PROJECTS FOR WHICH DMIA APPROVAL IS SOUGHT

Projects for which approval is sought under the Demand Management Innovation Allowance (DMIA) for the 2015 – 2020 Regulatory Period include the following projects with a total value of $3,213k, of which $8k was incurred in the 2019-20 Regulatory year.

1. Grid Side Storage ($157k Reg PTD, nil in 2019-20)
2. Future Network Modelling ($372k Reg PTD, nil in 2019-20)
3. Residential Energy Storage ($2,684k Reg PTD, $8k in 2019-20)

These projects form part of a package of investigations aimed at informing SA Power Networks' approach to design, management, and operation of the distribution network in response to increasing Distributed Energy Resource (DER) deployment.

1 Grid Side Storage

1.1 Nature and scope of the project

Energy Storage is being investigated by grid operators as a means to defer or avoid network augmentation in areas where demand constraints are forecast, but load growth is slow. Energy Storage also has the potential to increase the Photovoltaic (PV) hosting capacity of local networks and improve reliability. With a large range of storage technologies now available, very little is known about the whole of life costs and performance of these technologies under Australian conditions and applications. In conjunction with the University of Adelaide and other partners, SA Power Networks has been undertaking a practical research study into the performance of energy storage systems across a range of likely applications within the distribution network.

1.2 Aims and expectations

This project will produce a mobile testing environment to better understand the performance, costs and integration challenges of battery energy storage technologies and systems in a range of Australian conditions and applications. The project will create a knowledge base for industry and system developers and provide a platform for advanced training facilities on an operational system.

1.3 Implementation of the project

This project is being led by the University of Adelaide as part of a syndicate which includes SA Power Networks, with further funding support from the South Australian Government and Energy Networks Australia. The project has also attracted ARENA funding of $1.4 million.

The mobile testing platform comprises a mobile testing unit similar in size to a shipping container with a 270kW inverter, 270kWh of lithium batteries, associated control equipment, network protection and a SCADA interface. The unit includes a Lab view installation to provide comprehensive monitoring of the performance of both the inverter and any associated battery systems. This data will be made available as part of the Australian Energy Storage Knowledge Bank maintained by the University of Adelaide.

Between February 2018 and March 2019, the unit was installed and operating as part of a 1-year field trial on SA Power Networks' radial distribution network at Cape Jervis. This followed comprehensive factory testing in Bayswater, Melbourne and further acceptance testing once the unit was relocated to the Adelaide University Campus in Thebarton in Q4 2017.

1.4 Implementation costs

This project is now complete. Total project costs were $444K, with no cost having been recognised in the 2019/20 Regulatory year.

1.5 Identifiable benefits

This project has provided many valuable insights into the suitability, performance and future requirements of battery storage technologies and systems when utilised for grid support functions. These insights will be used to determine situations whereby such solutions could be used in future to cost-effectively defer network upgrades and/or deliver improvements in network DER hosting capacity and reliability. The data collected and analysis undertaken will be made freely available to industry and vendors via the Adelaide University knowledge sharing website.

2 Future Network Modelling

2.1 Nature and scope of the project

Energy Storage for residential installations is being proposed as a complementary technology for the renewable energy systems currently deployed within distribution networks. The impacts of these systems will be driven to some extent by their sizing and ability to supply electrical capacity (kW or kVA) versus their energy stored (kWh). To better understand these impacts on the distribution network and network operations and design necessary to accommodate these systems, SA Power Networks has undertaken a comprehensive modelling project.

2.2 Aims and expectations

The modelling developed under this project identified the most beneficial energy storage system for different customers based on their interval data records. It can also be applied at higher levels within the network to determine the optimal mix of distributed resources – for example at the distribution transformer or zone substation levels. This modelling will provide insights into the likely rate of take up of distributed energy resources based on the costs of those resources and the economic returns to the customer. It will also enable insights into the likely impacts on network load profiles.

2.3 Implementation of the project

Consultants were engaged to develop an Excel based modelling tool which has been further refined by SA Power Networks. This tool continues to assess specific customers and areas within the distribution network.

2.4 Implementation costs

This project is now complete. Total project costs were $610K, with no cost having been recognised in the 2019/20 Regulatory year.

2.5 Identifiable benefits

The project has provided insights into the potential scale and timing of distributed energy resources uptake, as well as the opportunity to reduce SA Power Networks' investment in network assets as a result of increased embedded generation and storage. Such opportunities could arise from reduced capacity requirements in greenfield situations or reduction in the size (capacity) of assets installed when asset replacements are undertaken.

3 Residential Energy Storage

3.1 Nature and scope of the project

The deployment of Residential Energy Storage systems is predicted to become increasingly prevalent across electricity networks as battery prices reduce, retail energy prices increase, and customers become more comfortable with the technology. This project has deployed 100 energy storage systems within a selected trial area to study the performance of energy storage systems across the likely applications for this technology as part of efficient distribution network operation and management.

3.2 Aims and expectations

The trial has had three key objectives:

1. Verify the applicability of residential battery systems to defer the building of new, or augmentation of existing, network infrastructure;
2. Validate assumptions about benefits accruing from batteries with a view to informing the likely timing of larger scale take-up and the levels of subsidy required to facilitate take-up for network purposes; and
3. To better understand the impacts of wide-scale battery take-up on load profiles and the performance of the distribution network.

3.3 Implementation of the project

The trial has now been operational for its intended 3 years and is now complete whereby the on-going maintenance and operation of the energy storage systems is transferred to the customers. Final analysis and reporting have been undertaken as part of project close out activities.

3.4 Implementation costs

The project is now complete. Total project costs were $2,684k, with $8k of this cost having been recognised in the 2019/20 Regulatory year.

3.5 Identifiable benefits

The trial has delivered significant insights for SAPN and the broader industry including:

- the effectiveness or otherwise of deployment of PV/storage systems at customers' premises in the manner being undertaken by the project to defer distribution network augmentation. This concept may then be included as a viable option(s) in future RIT-D and/or other expenditure assessment processes;
- the potential to pay customers in the future for the use of their batteries, where it is the least cost option, to defer network augmentation;
- understanding the potential demand reductions that are possible from the use of customers' solar and battery installations;
- better understanding of the technical and cost aspects of installation, operation and maintenance of battery/inverter/energy management systems operated on a portfolio basis;
- performance data on systems deployed;
- better load profile data from customers with and without PV/storage systems;
- the net impact on feeder load profiles;
- better understanding of commercial arrangements with equipment vendors and installers (price, service, equipment lead times) and associated risks;
- a clearer understanding of the benefits and attractiveness of residential energy storage to customers with a view to informing the likely timing of larger scale take-up and levels of subsidy required to facilitate take-up for network purposes;
- customer acceptance or otherwise of embracing this technology and the associated arrangements to defer network augmentation; and
- customers behaviour, need to understand/educate complexity of system operation, customer needs for more control and challenges with direct customer engagements.

4. Costs not recoverable

Costs for the DMIA projects described above:

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 scheme applies, or under any other incentive scheme in that determination.

5. Calculation of DMIA

The total amount of the DMIA spent in the 2015 -2020 Regulatory Control Period was $3,213k, of which $8k was incurred in the 2019-20 Regulatory year. This amount equates to the total spend against the three projects for which approval is sought under the DMIA as detailed in sections 1 to 3 of this report. The costs associated with these DM trials have been separately captured at the individual project level in SAP, SA Power Networks' integrated business management system. The expenditures incurred against these trials for each year of the Regulatory Control Period have been reported in Table 7.11.1 of SA Power Networks' Annual Reporting RIN Response and subject to independent external audit in accordance with the RIN requirements.