- Avoided environmental impact; and
- Avoided safety risk.

For the various demand management deferral options these cost and benefits include:

- The time-value-of-money benefit associated with deferring the network option;
- The avoided unserved energy for a given quantum of demand reductions;
- The expected costs of delivering demand reductions; and
- An options value benefit.

Based on the NPV assessment, a demand management project is considered feasible if the expected available budget exceeds the expected cost of delivering the demand management project.

6.3 PART A – Committed projects

There were zero (0) committed demand management projects in the 2023 – 2024 financial year.

6.4 PART B – Eligible projects

There were no committed demand management projects in the 2023 – 2024 financial year.

6.5 Demand Management Projects that have changed

There were no changed demand management projects in the 2023-24 financial year.

7 Demand management innovation allowance mechanism

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

Under Section 2.3 of the AER's final determination for The Demand Management Innovation Allowance Mechanism, Dec 2017, TasNetworks is required to submit an annual report on expenditure under the DMIA for each regulatory year.

The annual report must include:

- the amount of the allowance spent by the distributor;
- a list and description of each eligible project on which the allowance was spent;
- a summary of how and why each eligible project complies with the project criteria;

- For each eligible project on which the allowance was spent, and in a form that is capable of being published separately for each individual eligible project, a project specific report that identifies and describes:
    - The nature and scope of the eligible project;
    - The aims and expectations of the eligible project;
    - How and why the eligible project complies with the project criteria;
    - The distributor's implementation approach for the eligible project;
    - The distributor's outcome measurement and evaluation approach for the eligible project;
    - The costs of the eligible project:
        - incurred by the distributor to date as at the end of that regulatory year;
        - incurred by the distributor in that regulatory year; and
        - expected to be incurred by the distributor in total over the duration of the eligible project.
    - For ongoing eligible projects:
        - a summary of project activity to date;
        - an update of any material changes to the project in that regulatory year; and
        - reporting of collected results (where available).
    - for eligible projects completed in that regulatory year:
        - reporting of the quantitative results of the project;
        - an analysis of the results; and
        - a description of how the results of the eligible project will inform future demand management projects, including any lessons learnt about what demand management projects or techniques (either generally or in specific circumstances) are unlikely to form technically or economically viable non-network options.
        - any other information required to enable an informed reader to understand, evaluate, and potentially reproduce the demand management approach of the eligible project.
- Where an eligible project has extended across more than one regulatory year of the regulatory control period, details of the actual expenditure on each such project or program in each regulatory year of the regulatory control period to date.
- A statutory declaration signed by an officer of the distributor delegated by the chief executive officer of the distributor, certifying that the costs being claimed for each demand management project:
    - are not recoverable under any other jurisdictional incentive scheme;
    - are not be recoverable under any state or Australian Government scheme; and
    - are not otherwise included in forecast capital expenditure or operating expenditure approved in the AER's distribution determination for the regulatory control period under which the mechanism applies, or under any other incentive scheme in that distribution determination.

Each of the projects in the DMIA submission is defined as an ‘eligible project’ based upon the following criteria listed under Section 2.2.1. of the AER’s final determination for The Demand Management Incentive Scheme, Dec 2017. An eligible project must:

- be a project or program for researching, developing or implementing demand management capability or capacity; and
- be innovative, in that the project or program:
    - is based on new or original concepts; or
    - involves technology or techniques that differ from those previously implemented or used in the relevant market; or

    - is focused on customers in a market segment that significantly differs, from those previously targeted by implementations of the relevant technology, in relevant geographic or demographic characteristics that are likely to affect demand; and
- have the potential, if proved viable, to reduce long term network costs.

Accordingly, this submission details DMIA projects undertaken by TasNetworks in the 2023-24 financial year.

7.1 Governance

7.1.1 DMIA spending in 2023-24

There were three (3) new projects and two (2) ongoing DMIA projects under implementation or development for which TasNetworks incurred costs in 2023-24. The DSO Community Battery project, as reported in 2022-23 has been recast as two separate projects for financial reporting. That is, Community Battery Pilot – Howrah and Community Battery Pilot – Burnie. Three (3) projects were closed out during 2023-24.

TasNetworks submission identifies claimable costs incurred totalling $744,872.

7.1.2 Compliance with DMIA Criteria

Information addressing items Section 2.3 of the AER's final determination for The Demand Management Innovations Allowance Mechanism, Dec 2017, can be found in the sections below.

7.1.3 Project selection process

When opportunities are identified for new projects, TasNetworks uses the following methodology when assessing projects for funding under the DMIA allowance:

Concept Stage: For new concepts, approval for project research and development is carried out by the Network Innovation Leader who ensures that the proposed project meets the funding criteria specified under the DMIA Scheme. This component of the project is defined as a Conceptual Project.

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 where a project proposal for a full trial is prepared. Approval to proceed to Developmental Stage is by the Network Innovation Leader.

Delivery Stage: The project proposal is reviewed by the Network Innovation Leader to ensure it meets the funding criteria specified under the DMIA Scheme and checks are also made to ensure that budgeted project 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.

7.2 Statement on costs

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

- are not recoverable under any other jurisdictional incentive scheme;
- are not be recoverable under any state or Australian Government scheme; and
- are not otherwise included in forecast capital expenditure or operating expenditure approved in the AER's distribution determination for the regulatory control period under which the mechanism applies, or under any other incentive scheme in that distribution determination.

7.3 DMIA project summary

Table DMIA Project Summary

Projects	2023-24 Actual costs (excl GST)	Year Initiated
New Projects (initiated 23/24)		
LV Transformer Monitor Pilot	$125,478	2023
SAPS Feasibility Assessment Framework	$49,886	2023
Advanced Meter Staggered Restoration	$58,115	2023
New Project Sub-Total	$233,479	
Existing Projects (expenditure in 2023/24 and initiated prior)		
Derwent Bridge microgrid feasibility study	$416,322	2021
Community Battery Pilot – Howrah	$51,654	2022
Community Battery Pilot – Burnie	$43,417	2022
Existing Project Sub-Total	$511,393	
TOTAL	$744,872	

7.4 Project reports

7.4.1 Community Battery Pilots – Howrah and Burnie

TasNetworks has received grant funding from the Department of Climate Change, Energy, the Environment and Water for two low voltage, distribution connected community batteries – one in Glebe Hill, Howrah and one in Shorewell Park, Burnie. The batteries will be procured in an open tender, owned by TasNetworks, and operated by a third party in the energy markets and for network support. The project will inform TasNetworks' approach to community batteries (whether owned by TasNetworks or others) and future network support enhancement and augmentation.

This project is existing and ongoing (i.e., did not start or finish this regulatory year).

Project nature and scope

The scope of this project is:

- procurement and installation of two low voltage community batteries in the TasNetworks distribution network;
- engagement with local community groups and councils in affected areas;
- development of battery operating frameworks and contract arrangements with battery operator; and
- verification of project hypotheses (see below).

Project aims and expectations

The aims of the community energy project are broad, but can be summarised with four major hypotheses, these are:

- operation of the community battery is successful in creating additional solar hosting capacity in the substation low voltage network;
- operation of the community battery is successful in reducing the substation peak demand;
- there is net revenue generated by the battery in participating in the wholesale energy market;
- there is net revenue generated by the battery in participating in FCAS service.

The verification of these hypotheses will inform TasNetworks' approach to future distribution system management.

How and Why Project Complies with Project Criteria

The community energy project will test how network batteries can manage substation peak demand, eliminating the need for upgrades of the network infrastructure. Additionally, the project will help TasNetworks to quantify the demand management benefits that network batteries can provide, which will inform how TasNetworks engages with demand management providers who operate network batteries.

If proven viable, this project will successfully prove that community batteries can be used to reduce substation peak demand and defer costly upgrades required for load growth, reducing total network expenditure and reducing TasNetworks' costs. Similarly, the project will also test the viability of community batteries creating additional solar hosting capacity, which would have otherwise been enabled only with costly network upgrades, reducing total network expenditure.

Implementation approach

The approach to deliver this project is outlined below.

- Open tender for the supply of the Battery Energy Storage System(s) (BESS)
- Open tender for a community battery market services operator
- Site and connection design internally resourced
- Installation and maintenance internally resourced

In addition, TasNetworks will deliver community engagement and learnings.

Results

The project will be measured by testing against the project hypotheses listed above, as well as reviewing the financial benefit that the batteries provide.

Additional instrumentation and SCADA measurement points will be installed to gather the necessary data to assess the project hypotheses.

Implementation costs of the project

TasNetworks has obtained funding through a grant agreement under the 'Community Batteries for Household Solar Program – Delivery of Election Commitments Stream 1' from the Department of Climate Change, Energy, the Environment and Water (DCCEEW). DMIA funding will not be sought for the activities in this project that are funded by the grant agreement.

The costs of the DMIA eligible activities incurred by the distributor to date as at the end of the 2023-24 regulatory year are as follows.

Budget item	Total cost to date (incl. 2023-24)	Total cost in 2023-24	Forecast DMIA costs (whole of project)
Community Battery Pilot – Howrah			
Project cost	$262,540	$224,154	$848,540
Grant funding	-$172,500	-$172,500	-$500,000
Direct cost	$90,040	$51,654	$348,540
DMIA eligible (sub-total)	$90,040	$51,654	$348,540
Community Battery pilot – Burnie			
Project cost	$254,303	$215,917	$939,303
Grant funding	-$172,500	-$172,500	-$500,000
Direct cost	$81,803	$43,417	$439,303
DMIA eligible (sub-total)	$81,803	$43,417	$439,303
Total project cost (excl GST)	$516,843	$440,071	$1,787,843
Total DMIA eligible cost (excl GST)	$171,843	$95,071	$787,843

Project Progress & identifiable benefits

Key Milestones	Start date	End date
Milestone 1 – Design and Procurement	1/07/2023	30/01/2025
Milestone 2 – Factory Testing, Site Preparation and Battery Installation	13/09/2024	28/03/2025
Milestone 3 – Battery Commissioning and Operational Tests	21/03/2025	18/04/2025
Milestone 4 – Performance Monitoring, Data Collection, Evaluation and Reporting	21/04/2025	03/10/2025

Progress to date has included:

- Finalisation of BESS hardware procurement and supplier
- Initial design talks with hardware supplier to integrate TasNetworks' requirements
- Reaching final stages of contract negotiations with BESS operator
- Finalisation of site selection and securing land from the relevant councils

Results have not yet been collected regarding the project hypotheses.

7.4.2 Derwent Bridge microgrid feasibility study

Reliability improvements and modernisation of electrical networks have predominantly been in urban networks, with many rural networks facing poor reliability and with few options for improvement. The Tasmanian central highlands, with its particularly harsh winter, this issue is compounded – often customers resort to regularly using backup diesel generators. Derwent Bridge is a community in the central highlands with a small population of permanent residents and commercial customers, as well as a permanent Parks and Wildlife Service presence and growing accommodation for tourism at Lake St Clair.

Derwent Bridge is supplied by a 16.3 km long 110 kV line emanating from the Butlers Gorge switching station and experiences poor reliability, particularly in winter when outages can be long due to maintenance and repair difficulties. The transmission line was originally constructed for hydro generation facilities at Lake St Clair, which have since been decommissioned. Now the 110 kV line is considered oversized and more expensive to maintain than a standard MV line.

The purpose of this project is to develop a study to investigate the feasibility of a microgrid solution at Derwent Bridge as an alternative to the existing 110 kV transmission connection. Options to explore include demand management, mini pumped hydro, battery energy storage, hydrogen generation, thermal storage, or a combination.

This project is existing and ongoing (i.e., did not start or finish this regulatory year).

Project nature and scope

This project is focused on the development of a feasibility study into a microgrid solution to address future power needs of all Derwent Bridge customers (residential and business) connected to the current 16.3 km long 110 kV line. The project involves the installation of monitoring equipment, solar PV, and BESS at customer facilities. The solar PV and BESS will be handed over to the customers at the end of the project. This equipment will both assist in the evolving energy needs of the community, as well as provide valuable data for the feasibility study.

The project is a joint project between TasNetworks, the University of Technology Sydney (UTS) as research partner, Redback Technologies (Redback) as an innovative clean industry representative, and the Australian Power Institute (API).

Project aims and expectations

The aim of the Derwent Bridge Microgrid Feasibility Study is to bring together the Derwent Bridge Community, power utility (TasNetworks), the innovative clean energy industry (Redback Technologies), renowned knowledge sharing institute (API) and a leading research-intensive university (UTS) to understand, investigate and evaluate the suitability of a feasible and resilient power supply option for regional communities.

Specific project objectives are:

1. To undertake a study at Derwent Bridge to investigate the feasibility of a microgrid comprised of demand management, mini pumped hydro, battery energy storage, hydrogen generation, thermal storage, or a combination.
2. To provide measurable economic, social, environmental and technical outcomes from the study that will benefit the local community, aid TasNetworks in future infrastructure investment decisions at Derwent Bridge and transfer to wider Australian communities.

How and Why Project Complies with Project Criteria

The Derwent Bridge microgrid feasibility study project is both an innovative project and if proved viable, can reduce the long-term network costs inherent in supplying the Derwent Bridge community. The innovative project is focussed on a community that differs from others targeted by TasNetworks for similar projects. This community being a very small rural community in the central highland climate region of the state that suffers reliability issues throughout the year.

The purpose is to support regional communities and investigate whether a microgrid would be cost effective. The learnings from the feasibility study could be used for similar communities in the future.

The study may recommend the use of technology not used in Tasmania before like hydrogen generators for power supply. The microgrid concept is also focussed on alternative options for augmenting the ageing and costly 110 kV infrastructure supplying the town, thereby reducing long term network costs.

Implementation approach

The project will be delivered according to the following milestones.

Milestone 1 Project Inception – this phase focuses on establishing a solid foundation for the project.

- The execution of partner contracts and agreements.
- The development of a detailed project plan in consultation with project partners that will include scope, deliverables, budget and schedule.
- The development of a project control register comprising issues, risk, decisions, dependency, assumptions and benefits registers.
- Finalise timing of key calendar bookings for on-site events such as pilot inception meetings and business model design workshops.
- Conduct one-on-one partner meetings to discuss more detailed aspects of the approach and project plan delivery with each of the partners.

Milestone 2 – Engagement report

This phase focuses on engaging with the community to better understand their needs, concerns, and expectations on energy supply which will facilitate the optimal co-design of the Microgrid.

- The use of an innovative engagement method based on the concept of community as a socio-ecological system which is motivated by technological intervention and sustainable use of existing resources.
- Consultation with key stakeholders to understand the requirements and constraints of off-grid microgrid design based on information from their industries which will assist to uncover the risks of this project.
- Community visioning workshops and surveys.

Milestone 3 – Literature Review

This phase will focus on a systematic review of relevant literature, standards and regulatory frameworks.

- Conducting a systematic literature review on the main microgrid layers, such as business, standard, climate, infrastructure or control, and operation.

- Review of international and Australian literature: including academic studies, grey literature, and industry sources.
- Review of current technology and scale of markets; international and Australian typical and best practice; and identify international and Australian leaders in microgrid technology and best practice.
- Investigating general benchmarks, frameworks and standards to identify the best practice of designing a resilient islanded microgrid.

Milestone 4 – Data framework

This phase will focus on installing monitoring devices and data collection.

- Deploying sufficient monitoring devices to build a sufficiently robust understanding of the load and power quality at various business and community organisation sites within Derwent Bridge, with a focus on high-value controllable loads.
- Identifying:
- number of customer and types of connection;
- the replacement or augmentation capital expenditure for the Derwent substation;
- current costs of operating and maintaining the network; and
- reliability and/or power quality issues, with particular focus on flow-on local economic and socioeconomic impacts.

Milestone 5 – Load modelling and MG design

This phase will focus on the outline of load characteristics and microgrid design options

Deliverables – Successful completion of the field trial as per the plan.

- Identifying load characteristics (for the town as a whole and then individually so as there is some view to if and how it can be shaped).
- Identifying conceptual design options of Derwent Bridge microgrid considering its (i) economic feasibility, (ii) cash flows over its lifetime, (iv) different technology options, and (v) technical (reliability and resiliency) feasibility.
- Developing a high-level microgrid design with input from local community members, TasNetworks, Luceo, UTS experts and other relevant industry partners considering different options, for example (i) energy efficiency and demand response, (ii) hybrid storage (battery, mini hydro) thermal), (iii) electric vehicles

Milestone 6 – Digital twin

This stage will focus on the identification of design objectives and specifications for MG digital twin tool.

- Finding out design objectives and specifications of a digital twin which will enable local businesses and communities to make informed decisions on the utilisation and adoption of off-grid microgrids.
- Redback Technologies will work with the expert from School of Computer Science and Data Engineering (UTS) to identify specifications for developing a decision Management platform that leverages artificial intelligence (AI) and predictive analytics.

Milestone 7 – Capacity Building

As community satisfaction and trust are key factors for successful installation of microgrids, this phase will focus on developing community buy-in and support. This will be to assist in educating the community, sharing knowledge, reflections and finalise the policies and process in building a community micro grid.

Milestone 8 - Business Model

The focus of this phase will be to develop a business model to minimise cost of the implementation of a microgrid. The primary objective of this model will be to minimise the cost of the microgrid system (e.g., project development, system design, commissioning, service, and support).

Milestone 9 - Tools

This phase will focus on developing and implementing tools and algorithms. It includes developing and implementing innovative tools and models to explore the feasibility of, and provide guidelines for, the development of islanded microgrids for rural and regional communities. It is expected that the develop tool could be used for several purposes, for example, planning, evaluation of deployment of microgrid, benefits of deployment, load forecasting considering demand response and energy efficiency, quantify resiliency and reliability benefits, progressive optimal use of new and existing infrastructure, identification of boundary parameters and management strategies.

Milestone 10 - Digital twins

Digital twins for microgrids are emerging as a core enabler to implement and demonstrate cost-effective and resilient energy solution for regional communities due to the advancement in IOT, communication systems and industry 4.0. The platform can add value to business by integrating data for collaboration and decision making, and by developing innovative energy prediction and control applications. This includes utilising the real-time simulator at UTS TechLab, developing and implementing a digital twin that will combine a computational model and a real-world system through data and feedback in order to enhance operational efficiency, allow for resource optimisation, improve asset management, deliver cost savings, improve productivity and safety.

Milestone 11 - Recommendations

This phase focuses on what happens next and what recommendations there are for the Derwent Bridge Township.

- Providing the detail for the next steps of implementing the Derwent Bridge microgrid.
- Providing a reliable, integrated, and streamlined process that will guide the Microgrid developer and engineer through conceptual design, engineering, detailed electrical design, implementation, and operation in a standardized and data driven approach.
- Creating reliable results and financial indicators that can be replicated and repeated by investors and financers.

Milestone 12 – Final report

This phase focuses on generalising, presenting and publishing the model. Presenting, documenting and sharing the outcome of the project to relevant industries, researchers, communities, investors and students.

Results

The project is in its final stages with the final report and financial audit due early in the 2024-25 regulatory year. Following the publication of these documents TasNetworks will have a good understanding of the outcomes of the project.

Implementation costs of the project

TasNetworks will be obtaining funding through a grant agreement with the Commonwealth (as represented by the Department of Industry, Science, Energy and Resources) for the 'Regional and Remote Community Reliability Funds Microgrids'. DMIA funding will not be sought for the activities in this project that are funded by the grant agreement.

The costs of the DMIA eligible activities incurred by the distributor to date as at the end of the 2023-24 regulatory year are as follows.

Budget item	DMIA cost to date (incl. 2023-24)	DMIA cost in 2023-24	Forecast DMIA costs (whole of project)
Derwent Bridge Microgrid Feasibility			
Project cost	$2,232,540	$602,701	$2,256,040
Grant funding	-$1,281,243	-$186,379	-$1,281,243
Direct cost	$951,297	$416,322	$974,797
DMIA eligible cost (excl GST)	$932,228	$416,322	$955,728

Project Progress & identifiable benefits

Key deliverables	Start date	End date
Finalised Project Plan	01/09/2021	30/12/2021
Community engagement summary report	01/10/2022	30/06/2022
Preliminary report on monitoring device instalment and data collection	01/10/2021	30/06/2022
Microgrid literature review	01/11/2021	30/08/2022
Preliminary report on load modelling and microgrid design options	15/01/2022	30/08/2022
Report on local community survey and capacity building	01/09/2022	30/06/2023
Report on the development and implementation of microgrid digital twins	01/09/2023	31/01/2024
Report on the next step of the proposed feasibility study and recommendation for Derwent Bridge	15/01/2024	31/07/2024
Final report and knowledge sharing	15/01/2024	31/07/2024

7.4.3 LV Transformer Monitor Pilot

The transformer low voltage monitor pilot program is a pilot program to install 30 transformer monitors across diverse areas of the TasNetworks' distribution network. The primary purpose of this pilot is to test how network-based visibility data from transformer monitors compares with customer-based advanced meter data to inform TasNetworks' future strategies for each data source.

This project is new for the 2023-24 regulatory year and was completed in the 2023-24 regulatory year.

Project nature and scope

The scope of this project is:

- gather real-time network data from a diverse range of transformer types and customer types;
- analyse data against advanced meter data from the same transformers; and
- test varying use cases for network data and the value from each data source.

Project aims and expectations

The project intends to inform TasNetworks' long-term strategy for low voltage visibility. The project will test how advanced meter data and transformer monitor data can be used to achieve the same goals, using an economic and technical analyses of each technology. It is expected that TasNetworks will develop a set of conditions to determine when and where to install transformer monitors and how much real-time advanced meter data is needed in those circumstances.

How and Why Project Complies with Project Criteria

The devices and software will provide demand management capability or capacity

Network visibility is a key enabler of DSO related capabilities that are used to manage network demand, for example, DOEs. Visibility can also be more immediately used to more accurately rate transformer capacities and loading patterns, so demand management can be applied more effectively.

This project will provide TasNetworks with valuable low voltage visibility data. TasNetworks still has limited visibility in the distribution network, with less than 50 SCADA enabled distribution substations reporting back MV network information and no permanent devices installed in the network reporting back LV data.

Visibility can be used to more accurately rate transformer capacities and loading patterns allowing for timelier and more appropriate network upgrades.

The pilot will test how DSO capabilities, including demand management, can be developed using different sources of network visibility. The learnings will inform the future strategy for low voltage network visibility in the TasNetworks' distribution network. Any targeted demand management projects will benefit from greater awareness of the network, requiring network visibility.

Implementation approach

The project was broadly separated into two phases, as outlined below.

- Procurement and installation
    - Select supplier (Edge Zero)
    - Select sites (based on transformer loading, AMI penetration, PV penetration)
    - Install devices on LV side of selected distribution transformers

- Data collection and analysis
    - Collect data via supplier cloud-based platform
    - Integrate data with TasNetworks SCADA
    - Identify potential use cases for LV monitors and associated value
    - Compare LV monitor data with available AMI data
    - Summarise results and potential value of LV monitor rollout

Summary and analysis of results

As part of the analysis for this project, a method was developed for aggregating AMI data up to estimate transformer loading in 30min intervals in the absence of full AMI penetration. This estimate was compared to data from the installed LV monitors, with the following high-level outcomes.

- AMI data is sufficient to estimate transformer loading with an acceptable degree of accuracy
- LV monitors are able to provide voltage data at the transformer (not particularly valuable)
- LV monitors are able to provide near real time data (main use case that AMI data cannot provide, although TasNetworks is not at the stage where this is required)

The following recommendations came out of the project, which TasNetworks will use to guide future investment related to LV visibility and demand management.

- LV transformer monitors are unlikely to provide significant value where AMI penetration is high and AMI data is accessible unless close to real time applications are required. The need for the associated use cases should be monitored and action taken if necessary (it is not expected this will be necessary in the current regulatory period).
- LV monitors do provide useful data for validation of AMI data aggregation or other LV assumptions. A good use of these devices could be a targeted rollout in order to provide an additional high resolution data source for validation of LV/HV analysis.

Implementation costs of the project

Costs over the life of the project are provided below.

Budget item	Total cost to date (incl. 2023-24)	Total cost in 2023-24	Forecast DMIA costs (whole of project)
LV Transformer Monitor Pilot			
Project cost	$125,478	$125,478	$125,478
Direct cost	$125,478	$125,478	$125,478
DMIA eligible cost (excl GST)	$125,478	$125,478	$125,478

7.4.4 SAPS Feasibility Assessment Framework

The SAPS (stand-alone power system) feasibility assessment framework is a project to study the feasibility of SAPS in Tasmania. The study will take into account differing market and climate factors in Tasmania as well as the nature of the distribution network and costs to maintain certain network types and the unique environmental constraints in the state. Following the study, TasNetworks will obtain a feasibility assessment framework to apply to potential SAPS sites so a more informed choice can be made for potential projects.

This project is new for this regulatory year and was completed this regulatory year.

Project nature and scope

The scope of this project is:

- work with an industry expert to gain an understanding of the market conditions and ancillary considerations for SAPS infrastructure;
- based on the understanding gained and modelling of representative sites, develop a feasibility assessment framework assessing the performance criteria of candidate SAPS sites; and
- test the feasibility framework on potential sites identified through GIS analysis.

Project aims and expectations

TasNetworks does not have a history with managing generation assets, making it difficult to confidently assess the feasibility of SAPS in Tasmania. The project aims to leverage locally based technical knowledge of small generation systems to improve TasNetworks' understanding of SAPS. It is expected that TasNetworks will obtain an assessment tool which can be applied to potential SAPS sites, improving the outcome for customers and the business.

How and Why Project Complies with Project Criteria

In comparison to a traditional network connection, SAPS are extremely susceptible to changes in customer load. Additional load will mean upgrading the generation or storage capacity of the SAPS system, potentially leading to the financial benefit of the system being nullified. This inherent characteristic of SAPS necessitates some form of demand management to be considered in any design and will be incorporated in to the SAPS feasibility assessment framework.

There are currently no DNSP led SAPS projects operating in Tasmania, despite some network areas being potential candidates. SAPS have traditionally been employed in the warmer climates of mainland Australia. These climates not only provide greater total solar yield, but the loading patterns in these climates often coincide more with solar demand than the winter peaking loads of Tasmania. SAPS solutions in Tasmania must be innovative and cater for different needs, they cannot be a carbon copy of solutions used in mainland networks.

SAPS projects will only be considered if they provide greater benefits than traditional network solutions. This may be in the form of reduced risk, for example through bushfire risk, or more pertinently the reduced cost in maintaining long overhead medium voltage rural lines.

This project will deliver a framework with a primary purpose to be used for future SAPS projects, which if successfully carried out will involve some form of demand management to ensure that future load growth does not nullify the original benefits from the installation of a SAPS.

Implementation approach

The focus of this project was a general assessment of SAPS feasibility in Tasmania. This was facilitated by a piece of work undertaken by Entura to produce SAPS costs for representative sites. Key parameters were varied at each site to understand the impacts of different changes.

Two geographic locations were selected by Entura to capture different solar radiation levels across Tasmania. George Town was used as a high solar resource location and Kermandie as a low solar resource location. At each location four different load profiles were considered to represent different customer types and behaviours.

In parallel to the Entura work, TasNetworks conducted GIS analysis to identify potential SAPS sites. The outcomes of the Entura work was then applied to the potential sites and a cost/benefit analysis was performed to indicate the value associated with installing SAPS.

Summary and analysis of results

Of the four feasible sites identified as having positive cost/benefit ratios, the annual benefit expected ranged between $400 – $10,000. The analysis also showed significant sensitivity to cost, which could easily erode the above benefit.

This study has found that in general SAPS are not feasible in Tasmania based on the information available at the time of the analysis.

No clear indicator has been identified that would make SAPS feasible in the future. Promising sites should be assessed on a case-by-case basis if good benefits are expected in light of the information presented in this report.

There are a number of limitations with this study that arose either due to scope limitations or data availability. One limitation of the scope that is worth noting is that this study only considered replacing a single distribution transformer with a SAPS. Small groups of transformers or small rural communities were not considered. Unless the cost of maintaining a grid connection (including reliability costs, bushfire risk, etc.) to a community like this is far higher than any sites assessed as part of this study, it is unlikely SAPS will be beneficial.

Implementation costs of the project

Costs over the life of the project are provided below.

Budget item	Total cost to date (incl. 2023-24)	Total cost in 2023-24	Forecast DMIA costs (whole of project)
SAPS Feasibility Assessment Framework			
Project cost	$49,886	$49,886	$49,886
Direct cost	$49,886	$49,886	$49,886
DMIA eligible cost (excl GST)	$49,886	$49,886	$49,886

7.4.5 Advanced Meter Staggered Restoration

Anecdotally, feeder reclosers have historically struggled to hold the increase in load when restoring power from an outage due to a perceived "cold load pickup", a term used to refer to the increase in load after power is restored. This increase in load can be mitigated using techniques such as turning different loads back on at different times to spread out the peak (referred to as increased "load diversity") or by breaking the total load into smaller load blocks and restoring power separately. This project aims to determine the magnitude of cold load pickups and analyse the factors which affect the magnitude.

This project will trial an automatic randomised staggered restoration of LV customers with advanced meters following planned or unplanned outages. The purpose of this trial is to observe if this approach is successful in spreading cold load pickup over a fixed time period (e.g. 5-15min) and reduce the peak load on the LV network immediately following an outage restoration. The trial will be preceded by a desktop analysis undertaken by the meter data provider to identify if and where a trial should be conducted.

This project is new for this regulatory year and was completed this regulatory year.

Project nature and scope

The scope of this project is:

- Work with a meter data provider to complete a desktop analysis to identify conditions where a staggered restoration will be a benefit to the network. Factors that are expected to influence the network benefit from this project include: time and season of outage, length of outage, feeder length, customer type, etc.
- Trial the approach on a planned outage with sufficient advanced meter penetration and appropriate customers based on the results of the desktop analysis.
- Determine if a wider rollout of staggered restoration is beneficial to the network following analysis of the results from the desktop study and trial restoration.

Project aims and expectations

This project was aimed at identifying and rectifying issues associated with cold load pickup. If successful, the following outcomes are expected.

- Improved power quality for customers following outage restoration.
- Improved efficiency and outage restoration time by reducing the need to manually restore load segments.
- Less stress on LV network assets by reducing inrush and startup current immediately following an LV outage restoration.
- Avoid potential second outage due to excessive voltage sag on restoration.

How and Why Project Complies with Project Criteria

This project consisted of research into a new demand management solution that would reduce operational challenges associated with restoring large and long-lasting outages. This would be facilitated by a new capability brought in with advanced meters that allow a staggered restoration by randomly delaying the reenergisation of customers within a fixed interval once supply is restored.

This approach involves the use of functionality embedded in advanced meters which are emerging in greater numbers within the distribution network. Staggered restoration is a concept that has not been utilised before in Tasmania.

If viable, this project could reduce the complexity of restoring large outages. Historically TasNetworks has restored outages in blocks to reduce the pressure on the network. This involves additional switchgear and labour to restore the load blocks. Doing away with these requirements and automating the restoration could reduce long term network costs.

Implementation approach

Yurika Metering was engaged to perform the desktop analysis based on data from their fleet of smart meters in Tasmania. The hypotheses investigated were:

- As duration of an outage increases, the cold load pickup increases.

- Various demographic/seasonal factors will affect the magnitude and duration of cold load pickup, including:
  - Geographical Location: rural vs. urban (TN Supplied Categorisation)
  - Category of Customer: Residential, Commercial, Industrial, etc. (TN Supplied)
  - Load Type: Predominantly resistive or with some inductive components or solar sites.
  - Season: Summer/Spring, Winter/Autumn, and holiday periods
  - Tariff Element: Light and Power, Heating Load, Demand Tariff
  - Time: Weekday, weekend, and time of day.

If the desktop analysis identified clear tends, the project would progress to implement a trial to test whether a randomised staggered restoration could effectively mitigate cold load pickup.

Summary and analysis of results

Following the desktop analysis, a trial was deemed unnecessary as no clear trend in cold load pickup could be identified.

Yurika's study determined that there is a correlation between longer outage duration and increased cold load pickup. An outage of 4 hours or greater had an average increased load of 1.4kW per residential connection. However, the increased load remains high for up to an hour after the power is restored, making staggered restoration impractical as a remedy, as customers would be without heating/hot water circuits for too long after the outage. Furthermore, analysis of the outage durations and number of customers affected indicates that staggered restoration would not reduce the load substantially at the feeder level. Therefore, staggered restoration is not recommended as a remedy for cold load pickup.

Given that the cold load pickup magnitude is now quantified, this information can be used to predict increases in load after an outage and assist in planning for restoration processes. For example, if there is an outage on a transformer with 50 customers for 120 minutes, the estimated increase in load will be $50 \times 1.05 = 52.5kW$ upon restoration. It is possible that this will be greatly affected by electric vehicle charging and careful consideration of the increased loads and potential reduction of diversity in loads should be given. In summary, whilst cold load pickup is existent and measurable, it is not currently of significance to network design or operation.

Implementation costs of the project

Costs over the life of the project are provided below.

Budget item	Total cost to date (incl. 2023-24)	Total cost in 2023-24	Forecast DMIA costs (whole of project)
Advanced Meter Staggered Restoration			
Project cost	$58,115	$58,115	$58,115
Direct cost	$58,115	$58,115	$58,115
DMIA eligible cost (excl GST)	$58,115	$58,115	$58,115