TasNetworks DMIAM Report 2021-22

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1. Governance

1.1.1 DMIA spending in 2021/22

There were one (1) new projects and one (1) ongoing DMIA projects under implementation or development for which TasNetworks incurred costs in 2021/22.

TasNetworks submission identifies claimable costs incurred **totalling $478,744**.

1.1.2 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.

1.1.3 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 Future Networks Team Leader, Future Networks 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 Future Networks Team Leader, Future Networks.

Delivery Stage: The project proposal is reviewed by the Future Networks Team Leader, Future Networks 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.

1.2 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.

1.3 DMIA project summary

Table DMIA Project Summary

Projects	2021/22 Actual costs (exc GST)	Year Initiated
New Projects (initiated 21/22)		
Derwent Bridge microgrid feasibility study	$110,333	2021
New Project Sub-Total	$110,333	
Existing Projects (expenditure in 2021/22 and initiated prior)		
Dynamic EV charging trial	$368,411	2020
Existing Project Sub-Total	$368,411	
TOTAL	$478,744	

1.4 New projects

1.4.1 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 deasil generators. Derwent Bridge is a community in the central highlands with a small populations of permanent residential 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. If replaced, an alternative option should be considered.

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.

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 emanating from the Butlers Gorge switching station. The project will involve 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 investment infrastructure investment decisions at Derwent Bridge and are transferrable 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 and remote communities to investigate whether replacing, upgrading or supplementing a microgrid or upgrading existing off-grid and fringe-of-grid supply with microgrid or related new energy technologies would be cost effective'. As well as model production on microgrid solutions, with the learnings from the feasibility study to 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 around alternative options for augmenting the ageing and costly 110 kV infrastructure supplying the town, thereby reducing long term network costs.

Implementation approach

Project delivery will occur in three phases, which are broadly aligned to the 2021/22, 2022/23 and 2023/24 with 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.

Key Deliverable

- Finalised Project Plan (TasNetworks)

Sub Deliverables

- Partner Contracts/Agreements (TasNetworks)
- Project Governance Framework (TasNetworks)
- Project Plan and Related Artefacts – Budget, Project Control Register (TasNetworks)

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.

Key Deliverable

- Engagement Report (TasNetworks)

Sub Deliverables

- Community Stakeholder Engagement Plan (TasNetworks)
- Community Information Session/Visioning Workshop # 1 (TasNetworks)
- Community Information Session # 2 (TasNetworks)
- Survey for business and residents (TasNetworks/UTS)
- Webinar for API Bursary Students (API)

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.

Key Deliverable

- Report on literature review, lessons learned from previous studies and regulatory frameworks (UTS)

Sub Deliverables

- Capability Review of MG Projects Report (UTS)
- Islanded Showcase example of Standalone PV/Battery System (UTS)
- Report on most important impact factors for optimising design and operation of DERs in Microgrids (UTS)

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.

Key Deliverable

- Preliminary report on monitoring device instalment and data collection (UTS)

Sub Deliverables

- Provide requested network and customer data (TasNetworks)
- Procure and install Luceo Smart Meters (TasNetworks)
- Data cleansing and analysis (UTS)
- Report on design and operation scenarios and related economic analysis (UTS)

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

Key Deliverable

- Preliminary report on load modelling and Microgrid design options (UTS)

Sub Deliverables

Report on load characteristics (UTS)

- Conceptual Design Options for Derwent Bridge MG (UTS)
- High-level MG design (UTS/Redback/Installer/TN)

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.

Key Deliverable

- Report on design objectives and specifications of Microgrid digital twin (UTS)

Sub Deliverables

- Design Objectives (UTS)
- Specifications for decision management platform (UTS/Redback)

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.

Key Deliverable

- Report on local community survey and capacity building (TasNetworks)

Sub Deliverables

- Community workshops (TasNetworks)
- Report on customer trial and summarised survey results (UTS/TN)
- Provision of training to community (UTS/TN)

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).

Key Deliverable

- Report on the development of tools and algorithms (UTS)

Sub Deliverables

- Develop deep learning-based adaptable mode (UTS)

Milestone 9- G tools

This phase will focus on developing and implementing tools and algorithms. It include 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.

Key Deliverable

- Report on the development and implementation of Microgrid digital twins (UTS)

Sub Deliverables

- Develop innovative tools and model to support development of islanded MGs for rural and regional communities (UTS)
- Implement innovative tools and models to support development of islanded MGs (UTS)

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 include 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.

Key Deliverable

- Report on the development and implementation of the business model (UTS)

Sub Deliverables

- Develop Digital Twin using real-time UTS simulator (UTS)
- Implement Digital Twin developed using UTS simulator (UTS)

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.

Key Deliverable

- Report on the next steps of the proposed feasibility study and recommendations for Derwent Bridge town (TasNetworks)

Sub Deliverables

- Next steps for implementation of a full MG at Derwent Bridge (UTS/TN)
- Process to guide MG developers and engineers (UTS)
- Financial indicators for investors and financiers (UTS)

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.

Key Deliverable

- Final Report (TasNetworks)

Sub Deliverables

- Document outcomes of the project for sharing to relevant industries, researchers, communities, investors and students (API/UTS/TN)
- Share project outcomes to relevant industries, researchers, communities, investors and students (API/UTS/TN)
- Closing Event (TasNetworks)

Results

Key updates from the project so far:

- Project Inception – Complete
- Engagement report – Complete
- Literature Review – Complete

- Data framework – In progress
- Load modelling and MG design – In Progress

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 eligible project incurred by the distributor to date as at the end of that regulatory year and incurred by the distributor in that regulatory year is as follows:

Budget item	2021/22 Actual	Total Actual
Project management, engagement and research	$50,333	$50,333
Cash contribution	$60,000	$60,000
Total (excl GST)	$110,333	$110,333

The costs of the eligible project expected to be incurred by the distributor in total over the duration of the eligible project is as follows:

Annual budget	Yr 1 21/22 ($M)	Yr 2 22/23 ($M)	Yr 3 23/24 ($M)	Total ($M)
TasNetworks in-kind contribution	0.05	0.05	0.05	0.15
TasNetworks cash contribution	0.06	0	0	0.06
Total	0.11	0.05	0.5	0.21

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	31/05/2024
Final report and knowledge sharing	15/01/2024	30/05/2024

1.5 Existing projects

1.5.1 Dynamic EV charging trial

EV charging or transport electrification has the potential to improve electricity network efficiency by increasing network energy throughput (the amount of energy transported through the network of poles and wires) leading to a reduction in network charges ($ per kWh) to all customers, but the benefit can only be realised if no/limited additional asset investment is required to enable EV charging. If not managed efficiently, even non-EV owners will bear the burden of the additional electricity required to charge EVs in terms of network infrastructure augmentation and addition of fossil fuel peaking plants to manage the peak demand. Residential EV impact study undertaken by Future Networks identified potential network augmentation costs in range of $4.3m – $7.3m with every 10% increase in EV penetration in no intervention scenario, this cost can be reduced to $0.7m-$1.2m with dynamic EV charging or orchestration.

Project nature and scope

This project is focused on understanding the technology and customer EV charging preferences in orchestrating this new form of DER (distributed energy resources). The most unique value of this project is its co-funded by ARENA, participation by multi DNSPs including Jemena, AusNet, United Energy, Evo Energy, and TasNetworks so project will contribute to collective learning of multiple DNSPs and industry, and project will test future scenario where network capacity is monitored in real time and EV charging is managed dynamically to get the best outcome for the networks and customers.

Insights from project will be fed to the retailers and aggregators to further stake energy market value stream for the customers.

This project will remove barriers unique to the transmission and distribution networks, will facilitate EV uptake for customers and a reduction in the electricity network charges for all customers in Tasmania.

Project aims and expectations

The project aims to determine ways to optimise and defer network asset augmentation required as a result of EV uptake and offer a smoother pathway for all customers.

The project has three main objectives:

Understand what and when spare capacity is available in the network and how the spare capacity can be used to charge EV in a manner that satisfies both customer and network needs

Understand customer preferences and participation in such initiatives

Understand what incremental investment is required after spare network capacity is fully utilised

This is an ARENA funded project put forward as a joint proposal from five DNSPs and its proposal for ARENA funding is led by Jemena Electricity Networks, ARENA will cover half of the expenditure of each of the participating DNSPs

How and Why Project Complies with Project Criteria

The Dynamic EV Charging Trial is a project for researching, developing or implementing demand management capability or capacity especially in determining network capabilities in regards to customers expectations with EV charging. It is innovative using emerging technologies such as LV Monitoring and simulation tools to provide a solution to EV integration. By making these learnings it can reduce long term network costs by minimising augmentation costs.

Implementation approach

The project will be spread over three calendar years (CY 20, 21 and 22) and will have the following milestones:

Milestone 1

DNSPS will develop the detailed scope and design of the project. As the design progresses, the key material and services requirement will be identified and detailed specifications will be developed. It is more of refining costs particularly for the hardware-smart charger, control box etc. This stage will require some strategic decisions to be made on scoping, and design in consultation with all partners. A couple of OEMs will also be invited to provide input .A trial participant strategy will be developed during this time.

Deliverables – Completion of the design

Milestone 2 – Smart Charging Platform development

Development works related to the smart charging such as control box, Tesla API integration, aggregators platform JetCharge (ChargeFox), user interface, API integration with the DNSP side platform and optimisation engine will be completed by JetCharge. DNSPs will develop required platform to integrate with their internal systems as well as with the Charge Fox platform.

Deliverables – Fully tested hardware and software

Milestone 3- Customer recruitment

This is the most critical aspect of the trial given the low number of EVs hence will require concerted efforts from all DNSPs, JET Charge and other associates. A robust marketing plan will be developed to guide the process. This will continue until the end of the year.

Deliverables – Required number of EV owners recruited for the trial

Milestone 4 – Installations and testing

This involves installing the charging equipment at homes and distribution transformer monitoring systems on the Networks within DNSP's areas. The installation is expected to be staggered as the installation process will continue to be refined based on the lessons learnt as the installation progresses.

Deliverables – Onsite installation of the equipment at home and on Networks.

Milestone 5 – Dynamic charging field trials

A 12 month trial period is allocated to run variety of demand response trials offering variety of incentives in five DNSP's areas.

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

Milestone 6 – Analysis and knowledge sharing

DNSPs will collect the data and perform the analysis to underpin the evaluation of the trial.

Deliverables – Knowledge sharing activities.

Results

Key updates from the project so far –

- Project scope and design – Complete
- Smart Charging platform development by JET Charge – Complete

- Customer recruitment and on boarding for TasNetworks – Complete
- DNSP platform development and smart charger installation – Complete
- Dynamic charging field trials – In Progress

Implementation costs of the project

The costs of the eligible project incurred by the distributor to date as at the end of that regulatory year and incurred by the distributor in that regulatory year is as follows:

Budget item	2021/22 Actual	Total Actual
Project research and development	$120,598	$120,598
Project Delivery	$247,813	$247,813
Total (excl GST)	$368,411	$368,411

The costs of the eligible project expected to be incurred by the distributor in total over the duration of the eligible project is as follows:

Annual budget	Yr 1 20/21 ($M)	Yr 2 21/22 ($M)	Total ($M)
Internal Labour (Incl. CAM)	**0.293**	**0.036**	0.329
Procure Sub/contractor (Incl. CAM)	0.054	0.077	0.131
ARENA Reimbursement	-0.161	-0.052	-0.213
TasNetworks Contribution (Incl. CAM)	0.185	0.06	0.246
Direct Cost Total	0.347	0.113	0.46

Project Progress & identifiable benefits

Key deliverables	Start date	End date
Finalising agreements- Partners and ARENA	1 May 2020	31 December 2020
Pilot design: Marketing plans, test plans including hardware/ Software specifications, Knowledge Sharing plan.	1 May 2020	31 December 2020
Smart Charging Platform Development	1 January 2021	31 May 2021
Customer recruitment (existing EV owners and through point of sales)	1 January 2021	31 May 2021
Hardware installations and testing- Smart charging infrastructure with Network Sensors	1 June 2021	31 May 2022
Dynamic charging field trials	1 June 2022	30 November 2022
Analysis, final report and knowledge sharing	1 December 2022	29 April 2023