

# Hydro Tasmania submission

Joint Select Committee into Energy Matters in Tasmania

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## About Hydro Tasmania

Hydro Tasmania is Australia's largest generator of clean, renewable energy. Hydro Tasmania operates a unique hydropower system, with 30 power stations and more than 50 major dams. Our system has a total capacity of more than 2,290 megawatts, producing on average around 9,000 gigawatt hours of clean electricity from hydropower annually. We also generate energy from wind and gas.

Hydro Tasmania is understood to currently be the only supplier of wholesale energy contracts in Tasmania. Retailers can access wholesale contracts for the residential segment through the Wholesale Contract Regulated Instrument (WCRI) whereby Hydro Tasmania has an obligation to make contracts available to support small customers. Hydro Tasmania also offers a range of other contracts which provide retailers with options on how they manage their supply arrangements. Existing major industrial contracts are set on a much longer-term basis, all of which are due to expire this decade.

Demand in Tasmania is shared between the residential market (approximately 20 per cent), the commercial segment (approximately 24 per cent), and four major industrial consumers (approximately 56 per cent).

Hydro Tasmania's own generation meets 90 per cent of Tasmania's total energy consumption by way of 89 per cent hydropower, and less than one per cent gas in recent years. Total Tasmanian consumption receives the 10 per cent balance from non-Hydro Tasmania wind and small-scale generation, such as solar. Imports and exports across Basslink balance the variability in available hydropower and wind output.

Hydro Tasmania has invested in four wind power developments. The Huxley Hill Wind Farm on King Island is owned and operated by Hydro Tasmania. We are also a partner in the Woolnorth Wind Farm Holding (WWFH) joint venture with wind farms at Musselroe, Studland Bay and Bluff Point, which generate separately to the Hydro Tasmania portfolio.

Hydro Tasmania owns the Tamar Valley Power Station (TVPS), a gas-fired power station in northern Tasmania. In recent years, energy generated by gas through TVPS has made up one per cent or less of the total energy generation in Tasmania annually.

Momentum Energy and Entura are, respectively, retail and consulting businesses of the Hydro Tasmania group.

Momentum Energy (Momentum) is a 100 per cent owned subsidiary of Hydro Tasmania, and retails electricity and gas to more than 200,000 residential, small and medium enterprise and commercial and industrial sites across Victoria, New South Wales, Queensland, South Australia and the ACT as well as the Bass Strait islands.

Entura is Hydro Tasmania's consulting business and uses our Tasmanian experience and knowledge to solve complex issues for water and energy businesses and projects locally, nationally and internationally. Through Entura, Tasmania is helping communities around the world transition to low carbon energy, while also bringing the benefits of international experience back to Tasmania.

Hydro Tasmania's approach to energy generation is strategic, including prudent maintenance and upgrades to our existing power system through our Strategic Asset Management Plan. Additionally, we prioritise developments that are environmentally and financially sustainable, and deliver long-



term reliability. This will come in the form of long-duration energy storage, a critical requirement for grid reliability and stability as lower cost variable renewable sources like wind and solar increasingly develop in the market.

Hydro Tasmania also has an important trading function. Buying and selling energy is a vital part of our operations to manage and mitigate risks around water levels, energy availability and price.

Hydro Tasmania has typically returned up to 90 per cent of our profits to the Tasmanian people through dividends to the State Government. We invest the remainder in operating, maintaining and developing our infrastructure to deliver safe, clean and efficient energy today, and for future generations.

While trading plays a key part in Hydro Tasmania's operations to manage market risks and maximise the economic benefits to Tasmanians, our core business remains as being a custodian of the State's water resource and a sustainable energy generator.

#### Governance

As a Government Business Enterprise, Tasmanians are our ultimate owners. Hydro Tasmania's Board of Directors is accountable to the Treasurer and Minister for Energy and Renewables as shareholder ministers, and we operate under a robust legislative and regulatory framework. An overview of the accountability of Government Businesses is provided below:



Figure 1: Overview of the Accountability Framework of Government Businesses – Tasmanian Government Framework Guide, 2008



The legislative framework that applies to Hydro Tasmania includes, but is not limited to, the *Government Business Enterprises Act 1995*<sup>1</sup>, the *Hydro-Electric Corporation Act 1995*<sup>2</sup>, and the *Electricity Supply Industry Act 1995*.<sup>3</sup> Hydro Tasmania also follows the Treasurer's Instructions and its Ministerial Charter (November 2012)<sup>4</sup> and must also comply with other frameworks including National Electricity Law, National Electricity Rules<sup>5</sup> and national competition law.

Legislation sets out the principal objectives as well as the functions and powers of Hydro Tasmania. The principal objectives, set out in the *Government Business Enterprises Act 1995*, include operating in accordance with sound commercial practice, as efficiently as possible, and achieving a sustainable commercial rate of return that maximises value for the State.

Functions and powers, set out in the *Hydro-Electric Corporation Act 1995*, include:

- to generate electricity;
- to construct, maintain and operate electricity infrastructure necessary for the generation of electricity;
- to acquire and trade in, and facilitate the acquisition of and trading in, electricity; and,
- to participate in the National Electricity Market.

Hydro Tasmania's Ministerial Charter sets out broad policy expectations and requirements for Hydro Tasmania. The Charter states that the principal purpose of Hydro Tasmania is to efficiently generate, trade and sell electricity in the National Electricity Market.

The Charter outlines that the principal objectives of Hydro Tasmania is to be a successful business by operating in accordance with sound commercial practice and as efficiently as possible and to achieve a sustainable commercial return in accordance with Hydro Tasmania's corporate plan, having regard to the social and economic objectives of the State.

The *Electricity Supply Industry Act 1995* sets out Tasmanian specific provisions governing the electricity industry with the purpose of promoting efficiency and competition in the electricity supply industry and ensuring a safe and efficient overall power system.

#### Hydro Tasmania's hydropower system

Tasmania has one of the most complex hydropower systems in the world that dates from 1916 when our first power station at Waddamana in the Central Highlands began operations. Hydro Tasmania's system contains two large permanent water storages (Great Lake and Lake Gordon). These are supported by several seasonal water storages and run-of-river systems which use seasonal flows.

Run-of-river means water flows through a number of power stations as it travels down the river, such as in the <u>Derwent scheme</u>. This is advantageous because the same water is used multiple times to generate electricity. However, when operating a run-of-river scheme, water must continually flow down river, not stored like water can be in major dams or lakes.

<sup>&</sup>lt;sup>1</sup> <u>Government Business Enterprises Act 1995</u>

<sup>&</sup>lt;sup>2</sup> <u>Hydro-Electric Corporation Act 1995</u>

<sup>&</sup>lt;sup>3</sup> Electricity Supply Industry Act 1995

<sup>&</sup>lt;sup>4</sup> ministerial charter dec 2012.pdf (hydro.com.au)

<sup>&</sup>lt;sup>5</sup> AEMO | Legislation and regulation



Hydro Tasmania's hydropower schemes have been built in several high-rainfall water catchments formed from natural river systems in Tasmania's rugged landscape: Great Lake–South Esk, Derwent, Mersey–Forth, Gordon–Pedder, Pieman, King -Yolande. The water systems and power stations are interlinked through natural and man-made water channels. Diagrams of these systems are shown in <u>Appendix 1</u>.

Hydro Tasmania's system is incredibly complex to manage. Every catchment is interconnected, so operation or changes to one scheme impacts on the operation of others. Each system also has different operating rules considering environmental factors and threatened species habitat, as well as our commitments to recreational use of water, and irrigation agreements across the state.

#### Strategic Asset Management Plan

Hydro Tasmania invests significant resources to maintain and upgrade its network of assets to ensure ongoing reliability and efficiency. However, many of these assets are ageing. For example, the Tarraleah hydropower scheme is 85 years old. As they age, the assets become more expensive to maintain and less efficient in generating power.

The Strategic Asset Management Plan (SAMP) is a significant program of work. The expected CAPEX program is around \$150 million annually excluding *Battery of the Nation* projects. The SAMP proposes \$1,150 million in capital investment over the next decade. This is on top of the \$900 million invested since 2007.

Upgrades are currently planned or underway at Gordon, Poatina, Lemonthyme, and all five West Coast power stations, as well as upgrades to Murchison and Edgar dams.

In addition, investment is proposed on the Bass Strait islands to maintain existing levels of renewables as some of the assets are approaching (or at) end of life.

#### Wind

The Huxley Hill Wind Farm on King Island was one of the first built in Australia. It is 100 per cent owned by Hydro Tasmania and upgrades are planned to maintain operating efficiency and extend the asset life.

Hydro Tasmania also owns a 25 per cent share in the Woolnorth Wind Farm Holding (WWFH) joint venture. Shenhua Clean Energy Holdings owns the remaining 75 per cent share. The Musselroe, Studland Bay and Bluff Point wind farms in Tasmania's north are owned and operated under this joint venture.

Studland Bay and Bluff Point will reach nominal "end of economic life" between 2027 and 2032, subject to further analysis and cost expectations, while Musselroe wind farm has a nominal end of service life in 2038.

Woolnorth Wind Farm Holding is developing plans for repowering Bluff Point and Studland Bay. The two wind farms are approximately 2kms apart: Bluff Point in the north and Studland Bay in the south. The Bluff Point site has 37 wind turbine generators and Studland Bay site has 25 wind turbine generators. There is an approximately 49 km long overhead transmission line connecting the wind farm sites to the Smithton Substation.



The maximum installed capacity of Bluff Point and Studland Bay Wind Farms is 139.75MW. Repowering will involve replacing the ageing turbines with newer turbines that will have a greater electricity generation output and would enable the installed capacity to increase to up to 240MW. The proposed model of turbine will be larger than existing turbines, however, there will be fewer on the site.

The transmission system will also need to be upgraded to allow a significant upgrade in wind farm capacity. Woolnorth holds easements for the existing transmission corridor from the wind farm to point of connection to TasNetworks. The redevelopment project scope would include either additional, or replacement, transmission lines within that transmission corridor as well as an expansion of transmission lines.

Studies for repowering the sites, including approvals required, are currently underway, with a commissioning target of around 2030.

#### Gas

Historically, energy generated from gas provided baseload power for Tasmania from the Bell Bay Power Station and Tamar Valley Power Station. But Tasmania's energy mix has changed. Most significantly, Tasmania's energy demand is now met by hydro (primarily) and wind generation. Energy generated through the only remaining Hydro Tasmania gas-fired power station, Tamar Valley Power Station, has made up less than one per cent of Tasmania's energy annually in recent years.

Gas generated energy from Tamar Valley Power Station will be maintained for specific scenarios, such as a contingency for extreme events (like droughts and power system security); and on occasion, when economically optimal for managing Hydro Tasmania's broader portfolio.

The 386MW station consists of 208MW of Combined Cycle Gas generation (CCGT) and 178MW of Open Cycle Gas generation (OCGT).

The CCGT plant provides baseload generation capability but is less flexible (responsive) than the OCGT. The CCGT unit has not run since 2019. During this period, the unit has been kept in dry storage, capable of running with 10 days' notice.

The OCGT plant provides flexible power generation and can be used in specific scenarios where this makes economic sense. This flexibility comes at the expense of lower efficiency (higher running costs).

Gas generation is becoming a less favourable option for power supply growth for a range of reasons, including that it has higher costs and environmental impacts than other sources.

#### Bass Strait islands

Hydro Tasmania is committed to providing a safe and reliable supply of energy across the Bass Strait islands. We proudly generate energy using world-leading technology at our power stations on King and Flinders islands. These energy networks are physically isolated from both the Tasmanian electricity network and the National Electricity Market.

On King and Flinders Islands, our role is different to mainland Tasmania. Hydro Tasmania generates the energy, and we also manage the distribution network, and sell the energy to residents and



industry on the islands. The retailing function is performed by Momentum Energy, which is 100 per cent owned by Hydro Tasmania.

On King Island, energy is generated at the Huxley Hill Wind Farm, by diesel generation in the station, and a new solar farm on Huxley Hill. On Flinders Island, energy is generated with a similar mix of sources with two wind turbines (one privately owned), a solar farm and diesel generators that provide backup energy sources.

On both islands, there is also a large amount of customer rooftop solar integrated into the grid. Depending on load and resource conditions, this can provide a large percentage of the island's energy needs for short periods, as customers export their excess generation.

The hybrid, renewable energy systems we run on the Bass Strait islands are a model for the National Electricity Market. The way we integrate wind, solar, storage and customer generation, while reducing fossil fuels and maintaining grid stability, provides important learnings as the nation transitions to renewable energy. For example, over the past 10 years, we've reduced diesel consumption on King Island by 50 per cent, saving 2.1 million litres of diesel annually and cutting carbon emissions by 5,700 tonnes a year. Similar percentage reductions in diesel have also been seen on Flinders Island since the Hybrid Energy Hub was commissioned in 2017.

Since 1998, Hydro Tasmania has been directed to provide subsidised electricity and electricity concessions to the Bass Strait islands customers in accordance with the terms of a Community Service Obligation Deed. This allows customers on the islands to pay a similar cost for their energy to mainland Tasmania. The cost of providing this service is carried by Hydro Tasmania.

#### Our role as a water manager

Hydro Tasmania is Australia's largest water manager - our water licence gives us stewardship of six Tasmanian water catchments. A key focus is managing Tasmania's water resources not just for energy generation but with consideration to environmental factors, threatened species, recreational use by the community, and irrigation needs.

We conduct research to keep water ecosystems healthy at our lakes and rivers. In our environment team, scientists study diverse flora and fauna within catchment areas to ensure essential habitat is managed and protected, such as the galaxiid fish species in Arthurs Lake and yingina/Great Lake.

We are also investing in hydrological modelling for Macquarie Harbour on Tasmania's West Coast as part of National Recovery Team efforts to understand what impacts, if any, hydrological flows have on dissolved oxygen levels and how together we might be able to better manage the health of Macquarie Harbour to help protect the Maugean skate.



## Current generation and demand

Today, the Tasmanian energy system is in balance, with annual supply and demand for energy generally evenly matched<sup>6</sup>. Historically, demand and generation has remained steady, however, forecast future demand is growing more rapidly due to electrification of homes, transport and industry.

Figure 2 shows the breakdown of types of generation over time, matched against demand and Total Energy in Storage (TEIS).

## **Historical Demand versus Generation**





Figure 2: Historical Tasmania demand versus generation

# Meeting Tasmania's growing demand

Tasmania's demand is forecast to grow, both through the increased electrification of daily life, as well as significant proposed growth in new industries and the conversion of existing industries to low-carbon energy. The Australian Energy Market Operator's (AEMO) central forecast from the 2023 Electricity Statement of Opportunities (ESOO) forecasts Tasmania's consumption growing from 10.5 TWh in 2023 to 12.5 TWh by 2030. Hydro Tasmania has an important role in supporting Tasmania's growing demand.

The system is currently in balance on an annual energy management basis and ideally, supply and demand would be developed in lockstep.

Other states have the challenge of decommissioning coal and building new renewable infrastructure just to replace the current generating capacity. Tasmania already generates most of its energy from renewable sources, so it can focus on growing capacity.

<sup>&</sup>lt;sup>6</sup> Note this is on an average basis. At any given time Tasmanian demand may not match exactly with Tasmanian generation with the balance being supplied or delivered via imports or exports across Basslink.



Small increases in demand can be met by the current system. However, material increases in demand will need to be met by a combination of new generation such as wind, solar and pumped hydro, augmentation of existing hydro assets, and imports via interconnection where needed.

Wind and solar – or variable renewable energy (VRE) sources – are relatively cheaper forms of energy and harness Tasmania's natural assets to meet the growing demand for clean energy. There are a number of VRE projects in train in Tasmania. Having a mixture of projects from different sources will enable VRE in Tasmania to better support Tasmanian demand because the sun can shine at different times of day to when the wind blows and both don't always happen together.

For now, Hydro is the main provider of both energy and capacity in the state and so we have an important role in supporting this growth, including by contracting sustainably and in the best interests of the State. To achieve this, we are currently working with the State Government through Renewables, Climate and Future Industries Tasmania (ReCFIT) to develop a framework to be applied by Hydro Tasmania which will govern how we contract with large scale industrials in Tasmania in future and provide transparency about what contracts are available and how we will allocate them.

Part of this is also about ensuring that for small and medium Tasmanian residential and commercial customers, it's business as usual, so they can continue to deal with their electricity retailers and Hydro Tasmania can continue to support those retailers as we have been doing for many years.

Hydro Tasmania has published guidelines on its website to set out how we will conduct our wholesale contracting activities pending finalisation of this framework. These can be found on our <u>website</u>.

## Opportunities in the future energy market

AEMO's draft 2024 Integrated System Plan (ISP)<sup>7</sup> released in December 2023 highlights the future renewable energy opportunities as coal generation exits the national market. It confirms renewable energy as the lowest cost way to meet Tasmania and Australia's future energy needs, connected by transmission and firmed with technology like pumped hydro, batteries, and gas-powered generation that will smooth out the peaks and fill in the gaps from that variable renewable energy.

In the transition to low-carbon energy, Tasmania has an enviable head start. Tasmanian homes and industries have been largely powered by renewable energy for over a century and the state is now 100 per cent self-sufficient in renewable energy.

Hydro Tasmania's unique advantage is the dispatchable nature of our hydropower energy and deep storages, which act like a battery, storing energy until required. It is the combination of the increase in cheaper variable renewable energy sources, firmed by hydropower, that will be the effective way to keep downward pressure on power prices in the longer term relative to regions reliant on thermal generation.

<sup>&</sup>lt;sup>7</sup> As the independent planner, AEMO publishes the <u>Integrated System Plan (ISP)</u> for the National Electricity Market (NEM) every two years. The ISP is an actionable, 30-year roadmap for the development of the NEM power system. The ISP presents an 'optimal development path', a coordinated generation and transmission investment plan to modernise the power system. It aims to assist governments and industry to plan, invest and develop policy to support consumers' current and future energy needs.



AEMO predicts the need for a four-fold increase in firming capacity to smooth the increasing amounts of variable generation.

This is where a significant opportunity exists for Tasmania to get maximum value out of its infrastructure and resources. Firming (filling in the gaps of variable energy generation) will not only be a niche opportunity for hydropower in the future energy market but will be essential for the reliability and network stability of renewable energy supply.

Hydro Tasmania already has substantial storage capacity in our existing system. In addition, excess energy, either from Tasmanian generation or imported from the national grid, can be utilised (rather than our hydropower resources), saving our precious water resources for more valuable times when demand and prices are high. The revenue generated can be reinvested in energy infrastructure, as well as returned to the State Government through dividends to fund vital infrastructure and services for Tasmanians.

#### New generation infrastructure

Hydro Tasmania's core business has always been the development and operation of Tasmania's hydropower system. *Battery of the Nation* is the bold vision to maximise Tasmania's hydropower capacity for future generations.

The proposed Tarraleah redevelopment and the Cethana pumped hydro project are the two flagship projects. Business cases for both projects are underway as we work towards Final Investment Decisions. Through these projects, we can deliver flexible generation - being able to start and stop stations quickly to respond to rapid market changes or system operations.

The benefits to Tasmania are bringing jobs, investment, attracting new industry, and enhancing energy security. It will also increase revenue back to Tasmania through the provision of valuable firming services when there are gaps in supply.

Demand growth will require investment in other VRE. Numerous private investors are developing major wind and solar projects in the state, using their speciality skills, connections and experience.

Hydro Tasmania's focus is on further developing our hydropower system, leveraging on our expertise. The future national market will need the storage we have (and can build) to help keep supply reliable. Supplying on-demand energy (firming) for other renewable developments will bring significant economic benefit to Tasmania.

#### Tarraleah Redevelopment

The Tarraleah hydropower scheme in the Central Highlands was commissioned in the 1930s and produces about 630 gigawatt hours of energy each year – about 6.5 per cent of Hydro Tasmania's total annual production.

At present, Tarraleah runs primarily as a baseload generator. It runs continuously and the long and extensive water conveyance (the network of pipes and canals) means that it takes a significant amount of time to change its operation (if water needs to be turned on or off). The scheme also requires substantial investment to prudently manage risks. This includes environmental risks as well as reliability as major components are reaching end of life, such as the generators and turbines in the power station and the main water conveyance (No. 1 Canal).



By converting the station to a flexible operation (able to be started and stopped within minutes), the Tarraleah scheme will be transformed into a state-of-the-art hydropower asset, better suited for the changing energy system, and better able to support variable renewable energy sources.

Hydro Tasmania conducted a rigorous analysis of five potential options, carefully considering the social, environmental, commercial, and economic risks and benefits of each alternative. A full redevelopment with a pressurised water conveyance was identified as the preferred development opportunity. This option delivers the greatest capacity, storage, flexibility and reliability, while addressing the environmental risk posed by the ageing infrastructure. This option will see the construction of a new power station, and water conveyances and pipelines to deliver water from Lake King William.

A future redevelopment of Tarraleah is projected to bring an estimated 250 construction jobs in peak construction times over five years, up to 190MW of flexible hydropower capacity (an additional 100MW above the existing station capacity) and generate about 30 per cent more energy than the existing scheme from the same water.

The Final Business Case for the Tarraleah Redevelopment will be subject to further analysis, including environmental and planning approvals, as well as parliamentary approval as required under the <u>Hydro-Electric Corporation Act 1995</u>. A Final Business Case is planned to be considered by the Board in 2024, with a Final Investment Decision due in 2025.

#### Cethana Pumped Hydro Energy Storage (PHES) project

As wind and solar power continues to grow, water can play an important role in bringing renewable resources onto the power grid. One way is by storing energy through a proven technology known as pumped hydro energy storage.

Pumped hydro is a flexible technology that can respond to various electricity demands. It consists of a storage at higher elevation (upper storage) and a storage at lower elevation (lower storage). When the demand for electricity is high, or when variable renewable sources are scarce, the water in the upper storage flows through the underground station to generate electricity. When the demand for electricity is low, or when variable renewable sources are abundant, excess energy from the grid can be used to pump water back up into the upper storage. This process is utilised when the price of electricity is low or negative. Water is then stored, ready for future use to generate electricity when demand (and prices) are high.

Pumped hydro helps to ensure electricity network reliability by quickly filling in supply gaps. This firming capacity enables the addition of more renewable electricity to the grid, resulting in a lower cost of electricity generation.





Figure 3: An illustration of how pumped hydro works

#### Pumped hydro at Lake Cethana

Hydro Tasmania has conducted an extensive analysis of pumped hydro opportunity in Tasmania, identifying the top locations for further investigation. Three sites emerged as the most promising and were assessed on a range of technical, environmental, social and economic factors as part of a feasibility study.

Deep storage capacity, greater cost certainty, environmental and social sustainability and flexibility in sizing and capacity made Lake Cethana the preferred site.

Pumped hydro at Lake Cethana represents a 750MW, 20-hour, cost-competitive, long duration storage opportunity. There are many factors that make Lake Cethana ideal for pumped hydro, including the high elevation of the upper storage, a short connection distance between upper and lower storages, and proximity to transmission and existing hydro infrastructure (for the lower storage). It is also highly cost competitive compared to similar projects in Australia.

Developing Cethana is estimated to see up to 300 people employed over the six-year construction life of the project.

Pumped hydro, like the Cethana project, offers an opportunity to firm variable renewable energy sources, like wind and solar, both within Tasmania and across interconnection to the mainland.

A Preliminary Business Case for the Cethana PHES project is currently being developed and will be considered by the Hydro Tasmania Board in the first half of 2024. A Final Business Case is planned to be considered by the Board at the end of 2024. This will be subject to further analysis, including environmental and planning approvals, as well as parliamentary approval as required under the *Hydro-Electric Corporation Act 1995*. A Final Investment Decision is due in 2025.



#### West Coast upgrades

Optimising our existing hydropower assets is a critical part of *Battery of the Nation*. Hydro Tasmania is planning upgrades and refurbishments for the West Coast power stations and as part of this work, will increase the capacity of these stations. The three stations being refurbished in the first round of upgrades are Mackintosh, Bastyan, Reece (two units), with John Butters and Tribute Power Stations to be refurbished later this decade.

The financial investment in the first round of West Coast upgrades will be ~\$200 million to support a capacity increase of ~40MW of additional flexible capacity, along with an increase in asset life of approximately 40 years for each asset. A further financial investment of \$100 million will be allocated for John Butters and Tribute Power Stations to enable a capacity increase of up to 30MW (to be confirmed at procurement phase). Note, these estimates are in 2023 dollars and subject to changes, such as inflation and during procurement and construction.

During the works period, the capital program will deliver a significant economic and employment boost across Tasmania. Each of the six refurbishments requires approximately 70-80 jobs for the seven-month duration for each unit. This number of staff will be required to meet the multi-shift approach of these refurbishments.

#### Upgrades to Hydro's existing assets

Investing in the existing portfolio is still the most economical way to provide more cost-effective energy to Tasmanians. Through our Strategic Asset management Plan, we have a program of targeted, cost-effective upgrades and replacements of existing assets. The aim is to increase the flexibility of our portfolio, in addition to the capacity and efficiency of our assets.

The SAMP evolves in parallel with *Battery of the Nation* projects to capitalise on opportunities brought about by the energy transition, while maintaining reliable energy supply for Tasmania.

#### Funding arrangements

The business case process for the Tarraleah Redevelopment and Cethana Pumped Hydro Energy Storage (PHES) project includes evaluating various financing options and strategies. The funding strategy will be underpinned by factors such as cost, risk appetite, operational control, access to concessional finance and capital structure considerations.

Given the interrelationship of the Tarraleah Redevelopment with the hydro scheme, it is likely that the expenditure associated with that project will be on the balance sheet with both the Tasmanian Public Finance Corporation (TASCORP), and the Clean Energy Finance Corporation (CEFC) (as the likely source of funding). Given the scale and nature of the Cethana PHES project, a broader range of business structures and financing options, including sources of the funding, will be considered.

In October 2022, the Federal Government announced a new partnership with the Tasmanian Government to back the progression of Marinus Link and Battery of the Nation. Under the partnership, there is expected to be:



- Access to a concessional loan from Rewiring the Nation, through the Clean Energy Finance Corporation for approximately 80 per cent of the project costs of Marinus Link, with the additional 20 per cent to be an equity investment shared equally between the Commonwealth, Victoria and Tasmania.
- Up to \$1 billion of low-cost debt from Rewiring the Nation for Tasmania's Battery of the Nation projects including the proposed Tarraleah redevelopment and Cethana pumped hydro.
- Low-cost debt for the Northwest Transmission Developments (NWTD).

A further announcement was made in September 2023 by the Federal Government in relation to the Marinus Link equity arrangement. It was also announced that the Commonwealth will work with the CEFC to provide low-cost debt for the Battery of the Nation project at Tarraleah, and for the North West Transmission Developments (NWTD).

## Need for additional interconnection

As the energy market changes, the need for more interconnection between Tasmania and the National Electricity Market becomes more important.

Through Basslink, Tasmania can use its energy in a smarter way – if Tasmania imports energy from the mainland when prices are low or negative, this conserves Tasmania's hydropower storages, and exporting energy when prices are high creates what we call an 'arbitrage' benefit. But these opportunities are constrained by the current capacity of Basslink (~500MW). Further interconnection would provide greater opportunity for this.

Further interconnection is also vital for Tasmania's ongoing economic development. It ensures future energy security in light of prospective and expanding industries. It also helps attract the new wind developments Tasmania needs by providing greater access to the National Electricity Market for export opportunities when there is excess energy. Additional interconnection is also essential to capitalise on Tasmania's opportunities to provide valuable firming for the national grid.

Tasmania has a unique global competitive advantage to attract and retain clean industries through our renewable energy and fresh water. The opportunities for Tasmania's energy system can be realised by positioning the State for sustained economic development and electrification through continued sustainable build out of our renewables base, complemented by greater mainland interconnection.

## Operation in the National Electricity Market (NEM)

The National Electricity Market (NEM) is both a wholesale electricity market and the physical power system that connects Queensland, New South Wales, Victoria, South Australia and Tasmania. It is one of the largest interconnected electricity systems in the world, supplying around nine million customers. Tasmania is connected to the mainland and the NEM through the Basslink interconnector.



Electricity can't be stored at scale easily, meaning electricity supply and demand must be matched at all times to keep the lights on. Whenever anyone starts using electricity, whether it be turning on the kettle to make a cup of tea at home or a business starting up a large motor, more generation must be supplied instantly to meet this new demand. To make sure our supply of electricity is reliable, there needs to be a coordinated way of determining which generators will be used and how much they need to generate. This is the NEM, and it is administered by AEMO.

The NEM uses a market mechanism to facilitate the physical flow of power. The market works as a 'pool', which is a set of contracts and procedures managed by AEMO. This is also referred to as the 'spot market'.

AEMO uses a sophisticated algorithm that works out the least cost combination of offers that will meet demand across the NEM as a whole within the physical limitations of the system, to determine a spot price for each region. AEMO's procedure also co-optimises the dispatch of generators for the required ancillary services which ensure the stability and security of the electricity grid. This process is done every five minutes – every day and night, generators are switching on and off to ensure the lights stay on, and retailers are buying electricity from the market to supply their customers.<sup>8</sup>

The amount of electricity that is being produced and used across the NEM varies dramatically for a range of different reasons. Increasingly, this is being driven by the weather: wind and solar generation changes depending on the conditions of the day, and people use more electricity when it is cold or hot. This can result in the market prices changing dramatically across hours, days and weeks and consequentially, generators need to adjust their output and be switched on and off. To manage this, electricity generators operating in the NEM have control rooms and trading teams, who continuously monitor the market and their generating portfolios to respond to changes, manage risks (both financial and physical) and ensure their portfolio is meeting market requirements.

Participating in the NEM provides Tasmania with significant benefits.

- Being in the NEM gives Tasmania access to cheaper energy. This includes wind and solar, the cheapest forms of renewable energy. Tasmania can import this low cost energy when prices are low and export excess energy when prices are high. For Hydro Tasmania, this means we can optimise our revenue by trading on the NEM.
- The state wants to attract new renewable businesses. Being able to export into the NEM is
  crucial to attracting those businesses and growing the economy. It also helps attract industry
  development by enabling access to more power sources, and attracts private generation
  investors by allowing access to a bigger market. Wind resources in Tasmania are more
  attractive as an investment opportunity with additional interconnection. This is because it
  provides access to a broader market when local demand is low.
- As demand is forecast to grow materially, increased market access is also important to meet this demand. Being connected to the NEM provides a price signal for new supply development, which is critical for meeting the demands of electrification and industry expansion.

<sup>&</sup>lt;sup>8</sup> More information, see the <u>National Electricity Market Fact Sheet</u>, AEMO, December 2021



### **Energy security**

Tasmania maintains a robust renewable energy portfolio, ensuring energy security for its residents and industries. Hydro Tasmania actively manages the hydropower system and prudently manages its storages while also seeking to optimise market opportunities, operating in a highly volatile and competitive national wholesale energy market.

The total energy we can generate from our hydropower portfolio is constrained by inflows (rainfall). The pattern and volume of these inflows is being impacted, and will continue to be impacted, by climate change. We monitor storage levels, and since 2016, measure and manage these in accordance with Tasmania's Energy Security Framework.

The Framework provides measures to monitor energy security, including the Total Energy in Storage (TEIS), the High Reliability Level (HRL) and the Prudent Storage Level (PSL):

- TEIS is the total amount of water currently in all storages. It's expressed as a percentage of the total combined storage capacity, for example 36.1 per cent.
- HRL sits at the top of the energy security reserve. At the HRL, if Tasmania experienced very dry weather and a six-month Basslink outage, we'd still have enough energy in storage to maintain Tasmanian supply.
- PSL is the early indicator that Hydro Tasmania may need to adjust our operations accordingly to maintain water storages.

As identified by Tasmania's Energy Security Framework, there are other measures in place to ensure Tasmania's energy security, including the interconnection with the mainland through Basslink, retention of TVPS as a back-up baseload energy generator, and wind developments in the state.

The Tasmanian Economic Regulator (TER) is the Monitor and Assessor for Energy Security under the *Energy Co-ordination and Planning Act 1995*. The TER reports on energy security in Tasmania and, when necessary, commences the process for managing risks to energy security.

## Energy pricing in Tasmania for small customers

The *Electricity Supply Industry Act 1995* (Tas) requires the Office of the Tasmanian Economic Regulator (OTTER) to determine the maximum prices that may be charged by a regulated offer retailer for small customers under standard retail contracts in Tasmania. These prices are referred to as the Standing Offer prices. Hydro Tasmania is not involved in this price setting process.

Aurora Energy is the only regulated offer retailer in Tasmania. Small customers in Tasmania are those customers who consume less than 150 MWh per year.

The Standing Offer prices determined by OTTER are reflective of the costs of providing a retail service to customers. OTTER adopts a 'building block' approach whereby the various costs are summed together to produce a total value for supplying electricity to small customers.

Wholesale energy generation costs are one of three main costs that make up consumer power bills – the others being costs for transmission and retail services.



Figure 4, published by OTTER, outlines the various cost components and values for Standing Offer customers in 2023-24.



Figure 4: Breakdown of cost components for Standing Offer customers for 2023-24. Source: Office of the Economic Regulator.

We note there is currently a parliamentary inquiry into energy pricing in Tasmania, and Hydro Tasmania has provided a submission.

## What are the alternatives?

We note the Committee's interest in exploring "alternative options and associated costs and/or benefits to Tasmania including costs and cost of a 'do nothing approach'."

There is no 'do nothing' approach to meet Tasmania's future energy needs which are forecast to grow substantially. This growth cannot be met by current infrastructure or by hydropower alone.

Hydro Tasmania effectively manages a sizable fleet of hydropower assets, but over time, these assets will continue to attract maintenance costs without the matched efficiencies.

As noted above, Hydro Tasmania has investigated several options for the redevelopment of the Tarraleah Hydropower Scheme. Full redevelopment with a pressurised conveyance represents best value for investment in terms of improved generating capacity, and flexibility and reliability.

To meet the market need for greater energy storage, batteries may be an option. Current battery technology has a limited storage capacity of up to eight hours. Batteries also require an array of mined minerals and have a shorter lifespan, with issues around disposal. In comparison, the pumped hydro project at Cethana that Hydro Tasmania is progressing consideration of takes advantage of existing infrastructure, will have an estimated 20 hours of storage and a significantly longer lifespan.

Even with proposed hydro developments, Tasmania will still need new renewable energy infrastructure like wind and solar to meet growing demand.

If Tasmania does not have additional interconnection, it risks not being able to attract these developments.



The combined cycle unit at Tamar Valley Power Station might be viewed as another option to meet significant growth in energy demand; however, it has higher costs and environmental impacts than new wind or solar and is not a long term solution.



## Appendix 1 – Tasmania's hydro-electricity schemes



Great Lake - South Esk power scheme

Great Lake is Australia's second largest freshwater lake (Lake Pedder is the largest), 1030 metres above sea level. The lake has an area of 114 km<sup>2</sup>.

The South Esk catchment covers approximately 12 per cent of Tasmania, from the eastern slopes of Ben Lomond and incorporating Great Lake, Meander and Tamar Rivers on the way to the Tamar Estuary at Launceston.

There are three power stations operating in this catchment including Trevallyn, Poatina and Tods Corner.



#### Derwent power scheme



The Derwent River begins its journey at Lake St Clair, flowing from the Central Highlands to sea level and becoming an estuary between New Norfolk and Granton. Construction of the Derwent hydropower scheme began in 1934 and finished in 1968. The scheme involved the construction of 16 dams, 10 power stations, a mini-hydro power station and a large number of weirs, flumes, canals, tunnels and pipelines.

There are two sections in the Derwent scheme: upper and lower. Visually, the scheme resembles a Y shape, with the upper section formed from the Nive River system in the east and the Derwent River system in the west. The lower Derwent River section forms the tail of the Y.

The upper section uses lakes for storing water which can be released as needed to generate electricity. The lower section is run-of-river, which means water flows directly from the river, cascading through six power stations using the water multiple times.

Power stations included in this catchment include Tarraleah, Butlers Gorge, Tungatinah, Lake Echo, Wayatinah, Liapootah, Catagunya, Meadowbank, Cluny, Repulse and Nieterana mini-hydro.



#### Mersey-Forth power scheme



The Mersey–Forth Power Scheme uses water from four main rivers – the Fisher, Mersey, Wilmot and Forth rivers. The Mersey–Forth Power Scheme is a run-of-river system that includes eight power stations, seven large dams, three major tunnels and associated penstocks, canals and flumes. A mini-hydro power station at Parangana Dam was added in 2002. The development is spread over 2070 km<sup>2</sup> and uses water that begins its journey at an altitude of 1120 metres on the Great Western Tiers and falls to sea level below Paloona Dam.

Lake Rowallan is the major storage for this catchment. It is an important fishery for trout and supports significant populations of native fish.

Lake Barrington was created in 1969 on the River Forth. It is a world-class rowing course and is used for the annual Tasmanian schools Head of the River and Australian and world championship rowing competitions. The lake is also used for canoeing, fishing, water-skiing and nature appreciation. The foreshore is a protected area, known as the Lake Barrington Nature Recreation Area.

Power stations included in this catchment include Rowallan, Lemonthyme, Devils Gate, Wilmot, Cethana, Paloona, Fisher and Parangana mini-hydro.



#### Gordon-Pedder power scheme



The combination of Lake Gordon and Lake Pedder is the largest storage in Hydro Tasmania's system, nearly four times the volume of Great Lake and representing 32.5 per cent of Tasmania's total energy storage capacity. It is also the largest storage of water in Australia, and three times larger than the largest lake in the Snowy Hydro scheme. This catchment is located in the wild terrain of south-west Tasmania.

Lake Pedder was once a natural lake, expanded to become the largest freshwater storage in Australia by construction of three dams: the Serpentine Dam, Scott's Peak Dam and Edgar Dam.

Lake Gordon was created with the construction of Gordon Dam, a double curvature arch dam on the Gordon River. The dam is 192 metre-long, and 140 metre-high (the tallest dam in Tasmania) and produces approximately 13 per cent of the State's electricity demand.

The Gordon Power Station is the only power station in the catchment and is the largest in Tasmania.



#### Pieman power scheme



On the west coast of Tasmania is the youngest of our hydropower systems. The first stage in this catchment was the Pieman River Power Scheme.

This development taps into the Pieman River and its two major tributaries, the Mackintosh and Murchison rivers.

The second stage of development involved building three dams (Henty, White Spur and Newton), 7.4 km of canal and the Newton pumping station, diverting water from the Anthony and surrounding rivers.

The water goes to Lake Murchison via Lake Plimsoll through 7 km of tunnels to Tribute Power Station before flowing to Lake Murchison. It can then be used again in the other three stations in the Pieman scheme.

The Reece Power Station is located at the foot of the Reece Dam on Lake Pieman. The dam and power station are named after the Honourable Eric Reece who was the Premier of Tasmania (1958–1969 and 1972–1975) and a great supporter of Hydro Tasmania.

Power stations in this catchment include Mackintosh, Bastyan, Reece and Tribute.



#### King and Yolande power scheme



The King catchment is based around Lake Burbury. The King River Power Scheme began in 1983 after the Gordon-below-Franklin development was abandoned. The scheme consists of two dams: the Crotty and the Darwin dams. These were constructed to create Lake Burbury. Water from Lake Burbury falls 200 metres on its 7 km journey through a tunnel under Mt Jukes to the John Butters Power Station, the only station in this catchment.

The Yolande catchment contains the Lake Margaret power stations and flows into the Yolande River. Although Lake Margaret is a small lake, it receives very high rainfall. This catchment includes both upper and low sections of Lake Margaret.