AusNet Electricity Services Pty Ltd

Electricity Distribution Price Review 2016–20

Appendix 9A: DMIA Priority Projects

Submitted: 30 April 2015

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DMIA Priority Projects

2016-2020 EDPR

1 Residential peak demand incentives

This project will investigate the use of financial and non-financial incentives to alter the voluntary behaviour of residential customers such that their consumption of electricity at times of critical peak demand is reduced. The financial aspect is often referred to as a peak demand rebate or critical peak rebate. The participation or otherwise of customers to reduce demand when required can be monitored and verified via smart meter data. As a residential mechanism, this incentives program aims to directly address the main driver of network peak demand, that is, residential air conditioning use on summer afternoons & evenings.

1.1 Project driver

AusNet Services has built up significant experience in procuring demand response from commercial and industrial customers, but is yet to develop a comparable residential capability. Despite being similar in concept, residential voluntary demand response requires a vastly different approach in terms of analytics, customer engagement, and commercial structure compared to commercial and industrial demand response.

Trials have been undertaken by other utilities to prove the use of rebates and financial incentives for residential customers to reduce demand. AusNet Services proposes to build on the available results to not only expedite the planning of its own trial to build internal capability, but to test the benefit of non-financial behavioural motivators in improving participation rates and the level of delivered demand response.

This trial is a critical precursor to the development of a suite of residential demand management tools that can be deployed in the BAU environment to achieve capex deferrals across the 2016-20 period as discussed in the Demand Management chapter of the EDPR.

1.2 Project scope

The trial is envisaged to be of large enough scale to create a real-world demand reduction at 22kV feeder level, and be comparable to other feeder level demand management techniques such as mobile generation, the Grid Energy Storage System or C&I customer demand management. As such, at least 500 customers will need to be recruited into the trial which represents a significant proportion of customers on a typical high voltage distribution feeder.

Project scope elements include:

- **Project planning:** Preliminary planning has already been undertaken by AusNet Services including a literature review of existing trials, selection of appropriate high voltage feeders, customer segmentation based on demand patterns, research into the structure of financial incentives and research into potential non-financial behavioural motivators. The preliminary project plan will be reviewed and finalised as part of this project.
- **Customer engagement:** Liaison with key stakeholder groups such as Local Government, community organisations and community leaders to build awareness, understanding and interest will be critical for both successful participant recruitment and successful demand response actions. Customer feedback such as expectations, preferences and concerns will also be sought.

- **Customer enrolment:** An electronic and paper enrolment system needs to be established including verification of identity, acceptance of program terms, and interface with the metering database. Driving enrolment numbers will require a significant marketing and communications campaign.
- **Operational testing:** Operation of the program over the summer peak period will approximately 5 events where customers are asked to reduce demand. Metering data will capture the performance of individual customers and will be analysed to determine their eligibility for financial reward. Customer surveys will be conducted to establish the level of engagement with the program and the experience of the program from the customer viewpoint.
- **Business Case documentation:** Analysis of customer consumption during notified reduction periods compared to normal consumption will establish the technical benefit of the program in reducing network peak demand. This result combined with the financial factors around enrolment and payment of financial reward, as well as customer acceptance will inform the business case for rolling the program into the BAU environment.

The trial location will be selected from a shortlist of highly loaded but non critical 22kV distribution feeders, or feeders that have other demand management solutions already installed (such as mobile generators) in order that the uncertain level of performance of the incentive program will not risk asset overload or the need for customer load shedding.

1.3 Timeline

The trial is proposed to be initiated early in the 2016-20 regulatory control period in order to allow the technique to be deployed later within the period, should it prove to be technically and commercially viable.

The estimated timeline is as follows:

2016: Project planning, selection of location and development of customer enrolment process. Small volume enrolment of customers for proof of concept.

2017: Communications campaign to drive customer enrolment. Year 1 of full trial.

2018: Year 2 of full trial. Data analysis and customer surveys. Definition of business case parameters to facilitate BAU decision.

2019-20: Continuation of trial including scope to adjust technical & financial parameters. Update of business case inputs as needed.

1.4 Budget estimate

The level of financial incentive required to induce a certain reliable demand response will be a key output of the trial, but an estimate is required in order to establish a project budget. Based on literature surveys, an incentive in the order of $30 per event is typically required. Assuming 5 events per summer and 500 successful participants, a single summer period would cost $75,000 in financial incentive payments.

Table 1.1: Budget estimate for residential peak demand incentives trial

Network element	Cost item
Project Management	$100,000
Enrolment system	$100,000
Community engagement and communications	$250,000
Analytics tool development	$150,000
Financial incentive payments over 4 years	$300,000
TOTAL	**$900,000**

2 Residential air-conditioning load control

This trial involves the voluntary remote control of residential air-conditioners, via the smart meter communications network, to occasionally reduce power consumption at times of network peak demand. Recent model air-conditioners have the ability to reduce compressor load when signalled, and the trial will require development of a communications system between AusNet Services and the customer air-conditioner. As a residential mechanism, this load control trial aims to directly suppress the main driver of network peak demand, that is, residential air conditioning use on summer afternoons & evenings.

2.1 Project driver

The ability of AusNet Services to control air-conditioners remotely would provide the opportunity to reduce residential peak loads at source with little impact on customers' behaviour and comfort. AusNet Services does not currently have the technical or commercial capability to control residential air-conditioners and has identified this as a critical technique to test and develop during the 2016-20 regulatory control period.

Trials have been undertaken by other utilities to prove the concept of residential air-conditioning load control and AusNet Services proposes to build on the available results in developing its own trial. In addition, many new air-conditioners are compatible with AS4755 for demand response which allows a standard Demand Response Enabled Device (DRED) to be used to interface with the appliance. This avoids the need to retrofit or build a bespoke system at the appliance end.

The unique technical characteristics of AusNet Services' smart meter communications network means that significant development work is required to ensure the communications and control functionality can operate. In parallel, AusNet Services will need to evaluate customers' willingness to participate in load control trials and to test different commercial structures to attract customers to participate.

This trial is a critical precursor to the development of a suite of residential demand management tools that can be deployed in the BAU environment to realise capex deferrals across the 2016-20 period as discussed in the Demand Management chapter of the EDPR.

2.2 Project scope

The trial will involve a series of tests to scale up from bench-testing to live proof-of-concept in the field.

Scope elements include:

- **Technical proof-of concept:** Preliminary phase to build prototype communications system and prove the remote control of air-conditioners in response to a manual signal over the smart meter network. Bench-test of a variety of air conditioner models and different smart meter communications scenarios (urban, rural etc).
- **Customer engagement:** Liaison with key stakeholder groups such as Local Government, community organisations and community leaders to build awareness, understanding and interest will be critical for both successful participant recruitment and successful demand response actions. Customer feedback such as expectations, preferences and concerns will also be sought.
- **Customer enrolment:** An enrolment system, both electronic and paper needs to be established including verification of identity, acceptance of program terms, and interface with the metering database. A significant marketing and communications campaign will be required to drive enrolment numbers.

- **Linkage with ICT project:** AusNet Services has proposed to undertake an ICT project that is a pre-requisite for both this DMIA trial and the future BAU deployment of residential appliance load control. The ICT project will build the relevant functionality in AusNet Services' metering, communications and back-end IT systems to enable control of DRED-based appliances. The development of DRED capability within the ICT environment is captured as one component of the ICT project titled "Low Voltage Network Management and Integration of DER".
- **Technology deployment:** Procurement of DRED technology solution and installation services to connect and commission the DRED at each customer air-conditioner.
- **Operational testing:** Operation of the program over the summer peak period will involve a number of events where demand response signals are sent out to the enrolled fleet of air-conditioners. Smart metering data will capture the performance of enrolled households. Customer surveys will be conducted to establish the level of engagement with the program and the experience of the program from the customer viewpoint.
- **Business Case documentation:** Analysis of customer consumption during demand response dispatch periods compared to normal consumption will establish the technical benefit of the program in reducing network peak demand. This result combined with the financial factors around enrolment and technology costs will inform the business case for rolling the program into the BAU environment.

The trial location would be selected from a shortlist of highly loaded but non critical 22kV distribution feeders. This may be in an urban growth corridor, where, if the trial proves successful, the units can continue to operate to defer a future augmentation project. In this scenario, the cost of the trial would be directly returned to customers through the deferral of network capex.

2.3 Timeline

The trial is proposed to be initiated early in the 2016-20 regulatory control period in order to allow the technique to be deployed later within the period, should it prove to be technically and commercially viable.

The estimated timeline is as follows:

2016: Technical proof of concept, development of customer enrolment process. Small volume enrolment of customers for proof of concept.

2017: Communications campaign to drive customer enrolment. Technology procurement and field installation.

2018: Operational test of summer period. Data analysis and customer surveys. Definition of business case parameters

2.4 Budget estimate

The scale of the project is planned at 2,000 customers. The major cost items in the trial are the customer engagement program, the financial incentive for participation and the technology deployment. The cost for each of these items is forecast to be lower under a future BAU deployment, owing to the learning rates that will allow cost reductions and the standardisation of approach.

The total cost of the trial is estimated at $2m according to the following build-up

Table 2.1: Budget estimate for residential air-conditioning load control trial

Network element	Volume	Unit rate	Cost item
Project Management			$150,000
Technology proof of concept			$100,000
Enrolment system			$100,000
Customer engagement program			$250,000
Customer financial incentive	2,000	$200	$400,000
DRED procurement and installation	2,000	$400	$800,000
Trial operational support			$200,000
TOTAL			**$2,000,000**

3 Management and Automation Platform for C&I Demand Response

This project aims to drive efficiencies in AusNet Services' Commercial & Industrial (C&I) customer demand management program and to increase the level of reliability in customer response. The project will trial a software platform that can optimise and automate the dispatch and notification process, and hardware to facilitate voluntary automation of customer facilities. If successful on both technical and economic grounds, this capability would enable the AusNet Services C&I demand management program to grow and embed itself as a BAU solution to network risks and constraints.

3.1 Project driver

AusNet Services has built up a 20MW portfolio of demand response contracts with C&I customers across the distribution network. The management of these contracts is a manual process that sits outside the business-as-usual control centre systems. AusNet Services has identified that a management and automation platform could extract better value from the portfolio by:

- optimising the dispatch of demand response;
- enabling better integration into existing network control systems; and
- improving the firmness of customer response.

To demonstrate and prove the value of this concept, and to de-risk its potential future BAU implementation, an innovation trial is required.

The outcome of this trial will include sufficient information on the performance, costs, benefits and customer acceptance to feed into a business case for BAU deployment of a management platform and automation technology.

3.2 Project scope

There are different approaches to demand response management platforms and AusNet Services proposes to test one or more platforms in order to prove the business case for full implementation.

Scope elements of the trial include:

- **Functional specification:** Definition of the functionality required of the management platform including dispatch optimisation, customer notification system, baselining and verification of performance and financial settlement. The platform could run on a dedicated computer at AusNet Services or be remotely hosted. The customer automation function will be treated separately to the management platform and would require hardware to enable a control signal from the management platform to be communicated to the customer premises and used to action a demand reduction activity. Discussions will be held with customers regarding their suitability for automation and their interest in participating.
- **Procurement:** Refresh understanding of market offerings, assessment of value against the functional specification and procurement of preferred solution.
- **Implementation:** Deployment of management platform, upload of static data such as customer information, and creation of linkages to any dynamic data streams such as network asset loads and ratings. Installation of automation technology including communications systems and hardware in customer premises.
- **Operational testing:** The management and automation platform will be run across two summer peak demand periods and the performance of the system and customers will be logged. Discussions will also take place with customers regarding their experience of the system.

- **Business Case documentation:** A key outcome of the trial is a comparison of firmness of customer response between the existing manual process and the automated process. The benefits and cost savings of the management platform will be quantified in order to feed a business case that assesses the viability of BAU deployment.

3.3 Timeline

This project is planned for delivery early during the 2016-20 regulatory period. Full testing and analysis is expected to take until the mid-period, with results available to allow transfer into BAU prior to period end if the trial proves a commercially viable model.

The estimated timeline is as follows:

2016: Develop functional specification, test market, procure and deploy management platform.

2017: Year 1 of trial. Install customer automation at suitable sites.

2018: Year 2 of trial. Conclusions report and definition of business case parameters

3.4 Budget estimate

AusNet Services has already undertaken a preliminary survey of market offerings. This survey provides a good basis for assembly of a budget estimate although there is expected to be a significant variability in costs between suppliers depending on functionality and approach. The survey of market offerings will be refreshed as part of the project.

The total cost of the trial is estimated at $1m according to the following build-up

Table 3.1: Budget estimate for trial of management and automation platform for C&I DM

Network element	Volume	Unit rate	Cost item
Project management			$70,000
Procurement and installation of management platform			$600,000
Procurement and installation of automation technology	10 sites	20,000	$200,000
Training of AusNet operational staff			30,000
De-installation			$100,000
TOTAL			**$1,000,000**

4 Commercial-scale aggregation of residential battery storage

This project seeks to trial a large-scale deployment of residential battery storage systems on a single 22kV distribution feeder. The trial would include a communications and control system that can aggregate the response of all battery systems to maximise the demand management potential. The trial is designed to build on AusNet Services' existing technically-focussed trial of 10 residential storage systems, and will demonstrate the demand management potential of distributed storage in real-world network conditions. The trial will provide the commercial experience and technical data to allow AusNet Services to utilise distributed storage as an additional option to manage peak demand on constrained network areas.

4.1 Project driver

Energy storage has been identified as a potential means of managing peak demand on the distribution network and improving power quality. When installed behind the customer meter, storage can also offer value to customers through reduced electricity tariff costs.

Storage is emerging as a customer-driven initiative, and AusNet Services requires a good understanding of the network impact and potential benefits of storage prior to wide-scale uptake. Furthermore, there is a clear opportunity to investigate storage as a network-driven initiative given its potential to address peak demand at-source, and its declining cost curve.

To demonstrate and prove aggregated residential storage as a non-network solution to network constraints, a volume trial is required.

The outcome of this trial will include sufficient information on the performance, costs, benefits and customer acceptance to feed into a business case for BAU deployment of residential storage as a peak demand management solution.

4.2 Project scope

This project forms Phase 2 of AusNet Services residential storage innovation program and builds directly on the technical systems experience gained under the current Phase 1 trial of 10 non-aggregated systems. Key elements of the Phase 2 trial are the large scale of deployment, aggregation and remote control capability, customer engagement program and trial of the commercial business model.

Scope elements include:

- **Concept Development:** Based on the results of the Phase 1 storage trial, the functional requirements of the trial will be established including the kWh storage capacity of the systems, the maximum kW charge-discharge ratings, the operational algorithms and the communications and control capability. The aggregation capability will be an essential feature to enable the fleet of storage systems to act in unison as a virtual power station when required to deliver maximum network demand reduction. At other times, the mode of operation should provide reliable customer and network benefits.

- **Commercial structure:** Review of options for structuring the commercial basis of the trial such as outright equipment procurement, partnership with parties such as technology suppliers or electricity retailers, or co-funding with customers.

- **Customer engagement:** Liaison with key stakeholder groups such as Local Government, community organisations and community leaders to build awareness, understanding and interest. Customer feedback such as user experience surveys will also be collected.

- **Technology deployment:** Procurement of technology solution for both hardware and software, and services for both installation and operation.

- **Operational testing:** Development of a test plan that sets out the structure of the trial. Data collection and performance monitoring of the systems including level of peak demand reduction, system utilisation and system availability.
- **Business Case documentation:** Outcomes of the trial regarding the system technical performance, cost parameters, quantification of benefits and customer acceptance will feed into a business case for the application of residential energy storage as a solution to targeted network constraints and as a broad-based initiative to slow demand growth rates.

The trial location would be selected from a shortlist of highly loaded but non critical 22kV distribution feeders. This may be in an urban growth corridor, where, if the trial proves successful, the units can continue to operate to defer a future augmentation project. In this scenario, the cost of the trial would be directly returned to customers through the deferral of network capex.

4.3 Timeline

This project is planned for delivery mid-term during the 2016-20 regulatory period. Full testing and analysis is expected to take until the end of the period, however preliminary results would be available to allow transfer into BAU prior to period end if the trial generates a commercially viable model.

The estimated timeline is as follows:

2015: Analyse and report on phase 1 residential storage trial at the end of the 2-year trial period

2016: Further customisation and testing of phase 1 systems to maximise operational performance and definition of preferred technical parameters

2017: Market survey of technology solutions and customer engagement ground-work

2018: Procure and deploy systems – Year 1 of trial

2019: Year 2 of trial – preliminary results analysis

2020: Conclusions report and definition of business case parameters

4.4 Budget estimate

The trial is envisaged to be of large enough scale to create a real-world demand reduction at 22kV feeder level, and to be comparable to other feeder level demand management techniques such as mobile generation, the Grid Energy Storage System or C&I demand management. As such a 1MW total capacity is targeted which could nominally comprise 250 units of 4kW maximum output and 8kWh useable storage. Using a benchmark rate of $2,000 per kWh for a full-function and remotely controllable storage system, each unit is expected to cost in the order of $16,000.

The total cost of the trial is estimated at $4m according to the following build-up

Table 4.1: Budget estimate for residential battery storage aggregation trial

Network element	Volume	Unit rate	Cost item
Project Management			$200,000
Customer engagement program			$200,000
Procurement (hardware)	250	$16,000	$4,000,000
Procurement (software)			$200,000
Installation	250	$1,600	$400,000
De-installation	250	$1,000	$250,000
Buy-out / salvage value	250	-$5,000	-$1,250,000
TOTAL			**$4,000,000**

5 Mini grid or RAPS deployment for remote community

AusNet Services' view is that mini grids will develop in rural locations with existing communities where there is a motivation for 100% self-sufficiency or to be more environmentally sustainable by using local renewable energy sources. AusNet Services believes that these communities will not "cut the wires", but will rather use the existing network as a top up or standby supply.

In the case of new developments or rural communities where the AusNet Services faces large upgrade or connection costs, mini grids may be developed as self-sufficient islanded networks

5.1 Project driver

In order to prepare AusNet Services' approach to the technical and commercial challenges presented by this future trend towards mini grids we are proposing to carry out a trial. The trial would include selecting a location and funding the installation of mini grid components to allow observation of the behaviour of such a system together with significant community collaboration and input to test the acceptability of such an approach.

Whilst mini grids have been the subject of many studies and scenarios it is critical that DNSP's such as AusNet Services have practical information and technical know-how of the design and operation of mini grids to chart their future strategy with alternative non-network solutions reducing the need for augmentation capex in low load, low growth areas.

Outcomes of the trial would be

- Identification and integrated testing of products and systems
- Protection and control integration strategy and operational capability for mini grids
- Community support for non-network solutions
- Commercial and technical viability of mini grids as an alternative to augmentation

5.2 Project scope

At is simplest, a mini grid is a geographically defined section of network where generation and consumption occur in close proximity, and where use of the main high voltage network is significantly reduced or not required. This comparison is shown graphically in the following diagram.

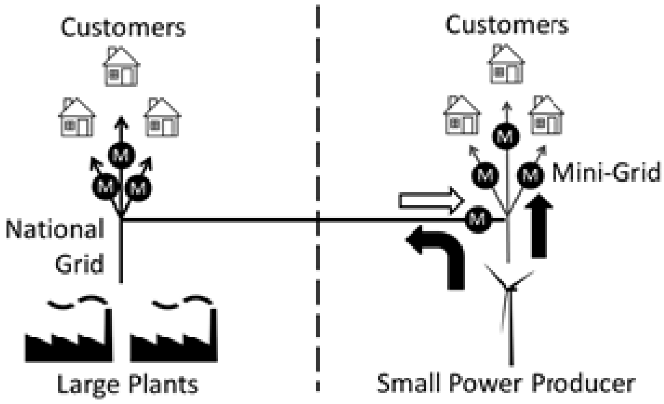

Figure 5.1: Simplified schematic of a minigrid (Credit: Berkeley Lab, 2013).

Key elements of the trial would be:

- Community scale generation using bio fuel sources
- Small scale renewable system network integration (individually owned)

- Control and protection system integration into conventional network control
- Integration with AMI data streams
- Community consultation, education and system design input

The exact project scope will depend on the trial location. Two examples of potentially suitable locations are described below.

Mallacoota

AusNet Services has been working with this community and considering mini grid options for some time to improve supply reliability given the occurrence of natural events (floods, fires etc) along the 300km long 22kV Bairnsdale feeder that can remove the town's network connection. This could equally apply to rural communities that are designated bushfire risk areas and would allow the high-risk element of distribution network to be de-energised as a risk mitigation measure.

There is potential for sewage-generated methane gas, waste to compost fuel and bio fuel which could be harvested to provide local generation. There are individually owned solar PV systems of various sizes that currently switch off during faults and are not useable for local supply of the residence without additional storage and inverter upgrades.

A mini grid would bring all these potential energy sources together into a functioning distributed generation network that could supply the local community, improve its supply quality and sustainability during outages.

Bendoc

AusNet Services has recently taken over responsibility for the network in Bendoc (a north eastern part of Gippsland) that is currently supplied form Country Energy in NSW. AusNet Services has identified the need for significant infrastructure expenditure to the Bendoc network connection. An alternative would be to build a mini grid to allow Bendoc to be powered locally.

5.3 Timeline

The trial is a relatively complex project that will span the duration of the 2016-20 regulatory period.

2016: Selection of location, survey of fuel sources, community engagement and design of the systems

2017: Planning, network studies, components selection and purchasing

2018: Installation and commissioning of the components and system testing

Summer 2018/19: First summer trial period for the mini grid

Summer 2019/20: Second summer trial period for the mini grid including any improvements

2020: Analysis and reporting of the findings to the industry and Asset Management strategy included in AusNet Services planning processes if found to be viable

5.4 Budget estimate

The cost of the project will depend heavily on the location chosen and the load requirements of the local customer base. A nominal budget estimate is provided below totalling **$1.7m**

Table 5.1: Budget estimate for remote community mini-grid or RAPS trial

Network element	Volume	Unit rate	Cost item
Project Management			$100,000
Customer engagement program			$100,000
Dual-fuel 1MW generator (diesel or biodiesel) or modular gas micro turbine for heat and power			$700,000
Storage upgrades for existing PV customers	25	$10,000	$250,000
AMI integration of data streams for analytics and customer feedback/control			$100,000
Protection & control upgrades/studies (network studies and consulting, relay upgrades, SCADA integration)			$200,000
Local small generation units	25	$10,000	$250,000
TOTAL			**$1,700,000**

6 Thermal storage to manage C&I cooling loads

In its recent demand management innovation work, AusNet Services has focussed heavily on batteries to provide energy storage .This project will trial a thermal storage system as an alternative to battery storage to shift the cooling loads of a large commercial or industrial customer from peak to off-peak times.

In the right application, thermal storage may offer a lower cost form of demand management to battery storage. However, the technique is likely to require significant intervention in the customers refrigeration systems.

6.1 Project driver

Cooling loads contribute significantly to peak summer demand, with total network demand on a 44°C day usually reaching more than double that of a 23°C day. The increase in penetration of residential air conditioning has been the main factor behind recent peak demand growth, but commercial & industrial cooling loads, either for space conditioning or process cooling, also contribute substantially to the peak. Commercial businesses are often unable to provide load curtailment throught reducing or deferring these cooling loads. For example, food cold storage facilities need to maintain food temperatures within a safe zone.

The use of thermal storage retrofitted onto existing heating, ventilation and air conditioning (HVAC) or process systems is one potential means to shift electrical cooling loads to outside peak periods while maintaining cooling performance.

A trial of commercial/industrial-scale thermal storage would aim to:

1. Evaluate the efficacy of thermal storage technology in shifting and reducing peak electricity demand due to cooling loads.
2. Obtain experience in integrating thermal storage technology into a customer premises.

Outcomes of the trial are to:

1. Determine technical feasibility of thermal storage for shifting peak demand related to cooling loads.
2. Obtain a better understanding of where and how best to deploy thermal storage technology.
3. Establish financial viability of thermal storage deployed at the commercial and industrial scale in helping to defer or reduce investment in network augmentation.

6.2 Project scope

The cooling requirements of commercial and industrial customers are typically served by a chiller running on a vapour compression cycle as shown in the figure below. In this 'baseline case' the compressor load constitutes the bulk of the electrical demand of chillers.

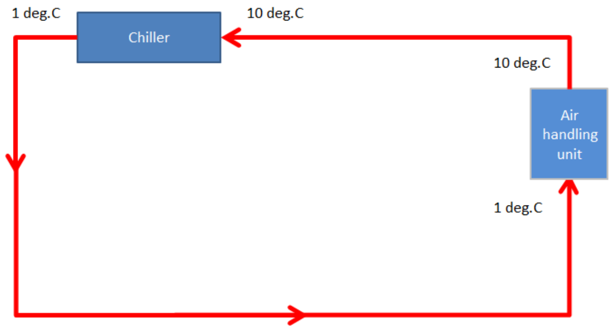

Figure 6.1: Typical air-conditioning cooling cycle

As depicted in the figure below, integration of a thermal storage system allows the compressor to shift operation to off-peak times, creating and storing ice that is then used during times of peak cooling demand. A thermal storage tank comprises phase change materials that can efficiently store the low temperatures. The discharging cycle circulates the chiller working fluid through the thermal storage units instead of the chiller, thereby utilising the stored cooling capacity in the tanks. The addition of electrical load from a small pump marginally reduces overall cooling efficiency, but instantaneous electrical demand is significantly lower than the chiller working directly.

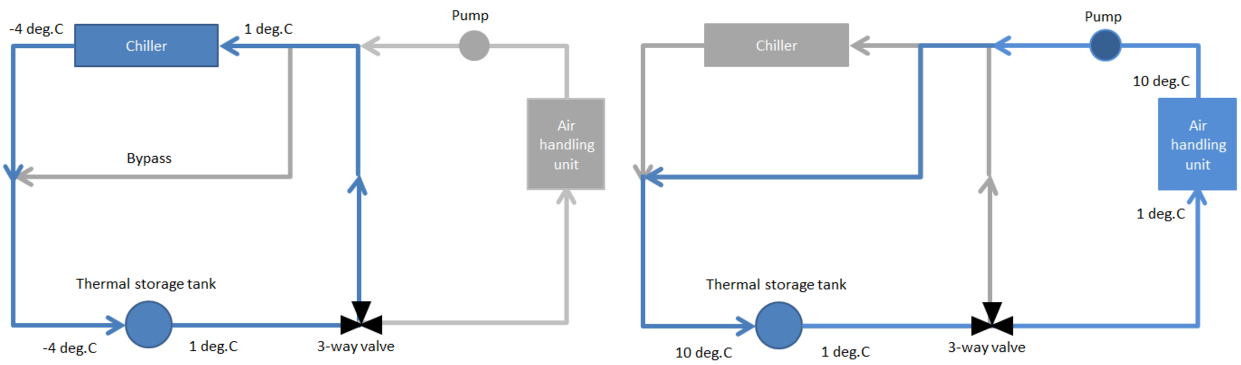

Figure 6.2: Off-peak 'charging' of thermal storage (left) and peak period 'discharging (right)

Scope elements include:

- **Customer identification:** Assessment of known or potential cooling loads against criteria such as customer peak load and network conditions. Discussions with prospective customers to identify trial participant.
- **Procurement:** Design and construct contract for retrofit thermal storage system.
- **Operational testing:** Data collection and performance monitoring of the system including level of peak demand reduction, system utilisation and system availability.
- **Business Case documentation:** Outcomes of the trial regarding the system technical performance, cost parameters, quantification of benefits and customer acceptance will feed into a business case for the further application of C&I thermal storage as a solution to targeted network constraints.

6.3 Timeline:

The project will be undertaken mid-period in during the 2016-20 regulatory period.

2017: Determine suitable location & customer for thermal storage trial.

2018: Engage technology providers, procure and install for 2018/19 summer.

2019: Collect and analyse operating data.

6.4 Budget estimate

The cost of the project will depend heavily on the technical requirements of the participating customer. A nominal budget estimate is provided below totalling $0.35m.

Table 6.1: Budget estimate for C&I thermal storage trial

Network element	Cost item
Project Management	$50,000
Chiller unit with sub-zero output: 400 kWR capacity (114 Ton, equivalent to approx. 100 kWe)	$150,000
Thermal storage units, approx. 15,000 kWR-h ice storage	$150,000
Installation and integration between chiller and thermal storage	$50,000
TOTAL	**$400,000**