What's that about?

Why lake levels change **Power station outages**

Updated May 2013

Hydro Tasmania is the largest water manager in Australia. We manage water for multiple uses, but the main purpose is for hydro-electric power generation. There are a number of factors that affect the level of the lakes we manage in Tasmania. A power station 'outage' (when the station is not operating) is one possible reason.

Across nearly a century of development Hydro Tasmania has constructed many dams, waterways and 30 hydropower stations. When many of these assets were built, they were world firsts. But, as with anything, they have a life span - as they age we monitor them for efficiency and safety. Planned maintenance and technical upgrades continue today which help to retain our world class standards.

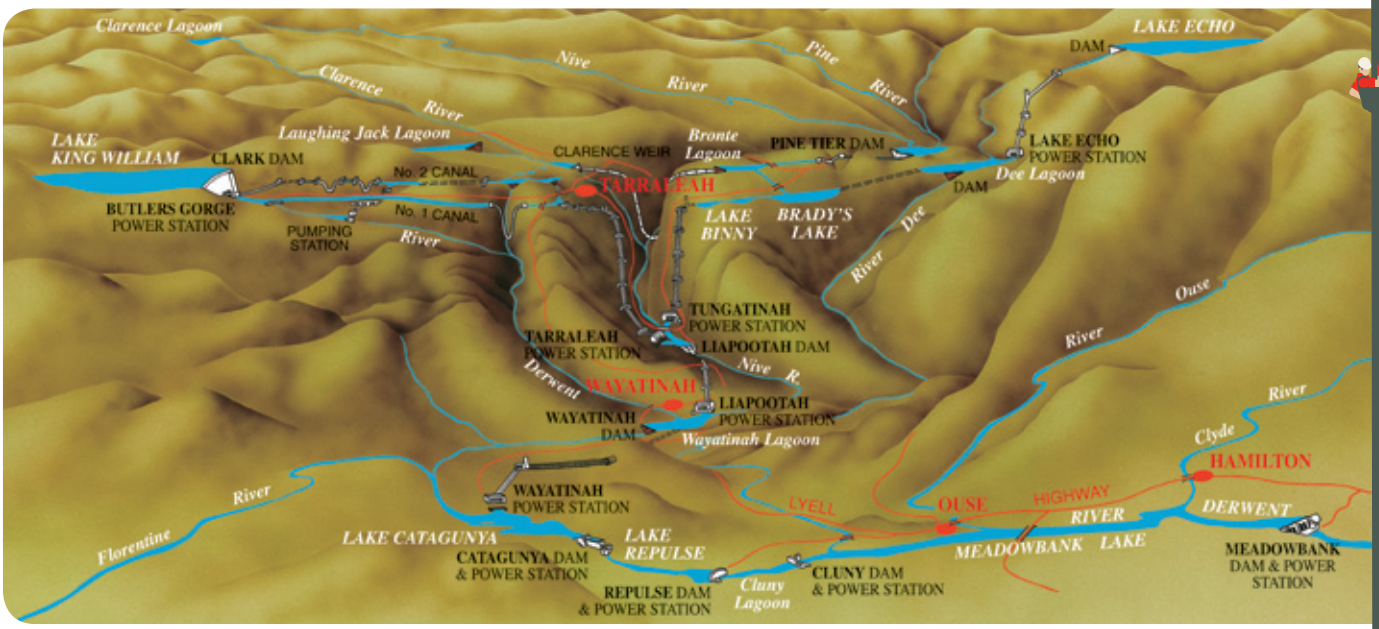
When we conduct upgrades and maintenance, the power stations are often 'out of action' and not running – we call this a power station outage. This will have an impact on the lake level which is the main storage for the power station, but can also affect the other lakes in a catchment up or downstream of the power station.

How can outages change lake levels?

Very simply, if a power station is not running because there is planned maintenance being carried out, the water does not run through the turbine. It stays in the lake – the water level in the lake will rise, possibly to a higher level than normal.

If the power station is part of a run-of-river system then it may impact the lakes further down the 'chain'. For example, in the Derwent Catchment (see below) if Tungatinah Power Station is having an outage then there are less inflows to Lake Liapootah. If Liapootah Power Station is run as normal the level in Lake Liapootah will drop. If it is run at a reduced rate then there will be less inflow into Lake Wayatinah, but a consistent level at Lake Liapootah and so on down the chain.

If a power station is having major refurbishments the water storage may be drawn down to a very low lake level. This is so that over the long period of time it takes to complete the work the water storage does not fill and overflow, resulting in a loss of potential energy water spill.



Hydro Tasmania

The power of natural thinking

What's that about?

Why lake levels change **Power station outages**

How do you decide which ones to shut down?

The task of deciding which power stations to operate and which can be shut down for outages depends on four main factors:

1. the amount of water available for use;
2. the amount of electricity being used;
3. the power stations that are available; and
4. the transmission lines that are available.

These affect the pricing of Hydro Tasmania's electricity in the National Energy Market (NEM) and determine what stations run.

1. Availability of water

When deciding which water storages and power stations to use we need to understand the amount of water in storage and the likely rainfall over each of the catchment areas. Large inflows of water into a small storage, or into a large storage that is close to full, could lead to spilling water out of the dam and losing the potential energy of that water. We manage water storages to keep spills to a minimum.

Water storages are managed according to their size:

- Small or run-of-river
- Medium
- Large (we call it interannual)

Small run-of-river storages such as the Mersey/Forth below Lake Rowallan (Lakes Parangana, Cethana, Barrington and Paloona) and the Lower Derwent (Liapootah, Wayatinah, Catagunya, Repulse, Cluny and Meadowbank) rely on short-term inflows of water so are used more during periods of wet weather, and less or not at all during dry periods.

Medium-sized storages such as Lake King William, Lake Echo, Lake Rowallan and Lake Mackintosh are situated at the head of run-of-river storages. They fill and empty on an annual cycle, supplying water to the cascade of storages below them during the drier months. These storages are the most flexible so need to be managed carefully to ensure secure energy supply all year round.

The large storages such as Lake Gordon and Great Lake fill and empty more slowly over a number of years. They are used more in drier weather when water is not available in the run-of-river or medium storages.

Hydro Tasmania

The power of natural thinking

What's that about?

Why lake levels change **Power station outages**

Updated May 2013

2. Demand for Electricity

Electricity needs to be created as it is used. Too much will cause lights to brighten and motors to speed up while too little will cause lights to dull and motors to slow. Extreme cases of either will cause instability that can ultimately lead to blackouts. For this reason there needs to be enough generation available to cover the highest likely demand for the day plus some additional capacity just in case a generator or transmission line fails unexpectedly.

When planning an outage for a power station, predictions must be made about the potential demand for the period and when generation can meet demand without the power station.

3. Power Station availability

Power station outages may range from just a few hours for basic routine maintenance to many months for large equipment refurbishments and replacements. Long outages need to be planned several years in advance while medium length outages can be planned 2-3 years in advance. Short outages can then fit in around the larger outages and are generally more flexible so can be moved if forecasts such as weather or loads change in the short term.

Generally longer power station outages will require the associated storages to be drawn down so that they do not fill and spill during the outage. To cover the loss of the generation other power stations need to be kept available and their storages kept higher. The decision on which storages to keep higher depends on the size of the storages and the inflows that can be expected for that time of year.

Other factors that affect outage timing and length are:

- Environmental flow requirements
- Water releases for town water supply/irrigators
- Recreational users (kayaks, rowers, fishermen)

4. Transmission line availability

Like power station equipment, the transmission equipment also needs to have outages for maintenance works. These include the transmission lines and the sub-stations they connect to. The transmission lines are owned by Transend Networks and it carries out the maintenance.

Having transmission equipment outages affects how much electricity generation can reach customers so they need to be aligned with power station outages where it makes sense to do so.

Transmission line outages affect station running and lake levels as well.

Hydro Tasmania

The power of natural thinking