November 2023

Investigating a new future for the Tarraleah hydropower scheme

The Tarraleah hydropower scheme has been generating energy for Tasmanians for over 85 years. Declining efficiency and increased risk of failure make its replacement a priority within the next 10 to 15 years. This is an opportunity to reimagine the scheme to deliver more energy and improve operational flexibility to meet Tasmania's future energy needs and suit a changing electricity market.

Hydro Tasmania has made significant advances in deciding the best path forward for the scheme. We have conducted a rigorous analysis of five potential options, considering the social, environmental, commercial, and economic risks and benefits of each.

This preliminary business case details that analysis and identifies our preferred option: full redevelopment of the scheme with a pressurised conveyance. This option delivers the greatest capacity, storage, flexibility, and reliability for every dollar invested, while addressing environmental risk.

A redeveloped Tarraleah hydropower scheme would increase peak capacity from 90MW to 190MW and deliver 30 per cent more energy from the same amount of water. The preliminary business case estimates the cost for this option to be $1.05 billion (in 2023 dollars); however, we want to be clear that this is a base cost estimate. This estimate will increase as we undertake more detailed assessments to progress the final business case and engage with potential suppliers.

Planning for major infrastructure projects such as the redevelopment of the Tarraleah scheme takes years and this preliminary business case, completed in May 2023, represents a moment in time. As we progress more detailed work, things will change, including cost estimates, timeframes, and procurement approaches.

For example, geotechnical work undertaken since this preliminary business case was finalised has indicated potential cost impacts and further assessment is required. Other unforeseen factors and market pressures will also influence final costs. Importantly, we will only proceed with the project if it is economically feasible and delivers benefits for Tasmania.

We would not ordinarily publish a preliminary business case. It is an internal document to identify our preferred option. But we recognise there is significant public interest in the project and that the release of this document allows for greater transparency.

In that spirit, we are publishing the preliminary business case in full, with redactions where information could put us at a commercial disadvantage. Hydro Tasmania commits to regular engagement with Tasmanians about the project benefits, costs, and risks (see our Tarraleah community engagement site). We will keep Tasmanians informed as we work towards a Final Investment Decision.

We look forward to working with Tasmanian communities as we progress this important project and to powering the State for another century to come.

Ian Brooksbank
Chief Executive Officer

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Tarraleah redevelopment background

The Tarraleah hydropower scheme was constructed in stages since the 1930s and its role and capability has largely remained unchanged since the 1950s. It has physical and operational constraints that make it unsuitable for the changing electricity market conditions, and some assets are reaching the end of their operational life.

It is proposed that Tarraleah is redeveloped to boost capacity, better support the growth of wind and solar, provide more flexible and fast response that would facilitate growth of wind and solar and generate around 30 per cent more energy from the same water. These are all valuable requirements in a future market.

This preliminary business case outlines the case to redevelop Tarraleah including:

- problems that need to be addressed
- key benefits that will be realised
- five project options
- a recommended option based on an integrated assessment of commercial impacts, qualitative impacts and project risks
- guidance on the implementation and delivery of the recommended project option.

It concludes that redevelopment with a pressurised conveyance (option 5) delivers the greatest benefit.

Social

- Protect existing social and cultural values linked to the River Derwent in the TWWHA.
- Help maintain downward pressure on energy prices for household customers.
- Historic Tarraleah Power Station preserved in its original location.
- Help balance supply and demand to maintain energy security in Tasmania and the wider NEM.

Economic

- Local and regional economic development opportunities.
- Help maintain downward pressure on energy prices which contributes to improved economic outcomes for the state.
- Risk mitigation of downstream impacts associated with a potential asset failure.

Environmental

- TWWHA better protected and preserved through a reduced risk of an environmental incident caused by a potential conveyance failure.
- Support the development of additional renewable generation in the NEM, facilitating the transition to net zero emissions.

Commercial

- Respond to changing market signals and be more resilient to future market conditions.
- Increased scheme capacity, flexibility and availability likely to increase revenue potential.
- Significantly reduce the occurrences of planned and unplanned shutdowns or repairs.

Preliminary Business Case purpose

Hydro Tasmania's Board has approved a preliminary business case (PBC) for the redevelopment of the Tarraleah hydropower scheme.

The PBC is a strategic document that informs Hydro Tasmania and key stakeholders of the scope of options, viability of these options and the additional work and investment required to develop a full business case for the redevelopment of Tarraleah. Additionally, the PBC recommends a preferred option for the redevelopment of Tarraleah.

KPMG has assisted Hydro Tasmania with preparation and it is aligned to:

- the Tasmanian Department of Treasury and Finance *Structured Infrastructure Investment Review Process* (SIIRP) and
- Infrastructure Australia's *Assessment Framework*.

The capital costs estimates outlined were utilised primarily for option comparison purposes. They are base cost estimates and do not include full contingency and risk allowances. As further information becomes available, including market informed civil construction and plant and equipment costs and improved geotechnical information, Hydro Tasmania will gain increased confidence for the capital costs, which are anticipated to increase beyond these estimates.

Next steps

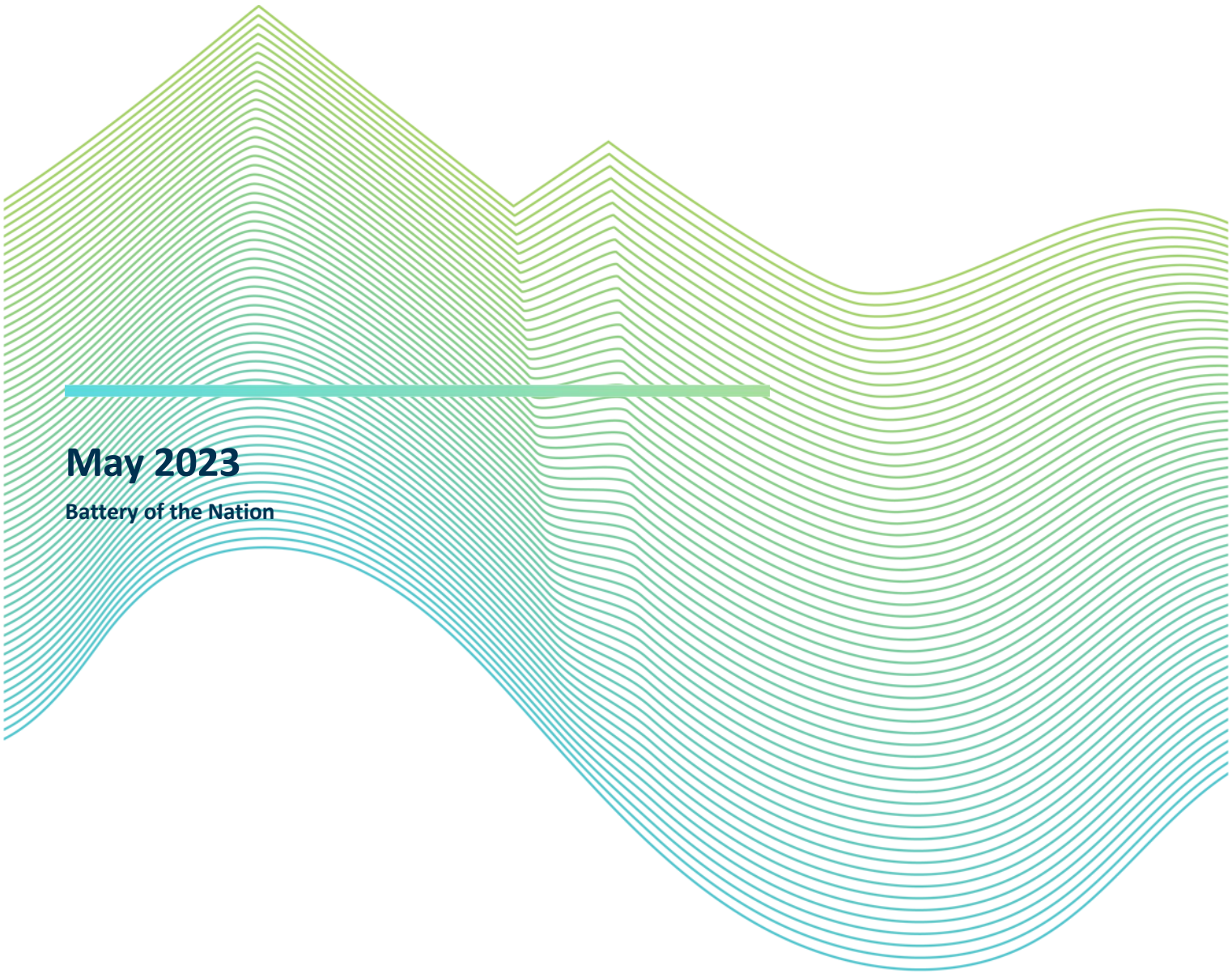
A full business case will be developed ahead of the Final Investment Decision and will comply with the Tasmanian Government's capital investment guidelines for government businesses.

Hydro Tasmania continues to work closely with Treasury and Renewables, Climate and Future Industries Tasmania (ReCFIT) on activities that will inform and support the Tarraleah redevelopment final business case and final investment decision process, including the timing of Parliamentary approval and any Government assessment and approval process.

Hydro Tasmania

Preliminary Business Case

Tarraleah hydropower scheme redevelopment



May 2023

Battery of the Nation

Contents

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Acknowledgement of Country

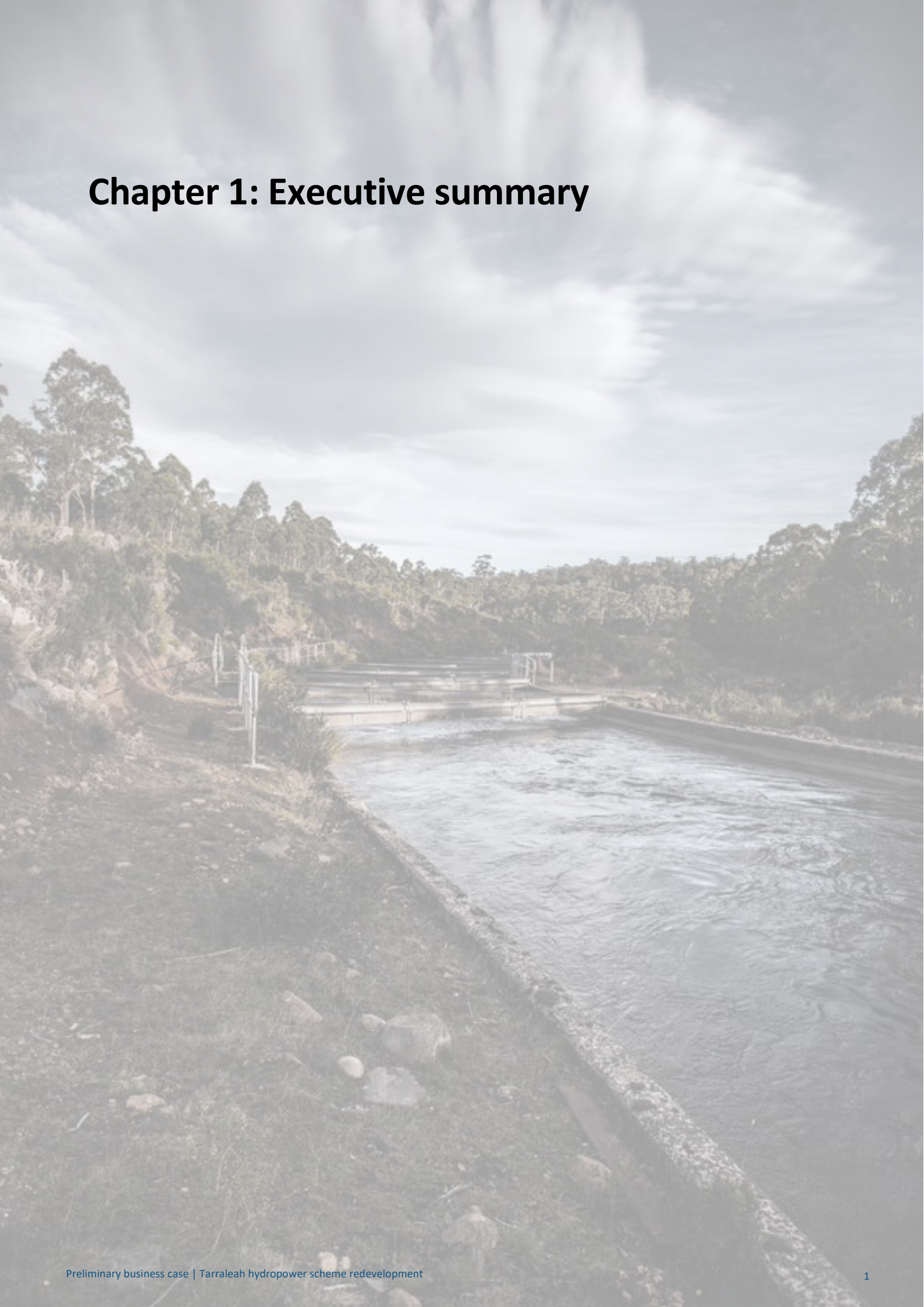
Hydro Tasmania acknowledges Aboriginal people as the traditional owners and custodians of lutruwita/Tasmania, as well as First Nations people from elsewhere, and their ongoing connection to Country and custodianship of the land, seas and waters.

We acknowledge that Hydro Tasmania has a responsibility to care for Country where our sites are located and we are committed to continuing learning from First Nations people. We pay our respects to Elders past and present, and appreciate their generosity in sharing knowledge and culture.

List of acronyms

Term	Description	Term	Description
AEMC	Australian Energy Market Commission	**MCA**	Multi-criteria Analysis
AEMO	Australian Energy Market Operator	**MW**	Megawatt(s)
BESS	Battery energy storage system	**MWh**	Megawatt hour(s)
BotN	Battery of the Nation	**NSCAS**	Network Support and Control Ancillary Services
CEFC	Clean Energy Finance Corporation	**NEM**	National Electricity Market
CPI	Consumer Price Index	**NPC**	Net Present Cost or discounted whole-of-life cost
DA	Development application	**NPV**	Net Present Value
DBB	Design-bid-build	**O&M**	Operations and Maintenance
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Australia)	**OUV**	Outstanding Universal Value
DEECA	Department of Energy, Environment and Climate Action (Victoria)	**PHES**	Pumped Hydro Energy Storage
E&M	Electrical and Mechanical	**PMO**	Project Management Office
ECI	Early Contractor Involvement	**PWS**	Tasmania Parks and Wildlife Service
EMPC	*Environmental Management and Pollution Control Act 1994* (Tas)	**RAID**	Risks, Assumptions, Issues and Dependencies
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	**RBA**	Reserve Bank of Australia
EPC	Engineering, Procure and Construct	**ReCFIT**	Renewables, Climate and Future Industries Tasmania
ESIA	Environmental and Social Impact Assessment	**REGO**	Renewable Energy Guarantee of Origin
FCAS	Frequency control ancillary services	**RET**	Renewable Energy Target
FID	Final investment decision	**RFP**	Request for proposal
FTE	Full time equivalent	**RMC**	Risk Management Committee
GW	Gigawatt(s)	**SEP**	Stakeholder Engagement Plan
GWh	Gigawatt hour(s)	**SRA**	Settlement Revenue Auction
HLT	Hydro Tasmania Leadership Team	**SRAS**	System Restart Ancillary Services
IBRM	Integrated Business Risk Management	**TASCORP**	Tasmanian Public Finance Corporation
ITC	Incentivised Target Cost	**THC**	Tasmanian Heritage Council
IRR	Internal Rate of Return	**TRET**	Tasmanian Renewable Energy Target
ISP	Integrated System Plan	**TWWHA**	Tasmanian Wilderness World Heritage Area
kV	Kilovolt	**VRE**	Variable Renewable Energy
KPI	Key Performance Indicator(s)	**WACC**	Weighted Average Cost of Capital
LGC	Large-scale Generation Certificate	**WM Act**	*Water Management Act 1999* (Tas)
LUPA Act	*Land Use Planning and Approvals Act 1993* (Tas)		

Chapter 1: Executive summary



Business case purpose

The Tarraleah hydropower scheme (Tarraleah) redevelopment involves upgrading the outdated existing scheme into a more reliable and flexible generation source that will significantly increase the portfolio's annual energy generation potential.

Tarraleah currently generates electricity from a large headwater storage (Lake King William). Constructed in stages since the 1930s, the scheme's three power stations[1] have a total installed capacity of 104 MW (peak capacity of 90 MW) and currently generate around 6.5% of Hydro Tasmania's total energy generation.

Many of the scheme's components have aged and there are physical and operational constraints that make it unsuitable for the changing market conditions. Further, the ageing canals are reaching the end of their expected operational life and are posing a risk of an environmental incident impacting the adjacent Tasmanian Wilderness World Heritage Area (TWWHA). Their replacement is a priority within the next 10-15 years.

Options to refurbish or redevelop the scheme, increasing its capacity and introducing operational flexibility through a range of storage options have been considered and assessed. Based on a robust options appraisal, the redevelopment of the Tarraleah scheme is the preferred option to progress to the final business case. This option will involve building a new Tarraleah Power Station, decommissioning the three existing power stations and constructing a new pressurised conveyance to bypass the existing No. 1 conveyance.

The upgrade will allow for inter-seasonal balancing capabilities and increase the scheme's peak capacity by 100 MW (to 190 MW). The enhanced flexibility of the scheme will enable it to respond to, and benefit from, changes in the transitioning National Electricity Market (NEM). The higher efficiency of the pressurised conveyance will also support the generation of approximately 30% more energy from the same water (up to an additional 200 GWh), which is significant.

This document outlines the case for the redevelopment and provides the analysis underpinning the selection of the recommended option. It may be used to support decision-making prior to the completion of a final business case and the final investment decision (FID).

Project background

Firming capacity needed for the transitioning national electricity market

Historically dominated by fossil fuel-fired generation, the NEM is currently undergoing an unprecedented transition. The future electricity system will be dominated by variable renewable energy (VRE) generation, including wind and solar. These changes are being driven by:

- societal shift, both from consumer and investor perspectives, driving uptake and demand for renewable energy
- significant reduction in the cost of utility-scale VRE technologies, such as wind and solar, driving penetration. These technologies can generate energy for close to zero marginal cost, and price traditional forms of generations (such as coal) out of the market
- the progressive closing of the existing coal-fired generation fleet. AEMO forecast that all coalfired generation will exit the NEM by 2043 as assets reach the end of their expected life, and commercial

[1] The Tarraleah hydropower scheme consists of Tarraleah Power Station (90 MW), Butlers Gorge Power Station (12 MW) and the Nieterana Mini-hydro Power Station (2 MW).

viability becomes more challenging due to higher maintenance costs and the inability to ramp up and down in response to increasing price and supply volatility

- State and Australian Government policies to reduce greenhouse gas emissions, with the Australian Government targets including a 43% reduction by 2030 and achieving net zero by 2050
- more demand-side (consumer) participation, through increased uptake in rooftop solar. This has led to reduced energy consumption from the NEM and low/negative wholesale spot prices during the daytime hours when solar generation has become abundant.

Electricity demand varies significantly over the course of the day due to residential, business, and large industrial consumption patterns. These energy needs must be met continuously by an evolving electricity generation mix. Changes in the traditional supply and demand dynamics have created the need for capacity that can firm VRE generation. Otherwise known as 'firming capacity', this refers to flexible energy supply that can be called upon instantaneously in response to changes in demand or to provide back-up over longer periods when there is limited wind or solar generation.

As the energy transition continues to play out, significant investment in new generation and transmission infrastructure will be required. This is expected to lead to upwards pressure on energy prices that will continue into the medium-long term. AEMO forecasts that a 30-fold increase in dispatchable storage capacity[2], including long duration storage and pumped hydro generation, will be required by 2050. This highlights the importance of additional flexibility in the NEM to ensure that system security and reliability is maintained in a system dominated by VRE generators.

Hydropower, with dam infrastructure and long duration storage capability, can provide this critical firming capacity to the market. It balances inter-seasonal variation in heating or cooling demand and addresses system resilience challenges such as wind droughts or plant and transmission failures.

In November 2020, Tasmania became one of only a few jurisdictions worldwide to generate enough renewable energy to exceed the average local power needs. The State's existing hydropower and wind assets, as well as the opportunity to expand its efficiency, capacity, and flexibility, place it in a unique position to provide firming capacity to the NEM and support its transition to net zero emissions.

Hydro Tasmania is the major electricity generator in Tasmania and is Australia's largest generator of renewable energy. The electricity that Hydro Tasmania generates supplies both Tasmania and the mainland NEM through interconnection provided by the existing Basslink cable.

The Tarraleah scheme includes three of the 30 conventional hydropower stations owned and operated by Hydro Tasmania. The combined installed capacity of the three power stations is 104 MW, but due to the lack of remote control and the current conveyance limitations, they only achieve a peak output of 90 MW (including 75 MW from the Tarraleah Power Station).

As the role and capability of the Tarraleah scheme has largely remained unchanged since the 1950s, it is currently inflexible and needs to run almost continuously to avoid spilling (subject to sufficient river inflows). Many of Tarraleah's assets, including its machinery and conveyances, are now nearing the end of their operational lives. **Figure 1** outlines the remaining expected

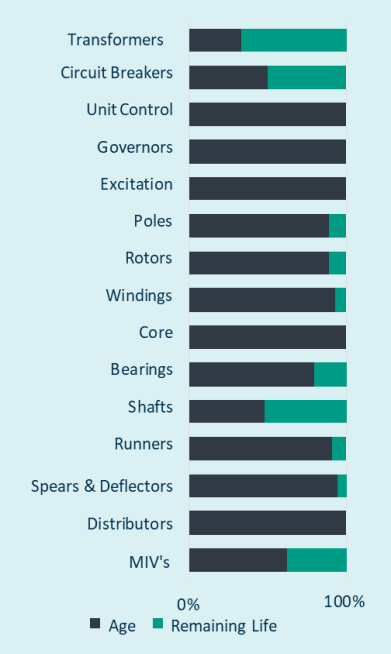


Figure 1: Remaining expected life of Tarraleah's assets

[2] From 1.5 GW to 46 GW of dispatchable storage.

life of the Tarraleah Power Station's electrical & mechanical (E&M) generation assets.

The Tarraleah scheme is located at the edge of the TWWHA (refer **Figure 2**) and is an iconic piece of Tasmanian history. It is one of the two main head storages for the Derwent hydropower scheme. Therefore, improving the operational flexibility of the Tarraleah scheme unlocks the potential for greater operational flexibility throughout the whole Derwent scheme.

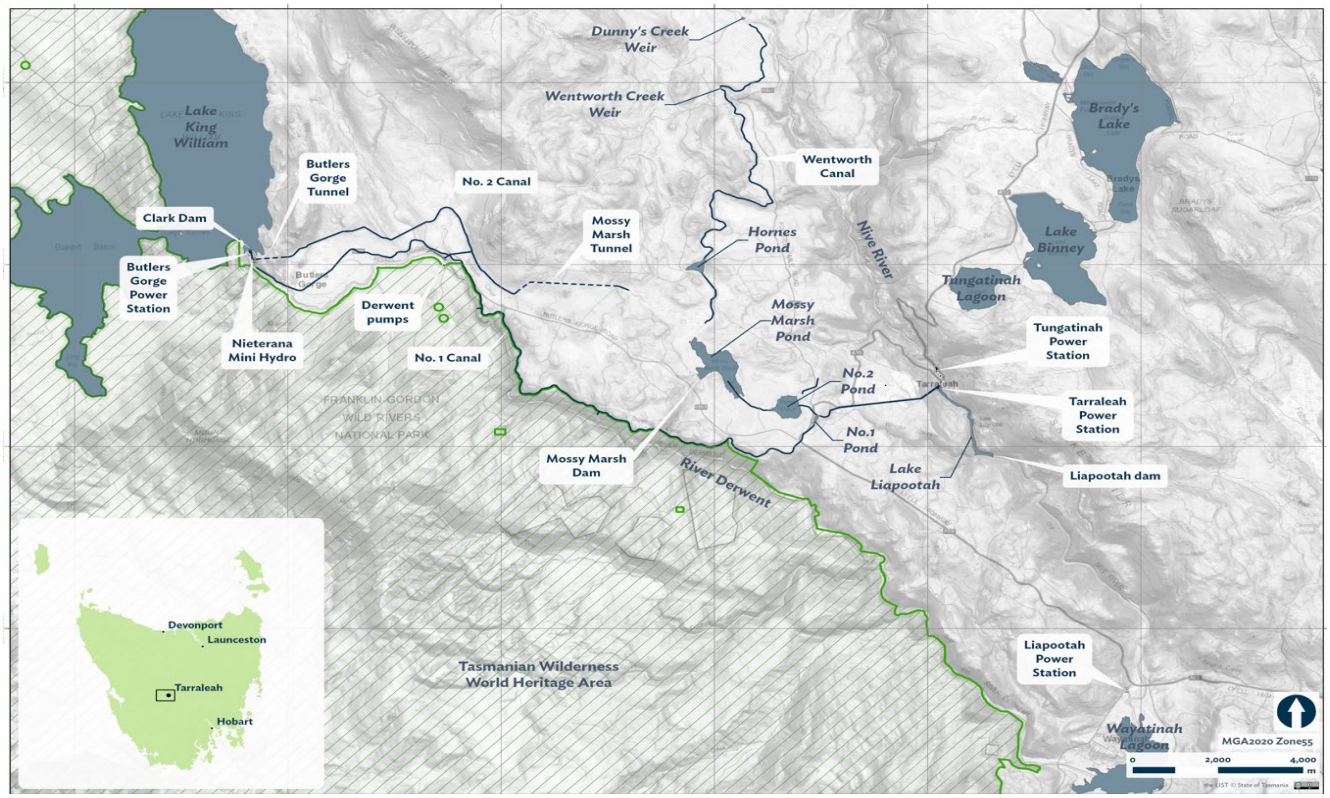


Figure 2: Tarraleah scheme location

Rewiring the Nation (Marinus Link and Battery of the Nation)

The Australian Government has pledged commitment to the 'Rewiring the Nation' initiative, offering low-cost finance to investors for critical infrastructure contributing to updating the NEM.

In October 2022, the Australian Government announced its support for two projects that are relevant to this business case:

- **Marinus Link** – a proposed two-way 1500 MW capacity undersea interconnector (comprised of two 750 MW cables) that will further connect Tasmania with Victoria (and the rest of the NEM). The first 750 MW cable is forecast to be built and operating from late-2028 and the second cable by late-2030[3].
- **Battery of the Nation (BotN)** – an initiative which proposes expanding Hydro Tasmania's existing hydropower systems, increasing capacity and developing a new pumped hydro energy storage (PHES) facility to provide deep, long duration storage.

[3] Completed by 2028/29 for the first capable and 2030/31 for the second cable.

Hydro Tasmania's preferred portfolio response for BotN is to invest in the redevelopment of the Tarraleah hydropower scheme and a new PHES facility at Lake Cethana. This combination of investments is likely to provide the greatest additional market capacity, storage and flexibility to support the transitioning NEM.

At a portfolio level, these projects share similar drivers and will complement each other. This business case considers the Tarraleah redevelopment project whilst the Cethana PHES project will be explored in a separate business case.

Funding to date

The Australian Renewable Energy Agency (ARENA) funded $2.5 million, as part of its Advancing Renewables Program, to support Hydro Tasmania to progress the $5.0 million Tarraleah feasibility study.

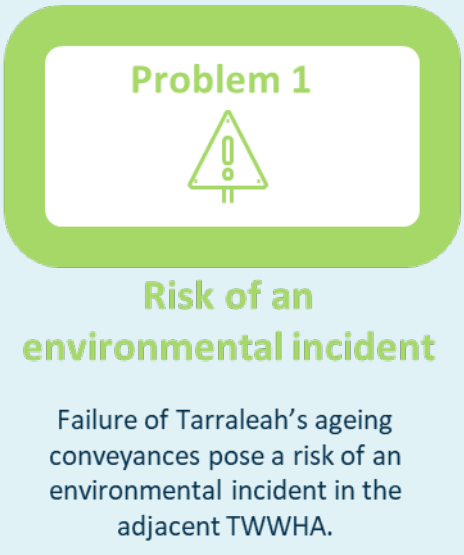
In December 2021, Hydro Tasmania's Board approved expenditure of $123m (including $3.9m already approved) to progress Tarraleah to FID. This investment included $65m of Federal grant funding and has two components that must be progressed together:

- Progressing the potential redevelopment of the Tarraleah scheme to FID at a cost of $25m.
- Delivering a package of upgrade works by mid-2025 at a cost of $98m, of which $65m would be funded by the Federal Government grant.

These proposed upgrade works were considered 'no-regrets' under all credible future scenarios. The works will substantially contribute to future options to improve the value of the scheme through increased operational flexibility and the early reduction of risk associated with the existing Tarraleah No. 1 canal system, regardless of whether the scheme is redeveloped or refurbished in future.

Why is investment at Tarraleah needed now?

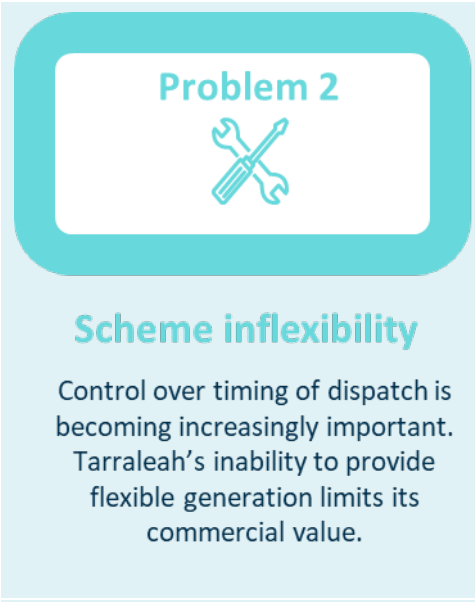
The criticality of the proposed works is highlighted across the three key problems discussed below.



Risk of an environmental incident

The highest priority to be addressed is the risk of an environmental incident in the adjacent TWWHA. Tarraleah's assets, including the machinery and conveyances, are now nearing the end of their expected operational life. The No. 1 conveyance currently presents the highest risk of failure, with an estimated 1 in 50 chance of a major failure each year and a 1 in 20 chance of moderate failure each year. This potential failure poses a risk to the adjacent TWWHA.

Many sections of the conveyance are located within 10 metres of the TWWHA extension area declared in 2013, one of the world's largest temperate wilderness areas. Hydro Tasmania has obligations under Tasmanian and Federal laws to prevent harm to natural and cultural values. Given the increasing risk of an environmental incident, it is prudent to replace the canals by the mid-2030s. The power station assets are also expected to reach the end of their operational life in the coming years, and it is prudent to replace them as soon as possible.



Scheme inflexibility

Tarraleah's current configuration only allows for manual operation and inflexible generation. This limits its ability to respond to market signals and provide the firming capacity needed to maintain system security and reliability.

These operational constraints will become an increasing barrier to realising opportunities and/or mitigating the risks associated with fluctuating market conditions, particularly as increased VRE penetration leads to more volatile wholesale prices. For example, the scheme's inability to ramp up in response to high prices or down in response to low prices is a significant commercial constraint.

Future reliability risk

Tarraleah's machinery in the existing power station is now nearing the end of its expected operational life and the risk of failure is increasing. Although the ageing conveyances are still operational, their deterioration has resulted in increased friction and slower movement of water. This leads to inefficient water management and reduced output.

Planned and unplanned shutdowns are expected to occur more frequently as Tarraleah's machinery continues to age and Hydro Tasmania works to mitigate safety and operational concerns (refer to **Figure 1**).

These disruptions represent lost generation from a scheme that is an important part of annual generation (6.5%).

Timing considerations

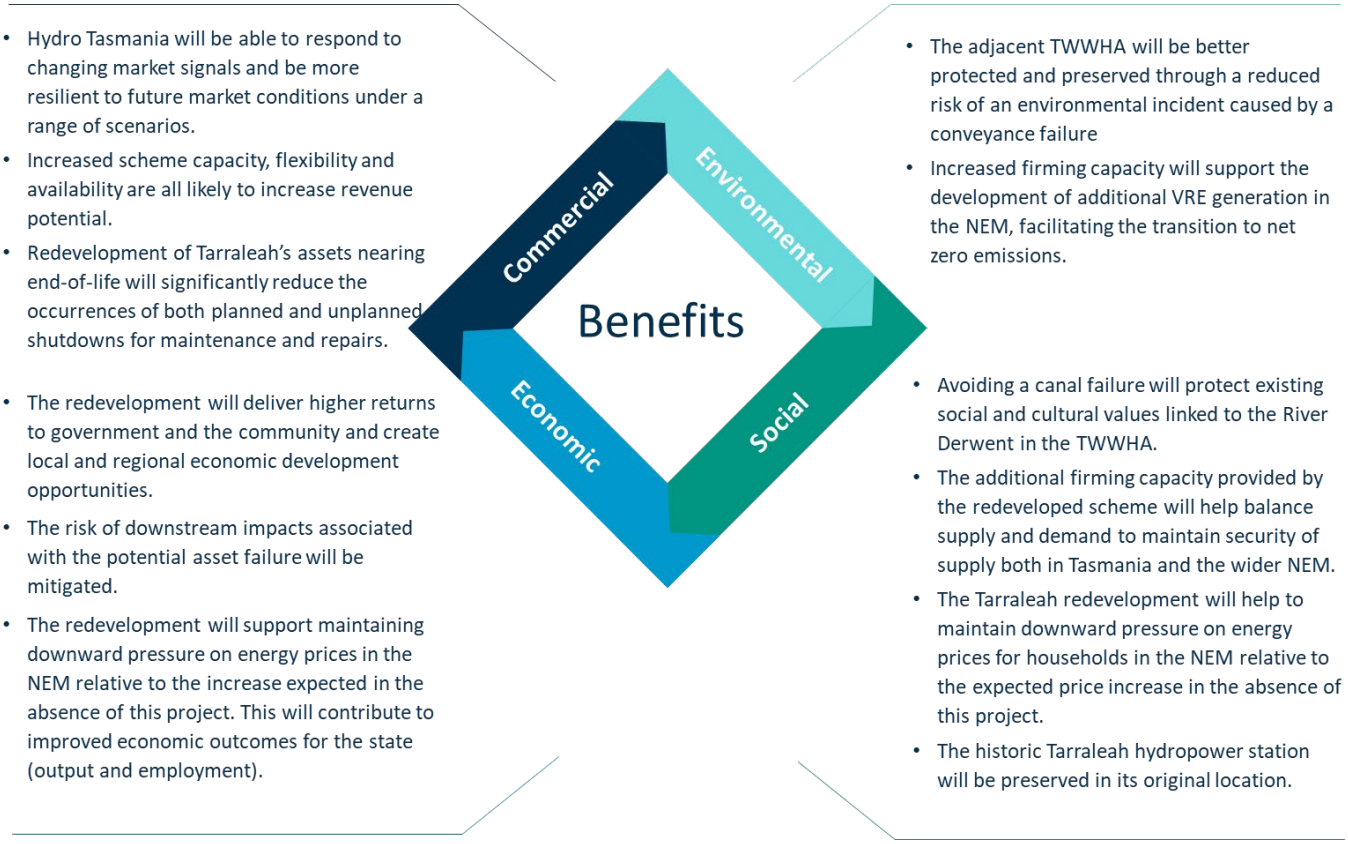
The risk of an environmental incident posed by the ageing canals is an increasing concern and a prudent timeframe for replacement is by the mid-2030s at the latest. There is also an opportunity to deliver additional benefits by timing Tarraleah's redevelopment with the planned increase in interconnector capacity. This will increase Hydro Tasmania's revenue potential, optimise value from Marinus Link and maximise Tasmania's contribution to the NEM's decarbonisation objective. To align with the timing of the first stage of Marinus Link and enable these benefits to be realised, an investment decision is needed for Tarraleah by mid-2024.

Benefits of the Tarraleah scheme redevelopment

Addressing the current problems within the Tarraleah scheme is likely to deliver a range of interrelated benefits for Hydro Tasmania, the environment, the community, and the Tasmanian economy.

These are summarised in **Figure 3.**

Figure 3: Intended benefits



Project options

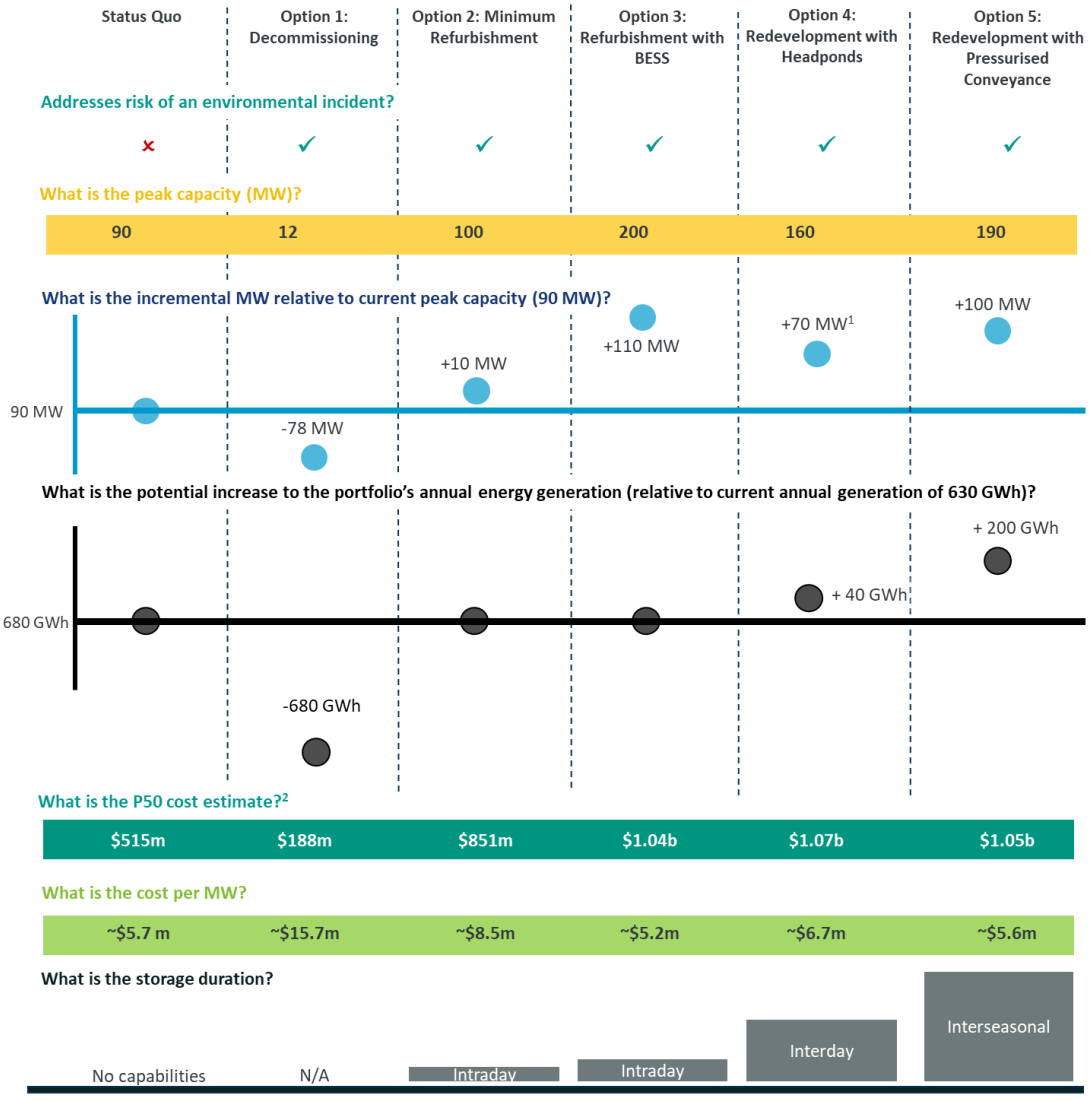
The following options were considered for the Tarraleah Scheme:

- **The Status Quo** – involves maintaining the current scheme. This scenario is included for comparison purposes only
- **Option 1: Decommissioning** – involves decommissioning the existing scheme once the assets have reached the end of their expected operational life however the risk of an environmental incident and continued operation is considered unsustainable
- **Option 2: Minimum Refurbishment** – involves refurbishing the existing power station and replacing the canals
- **Option 3: Refurbishment with battery energy storage system (BESS) (Additional Shallow Storage Capacity)** –this is equivalent to Option 2 but with additional capacity introduced by implementing a two-hour (200 MWh) BESS elsewhere in the portfolio

- **Option 4: Redevelopment with Headponds (Deep Storage)** – this option involves replacing the Tarraleah Power Station and increasing size of the headponds storage (No. 2 Pond) to provide some additional operational flexibility
- **Option 5: Redevelopment with Pressurised Conveyance (Inter-seasonal Storage)** – this option involves replacing the Tarraleah Power Station to provide maximum flexibility (inter-seasonal) and reliability.

An overview of the options is provided in **Figure 4**, including cost, peak capacity, flexibility and ability to address risk of an environmental incident. More detail on each option is provided in the following section.

Although the more flexible options cost more than Option 2 (Minimum Refurbishment), the cost per MW decreases as flexibility increases. Therefore, the incremental cost for the additional peak capacity offers significant value. For example, Option 5 (Redevelopment with Pressurised Conveyance) costs an additional $210 million relative to Option 2 but provides an additional 90 MW of peak capacity and more than returns this expenditure over the life of the project. This is equivalent to an incremental cost of $2.3m/MW relative to Option 2. Option 5 (Redevelopment with Pressurised Conveyance) is the only option that offers the potential to significantly add to the portfolio's annual energy generation.



[1] An additional unit could increase installed capacity by 55 MW (from 165MW to 220 MW), and peak capacity by 49 MW. This would increase peak capacity from 160MW to 209MW and incremental peak capacity from 70 MW to 119 MW.
[2] P50 cost estimates (in FY 2023 dollar terms) were developed by Hydro Tasmania and externally reviewed by Ranbury. These are point in time estimates based on available information and will only be known with more certainty once market pricing is available towards FID.

Figure 4: Option overview

The Status Quo represents the current Tarraleah scheme, and involves undertaking essential refurbishment works at Tarraleah and Butlers Gorge Power Stations with the sole objective of sustaining current operations. While these works will maintain operations, they will not address the key problems identified above, in particular the risk of an environmental incident posed by the ageing canals. The Status Quo is therefore considered for comparison purposes only.

The Status Quo, like all other options involves replacement of the six existing Pelton machines that are reaching the end of their operational life in Tarraleah Power Station with modern machines either in the existing station (Status Quo and refurbishment options) or a newly constructed power station (redevelopment options).

Option 1 involves decommissioning the existing Tarraleah scheme. The timing of this decommissioning is expected to be required around 2028, driven by the Tarraleah Power Station machinery having reached the end of its operational life by that time. This option therefore addresses the risk of an environmental incident occurring and delivers an environmental benefit to the River Derwent through returned flows in the TWWHA. The substantial disadvantage of Decommissioning is that it reduces system reliability, storage capacity or flexibility of the portfolio. From 2030, water released from Lake King William would bypass Tarraleah and Liapootah Power Stations and be discharged into the River Derwent to feed Lake Wayatinah and the remaining lower Derwent scheme.

Butlers Gorge Power Station will be refurbished to allow continued generation, discharge regulators and flood mitigation while Nieterana Mini-Hydro Power Station would be decommissioned along with the No. 2 canal.

As Decommissioning reduces the capacity of Hydro Tasmania's power system it is not considered an acceptable option.

Option 2 (Minimum Refurbishment) involves refurbishing the existing station and replacing the canals. This approach minimises capital investment whilst managing the risk of an environmental incident at the adjacent TWWHA and preserving current operations. The capability to remotely turn the power station on and off, and the new conveyance and headworks that will allow the station to run at full capacity, will provide some intraday flexibility in operations.

Due to the limitations of a new conveyance system, combined with no increase to the size of No. 2 Pond, the Tarraleah stations will not be able to provide inter-day balancing capabilities. There is only marginal impact (10 MW) on peak capacity relative to the Status Quo. While Butlers Gorge and Nieterana mini-hydro power stations are decommissioned (total capacity of 14 MW), there is a 24 MW increase in the output of the Tarraleah Power Station, driven by procurement of new equipment and the construction of a new conveyance and headworks.

Option 3 involves refurbishing the Tarraleah scheme (equivalent to Option 2), and providing additional capacity by introducing a 100 MW, two-hour (200 MWh) BESS elsewhere in the portfolio. This option is included to assess the impact providing additional dispatchable capacity compared to Option 2 and the shallow storage capability to

provide fast ramping and FCAS. A two-hour BESS is consistent with current industry standards. Although this solution is not specific to the Tarraleah site, it is included for comparison purposes to on-site storage solutions.

Similar to Option 2, this option manages the risk of an environmental incident at the adjacent TWWHA and improves reliability of the scheme's operations. It also enhances flexibility within Hydro Tasmania's portfolio by adding capacity through the construction of a BESS. This provides intraday balancing capabilities and captures greater revenue during the periods of high prices.

4 Option 4: Redevelopment with Headponds (Deep Storage)

Option 4 involves replacing the Tarraleah Power Station and constructing a new conveyance (including pipeline and tunnels) interconnecting Lake King William to the headponds storage lake to bypass the existing canals. The headponds storage lake (No. 2 Pond) would be enlarged to its maximum practical size to allow for up to 20 hours of peak capacity output, after which capacity will be constrained to 100 MW by the limited capacity conveyance system to supply No. 2 Pond.

This option addresses both the risk of an environmental incident and the reliability risk. The enlarged storage offers additional intraday and interday balancing capabilities.

5 Option 5: Redevelopment with Pressurised Conveyance (Inter-seasonal Storage)

Option 5 involves replacing the Tarraleah Power Station to provide maximum flexibility and reliability. The new station under this option will be capable of turning off for several days or weeks without spills and running at full output for as long as required (up to months) during extended periods of high prices.

The pressurised conveyance will directly connect the new power station to the head storage at Lake King William. The additional storage capabilities and increased efficiency (higher energy conversion rates) will effectively add 100 MW of capacity to the Tarraleah scheme. The combined impact of the improved efficiency inherent in the redesigned scheme and the increased operational flexibility in the Derwent hydropower scheme has the potential to add up to 200 GWh of annual energy generation to the portfolio (above the Tarraleah Scheme's existing 630 GWh of annual generation).

In addition to addressing the risk of an environmental incident and the reliability risk, the increased flexibility under this option allows for inter-seasonal balancing capabilities. This is expected to be valuable given winter prices are forecast to be at a premium to summer prices.

Market scenarios used for revenue analysis

After extensive research and analysis, three plausible and divergent market scenarios were developed by Hydro Tasmania to evaluate the spot market revenue outcomes for each Tarraleah project option.

For each of the three market scenarios, two different sensitivities, constrained (Sensitivity A) and unconstrained (Sensitivity B), were modelled to analyse the effect of Tasmania to Victoria interconnection constraints on the spot market revenue outcomes. These scenarios test the risk of on-island new generation significantly outstripping local demand. The resulting six market scenarios are outlined in **Figure 5.**

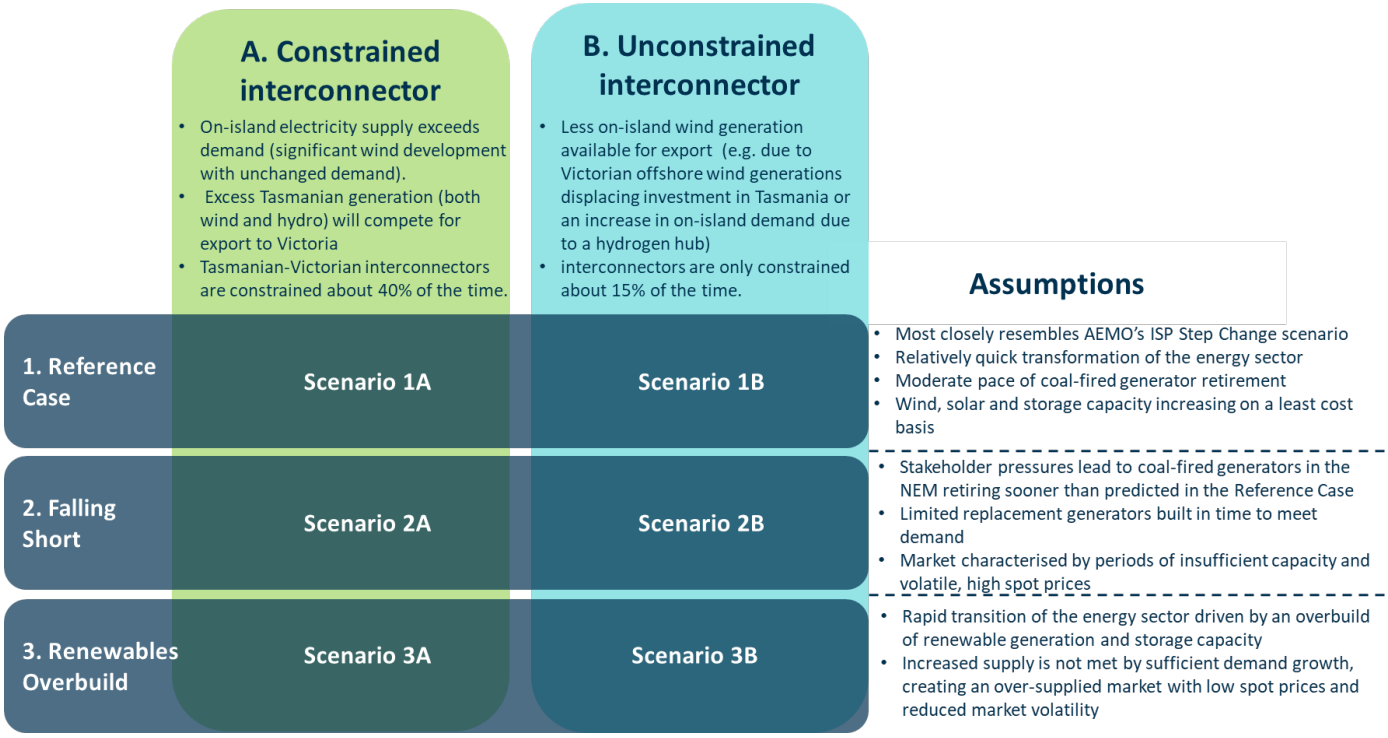


Figure 5: Market scenarios

The modelling results highlight that the extent of interconnection constraint (tested under Sensitivity A and B) has a significant impact on revenue across all project options. At a portfolio level, all project options have a higher spot market revenue when the interconnectors are unconstrained (Scenario B), and Hydro Tasmania can export more generation to the mainland NEM when prices are high. Options that offer the most flexibility (Option 4 and Option 5) result in higher spot revenue.

As shown in **Figure 6,** Option 5 delivers the highest spot revenue across all market scenarios

Exempt Information – Figure 6 - has been removed from this document:- the disclosure of which would be contrary to the public interest test (s 33 RTI Act) because the information contains data and data analysis which if disclosed is likely to expose Hydro Tasmania to competitive disadvantage (s 38 RTI Act) and likely be prejudicial to the further assessment of this Preliminary Business Case (s35 RTI).

Figure 6: Spot market revenue results

In addition to the spot market revenue, three other revenue streams were included in the analysis. These include:

- Capacity (cap) contracts – retailers pay Hydro Tasmania a premium for these contracts to hedge against spot prices above $300/MWh. Cap contracts provide retailers with some insurance against high spot prices for the volume of contracts purchased and provides stable and predictable revenue streams for Hydro Tasmania, which can help to offset the volatility of energy prices in the market.
- Asian call options (also known as "average rate call options") – retailers pay Hydro Tasmania a premium for these contracts to receive a pay-out if average spot prices during the option period exceed the predetermined option strike-price. The pay-out is equal to the extent (in $/MWh) that the average pool price exceeds the option strike price at the end of the period. These products enable retailers to hedge against average prices over a period and provide a stable and predictable revenue stream for Hydro Tasmania (as above).
- Renewable electricity guarantee of origin (REGO) revenue – the Australian Government's Department of Climate Change, Energy, Environment and Water has proposed a renewable electricity guarantee of origin certificate mechanism that would incentivise renewable electricity investment and procurement. While the exact policy details have not yet been announced for the proposed REGO scheme, it is

expected that they would be able to be created for all renewable generation. Initially, they are expected to exist alongside largescale generation certificates (LGCs) but to continue beyond 2030 when the Renewable Energy Target (RET) ends.

There is also likely to be additional revenue opportunities from the provision of deep storage capacity that are not well understood or adequately remunerated in the current market. As thermal generators are retired, the variability of new generation is expected to create a time-based risk for storage. The longer the weather drought, the higher the market risk of having adequate storage to meet the market need and the greater the revenue potential. For the final business case, these additional revenue opportunities will be explored further.

Options assessment

An integrated approach to the options appraisal was adopted (**Figure 7**) to determine the recommended option for consideration in the final business case. The Status Quo and five project options were screened against non-negotiable criteria. Projects that passed this preliminary screening were then assessed and ranked based on an integrated assessment that enabled decision makers to consider multiple impacts in parallel. This integrated assessment included the following:

- Commercial impact assessment. This included an assessment on the relative value for money offered by the options using several metrics.
- A multi-criteria analysis (MCA). This included assessment and scoring of financial and non-financial impacts to provide a value comparison of the options. Given that value considers both costs and benefits, there is intentional overlap between the commercial impact assessment and the MCA.
- Relative risk comparison. This provided an assessment of the relative project risks posed by each of the options.

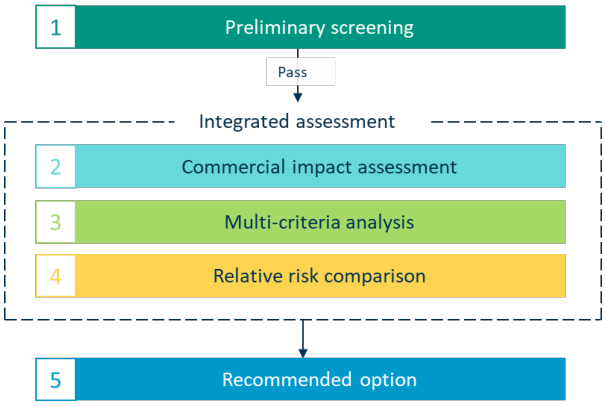


Figure 7: Overview of integrated assessment process

Preliminary screening

Preliminary screening of each option was undertaken against three criteria – technical viability, compliance (with legal, regulatory and contractual requirements) and environmental protection. This last criterion recognises the key project driver and ensures that only options that mitigate the risk of environmental damage (due to conveyance failure) are to be considered.

The Status Quo does not pass the preliminary screening as it does not replace the ageing canals, and therefore the risk of an environmental incident in the adjacent TWWHA is unmitigated. The Status Quo is therefore not considered further in the integrated assessment due to not passing the preliminary screening. Other than the Status Quo, all options pass the preliminary screening.

Commercial impact assessment

The commercial impact assessment results demonstrate that Option 5 (Redevelopment with Pressurised Conveyance) has the highest internal rate of return (IRR)[4] relative to the other project options.

As shown in **Figure 8:**

- both redevelopment options (Option 4 and Option 5) have a smaller spread between 'low IRR' and 'high IRR' values than the other options This reflects that these options pose a lower risk in the changing energy market

all project options have 'high IRRs' that are above Hydro Tasmania's WACC[5] of * *Exempt Information* Options 3, 4 and 5 are expected to attract preferential funding from the Clean Energy Finance Corporation (CEFC) which may reduce the WACC for these options * *Exempt Information* The 'high IRR' of these project options is significantly higher than this CEFC Funding Adjusted WACC.

Figure 8: IRR summary* *Exempt Information – numerical values and Figure 6 – have been removed from this document:- : the disclosure of which would be contrary to the public interest test (s 33 RTI Act) because the information contains data and data analysis which if disclosed is likely to expose Hydro Tasmania to competitive disadvantage (s 38 RTI Act) and likely be prejudicial to the further assessment of this Preliminary Business Case (s35 RTI Act).*

Option 5 (Redevelopment with Pressurised Conveyance) also has the highest NPV relative to other project options that maintain operations at Tarraleah.

The incremental value created by each project option compared with Option 2 (Minimum Refurbishment) is shown in **Figure 9**:

- Option 5 (Redevelopment with Pressurised Conveyance) has a positive incremental NPV under all market scenarios, indicating that it consistently delivers better commercial outcomes than Option 2 (Minimum Refurbishment)
- Option 5 also consistently generates a higher incremental NPV than the other redevelopment options under all market scenarios tested.
- Option 3 (Refurbishment with BESS) consistently has a lower NPV than the other options.

The preferential funding from the CEFC may improve the NPVs for Option 3, Option 4 and Option 5 further. These financial results reflect that there is value in increasing capacity and flexibility at Tarraleah (rather than a Minimum Refurbishment option).The NPV is strongest when the interconnector is unconstrained, and is positive for all operational options (Options 2 to 5) under the reference case (1B) and falling short market scenario (2B). This scenario offers the highest price volatility and therefore the greatest benefits from being able to dispatch quickly during higher price periods. These benefits are realised when the interconnector is unconstrained.

Whilst Option 1 (Decommissioning) has a higher NPV than the other project options in some market scenarios, this is a reflection of its lower capital cost. There is no incremental revenue associated with this option, and it has the effect of reducing Tasmania's hydro generation by more than 6.5%.

[4] IRR refers to the discount rate that makes NPV cash flows equal to zero in a discounted cash flow analysis.

[5] Weighted average cost of capital (WACC) represents Hydro Tasmania's average after-tax cost of capital from all sources, including debt and equity.[6] The Tarraleah hydropower scheme consists of Tarraleah Power Station (90 MW), Butlers Gorge Power Station (12 MW) and the Nieterana Mini-hydro Power Station (2 MW).

Figure 9:Incremental NPV to Option 2 Refurbishment without Additional Storage (Minimum Refurbishment)

** Exempt Information – Figure 9 - has been removed from this document:- : the disclosure of which would be contrary to the public interest test (s 33 RTI Act) because the information contains data and data analysis which if disclosed is likely to expose Hydro Tasmania to competitive disadvantage (s 38 RTI Act) and likely be prejudicial to the further assessment of this Preliminary Business Case (s35 RTI Act).*

The commercial impact assessment includes some sensitivity analysis to test the impact of increased project cost and a delay of Marinus Link (by 12 months). The results are more sensitive to cost than a delay in Marinus. The final business case will include more sensitivity testing including consideration of impact if Marinus Link does not proceed as planned.

MCA results

To complement the financial analysis, a wider comparative analysis of the project options was conducted against several evaluation criteria that reflect the impacts (negative and positive) that relate to the project drivers and that most materially differentiate the options. Importantly, the selected criteria expand on the financial analysis to consider the full breadth of benefits that the project aims to deliver. The weightings assigned to each criterion reflect the relative importance to Hydro Tasmania's decision making.

The Status Quo is not considered in the MCA as it did not pass the preliminary screening. However, it is used as a baseline to which all other options are compared against.

Performance against each criterion was scored using the following 7-point rating scale:

	7	Significantly supports the achievement of the criterion
	6	Moderately supports the achievement of the criterion
	5	Somewhat supports the achievement of the criterion
	4	No change to the Status Quo
	3	Somewhat opposes the achievement of the criterion
	2	Moderately opposes the achievement of the criterion
	1	Significantly opposes the achievement of the criterion

The analysis (**Figure 10**) and results in **Table 1** for the MCA concludes the following:

- Option 5 scores the highest of any option, followed by Option 4. Option 1 (Decommissioning) ranks lowest.
- Relative scores against four criteria improve with increased storage duration and flexibility. This reflects additional commercial agility and firming capacity impacts.
- Decommissioning only performs favourably relative to other options against the environmental benefits criterion as it would return more flows to the River Derwent.
- Community perceptions reflect real and perceived impact on Tasmanian communities. Minimum Refurbishment (Option 2) is likely to be preferred by customers as it is the lowest cost option that addresses the risk of an environmental incident. Customers may question the need for a BESS (Option 3) to be included as part of the development.

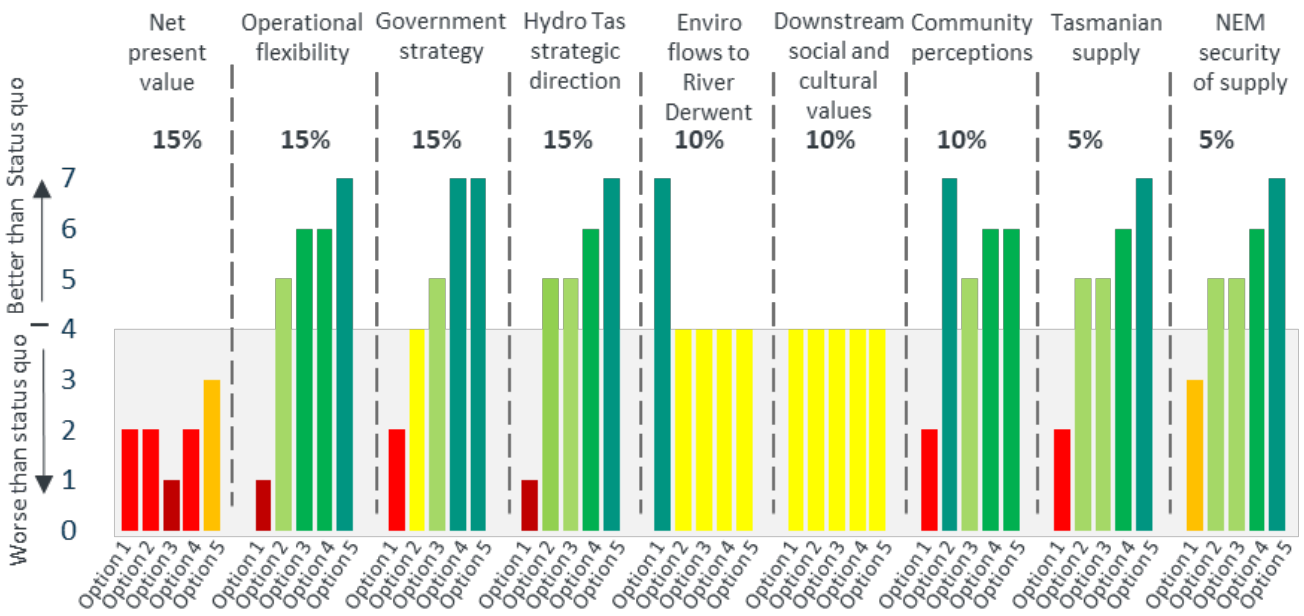


Figure 10: MCA results

Table 1: MCA total scores (weighted and unweighted)

Evaluation criterion	Option 1	Option 2	Option 3	Option 4	Option 5
Average score (unweighted)	2.7	4.6	4.4	5.2	5.8
Weighted Score	2.5	4.4	4.4	5.2	5.7

Relative risk comparison

The Status Quo is not considered in the relative risk comparison as it did not pass the preliminary screening. However, it is used as a baseline to which all other options are compared against.

The relative change in project risk compared to the Status Quo was assessed and compared using 13 evaluation criteria across six categories. These criteria reflect the risks related to the project drivers and that most materially differentiate the options. The risk of an environmental incident arising from canal failure was not considered, as this is already captured in the screening criteria.

Other than Decommissioning (which does not have as many delivery challenges), all the project options present a higher incremental risk than the Status Quo. All were rated as a 'somewhat increased risk' relative to the Status Quo and the difference between the options (Options 2, 3, 4 and 5) was immaterial. As such, relative risk was not a key differentiator between project options when considering the total scores.

Recommended option

Option 5 (Redevelopment with Pressurised Conveyance) is the preferred option to progress to the final business case. The key differentiator between these options is the flexibility to respond to changing energy market conditions and therefore the associated revenue potential. Option 5 offers the greatest value due to its inter-seasonal storage capabilities. This allows generation to be ramped down when prices are low for up to several months at a time without spilling and ramped up when prices are high again.

Based on the options appraisal, Option 5:

- passes the preliminary screening test along with the other redevelopment and refurbishment options, as they are all viable options that address the ageing conveyance and the associated risk of an environmental incident in the adjacent TWWHA
- provides an additional ~90 MW of peak capacity that is flexible to respond to future market conditions and has the potential to add up to 200 GWh of annual energy generation to the portfolio
- has the highest revenue and IRR relative to the other project options
- has the highest NPV of any project option that maintains operation at Tarraleah. Its potential to also attract preferential funding (along with Options 3 and 4) from the CEFC which may further improve the NPV
- has the highest MCA ranking of any option, with the highest weighted and unweighted scores. With the MCA considering quantitative impacts (NPV) as well the qualitative impacts, the highest score suggests a relatively higher value for money investment
- aligns best with the long-term strategy of Hydro Tasmania, and with both Tasmanian and Australian Government objectives
- results in a similar change in risk relative to other project options.

It is recommended that Option 5 is progressed to final business case. A schematic of the scope of works required under this option is shown in **Figure 11.**

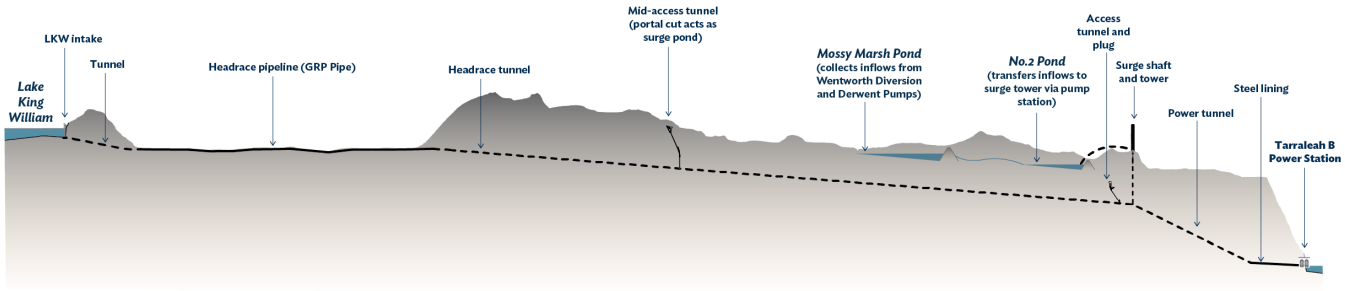


Figure 11: The proposed redeveloped Tarraleah scheme

Risk management

A risk register has been developed for Options 5 (Redevelopment with Pressurised Conveyance). The key strategic risks identified in the register at the time of the preliminary business case relate to:

- market and revenue uncertainties
- failure to obtain necessary financial investment / funding for Tarraleah business case
- failure to undertake effective and transparent procurement of infrastructure and assets
- limited availability of transmission rights due to increased competing generators
- failure to demonstrate compliance with environmental and cultural heritage assessments
- failure to identify and implement all legal and regulatory requirement during FID and construction
- inability to manage third party / contractor quality and capability
- failure to manage supply chain disruption leading to project delay and/or cost increase
- serious incident resulting in harm to a worker or public on/or adjacent to project site

- failure to engage and effectively manage community stakeholder groups leading to project delays, operational disruption and/or loss of social licence.

Of the ten highest ranking risks, one was at an '***extreme***' residual risk rating and nine were at a '***high***' residual risk rating. With the proposed controls and mitigation measure, risk ratings were all downgraded (six to high and four to moderate).

The register will be regularly reviewed and updated throughout the project to reflect the changes in scope certainty and understanding of project risks. Also, the register will be reported to Hydro Tasmania Risk Management Committee on a quarterly basis.

Delivery model

The proposed procurement strategy focuses on achieving the redevelopment of Tarraleah in time for the commissioning of the first Marinus Link interconnector, and in delivering the redevelopment, addressing the current risk of an environmental incident and replacing ageing Electrical & Mechanical (E&M) and civil assets.

The recommended approach for Tarraleah is a single package for the full scope of works, however, with the major E&M components (including turbines, generators and transformers and associated elements within the power station) separately selected by Hydro Tasmania and integrated into the single package.

It is recommended that the Tarraleah redevelopment project be delivered using a single Engineering, Procure and Construct (EPC) contract engaged through a competitive early contractor involvement (ECI) process. Under the proposed approach, Hydro Tasmania would separately run the major E&M equipment supplier selection process and progress performance requirement negotiations, before introducing the preferred E&M equipment supplier to the two EPC contractors in the competitive ECI phase.

As part of the EPC approach, Hydro Tasmania will engage with a single contractor to manage the entire Tarraleah Redevelopment project, including design, civil and E&M works.

**Exempt Information (1 paragraph) has been removed from this document:- : the disclosure of which would be contrary to the public interest test (s 33 RTI Act) because the information contains data and data analysis which if disclosed is likely to harm/prejudicial to Hydro Tasmania's business (Item (s) Schedule 1 RTI Act) and/or be likely be prejudicial to the further assessment of this Preliminary Business Case (s35 & 41 RTI Act and item (o) Schedule 1).*

Including a competitive ECI step in the procurement strategy requires additional investment, as the market expects to be compensated for a portion of their bid costs. However, feedback from other projects is that the competitive ECI step typically leads to:

- more innovative design and constructability approaches
- early identification, mitigation and allocation of delivery risks
- a higher level of cost certainty.

The proposed timeline for the procurement process to identify the preferred tenderer capable of delivering the Tarraleah Redevelopment project is summarised in **Figure 12.**

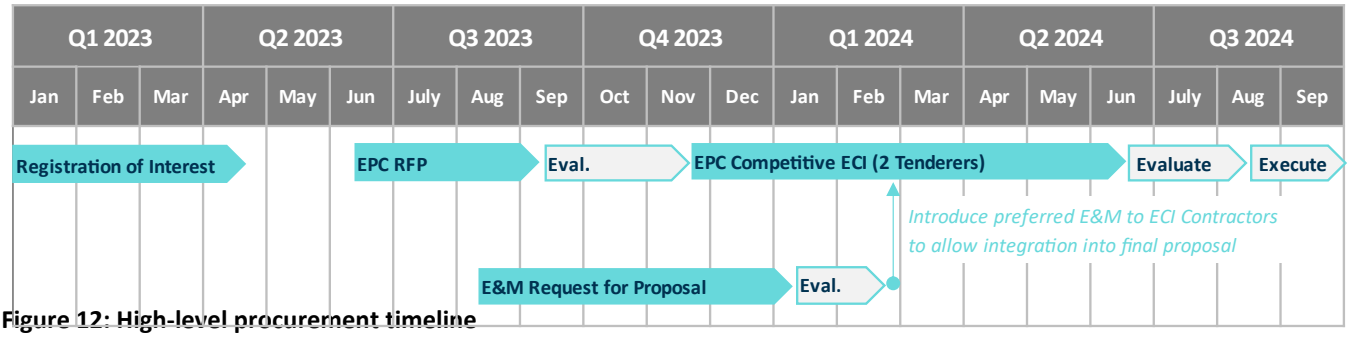


Figure 12: High-level procurement timeline

Stakeholder engagement

In accordance with the Stakeholder Engagement Charter, Hydro Tasmania is committed to engaging with all its stakeholders including its shareholder Ministers (the Tasmanian Government), partner organisations, the community, contractors and suppliers.

A stakeholder engagement plan (SEP) has been developed for the project, with the following objectives:

- identify key stakeholders that are affected by, and/or able to influence the project and its activities and engage them in impact assessment and other studies and processes
- enable community and stakeholders to understand the value proposition of the Tarraleah redevelopment, and the PHES/BotN more broadly, for Tasmania
- ensure communities and stakeholders are kept informed as to project proposals plans and to where possible, provide opportunities for feedback into decision making processes. This will be undertaken, whilst managing expectations throughout the project
- ensure the project understands stakeholder perceptions and potential concerns about the proposed project through participatory dialogue and engagement
- identify key stakeholders that are affected by, and/or able to influence the project and its activities and engage them in impact assessment and other studies and processes
- enable community and stakeholders to understand the value proposition of the Tarraleah redevelopment, and the PHES/BotN more broadly, for Tasmania
- support the development of impact assessments and mitigation plans (commonly known as Social Impact Assessment, Social Impact Management Plan, and a Benefit Sharing Plan) essential to the preparation of the development application documentation and aligned with relevant regulatory requirements for approval
- build an understanding of the feasibility and decision making around the design of project infrastructure.

It is intended that the SEP will continue to be developed over time throughout all phases of the project, including construction, operation and decommissioning – representing a continued commitment to engage with the local community and stakeholders to provide on-going information sharing and careful consideration of potential impacts and benefits.

Further work

The preliminary business case provides sufficient information to support the selection of Option 5 as the preferred option to progress to procurement activities and further analysis in a final business case. In addition, there is sufficient confidence in the preferred option to allow procurement activities to be progressed prior to the final business case and subject to environmental approvals processes.

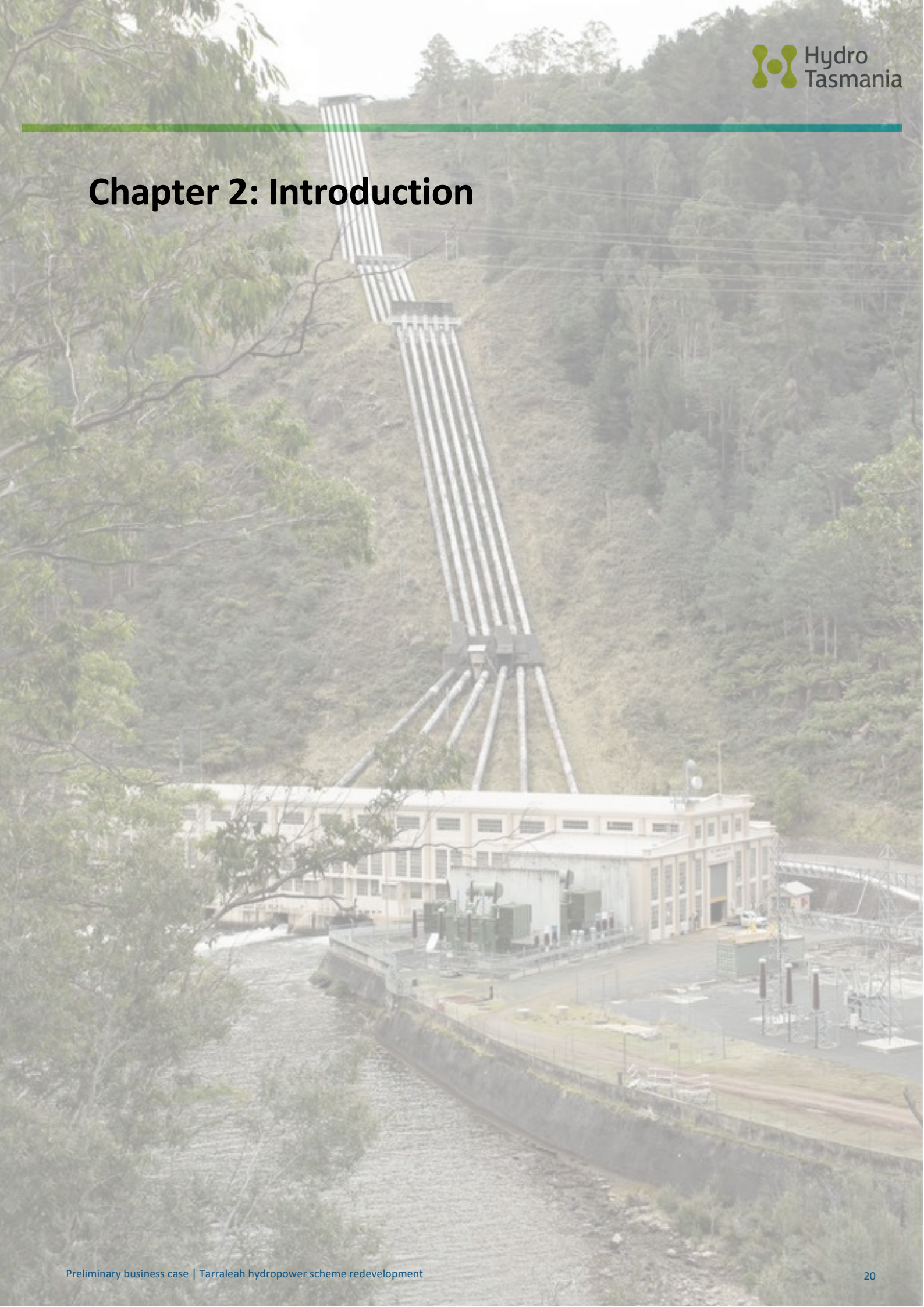
Further work is required to progress this preliminary business case to a final business case and, ultimately, FID. The preparation for the final business case will include the activities outlined in **Table 2.**

Table 2: Final business case activities

Workstream	Preparatory activities
Technical and procurement	• Develop a suite of procurement and delivery contracts, as well as RFP documentation • Refine design, schedule, risk allocation and cost estimate for the recommended option through the competitive ECI phase

Workstream	Preparatory activities
Commercial	• Further work on the contracting strategy to refine the associated revenue projections • Undertake more detailed sensitivity analysis on commercial impact assessment
Project delivery	• Continuous updating of the risk register including alignment between construction phase risks and allowed budget contingencies • Completion of a change management plan • Progressing planning, environment and heritage assessments and associated referrals • Finalisation and adoption of the updated project governance structure • Completion of a project management plan for the construction phase • Refinement of KPIs
Funding strategy	• Consideration and testing of different financing options
Business case approvals	• Develop criteria to support FID decision • Engagement with other approving parties (e.g. Tasmanian Government) and financing partners

Chapter 2: Introduction



Purpose of this business case

The Tarraleah hydropower scheme (Tarraleah) generates electricity from a large headwater storage (Lake King William) and feeds approximately half of the water that passes through the lower section of the Derwent hydropower scheme. Constructed in stages since the 1930s, Tarraleah's three power stations[6] currently generate around 6.5% of Hydro Tasmania's total energy generation. As the scheme's role and capability has largely remained unchanged since the 1950s, it is currently inflexible and its machines and canals are reaching the end of their operational life.

It is proposed that Tarraleah is redeveloped into a more flexible generation source. This preliminary business case outlines the case to redevelop Tarraleah and may be used to support decision-making prior to the completion of a final business case and the final investment decision (FID). More specifically the preliminary business case:

- outlines, and provides evidence for, the problems that need to be addressed
- articulates the key benefits that will be realised when the problems are solved
- identifies five project options that address the three problems to varying extents
- recommends a proposed option based on an integrated assessment of the commercial impacts, qualitative impacts and relative project risks
- provides guidance on the implementation and delivery of the recommended project option.

Project need

The proposed project is part of Hydro Tasmania's portfolio response to maximise the benefits of the:

- expected transitioning of the National Electricity Market (NEM) to net zero emissions, which will involve retirement of coal generation and significantly increased investment in renewable energy generation
- planned development of Marinus Link, which will increase the available interconnection capacity between Tasmania and the mainland NEM.

These changes create opportunities for more firming capacity to be delivered from Tasmania to the other parts of the NEM. Firming capacity can be called upon instantaneously as demand changes or to provide back-up over longer periods of time when there is limited wind or solar generation. Based on its current design, the Tarraleah scheme must run almost continuously to avoid spilling (subject to catchment inflows). This inflexible generation currently constrains the entire Derwent hydropower scheme.

The existing conveyances (canals) are also approaching the end of their operational life and their potential failure is an increasing concern. A prudent timeframe for their replacement is the mid-2030s. In addition to being an operational risk, their potential failure poses a risk of an environmental incident in the adjacent Tasmanian Wilderness World Heritage Area (TWWHA).

The proposed redevelopment

The proposed redevelopment involves converting Tarraleah to a more flexible generation source by building a new Tarraleah Power Station, decommissioning the three existing power stations and constructing a pressurised conveyance to bypass the existing conveyance. The pressurised conveyance will directly connect the new power

[6] The Tarraleah hydropower scheme consists of Tarraleah Power Station (90 MW), Butlers Gorge Power Station (12 MW) and the Nieterana Mini-hydro Power Station (2 MW).

station to the head storage at Lake King William, providing inter-seasonal storage capabilities and increased efficiency (through higher energy conversion rates).

The combined impact of the improved efficiency inherent in the redesigned scheme and the increased operational flexibility in the Derwent hydropower scheme has the potential to add up to 200 GWh of annual energy generation to the portfolio. Allowing for flexible dispatch will enable Tarraleah, and the entire Derwent hydropower scheme to an extent, to be more responsive to the price volatility resulting from increased reliance on variable renewable energy (VRE) generation. It will also provide additional firming capacity the market needs.

The redevelopment of Tarraleah is one of two projects being proposed as part of Hydro Tasmania's Battery of the Nation (BotN) program, which aims to maximise Tasmania's hydropower capacity and provide increased firming for the NEM. The second BotN project is a new pumped hydro energy storage (PHES) facility at Lake Cethana. At a portfolio level, these projects share similar drivers and will complement each other. Whilst some of these shared drivers are discussed in this business case, the Cethana PHES project will be explored in a separate business case.

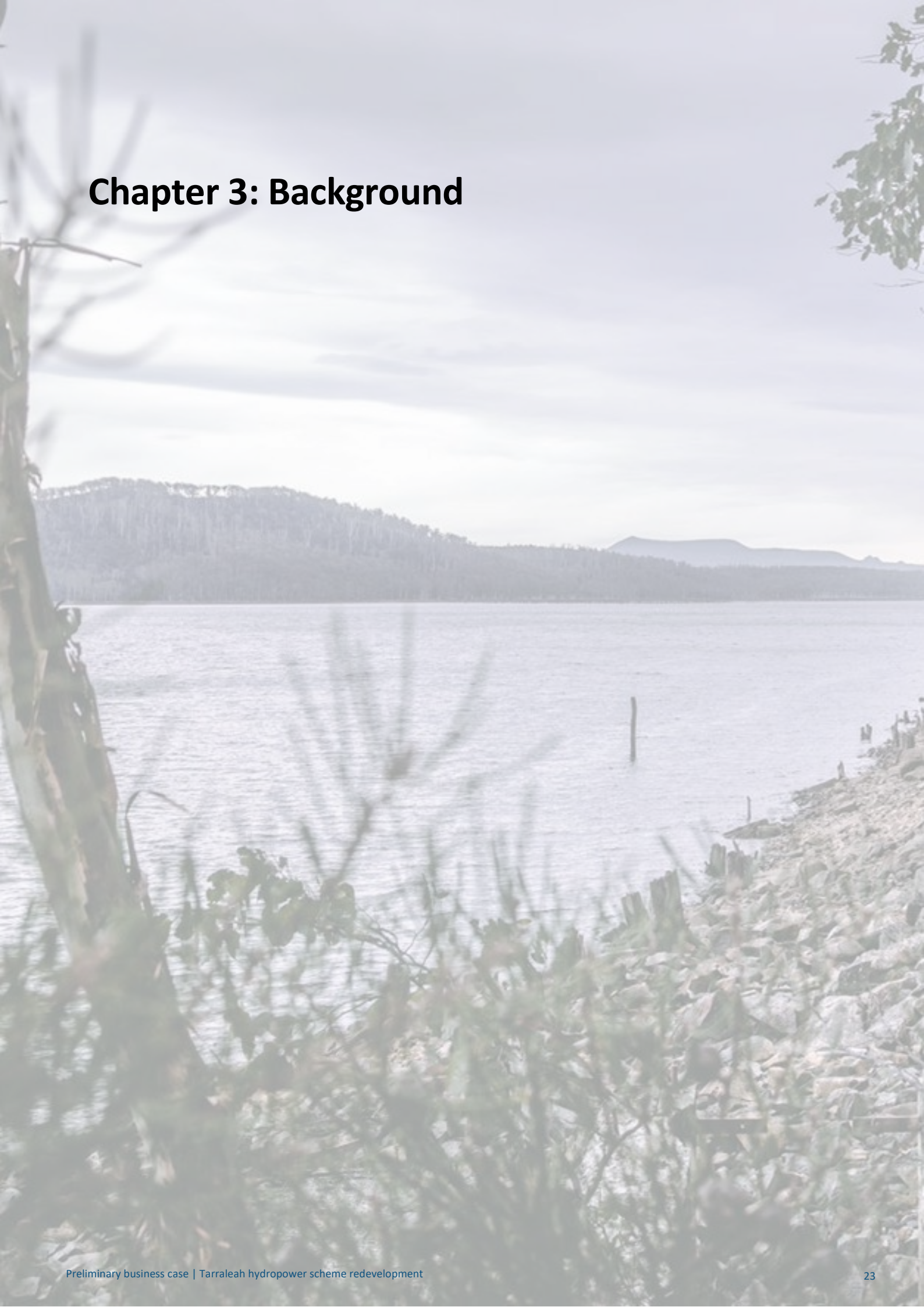
Business case structure

The structure of the business case is presented in **Figure 13.**

Chapter	Overview
3. Background	Provides background information relevant to the investment rationale in Chapter 5.
4. Battery of the Nation Vision and Strategic Response	Provides the policy and strategic context that has led to the BotN program and explains the broader portfolio response, which includes a redeveloped Tarraleah (this business case) and a new pumped hydro storage facility at Lake Cethana (future business case).
5. Tarraleah Scheme - Problem Definition	Provides the rationale for investment in the Tarraleah Scheme. This includes outlining the three key problems that need to be addressed as a matter of urgency.
6. Tarraleah Scheme - Benefits and Outcomes	Outlines how addressing the three key problems outlined in Chapter 5 will deliver a range of benefits to Tasmania and the NEM more broadly.
7. Project Option Overview	Identifies the different project options for the Tarraleah scheme and the reason for their consideration.
8. Project Option – Cost and Revenue	Outlines the different project costs and the expected project revenue streams under various market scenarios. These inputs underpin the financial analysis in Chapter 9.
9. Options Appraisal	Outlines the assessment methodology and approach used to assess and compare the options, and recommends an option for further analysis in a final business case.
10. Risk Assessment and Management	Outlines the process to assess and manage risks for the preferred project option (from Chapter 9).
11. Delivery Model	Provides an overview of the procurement and packaging considerations and the project schedule for the implementation of the recommended project option.
12. Implementation	Provides an overview of how the recommended option will be implemented, including the planning, environmental and heritage assessment as well as the stakeholder engagement and communications plan.

Figure 13: Business case structure

Chapter 3: Background



3.1 Chapter overview

Purpose

This chapter provides background information that is relevant to the investment rationale explored in **Chapter 5**. This includes information on the role of Tasmania and hydropower in the NEM, as well as more project specific information about the Tarraleah hydropower scheme.

Sections include background on the following:

- The NEM (**Section 3.2**)
- The role of hydropower in an evolving energy market (**Section 3.3**)
- Hydro Tasmania's portfolio and its increasingly important role in the NEM (**Section 3.3.1**).

Key points

- The energy market is currently undergoing an unprecedented transition, driven by the need to decarbonise our energy system.
- All coal-fired generation is forecast to exit the NEM by 2043 and be replaced predominantly by VRE generation, including wind and solar. Additional firming capacity will be required to support system security as VRE increases.
- Hydropower, with dam infrastructure and long duration storage capability, is becoming increasingly important in the NEM due to its ability to provide:
    1. dispatchable energy capacity that was previously provided by coal-fired power
    2. flexible firming capacity needed to ensure demand can be met when generation from VRE sources is insufficient
- Tasmania, through existing hydro and wind, is already generating renewable energy in excess of the average on-island electricity needs. The state's existing hydropower assets, as well as the opportunity to expand its efficiency, capacity, and flexibility, place it in a unique position to support the NEM in its transition to net zero emissions.
- Hydro Tasmania is Tasmania's predominant electricity generator and is Australia's largest generator of renewable energy. The electricity that it generates supplies both Tasmania and the mainland NEM through the interconnection provided by the existing Basslink cable.
- Hydro Tasmania has owned and operated the Tarraleah hydropower scheme since its construction in the 1930s. The scheme currently operates as an inflexible generator, generating around 6.5% of Hydro Tasmania's total annual generation.
- The Tarraleah hydropower scheme is located at the edge of the TWWHA, an area of global and national significance.
- The Tarraleah Power Station and it associated water conveyance system are rapidly approaching end of life.

3.2 The NEM

The NEM (also referred to as “the market” or “the grid”) connects generators to customers via 40,000 km of interconnected transmission and distribution lines spanning five different regions: Queensland, New South Wales (including the Australian Capital Territory), Victoria, Tasmania, and South Australia. Interconnectors allow electricity to be exported from regions that have excess electricity supply and imported to regions that have supply shortages.

Historically dominated by fossil fuel energy sources, the NEM is currently undergoing an unprecedented transition to a future where electricity will be sourced predominantly from VRE generation, including wind and solar. The catalyst for this transition can largely be explained by:

- societal shift, both from consumer and investor perspectives, driving uptake and demand for renewable energy
- significant reduction in the cost of utility-scale variable renewable technologies, such as wind and solar farms. These technologies can generate energy for close to zero marginal cost, and price traditional forms of generation (such as coal) out of the market. However, as these generation from these technologies is intermittent they require support from flexible energy generation that can ramp up and down to ensure demand is met
- the progressive closing of the existing coal fired generation fleet. The Australian Energy Market Operator (AEMO) forecast that all coalfired generation will exit the NEM by 2043 as assets reach the end of their expected life, and commercial viability becomes more challenging due to higher maintenance costs and the inability to ramp up and down in response to increasing price volatility
- Australian and State Government policies to reduce greenhouse gas emissions (Australian Government targets of 43% reduction by 2030 and net zero by 2050) (**Section 4.2**)
- increasing demand-side (consumer) participation, through increased uptake in rooftop solar. This has led to reduced energy consumption from the NEM and low/negative wholesale spot prices during the daytime hours when solar generation has become abundant.

As a result of these changes, price volatility[7] in the NEM has also increased in recent years. **Figure 14** illustrates this shift, with the daily average spread of Victorian spot market prices increasing substantially from 2017 to 2022[8]. The average daily demand curve has become ‘peakier’ with higher demand during the mornings and evenings and lower demand during daylight hours. Negative spot prices have begun occurring more frequently during these daylight hours when rooftop solar generation is abundant.

[7] The NEM experiences price volatility due to a number of factors, including changes in demand, weather patterns, and supply constraints. The increasing penetration of renewable energy sources in the market has introduced new sources of volatility due to their variable nature.

[8] A wider shaded band represents more price volatility.

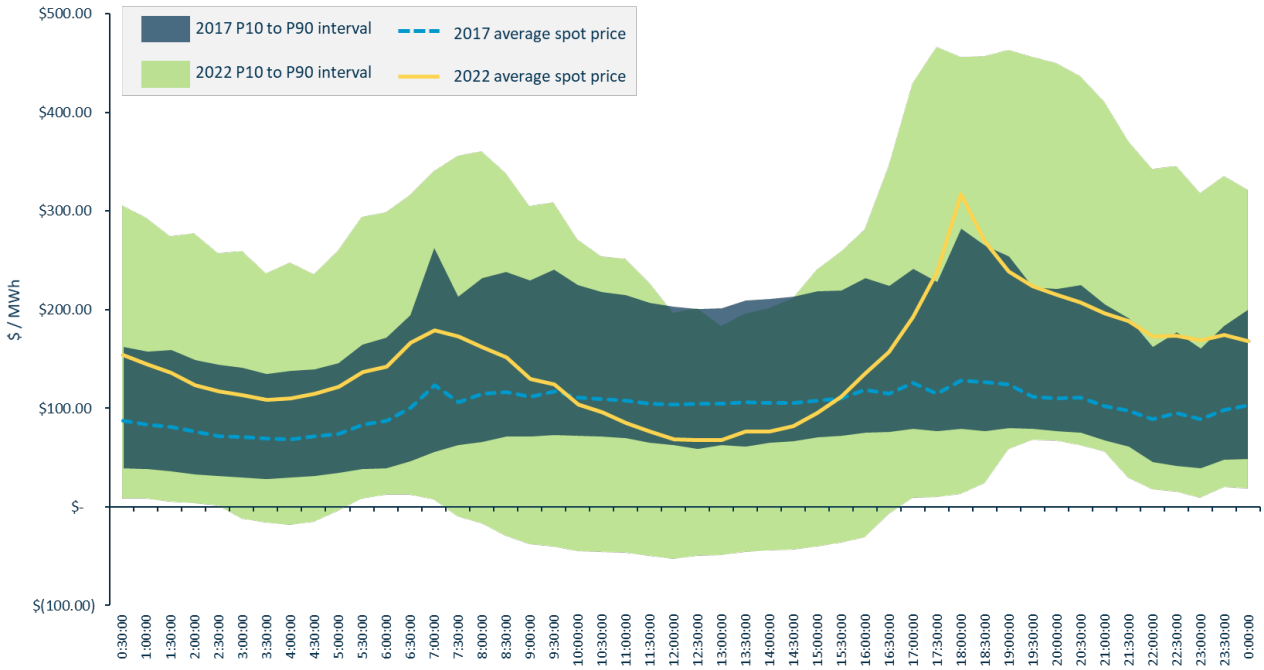


Figure 14: Time-of-day wholesale market price range in Victoria (P10 to P90 intervals), 2017 and 2022 (Neopoint, 2023)[9]

The following text box provides additional information on how spot prices are calculated in the NEM.

Spot market prices in NEM regions

For each five-minute block, generators submit bids to AEMO specifying the electricity price for the quantity they are willing to generate. AEMO centrally coordinates the dispatch of these offers from least to most expensive to achieve the lowest cost generation mix to meet expected demand. The spot price is calculated based on the five-minute dispatch price of the marginal generator at the regional reference node (RRN), or largest load centre, for each NEM region. All dispatched generators in the region receive this price for the relevant five-minute period.

When interconnectors are unconstrained, generators in regions with lower spot prices can sell their electricity to regions with higher spot prices. This assists in equalising prices across the NEM. When interconnectors are constrained, price separation occurs, and spot prices are generally higher in the region where there is a shortage of electricity.

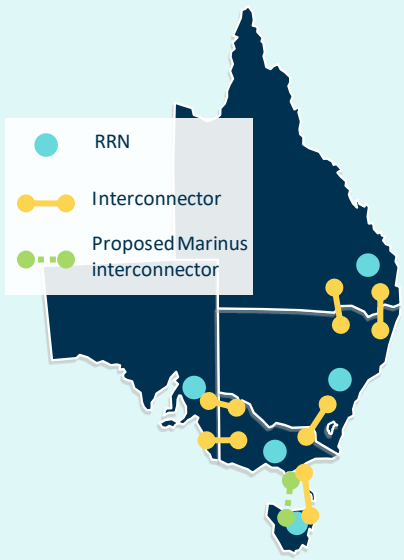


Figure 15: NEM RRNs and interconnectors

[9] The average daily price distribution is based on the P90 and P10 values (i.e. 90% of spot prices for the 30-minute interval are equal or higher than the P90 value and 10% are higher than the P10 value). The shaded band therefore shows where 80% of the spot prices for the interval fell each year. Note: 2017 spot market price data was only available in 30-minute intervals due to the spot market settlement period changing from 30-minutes to five-minutes in 2021. Five-minute spot price data from 2022 was averaged to 30-minute intervals to ensure a consistent comparison was achieved.

The following text box provides more detail on the different generation types that are currently utilised to meet the daily demand pattern.

A mix of generation types is needed to meet electricity demand

Electricity demand varies significantly over the course of the day due to residential, business, and large industrial consumption patterns, as shown by the sample daily demand profile in **Figure 16.** To meet this demand reliably, a combination of the following generation types is needed:

- **Baseload generation –** energy produced on a continuous basis to meet a minimum demand. In Australia, baseload energy has traditionally been met by coal-fired power stations.
- **Intermittent generation –** output from generators which is not readily predictable, including solar and wind-power generators. Intermittent renewable generation is also referred to as VRE.
- **Peaking generation –** flexible energy generation that can ramp up and down to match changes in demand. Peak demand occurs when electricity usage is at its highest, generally in the evenings. Gas and hydropower are typical providers of peak generation. More recently, batteries have been used to meet peak demand for short durations (usually less than two hours).

When there are sufficient storages and/or catchment inflows, hydropower can provide both baseload and peak generation, depending on the design of the hydro scheme.

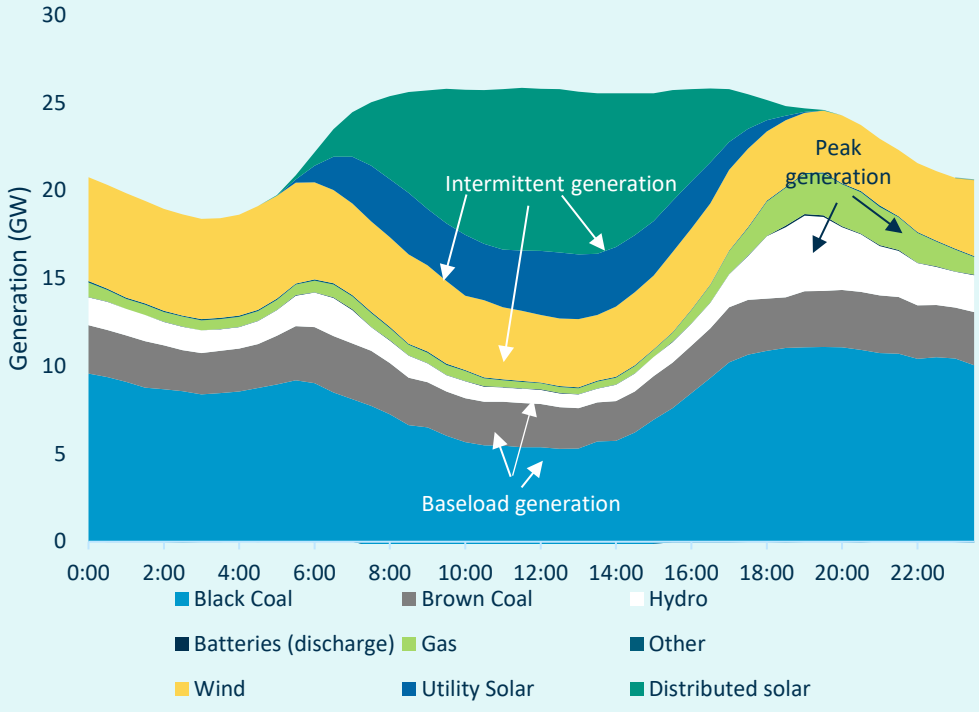


Figure 16: Illustrative example of NEM baseload and peak load energy (from 22 November 2022) (AEMO, 2022)

The increasing frequency of negative spot prices during daylight hours is eroding the financial viability of coal-fired plants and is contributing to their accelerated closure. In addition to baseline energy generation, coal-fired power stations provide the following ancillary services:

- Frequency Control Ancillary Services (FCAS)[10]
- Network Support and Control Ancillary Services (NSCAS)[11]
- System Restart Ancillary Services (SRAS)[12].

These services maintain key technical characteristics of the NEM, including standards for frequency, voltage, network loading, and system restart processes.

Coal-fired power stations are also a steady source of synchronous inertia. While not currently valued in the NEM, system inertia acts as a shock absorber to maintain consistent frequency across the grid, preventing surges and imbalances in supply and demand. The Australian Energy Market Commission (AEMC) is currently considering the implementation of an ancillary service spot market for inertia in the NEM (AEMC, 2023).

If coal-fired generators retire before new energy generators and providers of ancillary services come online, high wholesale energy prices and potential energy shortfalls are likely to follow.

3.2.1 Australian Energy Market Operator's optimal development path

Significant investment in costly new generation and transmission infrastructure will be required as the energy transition continues to play out. AEMO[13] publishes an Integrated System Plan (ISP) every two years which sets out the optimal development path for the NEM's rapid transition towards an energy system with net zero emissions in line with government commitments (see **Section 4.2**). The 2022 ISP highlights that additional firming capacity is expected to play a crucial role in ensuring the lowest-cost, net zero-emissions generation mix of the future NEM.

Four potential future market scenarios with varying rates of emissions reduction, electricity demand and decentralisation were identified in AEMO's 2022 ISP. The 'Step Change' scenario is widely adopted as the most likely pathway. Under this scenario, as shown in **Figure 17:**

- The NEM's total capacity will need to more than triple by 2050 to meet projected increases in demand arising from the electrification of transport, industry, offices, and homes. If Australia wants to become a net exporter of green hydrogen, VRE capacity would need to increase further to support this objective.
- Coal-fired generation (currently producing 65% of the NEM's energy need) is expected to be phased out by 2033 (brown coal) and 2043 (black coal), with wind and utility scale solar generation expected to increase nine-fold by 2050.
- A 30-fold increase in dispatchable storage capacity from 1.5 GW to 46 GW, including long duration storage and pumped hydro generation, will be required by 2050. This highlights the importance of

[10] A process used by the energy market operator to maintain the frequency of the system within the normal operating band of around 50 cycles per second.

[11] A non-market ancillary service delivered to maintain power system security and reliability of supply of the transmission network, or to maintain or increase the power transfer capability of the transmission network.

[12] Restart services allow electricity supply to be restored following a large-scale blackout of the entire power system.

[13] AEMO is responsible for operating the NEM and ensuring energy system security and reliability. The security of an electricity grid is its technical resilience (or strength), namely its ability to quickly respond and remain stable when unexpected events occur. Reliability is the ability of an electric power system to deliver electricity in the quantity and quality demanded by energy users.

additional flexibility in the NEM to ensure that system security and reliability is maintained in a system dominated by VRE generators.

While much remains unknown about the future market, critical investment decisions are required today to ensure that the NEM has the capacity and flexibility to support these changes in the future.

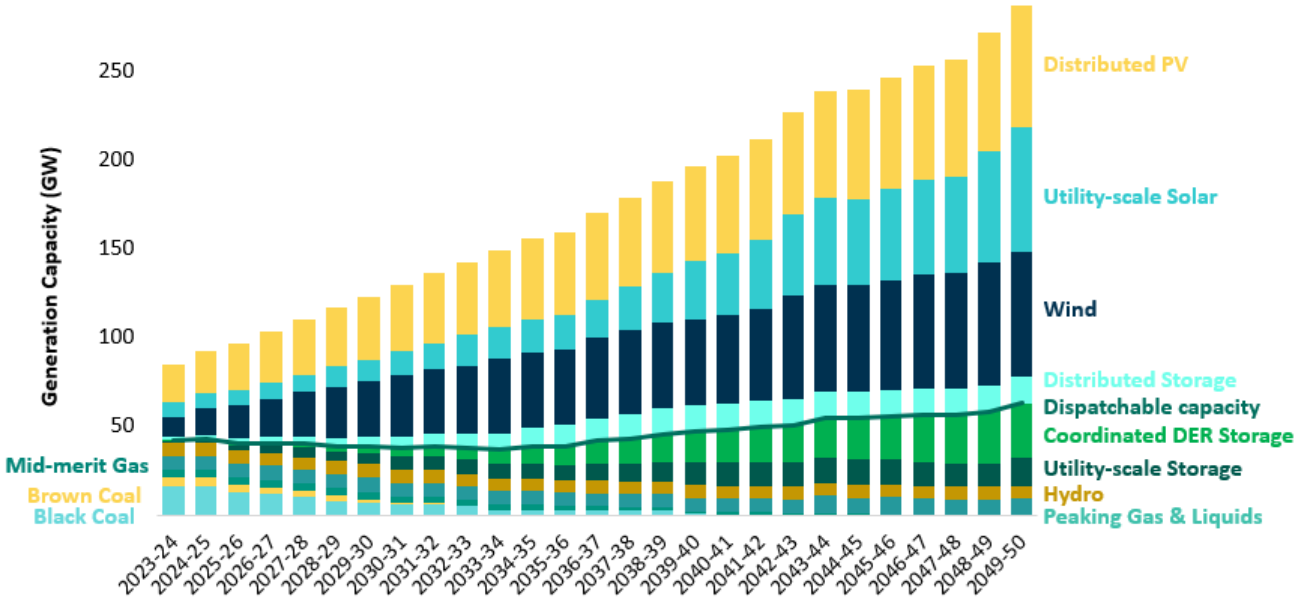


Figure 17: Forecast NEM capacity to 2050, Step Change scenario (AEMO, 2022)

3.3 Role of hydropower in an evolving energy market

VRE sources generate electricity intermittently (i.e. when the sun is shining, or the wind is blowing) and cannot be easily varied to match fluctuations in demand. Wind and solar "droughts"[14] also occur unpredictably, severely impacting grid stability and resulting in volatile spot prices.

With more VRE sources entering the NEM, flexible generation sources are needed to provide firming capacity to fill these supply gaps. This includes conventional hydropower as well as storage systems such as grid-scale battery energy storage systems (BESS, also referred to as "batteries") and PHES. Increased frequency and voltage control providers will also be needed to maintain grid stability as coal-fired generators retire and VRE penetration increases. Hydropower can contribute to this as an effective provider of FCAS, NSCAS, SRAS and system inertia.

AEMO forecasts that a significant increase in medium storage (4-12 hours) and deep storage (12+ hours) capacity will be needed in the NEM by 2044 (**Figure 18**). Hydropower generators can be designed to offer medium or deep storage services and can flexibly dispatch at maximum capacity within a few minutes in response to shortfalls of supply. For this reason, hydropower plays an increasingly important role in the NEM.

[14] Wind and solar droughts refer to periods of greater than one week, where sun and wind are lacking or are experiencing slower-than-usual wind speeds (Brown, Farnham, & Caldeira, 2021).

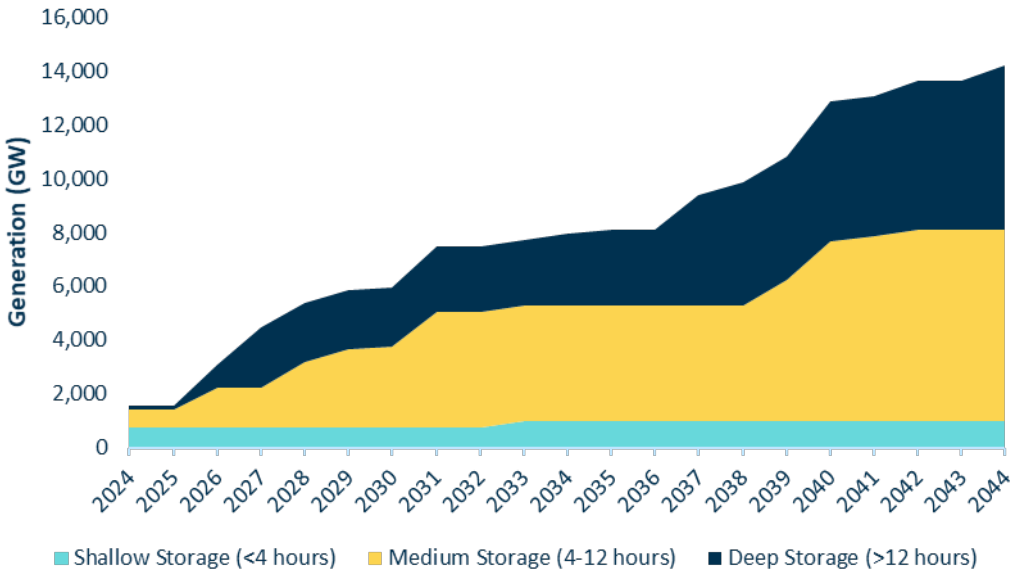


Figure 18: Forecast utility scale storage generation capacity to 2044 by duration (AEMO ISP Step Change scenario) (AEMO, 2022)

3.3.1 Hydro Tasmania's portfolio and its increasingly important role in the NEM

Hydro Tasmania is the major electricity generator in Tasmania and is Australia's largest generator of renewable energy. Over the past century, Hydro Tasmania has built 54 major dams, 30 conventional hydropower stations (producing 9,000 GWh per annum) and two major wind farms[15] (with a combined capacity of 300 MW producing 1,000GWh per annum) (Hydro Tasmania, 2023). This includes a number of hydropower schemes with storage capabilities that are somewhat flexible to ramp up in response to low VRE generation and ramp down when wind and solar generation is abundant and wholesale energy prices are low or negative.

Depending on annual inflows, approximately 85% (81% in 2022) of Tasmania's annual power needs[16] are supplied by hydropower generation managed by Hydro Tasmania. Hydro Tasmania's installed hydropower capacity alone contributes 2,280 MW of Australia's total 7,800 MW of hydropower capacity (Geoscience Australia, 2018). This hydropower capacity is entirely comprised of conventional dam hydropower. There are no PHES schemes currently in operation in Tasmania.

While Tasmania is the NEM's smallest State by both land size and population, it disproportionately contributes to the NEM's supply of renewable electricity. In November 2020, Tasmania became one of only a few places worldwide to generate enough renewable energy to exceed the average local power needs (Tasmanian Government, 2021).

100%

self sufficient in renewable energy generation on average

Tasmania contributed

15%

of the NEM's renewable electricity generation in 2022

Tasmania contributed

5%

of the NEM's total electricity generation in 2022

[15] Musselroe and Woolnorth (including Bluff point and Studland Bay) wind farms.
[16] Approximately 1,400 MW in summer and 1,800 MW in winter.

Tasmanian hydropower generation tends to significantly vary inter-seasonally and annually due to varying inflows into hydro catchments. On average, Tasmania generates more power in winter due to more rainfall causing high inflows and allowing for increased generation.

The State's existing hydropower assets, as well as the opportunity to improve their efficiency, capacity and flexibility, places it in a unique position to support the electricity market in its transition to net zero emissions. Furthermore, customer demand, generation and storage resources in Tasmania have a low correlation to those of the other eastern States. As Tasmania becomes more interconnected with the NEM, these characteristics create opportunities for Tasmania's generation to firm VRE generation and help smooth the total market supply curve.

The electricity that Hydro Tasmania generates supplies both Tasmania and the rest of the NEM through the existing Basslink 500 MW cable that connects Tasmania with the mainland NEM grid. This facilitates imports and exports of electricity to enhance the security of supply on both sides of Bass Strait and plays an important role in balancing supply and demand within Tasmania. Tasmania has been a net exporter via Basslink in four of the last five years (as shown in **Figure 19**).

Given the current capacity of the Basslink interconnector (500 MW), Tasmania must source most of its electricity from Tasmanian-based generators. This means that Hydro Tasmania remains the marginal generator setting the price outcome in the State. When transmission capacity between Tasmania and the mainland NEM increases (as a result of the new Marinus Link interconnector discussed in **Section 4.3.1.1**), there will be opportunities for Tasmania to increase its renewable energy exports while benefiting from imports in periods of low prices.

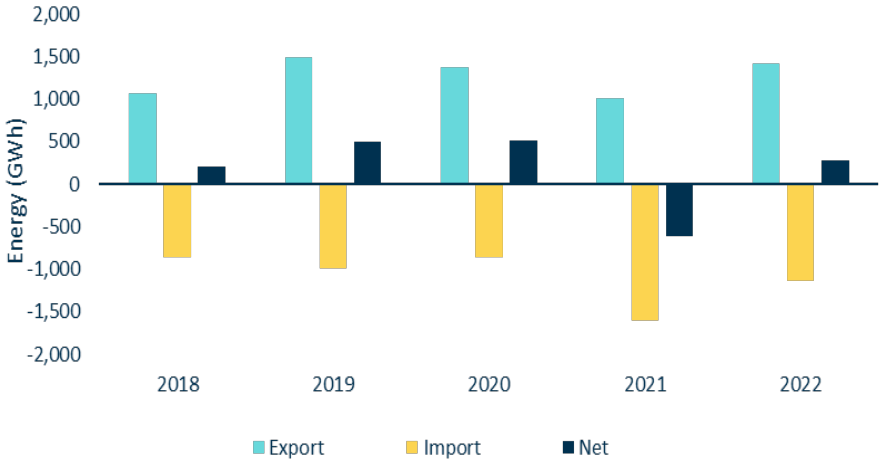


Figure 19: Basslink exports and imports, as at 30 June 2018-2022 (Hydro Tasmania, 2022)

The Tasmanian Government has a vision to develop a Green Hydrogen Hub Project at Bell Bay[17]. To support this vision, on-island VRE generation will need to increase significantly to meet the additional demand created by hydrogen manufacturing. Hydro Tasmania is expected to play an increasing role in generating hydropower to firm VRE generation for hydrogen production.

[17] Australia's National Hydrogen Strategy recognises Tasmania's potential to become a significant supplier of renewable hydrogen due to the State's availability of hydropower and wind resources (DCCEEW, 2019).

3.3.2 The Tarraleah hydropower scheme

Construction of the Tarraleah hydropower scheme commenced in the 1930s. The scheme includes three power stations:

- Butlers Gorge Power Station (approximately 12 MW installed capacity)
- Nieterana Mini-hydro Power Station (approximately 2 MW installed capacity)
- Tarraleah Power Station (approximately 90 MW installed capacity).

Together, these three power stations currently reach a peak operational output of ~90 MW[18] and generate around 6.5% of Hydro Tasmania's total annual generation.

Figure 20: Construction of the Tarraleah hydropower scheme in the 1930s

Constructed in the 1930s, Tarraleah has been one of Tasmania's most significant energy producing schemes for over 80 years.

Tarraleah is comprised of a large headwater storage at Lake King William, and several intermediate headponds: Mossy Marsh Pond, No. 1 Pond and No. 2 Pond (**Figure 21**). Water is diverted from the River Derwent through a series of tunnels, canals, siphons, flumes, penstocks and pipes to Tarraleah Power Station where it is used to produce electricity, before flowing into Lake Liapootah.

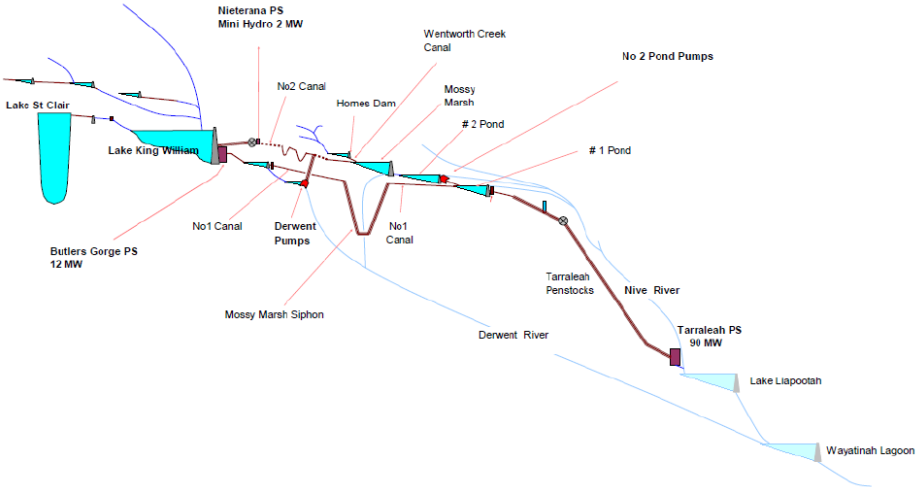


Figure 21: Tarraleah scheme configuration

The Tarraleah scheme is an iconic piece of Tasmanian history.

While the Tarraleah scheme's three power stations have a combined installed capacity of 104 MW, the water conveyances (canals) from Lake King William to the head storage are ageing and are currently constrained to only transferring water at around 30 m^3/s. This is equivalent to a scheme peak output of approximately 90 MW (including 75 MW from Tarraleah Power Station). These constraints in the canals also

[18] The installed capacity of the scheme is 104 MW, however peak output is constrained to 90 MW due to the water conveyances from Lake King William to the head storage currently only transferring water at around 30 m^3/s.

mean that the Tarraleah scheme currently needs to run for 95% of the time to avoid "spill"[19].

The ability to not only catch water, but also hold water in storage and choose when it is used, allows hydropower to be an effective capacity provider in the market. However, increased flexibility is needed to avoid being forced to generate into low market prices.

The Tarraleah scheme feeds approximately half of the water into the lower section of the Derwent hydropower scheme, alongside the Tungatinah scheme that also feeds water into the Nive River above Lake Liapootah. The combined installed capacity of this lower section is 273 MW.

Therefore, improving the operational flexibility of the Tarraleah scheme unlocks the potential for greater operational flexibility throughout the whole Derwent scheme.

3.3.2.1 Scheme description

Tarraleah was constructed in stages beginning in the 1930s and grew with the State's energy needs. The progressive stages are shown in **Figure 22**. The scheme's role and capability has not significantly changed since the 1950s and is limited to providing inflexible generation. Its machinery is comprised of a mix of original parts and upgrades, with some components having been upgraded more than once through routine maintenance.

Tarraleah's energy conversion is considered inefficient by today's standards. The existing Pelton turbines and generator units are currently operating at approximately 86% overall peak efficiency. Modern turbines and generators operate at around 94% peak efficiency.

The inflexible dispatch of that energy is currently constraining the entire Derwent hydropower scheme. These issues are explored in more detail in **Chapter 5.**

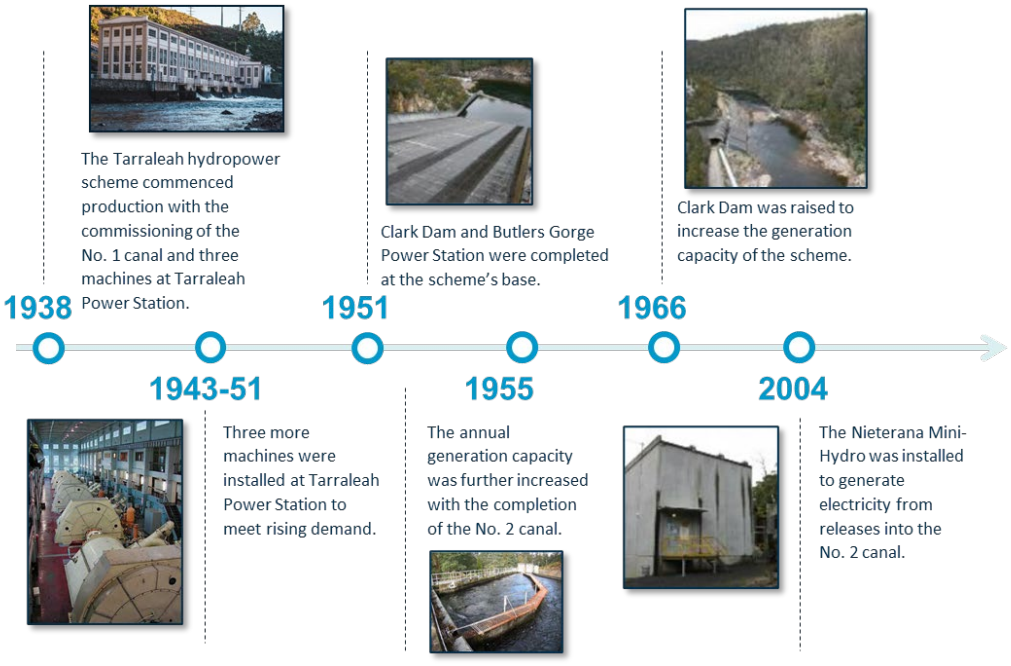


Figure 22: Overview of Tarraleah scheme changes over time

[19] Spills are inflows that, if not used for electricity generation, will spill through the catchments, and will be lost as fuel. Spills at Tarraleah occur from Lake King William at Clark Dam and bypass the downstream Liapootah Power Station.

3.3.2.2 Scheme location adjacent to the Tasmanian Wilderness World Heritage Area

As seen in **Figure 23**, the River Derwent runs along the edge of the TWWHA, starting immediately downstream of Derwent Pumps Weir and continuing along the boundary for approximately 23 km, until approximately 2.8 km upstream from Wayatinah Lagoon.

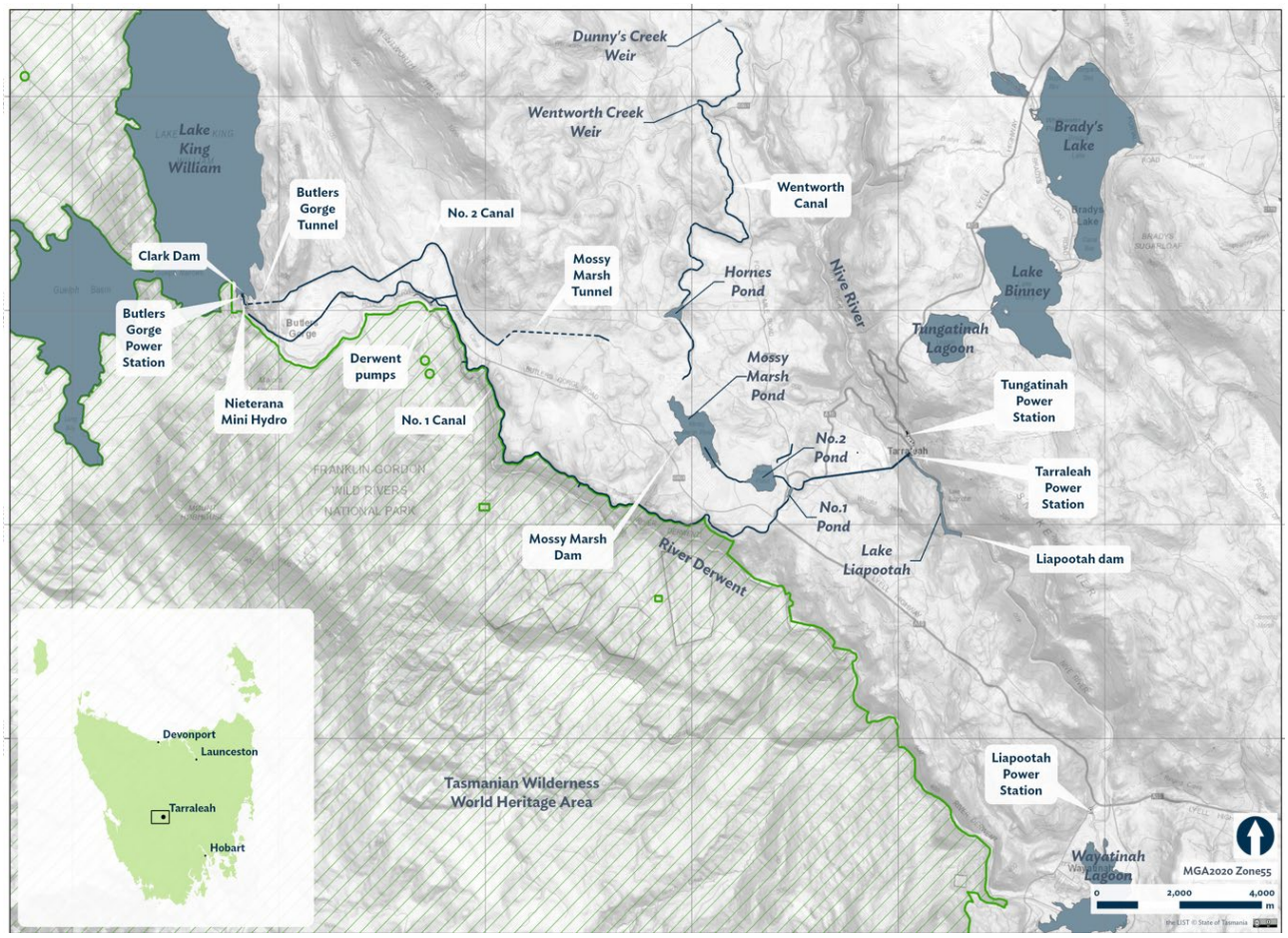


Figure 23: Tarraleah Power Station location

The TWWHA is an area of global and national significance due to:

- it being home to some of the deepest and longest caves in Australia, including many cave sites dating from the late Pleistocene and early Holocene epochs (between approximately 35,000 and 12,000 years ago). These cave sites are important to the archaeological understanding of the southern-most people in the world during the last glacial period
- it being a sanctuary for several animals that are either extinct or threatened on mainland Australia, including the Tasmanian Devil
- it being home to a diversity of flora, including some of the oldest trees and tallest flowering plants in the world
- its rich cultural heritage for Tasmanian Aboriginal people who have lived there for at least 35,000 years.

The significance of the TWWHA is further described in the following text box.

The criteria of the TWWHA that may be impacted if Tarraleah's No. 1 conveyance fails

The Tasmanian Wilderness is inscribed on the World Heritage List under four natural and three cultural criteria, and along with Mount Tai in China meets more criteria than any other World Heritage site.

The **natural criteria** include the following:

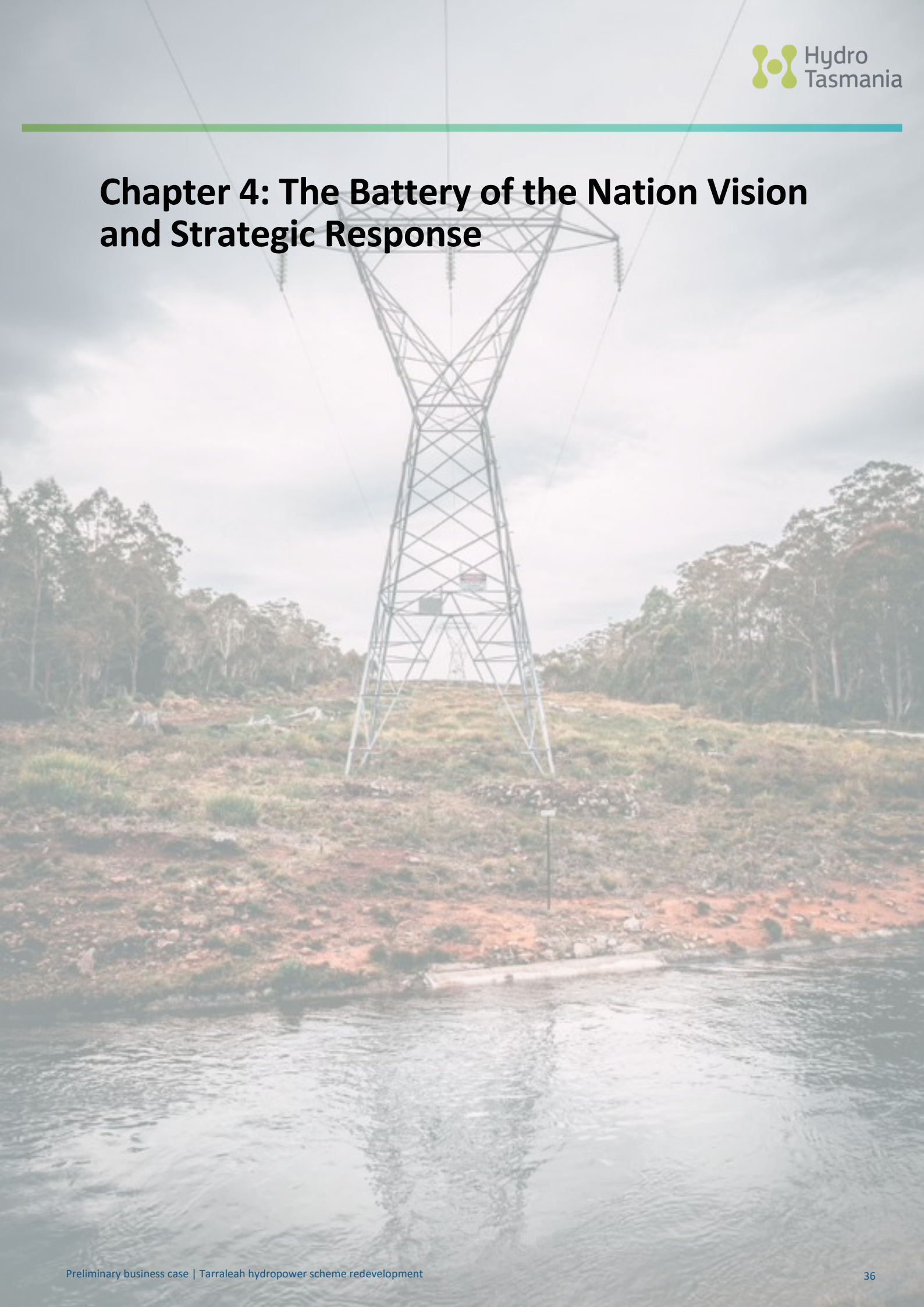
- The Tasmanian Wilderness is an outstanding example representing major stages of the Earth's evolutionary history.
- The Tasmanian Wilderness is an outstanding example representing significant ongoing geological processes and ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water and coastal ecosystems and communities.
- The landscape of the Tasmanian Wilderness has exceptional natural beauty and aesthetic importance and contains superlative natural phenomena.
- The ecosystems of the Tasmanian Wilderness contain important and significant natural habitats where threatened species of animals and plants of outstanding universal value (OUV), from the point of view of science and conservation, still survive.

The **cultural criteria** include the following:

- The Tasmanian Wilderness bears a unique and exceptional testimony to an ancient, ice age society, represented by Pleistocene archaeological sites that are unique, of great antiquity and exceptional in nature, demonstrating the sequence of human occupation at high southern latitudes during the last ice age.
- The Tasmanian Wilderness provides outstanding examples of a type of landscape which illustrates a significant stage in human history.
- The Tasmanian Wilderness is directly associated with events of outstanding universal significance linked to the adaptation and survival of human societies to glacial climatic cycles.

Source: World Heritage Places - Tasmanian Wilderness - DCCEEW

Chapter 4: The Battery of the Nation Vision and Strategic Response



4.1 Chapter overview

Purpose

This chapter outlines:

- Hydro Tasmania's vision for 'Battery of the Nation', an initiative to maximise Tasmania's hydropower capacity.
- The policy and strategic context that supports this initiative.
- Hydro Tasmania's preferred portfolio response to the BotN initiative, which includes redevelopment of Tarraleah hydropower scheme as well as a PHES facility at Lake Cethana. While the Cethana PHES project will be considered in a separate business case, this chapter discusses the shared drivers for these two projects and explains the complementary role that they play in achieving the BotN vision.

Key sections include:

- Legislative and policy context (**Section 4.2**)
- Rewiring the Nation (**Section 4.3**)
- Hydro Tasmania's strategic objectives (**Section 4.4**).

Key points

- Australia's transition to a low emissions power system is occurring rapidly, supported by a range of Australian and state government policies and initiatives aimed at encouraging investment in renewable generation.
- The Australian Government has also committed to providing funding for the 'Rewiring the Nation' initiative, offering low-cost finance to investors for selected projects that contribute to updating the national electricity grid, including:
    - Marinus Link – a proposed two-way 1500 MW capacity undersea interconnector (comprised of two 750 MW cables) that will further connect Tasmania with Victoria (and the rest of the NEM). The first 750 MW cable is forecast to be built and operating from late-2028 and the second cable by late-2030
    - BotN – an initiative which proposes the expansion of Hydro Tasmania's existing hydropower systems, increase capacity, and development of a new PHES facility to provide deep, long duration storage.
- Hydro Tasmania's preferred portfolio response is to invest in the redevelopment of the Tarraleah hydropower scheme and the development of a PHES facility at Lake Cethana. This combination of investments is likely to provide the greatest additional capacity, storage and flexibility improvements to support the transitioning NEM.

4.2 Legislative and policy context

Burning of fossil fuels (namely coal and gas) has historically been the major source of electricity generation in the NEM. As a result, the energy sector is the largest contributor to Australia's carbon emissions, contributing 54% of total emissions in 2021 (CSIRO, 2023).

Climate change has been recognised as a global emergency by world leaders. The most recent seminal response to this has been the Paris Agreement, where 196 countries, including Australia, entered a legally binding international treaty at the UN Climate Change Conference (COP21) in 2015. Its overarching goal is to substantially reduce global greenhouse gas emissions in an effort to limit the global temperature increase to two degrees Celsius above preindustrial levels, while pursuing the means to limit the increase to 1.5 degrees.

To comply with these obligations, Australia must reduce its emissions to 43% below 2005 levels by 2030. The *Climate Change Act 2022 (Cth)*, passed in September 2022, enshrines the 43% reduction target and a net zero target by 2050. A range of Tasmanian and Australian Government policies and incentives aim to support this objective by encouraging investment in renewable generation to decarbonise our energy system.

There is a significant opportunity for Hydro Tasmania to play a leading role in the transition of the NEM, as reflected in its vision and strategy. A key strategic objective is to capitalise on the renewable transition by delivering the BotN program. More detail on the Australian and State Government targets, Hydro Tasmania's strategic objectives and the future role of the BotN is discussed in the following sections.

Governments have legislated various targets aimed at reducing emissions and/or increasing renewable energy generation to provide confidence for investors while increasing accountability for reducing emissions. To meet these targets, the retirement of coal-fired generation is being brought forward, to be replaced with renewable energy generation. As outlined in **Section 3.2,** the impacts of these policies are already playing out in the market.

A summary of the various targets, and their impact on both the NEM and Hydro Tasmania, is outlined in **Table 3**.

Table 3: Overview of targets and obligations and their impact on the NEM and Hydro Tasmania

Government	Description	Impact (on NEM and Hydro Tasmania)
Australian Government	Net Zero by 2050	
	The Australian Government legislated an emissions reduction target of 43% less emissions by 2030 and net zero by 2050.	This creates opportunities for Hydro Tasmania to increase: • generation capacity to meet demand for renewable energy as emissions-intensive generation types are phased out • the storage duration and flexible dispatch capability of the portfolio to firm variable renewable generation in the NEM.
Tasmanian Government	Tasmanian Renewable Energy Target (TRET)	
	The Tasmanian Government legislated the target of 200% (21,000 GWh per annum) renewable generation capacity by 2040, with an interim target of 150% (15,750 GWh) by 2030.	This creates the opportunity for Hydro Tasmania to leverage Tasmania's hydro potential to increase the State's generating capacity and achieve Tasmania's vision of becoming a net exporter of renewable energy to mainland Australia.
	Tasmanian Renewable Hydrogen Action Plan	

Government	Description	Impact (on NEM and Hydro Tasmania)
	From 2030, Tasmania plans to be a significant global supplier of renewable hydrogen for export and domestic use.	This creates opportunities for Hydro Tasmania to expand its hydropower assets to firm wind generation for renewable hydrogen production.
Victorian Government	Renewable energy targets	
	In 2017, Victoria legislated its renewable energy targets of: • 25% by 2022 (achieved) • 40% by 2025 • 50% by 2030. In October 2022, additional targets were added of: • 65% by 2030 • 95% by 2035.	Creates opportunity for Hydro Tasmania to provide additional firming capacity to support Victoria by expanding its portfolio of hydropower assets. In particular, there is an opportunity for Hydro Tasmania to invest in pumped hydro assets which can import low-cost renewable electricity from Victoria to pump water into the upper reservoir for storage and dispatch at later intervals. This potential benefit also applies to other NEM States.

4.3 Rewiring the Nation

The Australian Government has pledged a $20 billion commitment over three years for the 'Rewiring the Nation' initiative, which provides low-cost finance to investors for selected projects that contribute to updating the NEM to support achieving a net zero emissions future (Peta Murphy MP, 2023).

In October 2022, it was announced that the Australian Government would support two projects that are relevant to this business case - Marinus Link and BotN. Further information on these two projects is provided below.

4.3.1.1 Marinus Link

Marinus Link is a proposed two-way 1,500 MW capacity undersea interconnector that will further enhance the transfer of electricity between Tasmania and Victoria (and the rest of the NEM). The project is planned to comprise of two 750 MW cables, delivered sequentially:

- Stage A - The first 750 MW link is forecast to be built and operating from 2028/29.
- Stage B - The second 750 MW link is forecast to be built and operating from 2030/31.

As seen in **Figure 24,** Marinus Link is proposed to run between Burnie, Tasmania and Hazelwood, Victoria and will operate in addition to the existing 500 MW Basslink cable.

Marinus Link will also allow Tasmania to increase exports of wind power and hydropower, supporting the NEM in its transition to net zero emissions. Furthermore, low-cost VRE generated on the mainland can be used to operate the pumps in Tasmania's proposed PHES facility, allowing for low-cost storage of water in the PHES' upper reservoir and making it available for future electricity generation when NEM demand exceeds supply.

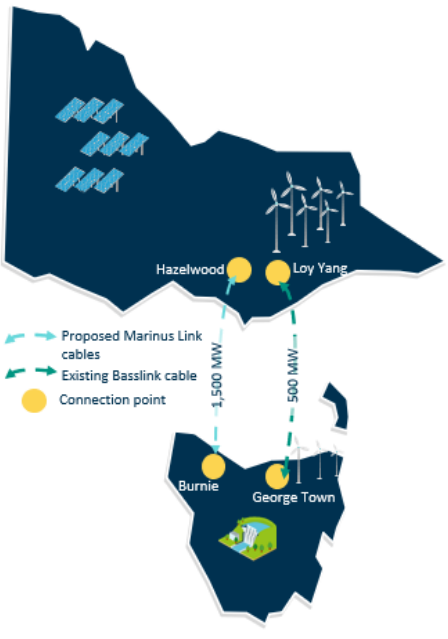


Figure 24: Proposed Marinus Link

Marinus Link is being developed by a subsidiary of the publicly owned Tasmanian Network Service Provider, TasNetworks.

A concessional loan administered through the Clean Energy Finance Corporation (CEFC) is expected to provide 80% of the debt funding required for Marinus Link. The remaining 20% of funding will be an equity investment split equally between the Tasmanian, Victorian and Australian Governments (Prime Minister of Australia, 2022). This follows previous Australian Government funding of up to $75 million announced in April 2022, and $56 million announced in February 2019 to support the progression of Marinus Link to FID (Marinus Link, 2022), expected in late 2024.

4.3.1.2 Battery of the Nation

Hydro Tasmania's existing asset base does not have sufficient capacity and flexibility to respond to the challenges and opportunities posed by increased VRE in the NEM nor to maximise the opportunity associated with the additional interconnection from Marinus Link. BotN is Hydro Tasmania's response to the opportunity of additional interconnection, maximising the capacity of the existing hydropower system and adding new pumped hydro capability.

Hydro Tasmania has over 100 years of experience in owning and operating hydro assets in Tasmania. It is therefore best placed to build the additional hydro capacity needed in the State in time to maximise value from the proposed Marinus Link connection. Two projects have been identified that, together, will maximise the value realised to Tasmania and the broader NEM from Marinus Link investment: redevelopment of the Tarraleah hydropower scheme and a new PHES scheme at Lake Cethana. Details of these two projects are provided in the following subsections.

Redevelopment of the Tarraleah hydropower scheme

Tarraleah is currently an inflexible hydropower scheme that, if redeveloped, could become a third major storage asset in the Hydro Tasmania portfolio. Tarraleah's assets are ageing, and their risk of failure is increasing. There is an opportunity for the scheme to be redeveloped to manage this reliability risk. Its redevelopment can further transform Tarraleah to a peaking generator that can target intraday and inter-seasonal price spreads.

Figure 25: Tarraleah Power Station

Increasing capacity from Tarraleah's existing assets will also be a cost-effective way to increase firming capacity needed by the NEM. AEMO estimates that 46 gigawatts (GW) of dispatchable storage capacity (including hydropower) will be needed by 2050 to firm intermittent renewable energy resources through all weather conditions across the NEM.

Investment to optimise Tarraleah could provide up to 100 MW of additional capacity to be used in Tasmania and across the NEM (if exported via Basslink or Marinus Link) and reduce current constraints along the entire Derwent hydropower scheme.

This redevelopment is proposed to align with the first 750 MW Marinus Link cable and be the first stage of the BotN investment. This is due to the immediate need to address the existing risk of failure, and Hydro Tasmania's commercial assessment that the capacity created by the first 750 MW Marinus Link cable could be met by the existing portfolio with some capacity upgrades.

A new pumped hydro facility at Lake Cethana

This project involves the construction of a new pumped hydro facility to realise the benefits from increased connectivity to the mainland NEM arising from the second 750 MW Marinus Link cable.

Lake Cethana was identified as the preferred site for this facility as it utilises the natural topographical advantages and existing infrastructure for the lower storage. To optimise benefits from the second 750 MW Marinus Link cable, Cethana would be delivered in 2030-31, and would be the second stage of the BotN investment.

At this stage, it is proposed this asset will have a capacity of 750 MW and up to 20 hours' storage duration. A separate business case is currently being prepared that will recommend the optimal capacity and storage duration.

Figure 26: Lake Cethana

As Cethana is a pumped hydro scheme, when VRE generation is abundant and prices are low/negative, water would be pumped to a new upper reservoir for dispatch at a future time when demand and prices are high. This will essentially act as additional load when energy is abundant dispatching this energy when required. The indicative efficiency of the proposed station is 76.4%, meaning that 23.6% of energy is consumed through the full pumping and generation cycle. The scheme provides firming capacity to support increased renewable energy penetration in the NEM.

The new pumped hydro scheme would also play an insurance role for the market, with long duration storage that can be used to meet prolonged generation shortfalls.

Funding to date

ARENA provided $2.5 million in funding (matched by Hydro Tasmania), as part of its Advancing Renewables Program, to support Hydro Tasmania in progressing BotN. As well as progressing studies for Gordon Power Station, Tarraleah and assessing suitable pumped hydro sites, Hydro Tasmania produced a series of white papers that considered the future energy market and the role of BotN.

In December 2021, Hydro Tasmania's Board approved expenditure of $123m (including $3.9m already approved) to progress Tarraleah to FID. This investment included $65m of Australian Government grant funding and has two components that must be progressed together:

- progressing the potential redevelopment of the Tarraleah scheme to FID at a cost of $25m
- delivering a package of upgrade works by mid-2025 at a cost of $98m, of which $65m would be funded by an Australian Government grant.

These proposed upgrade works were considered 'no-regrets' under all credible future scenarios. The works will substantially contribute to future options to improve the value of the scheme through increased operational flexibility and the early reduction of risk associated with the existing Tarraleah No.1 canal system, regardless of whether the scheme is redeveloped or refurbished in the future. More detail on this scope of work is provided in **Appendix A**.

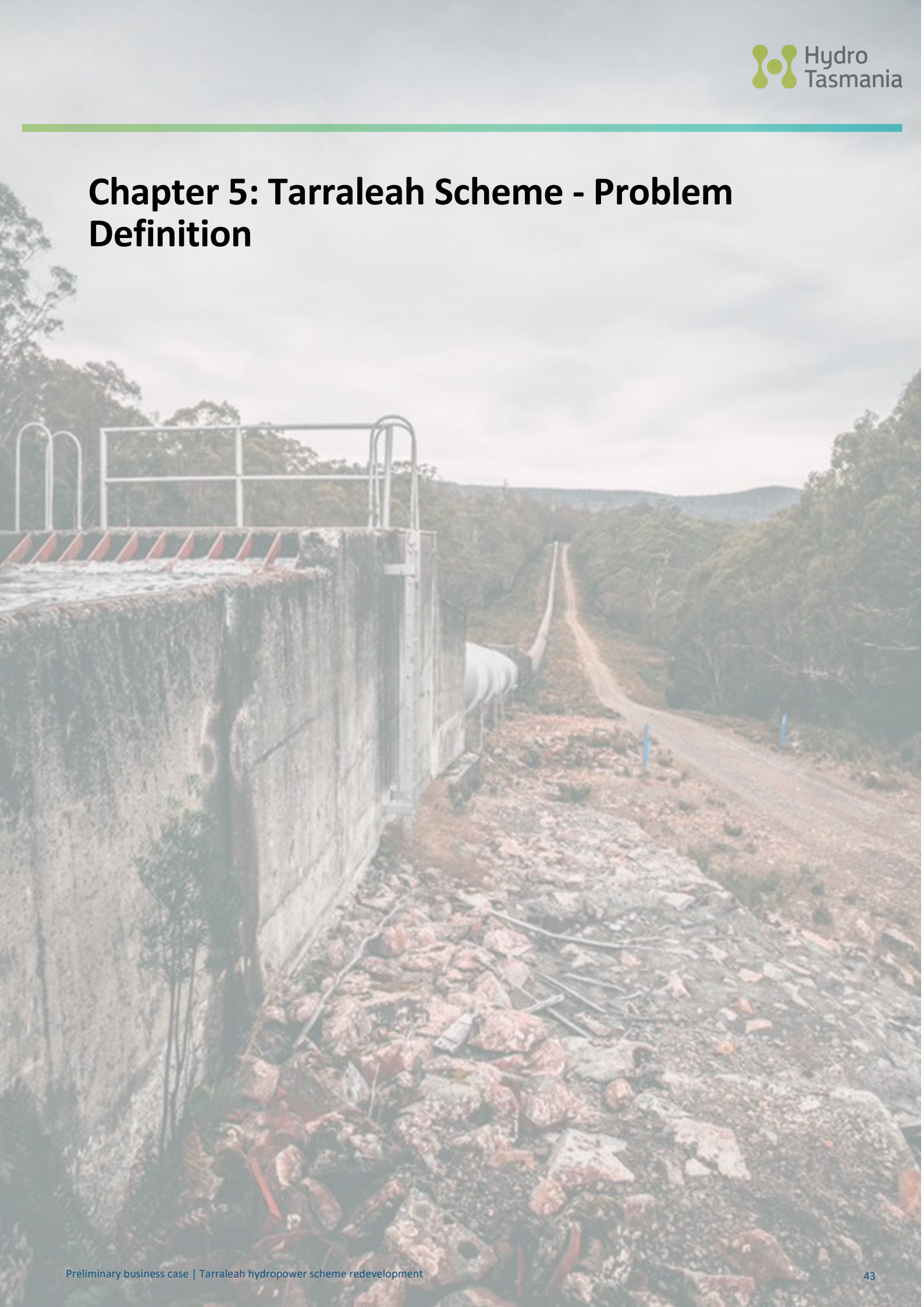
4.4 Hydro Tasmania's strategic objectives

Hydro Tasmania's vision is to drive the renewable energy transition. The relevant strategic objectives and their alignment with the BotN vision are summarised in **Table 4**.

Table 4: Hydro Tasmania's strategic objectives and their alignment with BotN

Hydro Tasmania objectives	Alignment with BotN
• Build BotN, capitalising on the renewable transition. • Adapt our existing portfolio capacity for the energy transition.	• There is a need to adapt the portfolio to deliver improved commercial outcomes (against a potentially lower and more volatile price environment) for a transitioning NEM. BotN has a key role in this adjustment.
• Play a key role in Tasmania's energy vision to supporting the decarbonisation of the NEM. • Maximise interconnection to benefit Tasmania and Australia.	• Increased interconnection capacity between Tasmania and the rest of the NEM will deliver energy reliability and stability benefits for Tasmania as well as Australia. This is dependent on increased capacity and flexibility in Hydro Tasmania's portfolio.
• A responsible custodian of environment and heritage.	• Reducing the current risk of asset failure at Tarraleah (see **Section 5.2.1**) leading to an environmental incident in the TWWHA. • Playing an important role in the transition of the NEM to a zero-carbon future will contribute to Tasmania's and Australia's emissions reduction targets. • Fit for purpose conveyances will contribute to the sustainable future use of Tasmania's valuable water resources.
• Deliver value to communities, customers and clients. • Long-lasting positive outcomes for people and communities.	• The BotN project represents a large increase in investment activity with associated macro-economic benefits. • There is reduced risk of asset failure. This will protect the value of the adjacent environment which is an asset to the community.

Chapter 5: Tarraleah Scheme - Problem Definition



5.1 Chapter overview

Purpose

This chapter provides the rationale for investment in the Tarraleah scheme. This includes outlining the three key problems that need to be addressed as a matter of urgency, including:

- Problem 1: Risk of an environmental incident (**Section 5.2.1**)
- Problem 2: Scheme inflexibility (**Section 5.2.2**)
- Problem 3: Future reliability risk (**Section 5.2.3**).

Timing considerations (**Section 5.3**) are also considered.

Key points

Three problems have been identified in the current operations of the Tarraleah scheme:

1. **Risk of an environmental incident**
   - Tarraleah's assets, including the machinery and conveyances, are now nearing the end of their operational life.
   - The No. 1 conveyance currently presents the highest risk of failure, with an estimated 1 in 50 chance of a major failure each year and a 1 in 20 chance of moderate failure each year.
   - Many sections of the conveyance are located within 10 metres of the TWWHA extension area declared in 2013, one of the world's largest temperate wilderness areas.
   - Hydro Tasmania has obligations under Tasmanian and Federal laws to prevent harm to natural and cultural values.
2. **Scheme inflexibility**
   - Tarraleah's current configuration only allows for manual operation and inflexible generation. This limits its ability to respond to market signals and provide firming capacity needed to maintain system security and reliability.
   - Operational constraints will become an increasing barrier to realising opportunities and/or mitigating the risks associated with fluctuating market conditions, particularly as increased VRE penetration leads to more volatile wholesale prices.
3. **Reliability risk**
   - Tarraleah's machinery in the existing power station is now nearing the end of their operational life and the risk of operational failure is increasing.
   - Planned and unplanned shutdowns will occur more frequently as Tarraleah's machinery continues to age and Hydro Tasmania works to mitigate safety and operational concerns. These disruptions represent lost output from a scheme that is an important part of Tasmania's annual generation (6.5%).

The risk of an environmental incident posed by the ageing canals is an increasing concern and a prudent timeframe for replacement is by the mid-2030s at the latest. There is also an opportunity to deliver additional benefits by timing Tarraleah's redevelopment with the planned increase in interconnector capacity. This will increase Hydro Tasmania's revenue potential, optimise value from the Marinus Link investment and maximise Tasmania's contribution to the NEM's decarbonisation objective. To enable these benefits to be realised, an investment decision is needed for Tarraleah by mid-2024.

5.2 Definition and evidence of the problem

Since its construction in the 1930s, Tarraleah has been regularly maintained as part of a rolling 15-year refurbishment program. The Tarraleah civil assets, in particular its water conveyances, were built in an inhospitable environment, using little mechanisation or quality control, and to standards that are now considered outdated.

Without major investment in the scheme, the risk of asset failure each year poses an operational and commercial risk.

The three problem statements for the Tarraleah scheme are summarised in **Figure 27** and discussed in more detail in the following sections.

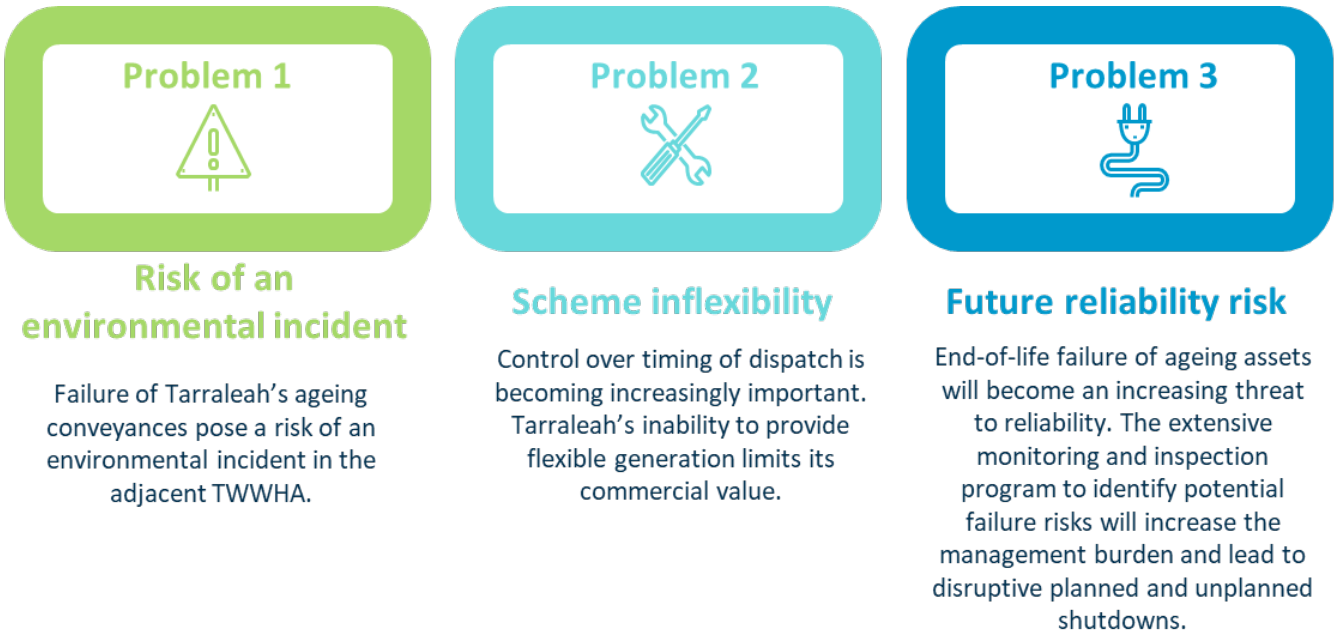


Figure 27: Overview of problems in current Tarraleah scheme

5.2.1 Problem 1: Risk of an environmental incident

Failure of Tarraleah's ageing conveyances pose a risk of an environmental incident in the adjacent TWWHA

There have been five major failures of No. 1 canal during its 83-year operational lifetime. Historical failures have all been water induced, either by heavy rainfall, leaking of the canals and flumes or from overtopping.

The last major failures occurred in 1994 when an overtopping of a flume section led to a substantial landslide below the flume, as highlighted in **Figure 28**. This resulted in a three metre-high blockage of clay, rocks and trees in the River Derwent. The supporting embankment did not immediately settle. Concerns about future settlement led to survey points being established- over a 500metre length which has been regularly monitored- over the past 29 years. Settlement of up to 75 mm has been recorded. This is significant for a concrete flume structure and has resulted in extensive cracking.

Figure 28: Damage from the 1994 failure of the No. 1 conveyance

In the event of a major failure, the expected remediation costs that would be incurred by Hydro Tasmania are circa $45 million. Hydro Tasmania has identified five sections of the No. 1 conveyance as representing high risk[20]. The failure of any one of these sections may cause landslides (as has previously occurred), leading to debris in the River Derwent. The plume of silt and discoloured water would likely result in reduced water quality as well as disruption to operations and downstream users, including to fish farms and Hobart's largest drinking water treatment facility at Bryn Estyn.

Many sections of the conveyance are located within 10 metres of the TWWHA extension area declared in 2013, one of the world's largest temperate wilderness areas. Hydro Tasmania has obligations under Tasmanian and Federal laws to prevent harm to natural and cultural values:

- ***Environment Protection and Biodiversity Conservation Act 1999*** **(Cth)** – Australia's central piece of environmental legislation that provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places.
- ***Environmental Management and Pollution Control Act 1994*** **(Tas)** – is the primary environmental protection and pollution control legislation in Tasmania. It is a performance-based style of legislation, with the fundamental basis being the prevention, reduction and remediation of environmental harm.
- ***Aboriginal Heritage Act 1975*** **(Tas)** – administered by Aboriginal Heritage Tasmania, the Act requires those conducting activities in areas of significance to take all reasonable and practical measures to avoid harming cultural heritage.
- ***Threatened Species Protection Act 1995*** **(Tas)** – provides a framework for the identification and protection of threatened flora and fauna in Tasmania.
- ***Historic Cultural Heritage Act 1995*** **(Tas)** – is the primary law relating to the identification, preservation and presentation of historic cultural heritage significant to post-colonial Tasmania.

Asset failure, leading to environmental damage, may cause reputation damage to the Hydro Tasmania brand and raise questions about Hydro Tasmania's ability to manage other assets in world heritage areas.

5.2.2 Problem 2: Scheme inflexibility

Control over timing of dispatch is becoming increasingly important. Tarraleah's inability to provide flexible generation limits its commercial value.

Tarraleah's outdated configuration and ageing assets mean that the scheme cannot adapt to the changing needs of the market. The current design only allows for manual operation and inflexible generation, meaning it cannot provide firming capacity needed to maintain system security and reliability.

Energy required to meet the NEM's minimum electricity demand can increasingly be generated from low marginal cost VRE, such as solar and wind. Meanwhile, generators that can rapidly respond to provide firming capacity when there are gaps in supply are becoming critical to support the renewable energy transition and maintain system security of supply. Tarraleah's

Figure 29: Turbines at Tarraleah Power Station

[20] Rated using Hydro Tasmania's Integrated Business Risk Management framework.

current inability to do so will become an increasing barrier to realising opportunities and/or mitigating the risks associated with fluctuating market conditions, including:

- ramping up in response to high prices and down in response to low prices
- providing deep storage capacity with flexible dispatch abilities to firm renewable generation.

Case study: Impact of Hydro Tasmania's inability to respond to negative prices

Solar farms competing for dispatch of their generation can lead to negative spot market prices during mid-day times. During the 2021-22 summer, the Victorian spot market price was negative for approximately 28% of the time.

Hydro Tasmania has largely been sheltered from these impacts to date due to limited interconnection capacity and Tasmania's low solar irradiation conditions, meaning that solar (both rooftop and large-scale) is not well-suited to the state. Once Marinus Link is commissioned, Hydro Tasmania will become more exposed to Victoria's solar-driven prices.

Without introducing additional flexibility to choose timing of generation, Tarraleah (and the broader Derwent hydropower scheme) will either receive a solar-driven spot price (that would often be zero or negative) or be forced to let the water spill and be lost for generation purposes.

Inability to dispatch energy more flexibly from Tarraleah also limits Hydro Tasmania's ability to respond to supply shortages in Victoria, such as those experienced in the 2019 heatwaves (see following case study), and to benefit from these opportunities. Risks of such events will likely increase over time as temperatures rise, and coal-fired generation plants exit the market and are replaced with variable generation.

Case study: 2019 Victorian heatwave

In January 2019, there was a significant heatwave in Victoria causing high demand at a time when two out of Victoria's three brown coal fired generators, Yallourn and Loy Yang A, were operating below capacity. To balance demand with the limited supply, AEMO directed involuntary load shedding for 200,000 Victorian customers.

During the heatwave, more than 500 MW of Tasmanian hydropower was available to be bid into the market, but not able to be dispatched because of insufficient interconnection capacity. Marinus Link will provide an additional 1,500 MW in interconnection capacity, addressing this issue and providing the opportunity for additional Tasmanian power to be exported to the mainland NEM.

As Victoria's brown coal-fired generators exit the NEM over the next 10 years, events like this will become more prevalent unless sufficient firming capacity is available.

Source: AER, March 2019, AER reports on high wholesale electricity prices in Victoria and South Australia on 24 and 25 January 2019: https://www.aer.gov.au/communication/aer-reports-on-high-wholesale-electricity-prices-in-victoria-and-south-australia-on-24-and-25-january-2019

5.2.3 Problem 3: Future reliability risk

End-of-life failure of ageing assets will become an increasing threat to asset reliability. The extensive monitoring and inspection program to identify potential failure risks will increase the management burden and lead to disruptive planned and unplanned shutdowns.

The ageing Tarraleah assets are an escalating risk to Hydro Tasmania's ability to maintain the productive capacity of its portfolio and to contribute to Tasmania's reliability of electricity supply. As shown in **Figure 30**, many of these electrical and mechanical generation assets have very little remaining operating life[21]. The ageing conveyances are still operational; however, their deterioration has resulted in increased friction and slower movement of the water. This leads to inefficient water management and hence reduced output.

Hydro Tasmania has an extensive asset inspection program, with planned shutdowns required for routine maintenance. Unplanned shutdowns may be needed in response to emerging reliability or workplace health and safety risks.

The Tarraleah scheme generates around 630 GWh of energy each year. Therefore, any planned or unplanned shutdown represents a loss of up to 6.5% of Hydro Tasmania's total generation.

While the program is effective at reducing the risks to worker safety, it results in the scheme being offline for extended periods of time without minimising the risk of failure. As the assets deteriorate further, disruptions to services will become more frequent and the impact greater. Based on Hydro Tasmania's most recent outage forecast, the following is expected:

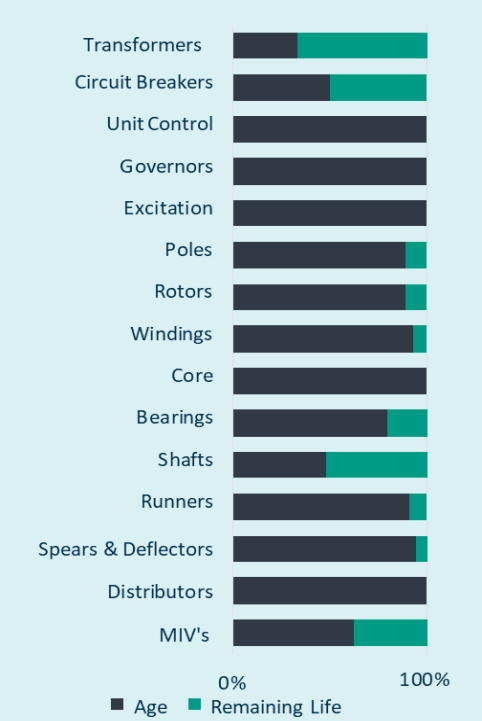


Figure 30: Expected remaining life of Tarraleah's electrical and mechanical assets

- Increased frequency of routine maintenance and assurance outages.
- Between 2024 and 2025, extended maintenance will be required to assess and address shaft fatigue. This is a lengthy process, requiring four months per unit.
- Between 2025 and 2029, machinery replacement will be required in the power station. Nine-month rolling outages will be required over six years to replace six machines. This means that the station will be operating at reduced capacity (five machines out of six). Five machines can achieve full output albeit at reduced efficiency.

During unplanned outages (e.g. two to three months per year), operation may be limited to only four out of the six machines. The scheme requires significant investment to ensure it can keep operating safely and reliably well into the future.

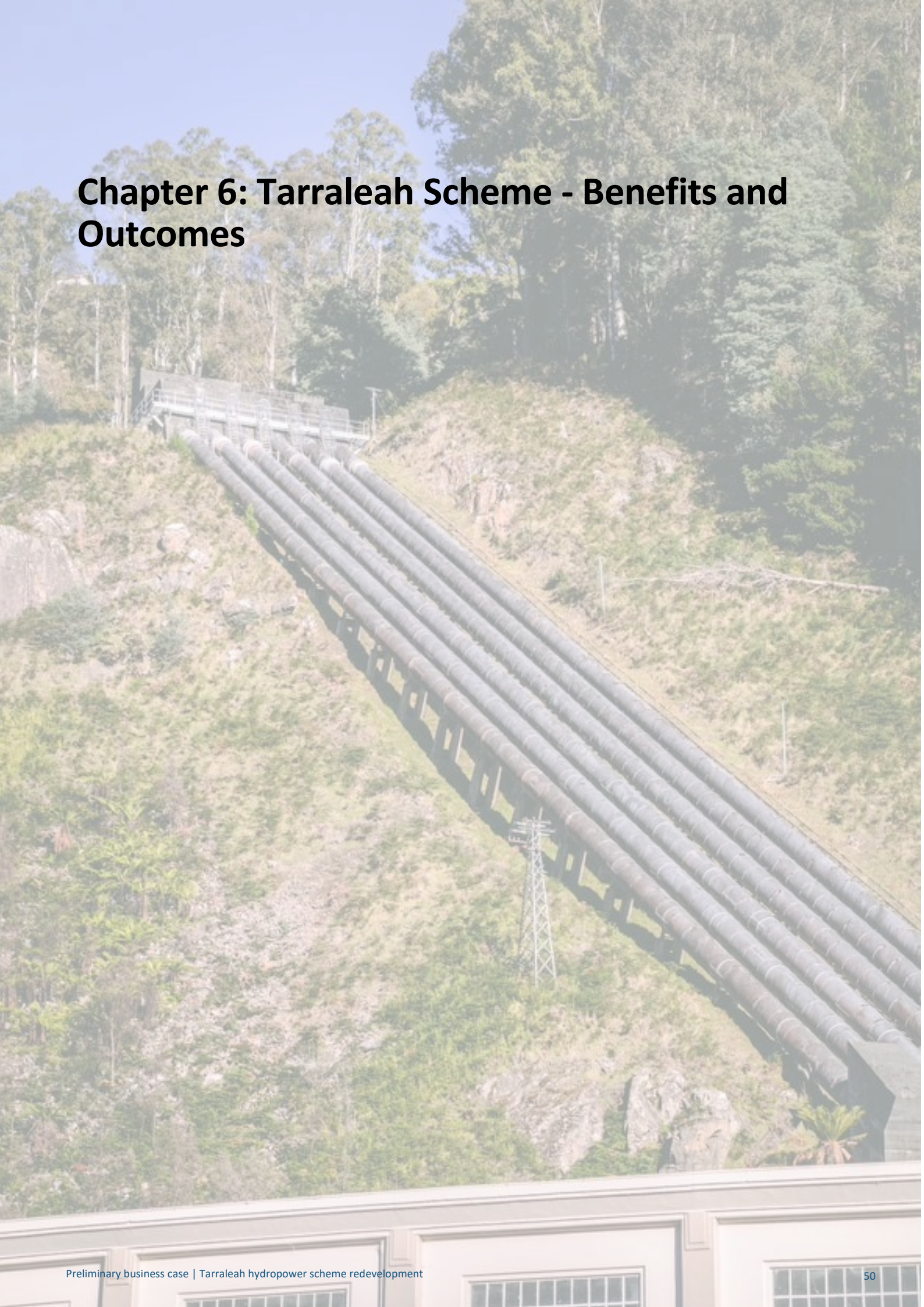
5.3 Timing considerations

Given the increasing risk of an incident in the area adjacent to the TWWHA, caused by failure of Tarraleah's ageing canals, it is prudent to replace the canals by the mid-2030s. The power station assets are also expected to reach the end of their operational life in the coming years, and it is prudent to replace them as soon as possible.

[21] Remaining life is defined as being the prudent operating life where spares and original equipment manufacturer support is available, and failure is not a high probability, where the equipment remains compliant with market rules. Under these conditions, the risk is considered acceptable and the risk cost is less than the cost of replacement.

There is also an opportunity to deliver additional benefits by timing Tarraleah's redevelopment with the planned increase in interconnector capacity. This will optimise value from the Marinus Link investment, maximise Tasmania's contribution to the NEM's decarbonisation objective and increase Hydro Tasmania's revenue potential. To enable these benefits to be realised, an investment decision is needed for Tarraleah by mid-2024.

Chapter 6: Tarraleah Scheme - Benefits and Outcomes



6.1 Chapter overview

Purpose

This chapter outlines how addressing the three key problems outlined in **Chapter 5** will deliver a range of benefits to Tasmania and the mainland NEM more broadly, including:

- Benefit 1: Commercial benefits (**Section 6.2.1**)
- Benefit 2: Environmental benefits (**Section 6.2.2**)
- Benefit 3: Social benefits (**Section 6.2.3**)
- Benefit 4: Economic benefits (**Section 6.2.4**).

Key points

Investment in the Tarraleah scheme is likely to deliver a range of benefits as detailed below.

Benefit 1: Commercial benefits

- Hydro Tasmania will be able to respond to changing market signals and be more resilient to future market conditions under a range of scenarios.
- Increased scheme capacity, flexibility and availability are all likely to increase revenue potential.
- Redevelopment of Tarraleah's assets nearing end-of-life will significantly reduce the occurrences of both planned and unplanned shutdowns or repairs.

Benefit 2: Environmental benefits

- The adjacent TWWHA will be better protected and preserved through a reduced risk of an environmental incident caused by a conveyance failure.
- Increased firming capacity will support the development of additional VRE generation in the NEM, facilitating the transition to net zero emissions.

Benefit 3: Social benefits

- Avoiding a canal failure will protect existing social and cultural values linked to the River Derwent in the TWWHA.
- The additional firming capacity provided by the redeveloped scheme will help balance supply and demand to maintain security of supply both in Tasmania and the wider NEM.
- Help to maintain downward pressure on energy prices for households relative to prices that would otherwise occur in the absence of this project.
- The historic Tarraleah hydropower station will be preserved in its original location.

Benefit 4: Economic benefits

- The redevelopment will deliver higher returns to government and the community and create local and regional economic development opportunities.
- The risk of downstream impacts associated with the potential asset failure will be mitigated.
- The redevelopment will support maintaining downward pressure on energy prices in the NEM relative to prices that would otherwise occur in the absence of this project.
- The redevelopment will create local and regional economic development opportunities.

6.2 Benefits to be delivered

A redevelopment of the Tarraleah hydropower scheme has the potential to deliver a range of benefits to Hydro Tasmania, the State and the NEM more broadly. **Figure 31** outlines how addressing the three key problems outlined in **Chapter 5** will deliver the intended benefits. More detail on each of the benefits is provided in the subsequent sections.

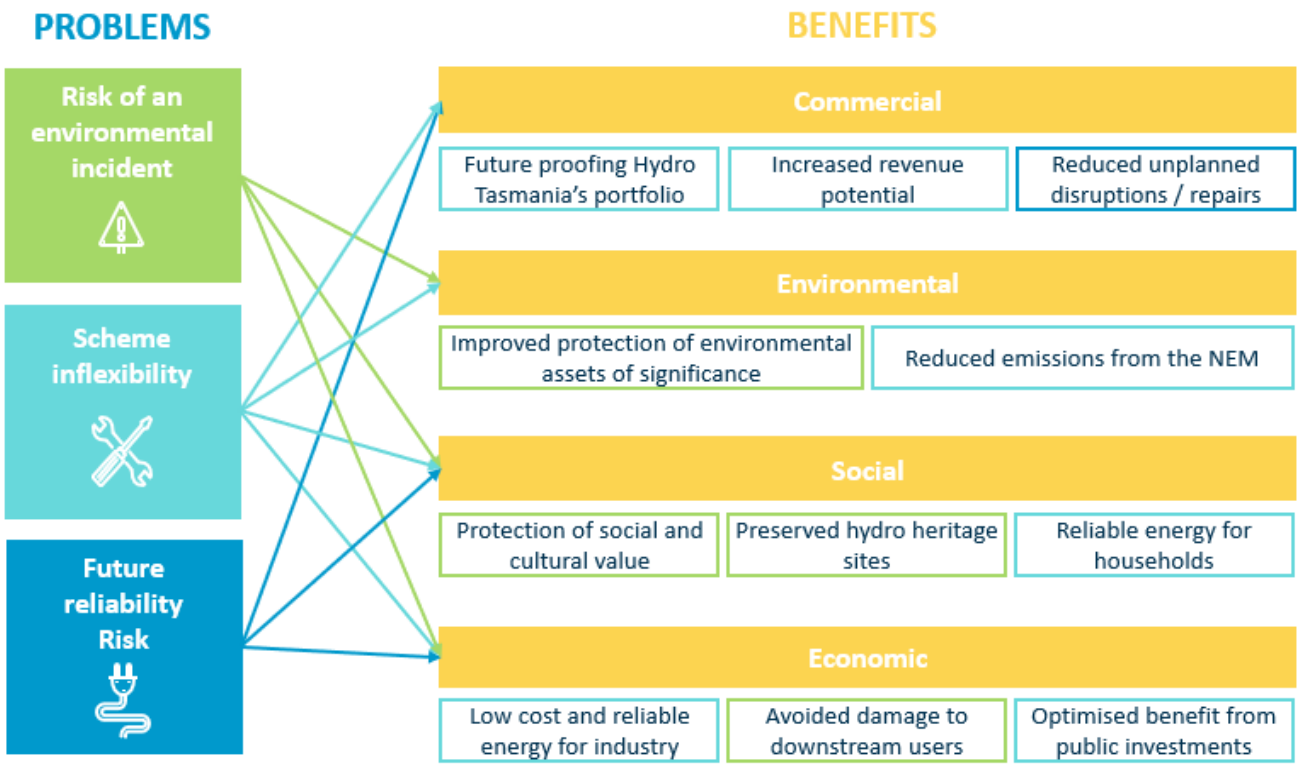


Figure 31: Overview of benefits to be delivered

6.2.1 Benefit 1: Commercial benefits

Future proofing Hydro Tasmania's portfolio

Improving the flexibility of the Tarraleah scheme will enable Hydro Tasmania to be more resilient to a range of future market conditions (for example, if coal-fired generators retire earlier than expected).

As low-cost variable energy resources continue to displace coal in the NEM, new system services (such as long duration storage, inertia and fast rate of change) will be required to help manage the strength of the network. Energy storage and flexible dispatch abilities, are both key improvement opportunities from redeveloping the Tarraleah scheme, are expected to play a major role in the provision of these new services. It is predicted that the NEM will evolve to recognise and value these new services and provide the financial incentives for generators to respond to the physical market needs.

Increased revenue potential

Addressing the problems identified in **Chapter 5** is likely to lead to the following outcomes for the Tarraleah scheme:

- the peak capacity will double and annual energy generated will increase by ~30% (including the potential increased energy contribution from the broader Derwent hydropower scheme)

- the Tarraleah scheme (and the broader Derwent hydropower scheme to some extent) will be able to be operated with greater flexibility in response to market signals
- generator availability will increase due to fewer planned and unplanned outages.

Each of these three outcomes will bring associated increases in revenue for Hydro Tasmania.

Reduced unplanned disruptions / repairs

Replacing Tarraleah's assets, which are nearing end-of-life, will significantly reduce the occurrences of both planned and unplanned shutdowns for maintenance and repairs, leading to increased generator availability and corresponding increases in revenue (as discussed above). This is increasingly valuable as the NEM's coal fleet nears retirement and must be replaced by flexible generation.

6.2.2 Benefit 2: Environmental benefits

Improved protection of environmental assets of significance

A redevelopment of the ageing Tarraleah scheme will better protect and preserve the adjacent TWWHA by reducing the risk that a conveyance failure could lead to damage to areas of outstanding universal value (OUV).

Reduced emissions from the NEM

Redevelopment of Tarraleah will provide some of the additional firming capacity needed to support the increasing development of VRE generation as the NEM transitions to net zero emissions. The following market responses will contribute to this transition:

- Additional storage will enable shortfalls in energy supply to be met without impacts to system reliability. This will facilitate the expansion of VRE generation.
- Increasing availability of low-cost VRE generation will further erode the commercial viability of emission-intensive, coal-fired generators leading to their accelerated closure.

6.2.3 Benefit 3: Social benefits

Protection of River Derwent social and cultural values

Investment in Tarraleah will significantly reduce the risk of a canal failure which will protect social and cultural values of the River Derwent in the TWWHA.

Preserved hydro heritage sites

A redevelopment of the historic Tarraleah hydropower site will preserve the scheme in its original location which is of historical importance to many Tasmanians.

Reliable energy for households

The additional firming capacity provided by the redeveloped scheme will contribute to improved reliability and security of electricity supply. It will also help maintain downward pressure on energy prices relative to prices that

would otherwise occur without additional firming capacity needed for the NEM's transition to zero emissions[22]. These impacts, discussed in the text box below, will benefit households.

Electricity is an essential service used every day for heating, cooling, communication, and mobility. All Australians should have access to affordable and reliability electricity. Maintaining downward pressure on prices will improve affordability of energy supply to households[23]This will lead to direct and indirect social benefits to residential customers (e.g. health, amenity and wellbeing).

Reliability and security of impacts of the redevelopment

Once redeveloped, Tarraleah will be able to go from standstill to full output in under five minutes. It can therefore provide the dispatchable capacity to support Tasmania and the rest of the NEM in the event of high demand (such as heatwaves and wind droughts) and/or low supply due to generators being offline.

Redeveloping Tarraleah's assets will also increase the energy generated from the available water resources due to new larger Francis machines in a new station and increased head (the difference in elevation between the machines and the storage after friction head losses). Depending on the redevelopment approach, as much as 25% more energy could be generated from the same volume of water. This will be increasingly beneficial in maintaining Tasmania's security of supply in a future where droughts are likely to occur more frequently.

The redevelopment of Tarraleah may also enable the provision of FCAS while in generator mode and synchronous condenser capabilities (providing inertia) while not generating. These system services help to maintain the frequency of the electrical system, preventing 'black system events' (wide-scale system blackouts) and ensuring consumers continue to have access to power. Tarraleah may also be able to draw on its stored water resources to provide SRAS. This enables the electrical grid to restart if black system events occur, resulting in less severe outages. This is not expected to be a key benefit and is therefore not considered in any revenue modelling.

6.2.4 Benefit 4: Economic benefits

Higher returns to government and the community

Improving scheme flexibility to enable Hydro Tasmania to export more energy to the mainland when prices are high will deliver returns to government as well as the community.

Affordable and reliable energy for industry

Redeveloping Tarraleah will support:

- increasing the supply of firming capacity in Tasmania and the mainland NEM as VRE penetration continues to grow.
- optimising the potential from the existing Lake King William storages. This will increase the energy associated with the Derwent hydropower scheme and potentially reduce the required investment in new generation elsewhere.

[22] Without sufficient firming capacity, the market would respond with additional investment in VRE which would require costly transmission upgrades.

[23] This improvement is not relative to current conditions, but relative to the expected future increase in prices if the proposed redevelopment does not go ahead.

- reducing the reliance on coal and gas-fired power and reduced exposure to local and global market and political conditions.

These impacts will help maintain reliability and offset some of the upwards pressure that would otherwise be expected. This will benefit businesses and industry and help control economy-wide inflationary pressures that are contributing to the current cost of living crisis.

Avoided damage to downstream users

The risk of downstream impacts associated with the potential asset failure will be mitigated with investment in the scheme. The likely potential avoided costs are in the order of $10 million, depending on the severity of the failure.

Optimised benefits from public investments

Investment in additional hydro capacity is needed to realise the full intended benefits from the expected investment in the Marinus Link (cable 1 expected to be operational in late 2028). Increased capacity can be mobilised relatively quickly at Tarraleah due to the existing storage infrastructure and the work currently underway to deliver a new conveyance. It is therefore possible to optimise the benefits of increased interconnection as soon as it is available. The redevelopment will also create local and regional economic development opportunities.

Chapter 7: Project Option Overview

7.1 Chapter overview

Purpose

This chapter details the Status Quo and five project options that were considered for the Tarraleah scheme.

Key points

- The **Status Quo** (**Section 7.2**) represents the current Tarraleah scheme and is the scenario that all options are compared against. While being the lowest cost option that maintains operation of the Tarraleah scheme, it only upgrades some of the assets through maintenance planning. It therefore does not adequately address the environment, flexibility or reliability concerns that underpin the need for investment.
- Five project options were identified for the Tarraleah scheme as follows:
  - **Option 1: Decommissioning** (**Section 7.3**) – involves decommissioning the existing scheme once the asset condition is assessed as untenable, addressing the immediate risk of an environmental incident. This option does not improve reliability, storage capacity or flexibility of the portfolio.
  - **Option 2: Minimum Refurbishment** (**Section 7.4**) – involves refurbishing the existing station and replacing the canals. This approach minimises capital investment while managing asset risk. This option will result in some operational improvements with the capability to remotely turn the power station on and off. It will also remove current constraints to provide some intraday flexibility in operations.
  - **Option 3: Refurbishment with BESS (Additional Shallow Storage Capacity)** (**Section 7.5**) – this is equivalent to Option 2 but with additional capacity introduced by implementing a two-hour (200 MWh) BESS elsewhere in the portfolio.
  - **Option 4: Redevelopment with Headponds (Deep Storage)** (**Section 7.6**) – involves replacing the Tarraleah Power Station to address the risks of an environmental incident and reliability. It also provides additional generation capacity and interday flexibility due to the increased size of the headponds storage (No. 2 Pond).
  - **Option 5: Redevelopment with Pressurised Conveyance (Inter-seasonal Storage)** – involves replacing the Tarraleah Power Station and constructing a new pressurised conveyance to bypass the existing canals to provide maximum flexibility (inter-seasonal) and reliability. Within the operational requirements for the broader Derwent hydropower scheme, the new station under this option will be capable of turning off for several days to weeks without spills and running at full output for extended periods during extended high price periods. There will similarly be the potential to improve operational flexibility for the broader Derwent hydropower scheme and generate an additional 200 GWh on an annual basis.

	Addresses environment risk (problem 1)	Addresses scheme inflexibility (problem 2)	Addresses reliability risk (problem 3)	Cost (P50)[1]	Peak capacity	Storage duration
Status Quo	Does not address	Does not address	Partially addresses	$515m	~90 MW	N/A
1. Decommissioning	Fully addresses	Does not address	Does not address	$188m	~12 MW (Butlers Gorge PS)	N/A
2. Minimum Refurbishment	Fully addresses	Partially addresses	Fully addresses	$851m	~100 MW	2 hours
3. Refurbish with BESS	Fully addresses	Partially addresses	Fully addresses	$1.04b	~200 MW	2 hours
4. Redevelopment with Headponds	Fully addresses	Partially addresses	Fully addresses	$1.07b	~160 MW	20 hours
5. Redevelop with Pressurised Conveyance	Fully addresses	Fully addresses	Fully addresses	$1.05b	~190 MW	Months

[1] *Cost inclusive of early works ($123m) across status quo and all options.*

Figure 32: Overview of Status Quo and project options

7.2 Status Quo

The Status Quo is the scenario represents the current Tarraleah scheme. It does not address the identified problems in **Chapter 5** and, as such, is not considered a viable project option.

Only essential refurbishment works at Tarraleah and Butlers Gorge power stations will be undertaken, with the sole objective of sustaining current operations. While these works will maintain operations, they will not fully mitigate the reliability risk due to the continued deterioration of the canal system. This also means that the risk of an environmental incident currently posed by the ageing canals is not mitigated.

The risk of canal failure will remain, and be equivalent to:

- 1-in-20-year chance of moderate failure costing $10 million in repair costs in addition to lost revenue (for approximately 3 months)
- 1-in-50-year chance of major failure costing $35 million for repairs and rehabilitation, $10 million for compensation (for downstream economic loss) and lost revenue (for approximately 12 months).

Following essential refurbishment works, including replacement of end-of-life turbines, the peak output of the Tarraleah scheme will remain unchanged at 90 MW[24]. As the canals age, it will become increasingly difficult to manage this risk with maintenance works, and it is expected that the canals will eventually be decommissioned (assumed to be outside of the analysis period). Until this level of deterioration is reached, the canals will be repaired and returned to operation if failure occurs. This assumption was used to develop a conservative estimate of the commercial impacts associated with a failure event.

Key works will consist of the following:

- Replacement of the six existing Pelton machines that are reaching the end of their operational life in Tarraleah Power Station with modern machines.
- Refurbishment and modernisation (to modern protection standards) of Butlers Gorge Power Station. The scope of work will ensure that Butlers Gorge discharge regulators and spillway gates remain operational for flood mitigation and protection of the Clark Dam on Lake King William.
- Ongoing maintenance of the canal system to manage continuing deterioration.
- Maintenance of the pipelines, penstocks and surge towers. This will commence with painting within the 10-year asset management planning horizon, with an eventual like-for-like replacement.
- Ongoing maintenance, repairs and replacement of other existing assets to maintain tolerable asset risk and condition.

A summary of the outcome of these works on key scheme assets is provided in **Appendix B.** The cost of the Status Quo is estimated at $515m (2022/23 dollars).

[24] The installed capacity of the scheme will decrease to 100 MW from the current installed capacity of 104 MW.

A summary of the advantages and disadvantages of Status Quo conditions that other options are compared against is provided in **Table 5.**

Table 5: Status Quo: overview of advantages and disadvantages

Advantages	Disadvantages
• Lower capital cost compared to all options that involve continued operation of Tarraleah.	• Sustained risk of failure of the canals: 1 in 50 chance of a major failure each year and a 1 in 20 chance of moderate failure each year. This will lead to planned and unplanned outages and may negatively impact the TWWHA • Increased operational disruptions from planned and unplanned outages. • Does not utilise the planned investment in the Marinus Link and does not offer any firming benefit to the NEM.

7.3 Option 1: Decommissioning

Option 1 involves decommissioning of the existing Tarraleah scheme once the asset condition is assessed as untenable.

The timing of this decommissioning is expected to be required around 2028, driven by the Tarraleah Power Station machinery having reached the end of their operational life by that time. Risk will be monitored on an ongoing basis, and the decommissioning date will be adjusted as required.

Decommissioning is assumed to require minimal spend to enable safe shutdown of the assets and infrastructure, with costs incurred in 2029 and 2030. The assets will not be in operation and therefore will not pose a direct risk of an environmental incident. Expenditure has not been allowed for removal and rehabilitation of assets to restore the scheme footprint to an original state.

From 2030, water released from Lake King William would bypass Tarraleah and Liapootah Power Stations and be discharged into the River Derwent to feed Lake Wayatinah and the remaining lower Derwent scheme. This will deliver an environmental benefit for the River Derwent through returned flows in the TWWHA section. Butlers Gorge Power Station will be refurbished to allow continued generation, discharge regulators and flood mitigation. A peak capacity of 12 MW will be achieved from the refurbished Butlers Gorge Power Station.[25]

This option manages foreseeable risks of an environmental incident. However, decommissioning Tarraleah will significantly reduce the energy conversion rates of the Lake King William and Tarraleah catchments, with approximately 700 GWh generation per annum removed from the portfolio. This loss of generation is made up of the current output from Tarraleah Power Station (and

12MW
Approximate peak capacity

$188m
Cost (P50)

No storage
Storage duration

Addresses environment risk (problem 1)	Fully addresses
Addresses scheme inflexibility (problem 2)	Does not address
Addresses reliability risk (problem 3)	Does not address

[25] The installed capacity of Butlers Gorge is also 12 MW.

Nieterana Mini-hydro Power Station) as well as the loss of approximately half of the current output from the Liapootah Power Station. As Decommissioning reduces the capacity of the Tasmanian power system, it is not considered an acceptable option.

While the heritage listed station at Tarraleah will be preserved as part of this option, any expenditure associated with its repurposing (e.g. for public access) will be subject to a separate business case. If public safety can be maintained, all other redundant assets, such as penstocks, pipelines, surge towers and canals, will be left on site.

Decommissioning would include the following works:

- Minimal maintenance works will be undertaken on the existing Tarraleah scheme, including canals, up to 2028.
- Refurbishment of Butlers Gorge Power Station in 2026/27. The station is at the end of its useful life and flagged for decommissioning under other options. Bringing it up to modern protection standards and providing for remote automated operation (currently manual start stop only), will allow discharge regulators and spillway gates to remain operational for flood mitigation and protection of the Clark Dam on Lake King William once the scheme is decommissioned.
- Redundant assets are decommissioned and made safe, e.g., Tarraleah machines, Derwent Pumps, Wentworth Diversions, No. 2 Pond, Nieterana Mini-hydro Power Station and Tarraleah conveyances[26].
- Ongoing operations and maintenance (O&M) to manage decommissioned assets. Assets will only be physically removed and sites rehabilitated if there is a risk to the public and/or the environment[27].

A summary of the outcome of these works on key scheme assets is provided in **Appendix B.**

The capital cost of Option 1 is estimated at $188 million (2022/23 dollars). Further detail on the cost estimate is provided in **Section 8.2.**

A summary of the advantages and disadvantages of this option is provided in **Table 6**.

Table 6: Option 1 - Overview of advantages and disadvantages

Advantages	Disadvantages
• Lowest capital cost • Eliminates risk of an environmental incident • By protecting the heritage values of existing assets, the ongoing confidence of the Tasmanian Heritage Council (THC), will be maintained and the risk of assets being formally listed by the THC will be managed.	• Significant loss of revenue and total system yield • Assets with heritage value will become a liability with no corresponding financial benefit • Devalues Liapootah Power Station, with 50% of its current water diverted past it • Does not utilise the planned investment in Marinus Link, and therefore does not offer any firming benefit to the NEM.

[26] This will include immediate isolation of all assets from hazardous energy sources (water, electricity, pressure, etc.), removal of hazardous substances from decommissioned sites (batteries, oils, treated timber, asbestos, etc.), and provision of communication (signage) and permanent barriers to manage/eliminate risks from public access to decommissioned assets.

[27] Timing of ongoing maintenance and future removal: It is likely that Hydro Tasmania will need to develop a plan for the decommissioning of assets for development and environmental approvals. This will be based on the likelihood of threats to people, environment or heritage values associated with the assets.

7.4 Option 2: Minimum Refurbishment

Option 2 involves refurbishing and upgrading the existing Tarraleah scheme to manage the risk of failure. This will improve protection of the adjacent environment and improve reliability of the scheme's operations in the long term.

The proposed works include an upgrade of the existing Tarraleah Power Station and the construction of a new conveyance system to replace the existing canals that are in poor condition as well as a new headworks. There is a marginal impact on capacity relative to the Status Quo. While Butlers Gorge and Nieterana power stations are decommissioned (removing 14 MW of capacity), there is a 24 MW increase in the peak output of the Tarraleah Power Station, driven by procurement of new equipment and the construction of a new conveyance and headworks.[28]

The capability to remotely turn the power station on and off, and the new conveyance and headworks that will allow the station to run at full capacity (40 m^3/s), will provide some intraday flexibility in operations. Generation will be able to be ramped up and down in response to intraday negative price periods and to respond to morning and evening peaks. Due to the limitations of a new conveyance system, combined with no increase to the size of No. 2 Pond, the Tarraleah station will not be able to provide interday balancing capabilities.

The refurbished scheme (**Figure 33**) would consist of the following works:

- Approved upgrade works that are currently under construction. These works include a new intake on Lake King William, a connecting 1 km intake tunnel, a spillway upgrade on Mossy Marsh Lagoon and minor access and road works.
- Refurbishment of the existing Tarraleah station through sequential upgrades of all six generating units (Pelton machines) with modern machines between 2025 and 2028 (same as the Status Quo).
- Construction of a new No. 3 conveyance system with increased capacity of 32-40 m^3/s dependent on levels at Lake King William by 2030. The conveyance will consist of a 6.5 km pipeline from the Lake King William tunnel, a pressure reducing station at the downstream end of the pipeline and a second 1.5 km tunnel connecting the new intake on Lake King William with Mossy Marsh and No. 2 Pond.
- Replacement of the headworks between No. 2 Pond and Tarraleah Power Station to address the deteriorating asset condition of the existing hilltop pipelines and penstocks and allow the Tarraleah Power Station to run at full capacity (40 m^3/s).
- A new 16 km transmission line connecting the refurbished power station to the existing Liapootah – Palmerston transmission line.
- Ongoing maintenance of existing assets to maintain tolerable asset risk and condition.

100MW

Approximate peak capacity

$851m

Cost (P50)

Intraday

Storage duration

Addresses environment risk (problem 1)	Fully addresses
Addresses scheme inflexibility (problem 2)	Partially addresses
Addresses reliability risk (problem 3)	Fully addresses

[28] The installed capacity of the scheme under this option will be 103 MW, peak capacity will be 100 MW.

- Redundant assets are decommissioned and made safe (e.g. Nieterana Mini-hydro Power Station, Butlers Gorge Power Station, Tarraleah conveyances and Tarraleah No. 1 Pond).

A summary of the outcome of these works on key scheme assets is provided in **Appendix B.**

The capital cost is estimated at $851 million (2022/23 dollars). This expenditure will maintain the Tarraleah hydropower scheme at a tolerable level of asset risk by removing the risk of an environmental incident. Further detail on the cost estimate is provided in **Section 8.1**.

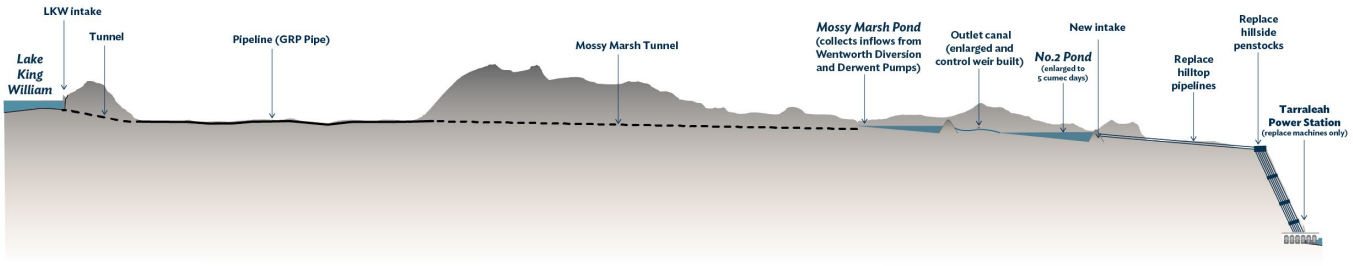


Figure 33: Option 2 (Minimum Refurbishment) schematic

A summary of the advantages and disadvantages of this option is provided in **Table 7**.

Table 7: Option 2 - Overview of advantages and disadvantages

Advantages	Disadvantages
• Lower capital cost than redevelopment options • Improvements in flexibility of the station achieved (intraday balancing).	• No material change in capacity of the station will be achieved • The station will still generally operate continuously throughout the year • Storage duration limited to intraday firming.

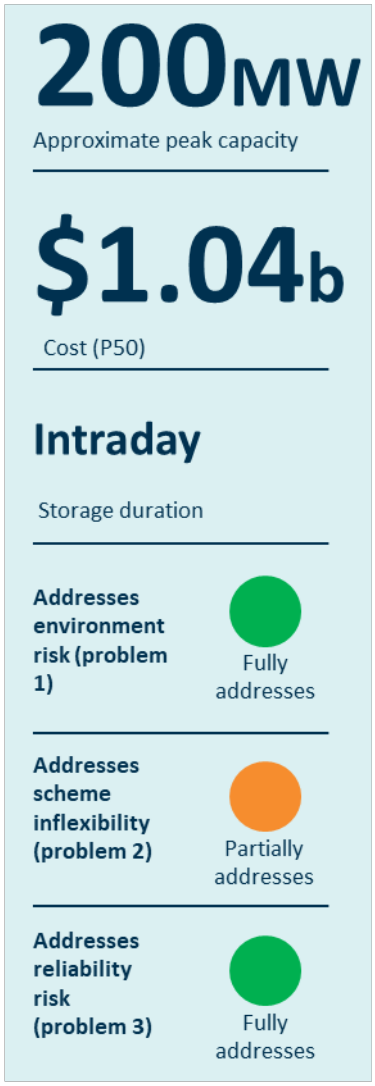
7.5 Option 3: Refurbishment with BESS (Additional Shallow Storage)

Option 3 involves refurbishing the Tarraleah scheme (equivalent to Option 2), and provides additional capacity introduced with a 100 MW (200 MWh) BESS located elsewhere in the portfolio. A two-hour BESS is consistent with current industry standards. Although this solution is not specific to the Tarraleah site, it is included for comparison purposes to on-site storage solutions.

Modelling of this system is basic, with this option considered after completion of the feasibility assessment to capture an alternative dispatchable capacity to Option 2. This shallow storage capability provides fast ramping and FCAS.

Similar to Option 2, this manages the risk of asset failure at Tarraleah to improve protection of the adjacent TWWHA and improves reliability of the scheme's operations. As an alternative to improving the storage duration of the Tarraleah scheme (as in Options 4 and 5 discussed in **Sections 7.6** and **7.7**), this option enhances flexibility within Hydro Tasmania's portfolio by adding capacity through the construction of a BESS elsewhere in the State.

The refurbished Tarraleah Power Station, together with a BESS, will have a peak capacity of 200 MW[29] and provide intraday balancing capabilities and capture greater revenue during the periods of high prices. The BESS would operate primarily for arbitrage with an average of 425 cycles per year.



The refurbished scheme would consist of the following works:

- All works described in Option 2 – including refurbishment of the existing Tarraleah Power Station, construction of a new conveyance system, replacement of the headworks between No. 2 Pond and the Tarraleah Power Station, and ongoing maintenance of existing assets to maintain tolerable asset risk and condition.
- Installation and connection of a 100 MW, two-hour (200 MWh) BESS. The BESS will be connected to the transmission network through a separate connection closer to load, as transmission losses near Tarraleah would be high.
- A new 16 km transmission line connecting the refurbished power station to the existing Liapootah – Palmerston transmission line.
- Redundant assets are decommissioned and made safe (e.g. Nieterana Mini-hydro Power Station, Butlers Gorge Power Station, Tarraleah conveyances and Tarraleah No. 1 Pond).

The capital cost is estimated at $1.04 billion (2022/23 dollars). Further detail on the cost estimate is provided in **Section .1**. A summary of the outcome of these works on key scheme assets is provided in **Appendix B.**

Table 8 outlines a summary of the advantages and disadvantages of this option.

[29] The installed capacity will be 203 MW.

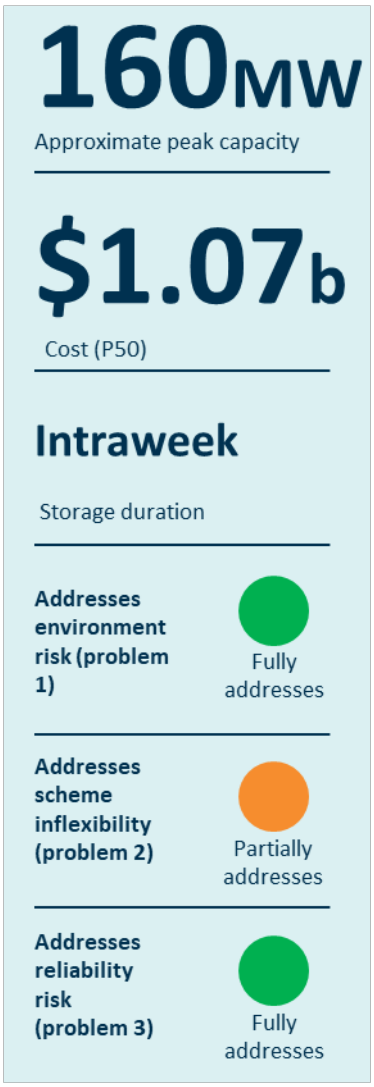
Table 8: Option 3 - Overview of advantages and disadvantages

Advantages	Disadvantages
• Highly flexible short-term storage • Allows for progressive, potentially modular, development in line with market needs • BESS creates opportunities to access other markets that are emerging, such as Fast Frequency Response Ancillary Service which hydropower generators cannot access • Subject to supply constraints, the BESS can be implemented relatively quickly, i.e. 12 to 18 months lead time • Potential to undertake investment with another counterparty to reduce the capital outlay required for the BESS.	• Storage duration is comparatively short compared to the size of storage in the redevelopment options[30] • Provides limited increase to storage duration targeting intraday firming • The station will still generally operate continuously throughout the year (same as with Option 2) • No suitable location for the BESS has been identified, potentially leading to project delays • Pricing for BESS components are currently very volatile, due to global shortages in supply of lithium carbonate driving prices up significantly since 2020. Pricing is expected to ease with new battery technologies becoming commercial and increasing manufacture capacity, but demand is also expected to increase with time • Battery storage has a short lifespan of only 20 years (compared to 80+ years for hydro storage), with material deterioration in performance over that period. • Larger environmental footprint as a BESS of this size requires approximately 2.5 hectares of land to construct.

[30] A two-hour BESS can absorb and shift approximately one-sixth of the energy that can be held and stored by Option 4 (Redevelopment with Headponds).

7.6 Option 4: Redevelopment with Headponds (Deep Storage)

Option 4 involves redeveloping the Tarraleah scheme to deliver reliability and capacity improvements as well as some additional flexibility (intraday and interday).



To address the current risk of an environmental incident and the reliability risks, this option involves replacement of the Tarraleah Power Station and constructing a new conveyance (including pipeline and tunnels) to connect Lake King William to the headponds storage lake (No. 2 Pond), to bypass the existing canals.

To improve the flexibility of the system, the headponds storage lake (No. 2 Pond) would be enlarged to its maximum practical size. This will allow it to run for up to 20 hours at 160 MW peak output[31], after which capacity will be constrained to 100 MW by the limited capacity conveyance system to supply No. 2 Pond (assuming no local inflows). This configuration provides for daily (intraday) generation cycles and will allow the scheme to flexibly respond to morning and evening peaks. The scheme will need to run for two cycles daily, with the conveyance system running regularly to minimise spills.

The redeveloped scheme (**Figure 34**) would consist of the following works:

- Approved upgrade works that are currently under construction. These works include a new intake on Lake King William, a connecting 1 km intake tunnel, a spillway upgrade on Mossy Marsh Lagoon and minor access and road works.
- Construction of a new No. 3 conveyance system with a capacity of 32-40 m^3/s dependent on levels at Lake King William. The conveyance will consist of a 6.5 km pipeline from the Lake King William tunnel, a pressure reducing station at the downstream end of the pipeline and a second 1.5 km tunnel connecting the new intake on Lake King William with Mossy Marsh and No. 2 Pond.
- Upgraded Mossy Marsh dam and spillway to meet changed operations and current standards. A replacement canal between Mossy Marsh Pond and No. 2 Pond, including a new gated control structure.
- Construction of a new power station on the right bank of the Nive River, opposite Tungatinah Power Station initially with three turbines with a total installed capacity of 165 MW (this site enables further expansion and can also accommodate a fourth 55 MW turbine increasing installed capacity to 220 MW and peak output of 209 MW).[32] The new station would be connected to the No. 2 Pond by a new intake and tunnel, with a surge shaft and 55 m surge tank to provide governing capability and protection against pressure transients.

[31] The installed capacity will be 165 MW.

[32] If a four-unit, 209 MW peak output (220 MW installed capacity) machine is installed, discharge at full capacity will result in spills to downstream stations, reducing the scheme's efficiency and the marginal value of the additional capacity. Therefore, modelling suggests that a 165 MW, three-unit station achieves a higher return on investment than the fully developed station. As such, as three-unit station would be constructed initially, with the option to add a fourth 55 MW turbine in the future.

- Construction of a surge shaft rising from the power tunnel, connected to a 63 m high surge tower to provide governing capability and surge protection during load rejections.
- A new 16 km transmission line connecting the new power station to the existing Liapootah – Palmerston transmission line.
- Redundant assets are decommissioned and made safe, e.g. Nieterana Mini-hydro Power Station, Butlers Gorge Power Station, Tarraleah Power Station, existing Tarraleah conveyances and No. 1 Pond.

The capital cost is estimated at $1.07 billion (2022/23 dollars). Further detail on the cost estimate is provided in **Section 8.1**. A summary of the outcome of these works on key scheme assets is provided in **Appendix B.**

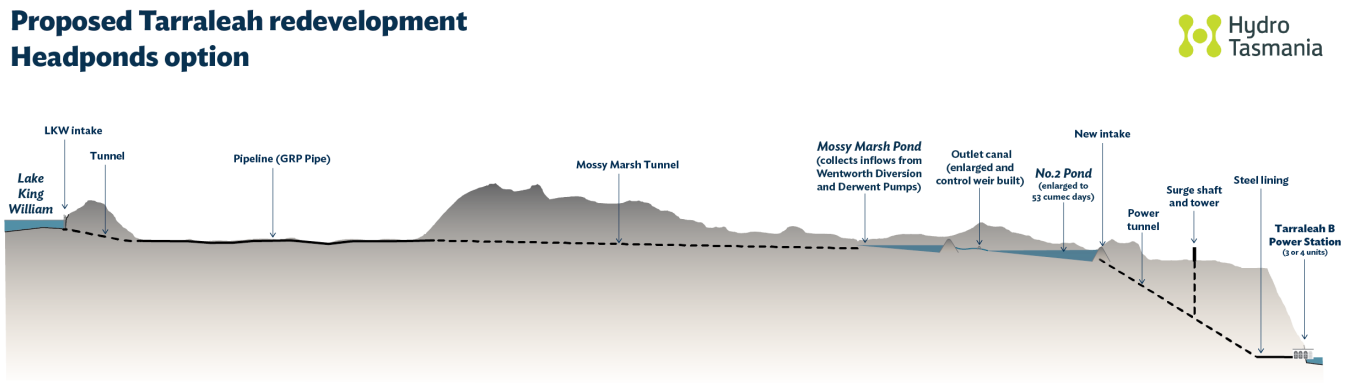


Figure 34: Option 4 (Redevelopment with Headponds) schematic

A summary of the advantages and disadvantages of Option 4 is provided in **Table 9**.

Table 9: Option 4 - Overview of advantages and disadvantages

Advantages	Disadvantages
• Improved reliability of the scheme (full replacement of Tarraleah Power Station) • Provides interday balancing capabilities • Potential investment flexibility, i.e. the potential to first develop the new power station, and later add capacity and flexibility with a delayed implementation of the new conveyance. However, staging the investment would result in a delayed mitigation of the risk of a potential environmental incident in the adjacent TWWHA. • Potential for the peak capacity to be increased over time to 209 MW if fully developed.	• Storage capacity limits full output operation to up to 20 hours before capacity is reduced to 100 MW • Complex scheme with additional assets and design challenges • Substantial underground works required (tunnelling), therefore exposed to cost and schedule risk commensurate with this type of construction.

7.7 Option 5: Redevelopment with Pressurised Conveyance (Inter-seasonal Storage)

Option 5 involves redeveloping the Tarraleah scheme to deliver reliability and capacity improvements as well as providing electricity balancing across multiple timescales. This helps to ensure system security and reliability is maintained in a system facing variability in demand and supply.

To address the current risk of an environmental incident and reliability risks, the option involves replacement of the Tarraleah Power Station, and construction of a new pressurised conveyance to bypass the existing canals to directly connect the new power station to the head storage at Lake King William. This will provide inter-seasonal storage capabilities, increase efficiency (higher energy conversion rates) and add up to 100 MW of capacity to the Tarraleah scheme, taking the peak capacity to ~190 MW[33].

The additional operational flexibility has the potential to add up to 200 GWh per annum to the portfolio from a combination of increased efficiency inherent in the redesigned scheme and increased operational flexibility in the Derwent hydropower scheme.

In addition to the services provided by Option 4, this option allows for better responses to short-term periods of low renewable generation, such as rainy days and windless nights. It also allows for smoothing of energy over longer durations (weeks and months), meaning that it can contribute to meeting demand during wind drought periods. This would make the new scheme capable of addressing balancing challenges of VRE with energy demand across multiple timescales — from interday to inter-seasonal.

The new power station will be capable of operating for longer periods at full capacity at high market prices over both intraday and seasonal price cycles, managing system generation by storing excess water in Lake King William for energy generation at a later time. This is expected to be valuable given winter prices are forecast to be at a premium compared with summer prices. The redeveloped Tarraleah Power Station is expected to operate as a peaking station, generating at or near full output when demand and/or market price is high; or providing system inertia and voltage support when demand is low.

The pressurised conveyance would be implemented in one stage and is not inherently scalable or flexible in its delivery. While there is some flexibility in timing for the implementation of the pump station units, this is a relatively small share of the overall investment and offers minimal benefit to overall flexibility.

The redeveloped scheme (**Figure 35**) would include the following key works:

- Approved upgrade works currently under construction. This includes a new intake on Lake King William, a 1 km connecting intake tunnel, a spillway upgrade on Mossy Marsh Lagoon and minor access and road works.

[33] The installed capacity will be 200 MW.

- Connection of the Lake King William intake (upgrade works) to a 4.2 km long 61 m^3/s capacity surface pipeline which would connect to a 9 km long headrace tunnel, incorporating a mid-tunnel surge pond.
- Construction of a 2.5 km long power tunnel, connecting the headrace tunnel at the base of the surge shaft to the power station. The tunnel will feed directly into a new power station comprising of 2 x 100 MW Francis machines.
- The new power station would be constructed on the terrace platform provided by the existing Tarraleah Switchyard (excavated in 1930s) with long axis orientated parallel to the Nive River.
- Construction of a surge shaft rising from the power tunnel, connected to a 70m high surge tower providing governing capability and surge protection during load rejections. Water collected by existing catchments downstream of Clark Dam including Derwent Pumps and the Wentworth Diversions would continue to flow into Mossy Marsh and then No. 2 Pond from where they are diverted into the scheme via a pumping station connected into the surge tower.
- A new 16 km transmission line connecting the new power station to the existing Liapootah - Palmerston transmission line.
- Redundant assets are decommissioned and made safe e.g. Nieterana Mini-hydro Power Station, Butlers Gorge Power Station, Tarraleah Power Station, existing Tarraleah conveyances and Tarraleah No. 1 Pond.

The cost of Option 5 is estimated at $1.05b (2022/23 dollars). Further detail on the cost estimate is provided in **Section 8.1** with a summary of the outcome of these works on key scheme assets provided in **Appendix B.**

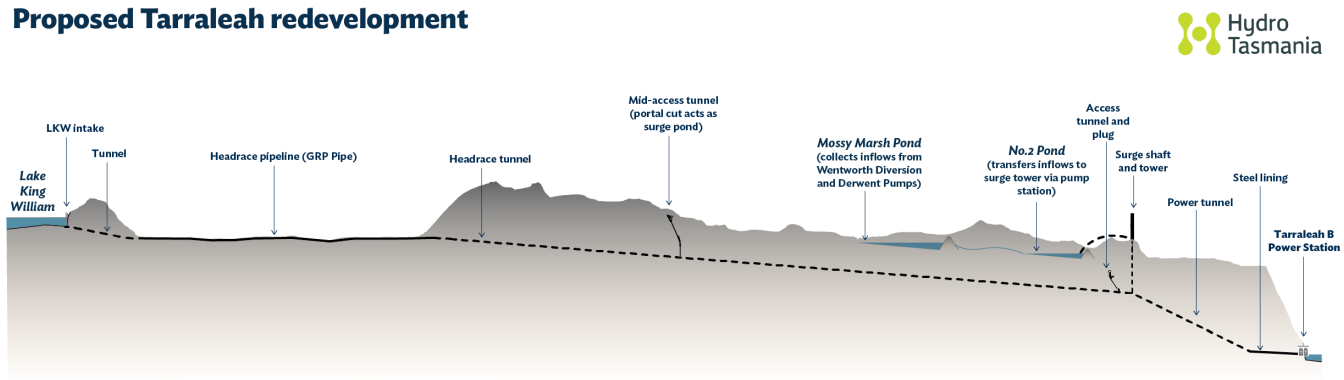


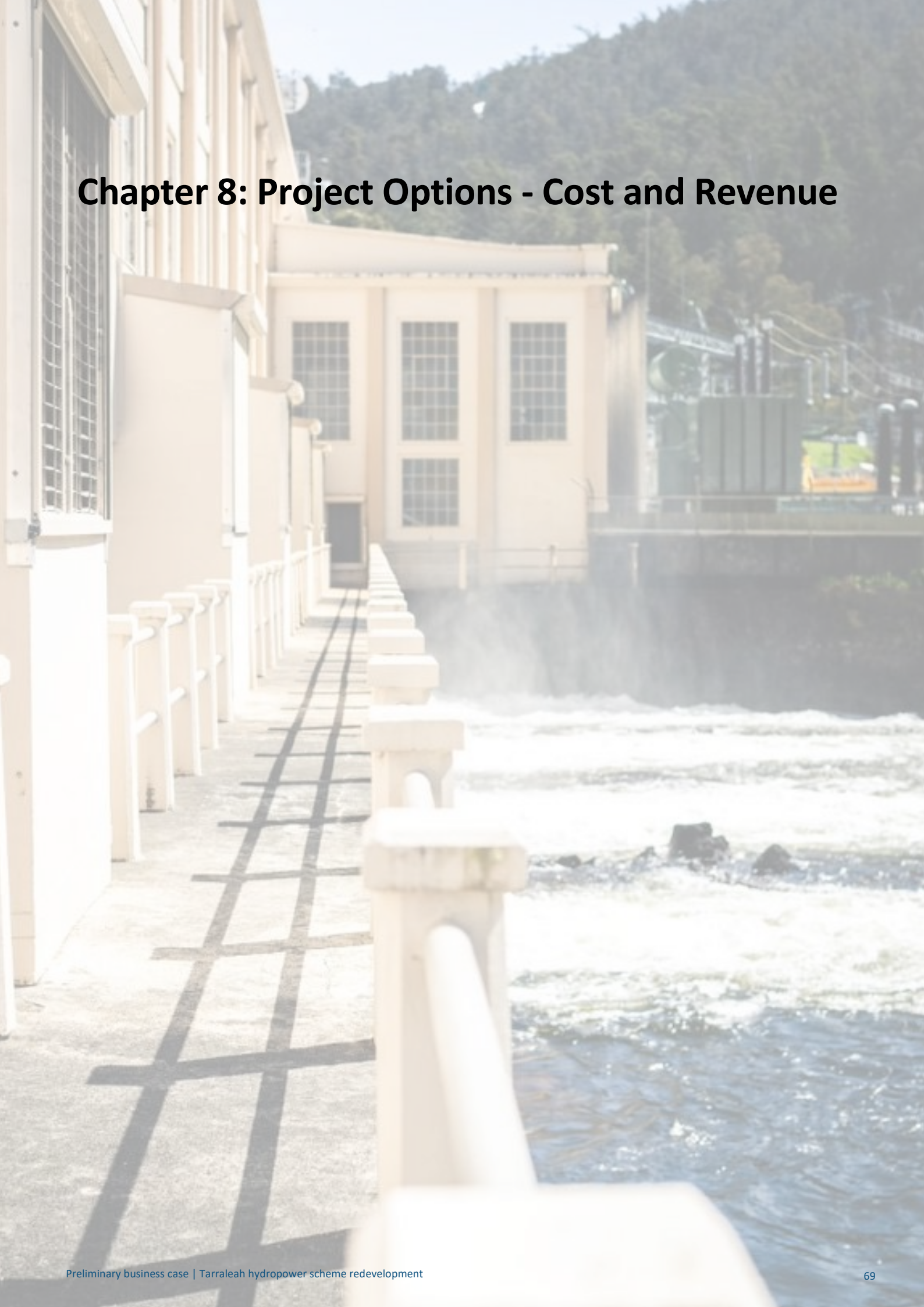
Figure 35: Option 5 (Redevelopment with Pressurised Conveyance) schematic

A summary of the advantages of this option is provided in **Table 10**.

Table 10: Option 5 - Overview of advantages and disadvantages

Advantages	Disadvantages
• Higher revenue opportunities and • Highest operational flexibility • Ability to generate at full capacity (peak output of approx. 190 MW) for several months without reducing load, subject to Lake King William storage levels and environmental considerations • Highest efficiency. Potential to increase annual total portfolio generation by up to 200 GWh when considering options to control operation better across the broader Derwent hydropower scheme • Traditional hydropower scheme arrangement, simple to maintain and operate once constructed.	• Substantial underground works required (tunnelling) therefore exposed to cost and schedule risk commensurate with this type of construction • Not conducive to staged construction or investment.

Chapter 8: Project Options - Cost and Revenue



8.1 Chapter overview

Purpose

This chapter considers the costs and revenues that underpin the financial analysis of project options in **Chapter 9**.

This section outlines:

- Project cost (**Section 8.2**)
- Project revenue (**Section 8.3**).

Key points

- Capital and project delivery cost estimations (P50) for the project options range from $188 million (Decommissioning) to $1.07 billion (Redevelopment with Headponds). These are point in time estimates and subject to further refinement as the project continues to progress.
- Hydro Tasmania optimises generator dispatch at a portfolio level. For modelling purposes, revenue estimates are based on the incremental revenue attributed to Tarraleah under the project options compared to the Decommissioning option.
- Plexos Pricing and Plexos Hydro models were used to project the revenue for each option under six market scenarios (three scenarios against two sensitivities). These market scenarios represent plausible future market outcomes with differing assumptions, including the extent of interconnector constraints.
- Hydro Tasmania considers four revenue streams in modelling the total revenue under each project option. These are:
  - spot revenue – the incremental spot revenue across Hydro Tasmania's portfolio directly attributable to each project option
  - capacity contract revenue – the revenue generated through the sale of contracts for the supply of a given capacity for a specified period
  - Asian option premium – the revenue from the sale of contracts where the payoff is calculated against the average spot price over a specified period
  - renewable energy guarantee of origin (REGO) certificates – revenue from the sale of certificates from the proposed REGO scheme.
- Option 5 (Redevelopment with Pressurised Conveyance) performs best across all modelled revenue streams.
- The revenue for all options is significantly higher under the market scenarios where the interconnector is unconstrained.

8.2 Project cost

This section outlines the capital and operating cost estimates for each of the project options. These are point in time estimates based on current available information and will only be known with more certainty once market pricing is available towards FID. The costs outlined in this section form key inputs to the commercial impact assessment in **Chapter 9.**

The Status Quo is not considered a viable project option (refer to Section 9.3) as it does not address the identified problems in **Chapter 5**. As such, cost estimates have not been included for the Status Quo.

8.2.1 Capital cost estimation

Table 11 outlines the P50 capital and project delivery cost estimates based on current available information. These estimates were developed by Hydro Tasmania and externally reviewed by Ranbury[34] and will be updated as more information becomes available. These estimates assume that work will largely commence on site in 2025 and completed in 2030 as scheduled with early operation targeted for late 2028.

Table 11: Capital costs summary ($ m, real as of 2023)

Capital expenditure	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Real ($m, 2023)	188	851	1,043[35]	1,070	1,055
Peak capacity (MW) [36]	~12	~100	~200	~160[37]	~190
$m/MW	15.7	8.5	5.2	6.7	5.6

The general assumptions underpinning the cost estimates are listed in **Table 12.** The cost estimates for each option are provided in more detail in **Appendix C.**

Table 12: General assumptions for costing estimates

Estimate	Detail
Dollar terms	All estimates are in 2023 dollars (real).
Escalation factor	An escalation factor of 2.5% per annum has been applied to convert real costs to nominal costs. This reflects the Reserve Bank of Australia's (RBA) long term Consumer Price Index (CPI) target and is the escalation factor adopted by Hydro Tasmania for all of its projects. This assumption will be reviewed and refined for the final business case.
Capital expenditure for FY2023-24	Capital costs for the financial year 2023-2024 are estimated to be the same across all project options ($22.1 million).

[34] Ranbury is an independent provider of specialist project advisory and delivery services.
[35] The battery lifespan is 20 years, and the replacement costs are considered in the commercial impact assessment in Section 9.4.
[36] Installed capacity is higher than peak capacity for all options. Refer to **Chapter 7** for an overview of installed capacities.
[37] Peak capacity could be increased to 209 MW with the full four machine redevelopment (subject to ~$65 million additional capex).

Estimate	Detail
Sustain capital expenditure (capex) post cost plan	A sustaining capital cost estimate was provided up to 2049. Annual sustaining capex costs post 2049 are assumed to be equivalent to the average sustain capex between 2039 and 2049.
Upgrade works	Total costs under the funding agreement are $123 million which includes approximately $98 million on upgrade works and $25 million for "Pre-FID cost". This is based on approved funding for previous and planned expenditure (refer to **Section 4.3** and **Appendix A**) and is therefore relevant to all options.
Status Quo maintenance works	The scope of works and costs associated with sustaining operations of the existing Tarraleah assets are based on the 2023 SAMP and are included in all options. A further $10 million for sustain works will be requested prior to the project FID for all options.
Transmission infrastructure	The 220 kV transmission infrastructure is assumed to be developed and paid for by TasNetworks and charged back to Hydro Tasmania in network access charges.
Decommissioning	Works are assumed to commence in 2028. The cost estimate includes expenditure to make assets safe, but no additional allowance has been included for any re-use options (e.g. to repurpose as a public facility such as a museum).

8.2.2 Operating and maintenance costs

O&M costs are estimated for two distinct periods as follows:

- 2024 – 2028: Annual operating costs are estimated to be the same across all project options, including Option 1 (Decommissioning).
- 2029 – 2050: Annual operating costs are estimated to be significantly higher under the two refurbishment options (Options 2 and 3) compared to the two redevelopment options (Options 4 and 5) due to the increased costs incurred through the extensive monitoring program associated with the refurbished existing Tarraleah Power Station. Annual O&M costs for Option 1 (Decommissioning) relate to the management of decommissioned assets and are expected to be relatively low.

These cost assumptions are summarised in **Table 13**.

Table 13: Operating costs assumptions

Assumption	Detail
Dollar terms	All estimates are in 2023 dollars (real).
Escalation factor	Escalation factor of 2.5% per annum, applied on a quarterly basis.

The total operating costs for the project options are summarised in **Table 14**. Over the same period, the redevelopment options (Options 4 and 5) have the lowest operation costs per megawatt ($/MW), reflecting a significant reduction in annual and periodic maintenance costs.

Table 14: Summary of operating cost components for the project options (2024 – 2050)

Operating expenditure	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Real ($m, 2023)	11.8	163	224	139	126

Operating expenditure	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Present value ($m)	5	63	88	55	50
Peak capacity (MW)[38]	~12	~100	~200	~160[39]	~190
$/MW	1.0	1.6	1.1	0.9	0.7

8.3 Project revenue

There are two markets in the NEM through which revenue can be generated: the spot market and the contract market. As an electricity generator, Hydro Tasmania participates in both markets. For the purposes of this analysis, it is assumed that Hydro Tasmania will:

- sell their generation in the spot market
- sell two contract market products[40] (capacity (cap) contracts and Asian call options)
- receive REGO certificates for all generation.

Hydro Tasmania optimises the dispatch of its power stations at a portfolio level. To isolate the revenue attributable to the Tarraleah scheme, Hydro Tasmania assesses the incremental portfolio-level revenue under each project option compared to a baseline scenario where Tarraleah is not in operation. For modelling purposes, Hydro Tasmania uses the Option 1 (Decommissioning) as a proxy for the portfolio scenario without Tarraleah. As a result, there is zero revenue for decommissioning under all market scenarios, despite the works required to maintain 12 MW of installed capacity at Butlers Gorge Power Station under this option.

Revenue is calculated against the Victorian spot and contract market prices, based on the assumption that Hydro Tasmania acquires the settlement residues[41] across the interconnectors at a portfolio level. This is consistent with existing practice, however, the validity of this assumption once Marinus Link comes online will be tested in the final business case[42]. The cost for the acquiring the settlement residues is part of Hydro Tasmania's overall cost structure and does not vary between project options.

There are four potential revenue streams that Hydro Tasmania has modelled. These revenue streams are triggered at different spot prices as shown in **Figure 36.**

[38] Installed capacity is higher than peak capacity for all options. Refer to **Chapter 7** for an overview of installed capacities.
[39] Peak capacity could be increased to 209 MW with the full four machine redevelopment (subject to ~$65m additional CAPEX).
[40] Swaps are another contract market product in which the variable wholesale market spot price is, in effect, swapped for the fixed strike price. These products have not been considered by Hydro Tasmania in their revenue market analysis.
[41] As defined by the Australian Energy Regulator, settlement residue refers to the difference between the price paid in the importing region and the price received in the importing region, multiplied by the amount of flow. These residues are auctioned off to generators by transmission operators through an auction process managed by AEMO.
[42] Hydro Tasmania is currently undertaking a review of the settlement residue strategy going forward in the context of Marinus Link and the development of the BotN project. This will be available for the final business case.

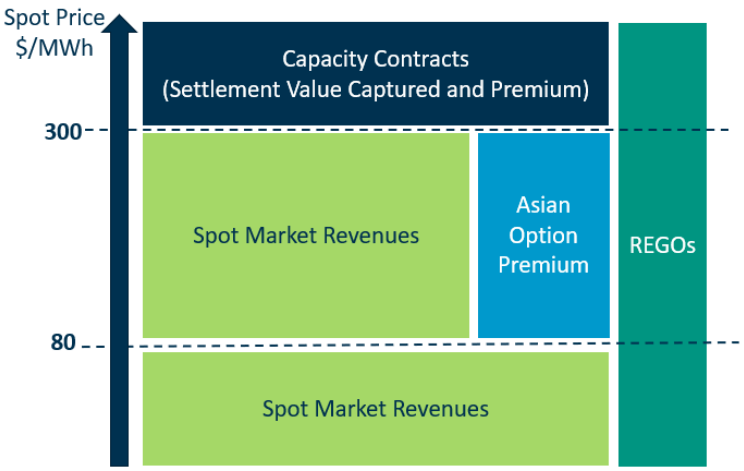


Figure 36: Revenue streams modelled by Hydro Tasmania

The market scenarios that impact potential revenue and a description of each revenue stream is provided in the subsequent sections. Potential revenue from the provision of ancillary services has not been included in modelling to date as Hydro Tasmania considers these revenue streams to be minor.

The Status Quo is not considered a viable project option as it does not address the identified problems in **Chapter 5** and does not pass the screening test in **Chapter 9.** There are also no revenue streams that are relevant to Option 1 (Decommissioning). As such, only the revenue results for Options 2 to 5 are presented.

8.3.1 Market scenarios

Through extensive research and analysis, three plausible and divergent market scenarios were developed by Hydro Tasmania to evaluate the spot revenue outcomes for each Tarraleah project option.

For each of the three market scenarios, two different sensitivities were modelled to represent whether the Basslink and Marinus Link interconnectors would be constrained or unconstrained, resulting in a total of six market scenarios as outlined in **Figure 37.**

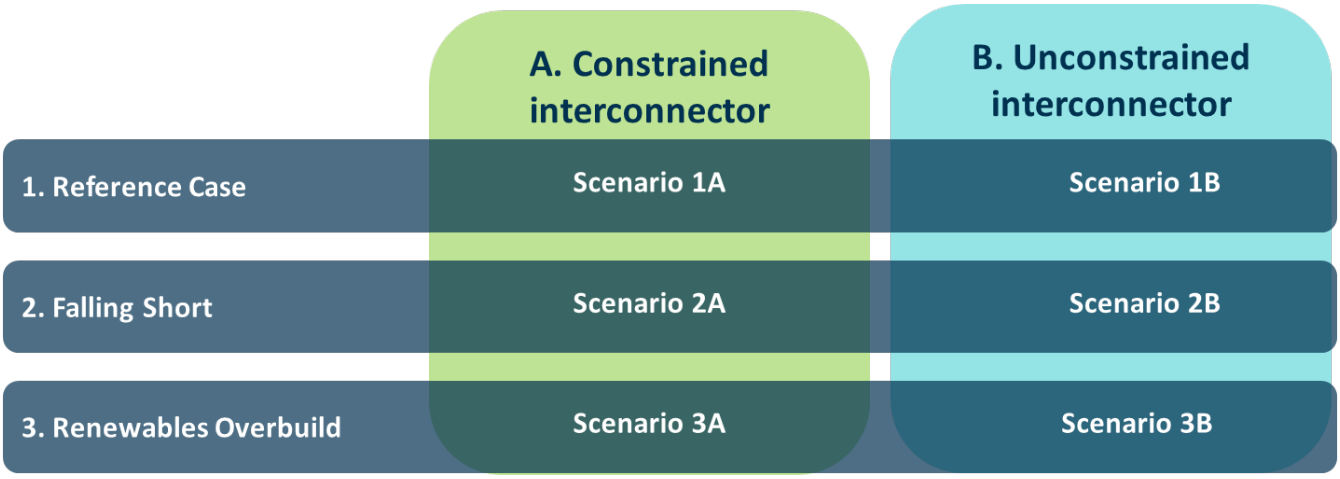


Figure 37: Market scenarios

The market scenarios selected demonstrate the potential spread of future spot prices, to assess the commercial viability risk under varying future market conditions. There is no single scenario that is 'expected' or considered highly likely.

Table 15 provides a high-level overview of assumptions under each market scenario.

Table 15: Overview of market scenario assumptions

	1. Reference case	2. Falling short	3. Renewables overbuild
Core assumptions			
Pace of coal retirement	Moderate	Rapid	Moderate / rapid
Extent / pace of wind development	Moderate	Minimal / slow	Significant / rapid
Spot market volatility	Moderate	High	Low
Average spot price	Moderate	High	Low
Sensitivity assumptions			
Sensitivity A	Constrained interconnector	Constrained interconnector	Constrained interconnector
Sensitivity B	Unconstrained interconnector	Unconstrained interconnector	Unconstrained interconnector

Further detail on each of the market scenarios and sensitivities is provided below.

- **Market scenario 1. Reference case**: This scenario most closely resembles AEMO's ISP Step Change scenario. It assumes that there is a relatively quick transformation of the energy sector driven by strong demand growth from electrification of homes, vehicles and industrial applications. A moderate pace of coal-fired generation retirement is assumed with wind, solar and storage capacity increasing on a least cost basis.
- **Market scenario 2. Falling short:** This scenario assumes that stakeholder pressures lead to coal-fired generators in the NEM retiring sooner than predicted in the reference case, with limited replacement generators being built in time to meet demand. This will lead to a market characterised by periods of insufficient capacity and volatile, high spot prices, leading to more frequent government interventions.
- **Market scenario 3. Renewables overbuild:** This scenario assumes a rapid transition of the energy sector driven by an overbuild of VRE generation and storage capacity. This increased supply is not met by sufficient demand growth, creating an oversupplied market with low spot prices and reduced market volatility.
- **Sensitivity A. Constrained interconnector:** This sensitivity tests a future market where there is significant wind development in Tasmania as generators capitalise on Tasmania's high-capacity factor wind resources. Tasmanian demand is assumed to remain relatively constant as no large-scale hydrogen industry is developed in the State. This results in on-island electricity supply exceeding demand. Excess Tasmanian generation (both wind and hydro) will compete for export to Victoria, resulting in the Tasmanian-Victorian interconnectors being constrained about 40% of the time.
- **Sensitivity B. Unconstrained interconnector:** This sensitivity tests a future market where there is less wind generation in Tasmania available for export to Victoria, resulting in the interconnectors (Basslink and Marinus Link) only being constrained around 15% of the time. These conditions could be driven by the following two market outcomes:
    - Accelerated investments in offshore wind in Victoria (in line with Victorian Government targets) displacing onshore wind development in Tasmania. As with Sensitivity A, this market outcome assumes that no large-scale hydrogen industry will develop in Tasmania. With minimal changes to Tasmanian demand or supply (through wind developments), there will be available capacity on the interconnectors to export excess Tasmanian generation; or

- A large-scale hydrogen hub is established in Tasmania, attracting wind developers to support this new load. There is less wind generation available to export resulting in greater availability of capacity on the interconnectors.

Appendix D provides more detail on the key assumptions under each market scenario and sensitivity.

8.3.2 Spot market revenue

Spot market revenue represents the incremental spot revenue across Hydro Tasmania's portfolio directly attributable to each project option. It is capped at $300/MWh as the revenue above this threshold is calculated separately as settlement values captured for the capacity contracts (discussed in **Section 8.3.3**). Spot market revenue is typically the largest revenue component.

Spot market revenue modelling is carried out in Plexos using stochastic multi-stage optimisation techniques that aim to assess the revenue impact of plausible market changes on the proposed project options. Plexos is a unified energy modelling and forecasting platform developed by Energy Exemplar, operationally used by energy market participants, system planners, investors, regulators, consultants, and analysts worldwide. Its cutting-edge mathematical programming and stochastic optimisation techniques can effectively deal with very complex problems and uncertainties (such as future load, natural inflow and fuel price). Its simulation engine analyses zonal energy models ranging from long-term investment planning to medium-term operational planning and down to short-term, hourly, and intra-hourly market simulations.

8.3.2.1 Spot market projection methodology

Plexos modelling

Hydro Tasmania uses two complementary Plexos models, the Plexos Pricing Model and the Plexos Hydro Model, to forecast spot revenue for each of the project options being considered. The Plexos Pricing Model undertakes NEM-wide price modelling and forecasting using market simulations while Plexos Hydro Model uses the Plexos Pricing Model outputs to undertake water valuations to determine an optimal strategy for long-term hydro system operations. Together they provide a portfolio-level outlook to assess the revenue impact of plausible market changes on the proposed project options.

Hydro Tasmania uses Plexos modelling in conjunction with other tools and methods, and regularly reviews and updates the underlying assumptions and inputs to ensure the models remains accurate and relevant.

A brief overview of the two Plexos models used is provided below.

Plexos Pricing Model

The Plexos Pricing Model models electricity generation, prices, and associated costs for the NEM.

The model incorporates forced outage modelling and provides detailed and sophisticated NEM-wide energy price outputs. Hydro Tasmania produces the Long-Term Price Benchmark using the Plexos Pricing Model, which is in turn used by Hydro Tasmania as:

- the long-term electricity price forecast
- a critical input to the accounting valuation of generation assets and long dated electricity contracts beyond the observable market curve
- an input to financial modelling for investment and strategic decision making.

Figure 38 provides an overview of the Plexos Pricing Model.

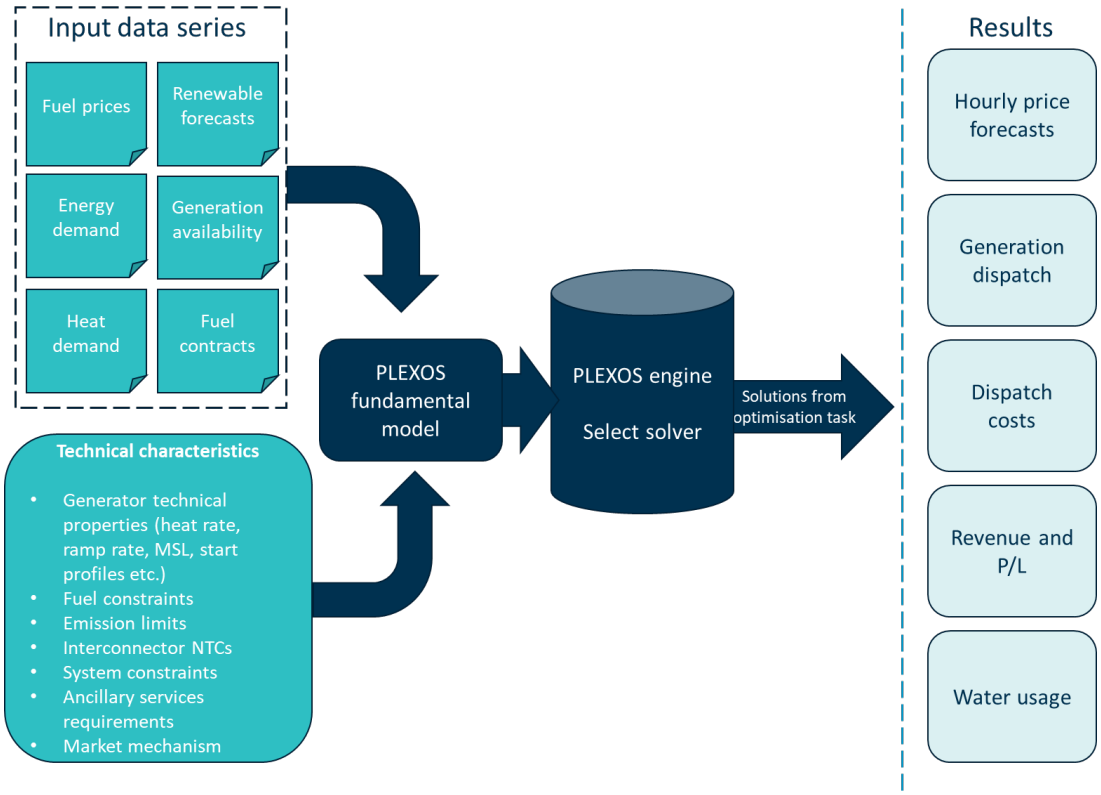


Figure 38: Plexos Pricing Model

Plexos Hydro Model

The Plexos Hydro Model is a high-resolution power system model that was developed to produce a detailed portrayal of the Tasmanian hydro system. Generation is optimised over a 22-year horizon (1 July 2028 – 30 June 2050) to provide system operation across all storages and power stations. The model provides detailed representations of hydrological, financial and energy outputs, accounting for:

- hydropower assets, including hydropower stations, storages, tunnels, canals, pumps, diversions
- hydrological constraints (e.g. low/high seasonal catchment inflows), including impacts of climate variability and climate change
- interconnector flows, based on Victorian price sensitivities
- considerations for business strategy based on evolving regulations, market design and a mathematical understanding of the evolving electricity grid.

The Plexos Hydro Model results in greater generation variability on a year-on-year basis compared to the Plexos Price Model, reflecting the hydrological constraints and optimisation (**Figure 39**).

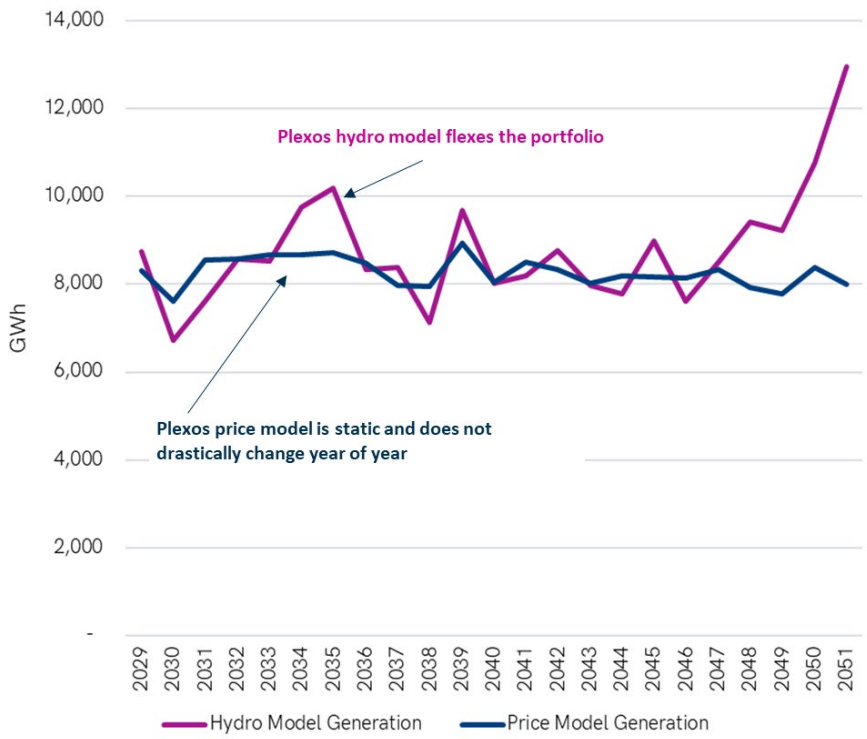


Figure 39: Plexos Hydro Model and Pricing Model generation

The methodology for the calculation for the spot market revenue is outlined in **Table 16.**

Table 16: Spot market revenue overview and modelling method

Revenue premium	Description	Modelling method
Spot revenue	This represents the incremental spot revenue across the Hydro Tasmania portfolio that is attributable to the project option being considered.	• Total Hydro Tasmania portfolio spot value specific to each option for Tarraleah *less* total Hydro Tasmania portfolio spot value under the Tarraleah Decommissioning option. • Spot revenue = spot price (below threshold) at Victorian Regional Reference Node (RRN) ($/MWh) x Hydro Tasmania portfolio generation (MWh). (Note: spot price modelling is capped at $300/MWh as "revenue" above this threshold is calculated as settlement value captured under capacity contracts).

8.3.2.2 Spot market revenue results

Figure 40 shows the modelling results for spot market revenue results across Options 2 to 5 for each of the six market scenarios outlined in **Section 8.3.1**. The light blue line compares the revenue under the scenario with the highest revenue (Scenario 1B) across all the options. A similar trend exists across all market scenarios.

Figure 40: Spot market revenue modelling results[43]

** Exempt Information – Figure 40 - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

The modelled results indicate that:

- Option 5 (Redevelopment with Pressurised Conveyance) achieves the highest spot market revenue of any project option under all six market scenarios.
- The extent of interconnection constraint (tested under Sensitivities A and B) has a significant impact on revenue across all project options.
- At a portfolio level, all project options have a higher spot market revenue when the interconnector is unconstrained (Scenario B), and Hydro Tasmania can export more of the energy generated to the mainland NEM when spot prices are high:
    - Options that offer the most flexibility (Options 4 and 5) result in the highest levels of spot revenue.
    - The options that do not directly target flexibility improvement at Tarraleah but provide more capacity (Option 2 and Option 3) also capture some additional revenue for the entire portfolio by taking advantage of the unconstrained interconnector.
    - Spot revenues are significantly lower under the constrained scenario (Scenario A). This is due to the limited capacity available in the interconnectors, restricting the ability for Tarraleah to generate when spot prices are high.

8.3.3 Capacity contract revenue

Capacity (cap) contract revenue refers to the revenue generated through the sale of contracts for the supply of a given capacity for a specified period between energy market participants, such as generators and retailers. These contracts provide a secure, steady stream of revenue for generators such as Hydro Tasmania. For retailers, they effectively act as an insurance policy during periods of high spot prices (due to high demand or low supply) by reducing their exposure to short-term price fluctuations in the spot market.

As a 'fast capacity responder', Hydro Tasmania can sell cap contracts into the Victorian market utilising the entire hydropower portfolio, using whichever station is opportunistic and only limited by the constraint of interconnection.

A "$300 cap" is the standard cap contract traded in the NEM between sellers (usually generators) and buyers (usually retailers). Retailers use these contracts to hedge against five-minute pool price outcomes over $300/MWh. Under these contracts, a fixed volume of energy is traded during a fixed period for a fixed price when the spot price exceeds $300/MWh (the "cap").

As shown in **Figure 41**, the total capacity value is the amount that retailers must pay to enter the cap contract. In return for this, generators must pay the retailer the settlement payment, calculated as the difference between the spot price and $300/MWh every time the spot price exceeds $300/MWh during the specified contract period. This amount must be paid to retailers regardless of whether generation occurs during these high price periods.

If the generator is dispatching during these high price periods, the spot market revenue received will offset (partially or fully) the settlement payment for that period. However, outside factors such as interconnector

[43] Spot market revenue under Option 1 (Decommissioning) is not included as no spot revenue is expected under this project option.[44] An option contract that gives the holder the right to enter into a swap contract, if they choose to do so.

constraints, can impact whether the generator can dispatch during these periods. Therefore, the settlement values captured in the spot market may be less than the settlement payments.

Net cap contract revenue is equivalent to the net outcomes across the cap contract and spot market. This is equivalent to the sum of the cap contract premium (net contract market revenue) paid by buyers as an insurance against high electricity prices and the settlement value captured.

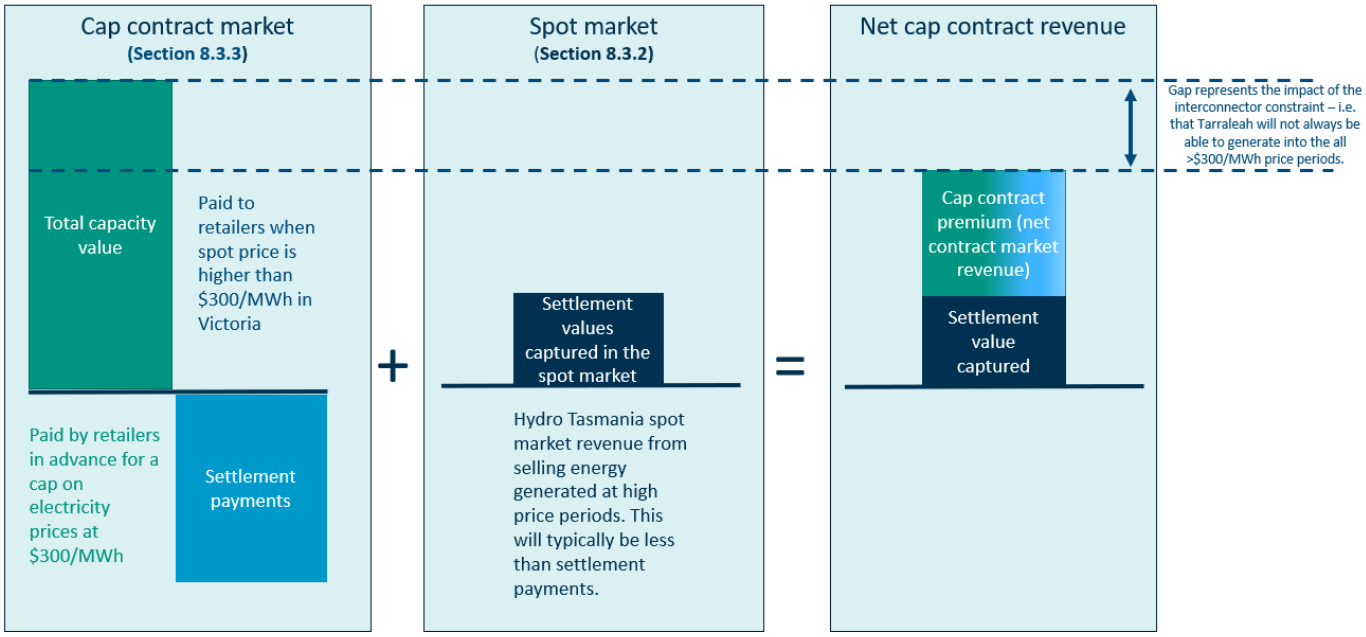


Figure 41: Calculation of net cap contract revenue

By increasing the capacity of the Tarraleah Power Station, Hydro Tasmania will be able to sell additional cap contracts, leading to higher contract revenue potential. The revenue from cap contracts provides stable and predictable revenue streams for Hydro Tasmania, which can help to offset the volatility of energy prices in the market. The cap contract volume increases with the maximum generating capacity, and therefore varies by option.

8.3.3.1 Cap contract projection methodology

The historical price at which cap contracts have been sold relative to the payouts (settlements values) associated with these contracts is shown in **Figure 42**. Historically, the price of cap contracts has been higher than the associated settlement value. This implies a premium paid by buyers to sellers of cap contracts. Events affecting the energy market impact the cap price that the market is willing to pay. For example, the closure of Hazelwood in 2017 (shown as point 'A') and the energy crisis in 2022 (shown as point 'B') significantly increased cap contract prices.

While the volume-weighted average annual capacity prices from 2010-2022 is $8.19/MWh

**** Exempt Information – in the form of an opinion- has been removed as being contrary to the public interest to disclose because it is an opinion prepared by a public officer and does not include nor relate to purely factual information (s 35 RTI Act) the public disclosure*** *of*

which would not ***contribute to a better public outcome (Item (b) Schedule 1 RTI Act).***

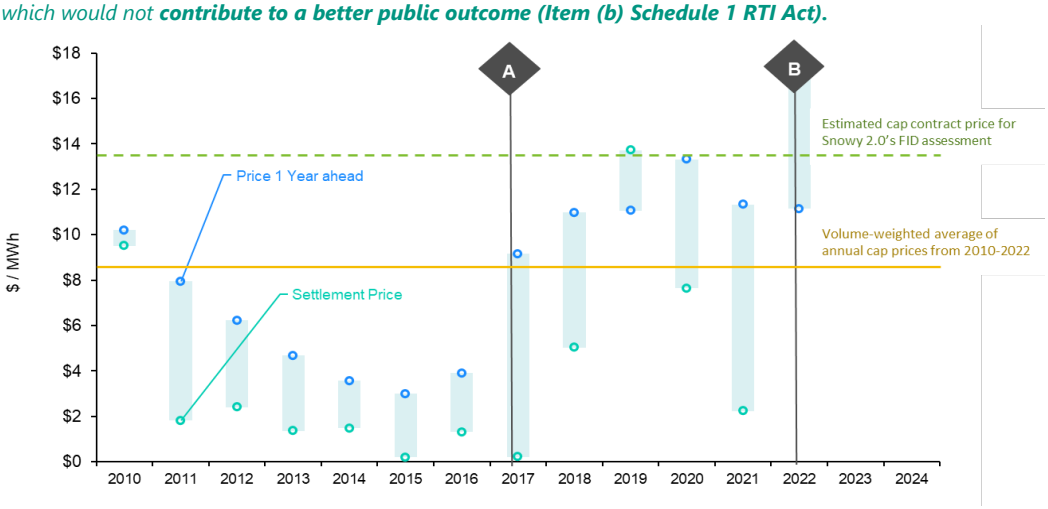


Figure 42: Contract risk premium in Victoria 2010 – 2022 (Hydro Tasmania analysis of historical ASX data and Snowy Hydro public documentation)

The cap contract value of (**Exempt Information*) is made up of two contract revenue streams: cap contract revenue premium value and settlement value. The premium associated with cap contracts has been forecast at (**Exempt Information)* (this is represented by the height of the left-hand column in) with the associated settlement value forecast to be (**Exempt Information*). The approach to estimating these cap contract revenue streams is as follows:

** Exempt Information- numerical/financial figures- have been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

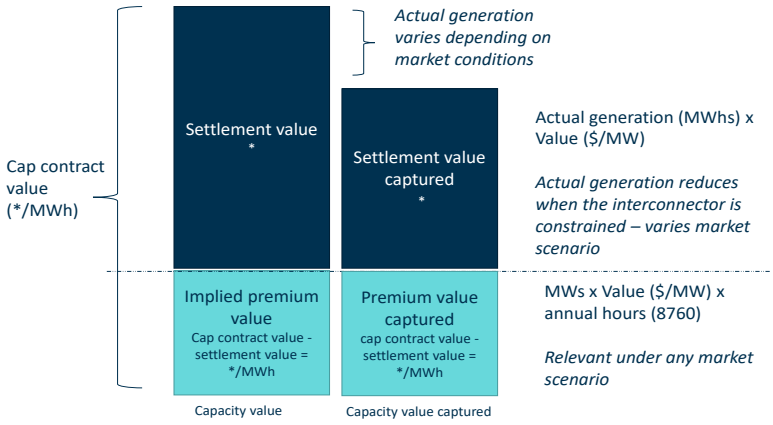


Figure 43 – Capacity contract overview ** Exempt Information – Figure 43 - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

- **Premium value.** The buyer of a cap contract pays a flat risk premium (the "premium value") to enter a cap contract with the seller. This is the contract revenue representing the risk premium value associated with a cap contract. It is calculated as the difference between the cap contract price and the estimated settlement price for cap contracts over 2010-2022.
- **Settlement value captured.** based on the forecast cap contract value minus the premium value assumption. This value is only realised as revenue if the Tarraleah scheme is generating during these settlement periods. Generation may be reduced when the Tasmanian electricity demand is being met and the interconnectors are at maximum capacity. This has been tested under Sensitivity A.

Table 17 outlines the methodology for the calculation of the contract revenue streams.

Table 17: Contract revenue overview and modelling method

Revenue Item	Description	Modelling method
Capacity value – premium (risk premium associated with a cap contract)	Contracting revenue representing the risk premium associated with a cap contract.	• Capacity value (premium) = historical risk premium in forward cap contracts above their historical actual pay out (settlement value) x option maximum capacity • Based on ASX futures VIC region volume weighted cap contract (forward) risk premium between 2010-2022 • Note: does not include pay out to cap buyers when spot price is >$300/MWh threshold (settlement value; discussed below) • Calculated as follows: MWs x premium value ($/MW) x annual hours (8,760).
Capacity value – settlement value captured	Contracting revenue representing the captured settlement value associated with a cap contract.	• Uses the forecast cap price minus the risk premium described above • Forecast cap price internal assumption informed by ASX futures VIC region volume weighted cap contract (forward) settlement values between 2010-2022 • Calculated as follows: incremental generation (MWhs) x settlement value ($/MW) (Note MWhs differs to the above due to ability to generate into cap prices) • This differs to the capacity value premium due to ability to generate above $300/MWh spot threshold (Note: inter-regional spot risk in providing this value stream).

8.3.3.2 Cap contract revenue results

** Exempt Information – financial / numerical values and Figure 44 - have been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1)*

(Figure 44 redacted) Cap contract revenue modelling results shows the modelling results for the two cap contract revenue components across Options 2 to 5 for each of the six market scenarios outlined in **Section 8.3.1**.

The modelled results indicate that:

- Option 5 (Redevelopment with Pressurised Conveyance) achieves the highest cap contract revenue of any project option under all six market scenarios.
- The only contract revenue that is impacted by the market scenario is the revenue from the settlement value, as this is linked to energy generation rather than capacity. Whilst generation is higher under Sensitivity B (unconstrained interconnector), the difference in revenue is marginal.

8.3.4 Asian call options contract revenue

Asian call options (also known as “average rate call options”) provide the option buyer with a pay-out if the average pool price during the option period, typically three months, exceeds the pre-determined option strike-price. The pay-out is equal to the extent (in $/MWh) that the average pool price exceeds the option strike price at the end of the period. In return for providing this market price protection for the buyer, the option seller is paid a premium in $/MWh, similar to the premium paid to an issuer of insurance. Typical buyers of Asian call options include NEM retailers, NEM generators (seeking outage cover) and proprietary traders.

These option contracts are more highly valued by buyers than vanilla swaptions[44] because they provide the buyer with the ability to hedge specifically against average prices throughout the pool period rather than needing to be exercised by the buyer in advance of the pool period. For the BotN contracting strategy and revenue evaluation, analysis of an Asian call option value three to six-months ahead of the option expiry period has been undertaken, similar to the analysis described above for cap contracts. This is an indicator of what the market expects to pay for energy three to six months before the market outcome and will typically include a premium for the certainty that the contract provides.

Asian call option contracts are an energy-focussed product (as opposed to a capacity-focussed product), meaning they provide contract cover up to the cap threshold of $300/MWh. They are therefore expected to include a larger number of settlement periods where generation cover is required. Asian options would not be sold against battery capacity (i.e. Option 3) as batteries would not be able to generate energy when required to back an Asian option.

8.3.4.1 Asian call option projection methodology

Table 18 outlines the methodology for the calculation of the contract revenue streams.

Table 18: Contract revenue overview and modelling method

Revenue premium	Description	Modelling method
Asian option premium	Contracting revenue represents the risk premium associated with an Asian contract.	• Option value is based on the difference between the average spot price over a quarter (average rate) vs. the strike price of a product • Option premium is the difference between the option contract price and the forecast settlement value. Settlement value is captured through the spot revenue line • Value has been forecast by calculating the option value two quarters before the start of the contract period • Inputs have been based on average market inputs • Calculated as follows: MWs x value ($/MW) x annual hours (8,760) (Note: settlement value assumed to be captured in spot revenue modelling) • Note: for Option 3 (Refurbishment with BESS), Asian option revenue is modelled using only the capacity of the portion of the asset that would be providing energy (i.e. the hydro generator capacity of 103 MW) as Asian options would not be sold against the battery capacity.
Asian option settlement value	Represents the captured settlement value associated with Asian option contract.	• Settlement values are already included in spot revenue forecast and are not separately calculated.

8.3.4.2 Asian options contract revenue results

Figure 45 shows the modelling results for the Asian options revenue stream across Options 2 to 5. Asian option revenue does not vary across the six market scenarios outlined in Section 8.3.1, therefore no breakdown of revenue by market

[44] An option contract that gives the holder the right to enter into a swap contract, if they choose to do so.

scenario is shown. Figure 43: Asian option contract revenue results

** Exempt Information – Figure 45 - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

The modelled results indicate that:

- Option 5 (Redevelopment with Pressurised Conveyance) achieves the highest Asian option revenue of any project option under all six market scenarios. As the scheme's capacity nearly doubles between the Minimum Refurbishment and Option 5, the revenue from the Asian option premium also nearly doubles.
- Asian option revenue is a significant differentiator between each option's contract revenue.

8.3.5 REGO revenue

The Australian Government's Department of Climate Change, Energy, Environment and Water (DCCEEW) has proposed a REGO certificate mechanism that would incentivise renewable electricity investment and procurement, and support Australia's transformation to a net zero emissions energy system. While the exact policy details have not yet been announced, the proposed mechanism would build on the large-scale generation certificate (LGC) framework currently in place under the Renewable Energy Target (RET) scheme. One LGC is currently created for each MWh of electricity generated by a power station from renewable sources. [45]

It is expected that REGOs would initially exist alongside LGCs but would continue beyond 2030 when the RET ends. REGOs are proposed to be created for all renewable generation, including electricity exported overseas, electricity generated by small-scale solar photovoltaic and renewable electricity dispatched from storage facilities.

8.3.5.1 REGO revenue methodology

Hydro Tasmania will generate revenue from the sale of these certificates. Although the exact value of these REGOs is not yet known, research undertaken by an external consultancy[46] of comparable international schemes indicated that a certificate price of approximately *(*Exempt Information*) is likely. As a conservative estimate, half of this price (*Exempt Information)* has been assumed for modelling purposes

* *Exempt Information – financial / numerical values – have been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

Table 19 outlines the methodology for the calculation of REGO revenue stream**.**

Table 19: REGO revenue overview and modelling methodology

[45] For stations commissioned pre-1997, one LGC is created for each MWh of generation above a baseline calculated on average generation over 1997-1999.

[47] Option 1 (Decommissioning) is not included in the figure as no revenue is expected under this project option.[48] Given that the Tarraleah scheme is heavily integrated with the broader Derwent hydro scheme, its output is not contracted separately to the broader portfolio. It is possible however, to contract an equivalent volume of energy equal to Tarraleah output and complementary to the generation profile that Tarraleah is expected to play in the portfolio.

Revenue premium	Description	Modelling methodology
REGO certificate – contracting value associated with the sale of certificates	• Contracting value associated with the sale of REGOs • The policy has been announced but not yet implemented. As such, the value attributable to the REGO certificates is not known.	• Incremental Hydro Tasmania portfolio generation MWh x certificate price $/MWh (calculated on the same basis as spot value) • The value is based on the incremental Hydro Tasmania portfolio generation • The certificate price of (**Exempt Information*) is based on external consultancy research of comparable international schemes multiplied by 50% for conservativeness* *Exempt Information – financial/numerical value - has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

8.3.5.2 REGO revenue results

REGO revenue modelling results (redacted Figure 46) shows the REGO revenue results across Options 2 to 5 for each of the six market scenarios outlined in Section 8.3.2.1[47]**Exempt Information – financial/numerical information including Figure 46 has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

The modelled REGO revenue results indicate that:

- The options that offer the most flexibility and storage capacity (Options 4 and 5) result in the greatest increase in REGO revenue.
- Option 5 (Redevelopment with Pressurised Conveyance) achieves the highest revenue from REGOs out of any project option under all six market scenarios.
- The extent to which the interconnector is constrained (tested under Sensitivities A and B) has a significant impact on REGO revenue across all project options. At a portfolio level, all project options have a higher REGO revenue when the interconnector is unconstrained (Scenario B), and Hydro Tasmania can export energy across the interconnectors.

8.3.8 Total revenue

Total revenue captures all four revenue streams: spot market revenue, capacity contract revenue, Asian option contract revenue and REGO revenue. The total revenue results for Options 2 to 5 under each of the six market scenarios are shown in **Figure 47.**

Figure 44 Total revenue by project option and market scenario

** Exempt Information including Figure 47 has been removed from this document :- the public disclosure of which would not be in the public interest*

[47] Option 1 (Decommissioning) is not included in the figure as no revenue is expected under this project option.[48]

[48] Given that the Tarraleah scheme is heavily integrated with the broader Derwent hydro scheme, its output is not contracted separately to the broader portfolio. It is possible however, to contract an equivalent volume of energy equal to Tarraleah output and complementary to the generation profile that Tarraleah is expected to play in the portfolio.

(s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).

The distribution of total revenue across the four revenue streams varies by option and market scenario. **Figure 48** provides an example breakdown of total revenue by revenue stream for market scenario 1B (Reference Case with unconstrained interconnector) for Options 2 to 5.

Figure 45 Breakdown of total revenue by revenue stream for Options 2 to 5 under market scenario 1B
** Exempt Information including Figure 48 has been removed from this document:- because the information is based on a speculative statement of belief for internal deliberative purposes only and does not include purely factual information (s 35 of the RTI Act) and (applying the public interest test) publication of that* speculative opinion would not assist public debate and not be in the public interest (Item (b) Schedule 1 RTI Act).

8.3.6 Future considerations for capacity contracting

The capacity contract revenue included in the revenue model is an indicative estimate.

Further work will be undertaken as part of the final business case to establish a contracting strategy for the Tarraleah scheme.[48]

The contracting strategy will principally be governed by balancing the risk appetite of the business with project revenue opportunities and will be aligned with the broader portfolio strategy. This broader contracting strategy includes the following two components:

- a total revenue of underlying energy value (as determined by the market settlement outcomes)
- a capacity contract premium.

There are several options for capacity contracting that could be considered for the Tarraleah redevelopment. Each option has its own advantages and risks, and the choice of which option to pursue will depend on a variety of factors, including market conditions, regulatory requirements, and the specific goals of Hydro Tasmania. Some possible options are listed in **Table 20.**

Table 20: Potential options for capacity contracting

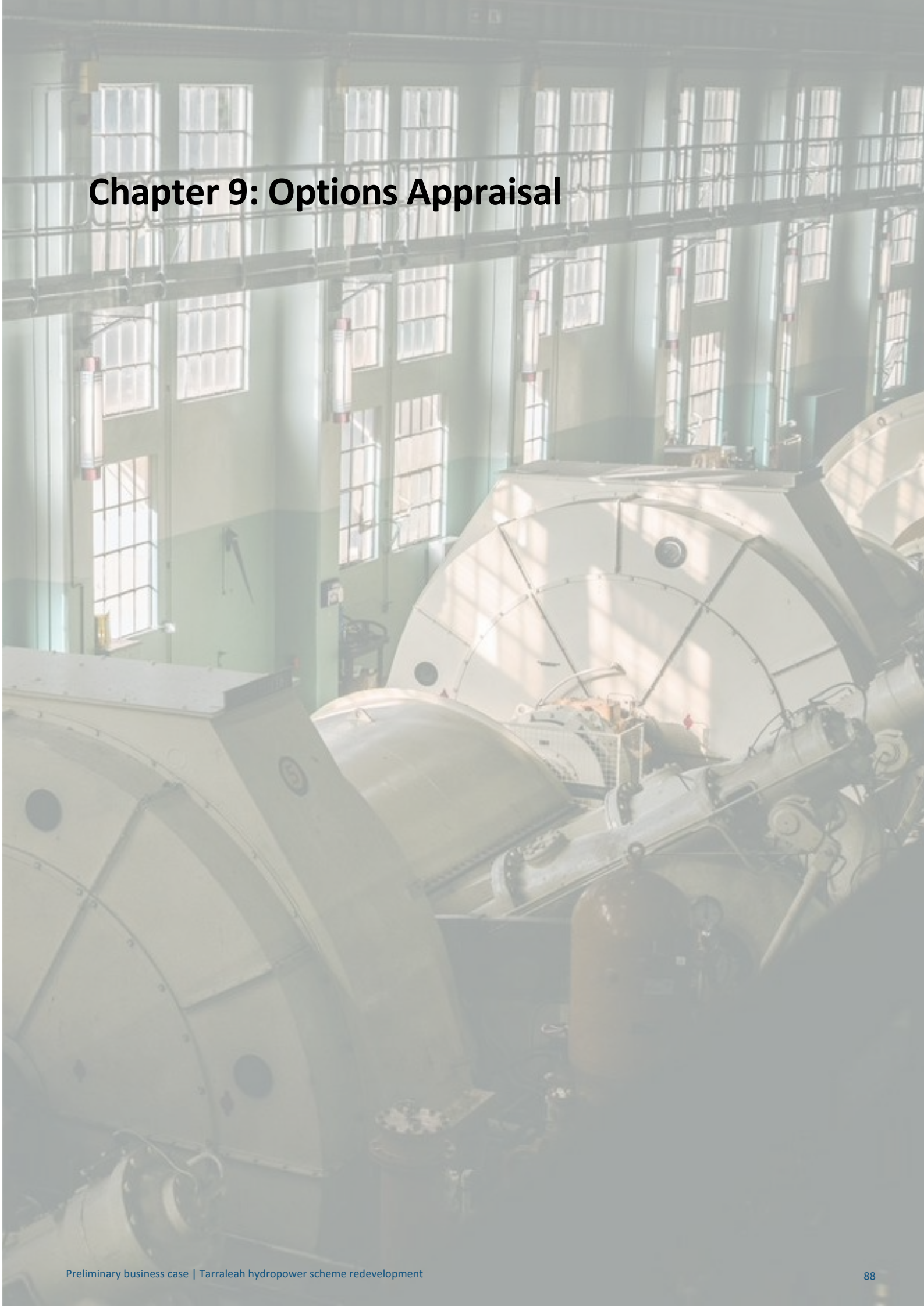
Contract type	Description	Advantages	Disadvantages
Bilateral contracts	Bilateral contracts are agreements between two parties, to provide a specific amount of capacity at a predetermined price.	• Provide a stable and predictable revenue stream for the generator. • Guaranteed source of capacity for the customer at a known price.	• Take some time to negotiate and typically include an extended tenure at predetermined price, which can create a 'winner and loser' situation.
Momentum Energy	There is an option is to sell capacity to Momentum Energy, to ensure renewable, dispatchable capacity to its customers.	• Reduced complexity and transaction costs associated with other capacity contracting options. • Reduces the risk of counterparty default.	• Price is reset each year so this doesn't provide revenue certainty for longer than 12 months.

[48] Given that the Tarraleah scheme is heavily integrated with the broader Derwent hydro scheme, its output is not contracted separately to the broader portfolio. It is possible however, to contract an equivalent volume of energy equal to Tarraleah output and complementary to the generation profile that Tarraleah is expected to play in the portfolio.

Contract type	Description	Advantages	Disadvantages
		• Provides avenue to market for capacity volume.	
Capacity auctions	Capacity auctions are a competitive process where generators bid to provide a certain amount of capacity to the market.	• Ability to sell large volume through one process.	• Can be complex to set up and manage and may not provide a stable and predictable revenue stream.
Capacity markets	Capacity markets are markets where generators can offer capacity to the market and buyers can purchase that capacity to ensure they have enough energy to meet their needs.	• Provide a transparent and efficient mechanism for buying and selling capacity.	• Capacity markets can be complex to set up and manage • May not always result in the most efficient allocation of resources.
Firming products	Capacity contracts are now starting to transact in non-traditional forms, particularly as firming products, such as a 'heads and tails' firming product structure, whereby Hydro Tasmania purchases the energy output at a lower percentile of prices and provides energy output at a higher percentile of prices.	• The purchased energy services the Tasmanian and Momentum Energy demand and secures a higher value for Hydro Tasmania's dispatchable capacity.	• Can be complicated and timely to negotiate.

There is also likely to be value in the market for deep storage capacity that is not currently understood, as this need is currently serviced by the thermal fleet of baseload generators. As these thermal generators are retired, the variability of new generation is expected to create a time-based risk for storage. The longer the weather drought, the higher the market risk of having adequate storage to meet the market need. For the final business case, further opportunities will be investigated to value this.

Chapter 9: Options Appraisal



9.1 Chapter overview

Purpose

The chapter outlines:

- the appraisal methodology used to assess the different project options for the Tarraleah hydropower scheme identified in **Chapter 7** (**Section 9.2**)
- the results of the preliminary screening (**Section 9.3**), commercial impact assessment (**Section 9.4**), multi-criteria analysis (**Section 9.5**) and relative risk comparison (**Section 9.6**)
- the recommended project option (**Section 9.7**).

Key points

- An integrated approach to the options appraisal has been adopted including the following assessments:

1. **Preliminary screening**
   - This assessment involves considering options against three non-negotiable criteria, which is passed by all project options but failed by the Status Quo.
   - The Status Quo does not replace the ageing canals, and therefore does not address their risk of failure nor mitigate the risk of an environmental incident in the adjacent TWWHA. As the Status Quo Does not pass the preliminary screening, it is not considered further (in the commercial impact assessment, MCA or relative risk comparison)
2. **Commercial impact assessment**
   - This assessment involves evaluating project options based on a series of commercial metrics including internal rate of return (IRR), Revenue per energy generated (Revenue/MWh), net present value (NPV), incremental NPV relative to the Minimum Refurbishment option (Option 2), and cost effectiveness ($/MWh).
   - The financial assessment supports increasing flexibility and generating capacity at Tarraleah. Option 5 (Redevelopment with Pressurised Conveyance) is the preferred option as it generates the highest revenue particularly in the unconstrained market scenarios. This results in achieving the highest NPV and IRR. In addition, Option 5 has the smallest spread in IRR results across the market scenarios tested relative to the other project options.
3. **Multi-criteria analysis**
   - This analysis involves assessing the performance of project options against various qualitative criteria.
   - Based on the MCA rankings (weighted and unweighted), Option 5 (Redevelopment with Pressurised Conveyance) delivers the greatest benefit and is the highest ranked option. The least preferred option is Option 1 (Decommissioning).
4. **Relative risk comparison**
   - This analysis considers the relative risk posed by each project option based on a series of risk categories. The results indicate that risk is not a key differentiator between options.
   - While all project options present a higher project risk compared to the Status Quo, Option 4 (Redevelopment with Headponds) presents the highest risk of any project option.
5. **Preferred option**
   - Based on the integrated options assessment, Option 5 (Redevelopment with Pressurised Conveyance) is the preferred option. It is recommended that this option is progressed in the final business case and. ultimatelv. towards FID.

9.2 Appraisal methodology

An integrated approach to the options appraisal has been adopted (see **Figure 49**).

The assessment includes a first round of preliminary screening of the Status Quo and the five project options identified in **Chapter 5** against three non-negotiable criteria. Project options that pass this preliminary screening are then assessed and ranked based on an integrated assessment that enables decision makers to consider multiple impacts in parallel. This integrated assessment considers:

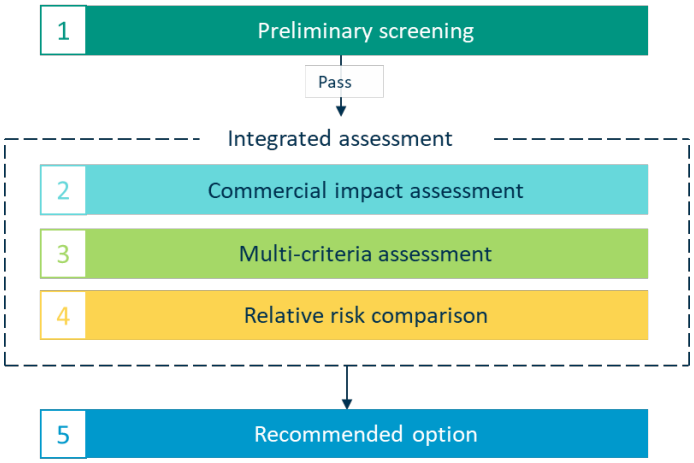


Figure 46: Overview of the integrated assessment process

- A commercial impact assessment. This includes metrics that measure value for money using several metrics.
- Performance against various qualitative criteria using an MCA framework. This includes assessment and scoring of financial and non-financial impacts to provide a value comparison of the options. Given that value considers both costs and benefits, there is intentional overlap between the commercial impact assessment and the qualitative assessments.
- Relative risk comparison. This provides and assessment of the relative project risks posed by each of the options.

Based on the combined results, a preferred option will be recommended to progress to a final business case.

9.3 Preliminary screening

9.3.1 Approach

Preliminary screening of options includes an assessment against three key 'hurdle' criteria which are considered non-negotiable. These include:

- **Technical viability** – it is essential that project options adopt available and proven technology that has been market tested. This hurdle criterion is required to test that all options being considered are feasible to implement and present an acceptable level of delivery risk.
- **Compliance** – any solution considered must maintain legal, regulatory and contractual compliance, including compliance with workplace health and safety regulations. For example, options that do not support the preservation of existing heritage sites would not be permitted.
- **Mitigates risk of an environmental incident** – only options that mitigate the risk of an environmental incident due to failure of the conveyance(s) are to be considered. Hydro Tasmania does not believe it is prudent to operate in the longer term carrying the current high risk associated with a major failure of the conveyance into the River Derwent.

9.3.2 Results

Other than the Status Quo, all options pass (✓) the preliminary screening (refer to **Table 21**). The Status Quo does not replace the ageing canals, and therefore their risk of failure, and impact on the adjacent TWWHA, is unmitigated. The Status Quo is included in the analysis for comparison purposes only.

Table 21: Preliminary screening results

Test	Status Quo	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Technical viability	✓	✓	✓	✓	✓	✓
Compliance	✓	✓	✓	✓	✓	✓
Mitigates risk of an environmental incident	×	✓	✓	✓	✓	✓

9.4 Commercial impact assessment

The commercial impact of the five project options is assessed for each of the marker scenarios discussed in **Chapter 8** using the following key metrics:

- **IRR** – refers to the discount rate that makes NPV cash flows equal to zero in a discounted cash flow analysis.
- **Revenue/MWh –** this measures revenue per energy generated ($/MWh)
- **NPV** – this assesses value for money based on the discounted revenue stream less the discounted costs over the assessment period. A positive NPV implies that the revenue stream exceeds the costs, and the proposed works are commercially viable. An incremental NPV has also been considered relative to the 'Minimum Refurbishment' option (Option 2). This provides the additional value for money that can be achieved from the additional flexibility offered by Options 3, 4 and 5.
- **Cost effectiveness** – measures the capital cost (discounted) per energy generated ($/MWh). This does not factor in the benefits from the varying flexibility offered by the different options.

9.4.1 Approach

Robust cost estimation and revenue modelling was undertaken to inform these metrics using a range of simulation software and other modelling techniques (outlined in Chapter 8). The estimated costs and revenue will then feed into the financial model specifically designed and developed for the measurement of financial viability of each project option to generate the above financial metrics. The approach is summarised in **Figure 50.**

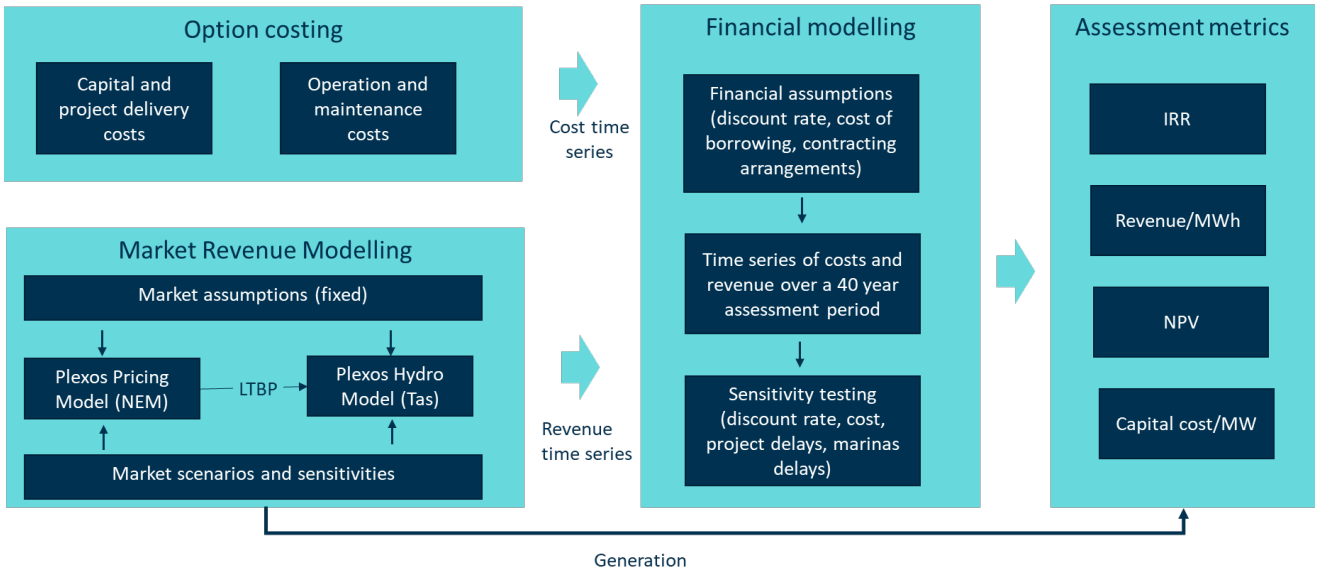


Figure 47: Financial viability modelling overview

The analysis is based on pre-financing cashflows.

Work is currently being undertaken to explore the impacts of different financing options. The analysis, along with a recommended option, will be included in the final business case.

Key assumptions are summarised in **Table 22**.

Table 22: Key underlying assumptions of the net cash flow

Assumptions	Descriptions
Assessment period	The assessment period is from January 2023 to 2069 on a quarterly basis. It is assumed that the refurbishment / redevelopment period is 2023 – 2028, while the operating period is between financial year 2029 – 2069.
Asset life	The asset life is assumed to be 40 years.
Dollar terms	Nominal dollar terms are used throughout. Capital costs, operating costs and revenue input were provided in 2023 dollar terms.
Discount rate	Hydro Tasmania's nominal post tax WACC of*** ** Exempt Information – numerical percentage - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).* [49].
Escalation factor	An escalation factor of 2.5% per annum, escalated on quarterly basis, is used for capital costs, operating costs, and revenue. This reflects the RBA's long-term CPI and

[49] Hydro Tasmania is currently updating its corporate WACC.

Assumptions	Descriptions
	is the escalation factor adopted by Hydro Tasmania for all its projects. This assumption will be reviewed and refined for the final business case.
Tax rate	A corporate tax rate of 30% is used.
Others	Full operation is assumed to commence once the refurbishment or redevelopment work is completed. There is no degradation assumed during the operation period.

9.4.2 Results

The financial results focus on the relative performance of Options 1 to 5, given that the Status Quo did not pass the preliminary screening and the results are only included for comparison purposes.

The financial assessments results demonstrate that Option 5 (Redevelopment with Pressurised Conveyance) has the highest IRR relative to the other project options. Option 5 also has the highest revenue and NPV relative to other project options that maintain operations at Tarraleah.

While Option 1 (Decommissioning) has a higher NPV than the other project options, this a reflection of its lower capital cost.

These financial results reflect that there is value in increasing capacity and flexibility at Tarraleah (rather than a Minimum Refurbishment option). More detail on financial analysis outcomes is provided in the following sections.

9.4.2.1 IRR

The IRR outcomes for each option based on varying market scenarios modelled (**Figure 51**) indicate that:

- the 'high IRRs' for all options are above the WACC of**** ** Exempt Information – numerical percentage - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*[50] both refurbishment options (Options 2 and 3) have 'low IRRs' close to zero, making these options a riskier investment.
- both redevelopment options (Options 4 and 5) have a smaller spread in IRR values than the other options.
- Option 5 has the highest 'high IRR' and the highest 'low IRR'. Option 5 therefore presents the lowest investment risk of any project option.

Options 3, 4 and 5 are expected to attract preferential funding from the Clean Energy Finance Corporation (CEFC) which may reduce the WACC for these options to (*Exempt Information) [51]. The 'high IRR' of these project options is significantly higher than this CEFC Funding Adj. WACC of *** ** Exempt Information – numerical percentage has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or*

[50] Weighted average cost of capital (WACC) represents Hydro Tasmania's average after-tax cost of capital from all sources, including debt and equity.

[51] This assumes accessing debt at a lower cost () via CEFC, as well as a higher debt gearing of 80% facilitated by this CEFC facility

procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).

Figure 48: **Project IRR spread for each project option across market scenarios**[52]

** Exempt Information – Figure 51 - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

9.4.2.2 Revenue per energy generated ($/MWh)

Revenue per energy generated ($/MWh) is a measure of commercial performance.

Option 5 (Redevelopment with Pressurised Conveyance) delivers the highest revenue per MWh generated in all of the unconstrained interconnector market scenarios other than Scenario 3A (Renewable Overbuild with constrained interconnector). Consistent with the revenue modelling results in **Chapter 8,** the market scenarios with an unconstrained interconnector (Sensitivity A) have the highest revenue per MWh.

A comparison of revenue per MWh for each project option is presented in **Figure 52.**

Figure 49: **Average revenue per MWh ($/MWh) by project option and market scenario**[53]

** Exempt Information – Figure 52 - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

9.4.2.3 NPV

All projects will commence full-scale operation at the start of financial year 2028-2029. With the new station operational by the end of calendar year 2028 and the revenue step change being generated from financial year 2028-2029 onwards.

The financial NPV results for each project option (**Figure 53**) indicate:

- Option 5 (Redevelopment with Pressurised Conveyance) has the highest NPV relative to other project options that maintain operations at Tarraleah. Options 3, 4 and 5 may attract preferential funding from the CEFC which may further improve the NPVs for these project options.
- Option 1 (Decommissioning) has a higher NPV than the other project options in some market scenarios, however this is a reflection of its lower capital cost.
- Option 3 has the lowest NPV across all market scenarios.

Figure 50: Summary of the financial NPV for each project option

** Exempt Information- Figure 53 - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33*

[52] Option 1 (Decommissioning) is not presented as no revenue is expected under this project option. [53] Option 1 (Decommissioning) is not presented as no revenue is expected under this project option. **Figure 40** includes aggregated revenue from all five revenue streams outlined in **Section 8.3.**[54] The other main environmental impact which is protection of the adjacent TWWHA is already captured in the screening criteria, meaning that only options that effectively mitigate this risk are considered.

[53] Option 1 (Decommissioning) is not presented as no revenue is expected under this project option. **Figure 40** includes aggregated revenue from all five revenue streams outlined in **Section 8.3.**[54] The other main environmental impact which is protection of the adjacent TWWHA is already captured in the screening criteria, meaning that only options that effectively mitigate this risk are considered.

RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).

The incremental value created by each project option compared with Option 2 (Minimum Refurbishment) is shown in **Figure 54.**

Option 5 (Redevelopment with Pressurised Conveyance) has a positive incremental NPV under all market scenarios, indicating that it consistently delivers better commercial outcomes than the Minimum Refurbishment option (Option 2). Option 5 also consistently generates a higher incremental NPV than the other redevelopment options under all market scenarios tested. Option 3 (Refurbishment with BESS) consistently has a lower NPV than the other options.

Figure 51: Incremental NPV to Option 2 (Minimum Refurbishment).

** Exempt Information – Figure 54 - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

9.4.2.4 Cost effectiveness

Capital cost per energy generation ($/MWh) is a measure of cost effectiveness. Options with a lower $/MWh are more cost effective than options with a higher $/MWh.

The results in **Figure 55** demonstrate that Option 5 (Redevelopment with Pressurised Conveyance) has the lowest cost per MWh of any project option.

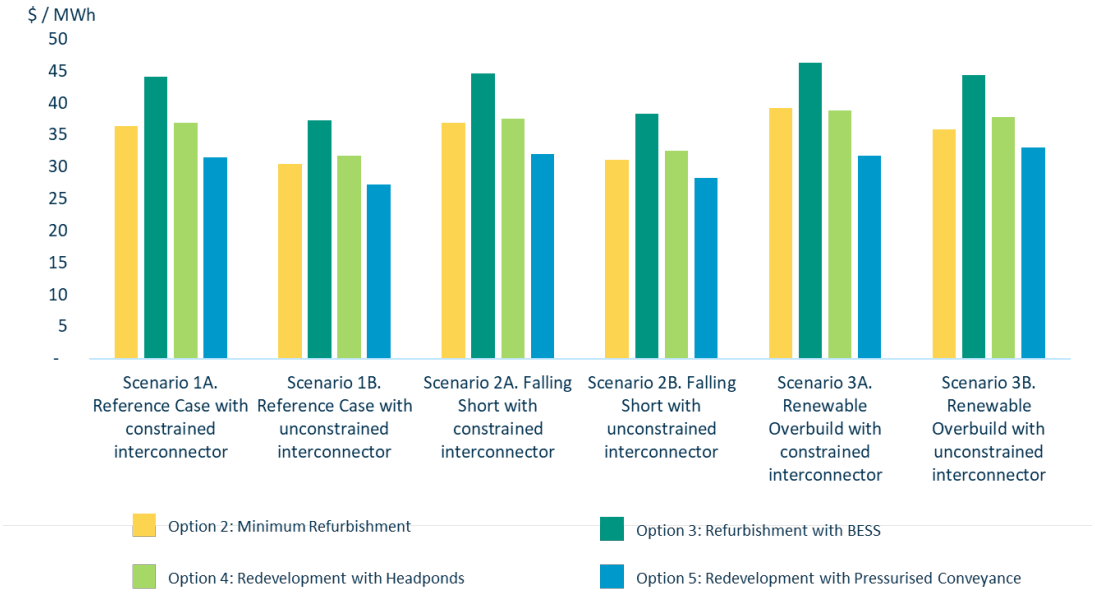


Figure 52: Cost effectiveness (average capital cost per MWh) by project option and market scenario

Sensitivity analysis

The impact on the project IRR of each project option across all market scenarios was considered under the following two sensitivities:

- a delay of the delivery of Tarraleah by 12 months
- capital costs overrun for the project of 20%.

The results of this sensitivity analysis are presented in **Table 23.** The results indicate that an increase in capital expenditure has a more significant impact on IRR than a project delay.

The final business case will include more sensitivity testing including consideration of impact if Marinus Link does not proceed as planned.

Table 23: Sensitivity analysis results

	Tarraleah 12-month delay	Capital cost overrun of 20%
Impact on IRR	The impact of IRR on each project option reducing between 0.1% and 0.5%, depending on market scenarios.	The impact of IRR on each project option reducing between 0.7% and 1.2%, depending on market scenarios.

Multi-criteria analysis

9.4.3 Approach

To complement the financial analysis, a wider comparative analysis of the project options was conducted against several evaluation criteria as outlined in **Table 24**. These criteria reflect the impacts (negative and positive) that relate to the project drivers and that most materially differentiate the options.

The key themes for the assessment include:

- **Commercial performance** – whole-of-life NPV (revenue less costs) of the options over a 40-year assessment period.
- **Policy and strategic alignment** – extent of alignment with, and contribution to, Hydro Tasmania's strategic direction and relevant Tasmanian and Australian Government policy and objectives.
- **Environmental benefits** – extent to which the downstream environment (impacted by flow releases) is protected.[54]
- **Social impacts** – Social impacts on key stakeholder groups (local communities and Aboriginal peoples).
- **Market opportunity** – impact on security of Tasmanian supply and ability to flexibility respond to future energy market conditions.

Weightings have been assigned to each criterion, reflective of the relative importance to Hydro Tasmania decision making. The criteria and weightings are summarised in **Table 24**.

Table 24: MCA evaluation criteria and assigned weightings

Evaluation criterion	Weighting	Description
Commercial performance (30%)		
NPV	15%	• Improves NPV, consistent with outcomes from **Section 9.4**.

[54] The other main environmental impact which is protection of the adjacent TWWHA is already captured in the screening criteria, meaning that only options that effectively mitigate this risk are considered.

Evaluation criterion	Weighting	Description
Operational flexibility	15%	• Ability to adapt to changing revenue streams now and in the future with flexibility to generate in periods with higher prices (a description of the scheme's current inflexibility is provided in **Section 5.2.2).**
Policy and strategic alignment (30%)		
Alignment with government strategy	15%	• Aligns with State policy, Australian Government commitments (as outlined in **Section 4.2**). • Aligns with / optimises outcomes from investment decisions (e.g. Marinus Link).
Alignment with Hydro Tasmania strategic direction	15%	• Aligns with the strategic direction as outlined in **Section 4.4**.
Environmental benefits (10%)		
Impact on environmental flows to the River Derwent	10%	• Improves or maintains the flows required in the River Derwent to protect its environmental value.
Social impacts (20%)		
Impact on downstream cultural and social values	10%	• Enhances social and cultural values via increased flows in the River Derwent
Community perceptions	10%	• Real and perceived impact on Tasmanian communities.
Market opportunity (10%)		
Tasmanian supply	5%	• Maintains or enhances Hydro Tasmania's productive capacity the ability to manage the Tasmanian supply and demand dynamics.
NEM security of supply	5%	• Supports security of supply across the NEM through increased flexibility.

The above criteria and subsequent scoring were discussed and agreed to in a workshop with the Hydro Tasmania project management team and subject matter specialists. The selected criteria reflect the project costs as well as the breadth of benefits that the project aims to deliver (discussed in **Chapter 6**). **Figure 56** demonstrates this alignment.

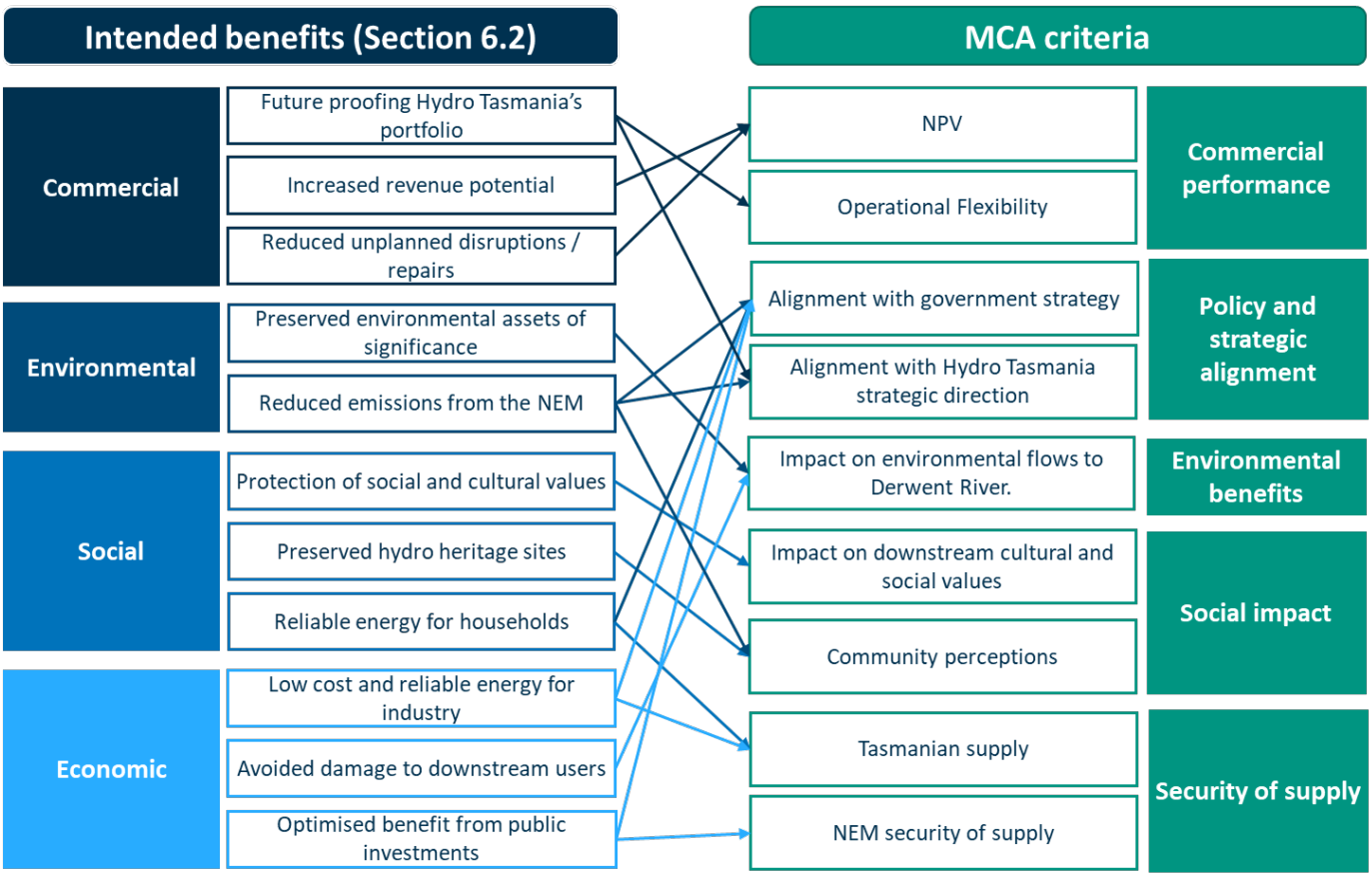


Figure 53: Relationship between assessment criteria and intended benefits from the scheme

The weightings associated with each criterion were developed with consideration given to Hydro Tasmania's ongoing strategic direction and commitment to work closely with customers, clients, stakeholders, communities, and its people to deliver sustainable value. Key considerations include the following:

- The commercial performance and policy and strategic alignment criteria were given the equally highest weightings (30%). This focus on commercial performance reflects the need to ensure the business is profitable and provides sustainable returns to government[55].
- The weighting given to policy and strategic alignment reflects the focus on ensuring the project aligns with the broader strategic goals of key stakeholders (including the Tasmanian Government).
- Managing impacts on the community and the environment are embedded into Hydro Tasmania's decision processes and is reflected in the weighting assigned to social impacts (20%) and environmental benefits (10%).
- The strategy to peruse opportunities that leverage the unique qualities of hydropower (being both renewable and dispatchable) to help manage the transition across the NEM towards VREs is reflected in the security of supply criteria (10%).

[55] It is noted that the financial performance is also captured separately in the financial viability element to the integrated assessment.

The Status Quo is not considered in the MCA as it did not pass the preliminary screening. However, it is used as a baseline to which all other options are compared against. Each project option's performance relative to the Status Quo was assessed against each criterion using the following rating scale:

	7	Significantly supports the achievement of the criterion
	6	Moderately supports the achievement of the criterion
	5	Somewhat supports the achievement of the criterion
	4	No change to the Status Quo
	3	Somewhat opposes the achievement of the criterion
	2	Moderately opposes the achievement of the criterion
	1	Significantly opposes the achievement of the criterion

9.4.4 Results

In assessing the options, regard was given to the vision and objectives of Hydro Tasmania, various government objectives, and relevant technical reports, stakeholder views and policies, targets and legislative requirements.

Based on the MCA rankings (weighted and unweighted), Option 5 (Redevelopment with Pressurised Conveyance) delivers the greatest benefit and is the highest ranked option.

The least preferred option is Option 1 (Decommissioning). A high-level assessment of each project option against the criteria is outlined in **Table 26** with a more detailed explanation of the relative scoring and outcomes provided in **Appendix E.**

(note: Appendix E as Exempt information has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).

The average rating scores for each option is the average of the scores for all criteria within it. For example, a score of 2.7 for Option 1 (Decommissioning) represents the average of the scores for each criterion. The weighted average for Option 1 (Decommissioning) is 2.5, representing the scores for each criterion multiplied by the weightings as set out in **Table 24**.

Table 25: High-level assessment of project options

Evaluation criterion	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Commercial performance					
NPV	2.0	2.0	1.0	2.0	3.0
Operational flexibility	1.0	5.0	6.0	6.0	7.0
Policy and strategic alignment					
Government strategy	2.0	4.0	5.0	7.0	7.0
Hydro Tasmania strategic direction	1.0	5.0	5.0	6.0	7.0
Environmental benefits					
Environmental flows to the River Derwent	7.0	4.0	4.0	4.0	4.0

Evaluation criterion	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Social impact					
Downstream cultural and social values	4.0	4.0	4.0	4.0	4.0
Community perceptions	2.0	7.0	5.0	6.0	6.0
Market opportunity					
Tasmanian supply	2.0	5.0	5.0	6.0	7.0
NEM security of supply	3.0	5.0	5.0	6.0	7.0
Total					
Average rating (unweighted)	2.7	4.6	4.4	5.2	5.8
Weighted average	2.5	4.4	4.4	5.2	5.7

Key outcomes

Option 5 (Redevelopment with Pressurised Conveyance) has the highest rating

Option 5 (Redevelopment with Pressurised Conveyance) has the highest average rating on both a weighted and unweighted basis, with Option 4 (Redevelopment with Headponds) having a marginally lower score. Option 1 (Decommissioning) is the only option that has a score that is below 4, meaning that is does not deliver improvements relative to the Status Quo.

Based on the results, the rating of each option is strongly influenced by storage duration and operational flexibility which improve commercial agility, align most strongly with Hydro Tasmania's strategic direction and the ability to support security of supply in the transitioning NEM.

Deep storage capacity, such as provided by Options 4 and 5, provides firming capacity that is needed to support the uptake of renewable energy required in the NEM. This supports decarbonisation objectives in Australian Government policies (such as Net Zero by 2050 and Rewiring the Nation), and state policies aimed at increasing the uptake of renewable energy (such as TRET).

Option 4 (Redevelopment with Headponds) consistently outperforms Option 3 (Refurbishment with BESS)

Option 3 (Refurbishment with BESS) was included as a comparison to deep storage (i.e. Option 4). The results indicate that Option 4 scores higher than Option 3 against most of the criteria (and scores equally in the remaining two criteria). This reflects the additional benefit gained from the longer storage duration in Option 4 (20 hours compared to two hours), particularly in providing interday energy balancing.

Option 1 (Decommissioning) is the least preferred option

Option 1 (Decommissioning) has the lowest score against most criteria, including commercial performance, policy and strategic alignment, and market opportunity. This is because the reduced capacity will negatively impact security of supply, lower revenue potential and make it more difficult to achieve renewable energy targets. In addition, there is a potential negative impact to Hydro Tasmania's reputation resulting from what may be deemed unnecessary upgrade works.

Decommissioning performs favourably relative to other options against the environmental benefits criterion as it would return more flows to the River Derwent.

Option 2 (Minimum Refurbishment) delivers some improvement relative to the Status Quo

Option 2 (Minimum Refurbishment) delivers some improvements to the s Status Quo (i.e. a score of 4 and higher) across all criteria due to the increased scheme flexibility (from automation) and reliability that this option offers. This option is also likely to have the greatest positive impact on the local community as it addresses the risks associated with asset failure while allowing continued operations for the lowest cost of any option. Options with increased storage capacity (Options 3, 4 and 5) all have a higher total score than Option 2 due to the reasons discussed above.

Weighted scores do not impact the ranking of options

Introducing weightings slightly reduces the overall score of all project options but does not have any impact on the relative ranking. This is because the ranking of options against most criteria is relatively consistent. The key difference is for the environmental criterion, where Option 1 (Decommissioning) has the highest score. Given that the environmental criterion has a low weighting, this does not impact the overall ranking of options.

Option 5 consistently outperforms Option 4

Option 5 (Redevelopment with Pressurised Conveyance) has the highest average rating on both a weighted and unweighted basis. This option scores equal to, or higher than, Option 4 (Redevelopment with Headponds) across all criteria due to its increased operational flexibility which results in a higher NPV and a greater contribution to security of supply.

9.5 Relative risk comparison of project options

9.5.1 Approach

A comparative analysis of the relative project risks was conducted against several evaluation criteria as outlined in **Table 26.** These criteria reflect the potential risks (negative and positive) relating to the project drivers that most materially differentiate the options. This is not intended to be a risk assessment or an assessment against risk appetite. Only the relative risk between the options is considered, with a risk assessment for the preferred option provided in **Chapter 10.**

The key themes for the assessment include:

- **Deliverability** – On time asset completion to required standard
- **Approvals** – Necessary approvals can be obtained on time
- **Cost risk** – Project risks are managed to avoid overspend
- **Operational risk** – Reduced risk of potential disruptions to operations / revenue
- **Commercial risk** – Reduced risk to Hydro Tasmania's commercial performance
- **Lack of broad community support** – Reduced risk of community opposition to the project leading to delays or reputation concerns.

Weightings have not been assigned to each criterion, reflective of the fact that an evaluation of the impact and, as such, relative importance of each of the criteria, has not been undertaken.

The criteria and weightings are summarised in **Table 26**.

Table 26: Project risk assessment evaluation criteria and assigned ratings

Evaluation criterion	Description
Deliverability	

Evaluation criterion	Description
Market depth for procurement purposes	• Sufficient market depth (availability and experience) exists for procurement purposes.
Resourcing and capabilities	• Resourcing and capabilities exist to support option delivery.
Approvals	
Approvals received in time to address conveyance safety and reliability	• Planning conditions can be met with no impact on the timely management of conveyance safety and reliability.
Approvals received in time to align with Marinus Link	• Planning conditions can be met with no impact on the ability to meet timing of commercial drivers (Marinus Link 2028).
Cost risk	
Site conditions	• Site conditions (e.g. Geotech) can be managed to avoid overspend.
Labour and material costs	• Labour and material costs can be managed to avoid overspend.
Whole-of-life costs	• Whole-of-life costs are certain and overspend risk can be managed.
Operating risk	
Risk to reliable operations and output during construction	• Operational risks during construction lead to changes in output and revenue impacts.
Ongoing operational risks	• Ongoing disruptions to operations (once commissioned) lead to revenue impacts.
Commercial risk	
Independence from Marinus Link	• Commercial viability is independent of the commissioning of Marinus Link (or its delay).
Revenue is resilient to changing market conditions.	• Operation can be adapted to respond to changing market conditions.
Lack of broad community support	
Project level support	• Community support can be maintained at a project level, preventing reputational damage and potential delays.
BotN support	• Community support to the broader BotN project (being a mechanism to support increased wind development) can be maintained, avoiding potential delays.

The Status Quo is not considered in the relative risk comparison as it did not pass the preliminary screening. However, it is used as a baseline to which all other options are compared against. Each project option's relative risk against the Status Quo was assessed against each criterion using the following rating scale summarised:

	1	Significantly reduced risk
	2	Moderately reduced risk
	3	Somewhat reduced risk
	4	No change to the Status Quo

	5	Somewhat increased risk
	6	Moderately increased risk
	7	Significantly increased risk

9.5.2 Results

Table 27 outlines a high-level assessment of each project option again each criterion.

A…more detailed discussion on the ratings of each option is provided in Appendix E

(Note: Exempt information – Appendix E - has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).

… further risk analysis for the preferred option(s) is provided in **Chapter 10**.

Table 27: High-level risk assessment of project options

Evaluation criterion	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Deliverability					
Market depth for procurement purposes	4	6	6	6	7
Resourcing and capabilities	4	7	7	7	6
Approvals					
Approvals received in time to address conveyance safety and reliability	4	5	5	7	6
Approvals received in time to align with Marinus Link	4	5	5	7	6
Cost risk					
Site conditions	4	5	5	6	6
Labour and material costs	4	5	6	7	7
Whole-of-life costs	1	3	4	2	1
Operating risk					
Risk to reliable operations and output during construction	4	6	6	4	4
Ongoing operational risks	1	2	2	1	1
Commercial risk					
Independence from Marinus Link	2	4	5	6	6
Revenue is resilient to changing market conditions.	7	4	2	2	1
Lack of broad community support					
Project level support	7	4	5	5	5
BotN support	5	4	4	5	5

Evaluation criterion	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
Total					
Average relative rating (unweighted)	3.9	4.6	4.8	5.0	4.7

Relative risk is not a key differentiator between options

Most project options present a higher project risk relative to the Status Quo (based on the prioritised risk categories), however the difference in average relative risk rating did not materially differentiate between the options.

It is important to note that the key risk of an environmental incident occurring that is unmitigated under the Status Quo is considered in the preliminary screening and hence not reconsidered in this section. Any project risks will be addressed as part of a comprehensive risk management plan with consideration of Hydro Tasmania's risk appetite **(Chapter 10).**

Option 4 (Redevelopment with Headponds) presents the highest relative risk

Option 4 (Redevelopment with Headponds) presents a marginally higher risk than both other storage options (Option 3 and Option 5). This is primarily due to Option 4 presenting a relatively higher risk of obtaining approvals on time as approval applications are further progressed for Option 5, and Option 3 requires fewer approvals due to the less complex scope of work.

Decommissioning presents the lowest relative risk

Option 1 (Decommissioning) presents the lowest relative risk. This is due to this option having a relatively small scope of work and low CAPEX, leading to a reduced risk that the project option would encounter delays or cost overruns compared to options with more complex works requirements. Ongoing operational risks are also greatly reduced as the scheme's operations will solely consist of the newly refurbished Butlers Gorge Power Station after the Tarraleah Power Station is decommissioned.

Despite this lower overall relative risk, decommissioning presents the highest relative risk against the project level support criterion. A decision to decommission may be result in poor public perception of Hydro Tasmania associated with the early upgrade works not being utilised and the removal of generation capacity from the portfolio.

** Exempt information – commercially sensitive information - has been removed from this document:- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

9.6 Recommended project option

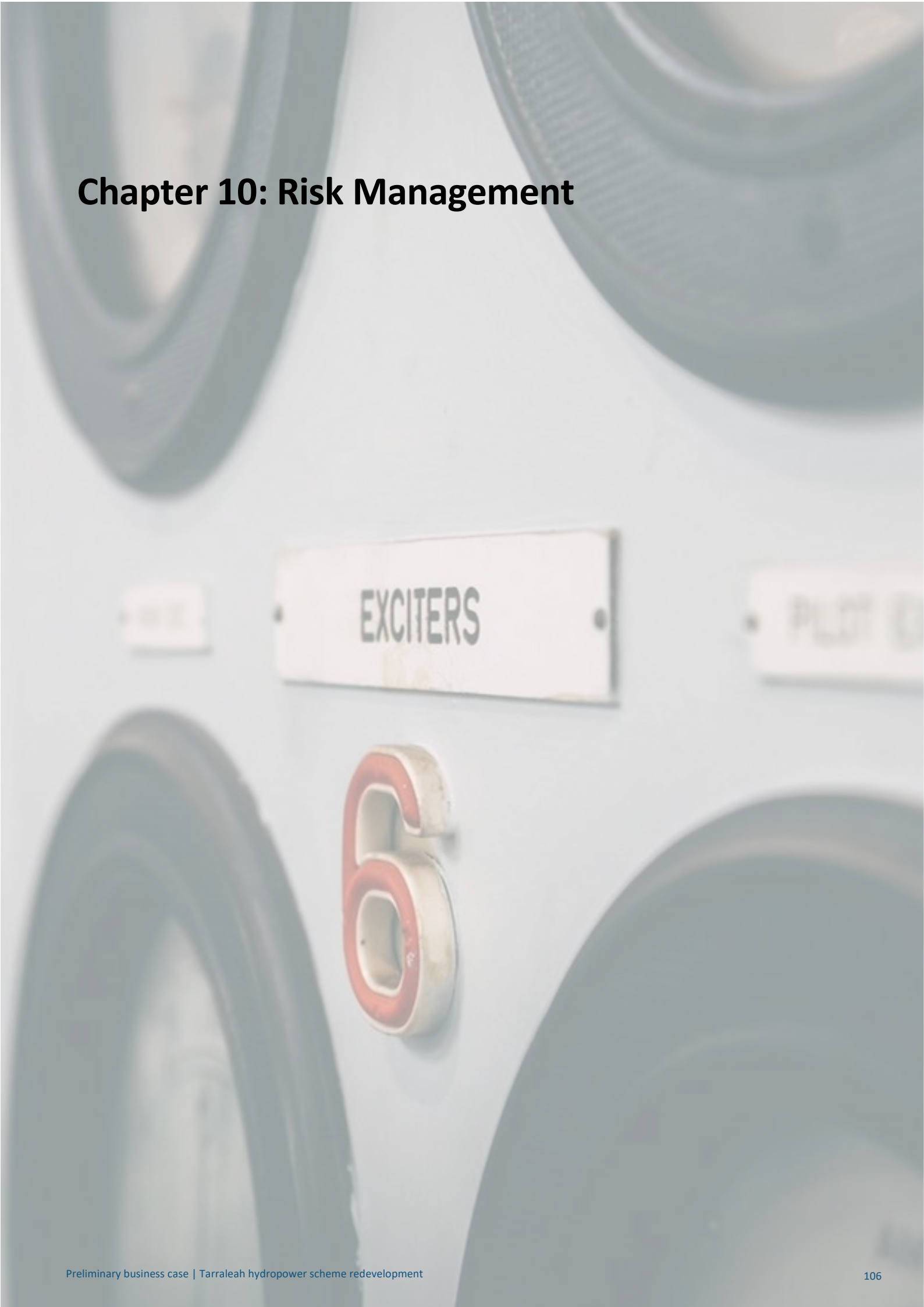
Option 5 (Redevelopment with Pressurised Conveyance) is the preferred option as it:

- passes the preliminary screening test along with the other redevelopment and refurbishment options, as they are all viable options that address the ageing conveyance and the associated risk of an environmental incident impacting the adjacent TWHAA
- provides an additional ~90 MW of peak capacity that is flexible to respond to future market conditions and has the potential to add up to 200 GWh of annual energy generation to the portfolio
- has the highest revenue and IRR relative to the other project options
- has the highest NPV of any project option that maintains operation at Tarraleah. It may also attract preferential funding (along with Options 3 and 4) from the CEFC which will further improve the NPV

- has the highest MCA ranking of any option, with the highest weighted and unweighted scores. With the MCA considering quantitative impacts (NPV) as well the qualitative impacts, the highest score suggests a relatively higher value for money investment
- aligns best with the long-term strategy of Hydro Tasmania and with both Tasmanian and Australian Government objectives
- results in a similar change in risk relative to the Status Quo as the other project options. Only Option 1 (Decommissioning) sees a reduction in the risk relative to the Status Quo, however this is more than offset by having the lowest MCA ranking. As a result, risk is not considered to be a key differentiator between options.

It is recommended that Option 5 is explored in more detail in the final business case.

Chapter 10: Risk Management



10.1 Chapter overview

Purpose

This chapter details the process to assess and manage risks for the preferred project option (identified in **Chapter 9**), including:

- Risk assessment process and methodology (**Section 10.2**)
- Project risks (**Section 10.3**)
- Risk appetite (**Section10.4**).

Key points

1. Hydro Tasmania adopts an organisation wide integrated business risk management (IBRM) framework that sets out the process for assessing and managing risk within set boundaries.
2. Project risks are assessed based on their likelihood and consequence and added to the project's risks register for ongoing management.
3. The key strategic risks identified in the register at the time of the preliminary business case relate to:
    - market and revenue uncertainties
    - failure to obtain necessary financial investment / funding for Tarraleah business case
    - failure to undertake effective and transparent procurement of infrastructure and assets
    - limited availability of transmission rights due to increased competing generators
    - failure to demonstrate compliance with environmental and cultural heritage assessments
    - failure to identify and implement all legal and regulatory requirement during FID and construction
    - inability to manage third party / contractor quality and capability
    - supply chain disruption leading to project delay and/or cost increase
    - serious incident resulting in harm to a worker or public on/or adjacent to project site
    - failure to engage and effectively manage community stakeholder groups leading to project delays, operational disruption and/or loss of social licence.
4. For each of the above risks, key controls and mitigation strategies have been identified to better align with Hydro Tasmania's risk appetite. It will be the role of the BotN project, via the risk management process, to implement and monitor identified risk mitigation strategies.
5. There are several mitigation strategies in place including third party legal review and procurement uplift and market analysis. Further analysis will be conducted to confirm the target risk rating and treatments in line with the business risk appetite. These updates will be reported to the Risk Management Committee (RMC) each quarter.

10.2 Risk assessment process and methodology

Risk management of the BotN program (including the Tarraleah redevelopment project) is governed and actively managed through Hydro Tasmania's established IBRM framework. The IBRM framework, along with associated standards and procedures, provides Hydro Tasmania with processes for assessing and managing risk within set boundaries. The framework, standards and procedures are aligned to the international standard on risk management, Infrastructure Australia guidelines and AS ISO 31000:2018 Risk Management – Principles and Guidelines.

The IBRM Framework is adopted across all of Hydro Tasmania as it aligns with dam safety risk assessment requirements and due to its specialised nature of operations requiring dam safety management. It allows for the assessment of dam safety risk, as stipulated by the Australian National Committee on Large Dams Guidelines on Dam Safety Management.

The overall approach is summarised in **Figure 57.**

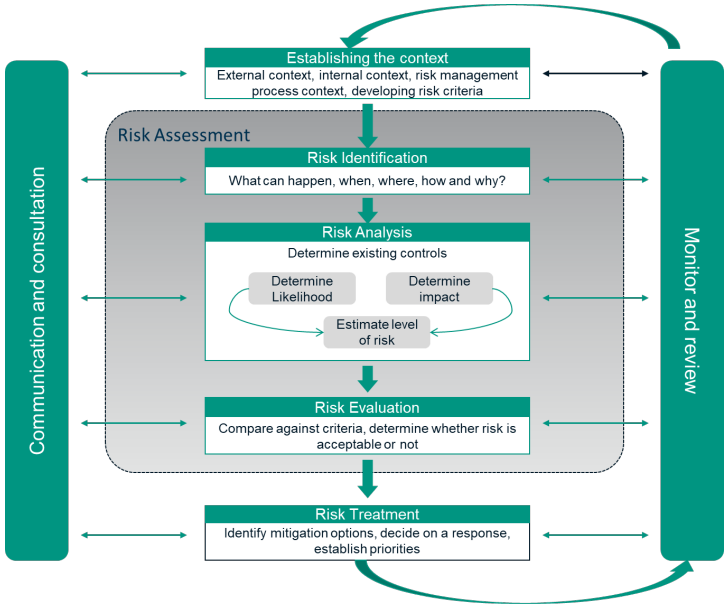


Figure 54: Risk assessment approach

10.2.1 Risk management plan

The BotN risks, assumptions, issues and dependencies (RAID) management framework, including the RAID management plan and supporting registers, provides a process for the systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context and assessing risks, assumptions, issues and dependencies.

The RAID management plan aligns with ISO 3100:2009 Standard for Risk Management Section 6 "Risks and Issues" and Section 7 "Assumptions and Dependencies" and sits under the whole-of-business Compliance and Risk Management structure based on the IBRM Framework and associated standards and procedures.

10.3 Project risks

A strategic risk register developed for Options 5 (Redevelopment with Pressurised Conveyance) currently includes 24 risks and is provided in **Appendix F.**

All risks are scored based on a combined assessment of likelihood and impacts as outlined in the IBRM risk rating matrix (**Table 62**), to provide one of four risk ratings:

Risk rating	Strategic threat level
Extreme	May threaten business sustainability. Achievement of key business strategies and objectives may no longer be attainable.
High	Risk may pose a threat to the achievement of one or more key business strategies and objectives, however recovery is possible.
Moderate	Risk may pose a threat to the overall achievement of business strategies and objectives. Almost immediate recovery is possible.
Low	Risk poses minimal threat to achievement of business strategies and objectives

Table 28 summarises the top 10 risks identified for the delivery of Options 5 (Redevelopment with Pressurised Conveyance).

The information provided includes:

- inherent risk - the rating in the absence of controls or mitigation strategies in place
- residual risk - the current rating with all existing / planned controls in place (i.e. the "managed risk" rating)
- target rating - a current assessment of a potential achievable target risk rating once all strategies to mitigate risk are implemented.

There are a number of key milestones in the delivery of the project that will have considerable bearing on the risks identified in the register. The register will be continuously monitored and updated throughout the project to reflect the changes in scope certainty and understanding of project risks. This process has been articulated in **Section 10.2.**

Of the ten highest ranking risks, one was at an '***extreme***' residual risk rating and nine were at a '***high***' residual risk rating. With the proposed controls and mitigation measures, risk ratings were all reduced (six to '***high'*** and four to '***moderate'***).

Table 28: Overview of key items from the risk register

Risk shortform	Risk Description	Inherent risk	Residual risk	Target risk
1. Market and revenue risk	Market and revenue uncertainties (feasibility and volatility of revenue assumptions) at FID result in investment decisions not being made and / or possible	30	25	12
2. Financial investment risk	Failure to obtain necessary financial investment / funding for Tarraleah redevelopment business case	30	25	18
3. Procurement risk	Failure to undertake effective and transparent procurement of infrastructure and assets to meet technical design specifications, quality requirements and project cost parameters	30	30	20
4. Transmission risk	Increased competing generation sources in Tasmania limiting Hydro Tasmania's access to transmission to maximise revenue and return on investment and cover its contract position.	30	25	20
5. Environmental and cultural heritage risk	Failure to demonstrate compliance with environmental and cultural heritage assessments to support a design and build specifications.	30	25	20
6. Regulatory risk	Failure to identify all legal and regulatory requirements during FID and construction resulting in a breach of requirement of delay to project timeframes.	30	25	15
7. Third party risk	Inability to manage third party / contractor quality and capability (inc. Engineer Procure, Construct (EPC) contractor) to deliver design requirements, meet project timeframes, supply disruption, and deliver within cost parameters.	30	25	15
8. Supply chain risk	Project costs impacted by supply chain disruptions and construction competition make assessed "optimal" project unviable; or failure to manage supply chain disruption leading to project delay and cost exposure.	25	25	20
9. Safety risk	Serious incident resulting in harm to a worker or public on/or adjacent to project site.	30	24	18
10. Stakeholder risk	Failure to engage and effectively manage community stakeholder groups leading to project delays, operational disruption and / or loss of social licence.	30	20	15

The successful delivery of the project relies on these strategic risks and other project delivery risks being managed appropriately, including by implementing effective controls.

The following section outlines the key frameworks and systems that govern and embed these controls to ensure risks are maintained at the identified residual risk rating and continuous improvement occurs to achieve the desired target risk rating.

10.3.1 Project controls

Project controls are the most significant mitigations used to maintain the residual risk within the project risk tolerances. They also help monitor progress towards the identified target risk rating.

Primary project controls include the governance arrangements (structure, ownership and accountability) put in place by Hydro Tasmania to manage and mitigate the delivery risks of the project (refer to **Section 12.4**). These controls provide project oversight, review, approval, and monitoring to support the status and issues management, cost control and risk management of the project. The Independent Technical Review Panel further strengthens the independence of technical review and oversight to maintain risk parameters during delivery and transition stages.

Dedicated and specialist resources will be utilised to manage the identified risks for a project of this scale and significance for the business. The project has human resources and communications support focusing on preparing and implementing a capability build strategy, resourcing plans, undertaking recruitment and managing the resourcing need and retention of skills throughout the life of the project.

In addition to the controls in place, a number of treatments have been identified. These additional treatments fall into two categories: firstly, those that will mitigate the risk to achieve the target risk rating, and secondly those that can be refined as a result of project milestones being achieved. An example of this will be the contract management and performance monitoring of key controls; these will have more specific controls once a supplier has been procured and the scope and terms of the third-party contract have been agreed.

As the project continues through the project management lifecycle there will be a greater need to monitor risks at a more granular level and this will be managed through the RAID process as identified in **Section 10.2.1** as part of the next steps outlined in **Section 12.8.**

Embedding strong project governance and project management are fundamental to the risk mitigations for risk 3, and risks 5-10.

Project controls underpinning the residual risk rating are monitored and maintained throughout the project using a range of existing frameworks and processes, for example Hydro Tasmania's work health and safety system, the integrated business risk management framework, and the recruitment and onboarding practices. Where existing project control frameworks and processes are inadequate or unsuited to a project of this scale, project specific controls will be introduced.

External party controls

A number of the key risks identified relate to the performance and or management of third parties; these include: contractor, supply chain, stakeholder, market and revenue and transmission. These risks are partially outside Hydro Tasmania's control.

The effective management of third-party risk is specifically identified in risk 7. In addition to the controls identified, the approach to sharing of responsibilities and accountability to manage supply and construction risk with a third party will be addressed in the procurement approach adopted. As discussed in **Chapter 11,** an Engineering, Procure and Construct (EPC) contract is recommended as this will best manage the cost and timeline risk. There will be some variable cost components where the level of risk is not acceptable to the market. For these components, a suitable risk sharing mechanism will be determined. Conversely, Hydro Tasmania may not effectively divest the risk to a third party resulting in still being exposed to risks without having any direct accountability to actively manage the risk.

Hydro Tasmania has engaged third party advice to support the design of risk sharing approach across the expected contractor and supplier relationships. This is particularly relevant for risks that are potentially outside the control of all parties involved (e.g. supply chain risk), and will include consideration of insurances, quality assurance and workers locations. Hydro Tasmania's approach to procurement seeks to understand and explore these issues before FID with industry to mitigate delivery risks. As per **Section 11.2**, Hydro Tasmania's approach to procurement is based on its desire for collaborative contracting arrangements including an early contractor involvement (ECI) phase; its intent is to separately procure the major electrical & mechanical package before introducing that work scope into the ECI phase to sit under an overall EPC contract.

The effective engagement of the community and stakeholder groups is also a key risk for the project. Controls to manage this risk are underpinned by project and business activities to engage and consult community and the government. These are outlined in the proposed stakeholder engagement plan (**Section 12.3.1**). The development, implementation and ongoing revision of the adopted stakeholder engagement and participation plans will provide a structured and transparent way to manage stakeholder risk throughout the different project stages. It is also envisaged that future community sounding, and forums will be a strong mechanism to illicit the appropriateness and effectively of stakeholder plans to manage this risk.

The uncertainty of the future state of the NEM and extent of regulation (discussed in **Chapter 3** and **Chapter 4**) will either be an opportunity or risk for the project. Market conditions are outside Hydro Tasmania's control. However, Hydro Tasmania can control the extent to which it advocates for reform and responds to these changes as they emerge. The management of these elements are outside the scope of this project and business albeit linked to the potential market risk articulated in risk 1.

Environmental and cultural heritage

The risk of a breach of compliance with Hydro Tasmania's environmental and cultural heritage obligations is a two-pronged risk for the proposed redevelopment of Tarraleah under Option 5 (Redevelopment with pressurised conveyance). The project itself seeks to avoid both the compliance and the current societal risk created by the existing condition of Tarraleah conveyance. Therefore, the current risk is fully mitigated by the preferred option. The project will however need to demonstrate compliance in design, delivery and operation with numerous environmental and cultural heritage obligations.

The key controls to mitigate the risk of non-compliance are embedded into the existing asset and infrastructure operations within Hydro Tasmania and involve monitoring procedures and compliance audits. In recent months, environmental audits have increased to support the preparedness for environmental approval processes for the Tarraleah refurbishment process. In addition to this, the business has maintained a strong relationship with the State regulator (Office of the Tasmanian Economic Regulator) and environmental bodies as a proactive manager and advocate for strong environmental practice. These relationships will also be important in navigating the achievement of approval and compliance processes.

Transmission risk

10.4 Risk appetite

**Exempt Information (3 text paragraphs) has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests of Hydro Tasmania or prejudicial to communications between States and or prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).*

The risk register compiled for Option 5 (Redevelopment with Pressurised Conveyance) demonstrates a risk profile that seeks to mitigate risk to tolerable target levels. The risk management approach identified in **Section 10.2** will support the governance and oversight of risk to achieve the target risk ratings and tracking of identified mitigation strategies to achieve this target.

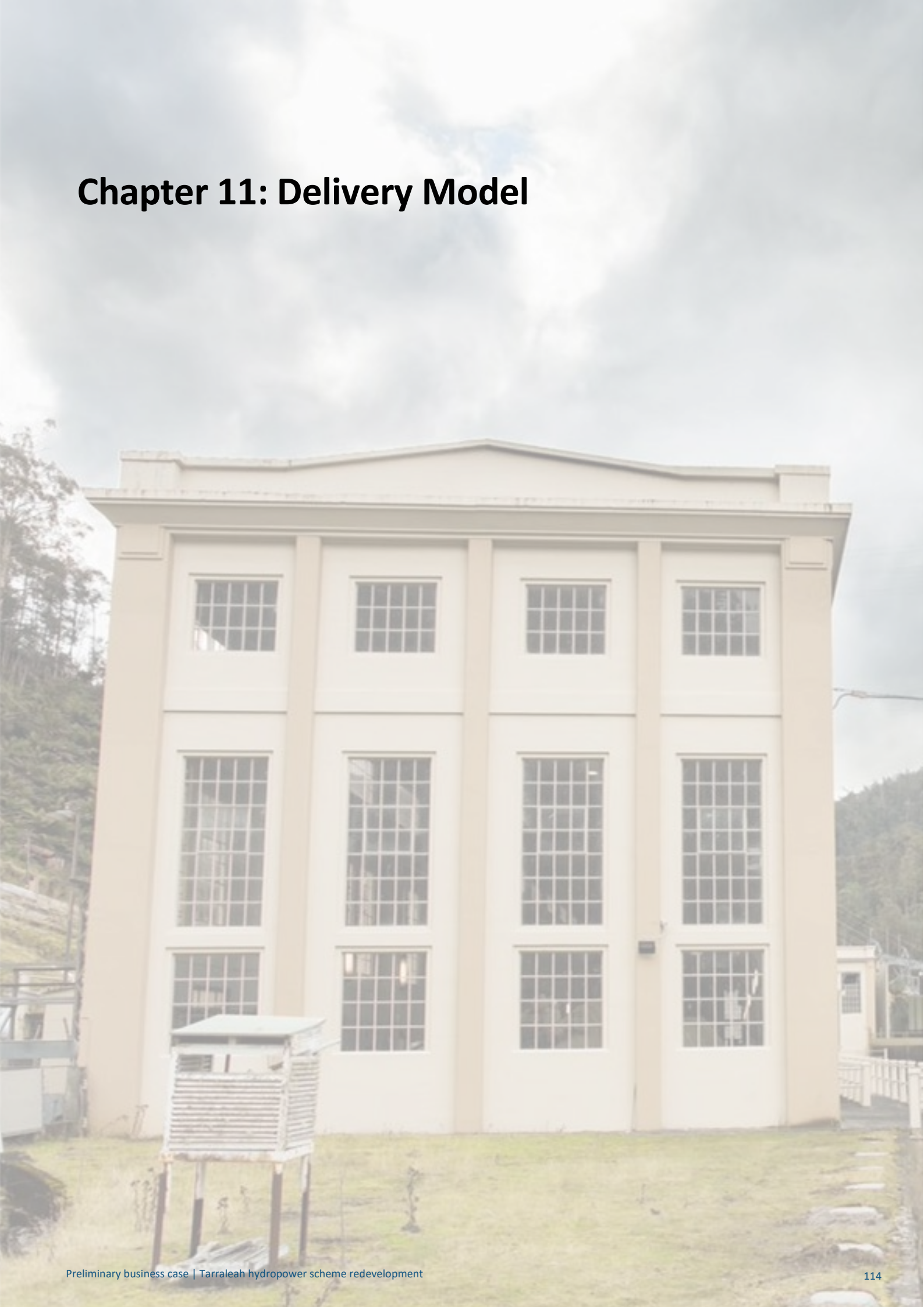
The environment, safety and infrastructure and asset procurement risks present the three highest target risk ratings. For each of these risks, it is important to note the following:

- Financial investment risk at a target risk rating (considered at a tolerable level) will be further reduced once the consultations with the various funding bodies and design of funding structure are confirmed following the approval of this business case.

- Safety, while at a target risk rating of ‘moderate’, is not above a tolerable target risk level but rather reflects the inherent nature of safety risk and priority of controls being maintained and should be considered at a ‘lowest achievable risk rating’.
- Infrastructure and asset procurement risk and environment risk are not considered to be outside the tolerable target risk level of the project but rather demonstrate the current inherent uncertainty in:
  - unknown environmental challenges or hurdles that the project may encounter through construction
  - unknown market competency and capacity to complete the desired design within risk tolerances.
- Increased competing generation sources in Tasmania limiting Hydro Tasmania’s use and availability of transmission rights to maximise revenue, return on investment and to cover its contract position remains at a high target risk rating until there is clarity over the Tasmanian growth in renewable generation and the mechanisms to manage the risk of transmission constraint.

The extent to which Hydro Tasmania has a risk appetite to undertake an investment of this scale, both financial cost and asset construct, will be balanced through the willingness to undertake activity at this cost and ultimate comfort obtained from commercial analysis contained in **Section 9.4** of this business case.

Chapter 11: Delivery Model



11.1 Chapter overview

Purpose

This chapter details the procurement and packaging considerations for the implementation of the preferred project option (identified in **Chapter 9**), including:

- Procurement strategy (**Section 11.2**).
- Project schedule (**Section 11.3**).

Key points

- The recommended packaging approach for Tarraleah is a single package for the full scope of works, however with the electrical and mechanical (E&M) components separately selected by Hydro Tasmania and integrated into the single package.
- The preferred procurement approach for project delivery is engineering, procure and construct (EPC) (lump sum) with some variable components where the level of risk is not acceptable to the market.
- A lump sum approach is preferred to incentivise target cost. The design and conditions are well understood and will provide more price and risk certainty given the length of time available to measure, quantify and allocate risks to those most suited to manage them.
- Market consultation was undertaken to gain feedback on the procurement approach from contractors and suppliers familiar with hydropower projects. Feedback was gained from a range of organisations, ranging from tier-1 contractors leading multi-million-dollar programs through to smaller contractors focusing on the Tasmanian construction sector. The proposed approach aligns with the market's preferences.
- A single preferred electrical and mechanical supplier would be selected (from four shortlisted providers) using a competitive tender process and introduced to both early contractor involvement (ECI) contractors during the competitive ECI process.
- A detailed procurement plan is being developed and will be used to manage project delivery to FID finalisation and approval, and procurement of the EPC contractors.

11.2 Procurement strategy

The primary objective of the procurement strategy is to support the delivery of the Tarraleah redevelopment in time for the commissioning of the first Marinus Link interconnector, and in delivering the redevelopment, address the current risk of an environmental incident occurring in the adjacent TWWHA and replace ageing E&M and civil assets.

The procurement strategy focuses on achieving this primary objective in a value-for-money manner through appropriate risk transfer, maximising certainty with regard to cost and performance at appropriate stages in the procurement and delivery process, and leveraging the capability and capacity of the engineering and construction industry.

The upgrade works packages (introduced in **Section 4.3.1.2** and set out in **Appendix B**) are excluded from this strategy, as procurement and delivery are already underway for these packages.

11.2.1 Evaluation methodology

In considering procurement and delivery approaches, an evaluation was undertaken consistent with the methodology in the Procurement Options Analysis volume of the National Guidelines for Infrastructure Project Delivery. The process undertaken is as summarised in **Figure 58.**

Figure 55: Infrastructure Australia Procurement & Delivery Strategy Development Process

Hydro Tasmania engaged a specialist advisor, Turner and Townsend, to lead this work on its behalf. Turner and Townsend delivered a procurement strategy in December 2022, with additions in February 2023, which is provided in **Appendix G** as a supporting document to the business endorsed position at the time of this preliminary business case noting a final procurement strategy is subject to further discussions with legal advisors prior to the commencement of formal procurement with respect to risk allocation, commercial terms and contract type.

The procurement strategy will continue to be refined as the project development progresses.

11.2.1.1 Project characteristics

This step involves gathering and considering key data and information on the project characteristics relevant to the procurement strategy assessment. This is also supported by the facilitation of packaging and procurement workshops, a market engagement process and analysis of key scope interfaces. An overview of the data is provided in the following section.

Overview of scope elements

The project is a complex undertaking, comprised of multiple interdependent scope elements with varying levels of design and delivery interfaces. At the highest level, the project can be split into two discrete elements – civil infrastructure and E&M infrastructure. Some scope elements for the preferred project option (Option 5 (Redevelopment with Pressurised Conveyance) are covered in **Table 29**.

Table 29: Scope elements for Option 5 (Redevelopment with Pressurised Conveyance)

Scope Element	Description
Civil infrastructure	
Pipeline	A 4.2 km long new surface pipeline constructed from large (DN4000) diameter glass reinforced plastic pipe connecting to the western portal of the headrace tunnel. The final configuration is still to be determined.
Headrace tunnel	A 9 km long headrace tunnel connecting to the 2.5 km long power tunnel. The tunnel is proposed to be driven by drill and blast methods through the dolerite sill that extends from the Wentworth Hills to the Nive River valley.
Surge shaft	Surge shaft (DN5000) connecting the headrace tunnel to a surge tower (DN18000) located on hill 1 km North-East of No. 2 Pond.
Power tunnel	A 2.5 km long power tunnel, connecting the head race tunnel at the surge shaft to the power station, the tunnel is proposed to be driven by drill and blast methods through dolerite and be predominantly unlined with a final 500m long section steel lined.
Site preparation	Access and egress to the station and headworks infrastructure.
E&M infrastructure	
Pump station	Pump station with rising main to divert inflowing water to No. 2 Pond into the surge tank.
Power station	A surface power station on the western bank of the Nive River adjacent to the existing Tarraleah Power Station.
Transmission	A switchyard and 220 kV transmission line connection to the existing transmission system.
High voltage	Power supply and communications to the station and the headworks.

Ongoing operations and maintenance of Tarraleah infrastructure has not been considered as this will be factored into Hydro Tasmania's core business SAMP.

E&M supply market

Exempt Information (1 paragraph) has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests / exposing Hydro Tasmania to competitive disadvantage and prejudicial to the further assessment of this Preliminary Business Case and would disclose the business affairs of third parties (s 38 RTI Act & Item (o) and (s) Schedule 1).

Market capacity

An important consideration in assessing packaging and procurement strategies is the impact of other Australian projects on market capacity. With several large projects occurring throughout the country, the competition for resources will have a marked impact on contractors' capacity and appetite to bid, as well as the overall cost to deliver the works.

Potential strategies to address these risks include:

- early and regular market engagement to understand key constraints and opportunities
- tailoring packages to manage market constraints

- staggering procurement processes to minimise the burden on bidders and enable resources to roll from one project to the next
- adopting sensible risk allocations and running efficient processes to attract market interest.

Interface with the potential delivery of a pumped hydro project at Lake Cethana

To allow the aligned completion of Cethana with completion of the second Marinus Link interconnector, Hydro Tasmania is considering the commencement of the procurement process for Cethana in late 2023. This will result in an overlap of procurement processes and delivery with Tarraleah.

The projects are different in terms of technical scope (traditional hydropower as part of an operational scheme compared to pumped hydro recycling water out of an existing hydropower storage), location and scale, however the combined delivery impacts need to be considered.

Also, the combined scale of two projects may lead to additional interest from national and international suppliers, so consideration will be given to how to optimise this interest for the benefit of both projects.

11.2.2 Packaging options assessment

11.2.2.1 Packaging options assessment approach

To establish the most appropriate delivery strategy for the Tarraleah redevelopment, it is necessary to determine if these works should be delivered as a single, integrated package or split into a number of smaller packages.

The approach used to develop and evaluate packaging options considers characteristics of Tarraleah, inputs from advisers, market feedback and analysis of approaches adopted or proposed to be adopted on comparable projects and comprised three key steps:

- **Step 1**: Consideration of a list of potential packaging options based on factors such as geography and technical discipline.
- **Step 2**: Identification of a shortlist of potential packaging options by undertaking a qualitative analysis to determine the most realistic, practical options.
- **Step 3**: Consideration of shortlisted packaging options to determine the most suitable option. **Table 30** summarises the value drivers that were considered to be key differentiators supporting the assessment and comparison of packaging options.

Table 30: Key value drivers for packaging options assessment

Value drivers	Description
Interfaces	Supports achieving value for money for Hydro Tasmania through: • offering design and delivery synergies from bundling project components • enabling natural and manageable points of interface • minimising the risk associated with design and delivery interfaces.
Technical capability	The required technical and delivery capabilities to deliver the elements of the package are sufficiently similar.
Market attractiveness	There is sufficient market interest in delivering the project scope through the packaging route proposed such that a competitive outcome is likely to be achieved.
Program schedule	The packaging approach delivers the project within Hydro Tasmania's schedule objectives and provides time certainty.

Value drivers	Description
Cost certainty	The packaging approach supports certainty of, and competitive pricing for, capital and whole-of-life costs.
Demands on Hydro Tasmania resources	The extent to which the packaging approach places additional resource demands on Hydro Tasmania personnel.

The shortlist of packaging options assessed are summarised in **Table 31.**

Table 31: Key options considered

Option	Description
Single package	A single package for the entire works.
Four packages	Separate packages for the: • Pipeline • Powerhouse • Tunnel • E&M equipment.

The recommended packaging approach is outlined in the following subsections, including the rationale for the proposed approach.

11.2.2.2 Packaging assessment recommendation

The recommended packaging approach for Tarraleah is a single package for the full scope of works, however with the major E&M components (including turbines, generators and transformers and associated elements within the power station) separately selected by Hydro Tasmania and integrated into the single package.

Transmission will likely be delivered as a separate package through TasNetworks as either a connection asset or potentially part of the grid (depending on final definition of grid connection point).

The rationale for this assessment includes:

- to mitigate Hydro Tasmania's construction interface risk associated with managing multiple interfacing packages throughout design, procurement, delivery, commissioning and handover. Under a single package, this risk is transferred to the contractor
- to minimise the internal resourcing requirement of Hydro Tasmania managing multiple contracts due to the reduced interface risk and also lower contract administration effort, as a single package will have a single point of contact
- to allow Hydro Tasmania to select a preferred E&M supplier, given the specialist nature of the works and the broader impacts on the business
- to enable a higher likelihood of achieving the 2028 completion date.

11.2.3 Delivery model options assessment

11.2.3.1 Delivery model options assessment approach

The delivery model options assessment builds on the recommended packaging approach to consider suitable delivery models for the Tarraleah redevelopment.

The approach used to develop and evaluate delivery model options involved consideration of the characteristics of Tarraleah, inputs from advisers, market feedback and analysis of approaches adopted or proposed to be adopted on comparable projects and comprised three key steps:

- **Step 1**: Consideration of a list of potential delivery model options based on factors such as geography and technical discipline.
- **Step 2**: Identification of a shortlist of potential delivery model options by undertaking a qualitative analysis to determine the most realistic, practical options.
- **Step 3**: Consideration of shortlisted delivery model options to determine the most suitable option.

Table 32 summarises the value drivers that were considered to be key differentiators supporting the assessment and comparison of delivery model options.

Table 32: Value drivers for delivery model options assessment

Value drivers	Description
Risk allocation	The extent to which the delivery model allocates risk to the party best placed to manage it.
Attractiveness to market	There is sufficient market interest in delivering the project scope through the procurement model proposed such that a competitive outcome is likely to be achieved.
Program schedule	The packaging approach delivers the project within Hydro Tasmania's schedule objectives and provides time certainty.
Cost certainty	The extent to which the delivery model supports cost certainty and competitive pricing for capital and whole-of-life costs.
Ability of contractor to influence design	The extent to which the delivery model provides incentives for the contractor to innovate to meet the required performance outputs and other requirements.
Demands on Hydro Tasmania resources	The extent to which the delivery model places additional resource demands on Hydro Tasmania personnel.

Table 33 summarises the final shortlist of delivery model options identified as part of the assessment.

Table 33: Delivery model options considered

Option	Description
Engineering, Procure and Construct (EPC) (lump sum)	Under an EPC structure, Hydro Tasmania will engage a contractor to design, build and deliver the works in an operational state, at an agreed lump sum price.
EPC (Incentivised Target Cost (ITC))	As above, substituting a lump-sum price with an open book/cost-reimbursable pricing mechanism with, an agreed target price. Expected to include a painshare / gainshare mechanism for overruns or underruns during delivery.
Traditional design-bid-build (DBB)	DBB is a traditional construction project delivery method that involves the completion of three distinct phases in sequence. Construction does not begin until the design process is complete and a bid accepted. There is no overlap between design and construction.
Alliance	The project proponent collaborates with one or more non-owner parties (e.g. a designer and constructor) to share construction risks and responsibilities. Project delivery risks are shared by the alliance participants via pre-agreed cost pain/gain share arrangements. Alliance

Option	Description
	partners may be guaranteed reimbursement of direct project costs and payment of project overheads in an open-book arrangement.

The recommended delivery model approach is outlined in the following subsections, including the rationale for the proposed approach.

11.2.3.2 Delivery model options assessment recommendation

The EPC model scored the highest in the delivery model options assessment due to:

- high level of price and risk certainty (particularly compared to DBB)
- lower level of Hydro Tasmania resourcing required and a single point of responsibility from the contractor (compared to an Alliance and DBB)
- shorter delivery timeframe (compared to DBB).

The recommended EPC model involves a lump sum approach with some variable components where the level of risk is not acceptable to the market. Utilising a lump sum approach may provide more price and risk certainty given the length of time available to measure, quantify and allocate risks.

Where risks are not acceptable to the construction market (e.g. ground conditions or other specific risks identified via the request for proposal (RFP) phase), particular elements may be subject to risk-sharing mechanisms.

The analysis undertaken provides the following recommendations:

- Delivery using an EPC (lump sum) contract, with some variable components where the level of risk is not acceptable to the market.
- Procurement using a competitive ECI process, to allow the contractors to progress design and value-engineering, reduce risk and provide better value for money proposals to Hydro Tasmania.
- A single preferred E&M supplier is recommended to be selected… *Exempt Information (2 sentences) have been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests / exposing Hydro Tasmania to competitive disadvantage and prejudicial to the further assessment of this Preliminary Business Case and would disclose the business affairs of third parties (s 38 RTI Act & Item (o) and (s) Schedule 1).* using a competitive tender process and introduced to both ECI contractors during the competitive ECI process. This allows the ECI contractors to develop a fully formed proposal.
- The lump sum arrangement will provide more price and risk certainty to Hydro Tasmania (as compared to an ITC arrangement) given the length of time available to measure, quantify and allocate particular risks to those most suited to manage them.
- Where risks are not acceptable to the market (e.g. ground conditions), a suitable risk sharing mechanism will be determined.

11.2.4 Market consultation

A market consultation exercise has been conducted to gain feedback from contractors and suppliers familiar with hydropower projects. Feedback was gained from a range of organisations, ranging from tier-one contractors leading multi-million-dollar programs through to smaller contractors focusing on the Tasmanian construction sector.

At a high level, notable key messages from the market engagement process were as follows:

- A high level of interest exists within the tier-one contractor market to participate in these projects, however, there appeared to be limited appetite from local contractors to participate in the information gathering process.
- Project alliance models are currently a popular model chosen for similar projects, noting that they required a large and experienced Owner's Team to be successful.
- The most recommended delivery model was a single EPC contract complemented by an ECI phase, with an ECI phase estimated to require six months.
- The nature of the geotechnical risk associated with hydropower projects means that achieving a full lump sum price is challenging, and often inflated to cover risk provisions.
- Adopting an ECI phase allows reduction of risk premium due to early involvement and collaboration between all relevant parties.
- Multiple EPC packages introduce significant risks for Hydro Tasmania to consider and mitigate, especially around co-ordination of activities at package interface locations (e.g. powerhouse construction and E&M package installation).
- Supply chain risks and inflationary risks remain in the market today, however, forecasts suggest these will reduce over the next 12-18 months.
- The packaging strategy was revisited following this market validation exercise to confirm that the proposed delivery strategy for Tarraleah ensures an optimal result for Hydro Tasmania as well as ensuring value for money is obtained for the state.

11.2.5 Recommended procurement strategy

11.2.5.1 Recommended strategy

It is recommended that the Tarraleah redevelopment is delivered using a single EPC contract engaged through a competitive ECI process.

Under the proposed approach, Hydro Tasmania would separately run the major E&M equipment supplier selection process and progress performance requirement negotiations, before introducing the preferred E&M equipment supplier to the two ECI contractors.

As part of the EPC approach, Hydro Tasmania will engage with a single contractor to manage the entire Tarraleah redevelopment, including design, civil and E&M works. Works will be priced during a competitive ECI phase, on a lump sum basis where possible, however, it is anticipated that the ground conditions risk will be subject to risk-sharing mechanisms.

Subject to further market feedback during the EPC RFP phase, other high risk cost items may be negotiated such that the risk (or opportunity) rests with Hydro Tasmania. This approach to risk management is expected to result in a higher level of interest in the procurement process, resulting in more competition and lower risk premiums.

Including a competitive ECI step in the procurement strategy requires additional investment, as the market expects to be compensated for a portion of their bid costs. However, feedback from other projects is that the competitive ECI step typically leads to:

- more innovative design and constructability approaches
- early identification, mitigation and allocation of delivery risks
- a higher level of cost certainty.

11.2.5.2 Summary of approach

E&M supplier procurement process:

- **E&M procurement:** Single competitive tender process *(Exempt Information –detailing a procurement procedure- has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests / exposing Hydro Tasmania to competitive disadvantage and prejudicial to the further assessment of this Preliminary Business Case and would disclose the business affairs of third parties (s 38 RTI Act & Item (o) and (s) Schedule 1).*
- **Introduction to competitive ECI contractors:** The preferred E&M supplier is introduced to the two ECI contractors to allow for the completion of a full formed proposal by the ECI contractors.

EPC procurement process:

- **Registration of Interest process:** An open market process used to get an understanding of the parties interested in delivering the project, improve awareness and interest in the project and allow time for consortia to form.
- **RFP phase**: An open market process used to identify two contractors to participate in the competitive ECI phase.
- **Competitive ECI phase:**
  - **Overview:** The two ECI contractors will work concurrently on the ECI execution, deliver key outputs and generate a proposal response (including price) for the works.
  - **Bid costs:** The two ECI contractors will be partially reimbursed for their costs during this phase.
  - **Pricing proposals:** ECI contractors will be required to submit pricing as part of their proposals at the conclusion of the competitive ECI phase. This will provide a sense check for the cost estimates included in the final business case prior to FID.
  - **E&M contractor introduction:** The preferred E&M contractor will be introduced to the two ECI contractors part way through the competitive ECI phase. The ECI contractors will incorporate the E&M design and pricing into their project proposals.
  - **Project proposals / evaluation:** The ECI contractors will submit fully formed and binding proposals for the full Tarraleah redevelopment project works. Hydro Tasmania will evaluate and select a preferred proponent for negotiation and EPC Award.
- **EPC award**: Hydro Tasmania will select an ECI contractor to award the full EPC contract.

Elements of this process will be further refined in the process of developing procurement documentation.

11.2.5.3 Proposed Timeline

The proposed timeline for the procurement process to identify the preferred tenderer capable of delivering the Tarraleah Redevelopment project is summarised in **Figure 59.**

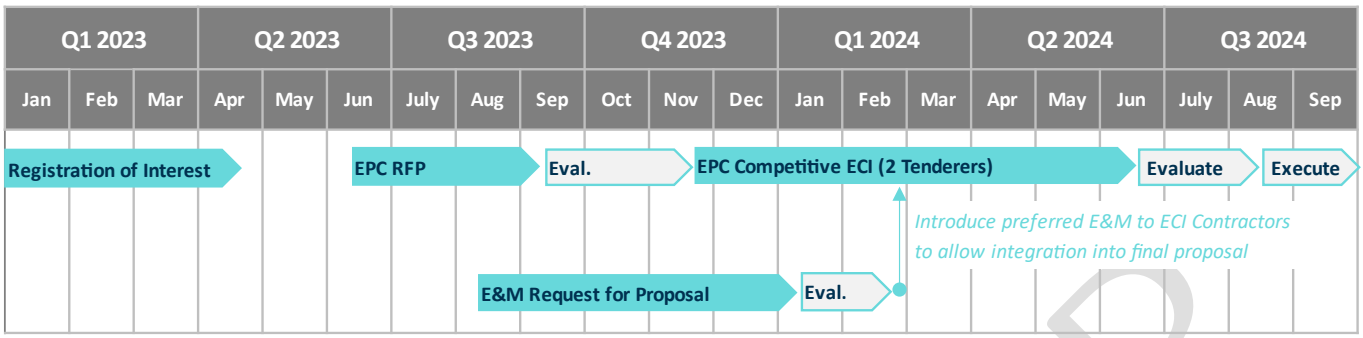


Figure 56: Procurement timeline

The timeline would result in the identification of a preferred tenderer by June 2024, in time for FID.

11.3 Project schedule

A detailed project plan has been developed and is used to manage project delivery to FID finalisation and approval, and procurement of the ECI. Progress is monitored regularly, and the plan is adjusted as necessary. An overview of key milestones is provided in **Table 34.** The final business case will include a schedule for the construction works.

Table 34: Overview of key project milestones

ID	Key milestone description	Date
1	Commence formal approvals process through lodgement of Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC) referral	March 2023
2	Board Approval of preliminary business case and funding request for ECI phase and capability build (April Board meeting)	April 2023
3	Funding request for ECI phase and capability build (May Board meeting)	May 2023
4	Lodge Notice of Intent	May 2023
5	Release of ECI RFP	June 2023
6	Release of E&M RFP	August 2023
7	Readiness for competitive ECI phase (reference design, tech specs, Geotechnical Baseline Report, cost estimate and construction schedule, Owner's Team) and execute ECI contracts with 2 selected proponents	November 2023
8	Finalise final business case ahead of FID	December 2023

ID	Key milestone description	Date
9	Board endorsement of final business case (initial release for stakeholder engagement and securing funding)	December 2023
10	Select E&M preferred tenderer	February 2024
11	Secure parliamentary approvals	February 2024
12	Lodge Environmental Impacts Statement and Development Application (DA)	March 2024
13	Secure funding arrangements including any support mechanisms	April 2024
14	Finalise connection agreement	April 2024
15	Complete ECI competitive phase and receive final tender submissions	June 2024
16	Verify final business case with market pricing from ECI to support FID	June 2024
17	Select of EPC preferred contractor	From June 2024
18	Board approval of final business case and FID	July 2024
19	Conclude negotiations with preferred tenderer and execute EPC contract	October 2024
20	Place E&M order under main contract	October 2024
21	Mitigate any construction impacts on affected stakeholders	Q3 2024
22	Progress workforce accommodation to support construction schedule	Q3 2024
23	Secure environmental offsets	Q3 2024
24	Receive permit and approval conditions (pre appeals period)	December 2024
25	Meet permit conditions prior to commencement of works (management plans, other)	January 2025
26	Commence works on site under main contract	January 2025
27	Start of wet commissioning (first power)	October 2028
28	Commissioning of first machine (1 of 2)	December 2028

Chapter 12: Implementation

12.1 Chapter overview

Purpose

This chapter details the implementation and project management considerations for the recommended project option (identified in **Chapter 9**), including:

- Planning, environmental and heritage assessment (**Section 12.2**)
- Stakeholder engagement and communications (**Section 12.3**)
- Governance (**Section 12.4**)
- Change management (**Section 12.5**)
- Project management strategy (**Section 12.6**)
- Key performance indicators (**Section 12.7**)
- Readiness and next steps (**Section 12.8**).

Key points

Approvals

- The planning, environmental and heritage assessments and approvals necessary to support the delivery of the Tarraleah redevelopment have been outlined in the Tarraleah approvals pathway prepared by Hydro Tasmania's BotN Social and Environmental Impact Assessment Team.
- The project may trigger *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) approval. The project has been referred to the Australian Government's Department of Climate Change, Energy, Environment and Water (DCCEEW). Conditions may be applied to the project as part of its approvals.

Stakeholder engagement and communications

- A stakeholder engagement plan (SEP) has been developed for the project. A detailed community engagement process is ongoing with community information sessions held most recently in March 2023. The SEP includes specific activities to support the project through the detailed design, development planning and development approvals phase of the project, up to and including the FID in July 2024.

Governance

- Hydro Tasmania has established a project governance framework that will be in place until FID to guide and inform decision making, facilitate a transparent and accountable reporting arrangement and enable the efficient and effective management of project delivery and risk management.

Project management strategy

- A project management strategy with a full resource plan has been developed for the pre-construction phase of the project. It includes seeking approvals and running a procurement process to enable construction to start immediately after FID.

12.2 Planning, environmental and heritage assessment

The planning, environmental and heritage assessments and approvals necessary to support the delivery of the Tarraleah redevelopment have been outlined in the Tarraleah approvals pathway document prepared by Hydro Tasmania's BotN Environmental and Social Impact Assessment (ESIA) team. The approvals pathway document describes the risks, benefits and critical inputs associated with four identified options that are considered most likely to apply to the Tarraleah redevelopment project. A preferred option is recommended based on the resultant risk position for the business.

Having regard to the likely environmental and cultural impacts of the project, it is expected that the following planning, environmental and heritage assessments and approvals will be required:

- referral, assessment, and approval under the EPBC
- assessment as a Level 2 activity in accordance with the *Environmental Management and Pollution Control Act 1994* (Tas) (EMPC)
- a Reserve Activity Assessment under the *National Parks and Reserves Management Act 2002* (Tas)
- a permit/s to take/interfere with Aboriginal Relics under the *Aboriginal Heritage Act 1975* (Tas)
- a Heritage Agreement under the *Historic Cultural Heritage Act 1995* (Tas)
- a permit/s to take threatened species under the *Threatened Species Protection Act 1995* (Tas)
- a forest activity assessment under the *Forest Management Act 2013* (Tas).

Based on the assessment to date, there are no significant risks associated with the planning approval process.

Further detail on the planning, environmental and heritage assessment process is provided in **Appendix H.**

12.3 Stakeholder engagement and communications

The project area is predominantly production forestry and hydropower generation, and as such there are very few directly or indirectly impacted landholders or communities. Initial consultation and engagement indicate that the key impacts from a community perspective are those related to visual changes in the landscape (during construction and enduring) and traffic and noise impacts during construction.

Tarraleah (and other infrastructure associated with the River Derwent hydro-electric scheme) has been a feature of the local and regional landscape for over 80 years. Regional communities are therefore acclimatised to the features of the landscape associated with hydropower generation and transmission.

General community engagement has been in the form of early community information sessions and interest group briefings, social media, local print media, public notices on community notice boards, all complemented by a project webpage (https://connect.hydro.com.au/reimagining-tarraleah). The website includes frequently asked questions, capacity to ask a question and a 'subscribe' facility to enable interested parties to receive updates, notifications and general information through direct mail-outs.

In addition, there is a specific section on the EPBC referral process provided on the project webpage.

12.3.1 Stakeholder Engagement Plan

Hydro Tasmania is committed to meaningful stakeholder and community engagement in order to develop and implement a sustainable project, grounded on the support of communities and key stakeholders. This will be achieved by interacting with communities and stakeholders to manage project related risks, reduce impacts, maximise benefits and obtain public support for the Tarraleah Redevelopment project.

A stakeholder engagement plan (SEP) has been developed for the project, with the following objectives:

- Keep communities and stakeholders informed about project proposals and plans and provide opportunities for feedback into decision processes at the appropriate times, managing expectations throughout.
- Ensure the project understands stakeholder perceptions and potential concerns about the proposed project through participatory dialogue and engagement.
- Identify key stakeholders that are affected by, and/or able to influence the Project and its activities and engage them in impact assessments and other studies and processes.
- Enable communities and stakeholders to understand the value proposition of the Tarraleah Redevelopment Project, and the PHES/BotN more broadly, for Tasmania.
- Support the development of impact assessments and mitigation plans (Social Impact Assessment, Social Impact Management Plan, Benefit Sharing Plan) essential to the preparation of the DA documentation in line with all relevant regulatory requirements for approval.
- Build an understanding of the feasibility and decision making around the design of project infrastructure.

Under the SEP, a detailed community engagement process is ongoing with information sessions held most recently in March 2023. The SEP includes specific activities to support the project through the detailed design, development planning and development approvals phase of the project, up to and including the FID in July 2024.

The key deliverables from the engagement activities include:

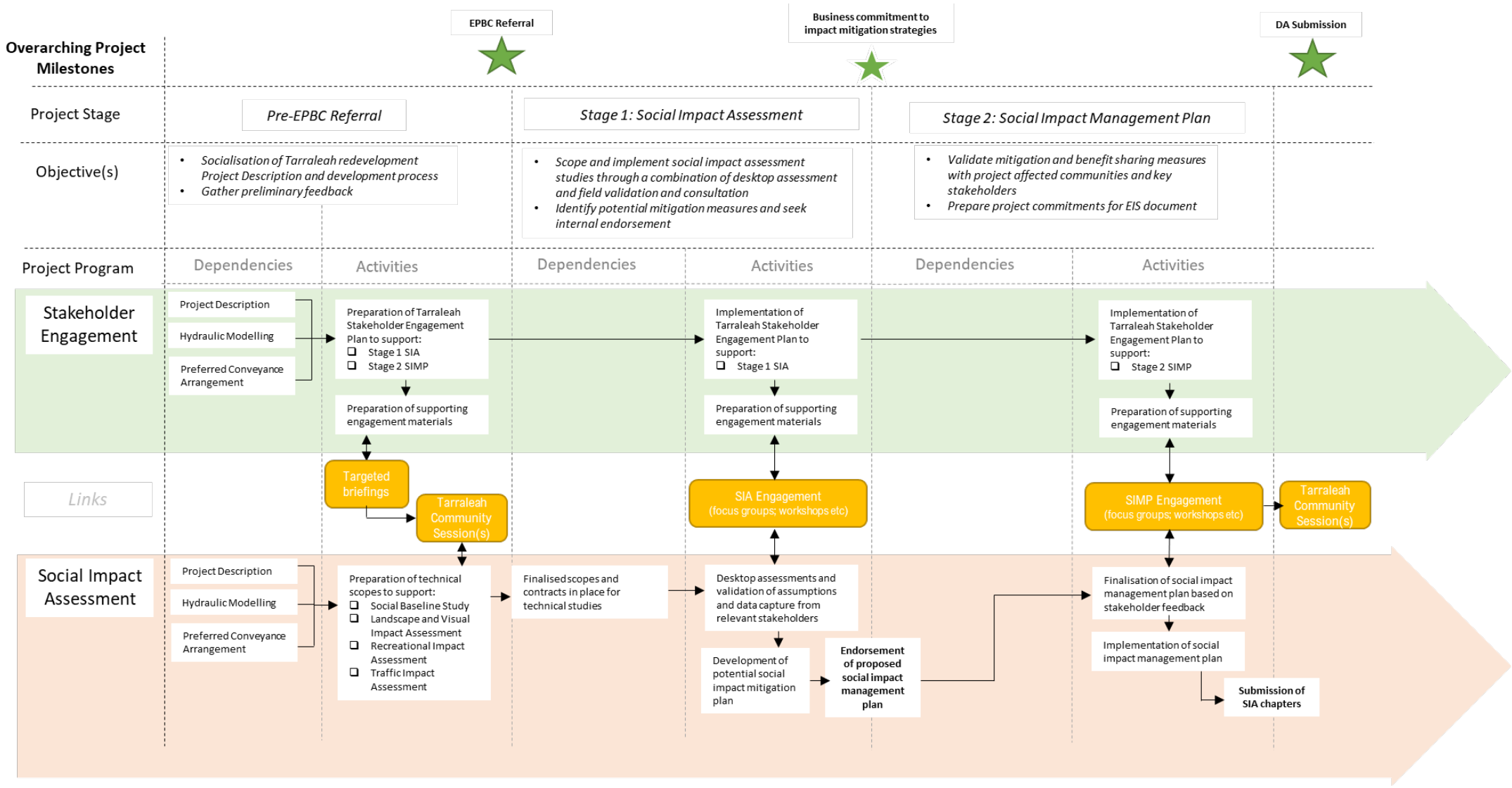
- A social baseline and impact assessment report. This is an engagement process aimed at understanding the potential range of impacts of the Tarraleah Redevelopment project and identifying mitigation measures in consultation with the stakeholders and communities that will be impacted if the project takes place.
- Access and easement agreements as required for the project.
- Benefit sharing program design. This is a strategy to equitably distribute the benefits and impacts of the project with local communities as partners in development. This will be achieved by including communities in the co-design of benefits sharing schemes and involving local businesses in the contracting and procurement processes. The objective is to build a legacy of positive economic and regional development initiatives that are recognised by host communities as deriving from the development project.
- Social impact Management Plan. Develop a plan to manage and mitigate impacts with directly and indirectly affected parties.

The SEP is attached in **Appendix I** and represents an initial plan for engagement activities that will continue to be developed and expanded as details of the project are developed.

Further updates to the SEP will also be required for future stages once the project has been endorsed. It is intended that the SEP would continue to be developed over time throughout all phases of the project, including construction, operation and decommissioning – representing a continued commitment to engage with the local community and stakeholders to provide on-going information sharing and careful consideration of potential impacts and benefits.

The approach overview, shown in **Figure 60** is based upon the BotN stakeholder management guidelines (also located in **Appendix I**) and is influenced by the concurrent engagements required to manage the Tarraleah Upgrade works alongside the Tarraleah Redevelopment pre-FID activities.

Figure 57: Stakeholder engagement overview



12.3.2 Key stakeholders

An overview of the key stakeholders identified to date, their interest in the project and the indicative consultation approach (including actions to date) is summarised in **Table 35** and **Table 36.** It is relevant to note that the identification of stakeholders and communities directly and indirectly affected will continue to be developed through the final business case phase, and that this list may change over time.

Local groups

Local groups impacted by the project include businesses, recreational users and Aboriginal communities/groups. Their interest in the project and the proposed consultation approach is summarised in **Table 35**.

Table 35: Local groups

Interest in project	Consultation approach
Anglers and other recreational user groups	
• Preservation of the natural environment • Stability and diversity of local fish populations and species • Continued access to fishing locations during construction and once commissioned.	The angling community has been engaged through briefing sessions with the Anglers Alliance (October 2022) and Trout Guides and Lodges Association of Tasmania (October 2022), as well as regular communications with Inland Fisheries Service and Marine and Safety Tasmania, as key communications channels for recreational users of the lakes and waterways within the project area.
Central Highlands Progress Association and Great Lakes Community Centre	
• Impact on owners' shacks and surrounding area • Preservation of trout health and populations • Preservation of visual amenity and natural environment • Tourism.	The Central Highlands Progress Association and Great Lakes Community Centre have been directly engaged and have been active in sharing project information with local shack owners, through posters and flyers. Face-to-face briefings with community organisations and 'community drop-in sessions' were held in early 2023. Early-stage community drop-in sessions and interest group briefings were held previously in 2019 and 2021.
Sustainable Timber Tasmania	
• Impact on healthy, thriving, and productive Tasmanian forests • Fire management.	The SEP aims to ensure information sharing on the project, its impacts, timeframes and key-decision points and to seek feedback throughout the stages of development. Face-to-face briefings will be offered at high levels and operational relationships are well established.

Interest in project	Consultation approach
Aboriginal communities/groups	
• Preservation of cultural values and sites • Preservation of visual amenity and natural environment • Energy prices.	Aboriginal community members have been engaged in several ways. For example, Aboriginal Heritage Officers and community members have been involved in the survey, identification and relocation of Aboriginal heritage artefacts from sites directly impacted by (current) scheme upgrade works. Aboriginal consultants are currently involved in the process of architectural design and interpretation of the proposed new Tarraleah Power Station. These and other engagement activities have enabled consultation with community around the broader Redevelopment Project to be undertaken simultaneously. The Tasmanian Aboriginal Heritage Council was briefed in October 2022 and an Aboriginal Liaison officer has recently been engaged by Hydro Tasmania to further develop and implement plans for Aboriginal community engagement and participation. Engagement will continue to build relationships, identify interests and seek feedback through direct discussions throughout all phases of the SEP.
Marinus Link and NW Transmission Development (TasNetworks)	
• Utilisation of Tasmania's RE sources • Energy market stability.	Hydro Tasmania is collaborating with Marinus Link and TasNetworks to coordinate and complement efforts and messaging with other stakeholders.
Key Businesses and Organisations (e.g. Tasmanian Small Business Council, Chambers of Commerce, Tasmanian Minerals, Manufacturing and Energy Council) and other local bodies	
• Local economics • Resource opportunities • Local supply options.	Immediate briefings have been offered to key entities. BotN has been the key item at the last two Chairmans Stakeholder events, and is also the theme for the May event in Launceston. Over 50 external stakeholders are invited to each event, including CEOs, Chambers of Commerce, local councils, key influencers and directors and Chairs of leading businesses.

Government stakeholders

Local government represents the local community and is therefore interested in similar issues as the local groups discussed above. State and Australian Government groups are interested in the project's alignment with government strategy and policy and compliance with environmental, planning and heritage requirements.

Their interest in the project and the proposed consultation approach is summarised in **Table 36.**

Table 36: Government stakeholders

Nature of interest	Consultation approach
Local government authorities	
• On site works and impact on local community	To date local government has been supportive of the project. Central Highlands Council have been closely engaged from early stages of the project and ongoing engagement is planned. This has

Nature of interest	Consultation approach
• Traffic management and noise management during construction • Utilisation of existing infrastructure and services • Tourism • Local employment and housing impacts.	included a briefing in March 2022 and a site tour for Council staff in November 2022. A site tour for Councillors is planned for early 2023. Other municipalities (Derwent Valley Council, Brighton Council) have been informed about the project and offered briefings (which have not yet been taken up).
Tasmanian Parks and Wildlife Service (PWS)	
• Surrounding parks and wildlife • Natural attractions • Visitor impacts/ tourism • Fire management.	The SEP aims to ensure information sharing on the project, its impacts, timeframes and key-decision points and seek feedback throughout the stages of development. Face-to-face briefings will be offered. Approvals from PWS are required for elements of the project on PWS land.
Australian and State Governments	
• Shareholder approval (State Government) • Alignment with renewable energy targets • Net-zero commitments • Alignment with planned investments.	There has been significant interaction with the State Government to progress the BotN project. This has included direct briefs to the Premier, Minister for Energy and Renewables and the Treasurer, and to Dean Winter MP (Shadow Minister for Energy) and the Legislative Council. It includes provision of information to support national Energy Minister's meetings, and other government communications including editorials in local papers and government speeches. This work will continue as the final business case is developed, with meetings set in Ministerial calendars in May 2023 to provide a progress update. Further briefings will be arranged as required and have been offered to the Tasmanian Minister for Environment and Climate Change to support the EPBC referral. This State Government interaction is supplemented by briefings provided to a number of Federal politicians, including Senators Carol Brown (Labor), Catryna Bilyk (Labor), Anne Urquhart (Labor), Jono Duniam (Liberal) and Tammy Tyrell (Jacqui Lambie Network), and House of Representatives members Brian Mitchell (Labor), Andrew Wilkie (Independent) and Ted O'Brien (Shadow Minister for Climate Change and Energy). Briefings have also been offered to all other Tasmanian Senators and Representatives.
Renewables, Climate and Future Industries Tasmania (ReCFIT)	
• Progress toward climate action • Renewable projects in Tasmania • Oversight on energy regulation and energy mix.	There is regular communication with ReCFIT who in turn inform the Victorian Department of Energy, Environment and Climate Action (DEECA). Fortnightly meetings with ReCFIT, specifically on BotN, have been re-established and will continue as the business case is developed. A key focus will be consideration of the process to progress a Motion through both Houses of Parliament, in accordance with Section 8 of the *Hydro-Electric Corporation Act 1995,* which enables Hydro Tasmania to construct, or participate in constructing, a major power facility (over 40MW).

Nature of interest	Consultation approach
	ReCFIT has also been asked for further detail on the Letter of Intent, particularly around the Marinus Link Principles. ReCFIT has noted that the State will be undertaking work across energy projects to better understand timing, how they meet Government objectives, costs and other impacts, and the Tarraleah business case should help complement that. There has also been interaction with Treasury, both on the development of the business case, and on the procurement process to support Tarraleah. Regular monthly meetings have been established with both Treasury and ReCFIT specifically on the business case development, and these meetings are timed to follow Hydro Tasmania Board meetings. Hydro Tasmania is also seeking to establish (through ReCFIT) CEO forums. These will include Marinus Link and potentially TasNetworks, and will help alignment across organisations, as well as assist in provision of information to the Cabinet Energy Sub-Committee.
DEECA (Victoria)	
• Victoria's RETs • Energy price stability for Victorians • Energy uptake from Tasmania RE sources.	Informed by ReCFIT
Regional Development Australia	
• Regional tourism • Regional energy price stability • Regional economics.	Regional Development Australia has recently been briefed and an ongoing relationship has developed.
Energy bodies - AEMO, AEMC, Australian Energy Regulator and the Energy Security Board	
• Provision for affordable, secure, and reliable energy • Alignment with strategic direction for the NEM.	These stakeholders will be advised as appropriate.
Marinus Link Pty Ltd	
• Energy market stability • Optimisation of Marinus Link investment.	Hydro Tasmania will work with Marinus Link to coordinate and complement efforts and messaging with other stakeholders. Hydro Tasmania's Communications team joins the Marinus Communications team regularly for meetings, and the Hydro Tasmania Government Relations team meets Marinus Link's equivalent fortnightly to ensure alignment of narrative and actions. Hydro Tasmania is also working to establish CEO Forums, including Marinus Link.

12.4 Governance

Project governance and control is critical to a project's ultimate success. A project governance framework is being refined to guide and inform decision making and to facilitate a transparent and accountable reporting

arrangement up to FID. It will enable the efficient and effective management of project delivery and risk management.

The proposed governance arrangements are assumed to be in place until FID, to provide clear lines of communication and reporting, with clear accountabilities at all project levels. The governance structure is also cognisant of the need to develop strategy at a business level in a future world with further interconnection, to respond to changing circumstances and to provide timely decision making.

Many governance arrangements are in place, however, they will be further developed in coming months in conjunction with the ongoing activities at an Executive level.

A separate governance arrangement for project delivery is being prepared and will be included in the final business case to support the delivery phase through construction.

Figure 61 summarises the proposed governance structure, with more detail on provided in **Table 37.**

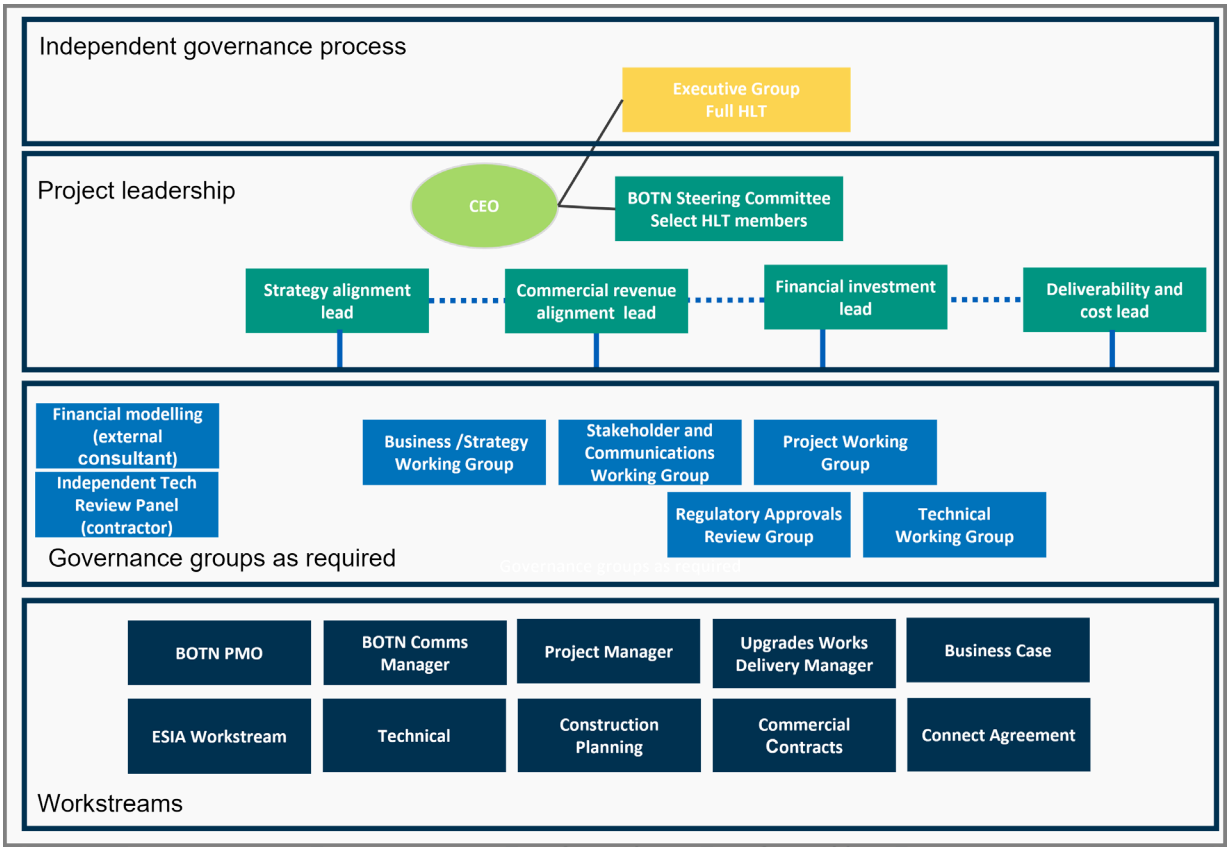


Figure 58: Governance structure

The following table provides further detail on the key responsibilities and accountabilities.

Table 37: Governance: roles and responsibilities

Party/Member	Function and responsibility
CEO	• Accountable and responsible for overall BotN program delivery to meet objectives • Reports to the Board • Convenor of BotN Steering Committee and appoints membership • Ownership of key engagement with government (including securing parliamentary and government approvals)

Party/Member	Function and responsibility
	• Ownership of change program to support BotN • Ownership of business case, approved expenditure and expected benefits • Provides ongoing oversight and guidance on risks and associated risks mitigating actions and ongoing risk management activities • Manages and communicates other business risks (outside BotN Steering Committee process) that may impact the project • Provision of support by advocacy at Hydro-electric Corporation Leadership Team (HLT) ensuring that the necessary business resources are available to the project • Ensures post implementation review is undertaken
HLT	• Reports to the CEO • Supports the CEO in the management of the business at an executive level including in its reporting to the Board • Supports the BotN Program Sponsor in the management of the BotN Program at an executive level including in its reporting to the Board and escalation of issues beyond the CEO delegation
BotN Steering Committee	• Reports to the CEO and HLT • Endorses for CEO and Board approval budgetary strategy and monitoring finances, defining, and realising benefits, and monitoring risk management strategy and risks, quality and timeliness • Forms project policies • Defines project objectives, including endorsement or delivery of key decisions on the project in conjunction with the Project Director, subject to Hydro Tasmania's Delegations Manual and possible Board approvals • Provides management and guidance to the Project Director in the development of project outputs that align with business requirements • Takes on responsibility for the project's feasibility, business plan and achievement of outcomes whilst ensuring project objectives continue to align with Hydro Tasmania business drivers throughout the duration of project • Endorses or approval of key decisions that support the meeting of project objectives • Assesses and approves changes to project scope or project management plan • Approves project proceeding to next phases of the project • Resolves project resourcing • Resolves priorities as required throughout the project
Deliverability and cost lead	Accountable for the successful delivery of the business case with the following key responsibilities during the planning and delivery stage: • ensure that the project meets its objectives and is delivered to the required quality, schedule, and budget, whilst managing Hydro Tasmania's external relationships and reputation • engage with Steering Committee for clarification and agreement of project targets, objectives, target outcomes, required outputs and stakeholders • ensure the project has internal support from the business and that the project team can efficiently navigate internal processes or blockers

Party/Member	Function and responsibility
	• participate in the relevant BotN Working Groups that are managing risk, ensuring that they are functioning effectively • manage any interfaces between the Tarraleah redevelopment project and the SAMP as well as other BotN projects • authorise project procurement in accordance with Hydro Tasmania Delegations Manual, including the engagement of external consultants and contractors to facilitate achievement of the project outcomes • prepare funding requests, business cases and Board reports with the project team • manage execution of project delivery strategy • navigate statutory approvals • navigate local community stakeholder engagement and consultation and risks • prepare for, and transition, into construction phase ahead of FID and then to operation • develop processes and systems as required to support implementation and operation • manage grant funding processes and stakeholder relationships • deliver (design and implementation) Tarraleah Upgrade works program
Strategy alignment lead	• In the context of whole of business strategy, support the project to align with corporate expectations in the short and long term as a market participant, a utility, and a government business enterprise. • Set key performance indicators and business requirements across a range of areas to inform broader project delivery objectives, particularly through the construction phase.
Commercial revenue alignment lead	• Ensure the approach to recognising revenue for the project is aligned with broader business' key assumptions. The project may require a longer-term view and that the mechanisms to earn revenue in this longer term may also differ because of the large capital investment being required for BotN projects.
Financial investment lead	• In the context of the broader business, secure funding and gain required support for the project through interactions with key stakeholders including key government relationships in Treasury.

Various working groups and review groups providing a governance function to the Project Director	Individual working groups have been established to provide subject matter advice to the Project Director - BotN Projects in support of the management of project risks in wider business context on behalf of the BotN Steering Committee
	Five groups have been identified as follows:
	• Stakeholder and Communications:
	  • support implementation of the project stakeholder and communications strategy aligned with business strategy and objectives
	  • support delivery of stakeholder engagement and communications plans aligned to key project deliverables, both internal and external.
	• Regulatory Approvals Working Group (to be formally established) [56] :

[56] Group has been working on as-needs basis to date (e.g. for the EPBC referral). Going forward it will form a permanent group.

Party/Member	Function and responsibility
	• endorsement of the proposed mitigations for the EPBC referral largely associated with water operational issues was secured through the EPBC referral review group (now completed) • to be responsible for managing risks and overseeing progress through the approvals process looking ahead into delivery and operations phases. • Technical Working Group: • participation in defining project scope and providing technical direction/review in support of the Design Manager, including from the Asset Owner viewpoint • review and endorsement of deliverables including reference designs, owners' requirements, and technical specifications aligned with the selected procurement strategy. • Project Working Group (to be formally established): • oversight of the development of the procurement strategy was managed by the Procurement Steering Committee (now completed) • responsible for managing risks and overseeing progress through procurement looking ahead into delivery and operations phases • responsible for oversight of the delivery of the preliminary and final business case, and all associated interim approvals required through that process • secure detailed funding agreements including any government support (e.g. underwriting) • management of competing or cross-workstream project objectives and/or risks before escalation to BotN Steering Committee. • Business / Strategy Working Group (to be revised): • responsible for providing key insight into the business requirements for the project • ensuring alignment with the wider business strategy.
Tarraleah project team and workstreams across all elements of project delivery up to FID	The team is responsible for different workstreams with work involving: • Undertakes tasks assigned by Project Director- Tarraleah and building appropriate project-wide scope to deliver the project objectives to reach FID • Deliver upgrade works programs • Manages project-level and workstream-level risks • Monitors project progress and direction • Secures internal resources and procuring external service partners, providers, and suppliers to support delivery • Works together to deliver project objectives across all workstreams • Coordinates and supports relevant working groups • Prepares the project for future phases including necessary plans for next stage.

12.5 Change management

Hydro Tasmania has an organisation-wide change management operational model that uses various tools to assess upcoming change initiatives. The expected impact of the upcoming change is then assessed as low, medium or high.

The redevelopment of Tarraleah will be the largest project undertaken by Hydro Tasmania in 30 years[57] and requires a step change in delivery capability. As such, the project has been identified as a high-risk change. A Change Lead has been integrated as a core member of the project delivery team and will facilitate appropriate tools and activities to effectively support delivery, embedding and measurement of the change.

A detailed change management plan will be developed in the final business case.

12.6 Project management strategy

A project management strategy has been included for the pre-construction phase. This phase includes seeking approvals as well as running a procurement process to enable construction to start immediately after FID. There is also a series of upgrade works being delivered separately which are drawing on key resources and workstreams from the redevelopment team.

A fully resourced schedule has been developed and includes all the supporting activities through to FID. This schedule:

- is being managed centrally by the BotN Program Management Office (PMO) and updated on an ongoing basis (including updated activities and new sequencing as required)
- includes tasks within workstreams and maps those dependencies between workstreams at an overall project level
- includes tasks leading into the start of construction to manage the overall delivery timeline through to operation
- will inform our overall budget (currently under refinement with the selected procurement strategy) to take the project to FID and to be ready to deliver it (including uplifting business capability where required).

12.6.1 Resourcing

The Tarraleah redevelopment project is being delivered using the governance structure outlined in **Section 12.4**. Subject matter experts have been appointed on a dedicated basis (0.7 to 1.0 full time equivalent (FTE)) to lead the workstreams, with supporting project management expertise within their own workstreams as required. These include:

- technical (including design and geotechnical assessment)
- ESIA, including stakeholder management and communications
- construction planning (including procurement)
- connection agreement
- business case development
- PMO development.

Each workstream is responsible for developing their own management plans to support their activities (whether that be a design management plan, procurement plans, an approvals strategy or stakeholder management plans).

[57] The Tribute Power Station (including a long tunnel) was constructed between Lakes Plimsoll and Murchison in 1994.

Some workstreams draw mainly on internal resources from Hydro Tasmania and Entura (Hydro Tasmania's Consulting business), while other workstreams are relying more heavily on external experts (or both).

In parallel to completing the final business case to support a positive FID outcome, the project will move further into the procurement phase. To facilitate this, the project team will include the following key roles:

- a dedicated Tarraleah Project Director (reporting to the BotN Projects Director/Program Director)
- a Commercial Contracts Manager (0.5 FTE) accountable for leading a team to establish fit for purpose contracts.

As the project continues to mature, administrative support will be required to support establishing accommodation needs, logistics and other support as the team continues to grow. The project will draw on the existing resources to provide integrated human resources (HR) support.

As part of the development of the final business case, full project management documentation will be developed outlining the strategy and polices to support the construction phase. This will also include a suite of policies and approaches that are cohesive with the business-as-usual processes within Hydro Tasmania.

12.7 Key performance indicators

Key performance indicators (KPIs) will be refined in the final business case, including targets, baselines and reporting framework. A preliminary list that will be considered and scoped further in the final business case is summarised in **Table 38.**

Table 38: Indicative KPIs

KPI	Potential measure/s
Improved reliability of supply	• Reduced frequency and/or duration of planned and unplanned disruptions.
Flexible special water licence with operational flexibility	Hydro Tasmania and Head Contractor environmental performance measures: • certainty of environmental permit conditions (Hydro Tasmania) (i.e. no surprises) • construction environmental performance measures against plans (Contractor) • reduced likelihood of TWWHA impacts from canal failure.
Offset in emissions generated by the NEM	• Increased number of REGO certificates.
Firming benefit	• Reduced time taken to ramp up/down.
Improved commercial outcomes	• Increased revenue attributable to Tarraleah Power Station.
Social licence for project	• Market research survey results and qualitative measures demonstrate broad community support for the project.
Local benefits of project	• Percentage of contracts awarded to Tasmanian businesses • Successful implementation of project local benefit sharing plan (as per HLT endorsed plan.
Confidence in Hydro Tasmania's capability to deliver mega projects ($1b+)	• Market research result on public perception

12.8 Readiness and next steps

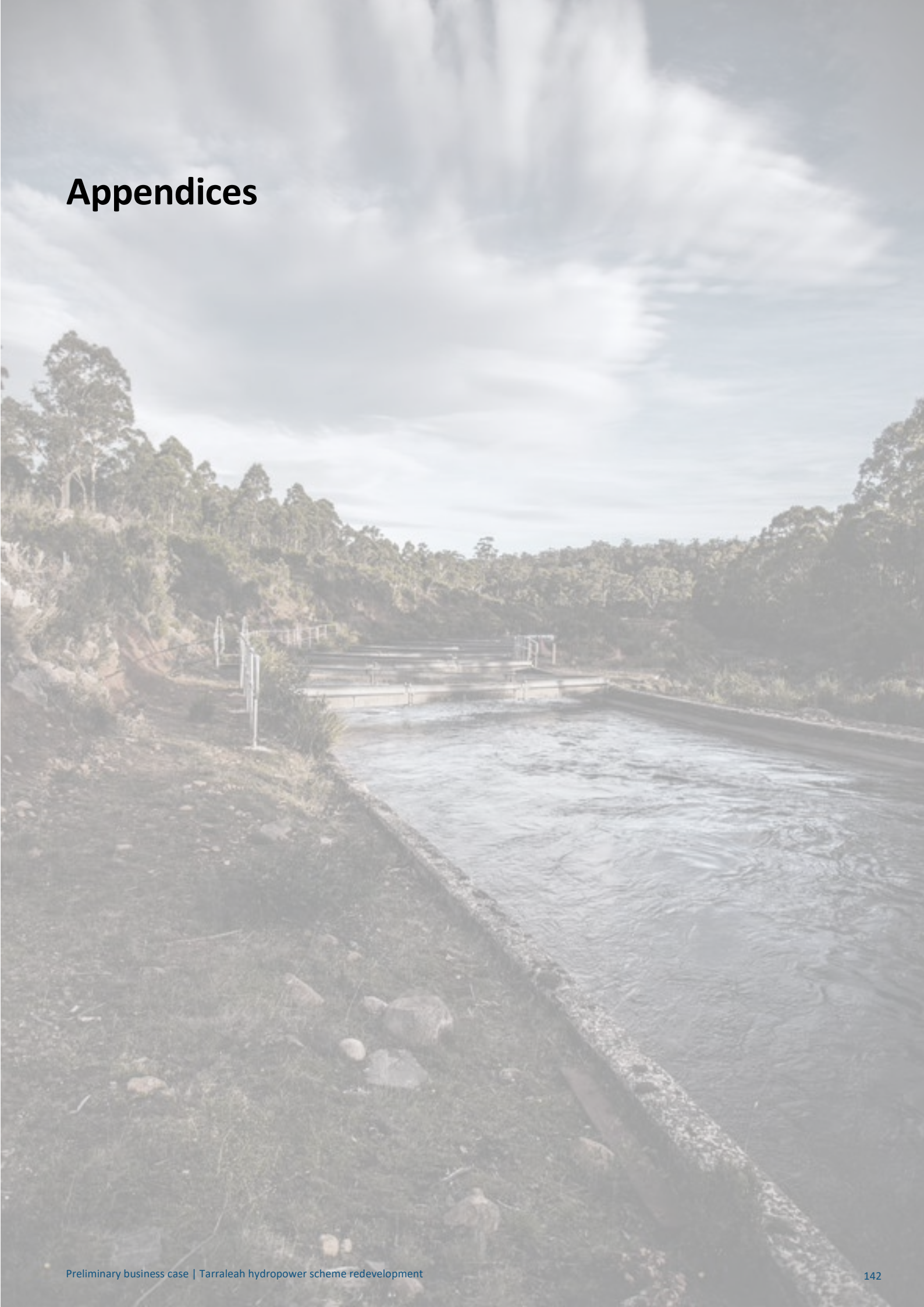
The governance structure and project management strategy are currently being refined to support taking the business case to FID. There is sufficient confidence in the preferred option recommended to progress procurement activities prior to the final business case.

The preparation for the final business case will include the activities outlined in **Table 39**.

Table 39: Final business case activities

Workstream	Preparatory activities
Technical and procurement	• Refine design, schedule, risk allocation and cost estimate for the recommended option through the competitive ECI phase • Develop suite of procurement and delivery contracts, as well as RFP documentation.
Commercial	• Further work on the contracting strategy to refine the associated revenue projections.
Project delivery	• Continuous updating of the risk register including alignment between construction phase risks and allowed budget contingencies • Completion of a change management plan • Build internal capabilities to deliver works • Progressing planning, environment and heritage assessments and associated referrals • Finalisation and adoption of the updated governance structure • Completion of a project management plan for the construction phase • Refinement of KPIs.
Funding strategy	• Consideration and testing of different financing options.
Approvals	• Engagement with other approving parties (e.g. Tasmanian Government) and financing partners.

Appendices



Appendix A: Summary of no-regrets upgrade works

The proposed **physical upgrade works** to be progressed prior to FID are set out in **Table 40** and shown in the following diagram of the full Tarraleah scheme (**Figure).** The work will be delivered in three (3) packages 'A', 'B' and 'C'; noting Package B is split into two components to support the proposed milestone payment schedule.

Table 40: Summary of no-regrets upgrade works

Works Package	Description	Colour coding in map
A	Design and specification, procurement and approvals of: • Lake King William intake – and starting excavation, opportunistic access channel and access works • Lake King William tunnel – and associated downstream portal approach excavation and access works • Mossy Marsh dam upgrade, emergency spillway and access – and completion of construction • Communications and power to Lake King William intake and tunnel portal sites – and staged delivery works	Green
B-1	Construction of: • Lake King William Intake final excavation and further opportunistic approach channel works • Lake King William tunnel excavation.	Blue
B-2	Procurement and construction of: • Lake King William intake structure	Blue
C	Design and specification, procurement, approvals and construction of potential flexible scope items adapted to actual project development requirements, including but not limited to elements such as: • Further site preparation and establishment activities, road improvements, further site-wide comms and power, Lake King William intake access channel, Lake King William tunnel lining and any other activity associated with the tunnel, No. 3 pipeline site preparation works, Mossy Marsh Pond Control Structure, and construction camp works, workforce accommodation improvements and maintenance.	Yellow
Post FID	• Completion of water conveyance (including pipeline and downstream tunnelling) from new intake structure to power station • New power station (including power tunnel and surge facilities).	Red

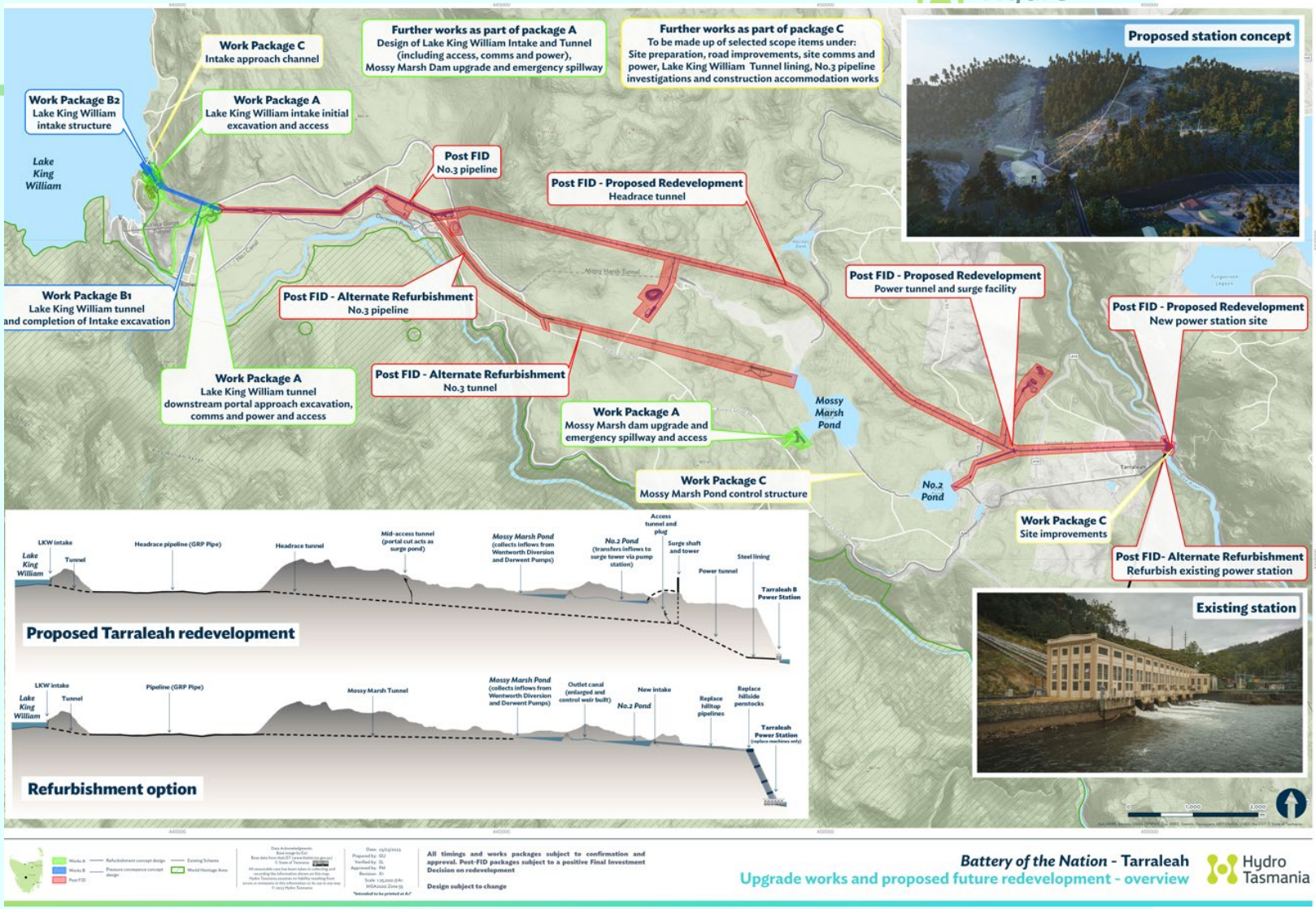


Figure 59: Diagram showing no-regrets upgrade works

Appendix B: Project options works summary

Table 41: Summary of asset operation, decommission and changing scheme across Status Quo and project options

Component	Description	Status Quo	Option 1: Decommission	Option 2: Minimum Refurbishment	Option 3: Refurbishment with BESS	Option 4: Redevelopment with Headponds	Option 5: Redevelopment with Pressurised Conveyance
CAPEX (P50)	Capital expenditure for delivery up to 2049 (real 2023 dollars)	**$515m**	**$188m**	**$851m**	**$1.04b**	**$1.07b**	**$1.05b**
Tarraleah (existing power station)	Existing operation - 6 x15 MW	-	×			×	×
	Machines replaced - 6 x 17 MW			✓	✓		
Tarraleah B (new power station)	3 x 55 MW machines					✓	
	2 x 100 MW machines						✓
Transfer conveyance	No. 1 canal	-	×	×	×	×	×
	Butlers Gorge Machine - 12 MW	-	✓	×	×	×	×
	No. 2 canal	-	×	×	×	×	×
	Nieterana Mini-hydro Power Station	-	×	×	×	×	×
	Derwent Pumps	-	×	-	-	-	-
	Wentworth, Hornes and other diversions	-	×	-	-	-	-
	No. 3 System 32 to 40 m^3/s			✓	✓	✓	
	Pressure Conveyance 61 m^3/s						✓
Transmission network	110 kV	-					
	220 kV			✓	✓	✓	✓
BESS	100 MW 2-hour BESS				✓		

Legend: - No change in operations × Asset decommissioned ✓ Change in configuration / new asset

Appendix C: Project options cost estimates

*Exempt Information – Appendix C 6 pages inclusive - has been removed from this document :- the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests / exposing Hydro Tasmania to competitive disadvantage and prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1).

Appendix D: Detailed modelling scenario assumptions

"Exempt Information – Appendix D has been removed from this document - the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests / exposing Hydro Tasmania to competitive disadvantage and prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1)".

Appendix E: Detailed qualitative options appraisal

"Exempt Information Appendix E has been removed from this document - the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests / exposing Hydro Tasmania to competitive disadvantage and prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1)".

Appendix F: Risk management

"Exempt Information – Appendix F - has been removed from this document - the public disclosure of which would not be in the public interest (s 33 RTI Act) because it would be commercially or procedurally prejudicial to the business or financial interests / exposing Hydro Tasmania to competitive disadvantage and prejudicial to the further assessment of this Preliminary Business Case (s 38 RTI Act & Item (o) and (s) Schedule 1)".

Appendix G: Turner and Townsend Procurement Strategy

22 February 2022

Procurement Strategy

Tarraleah Redevelopment Project Hydro Tasmania

making the **difference**

- **Turner & Townsend Pty Ltd**
  Level 10
  136 Exhibition Street
  Melbourne VIC 3000

Exempt Information has been removed – personal information (name) of 3rd party consultant's employees – s .36 and not in public interest to disclose (items (b), (h) RTI Act)

Hydro Tasmania
Tarraleah Redevelopment Project

Contents

Rev	Originator	Approved	Date
0.1	*****	*****	12/12/2022
1.0	*****	*****	20/12/2022
1.1	*****	*****	22/02/2023

Exempt Information has been removed – personal information of 3rd party consultant's employees – s .36 and not in public interest to disclose (items (b), (h) RTI Act)

Hydro Tasmania
Tarraleah Redevelopment Project

1 Approvals and Consultation

XXXXX Record Sheet
Summary of approval/consultation being sought

Cross Business Review with Stakeholders					
Name / Position					
Business Unit					
Decision	Agree/Disagree	Agree/Disagree	Agree/Disagree	Agree/Disagree	Agree/Disagree
Any interest declared	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No

Approval		
By signing below approvers confirm that they have no business interests in any organisation that may be interested in delivering the required contract.		
Name	**Signature**	**Date**

2 Executive Summary

2.1 ▪ Scope

This report provides a recommended procurement strategy for the redevelopment of the Tarraleah hydro power scheme in the Central Highlands of Tasmania (**the Project**).

The Project consists of the replacement of the existing Tarraleah hydro power scheme with a new modern scheme to make a bigger contribution to a future National Electricity Market (NEM). Out of scope of this report and associated research activities is the Upgrade Program being delivered as early works to the main redevelopment.

The procurement strategy builds on the previously recommended delivery model by adding procurement timelines and recommended contracting and commercial approaches.

Included in the scope of this report is:

- A summary of the approach used to arrive at the recommended procurement strategy;
- A recommended delivery model;
- Recommendations on potential commercial and contracting models; and
- An overview of the procurement timeline.

2.2 ▪ Process

A 5-step approach was utilised to arrive at the recommended procurement strategy, derived from the recommended approach of Infrastructure Australia.

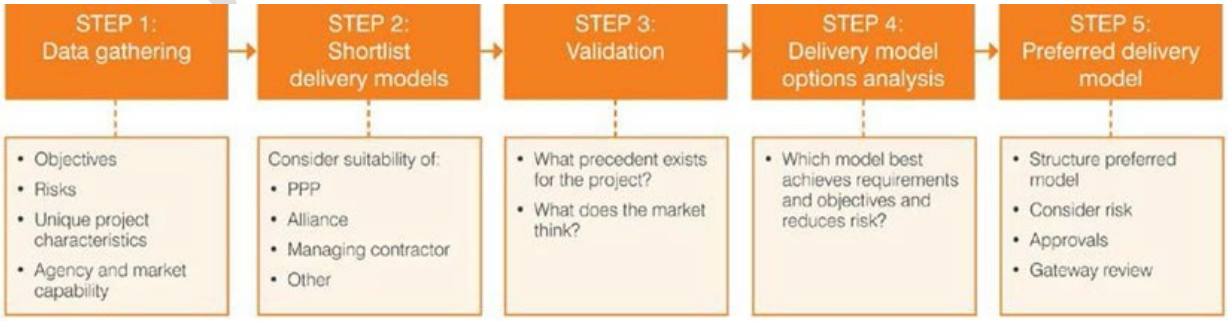


Figure 1 - Infrastructure Australia Procurement & Delivery Strategy Development Process

2.3 ▪ Recommended Delivery Model

Based on the results of the data gathering and analysis outlined above, the recommended Delivery Model for the Project is for a single EPC-style contract, with an Early Contractor Involvement phase.

Ideally, this ECI activity should be a competitive ECI process, comprising two potential contractors, noting however that this is subject to Hydro Tasmania being able to provide sufficient resources to support this process.

Major Electrical and Mechanical (E&M) would be selected by Hydro Tasmania, leveraging the team's knowledge of the supplier market, with the E&M package integrated into the EPC scope of work during the final phase of the ECI activity.

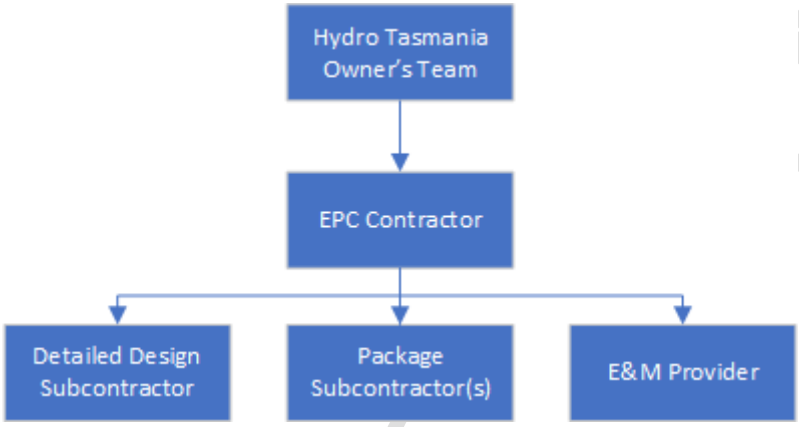


Figure 2 - commercial relationships under a single EPC model

2.4 ▪ Procurement Timeline

The Procurement Timeline is likely to be subject to change, as the expected timing of the availability and maturity of design information is refined.

The current procurement timeline used to develop this procurement strategy is summarised below:

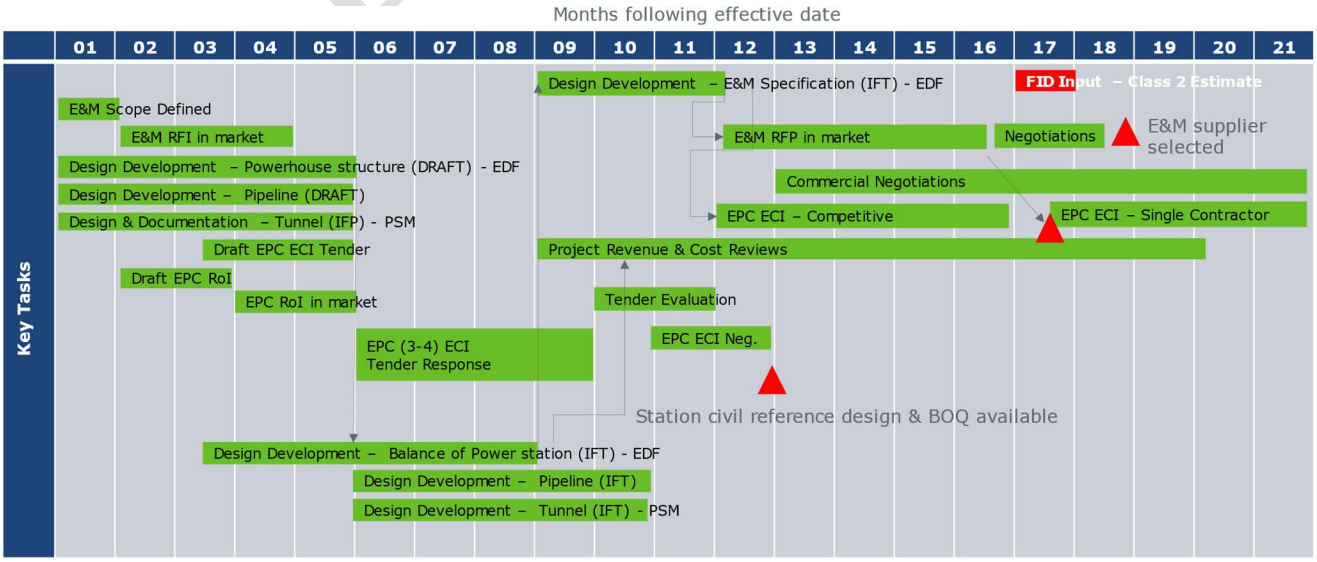


Figure 3 - Indicative Procurement Timeline

2.5 ▪ Recommended Commercial Model

As at the time of this report, the recommendation is that a target cost model is adopted for the project, comprising:

- Agreed target costs for specific packages (at the end of the ECI phase);

- If required, cost-reimbursable packages where design or requirements are unclear, or the contractor is unable to accept the risk;
- Project-level contract incentives such as pain-share/gain-share mechanisms for cost performance, or key performance indicators for non-cost targets (for example where incentives are paid or penalties incurred relating to safety targets); and
- liquidated damages regimes to address potential costs to Hydro Tasmania associated with poor performance or delay.

Similar to the Contracting Model options, the commercial model will be refined during the ECI phase of the procurement engagement to suit the risk profile agreed between the future EPC contractor and Hydro Tasmania.

2.6 ▪ Recommended Contractual Model

Based on the information available at the time of this report, the current recommendation is to adopt the NEC4 Engineering and Construction Contract (ECC) model Option C – (Target Contract With Activity Schedule).

The NEC4 ECC Option C is the target cost main works contract with an activity schedule. It can include any level of design and is ideal for more complex or larger projects, where the client and contractor are willing to share project financial risk in a fully collaborative way.

This contracting model is already set up so that the contractor prices activities in the client's activity schedule based on actual cost plus a fee, resulting in a target price. The client makes interim payments on completion of each activity and differences from the target price are shared according to an agreed pain/gain share proportion. This directly incentivises both parties to look for cost savings throughout the works.

A full review of the optional clauses under this contract form is recommended as the project's specific requirements develop, although initial optional clauses to be considered as a minimum are:

- "Y" clauses, which contain wording specific to each state and territory to address the relevant security of payment legislation,
- Option X1: Price adjustment for inflation
- Option X7: Delay damages
- Option X17: Low performance damages
- Option X22: Early Contractor involvement

However, the recommendation to use NEC4 is provided without engagement with Hydro Tasmania's legal team, or a full workshop/assessment process of the risk transfer that would occur under the NEC4 contract model. It is recommended that this additional activity is undertaken as a subsequent activity to this procurement strategy.

Other contract forms considered, including FIDIC, are outlined later in this document. Ultimately, the decision on which contract form to use is dependent on the agreed risk sharing position adopted by Hydro Tasmania, the response from the market, and the contract management capabilities needed to administer the contract.

3 Background

3.1 ▪ Purpose

The purpose of this document is to set out the procurement strategy and contracting framework for the redevelopment of the Tarraleah hydro power scheme in the Central Highlands of Tasmania (the Project). This document outlines the basis of the strategy and the options considered.

3.2 ▪ Business Context

Constructed in the 1930s, the Tarraleah scheme generates around 6.5% of Hydro Tasmania's total annual generation. The scheme plays a key role in the regulation of flows to the Lower Derwent cascade system of dams and power stations.

Due to its current configuration and age, many components are in need of significant refurbishment to ensure safe and reliable operation well into the future. The scheme also has a number of physical and operational constraints which mean that it may not be well suited to the needs of the future electricity market.

The Australian Renewable Energy Agency (ARENA) provided $2.5 million, matched by Hydro Tasmania, for a feasibility study to assess options for reimagining the scheme to better suit anticipated needs of the future energy market. This study demonstrated the technical feasibility of redevelopment, with potential to transform the scheme to increase and flexibility - all valuable requirements in the future market.

With Federal Government funding support and investment from Hydro Tasmania, we are now progressing activity on assessing the commercial viability of scheme redevelopment, alongside upgrade works that position the scheme well for the future.

3.3 ▪ Project description

As of October 2022, the Project consists of the following key elements.

- A 6km long new surface pipeline constructed from large (DN4000) diameter Glass Reinforced Plastic (GRP) pipe connecting to the western portal of the headrace tunnel. The final configuration is still to be determined;
- A 7km long headrace tunnel connecting to the 2.5km long power tunnel. The tunnel is proposed to be driven by drill and blast methods through the dolerite sill that extends from the Wentworth hills to the Nive river valley;
- Surge shaft (DN5000) connecting the headrace tunnel to a surge tower (DN18000) located on hill 1km North-East of No. 2 Pond Dam;
- Pump station with rising main to divert inflowing water to No. 2 Pond into the surge tank;
- A 2.5km long power tunnel, connecting the head race tunnel at the surge shaft to the power station, the tunnel is proposed to be driven by drill and blast methods through dolerite and be predominantly unlined with a final 500m long section steel lined;
- A surface power station on the western bank of the Nive River immediately upstream of Tungatinah Power Station;
- Access and egress to the station and headworks infrastructure;
- A switchyard and 220kV transmission line connection to the existing HV Transmission system; and
- Power supply and communications to the station and the headworks.

3.4 ▪ Key Objectives / Critical Success Factors

Through a series of workshops and meetings with Hydro Tasmania executives, Turner & Townsend has drawn out the program objectives and desired outcomes and critical success factors.

3.4.1 Project Objectives

The key objectives of the Project are listed below (in no particular order):

- On time and on budget;
- Value for Money;
- A requisite level of cost certainty to support FID;
- A requisite level of schedule certainty aligned to Marinus link and other adjacent revenue opportunities;
- Regulatory demands satisfied;
- Optimal whole of life cost and performance, driven in part by quality E&M design/selection;
- Hydro Tasmania's reputation enhanced;
- Local employment (talent and businesses);
- Achieve FID by June 24;
- Fit for Purpose;
- Highest Standard in Safety;
- Withstand public and government scrutiny; and
- Community benefit sharing.

3.4.2 Critical Success Factors (CSF)

We have identified a number of critical success factors which are necessary for the project to achieve Hydro Tasmania's objectives. They are:

- Collaborative working;
- Internal & external stakeholder buy-in;
- In-house capability and capacity enhanced;
- Risk placed with party best to manage it;
- Probity compliance;
- Procurement compliance;
- Clear communication with market on project timeline; and
- Improved culture and behaviours.

To achieve the project objectives, mechanisms through which the CSFs can be implemented must be designed into the delivery model and accountability placed with the best placed organisation and person(s) within the team.

3.5 ▪ Key Risks

To inform the selection of the optimal delivery strategy and procurement route for Hydro Tasmania, we have conducted a high-level risk assessment to identify the critical risks and ensure

these risks are considered as part of the determination of the optimal models. A summary of the findings of the risk assessment is provided in Table 1 below.

Table 1 – *Key Risks*

Risk	Risk Description	Potential mitigations
Scope change	Excessive levels of change will adversely impact cost, schedule, and quality. Change can be led by technological evolution, poor requirements definition, client habit, and behaviour and errors	▪ Early engagement with customer & operations ▪ Establishment of a design authority ▪ Introduction of design freezes ▪ Early development of E&M technology road map to be chosen for the Project ▪ Robust change management ▪ Behavioural change program
Failure of Hydro Tasmania to align with selected delivery model	Failure of Hydro Tasmania to implement organisational change management will undermine new delivery model	▪ Robust organisational change management process ▪ Strong leadership ▪ Effective communication and engagement
Interface failures between work packages	Poor coordination between the work packages may result in program delays and increased costs.	▪ Collaborative working ▪ Program wide incentivised, transparent contracting models ▪ Integrated design, joint risk management
Poor Integration & Commissioning	There is a risk that under performance of the process plant may extend integration and commissioning and delay operational use of the facility.	▪ Proof testing of production process prior to installation on site ▪ Inclusion of operational readiness period to ensure facility is fit for purpose and operators are trained
COVID & Macro Economy	Economic volatility may adversely impact project due to: ▪ skilled labour shortages ▪ supply chain disruption ▪ unforeseen delay/cost escalation	▪ Economic risk contingency funds ▪ Forward ordering ▪ Mapping of extended supply chains ▪ Build redundancy into delivery model

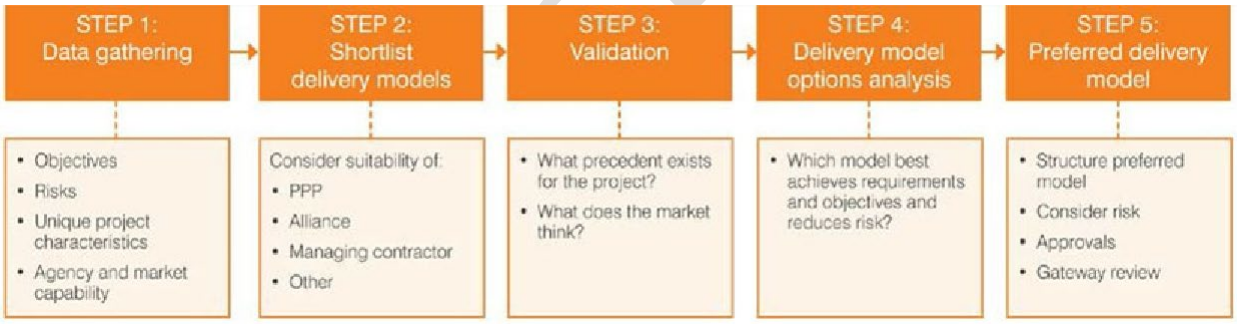
Risk	Risk Description	Potential mitigations
Supplier Chain Failure	There is a high dependency on a constrained supply chain, which introduces risks of supplier failure and delays linked to quality issues.	▪ Forensic supply chain due diligence ▪ Supply chain mapping ▪ Joint risk management ▪ Adoption of fair payment terms
Robust Business Case	There is a risk of optimism bias in the business case resulting in an unachievable budget and overly ambitious schedule.	▪ Clarity of requirements ▪ Use of industry benchmarking, robust cost planning, and informed risk contingencies.

4 Approach

To ensure the procurement strategy meets Hydro Tasmania's specific objectives and constraints, a 5-step approach was used to define the best delivery model to be used for the execution of the Project.

This approach took into consideration both internal - e.g., Hydro Tasmania's capacity and capability, and unique project characteristics in terms of scope and risks – and external factors such as market attractiveness, market capability and capacity, subject matter experts brought in by T&T and lessons learned from other Hydro Projects in Australia.

Figure 4 – Infrastructure Australia 5-step approach to Procurement and Delivery Model Development



4.1 ▪ Process

4.1.1 Step 1 – Data Gathering

To capture the data summarised in this document, the following activities have been undertaken:

- Aggregating data from:
  - Our C6 assessment conducted in 2020 and subsequently updated in the data gathering workshop;
  - The data gathering workshop (held in Hobart 7 May 2022);
  - Information gained during three workshops to develop the Procurement Strategy Development Plan (held over Teams from 4 April to 11 April 2022);
  - Subsequent off-line discussions with members of the project Steering Committee;
- Desktop research into other hydroelectric power projects and the lessons learned from these;
- Direct engagement with previous employees from Snowy Hydro involved in the development and execution of the procurement strategy for the Snowy 2.0 project;
- Workshops with the infrastructure leadership team within Turner & Townsend;
- Completion of a delivery model questionnaire, supported by two workshops (22 and 24 June 2022) to gain insights from senior stakeholders within the Project's team;
- Review of previous Hydro Tasmania market engagement activities; and
- Key insights were presented during a review held on 12 July 2022 in Hobart and via Teams. (refer to the presentation pack "Stage 1 – Data Gathering shared with the senior stakeholders within the Project's team).

4.1.2 Step 2 – First shortlist of the delivery models

To shortlist the relevant delivery models that could be used for the Project, the following activities were undertaken:

- Set up the framework to prepare for shortlisting;
- Establish an exhaustive list of delivery models typically used in large infrastructure projects;
- Define a list of criteria that will be used to shortlist the delivery models;
- Use the key insights from Step 1 Data Gathering for the Procurement Strategy Development Plan, allocating a weight to each criterion from 1 to 5 with:
  - 1 for low importance, and
  - 5 high importance;
- Shortlist the delivery models from 17 down to six;
- Workshop with the Project team on the 13 of July in person in Hobart (and via Teams) to confirm framework, criteria and weightings, and the shortlist of delivery models;
- Present back on 13 July the results to the Project team.

4.1.3 Step 3 – Market Validation

The Project team sought feedback from the market on the shortlisted delivery models by running a market consultation.

The view was to get constructive feedback from experienced contractors on the validity of the delivery model as well as to acquire additional and relevant inputs that would assist the team to recommend the best delivery model.

In addition, the market consultation was an opportunity for the market to understand the anticipated key dates of the procurement engagement of the Tarraleah Project, plan for future engagement, and hear from the project team as to the details of the project.

A list of 29 suppliers was established by the project team. It included a mix of international, Australian, and Tasmanian based organisations with expertise across the various key elements of the project (project management, design, engineering, procurement, construction, tunnelling, electro-mechanical (E&M) equipment).

Following definition of this list, a three-step process was followed to conduct the market consultation:

- Step 1 – an invitation letter was sent to each supplier to confirm their interest in participating in the market consultation. Out of the 29 suppliers, 28 positively responded. Please refer to 'Appendix A – List of Suppliers Invited to the Market Consultation' for the list of suppliers who positively responded to the invitation;
- Step 2 – a market consultation pack comprising a project overview and a questionnaire was sent to the 28 suppliers who responded positively to the letter of invitation. They were provided with two weeks to respond. Out of the 28 who received the questionnaire, 21 suppliers submitted their response. Refer to 'Appendix A – List of Suppliers Invited to the Market Consultation' for details of the suppliers who submitted a response; and
- Step 3: A virtual face-to-face interview was organised with six suppliers. It was decided that the interview will focus on the suppliers with experience in construction and less on those

with design experience only or E&M suppliers. Indeed, these types of suppliers tend to be involved as the main contractor in infrastructure projects similar to the Tarraleah project and therefore would have a good overview of the various delivery models and how to work with designers and E&M suppliers.

4.1.4 Step 4 – Delivery model options analysis

4.1.4.1 Risks

The risks associated with the procurement of the project were identified, captured and defined with the view that risks should be allocated to the party best able to manage them. The objective is for the optimal allocation of risk, rather than maximising risk transfer. It was key to understand Hydro Tasmania's risk appetite and how they are placed to own some of the risks.

As such, a workshop was run in October 2022 with Hydro Tasmania to discuss and agree how the risks would be apportioned between the parties.

4.1.4.2 Selection criteria

Six relevant selection criteria were clearly defined with the project team so that each delivery model could be assessed against them and help form a view on the best delivery model.

- Risk allocation
- Attractiveness to Market
- Demands on HT resources
- Program Schedule
- Cost Certainty
- Ability of Contractor to influence design

4.1.5 Step 5: Final delivery model selection

Following on from the previous steps, a final delivery model was proposed to Hydro Tasmania. A workshop was run in Hobart on 14 November to confirm the overall proposed procurement approach and delivery time frame.

The main objective of this workshop was to discuss with the overall project team the detail of how the competitive ECI would be run and how the ECI contractors would be shortlisted to one before awarding the EPC Contractor. It was the opportunity as well to review and understand in more detail the status of the design so that market engagement timing could be adjusted.

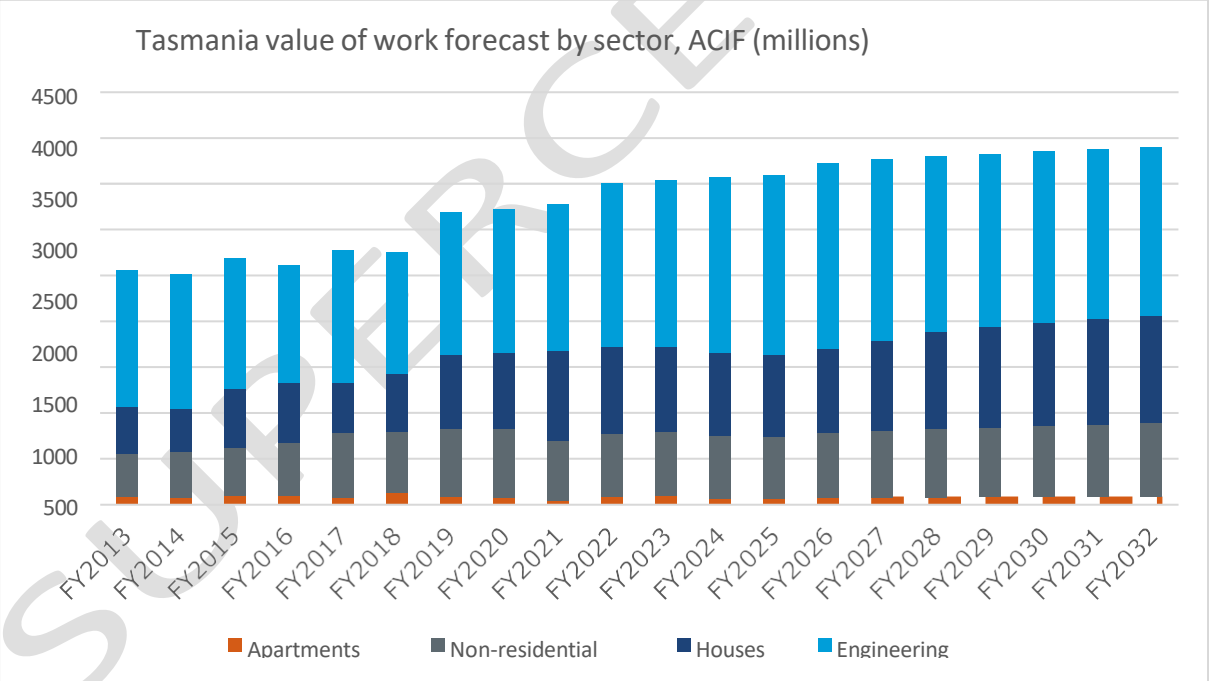
The final key document from this stage is this Procurement Strategy.

5 Supply Market Analysis

5.1 ▪ Market Overview

Construction activity across Tasmania continues to strengthen, supported by the growing pipeline of public infrastructure projects and a surge in house construction. Private sector activity has been slow to recover following the COVID-19 downturn, while public sector projects continue to uphold overall construction activity. *Figure 5* below looks at the value of work forecast across each sector over the next decade.

Figure 5 – Value of work forecast



Over the last five years, housing construction has continued to strengthen in Tasmania, driven by low supply, low interest rates, and the HomeBuilder stimulus. With interest rates rising and the surge in construction costs, housing construction activity is forecast to flatten and remain steady over the next five years. Non-residential construction has softened, following the COVID-19 pandemic and is not expected to see any significant increase over the remainder of the decade.

While these sectors are forecast to flatten over the coming years, engineering construction is in a strong upswing, driven by large public sector projects and renewable energy investment. There are several major renewable projects committed and planned for Tasmania, which will uphold overall construction activity over the next decade.

Major projects include:

- Battery of the Nation program, Hydro Tasmania;
- Tarraleah Power Station redevelopment, Hydro Tasmania;
- Marinus Link, TasNetworks;
- North West Transmission Developments, TasNetworks;
- New Bridgewater Bridge, Tasmanian Government;

- Bell Bay Hydrogen Plant, Fortescue Future Industries; and
- Jim's Plain and Robbins Island Renewable Energy Park, ACEN Australia

Like all other markets in Australia, Tasmania's construction sector is being impacted by global and local supply chain constraints and disruptions. Global supply chain disruptions have resulted in surging freight costs, longer lead times and overall higher costs for imported building materials and equipment. This is placing pressure on local suppliers, who in turn, have raised their prices due to high demand and short supply.

Strong domestic demand for construction inputs across Australia has also pushed up local prices. Building material costs have surged over the last 18 months and continue to add to higher construction costs on projects across all sectors. While the pace of this increase has started to slow over the September quarter of 2022, we expect that the large pipeline of work to be completed across the country will keep prices elevated for some time.

One of the biggest constraints the Tasmanian construction sector faces is the shortage of skilled labour to complete projects. Given the small size of the local market and the large pipeline of projects, it is likely labour shortages will be encountered if projects aren't managed and thoughtfully timed. Skills shortages are being experienced across the whole domestic market, which means sourcing interstate labour for major projects will be difficult and costly. New South Wales, Victoria and Queensland are all experiencing a strong upswing in engineering construction, which will keep demand for resources high while supply is constrained.

As a result of these factors, construction costs have experienced sharp growth in Tasmania over the last 18 months. With activity forecast to increase further over the coming years, we are likely to see further strong escalation persist.

5.2 ▪ Hydro Power Market

In the Hydro space, specific resources with hydro experience are even more scarce. Additionally, there are potentially many new projects to come live over the coming years as since 2017, the Australian Government put hydropower back in the spotlight.

A study by the Australian National University, supported by the Government's Australian Renewable Energy Agency identified over 22,000 possible off-river pumped hydro energy storage locations nationwide, but no large-scale facilities have been built in Australia in the last 30 years.

There are currently 15 to 20 pumped hydro projects that have been proposed in Australia and are in various stages of preliminary investigation. Key upcoming projects include:

- 1-2GW Borumba pumped hydro project for Queensland Hydro, near Brisbane;
- 5GW Pioneer-Burdekin pumped hydro project for Queensland in the Pioneer Valley, QLD;
- 400MW Big T pumped hydro storage project for BE Power at Cressbrook Dam near Toowoomba, QLD;
- 500MW Dungowan pumped hydro storage project for Walcha Energy, in the Dungowan Valley, NSW;
- Goat Hill pumped hydro project for Altura, Near Port Augusta, SA; and
- Burrawang to Avon Tunnel pumped hydro project for WaterNSW, near Wollongong, NSW.

The supply market for the Hydro Power infrastructure is organised around the following service lines:

- Engineering and design;
- Construction, particular emphasis on civil, tunnelling, and pipelines; and
- Electro-mechanical equipment supply, installation, and commissioning.

An analysis of the capability, capacity, scale and risk in the Australian supply chain available to Hydro Tasmania has been performed by Turner & Townsend. We have segmented Hydro Tasmania's key supply chain into five areas:

- Tier 1 Constructors and Construction Integrators;
- Tier 2 & 3 Constructors and Construction Integrators;
- Local Construction Operators;
- Tier 1 and 2 Engineering consultancy; and
- E&M Suppliers.

These suppliers were mapped and included in a market consultation exercise to receive feedback on the delivery model and key market risks.

Our evaluation suggests, that the current labour and skills shortage, together with other competing projects in Australia is currently leading to price escalation, although this is not currently forecast to extend into the construction period for the Project. However, these escalations and constraints should be considered as part of the overall economic modelling for the project.

Our engagement with the market identified a number of critical supply chain issues and risks which, if not mitigated, could threaten the success of Project.

5.3 ▪ Supply Market Issues & Risks

Table 2 – Supply chain issues/risks

Issue	Description	Suggested Mitigation
Access to Local talent / labour	Due to the project size and EPC contract Hydro Tasmania will not contract directly with local talent and businesses	▪ Specific criteria will be used to assess the level of local workforce and business sub-contracted by the EPC Contractor
Long lead times due to extended supply chain as a consequence of COVID disruption and other factors	There is currently three years of lead time to manufacture and ship long lead time items such as the Electro-mechanical items.	▪ Select the E&M technology provider as early as possible so that orders for turbine and other equipment can be placed early in the process.
Volatility of the commodities pricing	Exposure to price increases over the contract term	▪ Specific commodities to be identified and discussed with relevant contractors during the ECI phase ▪ Escalation clause to be included in the contract to reflect market reality
Attractiveness of Hydro Tasmania as a client	There is a risk that Hydro Tasmania will not be seen as an attractive client resulting in a smaller supply network available to Hydro Tasmania	▪ Early market engagement (consultation) to receive feedback on the best delivery model ▪ Consistency of approach to the market across Hydro Tasmania team ▪ Accurate and timely requirements definition ▪ Adopt more innovative contracting models e.g. incentivisation, risk share ▪ Be more open to innovation and remove 'gold plated' product standards ▪ Adopt supplier relationship management techniques and collaboration

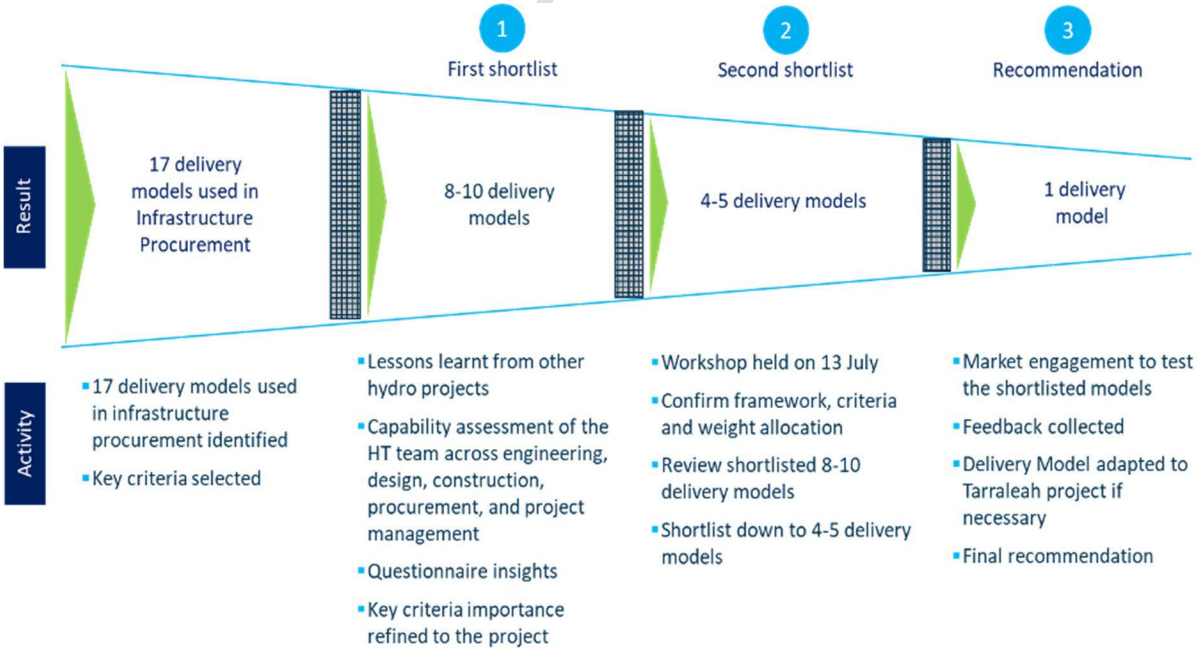
6 Delivery Model

Given the high risk, high value, and high-profile nature of the Tarraleah Project, Hydro Tasmania needs to select the optimal delivery model which will enable an on-time and on-budget delivery of the project.

6.1 ▪ Process

A three-step process was used to shortlist the delivery models. It involved a market consultation to receive valuable feedback from key market players and their experience in delivering hydro power projects in Australia and around the world. Figure 6 below highlights the stepped approach that was undertaken.

Figure 6 – 3-step process for rationalising delivery models



6.2 ▪ Key models considered

Five viable models were shortlisted and further evaluated using inputs from the market consultation, lessons learnt and Turner & Townsend's subject matter experts. The models are listed in Table 3 – Delivery models below.

Table 3 – Delivery models

Delivery model option	Description
EPC	A single engineering, procurement and construction contract for all packages, with nominated providers of key Electrical & Mechanical equipment.

Delivery model option	Description
Multiple EPC	Multiple engineering, procurement and construction contracts for specific packages (i.e. pipeline, powerhouse, tunnel, electrical & mechanical equipment installation and commissioning).
Traditional Design-Bid-Build	Project Management activities are retained by Hydro Tasmania. Hydro Tasmania would engage suppliers for and/or self-perform the design. Construction of the packages would then be performed by separate organisations.
EPC with Early Contractor Involvement	A single engineering, procurement and construction contract for the aforementioned packages, where the contractor is engaged early to progress design and value-engineering. Electrical & mechanical equipment scope would be through nominated providers.
Multiple EPC with Early Contractor Involvement	As above, but with separate EPC contracts for specific packages, not for the whole project.

6.3 ▪ Criteria selection

Whilst generic criteria were used to develop the shortlist in Step 2 of the Procurement Strategy Development Plan, further refinement to a recommended Delivery Model required a selection process using specific criteria relevant to Hydro Tasmania's procurement objectives, risk appetite, and other considerations such as timeframe requirements and some key input from the project. Those selection criteria are described in Table 4 below.

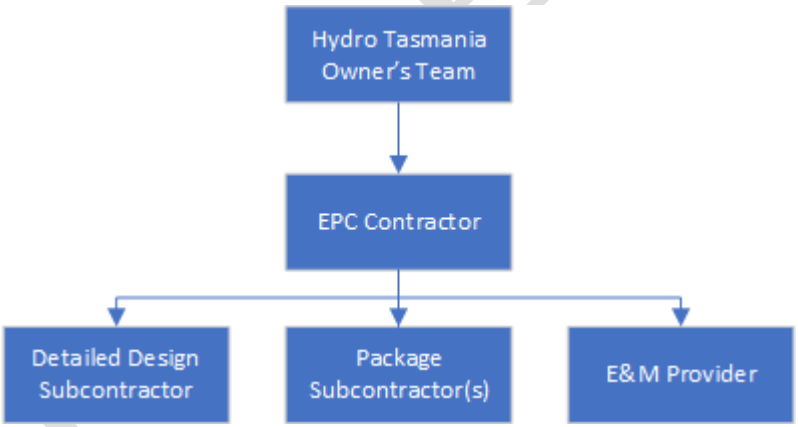
Table 4 – Selection criteria

Criteria	Description
Risk allocation and appetite	A preferred risk allocation was developed with the project team, and delivery models assessed against their ability to align to these preferences.
Attractiveness to the market	Assessing how attractive to the market and current supply chain conditions the delivery model would be.
Demands on Hydro Tasmania's resources	Delivery models were favoured that would minimise demands on Hydro Tasmania's resources, given the extensive BAU workload and challenges mobilising resources in the current market.
Project Schedule	Each delivery model was assessed against the objective to reach FID by June 2024
Cost certainty	Delivery models balancing both value-for-money and cost certainty with a preference towards achieving optimum cost certainty for FID would be favourably considered.

Criteria	Description
Ability of Contractor to influence the design	Models where contractors could influence the design, in order to drive constructability improvements, and enable contractors to take ownership of system performance were favoured.

6.4 ▪ Recommended delivery model

The recommended delivery model is a single EPC model where the EPC Contractor takes responsibility for delivering the Project from detailed design, construction and commissioning.



Under this model, the E&M contract will be novated under the EPC Contract.

A competitive Early Contractor Involvement (ECI) will be run up to the award of an EPC Contract, with a view to finalise the design of the project, ensure effective collaboration with both the Owner's team and the selected E&M provider.

The key elements leading to recommending the EPC model along with an ECI are as following.

6.4.1 Risk allocation

The EPC model allows Hydro Tasmania to transfer the risk to the party best placed to manage (in this case the lead Construction Contractor). The ECI will provide a process that enables parties to address the best approach to management of risk, i.e. allowing all parties to work together by identifying, eliminating / reducing the risk and then transferring risk to the party best placed to manage it while mitigating typical cost inflation associated with it.

6.4.2 Attractiveness to the market

The Single EPC delivery model aligns to the feedback received during the market consultation with national and local contractors (covering tier 1 contractors through to local specialist organisations). The model offers contractors sufficient scales to drive interest. By complementing the EPC with an ECI, it offers additional attractiveness by allowing collaboration between contractors and Hydro Tasmania.

6.4.3 Demands on Hydro Tasmania resources

A Single EPC delivery model requires a smaller Owner's team than other models such as Alliance, multiple EPC packages, Managing Contractor or EPCM, because:

- most of the risks will be transferred (without the expected cost premium due to the ECI process where risks are identified and allocated);
- Hydro Tasmania will have a single point of contact with the EPC Contractor and not with the multitude of subcontractor who will be involved during the life of the project. Hydro Tasmania will essentially need to manage the delivery partner; and
- all the activities like Construction Management, Procurement Management, Work Package Integration, Commissioning & Handover, Cost Management will be managed directly by the EPC contractor.

6.4.4 Program Schedule

One of the Project objectives is the ability to support key milestones especially June 2024 FID. In assessing the various delivery models, the single EPC Contract with an ECI was the best placed to enable schedule to be developed with a reasonable degree of certainty before the FID milestone.

6.4.5 Cost Certainty

The EPC Model was assessed as the optimal delivery model for achieving cost inputs in time for FID in June 24. As an example, the Traditional Design Bid Build (DBB) achieves cost certainty at the time construction is started. However, because it involves the completion of three distinct phases in sequence (the design (DESIGN) needs to be completed before going to market (BID) and full cost is not known until the contract is signed just before the BUILD, it is impossible to achieve cost certainty by June 24.

Additionally, the ECI process enables costs and risks to be collaboratively discussed and thought through before commitment is made to the project cost and scope.

The competitive ECI maintains highly competitive tension during this collaborative stage thus ensuring value for money is achieved out of the process and before a single EPC contractor is awarded.

6.4.6 Ability of main Contractor to influence design

Due to the size and complexity of the project, it is key for the Contractor to be able to provide input into the design to improve the constructability and thus reduce cost and risk. In this case, the ECI process was highly recommended as being a key process enabling input from experts familiar with similar projects.

6.4.7 Single ECI versus Competitive ECI

Early Contractor Involvement is a collaborative procurement methodology used to develop a tender for the Construction Phase of a project.

Although not technically a delivery model, Early Contractor Involvement may be incorporated into the traditional delivery arrangement to varying degrees. It can be applied to most of the shortlisted delivery models above.

While a Single ECI may be more straight forward and simpler to run due to the fact that Hydro Tasmania will only work with one team comprising of the ECI Contractor and the E&M supplier, the competitive ECI will achieve a far better value for money due to the competitive tension maintained throughout the process until the award of the EPC contract.

It is estimated that a Single ECI typically generates a premium in the range of 5-10% that will be paid by the client when a competitive process is used (source: In Pursuit of Additional Value: A

benchmarking study into alliancing in the Australian Public Sector, study realised by The Department of Treasury and Finance, Victoria)

The table below shows how each ECI Model compared to each other

Table 5 - ECI Comparison against criteria

Delivery model Criteria	Single ECI	Competitive ECI
Risk allocation	-	+
Attractiveness to Market	-	++
Demands on HT resources	++	-
Program schedule	++	-
Cost Certainty	+	++
Ability of Contractor to Influence design	+	-
Other criteria		
Value for Money	-	++
Risk of unsuccessful ECI (one ECI Contractor drops out or key ECI output of the ECI is not reached)	-	++

1

7 Client Owners Team Requirements

7.1 ▪ Impact of delivery model on Hydro Tasmania resourcing

It has already been identified that Hydro Tasmania's internal resources are highly utilised supporting 'Business as Usual' activities, and the Tarraleah Upgrade works. Furthermore, the C6 analysis performed by Turner & Townsend previously indicated a low level of organisational maturity and capability for the management of complex projects and programs.

In addition, given the sensitive nature of this project, it is foreshadowed that there will be significant demand on Hydro Tasmania's team to manage contractor and stakeholders/interfaces, including:

- The physical, contractual, statutory approval, stakeholders, operational, and related essential projects nearby that will impact the project and any other types of interfaces;
- Stakeholder liaison, influence and agreement required for success of the project;
- Ensuring commitments made to the public or stakeholders are maintained during project delivery; and
- Approvals and agreements required, and the likelihood of significant approval conditions.

Also, more generally, it should be noted that the higher number of discrete construction contracts in a project, the more project interfaces are created, leading to a higher level of management and greater inherent risk for the Owner. Strong internal Owner capability and capacity is required.

Given these factors, part of the selection criteria favourably considers those Delivery Models that minimise the impact and requirements on Hydro Tasmania's resources.

Table 6 – impact of delivery model on HT resourcing

Model		Demands on HT resources
Single EPC (with ECI)	**Pros**	Requires less resources from HT compared to multiple EPC, competitive ECI, or Alliance models.
	Cons	Will still require support from HT during ECI process (c.20% of team capacity).
Multiple EPC (with ECI)	**Pros**	Although there are more contracts, they will be smaller and more manageable (interfaces aside)
	Cons	Will require additional resource from HT to manage each of the separate contracts and to manage the interfaces between contracts
Traditional Design-Bid-Build.	**Pros**	A single construction package minimises interfaces and reduces contract administration effort. There will be additional effort required from HT when it comes to running a full-scale tender
	Cons	Since the Owner supervises both parties (design and construction) they are responsible for the problems associated with each including all interfaces.
Alliance (with ECI)	**Pros**	The success of an Alliance will rely on HTs ability to be actively involved and provide input to the Alliance
	Cons	HT has not had any involvement with Alliances in the past. The cost to establish and maintain relationships can be high
Managing Contractor	**Pros**	A single construction package minimises interfaces and reduces contract administration effort.
	Cons	Requires extended senior level input from HT during the planning phase to ensure success
Competitive ECI (vs Single ECI)	**Pros**	Maintains competitive tension as far into the project as is practicable
	Cons	Requires a larger Owner's team to provide the required separation and probity. This includes Owner's consultants

7.1.1 Selected delivery model

The competitive ECI process, comprising two potential contractors, maintains competitive tension as far into the project as is practicable. However, it must be noted that adopting this approach is subject to Hydro Tasmania's ability to provide sufficient resources to support this process.

Under the preferred EPC model, demands on Hydro Tasmania's resources are minimised to the greatest extent possible. Specific skill sets will still be required within the Owner's Team, which can be fully sourced from existing/future full-time employees or blended with expertise from external providers (creating an 'Integrated Owner's Team').

Key capabilities to be represented within the Owner's Team would include:

- Project Management;
- Cost Management;
- Technical Lead, with supporting Owner's Engineer resources;
- Contract & Commercial Management;

- Risk Management;
- Probity Management; and
- Stakeholder and Communications Management.

8 Procurement

8.1 ▪ Procurement Approach

It is recommended to approach the market through a structured competitive tendering process to identify and award the ECI contractors before awarding the Design and Construct Contract to the Single EPC Contractor.

A separate structured competitive tendering process will be run to select the E&M supplier before its contract gets novated under the EPC Contract.

8.2 ▪ Procurement Process

8.2.1 Variation of the process
8.2.2 Exceptional circumstances

- *Exempt Information (3 paragraphs of text 8.2, 8.2.1 & 8.2.2) has been removed from this document – if publicly disclosed that procurement procedural data would reveal commercially sensitive information which may prejudice the competitive tender process and harm the business and financial interests of Hydro Tasmania (ss, 33, 40 and Items (o) and (s) RTI Act).*

8.3 ▪ Proposed ECI Methodology

8.3.1 Register of Interest (ROI)

The objective of the ROI is to select 4-6 EPC Contractors to participate in the RFP process, by gaining an understanding of the participants' capability, capacity, and motivation. A list of suitably qualified contractors will be generated by:

- Raising awareness of the works and the intended contracting model;
- Recording their interest in both the works and contract method; and
- Increasing the potential pool and quality of bidders by enabling potential participants to self-organise into joint ventures.

To successfully complete the ROI process, the following is required:

- Develop and issue an ECI schedule (subject to Hydro Tasmania approval);
- Define the ROI selection criteria and the evaluation process (subject to Hydro Tasmania approval);
- Collate relevant high-level documentation for ROI inclusion, including an outline of the concept design, and Hydro Tasmania's project specifications and requirements;
- Issue the ROI (via the standard public tender portals normally used by Hydro Tasmania;
- Assess ROI submissions (including formed JVs and consortia) against agreed Hydro Tasmania criteria and select a shortlist of approximatively four to six EPC Contractors to be invited to participate in the request for proposal (RFP) process; and
- The ROI duration is expected to be approximatively 9 weeks including gaining approval from Hydro Tasmania for the shortlisted contractors.

8.3.2 Request for Proposal (RFP)

The objective of the RFP is to obtain a greater understanding of the participants' capabilities, ECI costs and project costs via the population of a project specific proposal. To successfully complete the RFP process, the following is required:

- Produce and administer an RFP criteria and selection process (subject to Hydro Tasmania approval);
- Develop an RFP scope of services containing available project documentation, including:
  - Relevant concept design;
  - Detailed Project specifications and requirements;
  - Issue the RFP to the identified participants;
  - Assess populated RFPs against agreed Hydro Tasmania criteria and select a shortlist of two EPC contractors to participate in the paid ECI process;
  - Hydro Tasmania to award two or three selected participants a paid ECI agreement

The RFP duration is expected to be approximately six months including four months in the market.

8.3.3 Competitive ECI Execution

8.3.3.1 Preparation phase

The objective of the preparatory step is to develop the required documentation and arrange workshops prior to the commencement of the paid ECI Phase. The preparation step will ensure that the constrained project schedule is not compromised, and key information is provided to the ECIs at the commencement of the ECI execution phase. To complete the preparation process, the following is required.

- Workshop schedule – develop a workshop schedule and agendas between the ECI contractors and various project stakeholders. The purpose of the workshops is to inform the ECI contractors of project risks, constraints, and potential value engineering opportunities.
- Key documentation – develop key documents required for the ECI process, including, but not limited to:
  - Draft Tarraleah Scope of work;
  - Pricing schedule template and notes on pricing;
  - Drawings and specifications (most recent and detailed concept design, 3D model if relevant, technology provider data, GBR reports);
  - Hydro Tasmania project, delivery, and operational requirements (e.g. HSE, Quality, ESG processes and procedures); and
  - any other contract schedules required by Hydro Tasmania procurement to conform the execution of a main contract with the ECI.

The duration of the preparation process will depend upon the level of existing Hydro Tasmania documentation which can be leveraged and repurposed. It is suggested that preparation steps commence as soon as practicable to ascertain the level of effort required.

8.3.3.2 Execution phase

The objectives of the Competitive ECI execution phase are, as follows:

- provide the opportunity for the ECI contractors to directly communicate with, and build relationships, with the Hydro Tasmania stakeholders;
- provide a class two cost estimate, level three delivery schedule, project delivery documentation and contract schedules prior to the final investment decision (FID).

The ECI execution phase contains five main workstreams, as follows:

- **Stream 1 – workshops**

A number of workshops will be required to present project details. Workshops will be attended by each ECI Contractor and the Hydro Tasmania stakeholders, including Hydro Tasmania Owner's team and the incumbent engineering consultant (Entura). Ideally, the E&M supplier has been selected and will form part of the ECI. The objective of the workshops is to:

- inform the ECI contractors of project specific information in the most efficient manner;
- enable dialogue and relationship building between parties;
- develop the project risk register;
- develop interface and logistics management plans to inform program forward planning with respect to likely project resourcing, traffic management, communications, utilities, procurement, interface planning and other requirements;
- construction phase schedule data provided to Hydro Tasmania;
- enable ECI contractors to interface and engage in dialogue with the Reference Design team and the E&M supplier in relation to their design strategy and potential construction risks inherent in the design; and
- allow the ECI contractors to provide informed value engineering solutions (Stream 2).

As there will be a number of workshops attended by similar Hydro Tasmania stakeholders and two to three ECI contractors, there will be a requirement to:

- facilitate the workshop and information dissemination process;
- manage information flow from the ECI contractors provided in workshops (Stream 1) and value engineering (Stream 2) to Hydro Tasmania for consideration and approval;
- aggregate and disseminate information between parties; and
- conduct follow-ups with the various parties as required.

- **Stream 2 – value engineering**

  The objective of the value engineering exercise is to optimise the Reference Design. Optimisation may come in various forms, such as:

  - modularisation, offsite fabrication and assembly (increased productivity);
  - reduction of Material Take-offs (MTO) (layout optimisation and removal of superfluous designed elements); and
  - other HSE, environment, quality, and schedule constructability design optimisations.

- **Stream 3 – cost and schedule estimates**
  - The objective of the cost and schedule estimates are to market test the designers baseline estimates prior to FID.

- **Stream 4 – project delivery documentation**

  The objective of receiving ECI project delivery documentation (project execution plan, HSE and Quality management plans etc.) and contract schedule documentation (e.g. nominated subcontractors, key personnel, IR plan etc) is to enable the assessment of qualitative ECI information in conjunction with their quantitative cost and schedule output (Stream 3).

  When generating an approved ECI evaluation and criteria process, it is key that Hydro Tasmania stakeholders will provide input into these criteria as this is a key factor to assess the ECI Contractor's understanding of the physical delivery of the project, including:

  - Construction methods and sequencing;
  - Project specific HSE, environmental and quality constraints;
  - Site access, logistics and traffic management requirements;
  - Procurement issues (specifically long lead items);
  - Services protection, relocation, and other requirements;
  - Interfaces and opportunities for synergies with other projects;
  - Quality requirements (including design and technology provider requirements);
  - Communication requirements and opportunities;
  - Innovation and other value engineering opportunities; and
  - Identifying and providing solutions to constructability issues and similarly identifying and investigating possible treatment for construction risks.

- **Stream 5 – contract schedules**

  Hydro Tasmania and ECI contractors' commercial teams will conform contracts and progress through commercial non-conformances and departures. The output of this step is to understand commercial alignment, or, lack thereof between Hydro Tasmania and the ECI contractors.

- **ECI Outputs**

  The output from the ECI execution phase will be a single report pack, including:

  - Tender design
  - Class two cost. ECI contractors to also provide basis of estimate including risks adjustment mechanisms (Stream 3)
  - Delivery Schedule and basis of schedule (Stream 3)
  - Preliminary project delivery execution plan and supporting management plans (Stream 4)
  - Conformed, or an understanding of alignment in relation to, contract terms (Stream 5)
  - Presentation from each of the ECI participants on their preferred methodology.

  As part of this presentation the Hydro Tasmania stakeholder team can raise queries and request clarifications from the ECI submissions having had the benefit of exploring various options and points of view from other ECI parties.

- **Duration**

  It is expected that the duration of the ECI execution phase will be 6 months.

8.3.4 Variation with a Single ECI Execution

There is the option to run a variation of this ECI process by shortlisting during the ECI execution phase from two to one supplier. This would be used in the case where the E&M supplier will not be selected in time to participate in the ECI and Hydro Tasmania still wants to achieve FID by June 24 by starting the ECI process earlier.

In this case, the ECI execution phase will be divided into two sequential phases.

- A competitive ECI phase *(a), and
- A single ECI phase (b)

8.3.4.1 Competitive ECI phase (a)

This phase would be similar to the competitive ECI execution phase described in 8.3.3 ECI Execution phase, but with a limited scope of work. This means that the ECI contractors would only work on sections of the project where the E&M supplier input is not required or limited. For example, the Tunnelling section and the Pipeline section.

Similarly, to the Competitive ECI phase, there will be 5 Streams.

Stream 4.a will focus on defining the approved ECI evaluation and criteria process so that a shortlist from two to one can be completed.

8.3.4.2 Single ECI phase (b)

The objectives of the Single ECI execution phase are, as follows:

- provide the opportunity for the Single ECI Contractor to directly communicate with, and build relationships with, the Hydro Tasmania stakeholders and the newly appointed E&M supplier;
- provide a class two cost estimate, level three delivery schedule, project delivery documentation and contract schedules prior to the final investment decision (FID) for the entire project.

Please note that as we shortlist from two to one, there will be a risk of cost inflation from the selected ECI contractor. As such, it will be key to have captured some key rates from each ECI contractor prior to shortlisting, that would be used to benchmark the rates used in Phase (b) of the ECI.

8.3.4.3 Duration

It is expected that the duration of this ECI Variation would take 6 to 8 months.

8.4 ▪ Selection criteria

The selection of suppliers along will be undertaken using the following selection criteria that will need to be confirmed as Hydro Tasmania progresses through the procurement process. For each stage, an evaluation team will need to be formed along with an evaluation process that contains the criteria, their weighting and the role of each evaluation team member.

Table 7 - supplier selection criteria

Stage	Mandatory Requirements	Qualitative Criteria	Quantitative Criteria
E&M RFI	To be defined - the E&M RFI has been developed by Hydro Tasmania without input from Turner & Townsend.		
E&M Tender	To be defined based on technical and project requirements		
ECI ROI	Compliance with mandatory requirements	▪ Capability ▪ Capacity ▪ Experience in Hydro projects as an EPC Contractor ▪ Financial balance statement ▪ Personnel available for the project ▪ Approaches to engage and work with local businesses	▪ None
ECI Tender	Compliance with mandatory requirements	▪ Proposed approach to project delivery ▪ Approach to driving a 'best for project' solution	▪ Profit margin ▪ Overheads ▪ Pre-construction stage fee ▪ Approach to risk pricing and any other cost

		▪ Proposed ECI and delivery team members ▪ Ability to deliver similar type projects on schedule ▪ Experience with similar projects (track record) ▪ Familiarity with local market conditions and supply chains ▪ Departures from EPC Contract Heads of Agreement	components and key unit rates
Two ECI contractors to One ECI Contractor (opt)	Compliance with mandatory requirements	▪ Legal agreement ▪ Project solution in detail ▪ Risk allocation	▪ Target Price on key elements of the Project
EPC Award	Compliance with mandatory requirements	▪ Legal agreement ▪ Project solution in detail including methodologies	▪ Total cost of the project

9 Commercial Model

The main options under consideration for the Project are Lump Sum (Fixed Price) or Target Cost model.

9.1 Target Cost

Target cost arrangements are designed to manage the cost risks that would normally be associated with an open book/cost-reimbursable pricing mechanism.

The target cost for the project would be set during the ECI phase, with savings achieved or cost overruns incurred at the end of the final project being shared between Hydro Tasmania and the contractor based on an agreed formula.

The main aim of these models is to create a positive financial incentive to the contractor to encourage good cost control, which can lead to good collaboration among the project team - much more so than under lump sum contracting models. It is for this reason that target cost pricing mechanisms tend to be a key feature of alliance delivery models.

The target cost can be set for the Project, or for specific elements of it. These elements can be defined during the ECI Phase, based on the commensurate levels of risk and opportunity attached to each element (e.g. pipeline, tunnel, powerhouse etc.).

Target costs typically comprise of:

- Direct costs: the cost of the labour, materials and other resources that are necessary for the successful completion of the project;
- Contractor fees: The contractor's overhead and management costs, and desired profit margin; and
- Risk: defined contingencies allocated for risks faced by both the contractor and the Hydro Tasmania.

Agreeing on the target cost will require Hydro Tasmania to have expertise in accurate estimation of the cost of the works, and effective contractor negotiation skills to arrive at an agreed target cost. This capability may not exist today, and would therefore need to be developed internally, or sourced through external professional services providers.

Additionally, target cost contracts will require Hydro Tasmania to develop or acquire suitable cost management expertise and experience in managing this type of approach, to ensure that the target cost is reasonable, and that all costs claimed by the contractor are properly due under the contract.

9.2 ▪ Lump Sum

A lump sum contract remains the most commonly-used pricing mechanism in a construction contract, with the contract price based on a single lump sum price agreed between Hydro Tasmania and the contractor prior to award of contract.

Lump sum contracts are most appropriate for projects where the requirements are well-defined (which is foreseeable at the end of the ECI process), as they will enable the contractor to accurately price the project, assuming that significant post-contract changes are unlikely.

Lump sum contracts transfer financial risk to the contractor and therefore offer Hydro Tasmania greater certainty about the likely cost of the works. However, a lump sum contract for the Project could be subject to variation caused by:

- Geological conditions beyond that stipulated in any Geotechnical Baseline;
- Design changes required by Hydro Tasmania post-contract;
- The Project encountering any agreed latent condition clauses required by the contractor;
- The need to include provisional sums to cover off undefined requirements relating to any of the packages; and
- Mechanisms to deal with the inflationary impacts of increases in labour and material costs.

In the current construction market, lump sum contracts are proving to be unattractive to contractors and can result in additional risk provisions being priced in, which translates to profit for the contractor should those risks not eventuate. Under a lump sum contract, there is no incentive for the contractor to drive innovation or cost saving for Hydro Tasmania, or consider longer-term operating efficiencies.

9.3 ▪ Recommendation for the Project

As at the time of this report, the recommendation is that a target cost model is adopted for the project, comprising:

- Agreed target costs for specific packages (at the end of the ECI phase);
- If required, cost-reimbursable packages where design or requirements are unclear, or the contractor is unable to accept the risk;
- Project-level contract incentives such as pain-share/gain-share mechanisms for cost performance, or key performance indicators for non-cost targets (for example where incentives are paid or penalties incurred relating to safety targets);
- liquidated damages regimes to address potential costs to Hydro Tasmania associated with poor performance or delay

Similar to the Contracting Model options, it is recommended that this model is further defined during the procurement activity for an EPC Contractor for the ECI phase, and potentially refined during the competitive ECI phase as a contributor to the choice of ECI contractor.

10 Contracting Strategy

The decision of the form of contract defines and shapes the relationships through the life of the project, blocking or enabling productive collaboration with delivery partners.

In developing the contracting strategy, Turner & Townsend have consulted our Contract Services team, and have reviewed other Australian projects with similar characteristics to the Project.

10.1 Key Findings

Similar projects planned or underway across Australia where Turner & Townsend have experience are utilising the following contract forms:

- **Transgrid – Project Energy Connect -** uses FIDIC Silver for EPC with Lump Sum, with significant customisation of the contract. Transgrid's next megaproject is HumeLink, which is currently working through an ECI process with multiple contract options being considered.
- **Sydney Water** – Major Projects use either a D&C Lump sum or NEC4 ECC Option C (Target Cost) contract. Sydney Water's P4S program utilises solely NEC4 contracts, specifically ECC Options A and C (Lump Sum and Target Cost)
- **Snowy Hydro 2.0** adopted the FIDIC Silver Book contract, although this was heavily amended by their lawyers (Allens)
- **Oil & Gas Client** – one of Turner & Townsend's major (ASX-50) Oil & Gas clients are utilising NEC4 with a Target Cost for a major renewables project
- **ElectraNet's** Project EnergyConnect interconnector (SA side) was bespoke ElectraNet terms that were once based on AS D&C contracts for transmission lines (Downer) and Substations (CPP). ElectraNet utilised an ECI process to arrive at a D&C / Lump Sum, with significant quantities of free-issue items.
- **Brisbane City Council** Recent Tunnelling / Underground major contracts in SEQ by Brisbane City Council such as Legacy Way, Kingsford Smith Drive Upgrade and Brisbane Metro are DCMO/D&C using a bespoke contract, which is modified from job to job to suit the specifics but is very similar to and has its origins in FIDIC style contracts.
- **Other tunnelling jobs in SEQ** such as Clem 7, Airport Link and the current Cross River Rail were all PPPs where the D&C contract is between the SPV and the Contractor. These contracts are bespoke for each project but also have their origin in the FIDIC style contracts.
- **Sydney Metro** tunnelling contracts are bespoke contracts developed specifically for Transport for NSW/Sydney Metro program.

In further research, it was also noted that **Consult Australia** (www.consultaustralia.com.au) has recognised in its July 2021 report note that standardised contracts should be adopted (for major projects) to underpin the collaboration required to deliver the projects, together with early warning mechanisms and dispute avoidance.

The advantages of using standard forms are:

- Familiarity;
- Easier to price;
- Reduced post-tender negotiations;
- Ease of administration;

- Ability to create back-to-back subcontracts; and
- the benefit from interpretation of contract terms in case law.

Suppliers are nervous of bespoke agreements, particularly newly developed agreements requiring higher levels of scrutiny by lawyers and potentially impacting suppliers' appetite to bid for works under bespoke contracts. Similarly, heavily amended standard forms can deter suppliers or elicit risk averse bids, undermining opportunities for collaborative working and innovation.

Turner & Townsend has observed how FIDIC focuses on claims, liabilities, dispute, and risks. NEC focuses on issuing early warnings, on program and on preventive measures to make the contract more manageable between the parties. However, it is worth noting that the new FIDIC emerald book is similar to NEC with its amendments.

The written format of FIDIC is traditional with sometimes complex language. NEC uses easy, clear, and straightforward language. The clarity and simplicity of the language in the NEC contract facilitates the understanding of its clauses which makes it more user-friendly than FIDIC.

Turner & Townsend's experience indicates that the greater the level of customisation from standard contract forms, the greater the level of legal support and involvement required, and the more risk is priced in by the contractor(s).

10.2▪ Contracting Options

There are a number of choices of standard forms each with a number of sub-options. There is also the option to create a bespoke form of agreement.

10.2.1 Relevant Forms of Agreement for Consideration

10.2.1.1 NEC Contract

- New Engineering Contract developed by the UK Institution of Civil Engineers;
- Widely adopted in the UK and the choice of contract form by the UK Government on many projects;
- NEC 4 facilitates ECI through X22 Secondary Option Clause;
- Facilitates two-stage tendering and each stage can have its own pricing mechanism; and
- Designed to be a collaborative contract and provides flexibility of procurement routes.

10.2.1.2 FIDIC

- Developed by the International Federation of Consulting Engineers;
- Internationally used standard form and preferred choice for funders;
- Mainly used for international infrastructure projects/plants;
- There are no specific ECI provisions however these can be introduced through amendments; and
- 2017 editions introduce provisions to aid collaboration but there are no obligations.

Standard FIDIC Agreements do not currently include provision for Target Cost models, however they can be amended to include these. Target Cost models for FIDIC are expected to be released in 2023.

10.2.1.3 IChemE

- Developed by the Institution of Chemical Engineers in the UK;
- Generally used for complex process plant projects;
- Provides flexibility of commercial model - lump sum, reimbursable and target cost forms
- Contract promotes and is based on co-operation and fairness between parties.
- No specific ECI provisions in the contract.

10.2.1.4 Bespoke Forms

- **Advantages:**
  - Can be tailored to accommodate the specific nature and risks of the project; and
  - Can be tailored to fit any commercial model.
- **Disadvantages:**
  - Market may not be familiar with these forms of agreement;
  - Increased post-tender negotiations;
  - Lacks a suite of subcontracts/other contracts to complement the main contract; and
  - Increased administration.

10.3 Recommended Contracting Approach

Based on the information available at this time, the current recommendation is to adopt the NEC4 Engineering and Construction Contract (ECC) model Option C – (Target Contract With Activity Schedule).

The NEC4 Engineering and Construction Contract (ECC) Option C is the target cost main works contract with an activity schedule. It can include any level of design and is ideal for more complex or larger projects, where the client and contractor are willing to share project financial risk in a fully collaborative way.

This contracting model is already set up so that the contractor prices activities in the client's activity schedule based on actual cost plus a fee, resulting in a target price. The client makes interim payments on completion of each activity and differences from the target price are shared according to an agreed pain/gain share proportion. This directly incentivises both parties to look for cost savings throughout the works.

A full review of the optional clauses under this contract form is recommended as the project's specific requirements develop, although initial optional clauses to be considered as a minimum are:

- "Y" clauses, which contain wording specific to each state and territory to address the relevant security of payment legislation,
- Option X1: Price adjustment for inflation
- Option X7: Delay damages
- Option X17: Low performance damages
- Option X22: Early Contractor involvement

However, the recommendation to use NEC4 is provided without engagement with Hydro Tasmania's legal team, or a full workshop/assessment process of the risk transfer that would occur

under the NEC4 contract model. It is recommended that this additional activity is undertaken as a subsequent activity to this procurement strategy.

Additional considerations that Hydro Tasmania should think about is the level of skill set and effort required to administer the NEC4 contract suite. This skill set does not exist in Hydro Tasmania today, and would need to be developed through appropriate training, recruitment or partnering with professional services firms familiar in using NEC4.

To finalise the Contracting model in the next phase of the program, it is recommended that a Contracting and Commercial workshop is held as part of the process to develop procurement documentation for the next phase of the Project, including specialist expertise in Contract and Commercial models for major infrastructure projects.

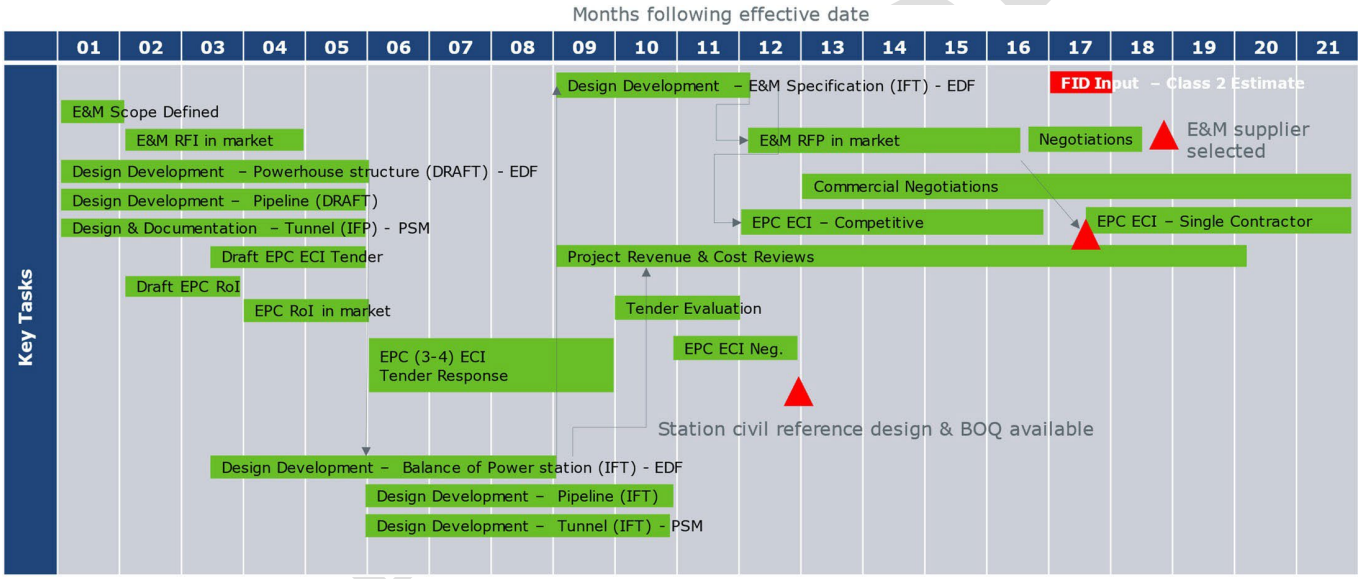
This workshop and follow up activity (over a period of 2-3 weeks) would consider a full risk and opportunity exercise for each contract option, and select an appropriate contract model based on complexity, target operating model and delivery model considerations.

Ultimately, the decision on which contract form to use is dependent on the agreed risk sharing position adopted by Hydro Tasmania, the response from the market, and the contract management capabilities needed to administer the contract.

11 Procurement Timeline

The Procurement Timeline is likely to be subject to change, as the expected timing of the availability and as the project matures through the delivery of the Preliminary Business Case. The procurement timeline to support this proposed procurement strategy is summarised below:

Figure 7 - Indicative Procurement Timeline



Appendix H: Planning, environmental and heritage assessment

The planning, environmental and heritage assessments and approvals necessary to support the delivery of the Tarraleah redevelopment have been outlined in the Tarraleah approvals pathway prepared by Hydro Tasmania's BotN ESIA team. The approvals pathway document describes the risks, benefits and critical inputs associated with four identified options that are considered most likely to apply to the Tarraleah redevelopment project. A preferred option is recommended based on the resultant risk position for the business.

H.1 Baseline considerations

The project area has been influenced by past disturbance, particularly from hydropower development, timber harvesting and plantation development for production forestry. For example:

- Hydropower infrastructure including dams, canals, flumes, penstocks and transmission lines are prominent features of the landscape.
- Approximately 200 hectares of native vegetation was recorded during ecological surveys within the disturbance footprint (i.e. the surface area that will be directly impacted by construction of the project), of which 183 ha was made up of wet or dry eucalypt forest. Approximately half of this eucalypt forest has been previously harvested and is currently regenerating.
- Waterbodies potentially impacted by the project - River Derwent from Clark Dam to Lake Catagunya, the Nive River from Tarraleah Power Station to Wayatinah Lagoon, Lake King William, Lake Liapootah, Wayatinah Lagoon, Mossy Marsh Pond, No. 1 Pond and No. 2 Pond) - are all currently regulated through Hydro Tasmania's current operation of the Derwent hydropower scheme.

H.2 Potential environmental and heritage impacts

Based on the reference design, it was determined that the project is likely to have a direct or indirect impact on terrestrial, aquatic, aboriginal heritage, and historic heritage values regulated by the Australian, State, or local government. In addition, the project will cross or require the occupation of land owned by Hydro Tasmania, Sustainable Timber Tasmania, and the Tasmanian Parks and Wildlife Service.

In seeking to assess the potential impacts and subsequent planning, environmental, and heritage approvals necessary to support the redevelopment, the following assessments and surveys will be undertaken and have commenced:

- Terrestrial Ecology Baseline Assessment (Vegetation Communities, Flora and Fauna)
- Aquatic Ecology Baseline Assessment
- Hydrology Report
- Aboriginal Heritage Survey
- Historic Cultural Heritage Survey
- Matters of National Environmental Significance Summary Report.

H.3 Approval requirements

Having regard to the likely environmental and cultural impacts of the project, it is expected that the following planning, environmental and heritage assessments and approvals will be required:

- referral, assessment, and approval under the EPBC
- assessment as a Level 2 activity in accordance with the EMPC
- a Reserve Activity Assessment under the *National Parks and Reserves Management Act 2002* (Tas)

- a permit/s to take interfere with Aboriginal Relics under the *Aboriginal Heritage Act 1975* (Tas)
- a Heritage Agreement under the *Historic Cultural Heritage Act 1995* (Tas)
- a permit/s to take threatened species under the *Threatened Species Protection Act 1995* (Tas)
- a forest activity assessment under the *Forest Management Act 201*3 (Tas).

EPBC approval

Assessments to date have identified that the operation and construction of the proposed redeveloped Tarraleah scheme has the potential to impact on the following matters of national environmental significance:

- suitable habitat for the threatened riparian plant species native wintercress (*Barbarea australis*) at locations in the River Derwent between Derwent Pumps and Wayatinah Lagoon
- *Barbarea australis* downstream of Liapootah and Wayatinah dams
- a patch of 'Alpine Sphagnum Bogs and Associated Fens' ecological vegetation community at Mossy Marsh
- Tasmania wedge-tailed eagle, masked owl, Tasmanian devil, spotted tailed quoll and eastern quoll whose habitat occurs through the redevelopment project footprint
- TWWHA downstream of Derwent Pumps and upstream of Wayatinah Lagoon.

The project has been referred to DCCEEW. Conditions may be applied to the project as part of its approvals.

Water Management Act 1999 (Tas)

Hydro Tasmania's rights to manage water are established under Schedule 4 of the *Water Management Act 1999* (WM Act) and are detailed in a Special Water Licence established under section 115(2) of the WM Act. The Special Water Licence affords Hydro Tasmania to licence manage water across six large catchments that cover approximately 60% of Tasmania and are subject to other conditions as may be agreed by the Minister and Hydro Tasmania.

The existing Tarraleah Power Scheme is located within the River Derwent hydro-electric district (originally called the River Derwent hydro-electric water district) appointed under statutory rule No. 111 of 1958, and forms part of the rights to take and manage water afforded by the Special Licence. No approvals are required under the WM Act or Special Water Licence to modify water operations associated with redevelopment of the Tarraleah Power Scheme.

Hydro-Electric Corporation Act 1995 (Tas)

In accordance with section 8 of the *Hydro-Electric Corporation Act 1995* (Tas) the construction of a major new power facility with a capacity exceeding 40 MW requires approval from the Tasmanian Parliament. To seek approval, details of the nature of the major power facility, its capacity to generate electricity, where the major power facility is to be situated, the estimated cost of constructing the major power facility and the extent to which the cost is to be met by the Corporation needs to be submitted for consideration.

Land Use Planning and Approvals Act 1993

Some aspects of the redevelopment may be exempt from the permitting requirements under the *Land Use Planning and Approvals Act 1993 (Tas)* (LUPA Act). This may include the construction or modification of power distribution or transmission infrastructure under section 57 of the Tasmanian *Electricity Industry Supply Act 1995 (Tas)*.

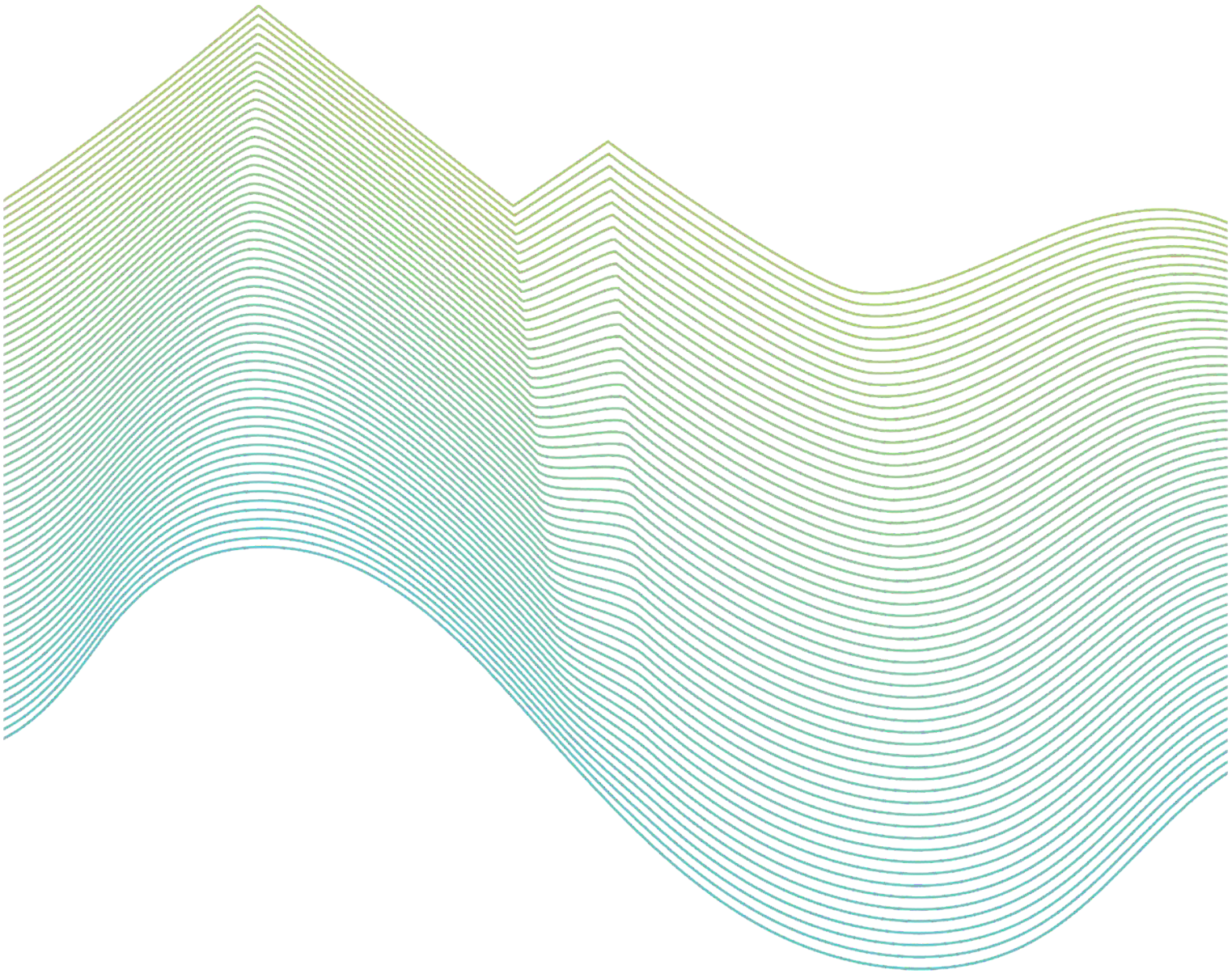
Additionally, in accordance with s.60A(2) of the LUPA Act, Hydro Tasmania, as a Water Entity administering a Water District, is not required to hold a planning permit for any activities necessary for the operation, maintenance, repair, minor modification, upgrading or replacement of existing assets owned by Hydro Tasmania, providing the works will not cause an environmental nuisance, material or environmental harm.

Appendix I: Stakeholder Engagement Plan

Stakeholder Engagement Plan

Proposed Tarraleah Redevelopment (Pre-FID)

March 2023



Contents

Hydro Tasmania document control			
Title	Stakeholder Engagement Plan, Tarraleah Pre-FID		Version: 3
		Document owner:	*********
		Date created:	1 September 2022
Approver:	*******	Date approved:	13 April 2023
		Date effective:	

Acknowledgement of Country

Hydro Tasmania acknowledges Aboriginal people as the traditional owners and custodians of lutruwita/Tasmania, as well as First Nations people from elsewhere, and their ongoing connection to Country and custodianship of the land, seas and waters.

We acknowledge that Hydro Tasmania has a responsibility to care for Country where our sites are located and we are committed to continuing learning from First Nations people. We pay our respects to Elders past and present, and appreciate their generosity in sharing knowledge and culture.

1.0 Introduction

Hydro Tasmania is committed to meaningful stakeholder and community engagement so that we can develop and implement a sustainable project, grounded on the support of communities and key stakeholders.

Our aim is to interact with our communities and stakeholders in a way that manages project related risks, reduces impacts, and maximizes the benefits for our communities derived from the potential future redevelopment of the Tarraleah hydropower scheme (the Tarraleah Redevelopment Project), as part of the broader Battery of the Nation (BotN) project. It is our expectation and intention that stakeholders and communities will be consulted throughout project planning, implementation, and execution.

1.1 Purpose and Scope

1.1.1 Purpose

This document is the Community and Stakeholder Engagement Plan (SEP) for the Tarraleah Redevelopment Project and associated upgrade works.

The SEP is the document that brings together the strategies, policies, assessments, and actions that contribute to a successful stakeholder engagement and management process. The SEP supports the identification, and engagement of project stakeholders, the management of impacts and enhancement of opportunities associated with the proposed Tarraleah Redevelopment Project. The SEP presents an implementation schedule for engagement activities across defined phases of the project development and approvals process.

3. **The SEP is a dynamic document designed to be updated as project planning and implementation progresses.**

To build trust in our processes and relationships

To provide equitable opportunities for communities to have their say

To manage project risk, mitigate impacts and make a positive difference for Tasmanians

1.1.2 Scope

The SEP describes the stakeholder engagement activities associated with the detailed design, development planning and development approvals phase of the Tarraleah Redevelopment Project (including upgrade works) up to and including the Final Investment Decision (FID). The scope of the SEP includes consultation to inform the preparation of the environmental impact assessment report, specifically the identification and consideration of potential impacts and opportunities.

It is recognised that the stakeholder engagement occurring under this plan sits alongside other stakeholder engagement and communications activities across Hydro Tasmania's usual business. Therefore, the general approaches, principles and methodologies adopted within this SEP are aligned to broader HT policies and operational plans.

1.2 Document Structure

This document is structured as follows:

- Section 1 – Introduction (this section) – describes the scope and purpose of the SEP.
- Section 2 – Community Engagement Principles – describes Hydro Tasmania's community engagement principles and alignment with Hydro Tasmania's 'Stakeholder Engagement Charter'1.
- Section 3 – Context– provides background context to the Tarraleah Redevelopment Project.
- Section 4 – Tarraleah Redevelopment Project Overview – provides a summary description of the Tarraleah Redevelopment Project and upgrade works.
- Section 5 –Tarraleah Redevelopment Project Social Setting – provides a summary description of the social setting of the Tarraleah redevelopment Project with reference to a of suite key social indicators.
- Section 6 - Social Risk Management Framework – describes the approach to social risk management.
- Section 7 – Integrated Stakeholder Engagement Plan – describes the approach to stakeholder engagement for the Tarraleah Redevelopment Project with reference to objectives, stakeholder identification, phasing and engagement methods.
- Section 8 – Phase 1 Engagement Implementation Plan – presents the implementation plan for Phase 1 engagement (EPBC Act Lodgement).
- Appendices

– Appendix 1 – IAP2 Spectrum, of Public Participation

– Appendix 2 – Hydro Tasmania's Stakeholder Engagement Charter

[1] See Appendix 2

2.0 Community Engagement Principles

In accordance with Hydro Tasmania's '**Stakeholder Engagement Charter**'[2], we are committed to engaging with all our stakeholders, including: our shareholder (the Tasmanian Government), partner organisations, the community and contractors and suppliers. The charter guides our community engagement principles (Table 1), defining how we hope to work together with our stakeholders.

Table 1 Community Engagement Principles

Principle	Description
Genuine	Seek community input and feedback, listen actively, report back what has been heard, respond thoughtfully, and make clear how community feedback has influenced the project (or not) and why.
Flexible	Allow opportunities for community input to influence actions and decisions relating to matters that affect them directly and to the project where appropriate. Tailor the approach to match the local context, based on local input.
Trustworthy	Build, maintain and value local relationships. Show that outcomes are delivered on commitments (however small or large)
Inclusive	Reach different people with different needs within the community using a good mix of methods that are sustained over time, recognise and reach out to the many segments of a community (e.g. including First Nations, youth). Support people to participate where required.
Mutually beneficial	Seek outcomes that benefit all parties. Remember that good practice will deliver better outcomes for communities, projects, developers, and government.
Collaborative	Seek out local organisations already doing good engagement and community development in the project area to get advice from and partner with. Seek out and engage with people's ideas, feedback, and suggestions.

Note: Adapted from the Renewables, Climate and Future Industries Tasmania Draft Guideline for Community Engagement, Benefit Sharing and Local Procurement (2022).

[2] See Appendix 2

3.0 Context

3.1 National Electricity Market

The demand for clean energy from wind and solar is rising and so is the need for a way to fill the gaps when the sun is not shining, or the wind isn't blowing. Through its *Battery of the Nation* initiative, Hydro Tasmania is looking at how we can adapt our assets - including Tarraleah - to make sure they are ready to meet these new needs and also investigating new pumped hydro projects.

The Battery of the Nation is reliant on more interconnection through Marinus Link. This link will unlock Tasmania's renewable energy potential which will bring benefits of lower power prices, greater economic returns to the state, and the jobs and investment that will help grow our economy for the future.

One of the characteristics of Tarraleah is that it is inflexible, operating essentially as baseload generation. It is therefore unable to respond effectively to changing demand patterns. The Tarraleah redevelopment is in response to this need and a new power station and associated conveyance system is a key to unlocking the value of hydro generation within a modern, renewable energy system.

The Final Investment Decision (FID) for the Tarraleah Redevelopment is scheduled to occur in mid-2024.

3.2 Tasmanian's attitudes towards renewable energy

A guideline for community engagement, benefit sharing and local procurement (RECFIT 2022) identified that most Tasmanians agreed Tasmania should be producing renewable energy due to:

- economic benefits,
- reduction of electricity costs in Tasmania,
- climate mitigation benefits.

However, one in three Tasmanians are concerned about the impact individual developments can have and the potential cost to taxpayers.

The key reasons for these concerns include:

- visual impact;
- the development being at odds with heritage listed sites or scenic beauty;
- lack of benefits for the local community;
- poor community engagement;
- risks to tourism; and
- environmental or biodiversity impacts.

4.0 Tarraleah Redevelopment Project Description

4.1 Background

Getting the most out of our existing hydropower generation is a key part of the Battery of the Nation initiative. The flagship project we've assessed is one of Tasmania's oldest hydropower schemes. The Tarraleah scheme in the Central Highlands was commissioned in the 1930s and produces around 630 gigawatt hours of energy each year (or 6.5%) of Hydro Tasmania's total production.

The Australian Renewable Energy Agency (ARENA) provided $2.5 million, matched by Hydro Tasmania, for a feasibility study to assess options for reimagining the scheme to better suit anticipated needs of the future energy market. This study demonstrated the technical feasibility of redevelopment, with potential to transform the scheme to increase and flexibility - all valuable requirements in the future market.

Hydro Tasmania is aligning our investment and development pathway to the development timeline and progress of Marinus Link, with Tarraleah aligned to the first 750MW Marinus Link cable.

In December 2020, the Tasmanian and Australian Governments announced a Memorandum of Understanding (MoU) that outlined a path and further certainty for progressing Marinus Link and the pumped hydro and hydropower upgrade opportunities (including Tarraleah) that form the Battery of the Nation.

In April 2022, the Federal Government announced a funding commitment of up to $65M for the Tarraleah hydropower scheme which will bring the exciting vision for its future one step closer.

Together with investment from Hydro Tasmania, this represents a ~$123 million project, with work progressing on assessing the commercial viability of scheme redevelopment and a staged program of upgrade works that enables the replacement of ageing assets (no 1 Canal) and allows for all future scenarios, including potential redevelopment.

4.2 Tarraleah Redevelopment Project and Upgrade Works

4.2.1 Upgrade Works

In August 2022, work commenced on the first stage of a program of upgrades as a program of work to replace the No. 1 canal. This work supports all future scenarios for the scheme and is required irrespective of a redevelopment proceeding. The upgrade works include:

- Preparatory activities ahead of construction of a new intake at Lake King William and campground closure
- Dam safety improvements at Mossy Marsh Dam and provision of a new emergency spillway location
- Power and communications to the upgrade construction sites.

The upgrade works will maintain the ability to progress redevelopment, subject to a positive financial investment decision (FID).

4.2.2 Tarraleah Redevelopment Project

The proposed Tarraleah Redevelopment Project would increase the capacity of the Tarraleah hydropower scheme from 90 megawatts (MW) to approximately 190 MW and increase its operational flexibility and efficiency. The key components of the Tarraleah Redevelopment Project include a series of new pressurised tunnels and a pipeline to convey water from Lake King William to a new hydropower station to be located adjacent to the existing Tarraleah Power Station on the Lyell Highway. The project also includes a new surge tower, approximately 70 m high (above ground level) and a new switchyard.The No. 1 Canal, existing Tarraleah Power Station and hillside penstocks would be decommissioned. Mossy Marsh and No. 2 ponds would transfer less water than current as the pressurised tunnel would bypass these storages and only water from Derwent Pumps and natural pickup flow through Mossy Marsh and would be pumped from Pond No. 2 to the new surge tower.

Figure 1 illustrates the key components of the Tarraleah Redevelopment Project and the upgrade works.

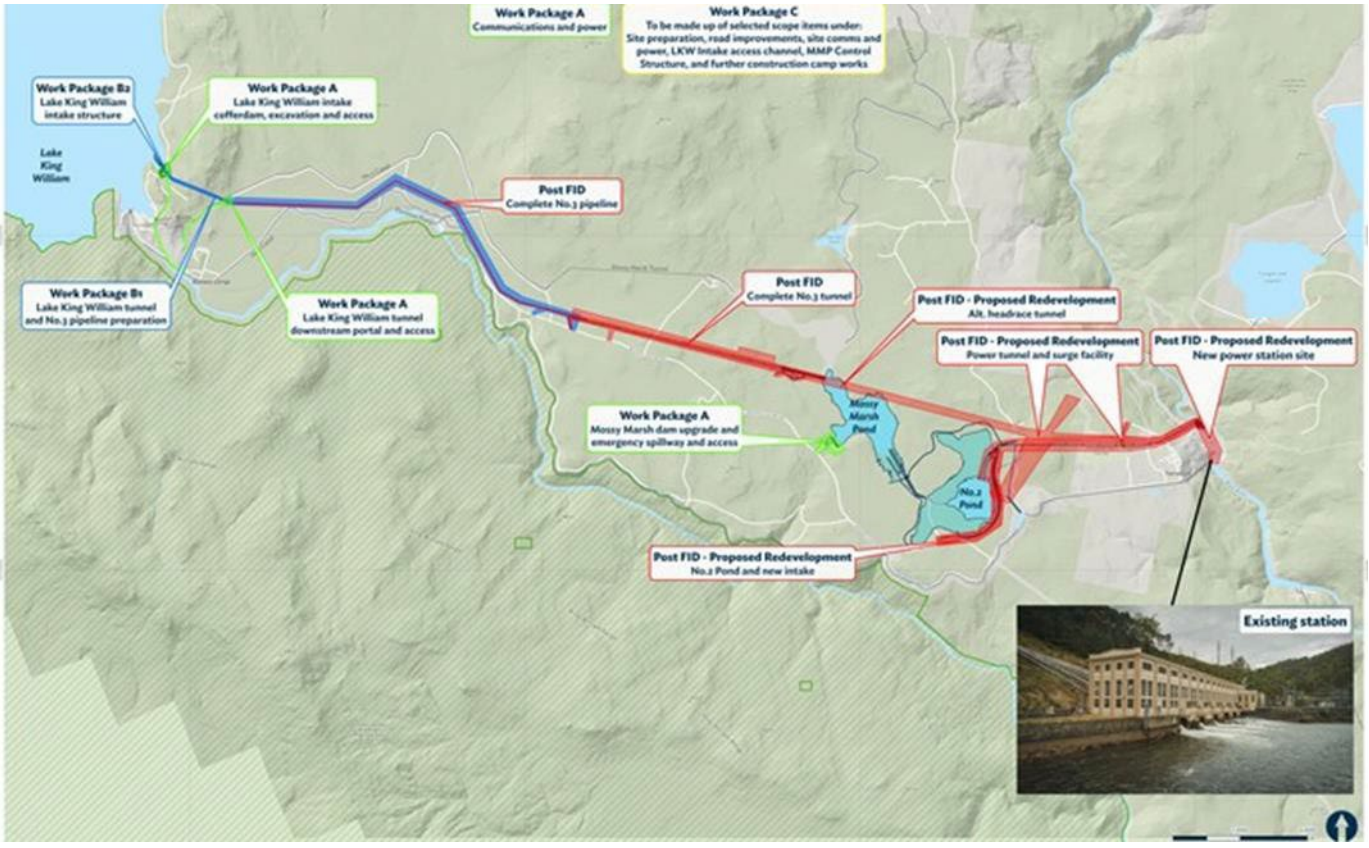


Figure 1 Overview of Tarraleah Redevelopment Project

4.3 A brief history of the Tarraleah scheme

Sitting at the top of the Derwent hydropower scheme, the Tarraleah Power Station and Scheme is one of Hydro Tasmania's oldest and most recognisable assets, with a network of canals and six penstocks that transport water 290m down to Tarraleah Station in the Nive Valley.

The Tarraleah Power Development was approved by the Tasmanian Parliament in 1934. It was seen as a way of both meeting future demands for electricity and helping to solve Tasmania's unemployment problem. The area was largely inaccessible and the first task was to construct an access road. There were few machines and mechanical aids and living conditions were primitive.

A small weir with control gates was built at the southern end of Lake St Clair, raising its level by three metres and providing control over downstream flow. A pumping station was also constructed. The pumps had the ability to lower the level of the lake by six metres but were rarely used and were removed from service in 1993.

Early work on the Tarraleah Power Development also involved the building of a small weir on the Derwent River at Butlers Gorge. Water flow in the river was diverted by the weir and sent some 25 kilometres overland in a combination of flume, canal and pipeline. It then dropped through steel penstocks, into the Tarraleah Power Station in the valley of the Nive River. Camps for construction workers were established at Tarraleah and Butlers Gorge as well as at five separate localities along the route of the overland channel. In 1938 the first three generators at Tarraleah were commissioned.

A further expansion of the scheme was hampered by serious labour shortages during the Second World War. The arrival of Polish and British migrants in 1947 allowed the completion of the 61-metre-high Clark Dam at Butlers Gorge in 1951. This created a second and larger storage for the development - Lake King William.

The small Butlers Gorge Power Station, with a capacity of 12.2 MW was constructed at the foot of the Clark Dam. The dam itself was raised a further six metres in 1964. A second overland channel between Lake King William and Tarraleah was completed in 1955. Extra water is diverted into it via an automatic pumping station on the Derwent River a few kilometres below the Clark Dam. Water is also diverted into the channel from three small tributaries of the Nive River. These works were completed in 1959.

The design of the existing Tarraleah Power Station was a bold statement for its time of engineering innovation and achievement in remote Tasmanian bush. It was designed as an architectural showcase, with its form, architectural features and detailing all reflective of the art deco influence of this era.

The fourth, fifth and sixth generators at Tarraleah were commissioned in 1943, 1945 and 1951 respectively. All six operate with a head of about 290 metres and a total capacity of 90 MW.

Figure 2 provides a schematic overview of the Tarraleah Scheme.

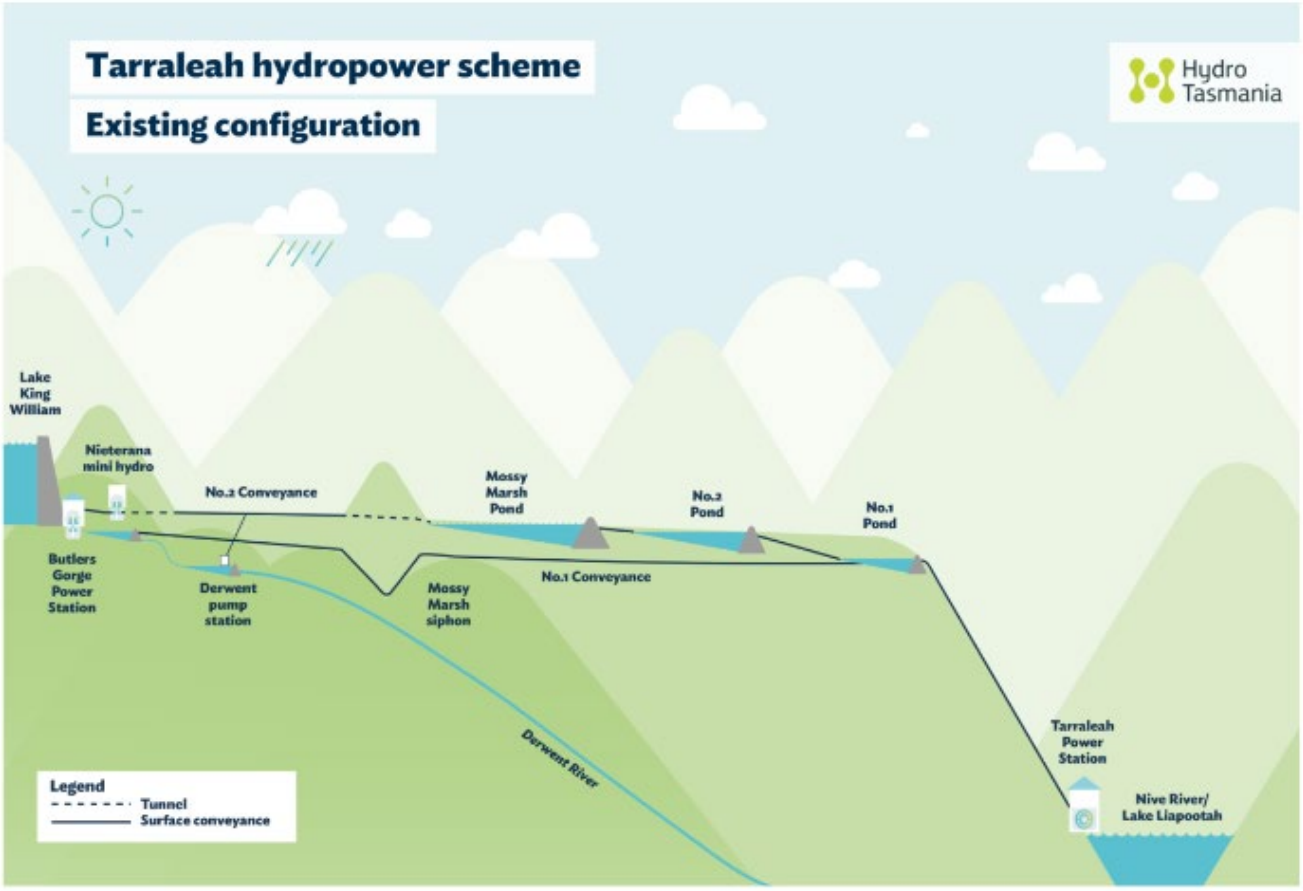


Figure 2: Schematic overview of the existing Tarraleah Hydro Electric Scheme.

5.0 Social Setting

5.1 Overview of Project Surrounds

The Tarraleah Redevelopment Project is located within the Central Highlands Local Government Area (CHLGA) in Southern Tasmania. Southern Tasmania is made of the local governments as shown in Figure 2.

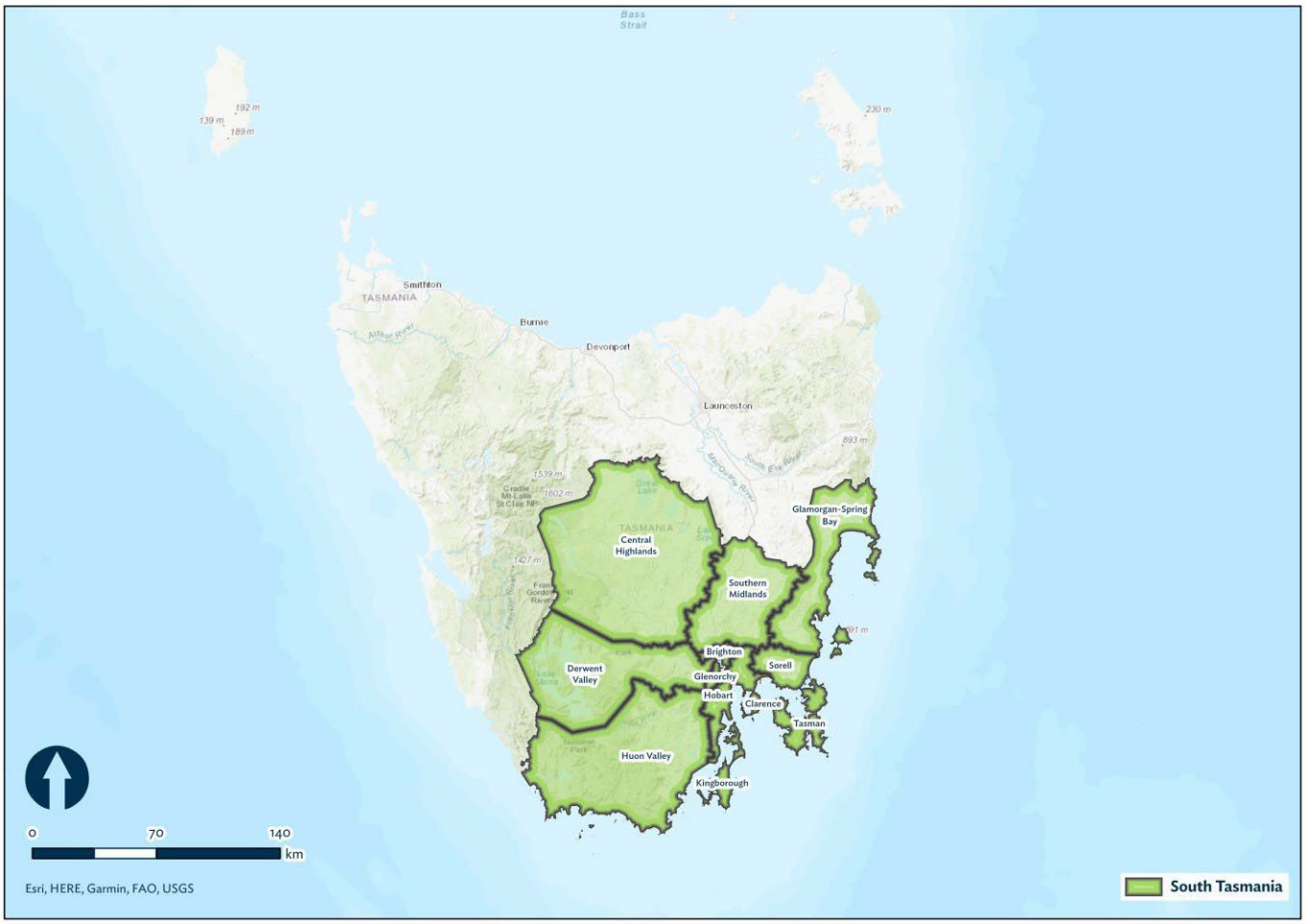


Figure 2: Central Highlands LGA within the context of Southern Tasmania.

The infrastructure proposed under the proposed Tarraleah redevelopment is generally located in remote areas of the central highlands, bordering the Tasmanian Wilderness World Heritage Area (TWWHA).

Most of the land along the water conveyance is 'authority land' managed by Sustainable Timbers Tasmania as production hardwood forests. The proposed conveyance follows the broad alignment of the existing No. 1 and No. 2 Canals, and the existing storages (Mossy Marsh Dam and No. 2 Pond) will remain under the new scheme. Much of the new conveyance will be through tunnels and will not be visible. Key visible elements will include surge facilities, such as a new surge tower, located near the Tarraleah Village.

The remoteness of the area and the nature of existing land uses mean that the impacts of the redevelopment on regional communities relate mainly to traffic, access and potential visual impacts for people traveling through the region. This activity will peak during construction, with traffic, noise and access implications particularly evident during this phase.

Public access to Butlers Gorge Dam and Lake King William, via Butlers Gorge Road, will not change under the redevelopment. For some periods of the construction phase, access to these areas may be impacted through traffic management arrangements. Similarly, access along the Lyell Highway will not change, although at times during construction some traffic management will be required.

Early investigations indicate that most directly impacted communities will be the Tarraleah and Wayatinah Villages (traffic, noise, worker accommodation). The communities of Ouse and Hamilton may be impacted, particularly during construction, through increased traffic and workforce accommodation demands. However, the extent of these impacts is being assessed in detail and are variable depending upon the construction methodology, timing, workforce accommodation model and other key variables.

Impacts on recreational (fishing, boating, camping) users of Lake King William and Mossy Marsh will be minimal and restricted to periods of peak construction activity, when temporary closures/access restrictions may be required to ensure public safety. Post-construction, there are no changes to recreational access proposed for these or any of the surrounding storages or facilities managed by Hydro Tasmania.

5.2 Social Area of Influence

The social area of influence of the project has been defined with reference to the following two spatial scales:

- **Direct area of social impact (DAI)** – comprising the immediate project area where material impacts such as noise and reduced access to recreational areas can occur.
- **Broader area of social impact (BAI)** – comprising the broader areas within the central/southern region of Tasmania, including townships and major traffic corridors and the transport network that provide core services to the DAI populations. These are discussed on a municipal level.

The social area of influence is illustrated in Figure 3. Within the social area of influence the:

- DAI consists of the local communities of Tarraleah and Wayatinah within the CHLGA (Figure 4) as well as Bronte Lagoon, Brady's Lake and Dee shack communities, and Meadow Bank.
- BAI consists of the settlements along the Lyell Highway including Ouse, Hamilton, Gretna and New Norfolk, within the Derwent Valley local government area (DVLGA) (Figure 4).

Figure 4: Primary Social Area of Influence

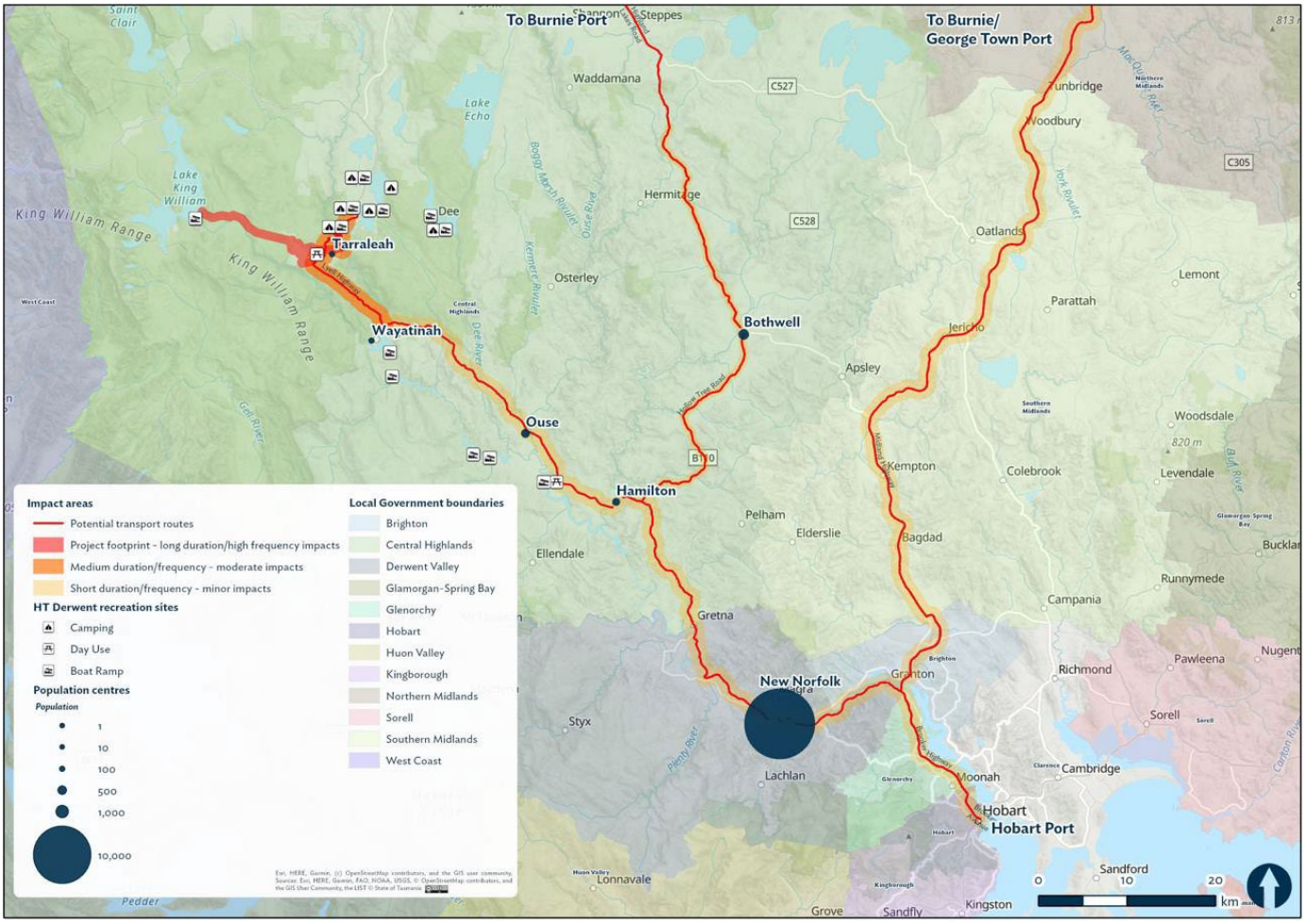


Figure 5 Map of the Central Highlands region highlighting key directly and indirectly impacted communities with respect to the Tarraleah Redevelopment Project

5.3 Socio Economic Characteristics

This section provides a summary of relevant socio-economic characteristics of the social area of influence for the Tarraleah Project. Unless otherwise noted, all statistical data presented is derived from the Australian Bureau of Statistics (ABS) 2016 Census.

5.3.1 Demographic profile

Population size: The DAI had a population of 89 residents, which is 0.04% of the population of the Central Highlands LGA. Of these residents, 34 resided in Wayatinah, 28 resided in Bronte Park, 11 resided in Dee and 16 resided in Meadowbank. There were no residents recorded for Tarraleah at the time of the census. The small number of residents within the DAI means that labour for construction will need to be sourced from outside the DAI. The BAI had a population of 7,362. Of the communities comprising the BAI, New Norfolk had the largest population (6,605) – markedly higher than any other community in the areas of influence.

Gender balance: The DAI had a higher proportion of males than females in the population (58% compared to 39%). In contrast the BAI had a slightly higher proportion of females than males in the population (51% compared to 49%).

Median age: The median age of the DAI population was 49 years, which is in line with that of the South-East Region, however individual communities were highly varied. The median age of the BAI population (47 years) was slightly lower than that of the DAI.

Income: The median weekly personal income level within the DAI was significantly higher than the BAI ($749 compared to $484). The median weekly income level in the DAI was also significantly higher than the Central Highlands LGA ($467) and the Derwent Valley LGA ($505).

Population growth: By 2042 the Central Highlands LGA population is projected to decrease by 1.17%. In comparison, and across the same period, the population of the Derwent Valley LGA is projected to increase by 0.99%, which is generally consistent with Tasmania's projected population increase of 0.93%.

Aboriginal community: At the time of the 2016 ABS Census, there were no Aboriginal and/or Torres Strait Islander people reported as residing in the DAI. There were 364 Aboriginal and/or Torres Strait Islander people in the BAI, with the majority of these (87% or 316 people) residing in New Norfolk.

Ancestry: A high majority of residents in the social area of influence have Australian and European ancestry.

Family structure: The dominant household composition within the DAI was couples and families with no children compared to couples and families with children in the BAI.

5.3.2 Community health and wellbeing

Access to healthcare: Very low access to healthcare within the social area of influence. Out of the 11 hospitals in Tasmania, none are located within the DAI, BAI, CHLGA or DVLGA. Out of the 165 General Practices in Tasmania, two are located within the CHLGA and one in the DVLGA.

Socioeconomic disadvantage: The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) summarises information regarding social and economic factors that contribute to relative advantage and disadvantage of people and households. Both the CHLGA and the DVLGA experience relative disadvantage compared to Tasmania as a whole.

Unpaid assistance: The project areas had lower proportion of persons undertaking unpaid assistance care compared to Tasmania as a whole.

Assistance requirement: Within the DAI population a lower proportion of persons required assistance due to impairment compared to the BAI (5.1% compared to 11.2%). It is notable that the BAI experienced a significantly higher proportion of persons requiring assistance than Tasmania (6.4%).

5.3.3 Education

Availability of schools and school attendance: There are six public pre-tertiary schools and education facilities located across the combined area of CHLGA and DVLGA. Five of these facilities offer primary school education, and two offer education up to year 12 (New Norfolk High School and Glenora District School located in the DVLGA). Each school recorded attendance rates greater than 71%.

Location of schools: The closest primary school to the project site is Ouse District school (approx. 40 km drive from project site), and the closest school offering up to year 12 is Glenora District School (approx. 83 km drive from project site).

Education levels: The proportion of population aged 15 years and over with a qualification in the DAI and BAI was higher than Tasmania (75.9% and 83.2% respectively compared to 55.7%). The proportion of population aged 15 years and over with certificate level qualifications in the CHLGA and DVLGA was higher than Tasmania (29.8% and 49.6% respectively compared to 21.3%).

5.3.4 Economy

The small but thriving communities of the Central Highlands LGA support a rural-based economy strong in the agricultural, aquaculture and tourism industries. Opportunity for investment is in farming, cropping, aquaculture, tourism, renewable energy and mining[3].

The Derwent Valley has a growing economy supported by emerging niche agricultural specialties, an internationally competitive hop industry, strong natural resources, new housing developments, and recent advances in the culture and arts sector[4].

Both LGAs experienced significant impacts due to the COVID-19 pandemic. Direct implications of the COVID-19 pandemic recession include the following:

- A tourism downturn affecting hospitality, accommodation, retail, and transport.
- A manufacturing and construction downturn due to social distancing and work-from-home rules.
- Limited labour availability due to state and international border closures and travel restrictions.
- Income reductions via job losses and / or less work hours leading to less spend on goods and services. Job losses have been greatest in accommodation and food services.

Small economy: The economies of the project areas are small, but strong in areas related to agriculture and natural resources.

5.3.5 Recreation

Popular tourist destinations: Mount Field National Park, Cradle Mountain-Lake St. Clair National Park, Walls of Jerusalem National Park, Tarraleah Estate.

Natural heritage: bushwalking, fishing, camping, sightseeing, water sports and farm and winery produce.

Key recreational activities: There are several different recreational activities that occur in the CHLGA and DVLGA, including hiking and bushwalking experiences as well as sporting endeavours such as kayaking at Brady's Lake. These activities are intricately linked to the provision of accommodation (including camping facilities) in the region.

Events and Attractions: There is a pattern of shows and market days throughout the area. This is supported by a variety of mostly low-key attractions and sites.

5.3.6 Housing

Occupied private dwellings: A large proportion (67%) of unoccupied dwellings are located within the DAI, which is generally consistent with the CHLGA (64%). In comparison, 10% of dwellings within the BAI were unoccupied, which is similar to the DVLGA (9%). Housing diversity across the DAI and BAI is low, with the majority of dwellings separate houses.

Tenure type: Majority of houses in the DAI and BAI are owned rather than rented. Of owned housing within the DAI, the majority is owned outright compared to the BAI where the majority is owned with a mortgage.

Housing Availability: Both the DAI and the BAI have a small number of properties available for purchase. Rental availability is highly constrained across both the DAI and BAI.

Housing affordability: Rent prices are significantly lower within the DAI compared to Tasmania overall. Rental affordability in the DVLGA is consistent with broader Tasmania (9.6% compared to 10.2%). Rental affordability in

[3] Tasmanian Government, 2021.
[4] Derwent Valley Council, 2022.

the CHLGA (3.0%) is significantly lower than both the DVLGA and Tasmania. With respect to home purchase, mortgage affordability in the CHLGA is similar to Tasmania (5.4% compared to 5.1%) and lower than the DVLGA (7.1%).

Car ownership is high: Majority of households within both the Central Highlands LGA and the Derwent Valley LGA have two motor vehicles.

Access to internet: Majority of households (62.2%) within the DAI have access to internet, but access throughout the individual suburbs of the DAI varies.

5.3.7 Social infrastructure and services

Limited number of community organisations: There are limited number of community organisations across the project area, many of which are also reliant on services partnered through Derwent Valley Community House.

Community facilities located in larger towns: There are several community facilities in the CHLGA and DVLGA, including parks, sportsgrounds, community halls and places of worship, although many are in the larger towns such as Bothwell and Hamilton.

Limited youth facilities: There are limited dedicated youth facilities across the social area of influence, with most facilities located in New Norfolk.

Limited aged care facilities: All aged care services are located in New Norfolk.

6.0 Social Risk Management Framework

This SEP has been developed within the overall BotN Social Risk Management Framework, that consists of four interconnected elements: Transparent Engagement, Contribution to Communities, Social Impact Management and Equitable Compensation (as shown in Figure 5).

These are designed to identify, avoid, minimise, mitigate and compensate/off-set social risks and social impacts (especially negative consequences, based on hierarchy of controls), throughout the project cycle. The framework will be revisited periodically to ensure it meets evolving project development needs.

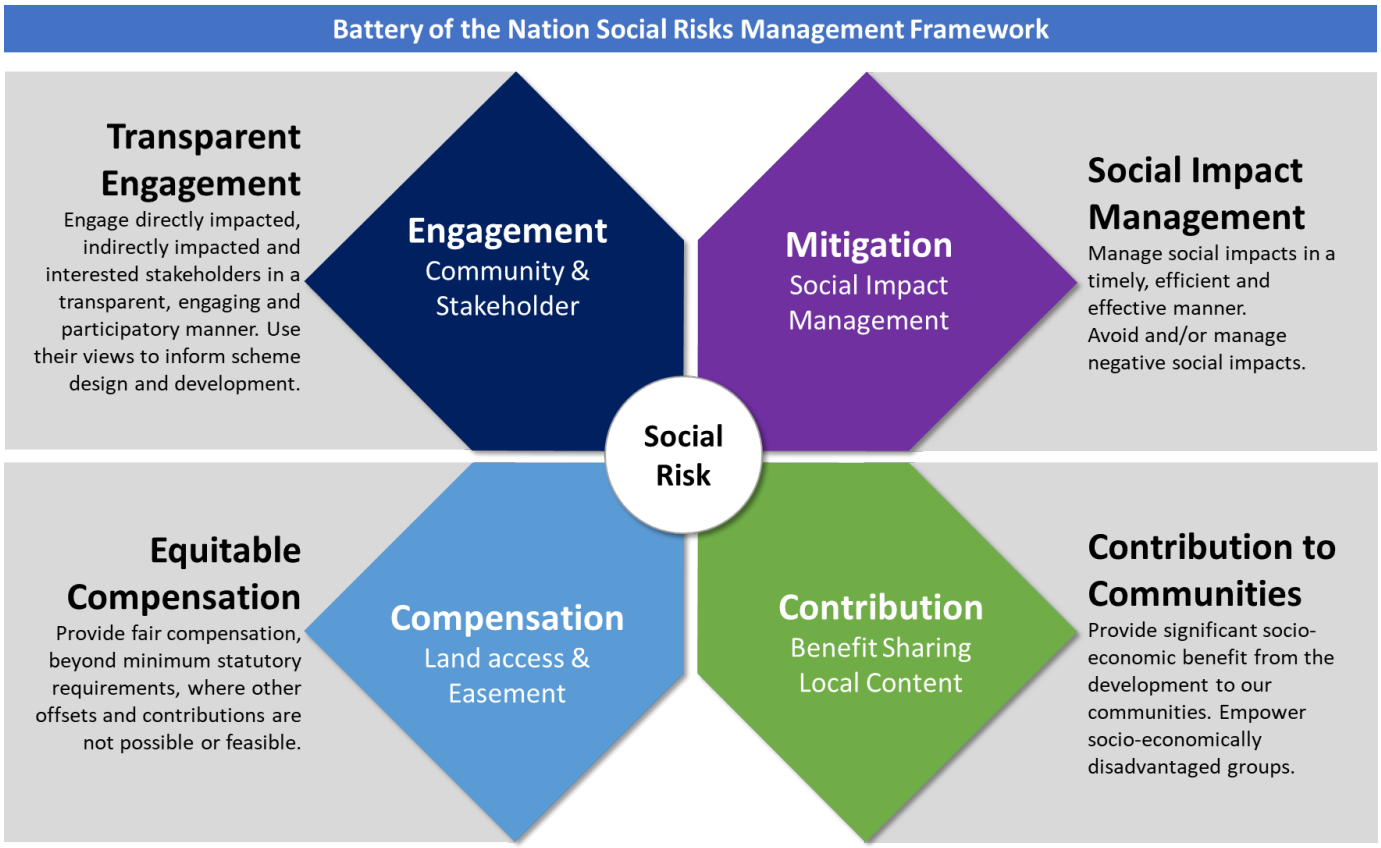


Figure 6: **Battery of the Nation Social Risks Management Framework**

7.0 Integrated Stakeholder Engagement Plan

7.1 Overview

Our broad approach to stakeholder engagement, in recognition of the iterative nature of this work, is to:

- Build engagement commensurate with each phase, enabling focussed attention to key strategic activities in a timely and audience-appropriate manner;
- Take a proactive but adaptive approach to planning and management, in recognition that emergent issues and contextual changes will mean that flexibility in delivery is required; and,
- Efficiently integrate all our needs and those of the community in respect of information dissemination, data collection, social impact assessment, identification of risks and mitigation strategies and co-design of benefits sharing, to streamline and build efficiencies across our communications and engagement efforts.

Therefore, specific planning will take place within three key phases over the period commencing now and finishing when the Final Investment Decision (FID) is made, in mid 2024.

7.2 Engagement Objectives

The objectives of the SEP are to:

- Keep communities and stakeholders informed about project proposals and plans and provide opportunities for feedback into decision processes at the appropriate times, managing expectations throughout;
- Ensure the project understands stakeholder perceptions and potential concerns about the proposed project through participatory dialogue and engagement;
- Identify key stakeholders that are affected by, and/or able to influence the Project and its activities and engage them in impact assessment and other studies and processes;
- Enable community and stakeholders to evaluate the value proposition of the Tarraleah Redevelopment Project, and the PHES/BotN more broadly, for Tasmania;
- Support the development of assessments and plans (Social Impact Assessment, Social Impact Management Plan, Benefit Sharing Plan) essential to the preparation of the DA documentation in line with all relevant regulatory requirements for approval; and,
- Build an understanding of the feasibility and decision making around the design of project infrastructure.

7.3 Phasing of Engagement Activities

The SEP objectives can be achieved by breaking the strategy into the following three phases, each with specific purposes, outcomes and methods, as outlined in Figure 6:

- Phase 1 – Pre project referral under the *Environmental Protection and Biodiversity Conservation Act (Cwth) (Pre- EPBC)*
- Phase 2 – EPBC Referral to Environment Impact Statement (EIS) Lodgement (EPBC – EIS)
- Phase 3 – Development Application Preparation to Financial Investment Decision (DA-FID)

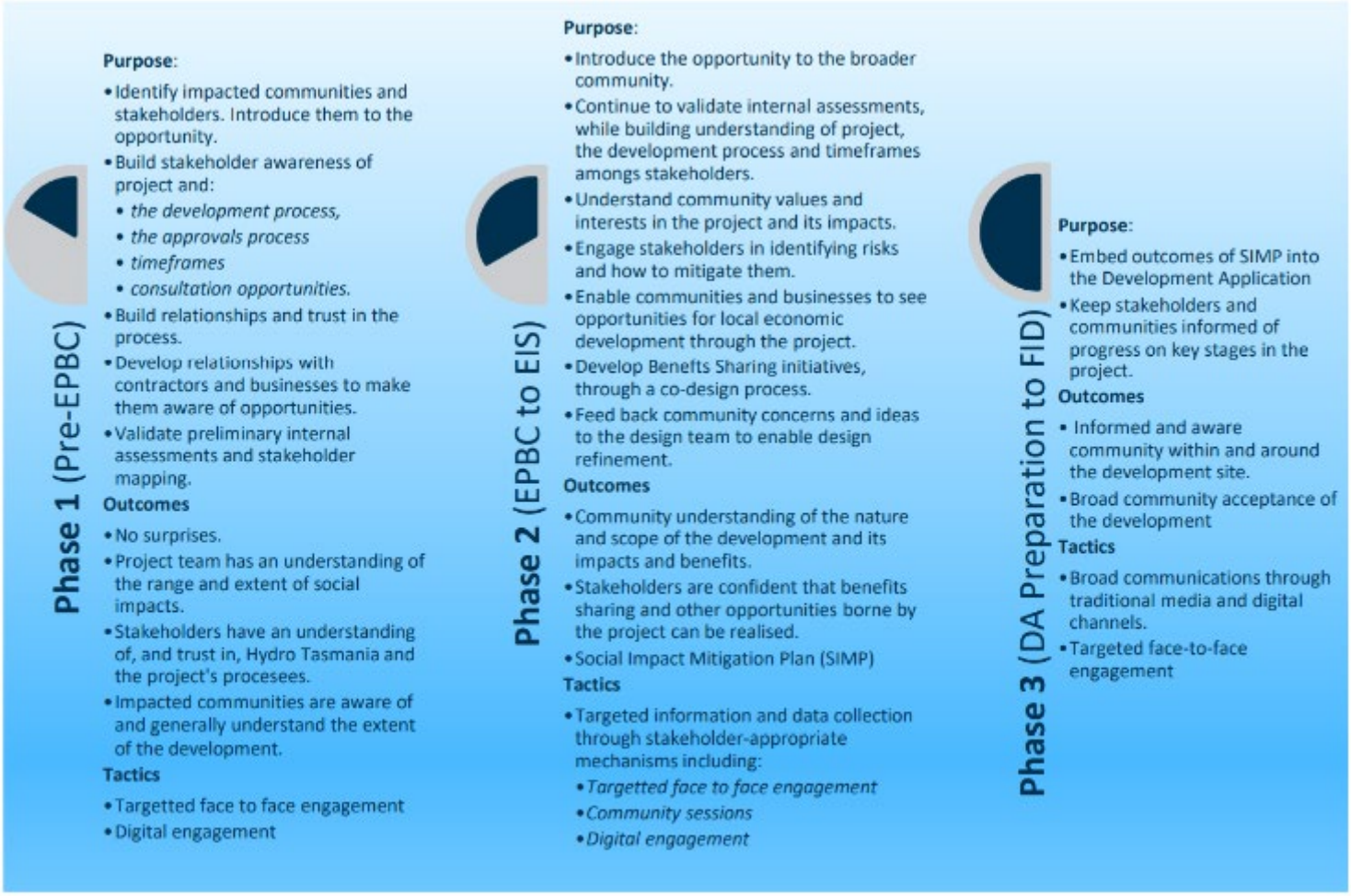


Figure 7 Purpose, outcome and tactics for each phase of the Stakeholder Engagement Strategy

7.4 Timing

Timing of key phases and activities across the SIA and Stakeholder Engagement works programs are outlined in Figure 7. Due to the iterative nature of many of the key elements of the project, schedules will need to be continuously updated.

From a stakeholder and community engagement perspective, this means that messaging around timelines needs to be carefully framed. We need to maintain a trusting, open and constructive relationship with stakeholders so that they feel they can be heard and that there is time for us to listen to and constructively respond to their concerns and ideas.

We can do this by maintaining consistency in messaging, that:

- We acknowledge that our timelines and those of our communities and stakeholders may not always align. However, we will always strive to make time to listen to and respond to stakeholder and community concerns and ideas.
- We have set out an adaptive, iterative approach to our communications and engagement that we will continuously monitor and respond to, to maximise opportunities for constructive engagement.
- We appreciate community members and stakeholders taking the time to engage with and respond to our requests, so that we can maximise our ability to incorporate their ideas and concerns into our project design, construction and operation.

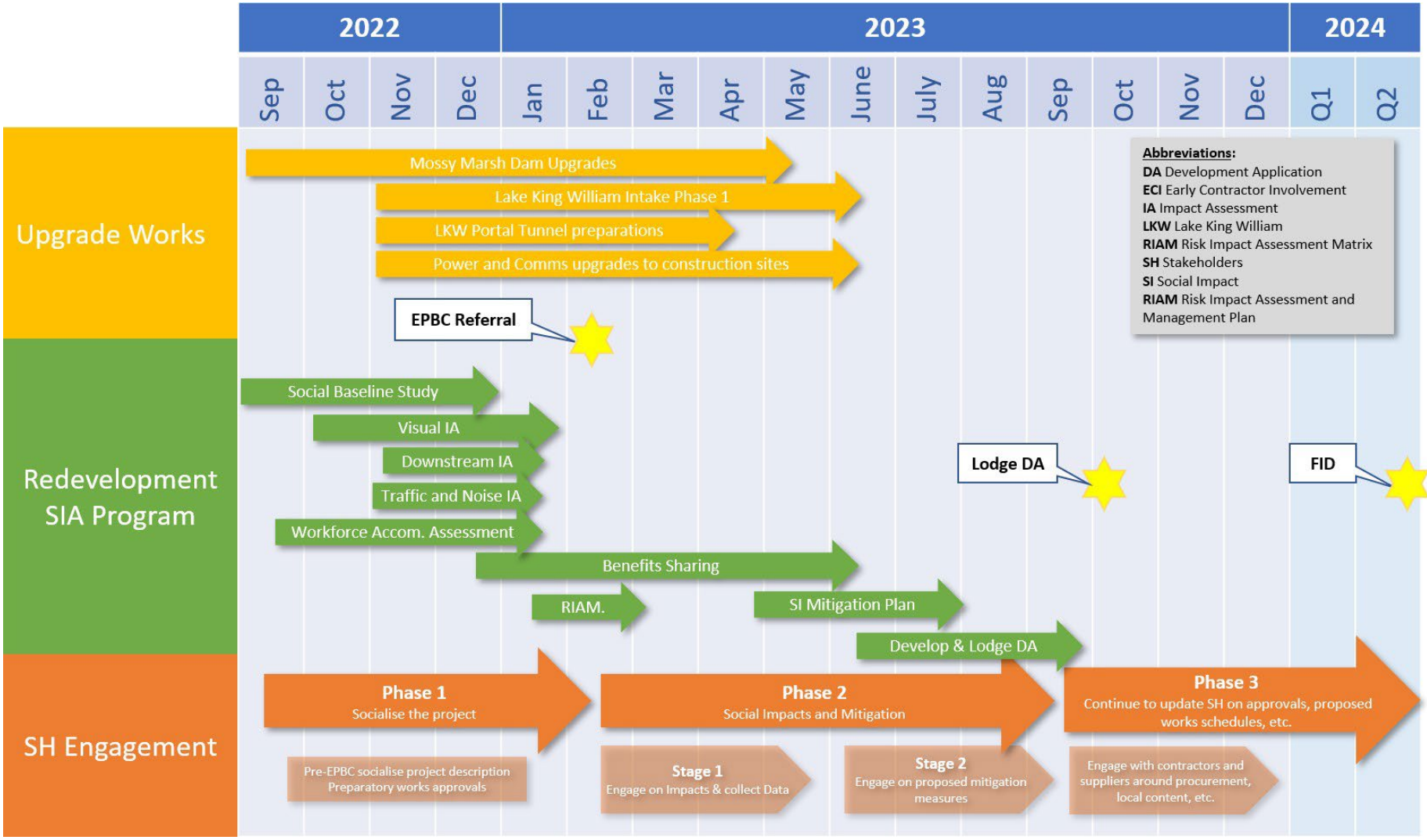


Figure 8 Timelines for key Stakeholder Engagement Phases relative to other SIA activities (subject to change)

7.5 Stakeholder Identification and Assessment

A stakeholder mapping process has been undertaken based on desktop analysis and consultations with key stakeholders. The broad outcome of this process is presented in Figure 8 below:

Figure 9 Stakeholder Map for Tarraleah Redevelopment

The engagement strategy recognises that there is significant overlap between stakeholder 'groups' and that at times through the project's life, there will be significant overlap in engagement purposes, objectives and methods. Figure 9 illustrates conceptually how these overlaps can manifest.

Our approach is to recognise these overlaps and design specific engagement processes and methods that are participant-oriented, rather than defining the engagement approach from a project proponent perspective. In other words, we use the stakeholder mapping and assessment process to identify key needs, messages and to broadly plan the engagement process, but the implementation will be more adaptive and responsive to the needs of people who often wear many hats.

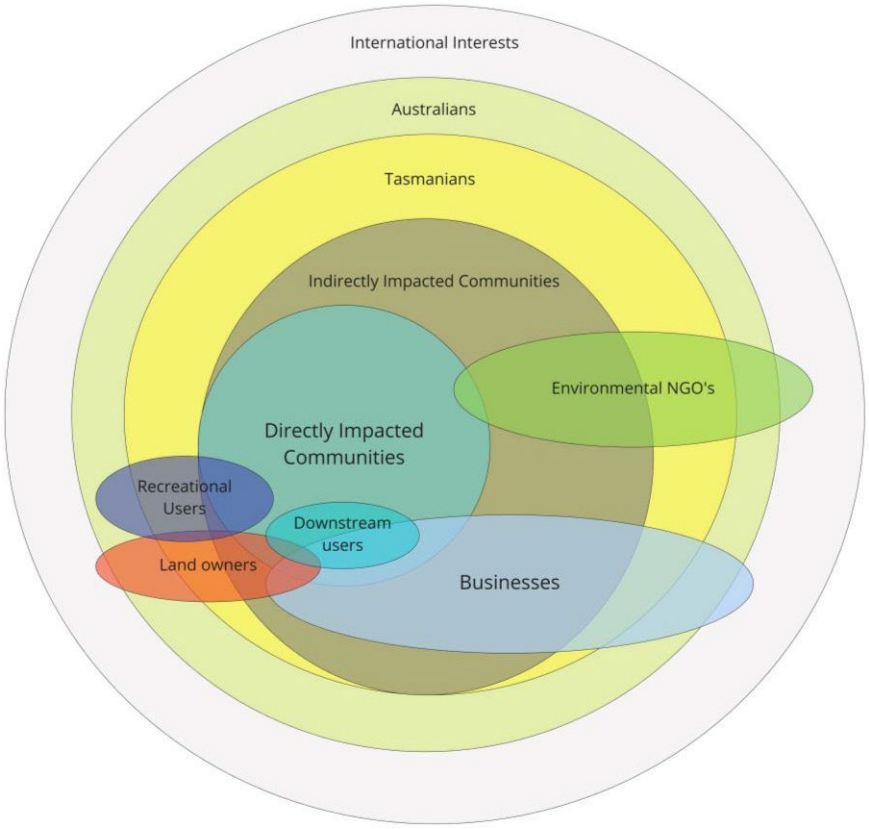


Figure 10 Stakeholders' overlapping interests

7.6 Stakeholder Engagement Plan

For each phase of the project (to FID), specific communications and engagement plans will be developed and continuously updated, in accordance with the strategic framework provided in Table 2 below. References to 'IAP2' follow the International Association of Public Participation (IAP2) Spectrum of Public Participation, which identifies five levels of public participation (or community engagement) and defines the roles, and extent of influence, of stakeholders in planning and decision-making (See Appendix 2).

Legend for IAP2 spectrum of engagement for Table 2

Inform	Consult	Involve	Collaborate	Empower

Table 2 Phase-by-phase high-level outcomes and methods for each stakeholder category

	Phase 1 (Pre-EPBC)	Phase 2 (EPBC referral to EIS)	Phase 3 (DA preparation to FID)
Tasmanian Aboriginal Communities	**Purpose**: Build relationships and support broader business approaches, recognising a community preference to avoid individual project level engagement in favour of business wide strategic engagement. Provide opportunities to understand project and its cultural landscape context. Scope level of interest and engagement preferences. Identify cultural values/sites and general level of interest in project. **Outcomes**: Establishment of key contact points and agreement about engagement methods, timelines and commitments. Documentation of interests, values and sites. Feedback on culturally appropriate methods of engaging and collaborating. **Method**: Face to face.	**Purpose**: Continue to build relationship. Invite feedback and review of impacts of project on cultural values and sites. **Outcomes**: Documentation of interests and values. Feedback on culturally appropriate methods of engaging and collaborating. Clarity of understanding about and agreement on how to protect cultural values and sites through all phases of the project. **Method**: Face to face, on-country visits.	**Purpose**: Continue to build relationship. Two-way dialogue on progress and how the protection of cultural values and sites is being accommodated throughout approvals process. **Outcomes**: Positive, collaborative, outcome-oriented dialogue. No surprises. DA application process is smooth and timely. **Method**: Face to face. Phone. Email.
Local Government Authorities	**Purpose**: Inform about project feasibility process, focussing on proposed engagement approach and upcoming activities on-site, including indicative traffic movements and workforce accommodation options. Socialise the project including indicative project description, footprint (including workforce accommodation options) and development	**Purpose**: Liaise on and manage specific requirements/steps in approvals process. Continue to build awareness of project as it evolves and develops. Build awareness of and seek feedback into outcomes of SIA studies. Continue to support the identification and management of risks. Assist in the identification and negotiation of	**Purpose**: Liaise on and manage specific requirements/steps in approvals process. **Outcomes**: DA application process is smooth and timely. **Method**: Statutory processes. Face to face. Email.

	Phase 1 (Pre-EPBC)	Phase 2 (EPBC referral to EIS)	Phase 3 (DA preparation to FID)
	process. Build shared understanding of broader Tasmanian opportunity of BotN. Capture any preliminary concerns to inform future planning. Identify opportunities to leverage local engagement activities; community and stakeholder identification and engagement methods. Confirm regulatory approvals processes and engage as per Project Approvals Strategy. Clarify and document requirements for stakeholder engagement within approvals processes. **Outcomes**: Council is aware of and supportive of the project generally. Clear understanding of stakeholders and interests. Approvals processes understood. **Method**: Face to face	risk mitigation, benefits sharing and local content opportunities. **Outcomes**: Councils have a detailed understanding of the project footprint, its social and economic impacts and benefits; impact mitigation and benefit sharing. Councils are providing opportunities for Project team to tap into key community events/engagement opportunities. **Method**: Face to face, site tours, workshops	
Impacted landowners/ lessees	**Purpose**: Introduce project and potential impacts; timeframes and key decision-points/milestones. Provide landholders/lessees with a clear point of contact to enable direct engagement. Outline key timelines and identify early concerns, values, attitudes. Seek understanding of level of interest and preferences for engagement. Commence land access discussions where required. **Outcomes**: Awareness by landowner/lessee of project and potential impact. Relationship commenced and forming. Agreed	**Purpose**: Seek feedback on SIA studies and findings. Identify risks. Liaise on risk and impact mitigation. Develop shared/agreed mitigation **Outcomes**: Project impacts and opportunities are understood from the perspective of impacted landowners/lessees. Risks identified and assessed. Mitigation options identified and assessed. Impacted landowners/lessees are supportive of proposed mitigation measures. Specific opportunities for land acquisition/benefits sharing/local content (as appropriate) are	**Purpose**: Keep informed as to progress in approvals process(es). Continue negotiating access, benefits sharing, local content issues as necessary. **Outcomes**: Informed and engaged landowners/lessees, satisfied that any of the impacts of the project are mitigated/compensated for. **Method**: Phone calls, Email.

	Phase 1 (Pre-EPBC)	Phase 2 (EPBC referral to EIS)	Phase 3 (DA preparation to FID)
	communications methods and timing for ongoing engagement. **Method**: Face to face	considered. Low likelihood of appeals against project approvals. **Method**: Face to face meetings, access to community information sessions; Facilitated workshops; targeted mailouts; Digital engagement	
Directly Impacted Communities	**Purpose**: Introduce project and potential impacts; timeframes and key decision-points or milestones. Identify early concerns, values, attitudes. Outline how and when communities will be informed, engaged in the project. **Outcomes**: Directly impacted communities are aware of the project and the upcoming opportunities to be involved throughout the project's phases. **Method**: Face-to-face meetings. Community Information Sessions; targeted mailouts; Digital engagement.	**Purpose**: Continue to socialise the project for broad community acceptance. Inform about (refreshed) schedule of engagement opportunities around co-design of Benefits Sharing program, etc. Inform about and seek feedback on outcomes of SIA studies. Formalise statutory public sharing of project description. Facilitate statutory process for public submissions to EIS guidelines. Validate impact management approaches with directly impacted stakeholders (encompassing avoidance; mitigation; offsets; benefit sharing) **Outcomes**: Directly impacted communities are aware of the project, involved to the extent they wish to be and are supportive of proposed mitigation measures. They are engaged in and contributing to SIMP, including Benefits Sharing plan. Communities feel heard and feel they have had access to opportunities to be consulted. Communities have ownership of benefits sharing plan outcomes.	**Purpose**: Keep impacted communities informed of the development approvals process and progress against key milestones. **Outcomes**: Communities are aware of the project's progress in the approvals process. **Method**: Posters, public notices, digital engagement

	Phase 1 (Pre-EPBC)	Phase 2 (EPBC referral to EIS)	Phase 3 (DA preparation to FID)
		Method: Community Information Sessions; Facilitated workshops; targeted mailouts; digital engagement	
Indirectly impacted communities	**Purpose**: Introduce project and potential impacts; timeframes and key decision-points or milestones. Identify early concerns, values, attitudes. Outline how and when communities will be informed, engaged in the project. **Outcomes**: Communities are aware of the project and its extent. Communities are aware of how they can learn more about and contribute to the assessment of impacts, risks and mitigation strategies. **Method**: Community Information Sessions; Facilitated workshops; Targeted mail-outs; Digital engagement.	**Purpose**: Continue to socialise the project for broad community acceptance. Inform about (refreshed) schedule of engagement processes. Inform about and seek feedback on outcomes of SIA studies. Formalise statutory public sharing of project description. Facilitate statutory process for public submissions to EIS guidelines. Validate impact management approaches with indirectly affected stakeholders (encompassing avoidance; mitigation; offsets; benefit sharing) **Outcomes**: Members of indirectly impacted communities have had the opportunity to engage in consultations/co-design processes if they are sufficiently interested. Communities feel heard and consulted. Indirectly impacted communities are supportive of proposed mitigation measures and of the project overall. **Method**s: Community Information Sessions; Facilitated workshops; targeted mailouts; Digital engagement.	**Purpose**: Keep communities informed of the development approvals process and progress against key milestones. **Outcomes**: Communities are aware of the projects' progress in the approvals process. **Method**: Posters, public notices, Digital engagement.

	Phase 1 (Pre-EPBC)	Phase 2 (EPBC referral to EIS)	Phase 3 (DA preparation to FID)
Businesses; Local Contractors and Suppliers	**Purpose**: Introduce project and potential impacts and opportunities guided by the procurement strategy and probity framework; timeframes and key decision- points / milestones. Identify early concerns, values, attitudes. Seek understanding of level of interest and preferences for ongoing engagement. To inform and gain initial feedback regarding local content strategy opportunities and barriers. **Outcomes**: Awareness by local businesses, local contractors and suppliers of project and potential impacts and opportunities. Relationship commenced and forming. Agreed communications methods and timing for ongoing engagement. **Method**: Face to face	**Purpose**: Seek feedback on SIA studies and findings. Enable businesses, local contractors and suppliers to identify and scope opportunities inherent in the project, directly and indirectly. Identify risks. Validate impact management approaches with directly and indirectly affected businesses (encompassing avoidance; mitigation; offsets; benefit sharing). **Outcomes**: Impacts and opportunities are understood from the perspective of local businesses, local contractors and suppliers. Risks and mitigation options identified and assessed. Opportunities to leverage economic development outcomes are identified. **Method**: Face to face meetings/workshops, Digital engagement.	**Purpose**: Keep businesses informed of the development approvals process and progress against key milestones. **Outcomes**: Businesses, local contractors and suppliers are aware of the projects' progress in the approvals process **Method**: Posters, public notices, Digital engagement.
Community Organisations/ Environmental NGOs	**Purpose**: Inform key interest groups about feasibility outcomes to date. Introduce current project description/options and potential impacts; timeframes and key decision-points / milestones. Identify early concerns, values, attitudes. Seek understanding of level of interest and preferences for ongoing engagement. **Outcomes**: Awareness of project and potential impact. Relationship commenced and forming. Agreed communications methods and timing for ongoing engagement.	**Purpose**: Seek feedback on E/SIA studies and findings. Identify risks. Validate impact management approaches (encompassing avoidance; mitigation; offsets; benefit sharing). **Outcomes**: Impacts understood and validated from the perspective of community organisations/environmental NGOs. Feedback on our impact assessments is received. Risks and mitigation options identified and assessed. Groups are supportive of proposed mitigation measures and of the project overall. Groups feel heard	**Purpose**: Keep informed of the development approvals process and progress against key milestones. **Outcomes**: Community organisations/environmental NGOs are aware of the project's progress in the approvals process **Method**: Email, Phone calls, Digital engagement.

	Phase 1 (Pre-EPBC)	Phase 2 (EPBC referral to EIS)	Phase 3 (DA preparation to FID)
	Method: Face to face	and involved in the co-design of mitigation measures and benefits sharing. **Method**: Face to face meetings/workshops, Digital engagement.	
Recreational Users	**Purpose**: Introduce project and potential impacts on recreational facilities/uses; timeframes and key decision-points / milestones. Outline key timelines for ongoing engagement opportunities. Identify early concerns, values, attitudes. Seek understanding of level of interest and preferences for engagement. **Outcomes**: Awareness by recreational users of the project and potential impacts. Recreational users are aware of 'how and when' they can be engaged in the project. **Method**: Face to face; targeted mailouts, attendance at meetings/events of user groups.	**Purpose**: Continue to socialise the project. Refresh communications around engagement processes for this phase. Inform about and seek feedback on outcomes of SIA studies. Validate impact management approaches (encompassing avoidance; mitigation; offsets; benefit sharing) **Outcomes**: Recreational users are aware of the project, how to be involved and are actively engaged in and contributing to SIMP, including Benefits Sharing plan. Recreational users feel heard and feel they have had access to opportunities to be consulted. Recreational users have ownership of benefits sharing plan outcomes. **Method**: Information Sessions; Facilitated workshops; targeted mailouts; digital engagement.	**Purpose**: Keep informed of the development approvals process and progress against key milestones. **Outcomes**: Recreational users are aware of the project's progress in the approvals process **Method**: Email, Phone calls, digital engagement.
Internal Stakeholders	**Purpose**: Identify key business interests and activities and their interactions with the project. **Outcomes**: Business risks and opportunities are identified and mitigated; appropriate review and internal consultation on various aspects of the project is achieved.	**Purpose:** Identify key business interests and activities and their interactions with the project. Ensuring appropriate review and oversight of the project and its potential operational and long-term implications. **Outcomes**: All proposed mitigations/public commitments in the EIS are internally reviewed and endorsed.	**Purpose**: Identify key business interests and activities and their interactions with the project. Ensuring appropriate review and oversight of the project and its potential operational and long-term implications. **Outcomes**: FID is made with all long-term business risks effectively identified and managed

	Phase 1 (Pre-EPBC)	Phase 2 (EPBC referral to EIS)	Phase 3 (DA preparation to FID)
	Method: Use of working groups. Face to face interactions, workshops, presentations, internal memos and emails etc.	**Method:** Use of working groups. Face to face interactions, workshops, presentations, internal memos and emails etc.	**Method:** Use of working groups. Face to face interactions, workshops, presentations, internal memos and emails etc**.**

8.0 Phase 1 Engagement

Detailed engagement plans will be developed for each phase of the project in a timely manner, reflecting contextual and project-refinements along the development, approvals, construction and operational phases.

Each phase plan will involve refining and re-analysing stakeholders, identifying engagement and communications methods, refining and updating collateral and digital engagement resources, and monitoring and evaluating engagement effectiveness and outcomes.

The following section outlines the key elements of the Engagement Plan for Phase 1 (to EPBC Referral lodgement).

8.1 Phase 1 Engagement Implementation Plan

Table 3 presents the Phase 1 engagement implementation plan.

Table 3 Phase 1 Engagement Implementation Plan

October 2022 to EPBC Referral Lodgement (March 2023)	
Interest Group Briefings	

Purpose	▪ Inform interested groups about the Redevelopment in terms of its:
	  ○ Scope and nature of works,
	  ○ timing,
	  ○ possible impacts,
	  ○ benefits.
	▪ Enable people to ask questions and seek more details.
	▪ Provide point of contact
	▪ Identify early concerns, values, attitudes towards specific issues/areas (e.g. visual impacts, access to recreation facilities, impact on threatened species/habitats etc).
	▪ Gain feedback on specific issues of concern, perspectives etc. (such as critical view points, access issues, etc).
	▪ Seek understanding of level of interest and preferences for ongoing engagement.

Outcomes	▪ Awareness group of project and potential impacts. ▪ Awareness of future opportunities for engagement through to FID. ▪ Level of interest/concern and specific issues of interest/concern documented. ▪ An understanding of what we might need to do to ensure long-term support for the project in terms of mitigation options, benefits sharing, etc.
Format	▪ Face to face meetings with groups, individually or collectively, depending upon the groups' preferences and availabilities.

October 2022 to EPBC Referral Lodgement (March 2023)	
Community 'Drop-Ins'	
Purpose	▪ Inform residents in key local communities about the Redevelopment in terms of its: o Scope and nature of works, o timing, o possible impacts o benefits ▪ Enable people to ask questions and seek more details. ▪ Provide point of contact ▪ Identify early concerns, values, attitudes. ▪ Seek understanding of level of interest and preferences for ongoing engagement.
Outcomes	▪ Awareness about project and potential impacts. ▪ Awareness about future opportunities for engagement through to FID. ▪ Level of interest/concern and specific issues of interest/concern documented.
Where	**Brady's/Bronte Lakes Shack Communities** **Hamilton** **Bushy Park** **Derwent Bridge** **Ouse** **Hobart**

8.2 Communications Plan

8.2.1 Digital Engagement

Table 4 presents the digital engagement tools implemented to support the Phase 1 engagement implementation plan.

Table 4 Digital Engagement Tools

Resource	Description	Status/Update methods
Bang the Table (BTT)	A key digital engagement tool, combining web-site-like information-sharing capability with a range of tools to facilitate feedback and primary data from stakeholders through surveys, interactive maps, etc. Capacity to collect contact information; stakeholder can register for newsletters, updates and ask questions.	

Resource	Description	Status/Update methods
HT Website	Link to BTT Project Page, with headline stories updated periodically on updates/progress, to drive traffic to the BTT Project Page.	
Stakeholder Websites	As part of our strategic communications plan, particularly for Phase 2 of the SEP, negotiating the inclusion of links to our BTT Project Page and/or posts about the Tarraleah Redevelopment on the websites of key stakeholders, such as: Central Highlands Council Derwent Valley Council Inland Fisheries Service	
Multi-Media Resources (e.g. Sway)	MS Sway enables a range of media to be used in a user-friendly, accessible manner, across different devices (computers, smartphones, tablets). This will enable a range of 'presentations' to be developed encompassing project descriptions, timelines, maps, aerial and ground-level annotated diagrams and illustrations, videos (fly-throughs), before-after comparisons, etc. Some preliminary topics for Sway's include: Project introduction/outline Outcomes of SIA studies (one for each, one integrated) Overview and timelines for consultation/ engagement opportunities These can be shared on/linked to the BTT Project Page.	
Facebook	Share key updates and links to BTT Project Page on HT Facebook page and those of key groups.	

8.2.2 Communications Channels

Table 5 presents the communication channels that support the Phase 1 engagement implementation plan.

Table 5 Communication Channels

Channel	Description	Details
Newspapers	Derwent Valley Gazette New Norfolk and Derwent Valley News Tasmanian Farmer	
Festivals and events	Central Highlands Bushfest Bothwell Bicentennial	Bothwell, 19 & 20 November 2022 Bothwell, 15 & 16 October 2022
School Newsletters	District schools' newsletters	Glenora District School (219 students, 12% indigenous) Glenora.District.High@education.tas.gov.au Westerway School
Community Centres/Facilities	Notice boards Newsletters	Great Lakes Community Centre (Linda Smith) Ouse Community Library Central Highlands Community Men's Shed (Ponsonby St, Hamilton)
Recreational Clubs and Associations	Newsletters Websites Social Media	Wayatinah Sports and Social Club Ouse Bowls Club Anglers Alliance Tasmania affiliated clubs

8.3 Data collection tools

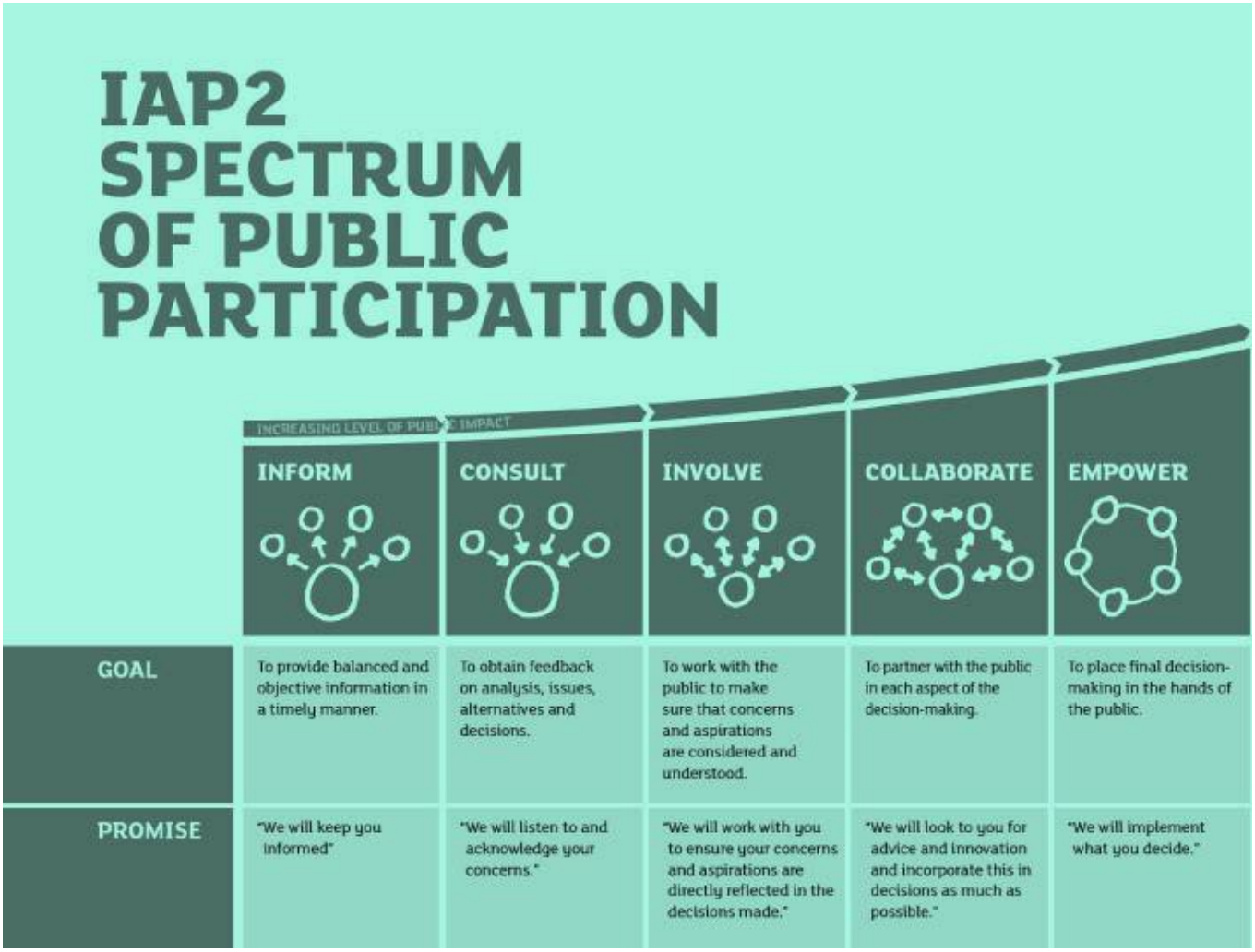
Effective and methodologically sound tools for monitoring, reporting and analysing the implementation of this SEP are required. Data collection tools will support the comprehensive and efficient collection, collation and analysis of data from stakeholders and community during the impact assessment and phase. We also need to be able to effectively collect, collate, report on and evaluate our communications and engagement activities. The resources described in Table 6 will enable this to occur in an integrated and efficient manner.

Table 6 **Data Collection Resources**

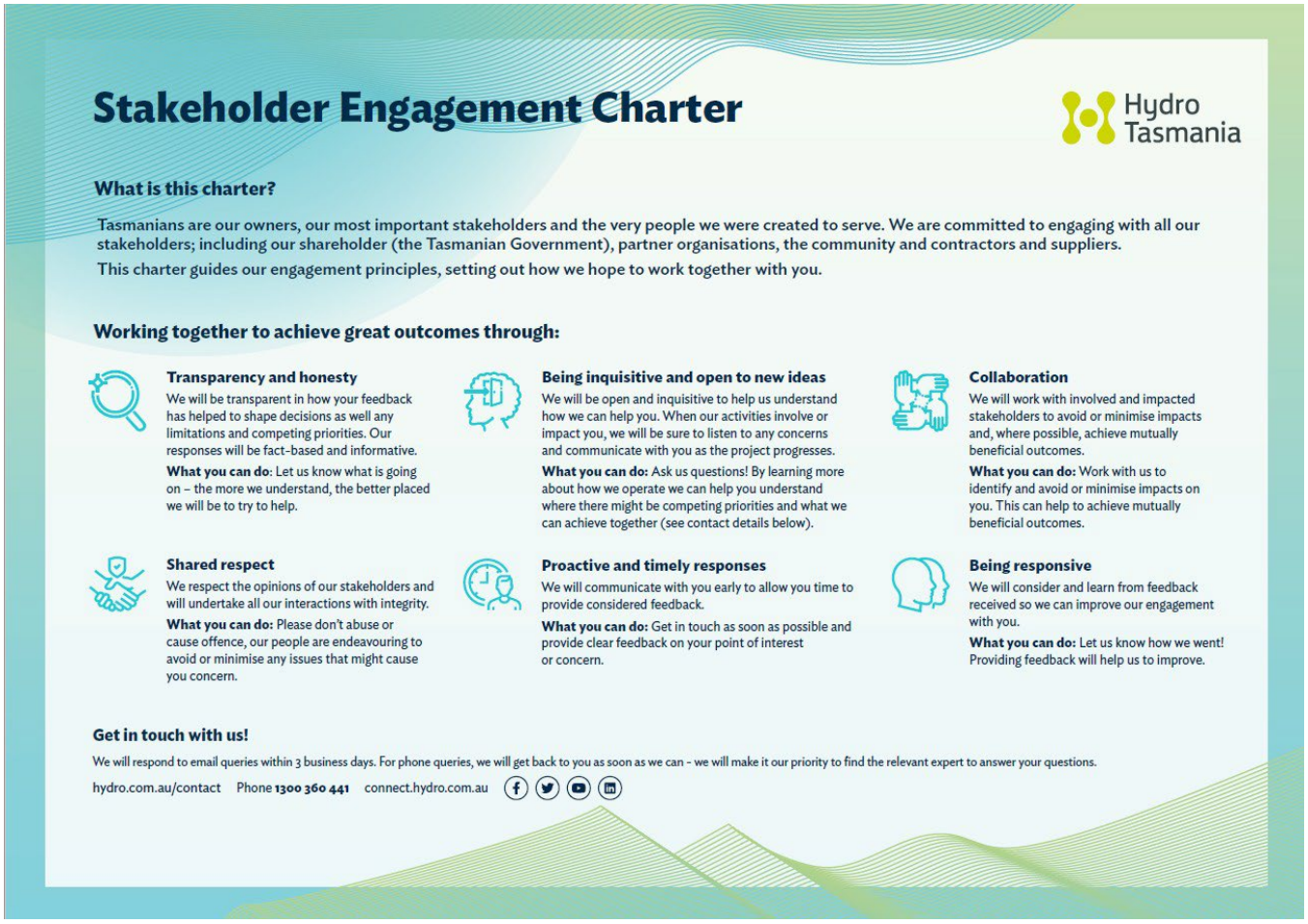
Resource	Description	Status
CRM	Capture contact details of stakeholders engaged for the project. Record key transactions with stakeholders throughout each phase of the Pre-FID SEP.	
Social Network Mapping	Map and analyse interactions to monitor key SNA metrics and identify key nodes within the network.	Structure set up.
Event registration form	Capture names and contact details of those engaged in information sessions, workshops and other engagements.	Completed.
SIA Feedback Survey	These can be provided in two main forms, using the Bang the Table platform: 1. Surveys 2. Interactive maps	Drafts completed
Feedback forms	Feedback 'form' that can be used across: • Events, e.g. community drop-ins • Presentations • Workshops	Draft completed

4. Appendices

1. IAP2 Spectrum of Public Participation



2. Hydro Tasmania's Stakeholder Engagement Charter



Stakeholder Engagement Charter

Hydro Tasmania

What is this charter?

Tasmanians are our owners, our most important stakeholders and the very people we were created to serve. We are committed to engaging with all our stakeholders; including our shareholder (the Tasmanian Government), partner organisations, the community and contractors and suppliers.

This charter guides our engagement principles, setting out how we hope to work together with you.

Working together to achieve great outcomes through:

Transparency and honesty

We will be transparent in how your feedback has helped to shape decisions as well any limitations and competing priorities. Our responses will be fact-based and informative.

What you can do: Let us know what is going on – the more we understand, the better placed we will be to try to help.

Being inquisitive and open to new ideas

We will be open and inquisitive to help us understand how we can help you. When our activities involve or impact you, we will be sure to listen to any concerns and communicate with you as the project progresses.

What you can do: Ask us questions! By learning more about how we operate we can help you understand where there might be competing priorities and what we can achieve together (see contact details below).

Collaboration

We will work with involved and impacted stakeholders to avoid or minimise impacts and, where possible, achieve mutually beneficial outcomes.

What you can do: Work with us to identify and avoid or minimise impacts on you. This can help to achieve mutually beneficial outcomes.

Shared respect

We respect the opinions of our stakeholders and will undertake all our interactions with integrity.

What you can do: Please don't abuse or cause offence, our people are endeavouring to avoid or minimise any issues that might cause you concern.

Proactive and timely responses

We will communicate with you early to allow you time to provide considered feedback.

What you can do: Get in touch as soon as possible and provide clear feedback on your point of interest or concern.

Being responsive

We will consider and learn from feedback received so we can improve our engagement with you.

What you can do: Let us know how we went! Providing feedback will help us to improve.

Get in touch with us!

We will respond to email queries within 3 business days. For phone queries, we will get back to you as soon as we can - we will make it our priority to find the relevant expert to answer your questions.

hydro.com.au/contact Phone **1300 360 441** connect.hydro.com.au

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