9 September 2016

Energy Security Taskforce Secretariat
c/- Department of State Growth
GPO Box 536
HOBART TASMANIA 7001

By email: energysecuritytaskforce@stategrowth.tas.gov.au

Dear Sir/ Madam,

TASMANIAN ENERGY SECURITY TASKFORCE – CONSULTATION PAPER AUGUST 2016

Thank you for the opportunity to provide a submission to the Tasmanian Energy Security Taskforce Consultation Paper.

Hydro Tasmania is Australia's largest water manager and producer of renewable energy. Our expertise in renewable energy operation and development is internationally recognised. We are an integrated energy business providing renewable energy to Tasmanian customers and retail energy products to the National Electricity Market through our Victorian-based retailer Momentum Energy. Hydro Tasmania is a material participant in the National Electricity Market (NEM) and South Eastern Australian natural gas market. Hydro Tasmania's principal purpose is to 'efficiently generate, trade and sell electricity in the National Electricity Market'. Our principal objectives are to perform our functions and exercise our powers to:

- meet the energy needs of the Tasmanian region;
- be a successful business by operating in accordance with sound commercial practice and as efficiently as possible; and
- achieve a sustainable commercial rate of return that maximises value for the State of Tasmania in accordance with Hydro Tasmania's Ministerial Charter and having regard to the economic and social objectives of the state.

The events of the 2015/16 financial year, a record low spring rainfall in Tasmania combined with a Basslink outage that extended 176 days were unprecedented. Hydro Tasmania, in co-ordination with the Tasmanian Government and other State Owned Businesses, developed and implemented an effective Energy Supply Plan that ensured the continuous supply of electricity through a challenging period.

The probability of such a combination of events, prior to it eventuating, was at least as low as a 1 in 3000, based on historical data and the coincidence of this low inflow period with the first undersea cable fault in 10 years of operation. While the probability of it happening again is still very rare, it is

appropriate to re-examine energy security in the light of significant changes to planning assumptions and the learning from this most recent experience.

It will be important that Tasmania does not respond to the events of 2015/16 by locking-in long-term, expensive or unnecessary supply options which could disadvantage the state in future years. All future energy supply options should be considered to ensure low-cost energy security in the event of very low probability events. For least-cost energy security, Tasmania should not preclude: additional water in storage; augmentation of the existing hydro system (as described in the Tasmanian Government's energy strategy); additional on-island wind generation; demand management and associated products; or temporary generation options (such as diesel).

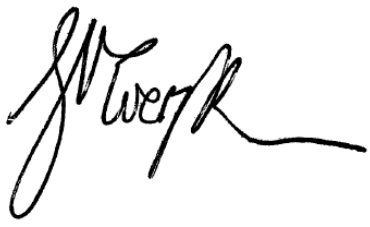
Further supply options will have financial implications. Caution must be taken with respect to the immediate cost of capital, ongoing cost of servicing capital as well as to the costs of operation. It is important that Tasmania does not invest heavily against outcomes that remain very unlikely to occur. Where Tasmania responds to the events of 2015/16 it must ensure that the investments made represent value for money for the State. Accordingly, it is appropriate to assess future energy supply mix options under a net-present value approach.

Please find attached Hydro Tasmania's responses to the consultation paper and the Terms of Reference. This submission has not directly addressed each separate question in the consultation paper, rather it provides an overview, and commentary on, a number of combined themes raised by the consultation paper.

Hydro Tasmania will provide its extensive experience and expertise to assist the Taskforce to meet its terms of reference. Tasmania's future energy security is of major importance to Hydro Tasmania and we look forward to improving the State's approach to energy security including enhanced risk monitoring and transparent reporting that can be efficient, effective and meaningful.

Should you have any queries or require further information, please contact Mr Alex Beckitt (email: alex.beckitt@hydro.com.au or telephone: 03 6230 5249).

Yours sincerely,



G.V. Every-Burns
Chairman

Hydro Tasmania Submission
Tasmanian Energy Security Taskforce – Consultation Paper September 2016

Contents

1. Executive summary

Hydro Tasmania's 16 May 2016 submission to the Parliamentary Standing Committee of Public Accounts inquiry into Government-owned energy entities provided a detailed outline of Hydro Tasmania's response to the unprecedented set of circumstances that affected the State through 2015/16[1]. This included components of the Energy Supply Plan put in place by Hydro Tasmania and the State Government to ensure the energy needs of the State continued to be met, and is provided as Attachment 1. As the consultation paper notes, water storages have since risen, and at the time of writing, total system storage is at 37.9 per cent. Hydro Tasmania is targeting storage levels of 40% by the beginning of summer and for storages to remain at or above 30% by the end of the 2016-17 financial year. This storage management approach, combined with the Basslink cable being fully available and Tamar Valley Power Station remaining on stand-by, means that energy security risk remains extremely low while the Taskforce process takes place.

In light of the energy security challenges faced during 2015-16 Hydro Tasmania has undertaken detailed internal risk analysis in conjunction with respected external advisors. This work has examined:

- key aspects of energy security (generation adequacy, reliability, affordability and acceptability) and how they could be calibrated and applied in Tasmania;
- climate advice from the Antarctic Climate Ecosystem Cooperative Research Centre, the Institute for Marine and Antarctic Studies (IMAS), the University of Tasmania, Commonwealth Scientific and Industrial Research Organisation (CSIRO) Oceans & Atmosphere and CSIRO Land & Water, relating to weather and climate predictions including both the frequency and predictability of extreme inflow events; and
- a range of approaches to Energy Supply Risk Management that can achieve energy security standards for Tasmania.

Hydro Tasmania's Ministerial Charter requires it to achieve a sustainable commercial rate of return and have regard to the social and economic objectives of the State. Accordingly, this submission seeks, where possible, to identify the trade-offs that might result when pursuing a particular course of action, especially in relation to the management of water storages and future energy supply options, and the cost implications these may have for the State of Tasmania, customers and/or Hydro Tasmania.

As the consultation paper correctly (in our view) notes:

> *"If a very high level of 'insurance' is desired, it would result in higher energy prices over the long term, which in turn has economic and social impacts. Too low a level of 'insurance' could also have economic and social impacts, if supply disruptions became prolonged and/or there are regular occurrences. Getting the right balance is key."*

[1] http://www.parliament.tas.gov.au/ctee/Joint/pacc.htm

Hydro Tasmania understands that the role of the Energy Security Taskforce is to investigate and assess the relative trade-offs between alternative future energy supply approaches and to provide this advice to the Tasmanian Government. Accordingly Hydro Tasmania looks forward to working with the Taskforce, in particular, on the following summary of key points made in this submission:

- **It is appropriate to reassess energy security for Tasmania in light of the events of 2015/16 and updates to planning assumptions;**

- **The establishment of a robust framework for undertaking periodic reassessments as circumstances change would be a very positive step for Tasmania;**

- **It is essential to define an energy security standard (or target) as a basis for evaluation of the options to provide the appropriate level of energy security in Tasmania;**

- **The key considerations of an energy security standard are: generation adequacy, reliability, affordability and acceptability;**

- **The importance placed on each of the four suggested elements of energy security (generation adequacy, reliability, affordability and acceptability) will significantly influence the adopted approach to energy security. There are clear trade-offs between the level of 'insurance' against energy security risk, on the one hand, and electricity prices, returns to Government and environmental outcomes, on the other;**

- **The flexibility provided by the hydro system must be fully recognised to avoid locking into longer term costly options;**

- **Transparent monitoring and reporting of energy security metrics is an opportunity to increase community confidence;**

- **The steps that should be taken to ensure energy security going forward will depend significantly on views and assumptions regarding the variability of future inflows. This warrants an ongoing review of climate science and climate modelling to improve future inflow assumptions; and**

- **Development of an energy security framework for Tasmania needs to be readily adaptable to future states of supply and demand. Future energy states for Tasmania could include higher renewable energy penetration, increased interconnection, demand side management and distributed generation.**

In responding to the events of 2015/16 we must ensure that the investments made represent value for money for the State. It is appropriate to assess future energy supply mix options under a net present value approach.

2. Introduction

The events of 2015/16 were unprecedented. The spring 2015 inflows into hydro storages were the lowest since records began in 1924 and less than half of the previously recorded low since reliable records are available (from around 1950) and coincided with an extended Basslink outage (176 days, compared with an expectation of a 60 day return to service).

While Hydro Tasmania had considered conservative credible scenarios in its generation planning, the actual events of 2015/16 fell outside the scenarios considered. Our generation planning was based around the convergence of two rare events: low inflows, and a 60 day Basslink outage. Recent experience demonstrates that the conservative planning approach Hydro Tasmania used was sufficient to accommodate a combination of low inflows and a 60 day Basslink outage. It was the unanticipated duration of the Basslink outage (to 176 days) that necessitated the implementation of the Energy Supply Plan.

Hydro Tasmania considers that it is essential to update inflow scenarios (including the effects of climate change) and our assumptions regarding the repair times for Basslink subsea cable faults. We welcome the opportunity to do this in a broader and more transparent framework.

It is appropriate to reassess energy security for Tasmania in light of the events of 2015/16 and updates to planning assumptions.

The establishment of a robust framework for undertaking periodic reassessments as circumstances change would be a very positive step for Tasmania.

3. Defining an appropriate energy security standard

It is very important to start by clearly defining the desired standard for energy security in Tasmania – that is, to spell out what 'energy security' actually means, in practice. Having done so, that standard must be effectively monitored and maintained as circumstances (supply/demand balance) change over time.

Hydro Tasmania suggests there are four key considerations that need to be assessed in terms of energy security - generation adequacy, reliability, affordability, and environmental and social acceptability. These considerations are derived from analysis of energy security practices across the globe.

- Generation adequacy – refers to the availability of both fuel resources and infrastructure for the delivery and use of electricity.
- Reliability – refers to the provision of electricity with minimal disruption. Barriers to reliability can include economic and technological factors. The current AEMO NEM reliability standard is designed to ensure that in any NEM region, no more than 0.002% of demand is unserved each financial year[2].
- Affordability – refers to the relative importance of electricity to the economy, and the level of exposure to price changes. Within the context of electricity security, affordability also refers to exposure to price shocks, rather than just the absolute cost of energy.
- Acceptability – refers to environmental and social considerations and generally reflects concerns about the environmental impact associated with electricity generation and use.

It is essential to define an energy security standard (or target) as a basis for evaluation of the options to provide the appropriate level of energy security in Tasmania.

The key considerations of an energy security standard are: generation adequacy, reliability, affordability and acceptability.

[2] http://www.aemc.gov.au/getattachment/2f4045ef-9e8f-4e57-a79c-c4b7e9946b5d/Fact-sheet-reliability-standard.aspx

4. The Tasmanian context

4.1. Tasmanian Supply / Demand Balance

Under normal circumstances the Tasmanian electricity system is broadly in balance. In a typical year, demand can be met predominantly through on-island supply, supplemented by around 800 GWh of energy imports or dispatchable on-island generation:

1. Total Tasmanian electricity demand, as measured by the total energy generated, is currently around 10,800 GWh per year (10637 GWh in 2013-14 and 10667 GWh in 2014-15 with reduced industrial demand[3]). Based on data from 1997-2015, in an average year, hydro and wind generation will total around 10,000 GWh with a standard deviation of 1,200 GWh. (That is, generation will fall outside of the range 10,000 GWh ± 1,200 GWh approximately once every three years on average, and can be expected to fall below 8,800 GWh around one year in six.)
2. Variability outside this range is managed by the Basslink interconnector (both import and export) and the storage reserves held in Hydro Tasmania's major storages (Great Lake and Lake Gordon).
3. Gas generation is currently available for energy security with the combined cycle unit in standby mode (<30 day recall).

Market projections (based on data from the Australian Energy Market Operator and external analysis) indicate that Tasmania's existing combination of hydropower, wind generation and interconnection is sufficient to meet both instantaneous demand and energy consumption over time under all but the most extreme scenarios.

4.2. Credible versus Extreme Events

It is standard practice in the energy industry to manage power system security to account for "the single largest credible event". Hydro Tasmania uses a similar concept with respect to its storage management by considering what constitutes a credible event in terms of its storage management and planning. Prior to December 2015, Hydro Tasmania's storage management and planning process considered the largest credible event to be a 60 day Basslink outage coincident with a very dry inflow sequence. In December 2015, Tasmania experienced such an event when the Basslink cable faulted after a record dry spring (which itself fell outside of planning parameters for a low inflow sequence). Tasmania was then faced with a more severe outlook when the repair time for Basslink was extended (beyond the initially advised and planned for 60 day outage) for an indefinite period. The Energy Supply Plan that Hydro Tasmania (and the Tasmanian Government) implemented was designed to bring Tasmania back to an acceptable state of energy security. By increasing generation from gas assets and

[3] AEMO 2016 National Electricity Forecasting Report

the installation of temporary diesel generation, the aim of the Energy Supply Plan was to maintain Hydro storages above the point (12% at 1 May) at which Tasmanian electricity demand would continue to be met even in the event of another credible event occurring.

The events of 2015/16 saw the coincident occurrence of what is understood statistically to have been a 1 in 300 year low inflow sequence (based on historical data[4]) and the first subsea cable fault in 10 years of Basslink operation, resulting in an extended 176 day outage. These events provide an initiator and opportunity to review what is considered to be the largest credible event for the Tasmanian region. At this stage of analysis, the Basslink outage of 176 days is not believed to be a 'new' or 'base' normal. It is considered an outlier, and should continue to represent a low probability event.

Care must be taken to avoid being overly conservative when adjusting key assumptions and in considering what constitutes a future credible planning event. There is an ever increasing cost to insuring against less and less likely contingency.

Hydro Tasmania recommends that careful consideration is given to determining and planning for Tasmania's largest credible contingency. Such an approach could facilitate planning for, and resilience to, such an event and could inform appropriate targets for the energy security elements of generation adequacy and reliability.

4.3. Supply Mix Choice

It would be useful to begin with an assessment of the current supply and demand side choices to achieve the optimal mix to meet a defined energy security standard and then follow with an assessment of the opportunities to add or subtract from the current state to further enhance the chosen make-up of the energy security mix. In making this assessment it is very important to consider the flexibility of the chosen portfolio to adapt to credible future states (this is discussed in more detail later in this paper). This is also where the energy security elements of affordability and acceptability need to be taken into account.

- Tasmania has substantial **hydropower** assets comprising a portfolio of 30 power stations with an installed capacity of 2250 MW which generate an average of 9000 GWh of renewable energy per year. The major power stations (Gordon and Poatina) provide significant flexibility to support the State's energy security objectives. Storage levels can be increased or decreased as circumstances change without creating the need for further long-term investment or the risk of investing in assets that are uneconomic over the long-term. The existing hydro assets will be the cornerstone of any energy security plan for Tasmania.
- Tasmania also has excellent **wind** resources through exposure to the 'Roaring 40s'. Renewable energy generated from wind, is non-dispatchable (i.e. non-storable / must be used immediately) and therefore not reliable for managing capacity. Wind is broadly

[4] Hydro Tasmania internal analysis of historical hydro inflows

recognised as a key part of progressing towards a decarbonised economy provided it is complemented with dispatchable generation. In Tasmania, the amount of wind generation can reduce the amount of hydro energy in storage required to maintain energy security.

- **Basslink** provides substantial flexibility to manage the natural variation of renewable energy (hydro, wind and solar), and in particular represents a much cheaper source of energy during periods of low renewable energy generation.
- The current **gas** assets comprise a main generation unit (combined cycle) that is designed for continual base-load running and four smaller units (open cycle) that are intended to meet peak demand. The main unit is uneconomical as a base load generator, as the cost is higher than prevailing market price, and has accordingly been in standby mode for the majority of the time since it was transferred to Hydro Tasmania in June 2013. The high fixed cost of maintaining these gas assets in standby mode (and incompatible design) significantly detracts from their ability to make a sustainable contribution to energy security in Tasmania over the long-term. For this to change, at a minimum, the high fixed cost structure will need to be addressed.
- Temporary **diesel** generation has been demonstrated to be a credible and achievable deployment option in response to an extreme event. The acceptability of a temporary generation response on a very rare frequency needs to be considered as part of the optimal approach to energy security.
- The engagement of major energy users and their participation in **demand management and associated products** is an important part of energy security planning and operation. The need to balance system costs, energy security and reliability mean that approaches to demand management and associated products are a necessary consideration in energy planning in all jurisdictions. Commercially negotiated arrangements that provide financial incentives to major industrial customers in return for energy security risk management products can be very effective. These arrangements provide mutual benefit to the parties and are a very effective mechanism to consider in the energy security mix.

The importance placed on each of the four suggested elements of energy security (generation adequacy, reliability, affordability and acceptability) will significantly influence the adopted approach to energy security. There are clear trade-offs between the level of 'insurance' against energy security risk, on the one hand, and electricity prices, returns to Government and environmental outcomes, on the other.

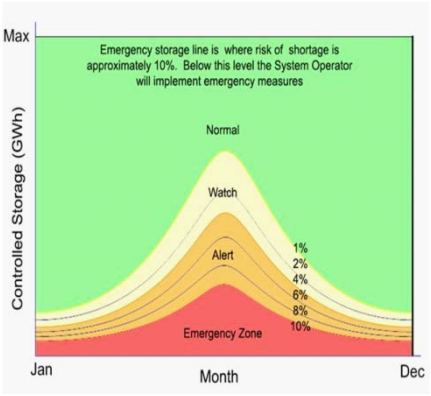
5. Water storage management and reporting

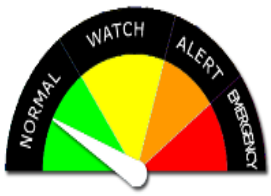
Attachment 2 provides an overview of Tasmania's hydro asset portfolio, depicting the mix of 'major', 'intermediate' and 'run of river' assets and the relative contribution of each category of hydro asset to our annual energy generation and to overall generation portfolio capacity. Understanding the characteristics of this complex portfolio mix is essential for effective water storage management.

In the aftermath of the extremely dry spring in 2015, and the prolonged Basslink outage spanning six months, Hydro Tasmania is undertaking a comprehensive re-assessment of storage management to incorporate the lessons from that experience. The risk analysis is also exploring how water storage management would change under different electricity generation supply portfolios (e.g. different volumes and mixes of wind, interconnection and/or other resources). With any combination of supply/demand assumptions, water management is the balancing element as it doesn't need to be fixed indefinitely and can be very adaptable to changing circumstances as is very likely over time.

Through the energy supply challenge it was apparent that increased transparency of the actual energy security risk would have increased community confidence in Hydro Tasmania's ability to meet Tasmanian electricity demand during the period. The consideration of alternative methods of reporting energy security represents an opportunity to improve transparency and increase community confidence.

In considering such methods, it would be sensible to reflect on approaches used internationally where hydropower is the dominant energy source. For example, New Zealand uses the following metrics for monitoring and reporting with respect to hydro storages:





Source: https://www.systemoperator.co.nz/security-supply/sos-weekly-reporting/hydro-storage-information

The flexibility provided by our hydro system must be fully recognised to avoid locking into longer term costly options that are incapable of responding to credible future states.

Transparent monitoring and reporting of energy security metrics is an opportunity to increase community confidence.

6. Potential impacts of climate change

As part of Hydro Tasmania's comprehensive re-assessment of storage management, external advice has been commissioned to improve our understanding and utilisation of medium-term weather and climate predictions - in particular relating to the frequency and predictability of extreme inflow events.

Hydro Tasmania's view is that while previously it has been reasonable to base storage management practices on our historical understanding of inflows, there is reasonable clear evidence that the climate is changing. It may well be that the extreme dry and wet events that we have seen over the last 12 months are due to climate change, not just due to the chance of extreme events happening within a certain year. Future work needs to assess whether those extremes that we have seen over the last 12 months are likely to become more frequent in the future. The external advice that Hydro Tasmania has engaged is examining the current state of climate science and climate modelling with the aim of better understanding likely climate variability and inflow invariability.

The steps that should be taken to ensure energy security going forward will depend significantly on views and assumptions regarding the variability of future inflows. This warrants an ongoing review of climate science and climate modelling to improve future inflow assumptions.

7. Adaptability to future circumstances

The Federal Government has set an emissions reduction target of 26% to 28% below 2005 levels by 2030 and has a stated support for moving towards a low carbon economy. Tasmania has significant **new renewable energy generation potential**. Developing new low or zero emissions generation is a significant part of tackling climate change and is likely to feature heavily in Australia's future energy mix. Tasmania has a significant advantage with its hydro system being the best available source of dispatchable renewable energy. The chosen energy security approach needs to be careful not to constrain the value of existing assets, or the opportunity to harness more of Tasmania's renewable resources.

Should Tasmania's renewable energy resources be developed to their full potential in combination with a **second interconnector,** energy security in Tasmania would be much greater. Similarly, should there be a significant change in demand for grid-connected energy supply - either from the loss of a major customer (~55% of Tasmania's energy is consumed by 4 customers) or material consumer take-up of off-grid solutions (solar, battery etc.) - the same energy security standard could be met with a different supply mix. The probability of a material increase in demand may be much lower, but should still be considered. Electric vehicles is one possible driver of an increased energy demand in Tasmania requiring more supply to be added for energy security (an additional 320GWh or approximately 3% of demand by 2030 under AEMO's strong EV uptake scenario).

The recently released preliminary report into the feasibility of a second Tasmanian interconnector noted that, if viable, a second interconnector would support long-term energy security in Tasmania, assist in the integration of Tasmanian renewable energy into the NEM, support the operation of the NEM and could open the way for more than 1000 megawatts of new renewable energy development in Tasmania.

With respect to **the role of customers**, **energy efficiency** offers a cost-competitive pathway to improving electricity security in the short to medium term. **Distributed generation**, **battery storage** and empowered customers are playing an increasingly important role in Australia's energy system. Energy businesses and commentators across Australia are acknowledging the growing role that consumers can play in the energy market through embedded generation (e.g. solar), demand displacement (e.g. solar hot water), heating and cooling and potentially storage options. This dynamic is likely to increase in Tasmania and, as a result, the role of consumers needs to be considered in Tasmania's energy future.

Development of an energy security framework for Tasmania needs to be readily adaptable to future states of supply and demand. Future energy states for Tasmania could include higher renewable energy penetration, increased interconnection, demand side management and distributed generation.

16 May 2016

Hon Ivan Dean MLC
Chair of Public Accounts Committee
Parliament House
HOBART TAS 7000

Dear Mr Dean

INQUIRY INTO GOVERNMENT-OWNED ENERGY ENTITIES

Thank you for your letter dated 19 April 2016 regarding the establishment of a Parliamentary Standing Committee of Public Accounts inquiry into Government-owned energy entities.

Hydro Tasmania's enclosed submission provides:

- an overview of the business and recent history; and
- our specific responses to the Committee's Terms of Reference for the inquiry.

The submission is accompanied by internal source documents relevant to the Committee's Terms of Reference.

Some of the material contained in this submission and the related documents is commercially sensitive to our business, our customers or our suppliers. This material is provided to the Committee on a confidential basis.

Also provided is a version of this submission for publication by the Committee.

Please note the overall submission represents an initial response to the Committee's Terms of Reference, as Hydro Tasmania understands them. With particular regard to term of reference 2, Hydro Tasmania seeks from the Committee an extension of time to make a supplementary submission.

The financial performance of the business continues to be impacted by factors that stem from the period of low rainfall that began in September 2015 and the subsequent Basslink outage (and delays in Basslink's return to service), as well as the high inflows into hydro storages of recent weeks. An improved understanding of the impact of these events will be provided to the Committee in the coming weeks.

Should the Committee determine that our interpretation of the Terms of Reference has overlooked a matter of interest, please advise us of any additional material required. Hydro Tasmania will provide supplementary materials that may be beneficial as the inquiry progresses.

Yours sincerely

G.V. Every-Burns
Chairman
16 May 2016

Corporate Profile

Hydro Tasmania is a trading name (along with Entura) of Hydro-Electric Corporation, an integrated energy business owned by the State of Tasmania.

Hydro Tasmania operates under the *Government Business Enterprises (GBE) Act 1995* and the *Hydro-Electric Corporation Act 1995*. The Minister for Energy has portfolio responsibility for Hydro Tasmania.

Our business

Hydro Tasmania's principal purpose is to 'efficiently generate, trade and sell electricity in the National Electricity Market'. Our principal objectives are to perform our functions and exercise our powers to:

- be a successful business by operating in accordance with sound commercial practice and as efficiently as possible
- achieve a sustainable rate of return that maximises value for the State of Tasmania in accordance with the Corporate Plan and having regard to the economic and social objectives of the state.

Building on 100 years of experience in the electricity industry, the Hydro Tasmania group operates as one business focused on delivering value to our customers: Hydro Tasmania (electricity generation and trading), Momentum Energy (our mainland retail subsidiary) and Entura (professional services). Each operates as part of the integrated group to deliver the business strategy, enhance value and mitigate strategic risks so that Hydro Tasmania can deliver sustainable financial returns to the State of Tasmania.

Ministerial Charter

Hydro Tasmania operates in line with its Ministerial Charter. The Charter sets out the Tasmanian Government's broad policy expectations of the Hydro-Electric Corporation and requirements of the business. The current Charter is dated November 2012 and can be found at Ministerial Charter.

Treasurer's Instructions

These lay out the requirements of the Government in relation to the financial management and reporting of GBEs. They are issued under section 23 of the *Financial Management and Audit Act 1990* and section 114 of the *Government Business Enterprises (GBE) Act 1995*.

They can be found at Treasurer's Instructions.

Other useful links

Hydro Tasmania's annual reports - annual reports
Tasmania's Energy Supply Plan - Energy Supply Plan

Submission – public version

Hydro Tasmania's submission to the Public Accounts Committee of the Tasmanian Parliament contains the following sections:

Part A: Background and overview

Explanatory note:

This document is the public version of the submission provided to the Public Accounts Committee on 16 May 2016. The full submission contains material and related documents that are commercially sensitive to our business, our customers or our suppliers and have been provided to the Committee on a confidential basis.

Part A

Executive summary

Overview

The Public Accounts Committee of the Tasmanian Parliament is conducting an inquiry into the financial position and performance of government-owned energy businesses.

In its submission to this inquiry, Hydro Tasmania seeks to:

- Provide a range of information and supporting documents in response to the Inquiry's specific terms of reference.
- Outline its response to the unprecedented set of circumstances that have impacted on the State over the last nine months and resulted in the Inquiry being initiated.
- Provide details of the Corporation's response to the emerging climatic situation and the Basslink outage.
- Outline the components of the Energy Supply Plan put in place by Hydro Tasmania and the State Government to ensure the energy needs of the State are met.
- Inform the Committee of the Corporation's response to a number of related government policy initiatives and changes in recent years, both at a federal and state level, that have required the business to make specific strategic decisions and adjust its operations.

As a result of 10 months of below average rainfall in Tasmania, combined with the extended Basslink outage, and the understandable increased level of community concern, some of the Corporation's actions and decisions have been questioned and criticised. The Corporation's submission also seeks to inform the Committee of the facts and to dispel some of the myths that have arisen as a result of increased public commentary and media coverage.

The key points of the submission are:

Financial position

- Hydro Tasmania is in a sound financial position. Its net debt balance of $826 million as at 31 March 2016 is less than the balance at the end of each of the previous five financial years.
- It has enough liquidity and debt facilities in place to fund the implementation of the Energy Supply Plan without needing to extend its existing borrowing arrangements.
- While the reduction in generation to rebuild storages will, in isolation, have a downwards influence on the valuation of the assets, the business has a strong net asset position.

Weather projections

- The Bureau of Meteorology's (BoM) seasonal outlook issued in late August 2015, at the start of the low inflow sequence into hydro storages, predicted average rainfall for September 2015. As late as 24 September 2015, the BoM was forecasting only slightly below average rainfall for October.
- Two weeks later BoM reassessed the rainfall outlook for October as extremely dry. Hydro Tasmania had already responded to lower than expected rainfall by increasing Basslink exports from late September.
- Spring 2015 inflows into storages were the worst on record for that period.

Basslink outage

- On 22 December 2015, Basslink Pty Ltd informed the national market of a 60-day outage. Through a series of public statements over the next three months, the date for a return to service was extended to mid-June 2016.
- An extended outage of Basslink was part of Hydro Tasmania's contingency planning and, along with low rainfall, was identified as a risk. These risks, which have never been experienced previously, required Hydro Tasmania to employ an escalating array of response mitigations, which have been incorporated into the Energy Supply Plan to meet Tasmanian energy demand through to the winter rains.

Carbon price – business strategy

- A price on carbon emissions from 1 July 2012 enabled Tasmania to secure a price premium for its clean electricity generation sold into the National Electricity Market (NEM).
- During the lead-up to the carbon period the business imported more heavily across Basslink to build up storages. This enabled Hydro Tasmania to exit the carbon priced period with a system storage level in excess of our long-run sustainable position.
- If there had been no carbon price, storages would have been held to a very similar level to where they were prior to the pre-carbon price build up (27.7 per cent at 30 June 2009) and at the end of the carbon price period (28.1% at 30 June 2014), meaning the net effect of the carbon price on storages was close to zero.

Tamar Valley Power Station (TVPS)

- Responsibility for the TVPS was transferred to Hydro Tasmania on 1 June 2013. This included a range of other assets and liabilities, including associated debt of $205 million.
- The Combined Cycle Gas Turbine (CCGT) was placed in dry lay-up from 8 July 2013, apart for a period from 10 December 2013 until 3 June 2014, to preserve it in good condition while it was not required to run within the generation portfolio.
- Based on a rigorous assessment of a range of issues such as projected inflows, approval was sought in January 2015 from the Tasmanian Government to sell the station's CCGT. In August 2015, the Government granted this approval subject to a range of conditions.
- Given the record low rain in October and the emerging challenge of responding to low storage levels, a commercial decision was taken in November 2015 to re-activate the CCGT. The unit was returned to service on 20 January 2016.

There is no doubt the energy supply challenges of the last nine months have had an impact on both our business and the state as a whole. The implementation of the Energy Supply Plan to maintain the state's energy supply is working but comes at a considerable cost which will be borne by Hydro Tasmania. As a result the Government has announced it does not expect the Corporation to provide dividends for the next three years.

While recent rains have been welcome and our position is significantly improved, the challenge is not over and Hydro Tasmania will continue to make operational decisions which are prudent and responsible as we focus on rebuilding dam levels and adjusting our planning assumptions to take stock of what has occurred.

Background

Hydro Tasmania generates electricity from 30 hydropower stations and one gas-powered station (Tamar Valley Power Station) and has entered into offtake agreements for Woolnorth (Studland Bay and Bluff point) and Musselroe wind farms as part of a single, complex statewide operating system built up over 100 years to meet the energy needs of the Tasmanian community.

For a century, the business has helped shape Tasmania's industries, economy, landscape and community. Its legacy is not only its engineering and construction feats, but also its lasting impact on the State's population and culture, and it will have an integral role in the state's economic development for many years to come.

As Australia's largest water manager, the business is responsible for many significant lakes, rivers and smaller water bodies in six large catchments covering 35 per cent of Tasmania's land area.

Managing water storages

Water flowing from the rains over our catchments and into our storage lakes around the state is the key energy resource that generates much of the electricity required to meet the needs of households and businesses. Energy generated from wind turbines and gas has added to that mix in recent years. The Basslink interconnector has connected Tasmania to the mainland since 2006 to provide a physical link to join the NEM.

Water inflows are highly variable from year to year. Hydro Tasmania expresses water inflows in energy output terms (GWh). From the period 1924-1996, modelled inflows for Hydro Tasmania's current system averaged approximately 10,000 GWh per year. Actual inflows for that period are not available as the current statewide system was only completed in 1993.

Long-term average inflows into our system have reduced over the past 40 years. This phenomenon has been generally observed across southern Australia since the 1970s. Hydro Tasmania considers there to be a risk that system inflows will continue to be adversely affected by climate change and has been working with a number of organisations to better understand this risk. As part of this work, Hydro Tasmania has supported the Climate Futures for Tasmania project.

As a consequence of inflow reductions, Hydro Tasmania has progressively lowered its expected long-term inflows from 10,000 GWh prior to 2007 to 9,000 GWh in 2014. The addition of Woolnorth (2002-2007) and Musselroe (2013-2014) wind farms, as well as on-island generation from small system enhancements, has maintained supply in Tasmania at around 10,000 GWh per annum without any contribution from gas-fired generation. Figure 1 illustrates system yield across the hydro system between 1924 and 2015 (Calendar Years).

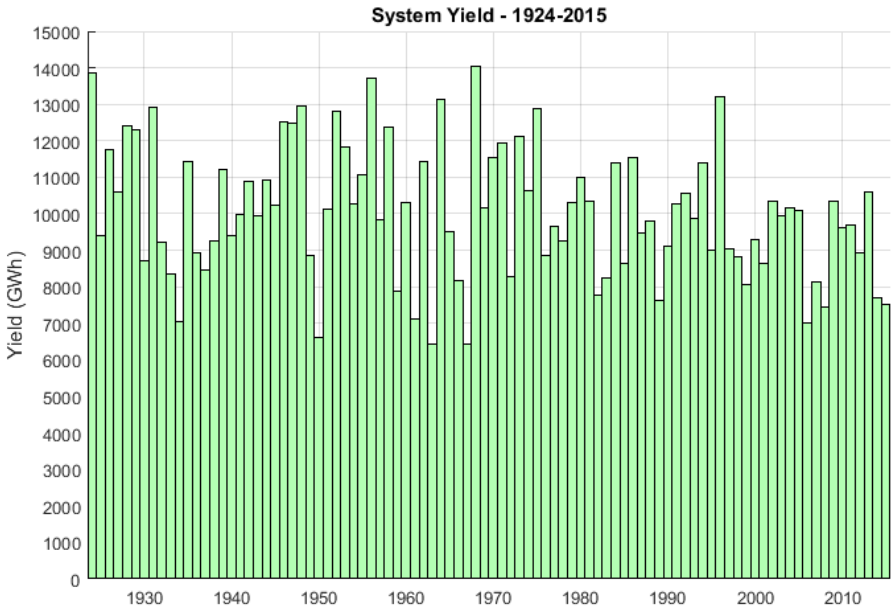


Figure 1. System Yield 1924-2015

Water storage is similarly defined in energy output terms. Storage 'levels' are expressed as a ‘per cent full’ in energy terms. This applies to the system as a whole, but we also refer to the level of particular lakes. The figure is relative to, but is not the same as, the actual level of water in the storage. Hydro Tasmania publishes water storage data on its website under ‘energy data’ and ‘lake levels’, which are reported as metres below full.

Hydro Tasmania has developed water management guidelines for managing the system as a whole. These guidelines include establishing preferred operating zones and storage operating rules, managing storage risks and recording protocols for communication with stakeholders. These guidelines and operational parameters have been informed by a long history of observations and experience in operating the hydropower system.

Modelling

The Tasmanian hydro system is complex given the number of relatively small and inter-dependent storages. System modelling makes use of current and historical water level and flow data. Hydro Tasmania uses this modelling to assist decision-making around generation from various storages. There are individual generation and portfolio considerations that influence decisions, balancing existing and future value from generation, including the risk of spilling water. Inflow data from 1997 to the present is utilised in current modelling because this period is considered representative of the current and near future climate.

These assumptions are consistent with the results of the Climate Futures for Tasmania modelling, which showed no strong trends in net inflows over the next couple of decades.

Storage operating rules

Storage operating rules describe how water levels and releases from the storages are to be managed. In developing the rules, Hydro Tasmania considers the attributes of the particular lake – physical, climatic, multiple-use, social, environmental and operational requirements. Adjustments to rules are made when conditions surrounding these attributes change significantly. Consultation with relevant stakeholders is undertaken where appropriate to do so.

Due to the prevalence of winter rains and dry summers, Hydro Tasmania's storage levels will vary considerably over the course of a year. Therefore Hydro Tasmania's preferred operating zone varies throughout the year. Hydro Tasmania's preferred operating zone is a band, the lower end of which leaves a reserve that can be used to generate electricity when inflows are low, both due to seasonal variations in rainfall and in the case of below average rainfall. The low point of the band varies across the year, with a lowest point of 25 per cent in June, at the start of winter, and a highest point of 33 per cent in November and December, at the end of spring. The preferred operating zone extends up to 45 per cent to provide flexibility in operations.

Low storage levels result in a greater risk that Hydro Tasmania may not be able to generate electricity as and when required. High storage levels require significant investment in the form of foregone generation and revenue, which has to be funded by increased debt.

Around two-thirds of Hydro Tasmania's expected yield in a year occurs in catchments that have minimal storage capability. These storages fill over the course of a full winter/spring season (in some cases many times). Around one-third of yield occurs in catchments from the major storages of Great Lake and Lake Gordon, which rise and fall over years and present no current spill risk.

In managing its storages Hydro Tasmania must constantly balance the risks arising from: uncertain inflows against the risk of spilling excess water without power generation; the current and potential future value of generation; and the risk of asset outages (including assets not owned or operated by Hydro Tasmania, such as Basslink and the NEM transmission networks) against the cost of alternative generation or supply sources.

Hydro Tasmania's storage optimisation is achieved by integrating water modelling outputs within its total generation portfolio of hydro and gas generation. This is in turn optimised based upon forecasts of Tasmanian demand, wind generation and wholesale electricity market price with imports or exports across Basslink. This process also considers contingencies such as plant and Basslink outages.

In general, as water storages fall, the energy value of stored water increases, which flows through into higher bid prices into the NEM. This in turn triggers decisions on non-hydro generation - Basslink imports and gas generation - to preserve hydro storages.

Through the interaction of these factors and optimisation, Hydro Tasmania meets its GBE obligation to maximise the value of the business for Tasmania.

Basslink and the National Electricity Market (NEM)

The drivers and history of Tasmania's connection to the NEM and the Basslink project were extensively covered by the Electricity Supply Industry Expert Panel in its March 2012 report. For current purposes, however, it is important that the Committee is aware that:

- The interconnector is owned by Basslink Pty Ltd (BPL), a special purpose company owned by the Singapore-listed Keppel Infrastructure Trust. Hydro Tasmania is a customer.
- Hydro Tasmania has a financial contract with BPL called the Basslink Services Agreement, which provides a partially firm revenue stream for BPL, and which underpinned BPL's original decision to build Basslink. This Agreement, and the associated Basslink Operations Agreement between BPL and the State of Tasmania, also set some basic performance requirements and provide Hydro Tasmania and the state with some rights to information and consultation in respect of Basslink operations.
- A key performance requirement under the Basslink Operations Agreement is a maximum repair time for cable failure of two months. BPL's ability to meet this requirement was reviewed by an independent expert and certified as part of the Basslink commissioning process.
- Hydro Tasmania does not, and is not able to, control the operation of Basslink. This is done by BPL, in accordance with the National Electricity Rules managed by the Australian Energy Market Operator (AEMO).
- The flow of electricity over Basslink is a function of Basslink's available capacity (which is affected by system constraints and asset design limits) and Victorian and Tasmanian electricity price offers. Hydro Tasmania is able to influence Basslink flows only through the structure of its Tasmanian price offers.[1]

[1] Hydro Tasmania can also make transport bids on the link. These are rarely used and their use is controlled by Tasmanian legislation.

Developments and decisions 2006-15

Figure 2 shows Hydro's Tasmania's budgeted and actual yield and hydro generation for the financial years 2005/06 to 2014/15, along with the most recent forecast for the 2015/16 financial year. The impacts of inflows and drivers of hydro generation decisions are described below.

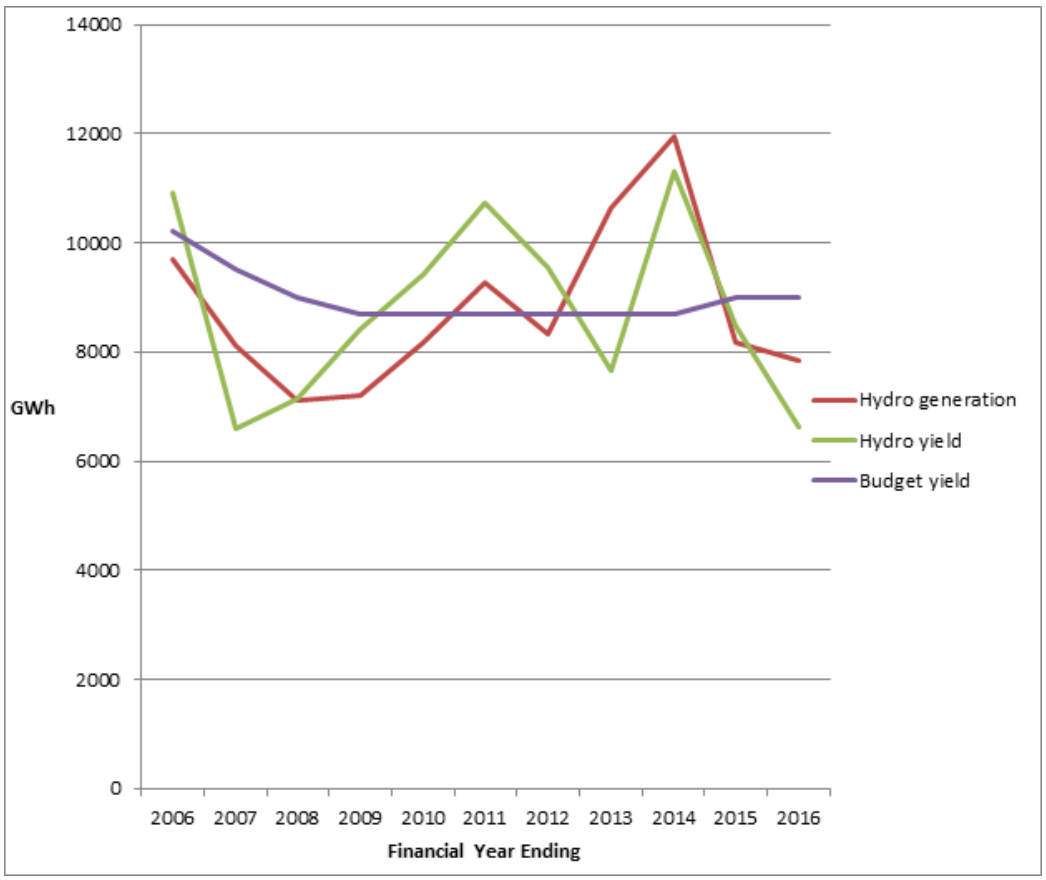


Figure 2. **Hydro Generation and Yield 2006-2016**

In describing the changes that have occurred in hydro storages over the last 10 years, it is instructive to use the financial year 1 July 2006 - 30 June 2007 (FY2007) as the starting point. The reason for this is that FY2007 saw Hydro Tasmania's catchments receive 73 per cent of their long-term average inflows (or 6606 GWh of our estimated long-term average yield of 9000 GWh), and storages declined from 30.5 per cent to 19.3 per cent during the year, with a low in early May 2007 of 17.3 per cent.

Poor rainfall and continued drought conditions saw Hydro Tasmania experience more challenges during the following year. Inflows into hydro storages during FY2008 yielded only 7,158 GWh, or 79 per cent of what was expected. The period from the end of October 2007 to the end of May 2008 was the driest in the preceding 75 years, with storages dipping to 16.5 per cent in early June 2008, the lowest they had been in 40 years.

The significant energy security, environmental and water management challenges presented by this situation were managed, while balancing higher costs, by protecting declining storages with increased Basslink imports and gas generation at Bell Bay Power Station.

The drought also led to a reassessment of the impact of climate change on rainfall patterns in Tasmania, and therefore on inflows into hydro reservoirs. In particular, for planning purposes, annual average inflows were progressively lowered from 10,000 GWh to 8,700 GWh. The figure of 8,700GWh was seen as a conservative estimate of expected future inflows at that point in time.

FY2009 brought some improvement in rainfall, albeit still below budget, with storages at 30 June 2009 reaching 27.7 per cent. Two months later they were at 43 per cent. With the improvement in the hydrological situation, the business was able to focus on building storages for the impending carbon price period, renewing its assets, building its financial strength, improving cash flow and reducing borrowings to turn around its performance after three drought-affected years. Also in FY2009, the obsolete Bell Bay Power Station was decommissioned as the Tamar Valley Power Station (TVPS) was completed.

Rebuilding storages (2010 - 2012)

The following three years (FY2010 through FY2012) saw an increase in storage levels resulting from stronger inflows, base load operation of the TVPS unit by Aurora Energy (Tamar Valley) Pty Ltd (AETV) and strategic use of Basslink flows to preserve water in storage ahead of a widely anticipated price on carbon emissions. These improved operating conditions allowed Hydro Tasmania to increase its returns to Tasmanian taxpayers.

The commencement of rebuilding storages from late 2009 resulted in total returns to government of:

Year	Returns to Government[2]	Dividends
FY2011	$51.7 million	$25.5 million
FY2012	$116.0 million	$49.0 million
FY2013	$115.7 million	$50.7 million

Table 1. Returns to Government 2011 to 2013

[2] Returns to government include: government guarantee fee, income tax equivalent, ordinary dividend and rates equivalent

A timeline of impending policy, legislated carbon price mechanism and subsequent repeal is shown in Table 2:

A Carbon Timeline 2005-2014	
March 2005	State and territory governments agree on design principles for a multi-state emissions trading scheme
June 2007	Coalition Government announces it will develop an emissions trading scheme beginning no later than 2012 – *PM Howard*
November 2007	*Labor wins the Federal election – PM Rudd* **Labor, the Coalition and the Greens take to the election climate policies which include emissions trading**
July 2008	Labor releases the Carbon Pollution Reduction Scheme (CPRS) green paper with the aim of launching a trading scheme in 2010.
September 2008	PM Kevin Rudd receives final Garnaut report
December 2008	CPRS white paper released
August 2009	The Senate votes down the CPRS
November 2009	Labor and the Turnbull-led Coalition reach agreement on final terms of the CPRS
December 2009	*Abbott elected Coalition leader December 1* The Senate votes down the CPRS for the second time December 2
August 2010	*The Federal election results in a hung Parliament – PM Gillard*
September 2010	Labor Government establishes a **climate committee to develop a carbon pricing scheme** with the Greens (and independents)
February 2011	Labor and the Greens reach agreement that culminates in clean energy bills
November 2011	**Carbon price scheme and associated measures pass the Senate**
July 2012	**Carbon pricing scheme begins**
September 2013	*Coalition wins the Federal election – PM Abbott*
November 2013	Coalition Government introduces bills to abolish the carbon price scheme
July 2014	**Carbon tax repeal** legislation received the Royal Assent. Repeal effective from **1 July 2014**.

Table 2. Carbon pricing timeline

The final introduction of a price on carbon emissions from 1 July 2012 was an event that was anticipated for some years. From the beginning of the carbon price policy debate, Hydro Tasmania recognised that, for the first time, Tasmania would be able to secure a price premium for its clean electricity generation sold in the NEM. As a result, Hydro Tasmania planned and executed a progressive build-up of hydro storages as mentioned above, and the business was in a strong position to maximise opportunities that were expected to be presented by any carbon price scheme.

In FY2010, FY2011 and FY2012, Hydro Tasmania's hydro generation was less than inflows as a result, the difference being 1,254 GWh, 1,471 GWh and 1,217 GWh respectively (see Figure 2 on page 13). During the same period AETV produced 1,131 GWh, 1,503 GWh and 1,556 GWh respectively.

Storage levels at the end of June 2010, 2011 and 2012 were 36.3, 45.9 and 53.6 per cent respectively. If there had been no carbon price, storages would have been held to a very similar level to where they were prior to the pre-carbon price build up (27.7 per cent at 30 June 2009) and at the end of the carbon price period (28.1 per cent at 30 June 2014) and generation levels in those years would have been closer to inflows. This was a very public strategy. As a business we are charged under the GBE Act with acting commercially and continued to do so in this period with the considerable benefits returning to Tasmania while managing the hydro storages in a careful and prudent manner. The net effect of the carbon price on storages was close to zero.

The carbon pricing scheme (2012 - 2014)

The Clean Energy Act 2011 (the carbon price) began on 1 July 2012 with a fixed price of $23 per tonne CO2-e for FY12/13. The legislation stipulated a fixed price of $24.15 per tonne in FY13/14 and $25.40 in FY14/15. From 1 July 2015 the fixed price was to transition to a floating price emissions trading scheme. Hydro Tasmania's electricity generation strategy during FY2013 and FY2014 aimed to maximise the value of its hydro generation while ensuring hydro storages were managed within pre-set guidelines to ensure energy security was maintained. As a result of increased generation, water storages fell from 53.6 per cent on 1 July 2012 to 32.8 per cent at the end of FY2013 and 28.1 per cent at the end of FY2014 (when the carbon pricing scheme was terminated). This storage level was in the long-term desired operating zone.

The financial outcome of this strategy was a significant increase in returns to the Tasmanian Government as seen in the table below:

Year	Returns to Government[3]	Dividends
2013-14	$235.4 million	$116.0 million
2014-15	$211.5 million	$118.6 million

Table 3. Returns to Government 2013-14 to 2014-15

Energy reform impact

In May 2012, the Tasmanian Government announced it had adopted many of the recommendations of an Expert Panel that had reviewed the state's energy challenges and requirements over an 18-month period. These included the transfer of TVPS from Aurora Energy to Hydro Tasmania with effect from 1 June 2013, and a change in the wholesale pricing methodology used for regulated customers that would reduce this input cost component for customers.

[3] Returns to government include: government guarantee fee, income tax equivalent, ordinary dividend and rates equivalent

The rationale for the transfer of TVPS was that the value of the AETV assets could be optimised within Hydro Tasmania's larger energy portfolio as the reduced wholesale price made TVPS uneconomic on a stand-alone basis.

As part of the transfer, Hydro Tasmania took over the associated debt from Aurora Energy of $205 million, as well as a range of other assets and liabilities such as gas transportation and commodity contracts and a tolling agreement for Bairnsdale power station in Victoria. As required by accounting standards, the fair value of these assets and liabilities was assessed and a $335 million impairment was recorded in Hydro Tasmania's annual accounts for 2012/13. The resultant challenge for Hydro Tasmania was to maximise the efficient use of TVPS and associated gas contracts while achieving efficiencies through running the asset as part of the Corporation's broader hydro and wind portfolio.

For optimal use and to reduce the running cost of the TVPS, it was initially decided to operate the CCGT at the station during the summer months. This would reduce the need to draw from the major storages (retaining water for higher value periods) and to shut it down over the winter months where smaller storages 'must generate' during the higher inflow periods to avoid spilling. The smaller open-cycle gas generation units were to be maintained all year and used as needed for peaking load.

Emerging challenges

Following the end of the carbon scheme at 30 June 2014, Hydro Tasmania's system storage initially remained in the preferred operating zone, but then tracked at the bottom of or below the preferred operating zone between December 2014 and April 2015. Inflows between 1 August 2014 and 31 Dec 2014 were over 1,500 GWh (equivalent to 10.5 per cent of system storage) below the long-term average for the period.

Substantial inflows in May 2015 and winter rains through to August 2015 took storage levels back into the preferred operating zone until September 2015.

The business reported in 2014 that the overall outlook for the Hydro Tasmania group over the following five years would be extremely challenging with profitability forecasts projected to decline dramatically from 1 July 2015. This was the result of a combination of external factors and events, including reduced demand nationally across the wholesale electricity market leading to lower wholesale prices, uncertainty around the future of the Renewable Energy Target (RET) and the removal of the price on carbon. Under the circumstances there was a heightened (and continued) focus on reducing costs, improving productivity and operational efficiency across the whole business.

The CCGT remained in dry lay-up (shut down) during FY2015 to reduce the running cost of the power station. As an initiative to reduce its recurring expenditure, Hydro Tasmania sought approval in January 2015 from the Tasmanian Government to sell the CCGT.

Hydro Tasmania estimated that closure and sale of the CCGT would reduce fixed costs by $7.5 million per annum. At the time of seeking approval, extensive modelling was undertaken that demonstrated that the CCGT was not required for energy security for all credible scenarios, including where Basslink was unavailable for a period of two months. The modelling also concluded that Tasmanian demand can be met in extreme scenarios of a 12-month Basslink outage and a coincident drought.

On 11 August 2015, the Tasmanian Government granted this approval subject to endorsement of any sale price for the CCGT, and confirmation from Hydro Tasmania that it would be able to meet a formal responsibility for Tasmanian security of supply.

Impact of weather from Spring 2015

Long-range forecasting of rainfall in Hydro Tasmania's catchments is extremely difficult. While the 2015-16 El Niño was predicted well in advance, the El Niño Southern Oscillation (ENSO) feature has a low correlation with rainfall in our western catchments. As well as observations about ENSO, meteorologists also measure other features that seem to be better correlated with our inflows.

Rainfall in Hydro Tasmania's catchments is observed to be more strongly related to conditions in the Southern and Indian Oceans. In the Southern Ocean, a natural oscillation feature known as the Southern Annular Mode (SAM), which affects the latitude at which westerly air flows prevail, is the single strongest driver of wet season (winter and spring) rainfall for the western half of Tasmania. Another feature known as the Indian Ocean Dipole (IOD) and a phenomenon referred to as "blocking", associated with high pressure systems and the Pacific South American pattern, may also influence the extent of wet season rainfall for Tasmania.

ENSO, which has well-recognised impacts across much of eastern Australia and elsewhere around the Pacific Ocean, is reasonably well understood and is able to be predicted with some degree of confidence. The same does not apply to SAM, IOD and blocking. To the best of Hydro Tasmania's knowledge, there is no long-range forecasting of these systems.

BoM's seasonal outlooks represent the best combined information available at the time. The seasonal outlook issued in late August 2015, at the start of the low inflow sequence, predicted average rainfall for September 2015. As late as 24 September 2015, BoM was forecasting only slightly below average rainfall for October. On 7 October 2015, BoM took the step of re-assessing the rainfall outlook for October as extremely dry. By this point, Hydro Tasmania's energy in storage was down to 31 per cent and Basslink was running on strong import (average import flow was 408MW for the first week of October) in response to the unexpected low inflows.

Spring 2015 inflows were the worst on record for Hydro Tasmania. The months of October and November 2015 and the periods September to November 2015 and July to December 2015 all recorded the lowest inflows to storages since our records began in 1924. Low rainfall was exacerbated by high temperatures, leading to reduced run-off into storages. High temperatures also increase evaporation rates, leading to a reduction in storage levels.

Response to changing weather patterns

Hydro Tasmania was a net exporter across Basslink from May to August 2015. This period was wetter than average, and Hydro Tasmania's storages built steadily. Figure 3 charts total energy in storage (TEIS) along with actual and long-term average inflows. By the end of August, Hydro Tasmania's smaller head storages were around 10 per cent, well above the seasonal target, and the system was operated to minimise the risk of spill.

If Hydro Tasmania does not generate from smaller, seasonal storages, we 'spill' or waste water in significant inflow sequences, as water flows into storages more rapidly than our power stations can

use that water. Energy generated in excess of Tasmanian demand is able to be exported across Basslink.

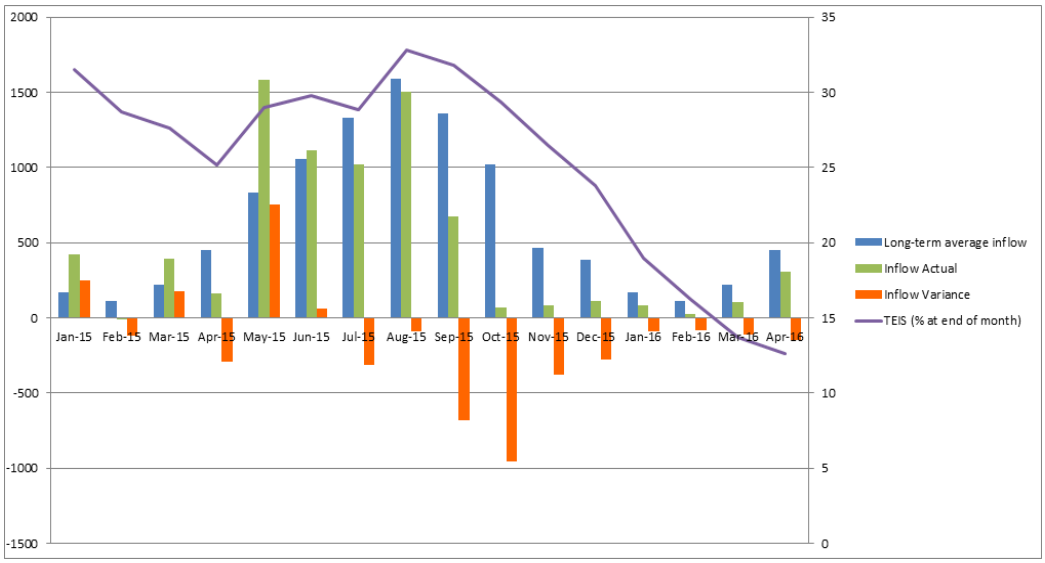


Figure 3. Storage and Total Energy in Storage (TEIS)

In September 2015, when it became clear inflows into hydro storages were falling further and further behind the average, Hydro Tasmania reduced hydro generation and Tasmania imported additional energy across Basslink from late in the month. This helped preserve hydro storage levels, although these continued to fall, as they do annually when winter/spring rains cease.

Between October 2015 and when the fault in Basslink occurred on 20 December 2015, Tasmania imported 839.1 GWh of energy across Basslink (average import price was $37/MWh). In the same period, Tasmania exported only 10.4GWh. This included 9GWh in December because prices were high enough to justify this action (average export price was $198/MWh). 9GWh is equivalent to about one-third of a day's average Tasmanian demand.

As the low inflow sequence continued, and storage levels dropped below the preferred operating zone and into prescribed risk zones, Hydro Tasmania established a working group to oversee the business response to the emerging situation. On 2 November 2015, "level 3 situation management" was activated internally according to Storage Management Guidelines. A 'crisis management team' was formed and met regularly to manage the situation. This process reviewed plant utilisation across the state, including deferring planned maintenance on hydro generation assets and initiating the return to service of the TVPS CCGT unit.

As a result of the record dry spring, the Tasmanian Government initiated the Water Storage Advisory Committee (WSAC) overseen by the Department of State Growth. Hydro Tasmania provided regular reports to this Committee.

On the basis of credible inflow and outage scenarios, including sensitivity to lower than usual inflows, Basslink imports and supply from the TVPS when it was fully operational, Hydro Tasmania continued to have a high level of confidence that state energy security would not be compromised in

the lead-up to the winter of 2016, even in the event of an extended Basslink outage of two months as per its contractual agreement. This was the position immediately before the Basslink outage on 20 December 2015.

Response following Basslink outage

Basslink - timeline of announcements

The Basslink outage commenced at 2.10pm (market time) on 20 December 2015. Initially, no details about the cause or extent of the possible return-to-service date were communicated by BPL to the Australian Energy Market Operator (AEMO), the Tasmanian Government or Hydro Tasmania.

On 22 December 2015, BPL advised the market, Hydro Tasmania and the Tasmanian Government that the outage had been caused by a fault on the subsea cable. BPL advised the national market of a 60-day outage of the cable. This reflected the contractually-agreed performance standard which stated the expected maximum duration of a continuous interconnector outage was two months.

Following is a timeline of BPL's advice concerning the Basslink outage since the original announcement of 22 December 2015:

- BPL issued a media release on 14 January 2016, with a revised return-to-service date of 19 March 2016 (90-day outage).
- BPL issued a media release on 12 February 2016 indicating there were problems identifying the cable fault location and that the 19 March return to service date would not be achieved.
- BPL issued a media release on 8 March 2016 that provided an update on progress and estimate of late May for return to service.
- The Basslink interconnector was cut on Friday 11 March 2016. In a media statement on 13 March, BPL indicated that the fault was determined to be in the northern section. BPL advised that the southern section of cable had passed initial testing.
- On 29 March 2016, BPL announced that it had successfully identified the fault and removed it from the cable, and was preparing for the jointing phase to connect a replacement section of cable. BPL advised that the northern section of cable had passed initial testing and advised key stakeholders to prepare for a mid-June return-to-service date.
- On 22 April 2016, BPL announced it had successfully completed the first of three cable-jointing exercises, with 1355 metres of new cable laid. While its work is highly susceptible to weather, BPL indicated it still expected to meet the June return-to-service target.
- On 3 May 2016, BPL advised severe weather conditions had impacted on the repair project. It reconfirmed the mid-June return to service date but noted the timeline may need to be revised if poor weather extended past allocated contingency days.
- On 13 May 2016, BPL again repeated its concerns as outlined on 3 May regarding weather-related delays and reconfirmed an anticipated return to service by mid-June.

The cause of the Basslink cable fault remains unknown.

Government and Hydro Tasmania response

Following the announcement of the Basslink fault, the situation was escalated within Hydro Tasmania to a level 4 emergency management event. The Energy Supply Management Team (ESMT) chaired by the CEO was formed as the forum to oversee relevant management activities and first met on 22 December 2015. This forum has met on a regular basis (minimum once per week, often three times a week) since then.

On 14 January 2016, the Tasmanian Government announced the establishment of the Energy Cabinet Sub-Committee to be chaired by the Energy Minister. It met for the first time on 15 January and has met weekly since then.

Energy Supply Plan

Low rainfall and an extended fault in the Basslink interconnector are both contingent events that had been identified as risks by Hydro Tasmania, and for which Hydro Tasmania has contingency plans. The combination of a sudden, severe rainfall deficiency and a Basslink outage compounds these risks, especially as Basslink has been unable to return to service within the contracted, and initially advised, repair period.

These compounding risks, which have never been experienced previously, required Hydro Tasmania to employ an escalating array of mitigating responses, which, in consultation with the Tasmanian Government, have been incorporated into an Energy Supply Plan to meet Tasmanian energy demand through to the winter rains without Basslink in operation, allowing for continued low inflows and a further adverse contingency. The plan was released in February, and regular updates have been provided to the Tasmanian community by the Government and Hydro Tasmania on its implementation and progress through a variety of channels, including media releases, press conferences, interviews, printed editorial and advertisements, as well as online, primarily on Hydro Tasmania's website.

The response encompasses a range of actions that are detailed below. They demonstrate a prudent approach to ongoing uncertainty over inflows and the repair of Basslink, building on pre-existing planning. Figure 4 on page 21 is illustrative of the impact of the combined responses.

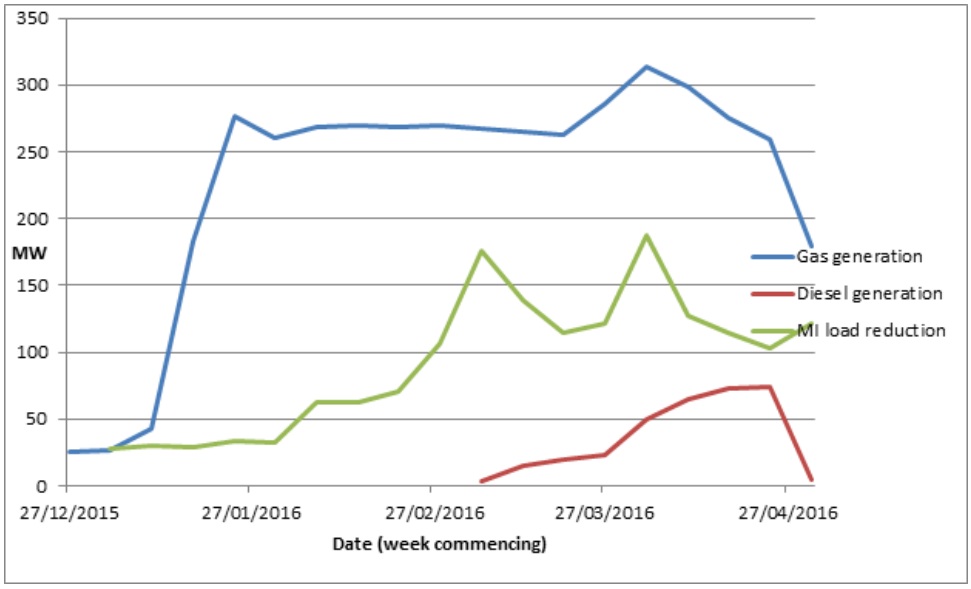


Figure 4. Energy Supply Plan responses (MW versus time)

The actions encompassed within the Energy Supply Plan in response to the unprecedented situation, are:

Gas generation

All of Hydro Tasmania's gas generation is located at the TVPS Station.

The Combined Cycle Gas Turbine (CCGT), with a capacity of 208 MW, was commissioned in April 2009 and has been well maintained throughout and remains in good condition today. The CCGT was placed in dry lay-up from 8 July 2013, apart for a period from 10 December 2013 until 3 June 2014, to preserve it in good condition while it was not required to run within the generation portfolio. In response to the crisis management situation being escalated to level 3, the decision to return the CCGT to service was made in late November 2015. The CCGT was successfully returned to service on 20 January 2016 and has since operated reliably on a round-the-clock basis.

The Open Cycle Gas Turbine (OCGT), a Rolls Royce 'Trent' unit, with a capacity of 58 megawatts (MW), was commissioned in 2009. In September 2014, Hydro Tasmania was advised by Rolls Royce that the unit contained a design fault which required off-site repair. To rectify this defect in September of 2015, prior to the current energy supply situation, the unit was shipped to Abu Dhabi for repair. The original expected return date of the Trent was mid-2016, however as storage levels deteriorated, Hydro Tasmania engaged with Siemens, who had acquired the Rolls Royce business, and worked to expedite the unit's return. The unit was returned to Australia by air freight and successfully returned to service on 31st March 2016.

The OCGT Pratt & Whitney units, each with a maximum capacity of 40MW, were purchased second-hand in 2006, in response to capacity concerns that emerged early in the 2006-2008 drought. These units are aged and not considered reliable. They have, however, provided significant support both in terms of energy output and ancillary services required for system stability.

All gas-fired generation was backed off in early May 2016, as sustained and significant rainfall produced sufficient inflows into Hydro Tasmania's seasonal storages to allow, and require (to avoid spill), a substantial increase in hydro generation.

Load reductions

As an alternative to additional generation, Hydro Tasmania has negotiated load reduction arrangements with major industrial customers since January 2016. Load reduction arrangements are useful as they can be implemented much more quickly than the installation of additional generation.

Initial load reduction arrangements commenced in January 2016, and additional arrangements were reached over February and March. These initially focused on the period to the end of April (when Basslink was expected to return to service in March), and then extended as Basslink return to service was also extended. These arrangements have provided a voluntary reduction in Tasmanian demand of between 95MW and 105MW on a sustained basis since 4 March 2016.

Briefer arrangements (of between four and 12 days) have provided further reductions in addition to the sustained reductions described above.

The terms of load reduction arrangements vary from customer to customer, depending on each customer's specific circumstances and pre-existing contractual arrangements.

Hydro Tasmania and TEMCO entered into a load reduction agreement) which saw TEMCO load reduced by approximately 30MW in January and February, and 65MW in March and April.

This is in addition to reductions of 43MW at Norske Skog's Boyer Mill for one week (now concluded), and up to 40MW by Bell Bay Aluminium since February 2016.

In an extension of the agreement with Norske Skog, the business voluntarily reduced load at its Boyer Mill in early May. This reduction was timed to coincide with a planned maintenance outage and involved a reduction of 85MW/h over the additional four days of downtime. These arrangements are temporary and have had no effect on the Boyer workforce.

Temporary diesel and dual fuel generation

From February, Hydro Tasmania has progressively installed temporary diesel generation at a number of sites across Tasmania, as a further mitigation against future contingencies. With significant preparatory work and longer lead times than expected, diesel generation has had a limited impact on the Tasmanian electricity supply system to date, but is important to provide support for the system should Basslink remain out of service for longer than expected and low inflows return.

At 16 May 2016, Hydro Tasmania had approximately 220MW of temporary diesel capacity installed. The amount of diesel generation running at any given time will vary depending on the current level of inflows to hydro storages, individual storage levels, the short-term inflow and wind forecast (next seven days), and the expected timing of the return to service of Basslink.

The rollout of Hydro Tasmania's temporary diesel generation has been a major logistical and project management challenge. In April, Hydro Tasmania estimated approximately 330 people were working on the response.

The following table shows a breakdown of the estimate at that time (reflecting people whether full-time or not):

Activity	Approx. number of people involved (Hydro Tasmania)	External Contractors
Situation response activities	77	20
Temporary generation activities	73	130
TVPS activities	15	15
Estimated total people: approximately 330		

Table 4. Number of people involved in implementing the energy supply plan

Temporary diesel generation installations throughout the state are subject to approval by the Environment Protection Agency (EPA).

Hydro Tasmania continues to engage with relevant stakeholder groups, including local councils and communities, to keep them informed as this work has unfolded.

Cloud seeding

Cloud seeding is a proven technique that increases rainfall in a target area. Cloud seeding can only occur if cloud conditions are favourable. Due to the unprecedented dry conditions, Hydro Tasmania began cloud seeding on 1 April, one month earlier than usual. There have been a number of successful seeding flights over a range of our catchments in the six-week period since.

While seeding over hydro generation catchments has the highest priority, Hydro Tasmania is also undertaking cloud seeding over agricultural catchments.

More details of the Government and Hydro Tasmania's response can be found in the current version of the Energy Supply Plan at www.hydro.com.au/energy.

Impact of the unprecedented challenges

Financial

Maintaining energy supply in Tasmania has come at a considerable cost. The cost of implementing the Energy Supply Plan will be borne by Hydro Tasmania. We will make an operating loss for 2015/16 as a result, and our financial results are not expected to return to previously anticipated levels for a further three years after this. We do not expect to provide dividends to the Tasmanian Government for the next three years as we recover from the impact of the Basslink outage and record low rainfall and focus on rebuilding hydro storages.

The final cost to the business and the State of maintaining energy supply will depend on a range of unknowns such as rainfall, inflows to storages, how much gas and diesel we use and the return to service date of Basslink. These will be partially offset by Hydro Tasmania not paying the Basslink facility fee during the outage.

The cost to secure and install approximately 220MW of temporary diesel generation includes installation and equipment hire cost of approximately $50.5 million. The monthly operational cost was originally estimated at approximately $11 million per 100 MW. The final costs will depend on how long and how many of the temporary diesel generators are operated. The operating times of the diesel generators will depend on inflows into storages, energy demand and the return to service of Basslink.

Our focus continues to be on doing all that is required to maintain energy security in a cost-efficient manner.

Environmental

The ongoing dry conditions and extended Basslink outage are having an environmental impact in some of our storages. It is expected this will continue for some time to come and be dependent on the level of winter rains through to next summer when it will return to drier conditions.

Low lake levels, particularly in Great Lake, are putting pressure on aquatic species and lake ecosystems. We continue to monitor those impacts carefully. Our approach to environmental monitoring and risk management enables the business to assess impacts and respond where possible.

We have been working with experts from the University of Tasmania, independent researchers, and specialist Hydro Tasmania and Entura staff to update risk assessments, and design monitoring and mitigation measures.

We are working with our key stakeholders, including: the Inland Fisheries Service; the Department of Primary Industry, Parks, Water and Environment; the EPA; and the federal Department of Environment to keep them informed.

Storages

Good rainfall has continued across the state since the start of May which has led to storages rising strongly. At 16 May total energy in storage was 20.0 per cent, which was an increase of 7.5 per cent from the lowest point of 12.5 per cent on 30 April 2016. The business is taking a cautious and prudent approach to recovering from the current situation.

Part B
Specific Response to the Inquiry Terms of Reference

In response to the Inquiry's specific terms of reference, annexed to this submission is a bundle of documents. Where those documents contain information which is commercially sensitive to our business, our customers or suppliers, are subject to confidentiality obligations or legally privileged, these are provided to the Committee on a confidential basis (or otherwise redacted).

TOR1: The financial positions of the Government-owned energy entities (Aurora Energy, Tasmanian Networks and Hydro Tasmania) and their interrelationships, considering their recent financial reporting, including their half-yearly financial statements and Corporate Plans

The Committee is provided with the Hydro-Electric Corporation Half Year report for the six months ending 31 December 2015 and with the most recent Performance Report provided by Hydro Tasmania's Chief Financial Officer to the Corporation's Board for the period ending 31 March 2016.

As the Committee would appreciate, the final 2016 financial results will depend on water inflows, when Basslink is returned to service and how long the contingencies outlined in the Energy Supply Plan remain in place. Given these uncertainties, Hydro Tasmania agreed with its shareholders to submit the 2016/17 Financial Year draft Corporate Plan by 31 May, 2016. At the time of writing, the draft Corporate Plan is still under development.

TOR2: Factors currently impacting on the financial performance of the energy entities

Hydro Tasmania is currently disconnected from the NEM and implementing the Energy Supply Plan.

Future costs will depend on water inflows, when Basslink is returned to service and how long the contingencies outlined in the Energy Supply Plan remain in place. Hydro Tasmania is currently experiencing high inflows into its storages as a result of ongoing rainfall. The storage position once these inflows abate will significantly influence future Energy Supply Plan requirements and Hydro Tasmania's financial position.

Accordingly, Hydro Tasmania has sought from the Committee an extension of time of two weeks to make a supplementary submission.

TOR3: Any strategies being implemented by the energy entities to address their current and future financial performance

Hydro Tasmania continues to operate in accordance with its 15/16 Corporate Plan.

TOR4: Past and current Government's energy security policies and management, including risk management strategies and plans

TOR4 is directed to government.

TOR5: Past and current Governments' and Government-owned energy entities energy-mix policy decisions and challenges;

Hydro Tasmania energy mix policy decisions and challenges are described in Part A of our submission.

Hydro Tasmania has provided the Committee with a number of documents relevant to this term of reference.

Attachment 2 Overview of Tasmania's hydro asset portfolio

Water storages in Tasmania can be categorised into three sizes: major; medium; and minor, based on the life cycle of the storage, that is, typical time taken to fill or empty the storage under normal inflow/weather conditions.

Table 1 lists the assets against their appropriate category and Figure 2 illustrates the comparative contribution in term of relative energy produced in a year and the generation capacity of the generators.

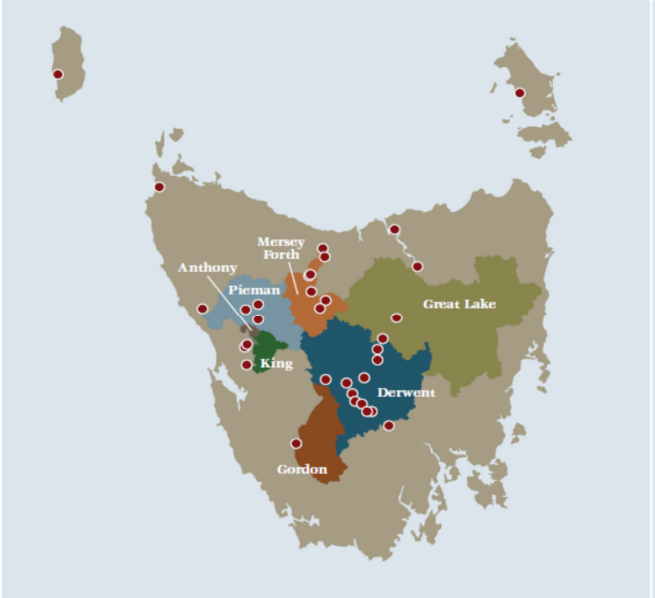


Figure 1: Major Storage Catchments and Power Stations in Tasmania

Table 1: Categories of Hydro Tasmania Water Storages

MAJOR (long period cycling)	MEDIUM (annual cycling)	MINOR (run-of-river)
Great Lake	Lake Echo	Lake Liapootah
Lakes Pedder + Gordon	Bronte Lagoon+ Bradys Lake + Lake Binney + Tungatinah Lagoon	Wayatinah Lagoon
	Lakes St. Clair + King William	Lake Catagunya
	Lake Rowallan	Lake Repulse
	Lake Mackenzie	Cluny Lagoon
	Lakes Murchison + Mackintosh	Lake Meadowbank
	Lake Burbury	Lake Trevallyn
	Lake Gairdner	Lake Parangana
	Lake Plimsoll	Lake Cethana
		Lake Barrington
		Lake Paloona
		Lake Rosebery
		Lake Pieman

Figure 2: Comparative Contribution of Categories Hydro Tasmania Water Storages