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30 August 2002

Mr. Ian Dundas
Committee Secretary
House of Representatives
Standing Committee on Agriculture, Fisheries and Forestry
Parliament House
Canberra ACT 2600

Dear Mr Dundas,

Thank you for the opportunity for Hydro Tasmania to make a submission to the Inquiry into Future Water Supplies for Australia's Rural Industries and Communities.

Hydro Tasmania is pleased to note that the Commonwealth Government is acutely aware of the need to develop a strategy to create an adequate and sustainable supply of water in Australia. The attached submission contains Hydro Tasmania's comments and suggestions that address the terms of reference supplied in your letter dated the 4th July 2002.

Hydro Tasmania would welcome any opportunity of further involvement in this inquiry.

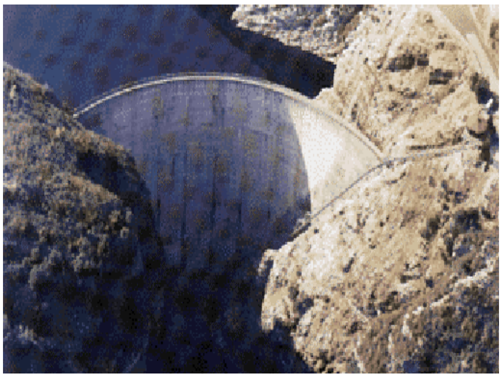
Yours sincerely,

Geoff Willis
Chief Executive Officer

Hydro Tasmania

the renewable energy business

Hydro Tasmania welcomes this opportunity to make a submission to the House of Representatives Standing Committee on Agriculture, Fisheries and Forestry – "Inquiry into Future water Supplies for Australia's Rural Industries and Communities".



1. Summary

As the largest water manager in Tasmania - and one of the largest in Australia – Hydro Tasmania has a significant interest in the outcomes of this inquiry.

Water is a scarce and valuable resource and its value is increasing as the availability of new water supplies decreases through either the existing allocations approaching the reasonably reliable resource availability, or the water quality being reduced below acceptable levels.

It is now necessary to refine the existing policies, processes and infrastructure to encourage water to be transferred via commercial trades between competing water users. Any such transfer should be between willing parties. A water market is the only viable means of reallocating water between conflicting uses, both existing and future, as it allows and encourages the transfer of water from less efficient or productive uses to other higher value uses.

Hydro Tasmania has shown that cloud seeding is a commercially viable means of enhancing rainfall and water availability in an area. Prior to any decision to proceed with an operational cloud seeding programme an experimental programme is required to confirm the likely benefits.

2. Description of Hydro Tasmania's Infrastructure

Hydro Tasmania's generating system consists of a network of 51 major dams, 27 hydro-electric power stations and three wind farms. In addition, a thermal power station at Bell Bay can be utilised to supplement generation if there is a projected short-fall in system ability to meet demand. Hydro Tasmania has an installed capacity of 2,509 MW (hydro-electric power stations only) and generates approximately 10,000 gigawatt hours of energy per annum with a system peak generation of approximately 1600MW. An overview of Hydro Tasmania's storages and infrastructure is shown on Figure 1

The objectives of the Hydro Tasmania water management operations are two-fold:

1. To operate a secure power system in order to meet customer requirements in terms of electric energy, capacity and quality of supply; and

2. To operate the integrated hydro power system efficiently while satisfying hydrological, electrical, legislative, social and environmental constraints.

To meet these objectives, Hydro Tasmania has developed and uses a system-planning regime. The operating system is planned for the long term (10 years), the medium term (2 years) and the short term (3 months). Half hourly generation scheduling and real–time operation extends from the immediate to one week ahead. In planning the operation of the system, various constraints apply including safety, electrical, hydraulic, maintenance, irrigation, environmental, hydrological, commercial and recreational considerations.

Storages in the Hydro Tasmania system can be categorised into three types; minor, medium and major. These categories are based on the typical time it takes to fill or empty the storage under normal inflow conditions. Although storage size is generally the major category determinant, catchment area and associated power station size are also relevant. Minor storages are limited in storage volume capacity and have an inflow regime and discharge capacity that makes it possible to fill or empty them over a period of hours to days. Medium storages, usually the top storage of a cascade of minor storages (eg Lake King William and Lake Rowallan), fill and empty over a period of months or seasons. There are only two major storages, Lake Gordon and Great Lake, which have a normal fill/emptying cycle of decades. The long storage time of these two reservoirs makes them very important as they allow excess water to be stored during times of plenty for later use during a drought (see Figure 1).

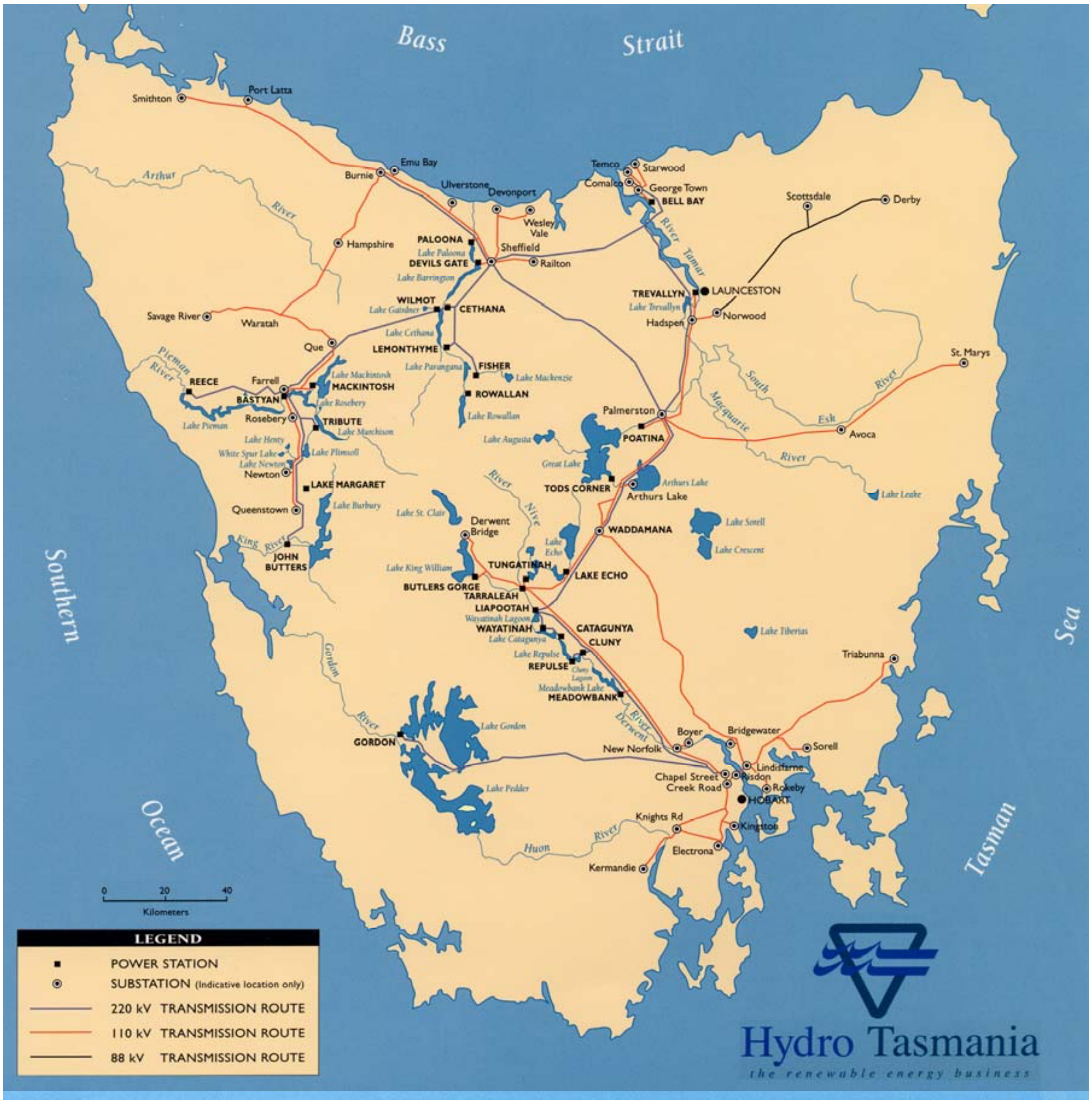


Figure 1: Tasmania's Electricity System 2001.

The Hydro Tasmania generation system is managed to maximise operational efficiency while also satisfying legislative social & environmental constraints. A major part of this is to minimise lost energy production due to spilling water out of the storages, past the generators. Operating policy and daily power station generation scheduling is largely determined by proximity of a storages water level to spill level. The priority order of storage use and the energy value to be achieved by water release are both directly determined by storage probability of spill. This objective results in the following general storage use priorities for planning a generation schedule:

1. Use any water inflow to a storage for generations which would otherwise cause the reservoir to spill. This is water that would otherwise spill and therefore bypass the generators.
2. Use pickup (local water runoff immediately around a reservoir) into minor storages. These storages have limited capacity and are therefore likely to spill if inflow is not utilised;
3. Use water out of the medium storages; and
4. Use water out of the major storages.

There are a number of water level controls used with individual storages that limit their water release, effectively reprioritising water use from each reservoir and thereby ensuring a balanced use of water from all reservoirs.

A second part of maximizing operational efficiency is to operate the generators themselves as efficiently as possible. A generator is capable of a range of outputs with its most efficient point, measured as maximum power for water used, at about 85% of the theoretical maximum electrical generation capacity. To meet the power demand at any point in time, the output from a number of generators is required. The aim is to have as many of these generators as possible at their maximum efficient generation point. This is not always possible. There are four major circumstances that act against this aim:

- When system water inflows are low and minor storage reservoirs are at a low level, generation from medium and major reservoir storages may have to be at maximum capacity rather than optimising generation efficiency to meet demand;
- When water is abundant and reservoirs are full, maximum capacity operation is required to avoid spill;
- Some generators are operated at low output to provide reserve generation capacity which protects the system in case of an unforeseen event; and
- Water is released to meet environmental flow or lake level requirements.

The Bell Bay Power Station (BBPS) is Hydro Tasmania's only thermal generator in mainland Tasmania and is used for long and short-term drought support. BBPS is used as the lowest priority generator in the system because of its relatively high cost of operation. Fuel oil and gas are both relatively expensive when compared with hydro generation. BBPS is normally brought into operation when the total system energy in storage falls below the 'thermal control' level or the medium storages fall to a critically low level.

The Thermal Control level is set to ensure a desired system security with minimum expenditure on thermal generation. The thermal control rule describes a dynamic control level, the threshold changing in response to forecast load, system yield, and thermal generation costs. When both the medium storages and major storages have been drawn to low levels due to low inflows during very dry years (eg. 2002 – see Figure 2 and Figure 3) then BBPS is operated to meet electricity demand.

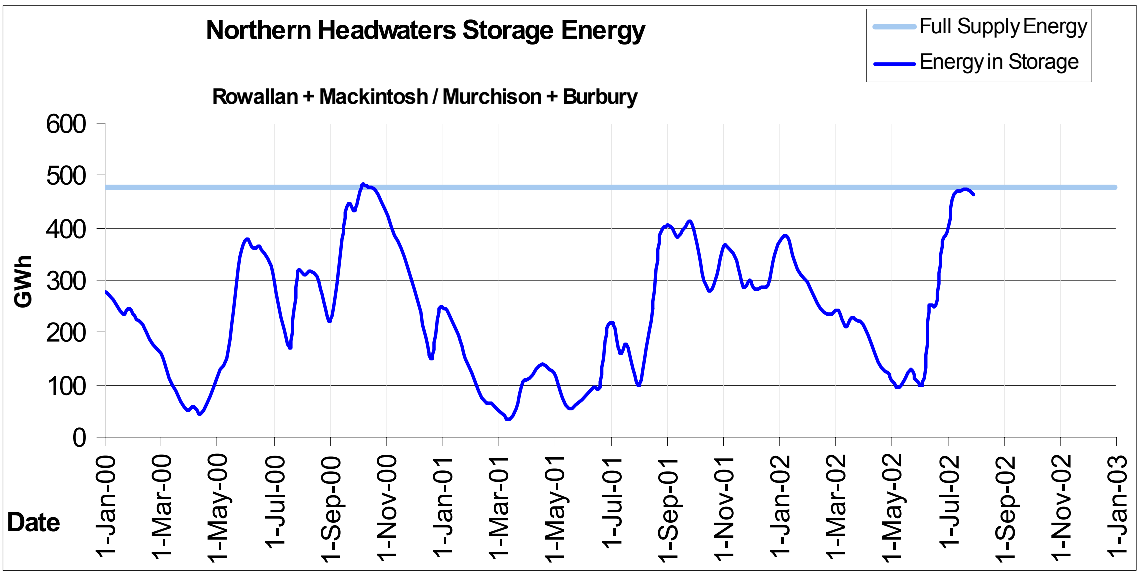


Figure 2: Available energy in the Northern Tasmanian hydro-generation headwater storages

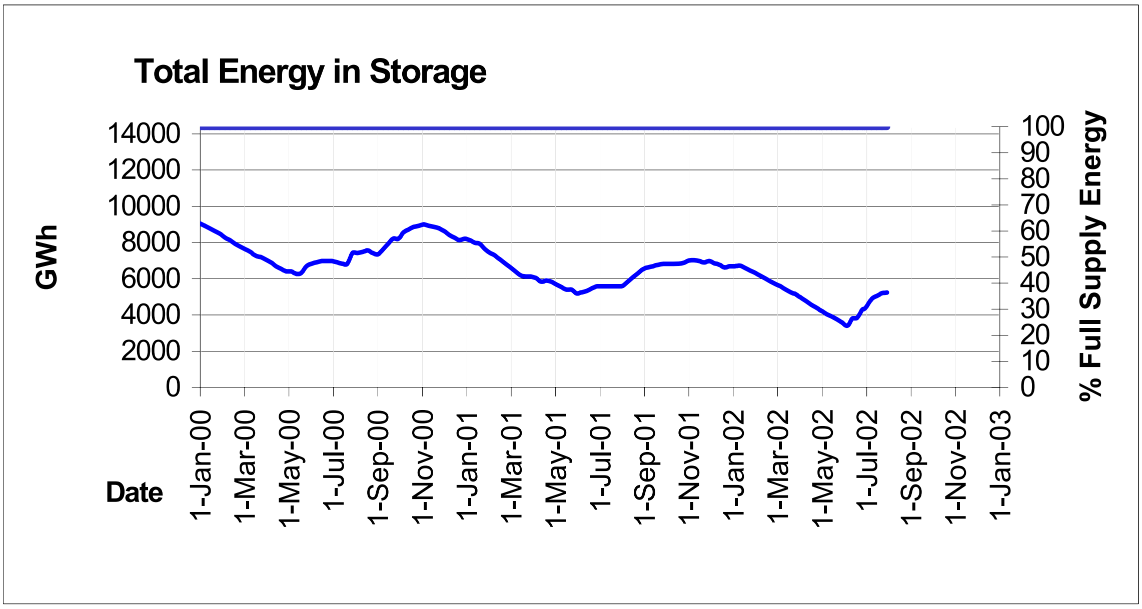


Figure 3: Total energy in the Tasmanian hydro-generation storages

3. Terms of Reference

The role of the Commonwealth in ensuring adequate and sustainable supply of water in rural and regional Australia.

The role of the Commonwealth in water management is limited by the Constitution and any involvement is typically the result of an agreement between the relevant State Government and the Commonwealth (eg. the Council of Australian Governments Water Reform (1994) package). These reforms will be discussed in more detail in subsequent sections.

Recent law changes (eg. the *Environmental Protection and Biodiversity Control Act 1999 (Cwth))* have increased the Commonwealth's role in the planning and approval process for water developments. This additional layer of approval adds to the cost of getting a project started and has the potential to deter some developers from commencing a water supply/management project. Having obtained the necessary State and Local Government approvals there is an additional 'hurdle' to cross. Potential barriers of this form should be minimised with local regulators taking the lead role in assessing the merits of a proposal.

Commonwealth policies and programs, in rural and regional Australia that could underpin stability of storage and supply of water for domestic consumption and other purposes.

The volume of water that is yet to be allocated to either abstractive uses or to the environment is extremely limited and where there is any surplus water is it unlikely to be in a location that is convenient for agricultural or other forms of production. Hydro Tasmania submits that the Commonwealth Government should consider cloud seeding as a means of increasing water availability in areas where its is both practicable to do so and there is a socio-economic reason for doing so.

Cloud seeding is a technique used by Hydro Tasmania to increase precipitation over its key hydro-generation catchments. Hydro Tasmania has been involved in both operational and experimental cloud seeding over Tasmania and mainland Australia for over 38 years and has developed a great deal of knowledge and expertise in this area. We estimate the benefits to Hydro Tasmania of our existing cloud seeding program as being at least 6:1.

The theory behind cloud seeding is, in principal, quite straightforward. All clouds contain levels of supercooled liquid - ie. water in a liquid state at a temperature less than 0^{o}C. It is the amount of this water present and the number of naturally occurring cloud condensation nuclei that determine the probability of precipitation from a cloud. The cloud droplets form small ice crystals on the surface of the cloud condensation nuclei. Once the cloud is suitably seeded the ice crystals falling through the cloud collide with cloud droplets thus growing in size. Eventually when this ice falls from the cloud it melts as its temperature rises above the melting point or 0^{o}C, and falls as rain.

Research undertaken in Australia has demonstrated that generally the number of naturally occurring cloud condensation nuclei is well below the optimum value for maximum precipitation efficiency. The aim of cloud seeding is to add artificial cloud condensation nuclei such as silver iodide to serve as additional nuclei for ice crystal production.

It is important to realise that the success of a cloud seeding program is dependant upon the type of clouds that are present and that, just because an area may be cloudy, this does not mean that could seeding will be successful. For this reason it is important that, prior to commencing any operational cloud seeding programme, a series of experiments are undertaken to determine the likely success of the proposed operational cloud seeding program.

Hydro Tasmania has to date conducted three successful cloud seeding trials, the first two in conjunction with CSIRO. Hydro Tasmania has capitalised on the success of these trials by commencing operational cloud seeding, drought relief cloud seeding and a cloud seeding trial in NSW.

The Tasmanian cloud seeding programme is as follows:

Stage I - 1964-1971. This was an alternate year trial over Tasmania's Central Plateau providing randomisation on a seed / no-seed 1:1 ratio, using silver iodide. This trial was designed and assessed by CSIRO. From this trial it was concluded that there was strong statistical evidence that seeding increased rainfall by estimated values of 30% in Autumn and 12% in Winter. The experiment was concluded in 1971 when the reservoirs were at the full supply level.

Stage II - 1979 – 1983. This experiment over the same catchment area used a ratio of suitable seeded / unseeded days at 2:1 to provide randomisation with clouds seeded every year. Again silver iodide was used as the seeding agent and the work was done in conjunction with CSIRO. The results of this experiment again showed increases in rainfall attributable to cloud seeding in the order of 37%.

Drought Relief Operations - 1988-1991. During this period all suitable cloud was seeded over Hydro Tasmania's catchments.

Stage III - 1992 –1994. This trial was very similar to Stage 2 except that dry ice was used as the seeding agent. This experiment found statistically significant increases in rainfall due to seeding but the magnitude and temporal duration of this was less than Stage II.

Drought Relief – Spring 1994 and 1995 – Hydro Tasmania conducted drought relief operations over the agricultural areas of Tasmania's midlands and east coast.

Operational Seeding – 1998 – present. Currently cloud seeding is being undertaken in operational mode. All suitable cloud over designated hydro catchments are seeded between April and November each year during both night and day. Silver iodide is used as the seeding agent.

After experimenting on single cumulus clouds in the early 1950s CSIRO has conducted four large area experiments in Australia with varying successes during the period between 1955-63. The experimental areas were New England, Warragamba, Snowy Mountains and Western Victoria. All of these experiments used silver iodide as the seeding agent. Both the Snowy Mountains and the New England experiments showed statistically significant increases in precipitation of between 26% - 30% in their early stages[1]. The subsequent gains were seen to decrease in the later stages of the experiment. This was believed to be due to poor experimentation design leading to contamination of the control areas (areas where seeding is not undertaken).

A five year experiment over the Snowy Mountains area of NSW in 1955 – 1960 produced a 17% increase in rainfall significant at the 3% level. A proposal to re-run the experiment with improvements was never implemented and Hydro Tasmania believes there would be benefit in doing so.

The Western Victoria trial was cancelled due to a lack of suitable cloud and a decrease in the cost to benefit ratio.

In 1994, based upon the results of the CSIRO studies conducted about the Great Dividing Range in New South Wales and Victoria, Hydro Tasmania was asked to undertake a 12 week cloud seeding trial in North Western New South Wales. This trial was based in the area north of the town of Tamworth. The initial seeding agents used in this study were dry ice and silver iodide. As this was not a formal trial there was no conclusive means to quantify the gains from the trial. Rainfall was consistently recorded throughout the trial and was generally acknowledged to be a success.

Considering the success of Hydro Tasmania in Tasmania and Northern New South Wales cloud seeding, the results of CSIRO trials and the increasing economic value of water it would appear that commencing a new series of mainland Australian trials should be considered. Any future trials must take into account the experience gained from past trials and be designed to maximise the opportunities for defining and achieving a successful result. Consequently this work should follow very closely the guidelines laid down by CSIRO in the paper "Guidelines for the utilisation of cloud seeding as a tool for water management in Australia".

Hydro Tasmania believes that a carefully designed trial will show cloud seeding to be a cost effective tool for precipitation enhancement. Hydro Tasmania believes that in light of the current problems in the Murray-Darling River System and the requirements of minimum environmental flows in the Snowy River, that these areas would be prime candidates for such trials. It would be hoped that these regions would eventually gain their own long-term operational cloud seeding program.

As the only Australian group currently involved in active cloud seeding, Hydro Tasmania has significant practical experience and knowledge in all areas of experimental and operational seeding gained over the last 38 years. Hydro Tasmania is prepared to participate in any future cloud seeding operations undertaken in Australia.

The effect of Commonwealth policies and programs on current and future water use in rural Australia.

Declining prices for traditional agricultural produce (eg. meat and wool) have meant that farmers are diversifying away from traditional grazing and cropping into higher yielding crops (eg. poppies and pyrethrum) and dairy conversions. These new types of farming typically have large set up costs and as such require long term access to a

[1] McDonald, D J,1983: *A Review of the Potential for Influencing Rainfall in New South Wales by Cloud Seeding*. Report to the Department of Agriculture NSW.

reliable water source and in some cases may require access to additional water supplies. These changes in agricultural production types and methods have led to increased demands being placed upon the existing water resources.

It is Hydro Tasmania's view that the best means of re-allocating water to these higher value agricultural products is via a water market where water is transferred between willing purchasers and sellers. A functioning water market allows new irrigators to obtain water for high value initiatives and encourages movement away from inefficient water use practices. This can be achieved without the need for new regulation and external intervention.

The water policy framework of most interest to Hydro Tasmania is the water reforms encapsulated in the Council of Australian Governments water reform package adopted in 1994. This framework covered issues as diverse as:

- natural resource management and the need to consider environmental flow requirements;
- water pricing (including the treatment of cross-subsidies);
- trading in water entitlements; and
- improved consultation.

While in general Hydro Tasmania endorses the intent of the reform package we have some concerns about the willingness of the community to adopt some aspects of the package.

For example, Hydro Tasmania has been in active discussion and negotiations with both the Tasmanian regulator (ie. Department of Primary Industries, Water and Environment (DPIWE)), the Tasmanian Farmers and Graziers Association and other water users on the potential for water markets to address perceived water allocation issues. While this process has been useful in raising the profile and potential of water markets, the outcome to date could best described as inconclusive. Not surprisingly, there is reluctance within sections of the farming community to pay for new water allocations where these have previously been available relatively free of charge. In the past, the only charge has been an administrative fee that did not accurately reflect the value of the water nor the cost of supplying it.

This reluctance by the community to pay the full cost of water is a problem for future and current water developments. New infrastructure is unlikely to be built because the economic returns may not exist to encourage investment.

For infrastructure owners, the problem is that their existing investment will be adversely affected if their water allocation is reduced. Billions of dollars have been spent on water infrastructure (in the form of irrigation schemes, town water supplies and hydro generation facilities) and this investment would not have occurred if the proponents believed that they would have to accept a reduced economic return. To this end, Hydro Tasmania supports the COAG Policy that water users pay the full cost of their water supply.

At the same time there is an increasing awareness of the environmental impacts of historical water use practices and an increase in pressure to bring these historical practices into line with more environmentally sustainable water management practices. Thus adding to the already significant pressure on the existing water resource. Sixteen catchments in Tasmania have been identified as having been potentially over allocated and will have water management plans prepared as a priority.

Hydro Tasmania takes its environmental responsibilities very seriously and has initiated a series of projects under the banner of its Aquatic Environment Program. Typical projects may be to:

- assess the impact of hydro dams on fish passage;
- evaluate the environmental flow requirements in waterways affected by diversions;
- monitor and assess the impacts of hydro operations on water quality;
- investigate options to mitigate the impacts on hydro operations on threatened species; and
- assess the impacts of pest species in hydro reservoirs or water ways.

These projects are ongoing and provide an updated assessment of the environmental impacts of its activities on the environment and develop measures to address any significant adverse impacts since the schemes were originally built.

In addition, Water Management Reviews are being completed on a catchment by catchment basis with the first catchment (South Esk) about to enter the final stage. A key component of the process is extensive stakeholder consultation during the initial issues identification and later phases. Based upon the results of the studies a series of mitigation measures are being developed and following a period of community review a final package of mitigation measures will be adopted.

The implementation of the Mersey River environmental flow and Parangana Mini-hydro Power Station is an example of Hydro Tasmania modifying its operations to meet an environmental need. The Upper Mersey River was diverted into the Forth catchment at the Parangana Dam when the Mersey-Forth Power-scheme was constructed in the 1960s. Following a period of consultation with local stakeholders it was determined that an environmental flow release should be trialled into the Mersey River with the release being made from the Parangana Dam. The trial flow commenced in July 2000. During the three years trial the state of the river was monitored with the aim of confirming that the anticipated benefits were realised.

Hydro Tasmania believes that the environmental flows should be based upon good science and demonstrable gains to the environmental and ecological health of the river. Where these cannot be shown then the environmental flow should be reviewed.

Although Parangana Mini-hydro generation is not eligible for inclusion in the Mandated Renewable Energy Target (MRET), a mini-hydro development at the site was still feasible and the energy that had previously been dissipated (and allowed to go to waste) is now used to generate additional energy for use in the Tasmanian energy grid. Similar situations will arise in future and an increase in the Commonwealth's MRET and extension of hydro plant availability criteria would encourage further investment. This would provide benefits in both the water management area and the renewable energy generation area. For example there may be irrigation proposals where the irrigation scheme on its own may not be economic, while a combination irrigation/mini-hydro development may be economic. Alternatively where the irrigation scheme is economic the incorporation of a mini-hydro and the additional revenues generated may allow water to be made available to irrigators and other water users at a reduced cost.

The use of renewable energy to pump water (including groundwater) should be encouraged in more remote areas. Many of the drier agricultural areas of Australia are a significant distance from a transmission line and as such, it may not presently be cost effective to install any electrical pumps or water treatment infrastructure. Increasing the quantity of Renewable Energy Certificates (REC's) available under MRET, will provide an alternative revenue stream that makes the installation of renewable energy generators (eg. wind turbines or solar cells) to power pumps and water treatment facilities cost effective. Additionally, where the area affected by salinity is localised, it may be that renewable energy could be used to power pumps that draw the groundwater down reducing the surface salinity.

Commonwealth policies and programs that could address and balance the competing demands on water resources.

Since its creation in 1916, Hydro Tasmania (and its predecessors) have made a significant investment in the hydro-generation facilities in Tasmania. These facilities have, and continue to make, a considerable contribution to the economic wellbeing and lifestyle of Tasmanians. These generation facilities are environmentally sustainable and represent an appropriate use of the natural water resources of the State.

The Tasmanian electricity generating system has grown over time as new power schemes were built, thereby increasing the system capability to meet the accompanied growth in load (electricity demand) over time. The transmission system in Tasmania has also grown over time to accommodate the changes in generation infrastructure.

The long-term trends in growth of Tasmania's total generating system capacity and average annual load are clearly illustrated in Figure 4. Notable from this figure is that the load in the year 2000 is at the top end of range of existing system capability.

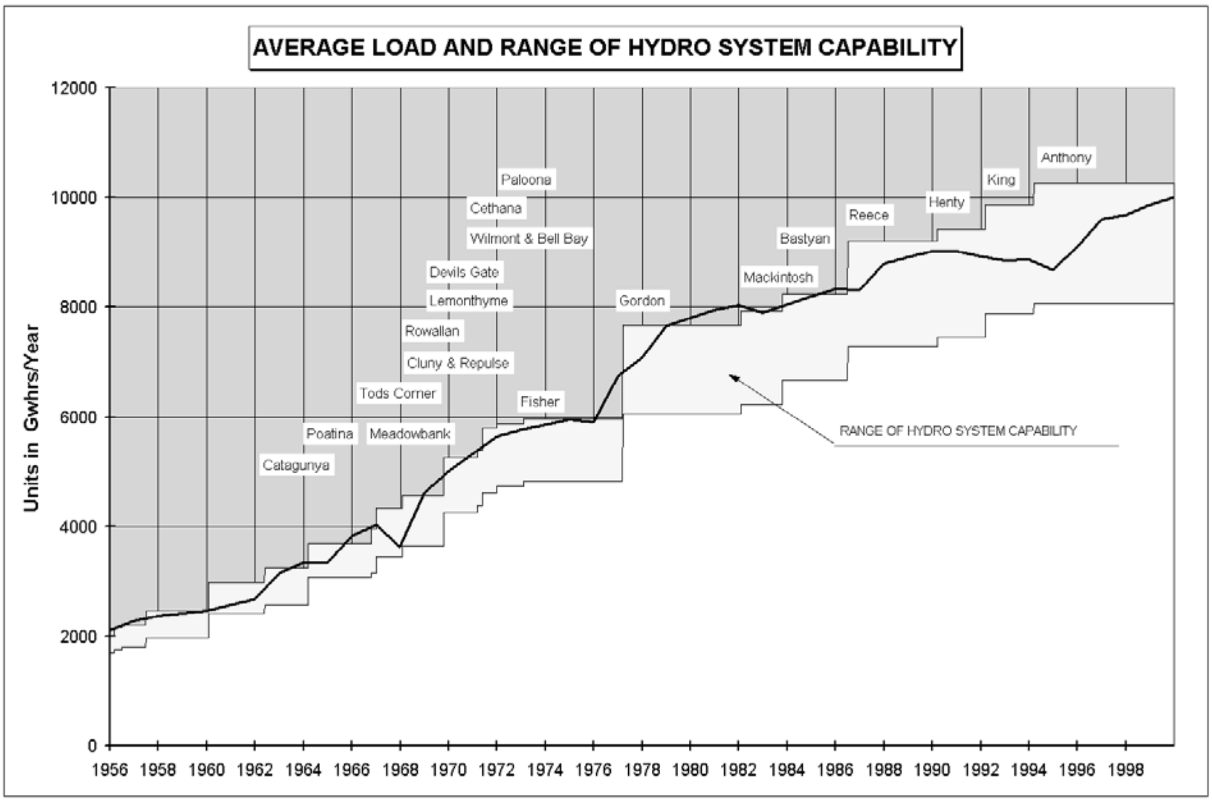


Figure 4 Average Load and Range of Hydro System Capability from 1956 to 2000

To meet future increases in demand, Hydro Tasmania has a series of projects underway to:

- Improve the efficiency of existing generation schemes;
- Install new mini-hydro plant to take advantage of environmental flow releases and previously unutilised head; and
- Develop Tasmania's wind energy potential.

The completion of these projects relies upon two fundamental requirements. These are that the:

- Developer is confident that they will have long term access to the resource on conditions similar to those in the original approval; and
- That the project is economically viable.

Implicit within these two requirements, is the need for certainty that either there is a low risk that more onerous conditions will be imposed upon access to the resource, or that if new conditions are imposed then compensation will be paid.

We note with interest the Federal Cabinet's recent decision to compensate farmers for alterations in their water allocations to meet the requirements of the *Environmental Protection and Biodiversity Conservation Act 1999* (Cwth) – Hydro Tasmania believes that this measure should be extended to other water users. For example, it is likely that in the future, new irrigation schemes and the associated infrastructure will not be constructed by either the State Governments, or the water users, but by consortiums of investors who regard their involvement in infrastructure project as a sound investment.

The developer would enter into long-term water supply contracts with downstream water users (eg. town water supplies, irrigators, fish farms and/or hydro-generators) in the expectation that they would be able to deliver the contracted water volumes. A change in the rules that reduces the available water volume may lead to litigation against the developer for non-delivery.

An example of how this might work in practice is the proposed Meander Dam in Tasmania. This Dam will be constructed by a consortium comprising of the eventual water users, Hydro Tasmania, the State Government and a private investor. While all of the parties will be contributing capital towards the cost of constructing the dam, the lead proponent and eventual owner is likely to be the private investor. The owner will then enter into contracts to supply the water to irrigators and other water users. The magnitude of investment in improved farming operations and alternative higher yielding crops will be dependant upon both the certainty that the water will be available in the longer term and the price the dam developer decides to charge for the water. Where the dam developer has concerns about the potential for a reduction in the allowable water volume that may be made available in the future they would have to charge a higher water fee in order to recoup their investment.

The adequacy of scientific research on the approaches required for adaptation to climate variability and better weather prediction, including the reliability of forecasting systems and capacity to provide specialist forecasts.

There is considerable inter-annual variability in the total inflows to the generating system over time, as is shown in Figure 5. This figure shows the total system yield (inflows to all of the storage reservoirs) between 1924 and 1998. Lake level fluctuations and discharge patterns for the power stations which draw water from the smaller reservoirs are most influenced by local rainfall into the catchments – when the water is available, the power stations are operated. However, for the power stations which draw water from the large storage reservoirs, their operational patterns reflect the amount of total inflows to the generating system. More detailed information can be provided upon request.

Tasmania’s hydro-electric power stations also exhibit seasonal, daily and hourly trends in operation. These trends will vary between power stations depending on factors other than rainfall patterns, including the size of their storage, the capacity and peculiarities of the generating infrastructure, and their location in the State in relation to transmission pathways and centres of demand.

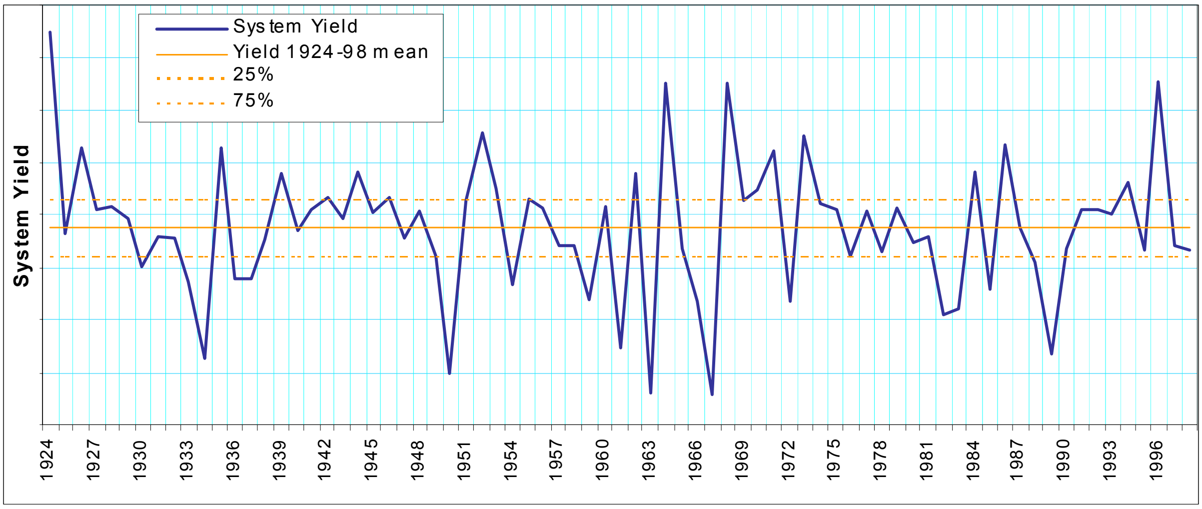


Figure 5: Hydro Tasmania System Yield 1924-1998

There is also an increasing need to understand the effects of Climate change on the current water resource. A good example of change in climate is exhibited in the reduction in the Perth water supply inflows over the last 25 years. In this case there has been a reduction in the mean annual inflow over the period 1975 – 1999 equivalent to 59% of the long-term (1911 – 1999) mean. This is shown clearly in the following diagram.

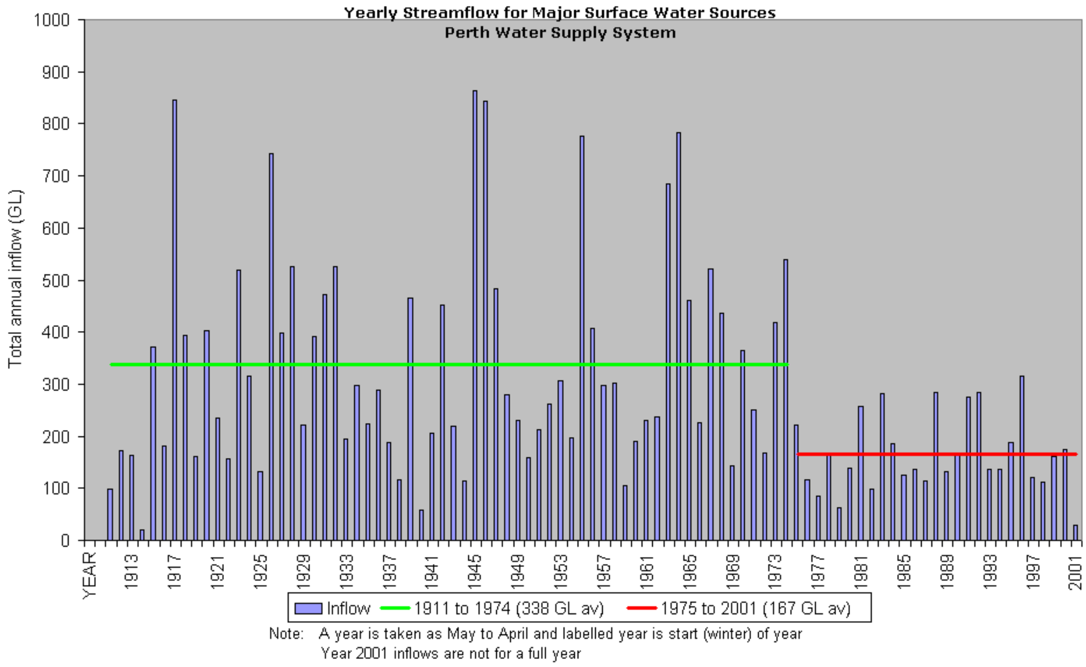


Figure 6 – Yearly Stream-flow for Major Surface Water Sources – Perth Water Supply System

While the same effects have not been seen in other parts of Australia, the question becomes "Is this foreshadowing future trends in other areas in Australia?". The current prediction by CSIRO is for significant changes over the next 30 years in rainfall throughout the country. Thus the effects demonstrated above could potentially be seen to some extent in many parts of Australia over the next 30 years.

There is a need for such effects to be considered in any allocation of water resources. The occurrence of such a phenomena in Tasmanian catchments would lead to a considerable over allocation of the water resource. At present there is no evidence that such an extreme effect has occurred in Tasmania. The following graph illustrates that there is only a marginal decline in the annual inflows to Hydro Tasmania's storages during the period of historical records. This trend is not statistically significant and is small compared to annual inflow variability. Nevertheless, the threat of a Perth style change is of concern to Hydro Tasmania and questions of whether it may occur in the future still need to be addressed.

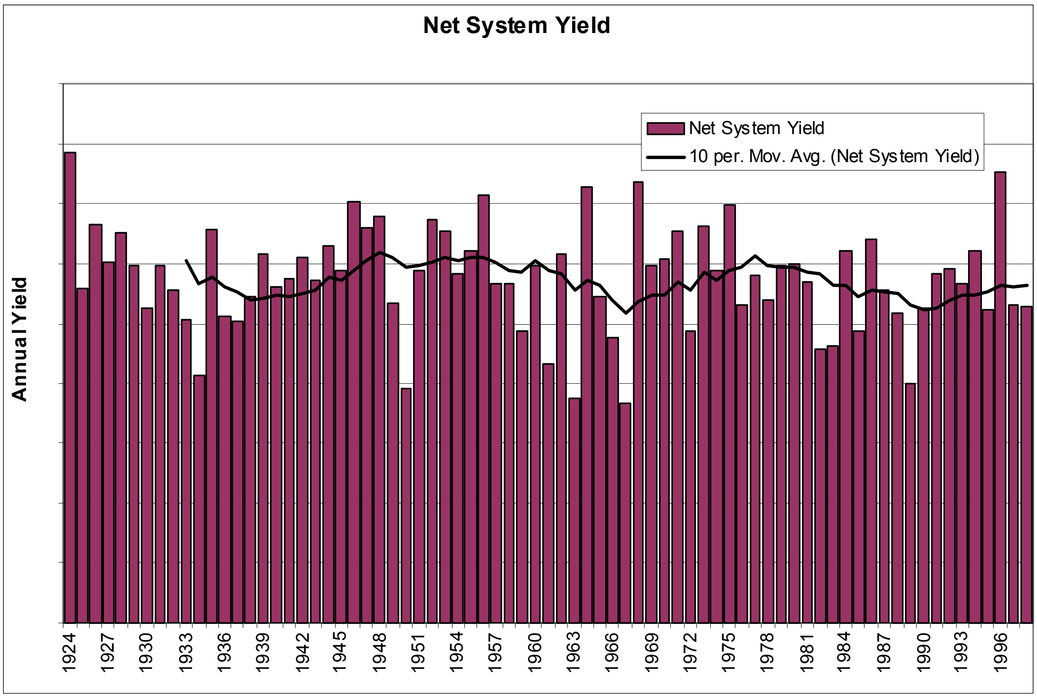


Figure 7: Annual Trend in Hydro Tasmania's Storage Inflows

While there does not appear to be any significant changes in annual inflows to date, Hydro Tasmanian catchments have experienced a change in seasonal rainfall and inflows since 1950. This changed has requited Hydro Tasmania to operate its storages in a different manner in order to provide surety of water during drier times of the year. Such changes will also influence future irrigation developments, as the variability of rainfall will effect the sizing of reservoir storages required.

The ability to predict climate change effects will be extremely useful, even if the predictive tools could only provide order of magnitude changes then this would be beneficial. There is a need to undertake more analysis of the climate change effect on all regions in Australia. As a major water user, Hydro Tasmania is embarking on a study focusing on Tasmania and the potential effects on rainfall and climate change. However, a stronger Commonwealth Government initiative is imperative to ensure more knowledge is available on climate change in Australia. If the effects in other systems in Australia are as dramatic as experienced in Perth, then along with water quality issues and higher demand for water, climate change will have a major impact into the future.

The effects shown above raise serious questions with regard to current catchments and water supplies. These include:

- What level of environmental flow should be provided;
- What effects are there on water surety for irrigators in such catchments; and
- What mechanisms are there for compensating existing users if water allocations are changed as a result of reduced water availability due to climate change.

Hydro Tasmania believes that with greater insight, the development of water markets and compensation for environmental allocations can only assist in the better management of our scarce water resources.

Hydro Tasmania would welcome the opportunity to provide additional information to the Committee either in Canberra or at some other mutually agreed location. Please contact Carol Finn (ph 6230 5951) in the first instance to arrange a convenient time and venue.