

Discover

Benmore



meridian



Meridian Energy's hydro station

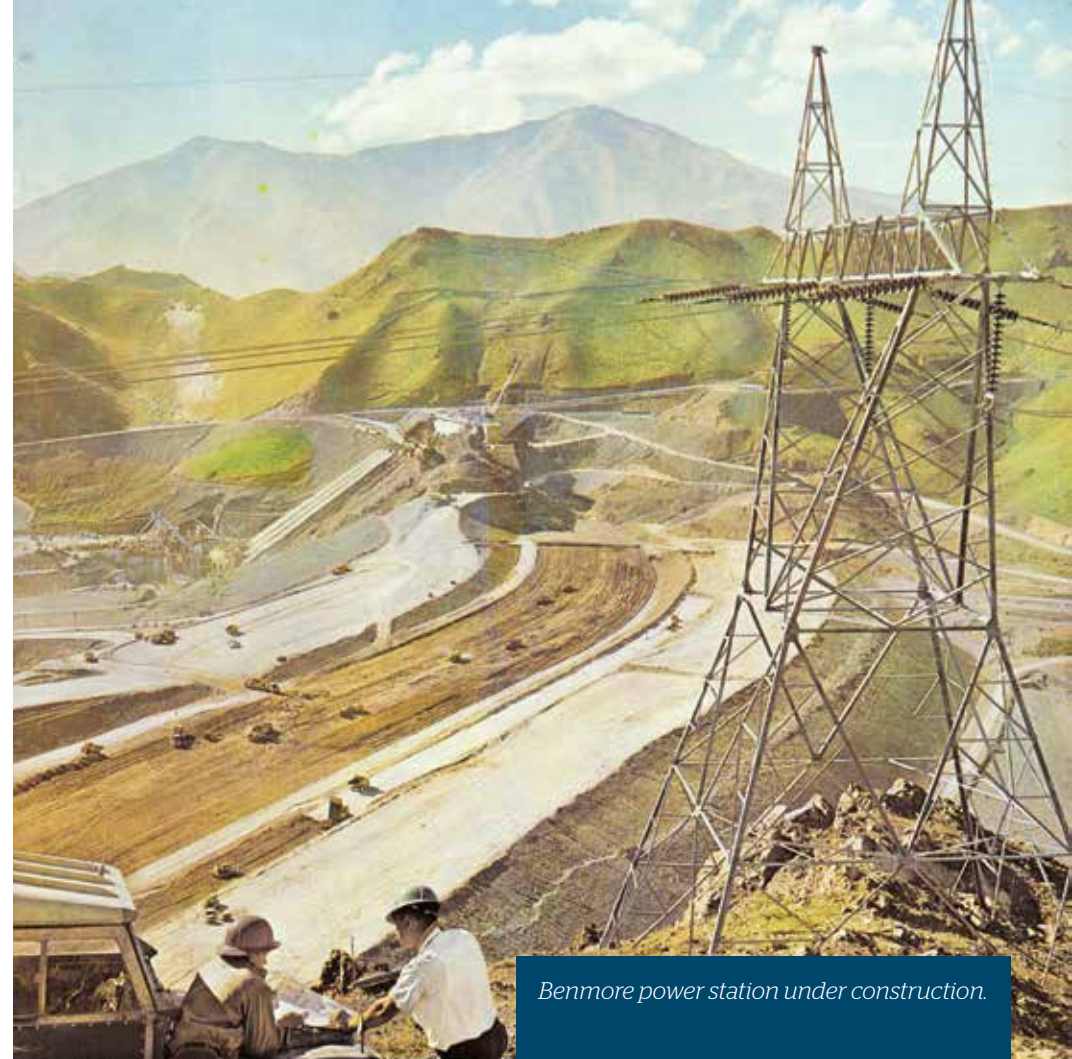
Benmore power station lies below New Zealand's largest solid-earth dam and is located on our country's largest man-made lake – Lake Benmore.

At the time of construction, the dam at Benmore was the largest in the Southern Hemisphere. Twenty-eight million tonnes of material were removed during construction of the dam. At the peak of construction, more than 1500 workers were employed.

Did you know?

In a recent refurbishment project, the station's six turbine runners were replaced. Benmore is now producing 2.8 percent more energy while using the same amount of water. This equates to nearly 70GWh per year of electricity, enough to power 7000 average New Zealand homes and avoid 14,000 tonnes of CO₂ emissions.

Construction started in 1958. The lake was filled in December 1964 and the first power was produced in January 1965. At full capacity Benmore power station produces 540MW, making it the country's second largest hydro station after Manapouri.



Benmore power station under construction.

Supplying *the nation*

Benmore was originally designed to include two generating units to supply South Island electricity needs. However, the final design contained six units. The four additional units were added to help supply the North Island with cost-effective South Island electricity.

This was possible due to another ground-breaking engineering achievement – the world’s largest and longest submarine cable. In 1965, the 600MW/500kV high-voltage direct current Cook Strait cable was installed, enabling electricity to flow between the North and South Islands. This was a remarkable accomplishment, and today it still remains one of the largest direct current links in the world.

Benmore straddles two South Island provinces. The spillway, which allows excess water to pass safely over the dam, lies on the Canterbury side of the Waitaki River, and the powerhouse lies on the Otago side of the river.

The 110-metre-high earth dam runs between two natural projections. One holds the spillway

and the other houses the intake block and penstocks – large pipes that channel water through the turbines. The dam core is built of waterproof, clay-like material, supported by two massive shoulders of river gravel and an outer layer of rock designed to withstand the effects of waves and weather.

Building a dam and a community

In October 1957, the plan to build Benmore station was approved and work began on constructing a camp nearby for which the workers would live. Single-men’s huts from Roxburgh were split into two and transported on trucks to Otematata. These huts were just 3 metres by 2.5 metres and contained the basic necessities for the individual workers, such as a small bunk, stove, table and stool.

The first group of around 150 men arrived at the single-men’s camp in February 1958,

and began excavating soil and creating a diversion culvert (or tunnel) to lead the Waitaki River away from the dam site. This would allow construction over the top of the culvert. In August 1958, the first 11 shopkeepers arrived to open stores to cater for the growing population, and by the end of the year there were more than 450 workers living and working in Otematata. This was the start of what was to become significant growth in the small town.

Did you know?

One of the key concerns for the Otematata community was to live in a safe environment. This explains why there are no four-way intersections of the roads, only T-junctions.

The Otematata baby boom

The Otematata community continued to grow after the arrival of the first workers. The first child was born in Otematata Maternity Hospital in December 1958. By 1966, more than 1000 babies had been born, with a record number of 179 births in 1964. That year the town's population was at its peak of 4166 people.

During Otematata's growth, more and more facilities began appearing to serve the burgeoning community. A sports pavilion was built, along with a community library, cinema, shopping centre, recreation hall and the town's own primary and secondary schools. The Otematata community also had a large variety of clubs, such as bowling, cricket, golf and bridge clubs, a housewives' association, a gardening club and many more.



Concrete batching plant a war veteran

The concrete batching plant used for the construction of Benmore and other stations around this time was purchased by the New Zealand Government at the end of World War II, after it had played a major role in the reconstruction of Pearl Harbor.



Otematata today

In 1968, Otematata's population began to decline as the Benmore project neared completion and workers moved on to other projects such as Aviemore and Twizel. The township slowly began to lose services such as doctors, nurses, dentists and shopkeepers, and many of the houses were sold as holiday homes. Not long after the decline of the Otematata community, the old maternity hospital moved to Twizel, where it is currently used as a backpackers' lodge.

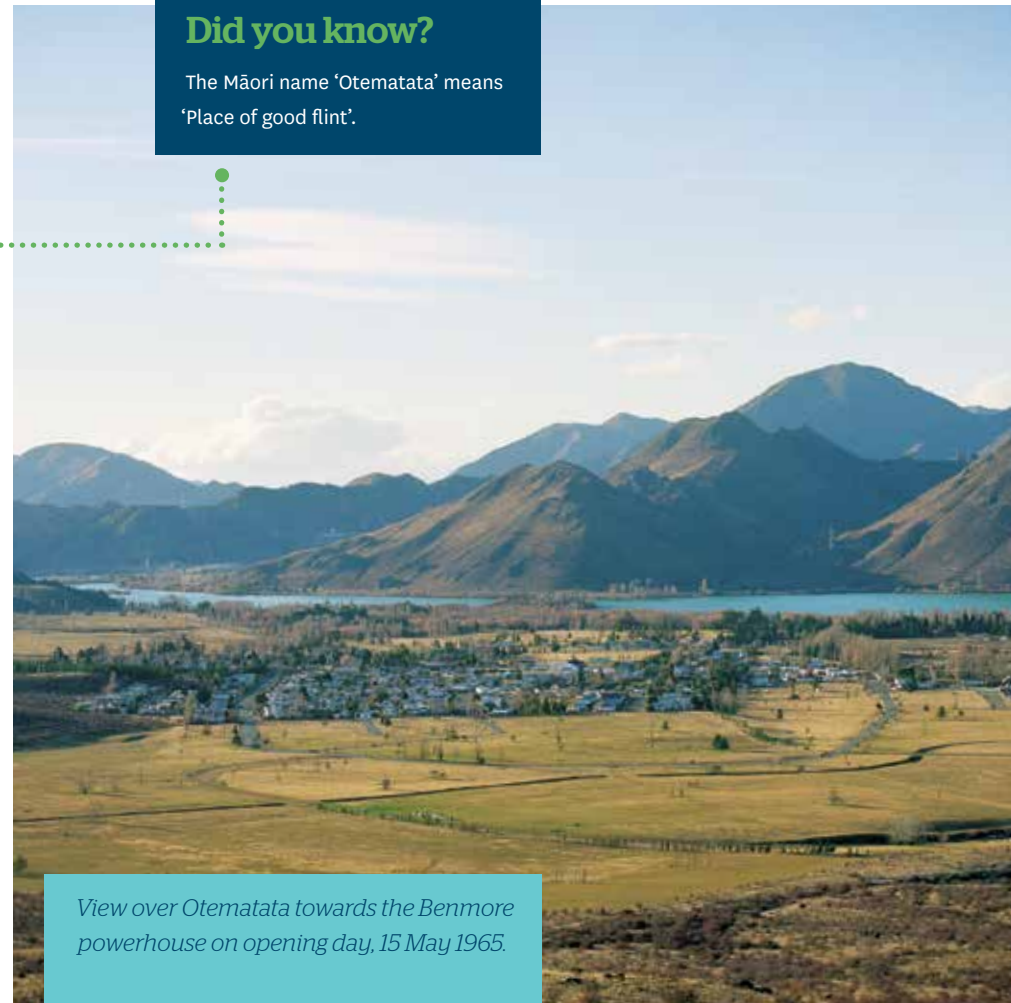
Today Otematata has around 250 permanent residents. During summer the population increases, largely with holiday-makers and part-time residents who come to enjoy the local

attractions. Many walk the Benmore Peninsula Track, which climbs through exotic forest and around a peninsula that juts into Lake Benmore, presenting spectacular views across the lake and up towards the mountains. Others come for the camping ground, golf course, horseback riding, motorbike tracks, fishing, hunting, sailing or swimming in Lake Benmore and nearby Loch Laird.

Today there are still traces of Otematata's history as a thriving hydro-community. The original hall is located near the fire station and it is possible to see where the single men's huts used to sit in the grass.

Did you know?

The Māori name 'Otematata' means 'Place of good flint'.



View over Otematata towards the Benmore powerhouse on opening day, 15 May 1965.

Hydro power

– how does it work?



Benmore power station.

A hydro power station works by harnessing the energy from falling water. The water held above the power station in a lake or reservoir is channelled through pipes or penstocks **A** to the turbine **B**. The height from which the water falls from the reservoir to the turbine, known as the head, determines the amount of energy that can be extracted from a given volume of water. The turbine extracts the energy from the water, turning it into mechanical energy that spins the generator rotor **C**. Similar to a car alternator, the generator rotor carries a set of electromagnets that spin within a stationary set of insulated copper windings embedded in an iron core called the stator **D**. The motion of the magnets within the stator generates electricity in the windings. Most large hydro generators in New Zealand generate at between 11,000 and 16,000 volts (Benmore generates at 16,000 volts) alternating current (AC). The generator is connected to a transformer **E**, which steps up the voltage – usually to 110,000 or 220,000 volts AC – to make long-distance transmission more practicable and

energy efficient. The transformer connects to the national grid at a switchyard, which contains the circuit breakers and other connecting switches that allow the generator to be connected and disconnected from the grid as required. Some



Did you know?

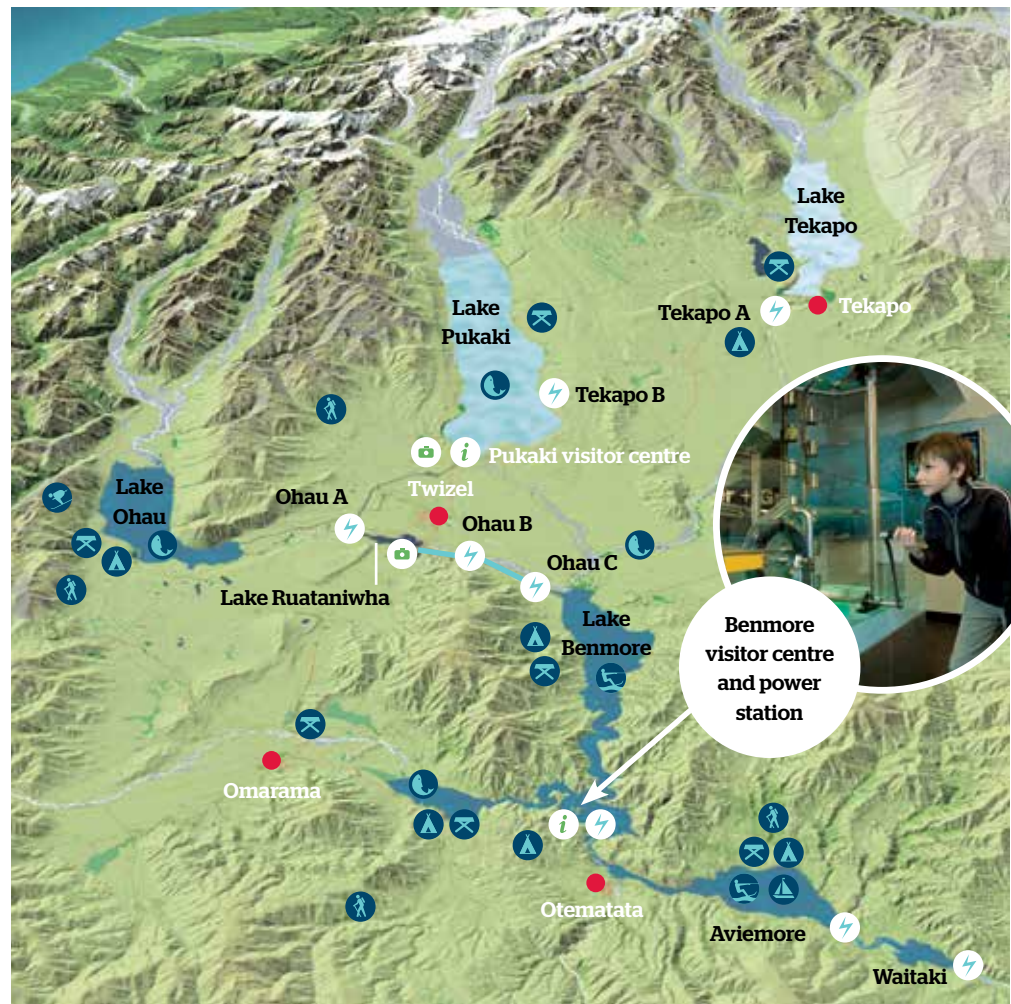
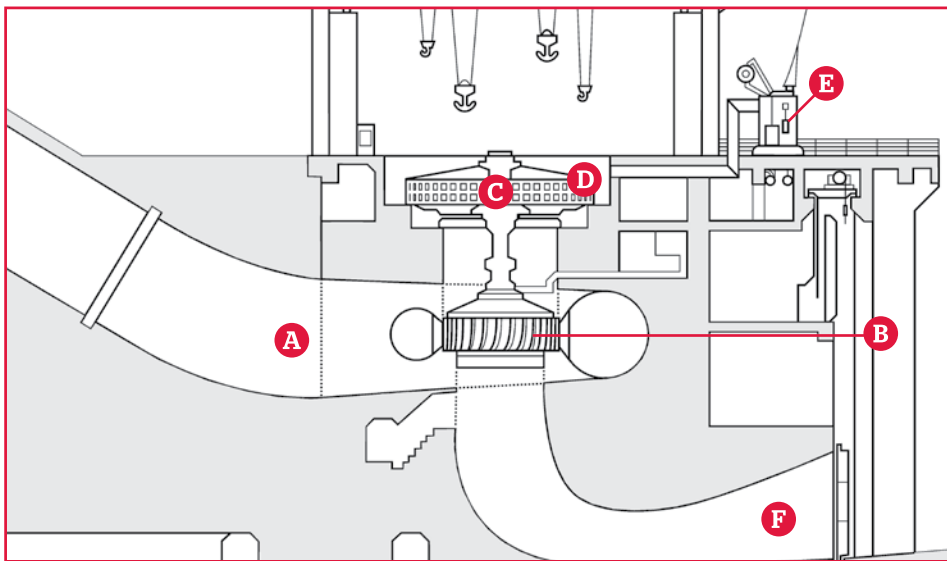
Lake Benmore is the country's largest man-made lake; it is 74.5 square kilometres, with a shoreline of 116 kilometres. It holds 1.5 times more water than Wellington Harbour.

of the electricity generated into the grid is also converted from AC to direct current (DC), which makes transmission between the North and South Islands, using special high-voltage undersea cables in Cook Strait, much more practicable. After passing through the turbine, water exits through a draft tube **F**, back to a river, canal or lake.



Activity guide

- | | | | |
|---|---------------------------------------|---|--------------|
|  | Power station
Genesis Energy owned |  | Canals |
|  | Lookout |  | Bush walks |
|  | Information |  | Picnic |
|  | Fishing |  | Camping |
|  | Skiing |  | Water skiing |
| | |  | Boating |



About Meridian Energy

Meridian Energy is an integrated renewable energy company. We are the largest electricity generator in New Zealand, generating power from 100% renewable resources. We retail electricity to homes, farms and businesses across the country, through our Meridian and Powershop brands.

Meridian is creating a better energy future by leading the way in harnessing the power of renewable energy sources – water, wind and sun. In New Zealand, the company owns and operates seven hydro stations, six within the Waitaki hydro scheme, and wind farms throughout New Zealand.

We also own and operate wind farms in Australia and have a strong pipeline of new generation options in both countries. We've built solar facilities in California and Tonga, and see future opportunities for solar in Australia.

Sustainability is fundamental to our operational approach, reflecting our long-term focus. We work with organisations to preserve the natural environment and protect native plant and animal life, and support local communities through our award-winning Community Fund Programme and national and local sponsorships.

To help our customers manage their energy use, we offer a range of innovative, energy-efficient products and services.

Benmore power station machine hall.



Did you know?

Benmore's average output of 2215GWh is enough to power approximately 220,000 average New Zealand households.

Interesting facts

Station generation output: 540MW

Number of generating units: Six x 90MW

Net head: 92 metres

Turbine type: Francis

Generator details: Six x 16kV

Year commissioned: 1965

WANT TO BE A CUSTOMER?

Please feel free to contact our Energy Centre Team.

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