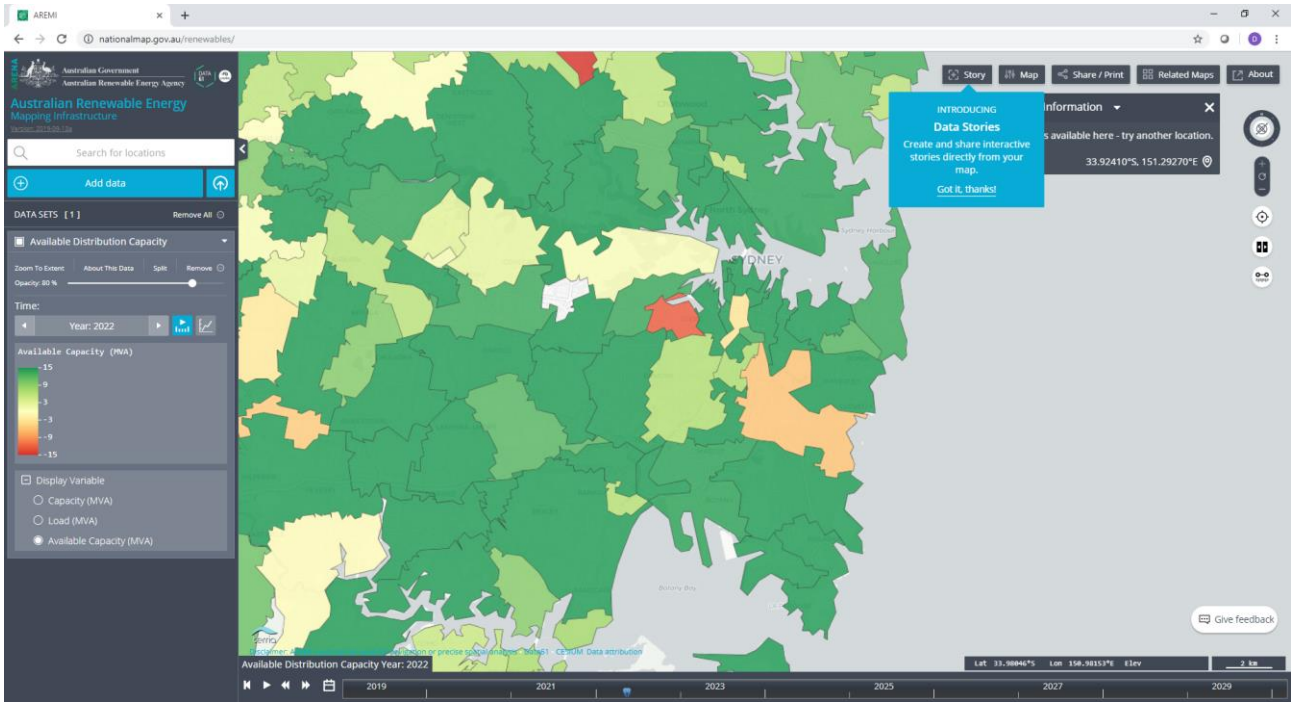
This option involved Ausgrid providing DTAPR information to the Australian Renewable Energy Mapping Interface (AREMI map), which is a mapping platform spanning the entire National Electricity Market and also displays other information layers such as population attributes, infrastructure, environment and topography. The AREMI map is funded by ARENA and was developed by CSIRO in partnership with the Clean Energy Council. The AREMI map is an evolution of the Network Opportunity Maps used to display information contained in prior annual planning reports.

Following an assessment of the two options, option 2 was selected as the preferred option at this time. The AREMI solution was selected as it:

- offered a standard, NEM wide solution for industry;
- encouraging signs that additional information layers could be accommodated;
- identified transition pathway to improved update process; and
- existing shared funding arrangements such that it offered a lower cost solution.

See below Figure 1 for a screenshot of AREMI platform showing the Ausgrid network area.

Figure 1 – AREMI platform – Available Distribution Capacity



4.1.5 Implementation costs of the project

A summary of the actual project costs for 2018/19 is shown below, with all expenditure being operating expenditure (OPEX):

Budget Item	2018/19 Actual	Total Actual
Project research and development	$6,844	$6,844
Project delivery	$0	$0
Total (excl GST)	$6,844	$6,844

4.1.6 Project Progress & identifiable benefits

In 2018/19, progress was as described in 4.1.4. Identifiable benefits include the successful upload and display of Ausgrid's 2018 DTAPR dataset in the AREMI mapping platform found at https://nationalmap.gov.au/renewables/.

4.2 Peak Time Rebate (Retailer Demand Response)

4.2.1 Project nature and scope

Ausgrid is seeking to assess the cost-effectiveness of a peak time rebate offer in localised areas of the Ausgrid network area on peak demand days. The project aims to test whether this option can be used to alleviate location specific short-term network constraints, to defer or reduce the need for longer term network infrastructure upgrades.

4.2.2 Project aims and objectives

The main objectives of the project include:

- Measure demand reductions on peak event days for statistically significant samples of customers in specific geographic locations;
- Assess customer acquisition strategies and associated costs when using various engagement techniques and offerings;
- Identify average costs to roll out this program, in $/customer and $/kVA (or kW) peak reduction; and
- Identify opportunities and barriers for future deployments.

4.2.3 Implementation plan

Ausgrid planned to collaborate with electricity retailers and/or aggregators to leverage their existing residential peak time rebate customer offerings for summer 2019/20 and potentially future summers (e.g. 2020/21 and 2021/22). Ausgrid is seeking to assess the value of peak time rebate offers in areas that replicate areas with forecasted network investment needs.

Locations proposed for this trial will be selected based on similar weather conditions, location and demographics to areas forecast to have network investment needs in the future. In addition, areas that have high customer penetration and generally large load flexibility will be chosen.

The preliminary draft implementation plan is for Ausgrid to collaborate with electricity retailers or other aggregators to offer network peak reduction incentives to customers in a few geographically specific areas to reach the aims and objectives outlined in section 4.2.2.

4.2.4 Results

Up until June 2019, the project was still being developed and no specific results can be reported. Research was conducted on past projects and discussions and workshops with electricity retailers were held to investigate and collaborate on a potential program. These discussions and further project development will continue into 2019/20 towards development of a full implementation proposal plan.

4.2.5 Implementation costs of the project

A summary of the actual project costs for 2018/19 is shown below, with all expenditure being operating expenditure (OPEX):

Budget Item	**2018/19 Actual**	**Total Actual**
Project research and development	$19,087	$19,087
Project delivery	$0	$0
Total (excl GST)	**$19,087**	**$19,087**

4.2.6 Project Progress & identifiable benefits

In 2018/19, progress was as described in section 4.2.4. During this period, the project was in the research and development phase with the implementation stage scheduled for 2019/20.

4.3 Stand Alone Power Systems

4.3.1 Project nature and scope

This project was developed to improve the techniques and processes by which Stand Alone Power Systems (SAPS) can be assessed as non-network options for Ausgrid's demand management investigations and regulatory investment test- distribution (RIT-D) projects. To date, Ausgrid has dealt with only a few instances where SAPS have been investigated as a non-network solution.

4.3.2 Project aims and objectives

The primary objective of this project is to develop the tools for performing initial screening of network investments (projects and programs) comparing credible network options to SAPS solutions.

Secondary objectives include identifying case studies in the Ausgrid network where SAPS are a potentially viable alternative to traditional network options and the associated customer engagement processes that might be needed to implement an individual power SAPS system or micro-grid SAPS solution.

4.3.3 Implementation plan

The project is planned to take place over two years in 2018/19 and 2019/20 as follows:

Phase 1 - Costs Benefit Assessment tool development for SAPS

Phase 1 will involve the development of a suite of tools that can be used to quantitatively assess whether a Stand-Alone Power System is a more cost-effective alternative to a traditional network solution. Two specific tools that are envisaged to be in scope of this phase of the project are:

Phase 1A - Stand Alone Power Systems planning tool

Phase 1A of the project focuses on development of a SAPS planning tool to estimate the likely cost of delivering a SAPS for a defined set of customer and network characteristics. This phase of the project will provide:

- A whole-of-life SAPS sizing and costing tool that determines the optimum SAPS configuration based on customer interval demand data and a given set of constraints; and
- A customer interval demand data estimation tool where metered interval data is not available.

Phase 1B - Overall Cost Benefit Assessment tool

Phase 1B of the project builds upon Phase 1A to develop a cost-benefit assessment (CBA) tool which will capture all the relevant costs and benefits associated with deploying a SAPS, which include:

- Avoided costs associated with bushfire risk due to network assets traversing bushfire-prone areas;
- Avoided costs associated with safety risks due to electrical infrastructure;
- Avoided network asset replacement and maintenance costs;
- Financial impacts of improved customer reliability;
- SAPS installation costs; and
- SAPS maintenance costs.

The CBA tool delivered in Phase 1B will allow a consistent, quantitative assessment of whether SAPS deployment offers a cost-effective alternative to traditional supply-side network investment for a given part of Ausgrid's network.

Phase 2 – Case study identification and customer engagement

Phase 2A - SAPS case study identification

The case study identification phase of the project would commence in parallel with activities to help define the inputs, scope and outputs required for the tools being developed in Phase 1. Case study identification will assist in getting a better understanding of how different scenarios may affect the scope of the tools required.

Phase 2B - Customer engagement process development

This phase of the project would develop a customer engagement process and strategy for providing customers with a SAPS solution which would consider how the various ownership options might influence the overall process (customer-owned, third party owned or DNSP owned). To inform this component of the project, a customer survey would be planned to explore customer experiences around the reliability of supply in rural areas and their perceptions/ reactions to going off-grid.

Phase 3 – Stand Alone Power Systems pilots

Building upon work in Phase 1 and 2, one or more of the case studies identified in Phase 2A could be progressed to a pilot program. The budget for a pilot program has not been included in this proposal and may be funded from Ausgrid's Network Innovation program funding for the 2019-24 regulatory period.

4.3.4 Results

An external provider was engaged to deliver Phase 1A.

The SAPS planning tool involved the customization of a widely used commercially available SAPS sizing and costing software tool, as well as development of training and instruction manuals from an external provider.

The customer interval demand data estimation tool included the development of six use cases to represent typical customer profiles, to be used when interval meter data is not available. These six customer profiles represented residential, residential with controlled load hot water heating, microgrid, pumping stations, telecom towers and small commercial premises. Monthly or quarterly electricity meter reads are inputted to develop an approximate hourly load profile, with sensitivities enabled for higher or lower peak demands. The default profiles were developed from a statistical analysis of real customer data.

Following are screenshots from the Ausgrid SAPS planning tool.

Figure 2 – Ausgrid SAPS planning tool – SAPS design interface

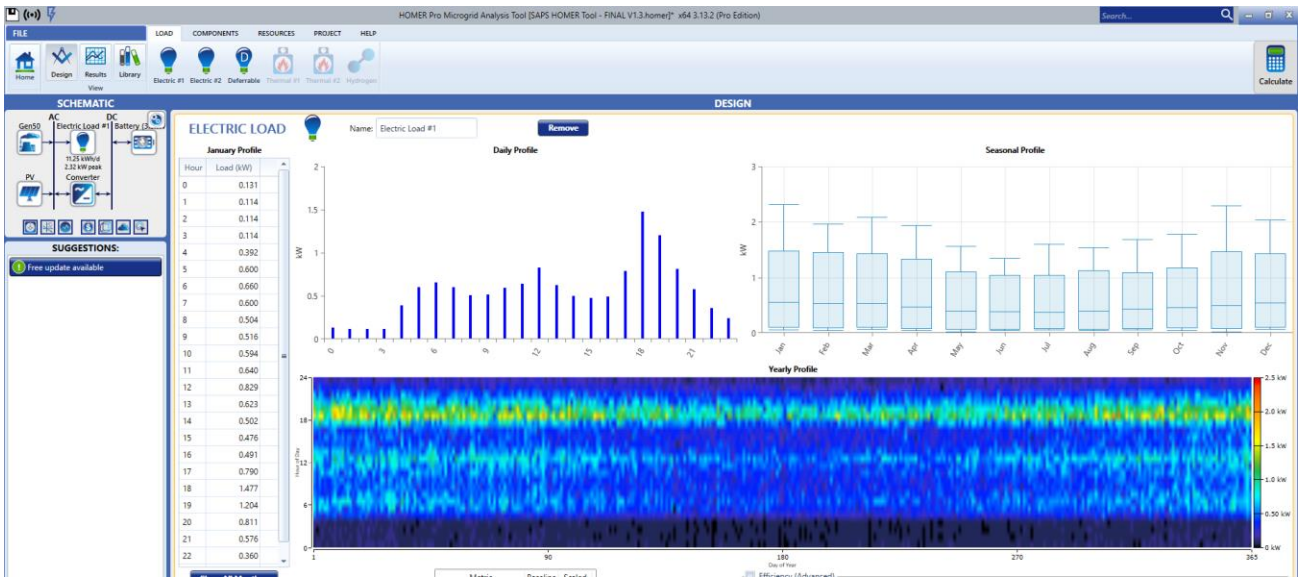
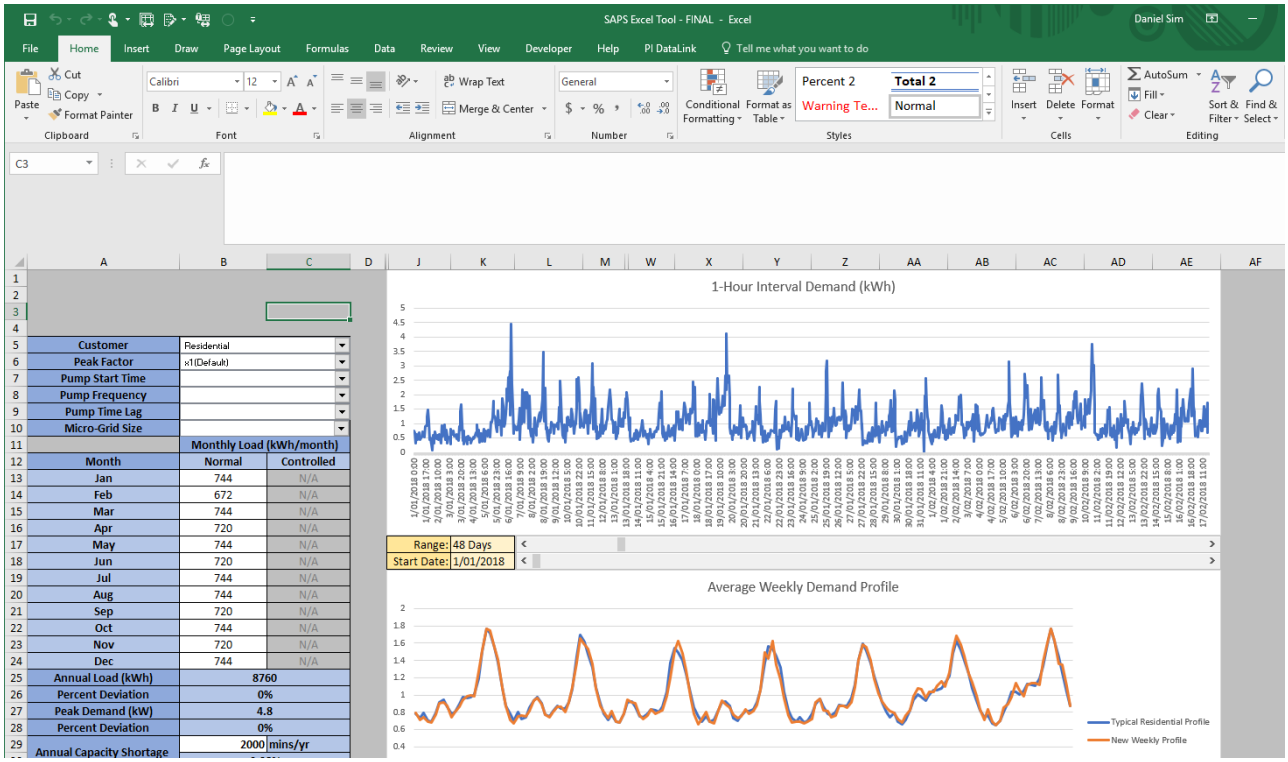


Figure 3 – Ausgrid SAPS planning tool – customer interval data estimation



Once customer interval demand data is obtained from actual metered data or from the customer interval demand data estimation tool, the SAPS planning tool is used to determine the optimum SAPS configuration. An external consultant established equipment costs on a per kW (for photovoltaic systems and generators) or per kWh for battery systems, to enable the tool to optimise the sizing and costing of the SAPS to meet the customer's load requirements subject to a given set of constraints, at the lowest net present cost. Costings include whole of life costs, including fencing, inverter sheds and project management, as well as lifetime maintenance and refuel costs. Constraints may include minimum reliability requirements, allowable backup diesel generator operation hours etc.

4.3.5 Implementation costs of the project

A summary of the actual project costs for 2018/19 is shown below, with all expenditure being operating expenditure (OPEX):

Budget Item	2018/19 Actual	Total Actual
Project research and development	$0	$0
Project delivery	$51,893	$51,893
Total (excl GST)	**$51,893**	**$51,893**

4.3.6 Project Progress & identifiable benefits

In 2018/19, progress was as described in section 4.3.4. Identifiable benefits to date has been the finalisation of the SAPS planning tool.

4.4 Electric Vehicle Demand Research

4.4.1 Project nature and scope

This project will be conducted over a 2-year period which will explore the potential impacts of electric vehicle (EV) charging on the Ausgrid network and the viability and customer response to various demand management interventions.

Phase 1 of the project involves supporting an ARENA-funded project called Charge Together being led by start-up company, EVenergi and other partners including the EV Council, NRMA and the NSW Government.

Phase 2 of the project will take lessons learned from Phase 1 to trial potentially viable demand management options for electric vehicle charging.

4.4.2 Project aims and objectives

The primary objective of the project is to

- Understand and research options for demand management interventions using EV chargers to shift or curtail demand during peak demand periods; and
- Conduct a demand management trial, where possible, to explore potential demand management options based on the research outcomes.

Other secondary objectives include:

- Determining a best practice approach for activity-based forecasting of EV uptake and related impacts;
- Sourcing, creating and collecting activity-based data;
- Reviewing and making recommendations on the collection of data on new demand on the network resulting from EV charging;
- Reviewing and making recommendations on available distribution network capacity for EV charging; and
- Producing an example simulation to demonstrate the approach.

4.4.3 Implementation plan

The project will be conducted in two phases:

Phase 1 - Charge Together Project support, led by Evenergi (ARENA-funded) in 2019

There are three main activity streams for this project that were initiated in 2018/19 and are planned to be completed in 2019/20. Ausgrid is supporting all activities via in-kind support but is principally supporting the third activity around the development of the electric vehicle network forecasting and planning tool. The three main activities are:

1. The development of a suite of fleet products which can be provided to fleet managers with all the tools necessary to migrate their fleets to electric vehicles.
2. The development of a private individual product that will provide individual EV buyers with the tools necessary to make an EV purchasing decision.
3. The development of an electricity network planning tool to assist Australian electricity network providers in planning and preparing for the impacts of EV charging on their network.

Phase 2 – Customer pilot/ trial to commence in 2020

This phase of the project will be contingent on the outcomes from Phase 1 and additional project funding may be requested depending on the scope of these activities. The primary objective will be to trial demand management options for electric vehicle charging.

4.4.4 Results

The project commenced in January 2019 when the Charge Together project extension was confirmed and Ausgrid's support was finalized including execution of a project funding deed including where deliverables and scope were defined. Up until June 2019, the following activities were completed as part of Phase 1 support for the EVenergi project

- Ausgrid (with the support of AEMO) conducted an Australian DNSP survey of electric vehicle impact forecasting methodologies during April 2019. The results from this survey were presented at an AEMO Forecasting Reference Group meeting in April 2019;
- In June 2019, a workshop with Ausgrid, Endeavour Energy, Essential Energy, SA Power Networks EVenergi, NSW Government and Macquarie University was conducted in Sydney to develop the framework and typology methodology to be used for the network forecasting tool; and
- Participation by Ausgrid's fleet and sustainability manager in meetings and development work for the fleet products and tools.

4.4.5 Implementation costs of the project

A summary of the actual project costs for 2018/19 is shown below, with all expenditure being operating expenditure (OPEX):

Budget Item	2018/19 Actual	Total Actual
Project research and development	$0	$0
Project delivery	$99,244	$99,244
Total (excl GST)	**$99,244**	**$99,244**

4.4.6 Project Progress & identifiable benefits

In 2018/19, progress was as described in section 4.4.4. Identifiable benefits to date have been the engagement and knowledge sharing aspects with other DNSPs and industry stakeholders who are preparing for the future electrification of the transport sector.

4.5 Digital Energy Futures

4.5.1 Project nature and scope

This project is a 3-year research project being led by Monash University in which Ausgrid is a co-funding and in-kind contributor in partnership with Energy Consumers Australia and Ausnet Services. The project has been granted funding from the Australian Research Council due to its innovative combination of research techniques.

The project aims to understand and forecast changing digital lifestyle trends and their impact on future household electricity demand, including at peak times. The project expects to generate new knowledge by employing digital ethnography and sociological theories to investigate how changing social practices will impact on electricity sector planning. Expected outcomes include: scenarios and principles for digital energy futures; an interdisciplinary energy demand forecasting methodology; and demand management tools to help the sector meet future residential consumption. This should provide significant benefits, such as lowering the cost of infrastructure spending, and helping secure affordable electricity provision.

4.5.2 Project aims and objectives

The project has 5 key objectives, which are to:

1. Understand how Australian household practices (e.g. heating, cooling, entertaining) are changing and likely to change in relation to emerging digital technologies and across different electricity consumer groups.

2. Identify emerging future scenarios and principles that will affect electricity sector planning in the near-medium (2025-30) and medium-far (2030-50) futures.

3. Develop a theoretical and methodological approach to anticipate changing trends in household practices and energy demand, which brings a futures perspective to theories of social practice and digital ethnography.

4. Develop an industry-relevant forecasting methodology for tracking and anticipating peak electricity demand, and energy consumption more broadly, that incorporates insights from this future-oriented social science research.

5. Develop practical demand management solutions for Australian electricity network businesses to plan for efficient, cost-effective and reliable networks.

4.5.3 Implementation plan

The project will take place over 3 years, starting in late 2018/19 and continuing through 2019/20, 2020/21 with completion expected to be in 2021/22. There are 6 stages to the project that were put forward in the ARC grant proposal:

Stage 1: Digital and energy futures analysis – to inform the ethnographic research and establish trends (Year 1, objective 1)

Stage 2: Digital ethnography with households – with consumer groups in Ausgrid's and AusNet's work areas to generate future scenarios and medium-far futures principles (Years 1 and 2, objectives 1, 2 and 3)

Stage 3: Survey supplement for ECA's annual Energy Consumer Sentiments Survey – (Years 2 and 3) objectives 1, 2 and 3

Stage 4: Scenario innovation workshops – with residential consumers in Ausgrid's and Ausnet's networks to update and extend the scenarios and principles (Year 2, objectives 1, 2 and 3)

Stage 5: Modelling and forecasting development – to cross-analyse, translate and refine the findings, and develop a forecasting methodology (Year 3, objectives 3 and 4)

Stage 6: Demand management innovation – to identify opportunities in emerging trends that are likely to impact the affordability and reliability of electricity supply for residential customers (Year 3, objective 5)

4.5.4 Results

In 2018/19, the project was in a development phase and involved work on developing the original ARC grant proposal in conjunction with the lead and partner organisations and finalising the partner agreements for the ARC grant funding. The ARC grant was awarded in January 2019 with further information can be found here.

4.5.5 Implementation costs of the project

A summary of the actual project costs for 2018/19 is shown below, with all expenditure being operating expenditure (OPEX):

Budget Item	2018/19 Actual	Total Actual
Project research and development	$13,042	$13,042
Project delivery	$0	$0
Total (excl GST)	**$13,042**	**$13,042**

4.5.6 Project Progress & identifiable benefits

In 2018/19, progress was as described in section 4.5.4. During this period, the project was in the research and development phase and included work on developing the original ARC grant proposal in conjunction with the lead and partner organisations and finalising the partner agreements for the ARC grant funding.

4.6 Cost Reflective Network Pricing Research

4.6.1 Project nature and scope

This 2-year project will aim to quantify the peak demand reduction benefits from the introduction of cost reflective network pricing to residential and small business customers to better understand the effectiveness of these pricing structures as a targeted demand management tool for network investments. The network pricing structure under study will include both seasonal time of use and monthly demand pricing structures and be focused on the residential sector for the first phases of the project. The project would be split into several phases as detailed in section 4.6.3 below.

4.6.2 Project aims and objectives

The primary objective of this project is to better understand and quantify the impact of cost reflective network pricing structures on reducing electricity demand at times of peak demand.

Secondary objectives include better understanding of the complementary measures that could be used to increase the effectiveness of these network pricing signals as an effective demand management tool.

4.6.3 Implementation plan

The project will be conducted over a 2-year period in three phases:

Phase 1 – Customer research and surveying

A. Customer surveying

Phase 1A will involve surveying around 1,000 residential customers and obtaining more detailed information about their appliances, socio-demographics and retail pricing plans. Costs for the customer survey work will be shared with network pricing team who are focusing on understanding customer impacts of demand pricing and conducting a longitudinal study of these customers that are subjected to demand pricing.

B. Customer focus groups

Phase 1B will involve following up with a sample of customers from the survey to further explore their understanding of pricing plans, energy-use behaviors and responses to these pricing signals. Potential complementary measures will also be explored in more depth during the phase.

Phase 2 – Demand reduction study and analysis

Phase 2 will involve engaging a consultant or other party to perform a more detailed study of the impact of cost-reflective network pricing using historical data from interval and smart meter customers, results from the customer survey above, and further survey work or follow ups with customers from the survey.

A more detailed scope of works will be developed during FY19/20 including monitoring of customer statistics and details of customers who are defaulted onto demand pricing during FY19/20.

Phase 3 – Trial program

Phase 3 would involve a trial of complementary measures identified in Phase 1 and Phase 2 that increase the effectiveness of seasonal time of use or monthly demand pricing in reducing peak demand as well as mitigating customer impacts particularly on vulnerable customers.

4.6.4 Results

In 2018/19, work included development of the project and completion of the Phase 1A survey of residential customers with a total of 1,118 respondents. This survey was statistically designed to achieve the objectives of the study and included over sampling in known areas of the network where there is a known or emerging network constraint.

Analysis of the survey results and Phase 1B and Phase 2 activities are planned for 2019/20.

4.6.5 Implementation costs of the project

A summary of the actual project costs for 2018/19 is shown below, with all expenditure being operating expenditure (OPEX):

Budget Item	2018/19 Actual	Total Actual
Project research and development	$0	$0
Project delivery	$58,761	$58,671
Total (excl GST)	**$58,761**	**$58,671**

4.6.6 Project Progress & identifiable benefits

In 2018/19, project progress is outlined in the results section 4.6.4. Outcomes from the study will be reported in future years.

4.7 Community Battery Feasibility Study

4.7.1 Project nature and scope

This project aims to develop a feasibility study and model business case for community batteries as a solution for local network constraints. The program is designed to research and develop capability in a new and innovative approach to managing network constraints driven by peak load, minimum demand and associated issues with voltage, system frequencies and power quality management, and the need to manage diverse power flows and system security issues.

4.7.2 Project aims and objectives

The primary objective for this project is to develop a feasibility study and model business case for community batteries as a solution for local network constraints. Where potentially viable, the project will develop an implementation proposal/ plan for a possible community battery pilot to verify model business case assumptions on battery and market performance.

4.7.3 Implementation plan

The project will take place over the 2018/19 and 2019/20 years according to the following phases:

Phase 1 – Feasibility study and model business case

The first phase of the project is to develop a Feasibility Study and Model Business Case for community batteries as a solution or local network constraints. The supplier consultant chosen for this phase of the project will lead and manage the development of the Feasibility Study and Model Business Case. Ausgrid will provide access to internal subject matter experts (SMEs) and data as necessary for the project.

Phase 2 – Possible follow up work

Phase 2 is contingent on any further work identified in Phase 1 outcomes. This further work may be the result of internal and external review of Phase 1 deliverables that were not in the scope of Phase 1 and may allow for more detailed business case development work or to develop a detailed implementation or delivery plan.

Phase 3 – Community Battery pilot project

The details and funding of a Phase 3 pilot program would be contingent upon the outcomes from Phase 1 and 2 and internal and external review of these outcomes. Where the solution is found to be potentially viable, the project will develop an implementation proposal/ plan for a community battery pilot to verify model business case assumptions on battery and market performance.

4.7.4 Results

During 2018/19, Phase 1 of the project commenced where a consultant was engaged to conduct a Feasibility Study and develop a Model Business Case. In 2018/19, the consultant had conducted a series of workshops together with Ausgrid to advance the study. The workshops were divided into category streams of Engineering, Regulation and Commercial.

As part of this phase, Ausgrid also conducted a detailed analysis of all 34,000 distribution transformers in the network to identify representative distribution transformers to assist in the development of the use cases for the feasibility study and model business case. A material proportion of the representative locations had distribution transformer monitoring offering half-hourly interval data.

In addition, customer half-hourly energy use data from around 10,000 customers from the representative distribution transformer dataset was compiled. This customer data included customers with and without solar power systems. This data was provided to the consultants for more detailed analysis to better understand the potential customer and network benefits of a community battery.

Final reports from the Phase 1 feasibility study and model business case are expected to be completed early in 2019/20.

4.7.5 Implementation costs of the project

A summary of the actual project costs for 2018/19 is shown following, with all expenditure being operating expenditure (OPEX):

Budget Item	2018/19 Actual	Total Actual
Project research and development	$0	$0
Project delivery	$158,977	$158,977
Total (excl GST)	**$158,977**	**$158,977**

4.7.6 Project Progress & identifiable benefits

In 2018/19, project progress, focused on Phase 1 activities, is described in results section 4.7.4. Outcomes from the study will be reported in 2019/20.

5 Existing projects

5.1 Power2U (Demand Management for Replacement Needs)

5.1.1 Project nature and scope

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 / replacing aged assets. Around 80% of Ausgrid's capital investment expenditure over the next 5-10 years is related to the retirement / replacement of aged assets and this will be an important project in building demand management capability for this type of application.

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. The project plans to leverage the interest from market providers created by the Powering Sydney's Future project, which includes major retailers and other key market providers.

The project consists of the following phases:

Phase 1: Market engagement and partner selection – this was completed in the first quarter of 2019, and the last market provider was on-boarded in August 2019.

Phase 2: Initiate and operate trial activities over an 18 to 24-month period

Phase 3: Assessment of trial objectives with project partners, reporting and sharing of lessons learned

5.1.2 Objectives

The two primary objectives of the project would be to:

A. Test the effectiveness of customer incentives in a targeted geographic area that lead to new installations of technologies that offer permanent demand reductions (e.g. solar power and energy efficiency). This trial is aimed to test whether targeted incentives can create additional customer activity (i.e. above business as usual).

B. Study the viability of traditional demand response options to manage load at risk in the event of a network outage. This objective would be more focused on exploring the potential of using customer generation, battery storage, load shedding or other flexible demand response options for longer durations typical of a network outage scenario.

Secondary objectives include

- Identification of strategies to build effective solution portfolios to manage risk; and
- Policy and contract mechanisms to support agreed non-network solutions with customers; and
- Identification of connection process changes to improve customer outcomes.

5.1.3 Implementation plan

Phase 1: Market engagement and partner selection – invite submissions/proposals from market to clarify specific trial operational issues and select preferred project partners. Establish service contracts with market providers and project partners. Completed in 2018/19.

Phase 2: Initiate and operate trial activities over an 18 to 24-month period.

Phase 3: Assessment of trial objectives with project partners, reporting and sharing of lessons learned.

5.1.4 Results

During 2018/19, Phase 1 market engagement and project partner selection was completed, and Phase 2 trial operations were initiated. The results of the activities in 2018/19 included the following:

- Contracts with funding partners were finalised in Q1 and Q2, with funding agreements with City of Sydney and the Australian Renewable Energy Agency (ARENA) completed.
- Contracts with five (5) market provider partners finalised in 2018/19 Q3 and Q4. Market partners and program areas detailed on Ausgrid's website here.
- Trial activities commenced in selected suburbs in the Canterbury Bankstown in 2018/19 Q3, Concord in 2018/19 Q3 and City of Sydney areas in 2018/19 Q4.

As at end 2018/19, the market providers had established preliminary market offers to customers with limited progress to end 2018/19. Detailed reporting will be available in 2019/20.

5.1.5 Implementation costs of the project

A summary of the actual project costs for this year and previous years is shown below, with all expenditure being operating expenditure (OPEX).

Actual DMIA project costs:

Budget Item	Previous Years Actual	2018/19 Actual	Total Actual
Project research and development	$ 5,552	$0	$ 5,552
Project initiation	$264,883	$215,353	$480,236
Project delivery		$154,970	$154,970
Total (excl GST)	**$270,435**	**$370,323**	**$640,758**

5.1.6 Project progress & identifiable benefits

In 2018/19, project progress is described in results section 5.1.4. Outcomes from the implementation of incentives for solar and lighting upgrades will be reported in 2019/20.

5.2 Battery Demand Response (VPP) Trial

5.2.1 Project nature and scope

Ausgrid's Battery Demand Response (Virtual Power Plant, VPP) trial explores whether battery VPP's can provide reliable and cost competitive sources of demand reductions or voltage support services to defer network investment. This project will show how the grid can integrate with renewables and partner with industry and customers to maximize grid efficiency benefits and reduce costs for customers. This project aims to investigate the potential application of demand response for residential batteries for network support services by engaging with customers with an existing battery system.

5.2.2 Objectives

The three primary objectives of the project are to:

- Test whether customer battery systems offer a technically and commercially viable demand management option.
- Test customer take-up of a network support (demand response) offer whereby customer battery systems are dispatched to align with network needs.
- Investigate and trial the integration of battery management platforms or systems within the Distributed Energy Resource (DER) optimisation platform of Ausgrid's Advanced Distribution Management System (ADMS).

Secondary objectives include;

- Better understanding of the types of customer battery systems being installed by early adopters of the technology
- Better understanding of the impacts on maximum demand and energy volume for a customer with a battery system with and without a demand response offer.

5.2.3 Implementation plan

The project is planned to be divided into 3 phases to align with the objectives set for the project:

- Phase 1 – Battery customer market research (completed)
- Phase 2 – Customer trial over 2 to 3 summer seasons
- Phase 3 – Distributed Energy Resource integration with the Advanced Distributed Management System (ADMS)

Phase 1 of the trial included collation and analysis of information of battery systems connected to Ausgrid's network and an exploration of possible offers and contractual arrangements with a range of different market providers (e.g. battery suppliers, aggregators and energy service providers). This Phase was completed in 2018/19.

Phase 2 of the project will include customer battery system dispatch and further development of aggregator partnerships. This Phase was initiated in 2018/19.

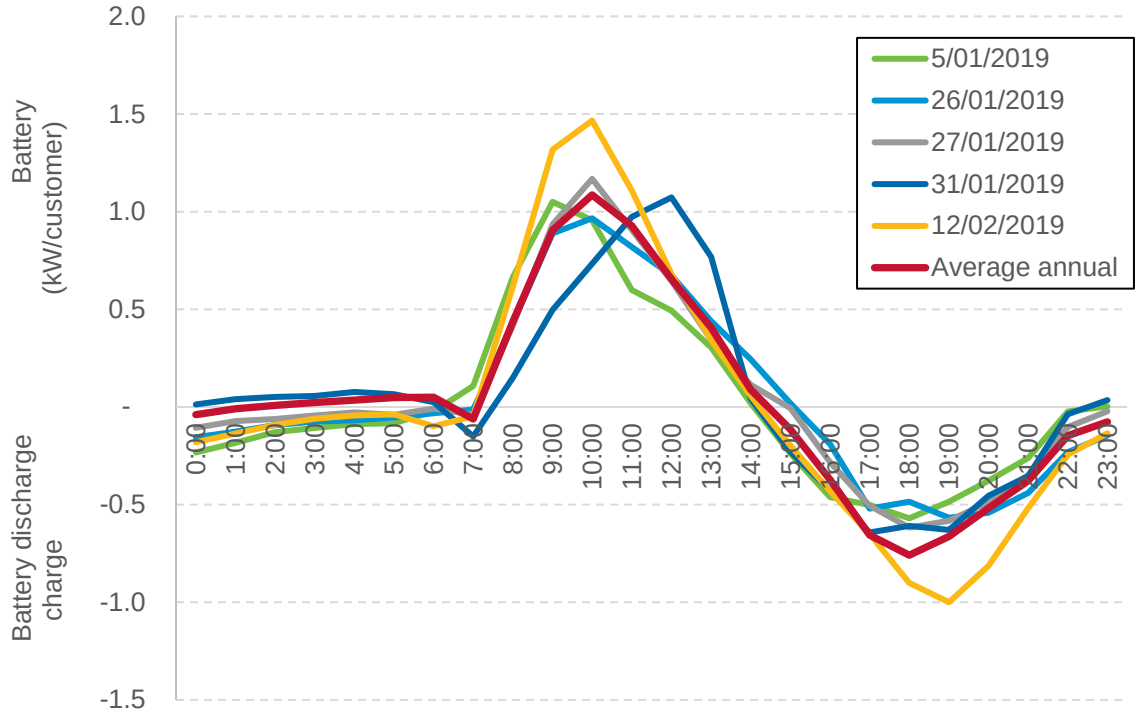
Phase 3 of the project will focus on the integration of network support dispatch and constraint management into the DER platform of Ausgrid's Advanced Distributed Management System (ADMS).

5.2.4 Results

Ausgrid's Battery Demand Response (VPP) Trial is designed to assess whether battery VPPs can provide reliable and cost competitive sources of demand reductions or voltage support services to avoid or defer network investment. Ausgrid's partnership with Reposit Power marked the first stage of the program during 2018/19, with hundreds of customers combining to form a 1-megawatt VPP (phase 1). The second phase of the project for 2019/20 and 2020/21 will include additional VPP aggregators and technology providers to expand the scope and scale of the VPP and enable greater customer choice.

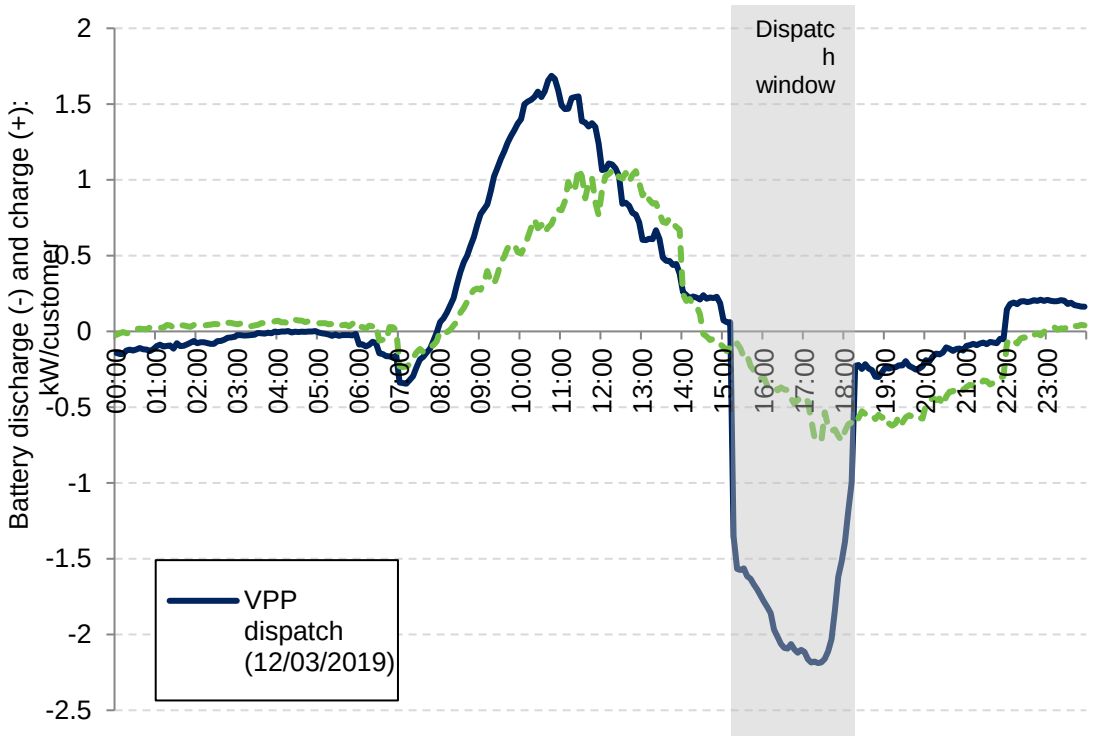
Results of phase 1 of the VPP trial conducted during 2018/19 were published in August 2019 and is available on Ausgrid's website, here. The results suggest that residential battery systems without VPP control (Reposit Power's 'business as usual' operation) typically reduce grid electricity demand during evening peak periods, suggesting that the wider rollout of residential batteries will have a positive benefit on the network. Typical charge and discharge profiles of the fleet can be seen in the graph below, for 5 high temperature days and the annual average.

Chart 1, the daily battery cycle for 'business as usual' and five extreme temperature days for 2018/19, normalised averaged



Results also highlight the significant potential for the orchestration of residential batteries to support Ausgrid's network needs, above and beyond typical 'business as usual' operation, suggesting that VPPs can offer both a cost-effective source of demand reductions for Ausgrid and additional income for customers. This can be seen during a dispatch of 207 customers on 12th March 2019, where an average of 1.8kW/customer was dispatched.

Chart 2, average battery charge and discharge profile on 12 March 2019



5.2.5 Implementation costs of the project

A summary of the actual project costs for this year and previous years is shown below, with all expenditure being operating expenditure (OPEX).

Actual DMIA project costs:

Budget Item	Previous Years Actual	2018/19 Actual	Total Actual
Project research and development	$66,871	$0	$66,871
Project delivery	$0	$148,288	$148,288
Total (excl GST)	**$66,871**	**$148,288**	**$215,159**

5.2.6 Project progress & identifiable benefits

This second year of the project saw the delivery of the first trial project with the selection of a single market provider for the first year of the customer program, Reposit Power, whom Ausgrid contracted to engage battery customers to take part of the VPP trial. The trial was launched in March 2019 where over 240 of Ausgrid's battery customers participated in various dispatch events in return for a financial incentive.

The project activities have not been planned to align with an area of the network with an investment need. The project is designed to build capability and capacity and explore efficient demand management mechanisms with market providers. This will include measuring the effectiveness and sensitivities of changing incentive levels on encouraging customer demand and gauging how effective they are in achieving permanent demand reductions.

Results of phase 1 of the VPP trial conducted during 2018/19 were published in August 2019 and is available on Ausgrid's website, here. Results from the first season of the phase 2 customer trial are presented in section 5.2.4.