The Alchemy of the Engineer: Taranaki Hydro-electricity

The alchemy of turning falling water into energy has been a New Zealand speciality in the provision of electric power.

Taranaki was at the forefront of its early development.

"Taranaki takes the prize as the most electrically-minded province during the early years of power generation in New Zealand."
Rennie, Neil: *Power to the People*, Wellington, 1989

Of the first 14 publicly available electricity supplies in New Zealand, seven were in Taranaki. Most of these were hydroelectric schemes, based on the seasonally consistent water supply provided by Mt Taranaki/ Egmont's many streams. A number of our dairy factories also provided their own power supply, either with water- wheels, small turbines or Pelton wheels. It was the demand for electric lighting by both the increasing urban populations and local farmers – who were busy installing the new-fangled milking machines and separators in their cowsheds - who provided a sound economic reason for the public power schemes at the beginning of the 20th century.

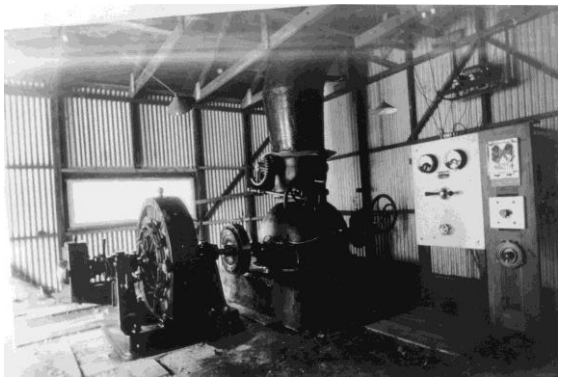
In recent years, as the cost of electricity increases and the supply becomes subject to purely commercial considerations, there has been a revival of interest in small hydro schemes and some of the remaining structures have been assessed for possible re-commissioning.

STRATFORD - PATEA RIVER

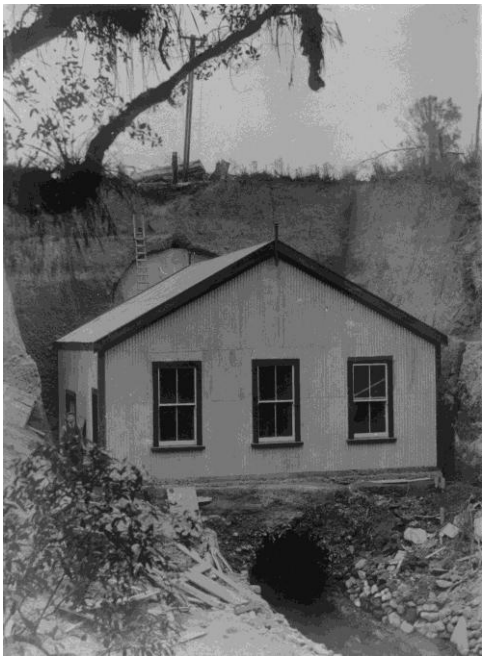
A private company installed the first of Taranaki's electricity generators in 1898 on the Pātea River at Stratford. Following Reefton (1888) and Wellington (1889), the town became the third in New Zealand to have a hydro-electrical supply. One of the initiators of the project was local engineer and entrepreneur, Alexander W. Reid who also built three steam-powered cars, designed and marketed a milking machine and

was involved in at least one local dairy co-operative. The scheme was designed by H.W. Climie, one of Taranaki's most influential engineers of the time.

Stratford Dam



Turbine and Generator



Stratford Station

This initial scheme was followed by the one installed on Te Whiti and Tohu's Parihaka marae. The committee there installed a water-driven Pelton wheel in 1899.

Then followed the installations at Pātea (Kakaramea, 1902), Hāwera (Waingongoro River, 1903), Inglewood (Ngatoro Stream, 1904), Waitara (1905) and New Plymouth (Waiwhakaiho River, 1906).

PĀTEA – KAKARAMEA

Pātea's electricity plant (1902) was the first in the country to be run, from the start, by a local authority – the Pātea Borough Council. The power station was built at the base of the coastal cliffs north of the town - near Kakaramea - and was supplied by water from a shallow lake (Payne's) originally part of a flax, and after that a flour, milling operation. In the early 1920s the holding dam at the cliff-top gave way and two men in the powerhouse below were washed into the sea and narrowly escaped drowning. A new building was constructed and the dam heightened to give a better head of water. The engineers were Climie and Fairhall (Hāwera). It was abandoned in the late 1950s.

Patea Hydro-electric Station – Kakaramea

Photograph: Ivan Bruce, 2015

HĀWERA – WAINGONGORO RIVER

The Hāwera hydro scheme, based on a dam and generating station on the Waingongoro River at Normanby, was commissioned in 1903. It only ceased operating in 1967 after a flood seriously damaged the station. Some of the early generating equipment is presently held in the Museum of Transport and Technology (MOTAT) Auckland.

The first station on the Waingongoro

The original powerhouse was replaced by a more substantial concrete structure in the 1930s when the generating capacity was increased. The original weir was also rebuilt and heightened in the 1930s to increase the capacity of the reservoir and the operating "head".

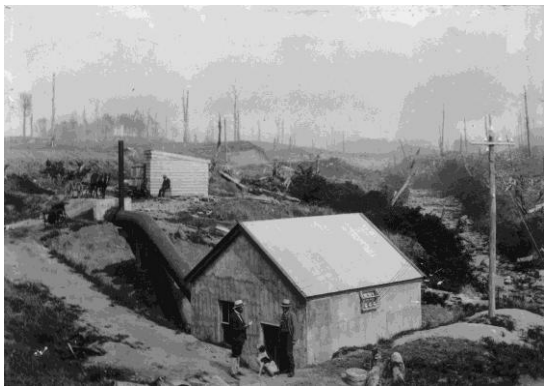
Waingongoro Dam – 2003

Hāwera Powerstation Remains - 2003

The present 5.5-metre high structure is presently used for "dam dropping" – an adventure tourism operation of Kaitiaki Adventures.

INGLEWOOD – NGĀTORO STREAM.

Like many of the early Taranaki hydroelectric schemes, Inglewood's was initiated by a private company in 1904. A concrete weir on the Ngātoro Stream on Tarata Road diverted water by tunnel and race, to a shallow lake and then, to the generating station on the banks of the river further downstream.

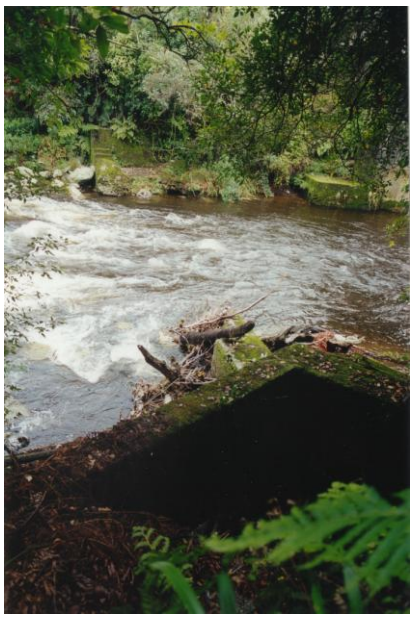


Inglewood Station

Storage lake

The shallow storage lake was formed from a natural hollow which was enhanced by an earthen wall. This wall may still be seen in 1950 air photographs but was later destroyed in farming operations.

The power scheme was taken over by the Inglewood Borough in 1912 and operated until 1930 as a feeder for New Plymouth Borough Council.



Inglewood:. Dam Remains & Intake

Powerstation - 2000

WAITARA

In 1905 a gas-fired electricity generating plant was built in central Waitara. This enterprise was supplemented later by a small hydro plant associated with the borough water mains. Electricity was later supplied by New Plymouth until 1933 when Supreme Court and Privy Council action determined that New Plymouth had no legal right to be the sole supplier for either Waitara or Inglewood. The two towns then, along with Stratford and Kaponga joined the Taranaki Electric Power Board. These amalgamations now determine the boundaries of the Taranaki Electricity Trust

By the time other Taranaki communities followed - Waverley (1916), Kaponga (1916) and Opunake (1923) - electricity was becoming widespread throughout the country.

The Electric Power Boards Act of 1918 saw the establishment of the board system that operated until the present complex division of generator, distributor and supply companies in 2000?

Electric Power Boards were formed at Opunake (1921), Taranaki (1922), South Taranaki (1924) – Egmont (1963) was formed from the amalgamation of Opunake and South Taranaki.]

KAPONGA-KAUPOKONUI RIVER.

A small power scheme for supplying Kaponga and the surrounding rural area was begun in 1915. The first electricity was produced in 1916 and the plant closed in 1944.

Although the dam on the Kaupokonui River was removed some time ago, the first powerhouse – an intriguing hemispherical concrete structure - still remains on site as a farm shed. A second supplementary station was built in 1925 with the assistance of the Kaponga Co-operative Dairy Factory.

Kaponga Dam

Kaponga Powerhouse - 2003

NEW PLYMOUTH - MANGOREI

New Plymouth's hydro scheme still operates as the Mangorei Power Station alongside the Waiwhakaiho River near Burgess Park. The complex has been added to a number of times over the years since its beginnings as a combined water and electricity supply in 1906. It's one of New Zealand's oldest operating stations albeit much-evolved from its simple beginnings. The remains of the various stages of development may still be traced and the whole complex is a major part of Taranaki's and New Zealand's industrial heritage.

The first scheme was just a 1200-metre water supply piped directly from the Waiwhakaiho River to the generating station. The water supply, of course, suffered in times of low summer flow, so a storage dam was built on the Māngamāhoe Stream in 1914. A new intake was also constructed further up the Waiwhakaiho River and a 420-metre open water race led to the dam.

1906 Intake, Waiwhakaiho River – 2002

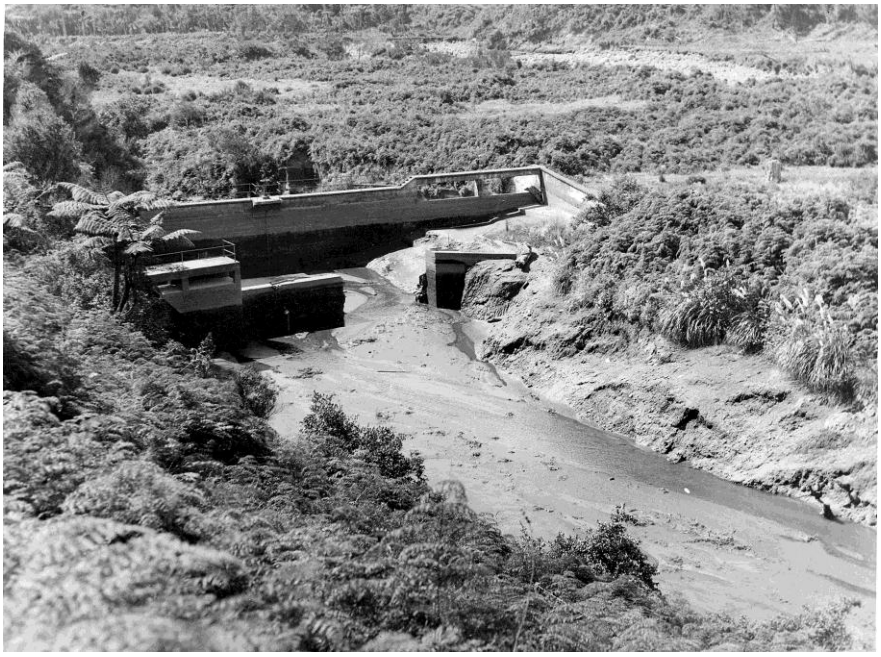
1914 Intake, Waiwhakaiho River - 2002

1914 Race-tunnel to dam

1914 (?) Water Race Bridge

1917-18 Low Head Dam, Māngamāhoe Stream - 2002

This second intake proved difficult to maintain as it frequently became blocked with boulders, gravel and flood debris which had to be removed by hand. The piles of boulders removed over its operation may still be seen near the intake. The first low-head dam was washed out in 1917 and replaced by the surviving, but now unused low-head dam a few metres downstream. The remains of the first dam and its intake to the power station may still be seen a few metres up from the second dam.

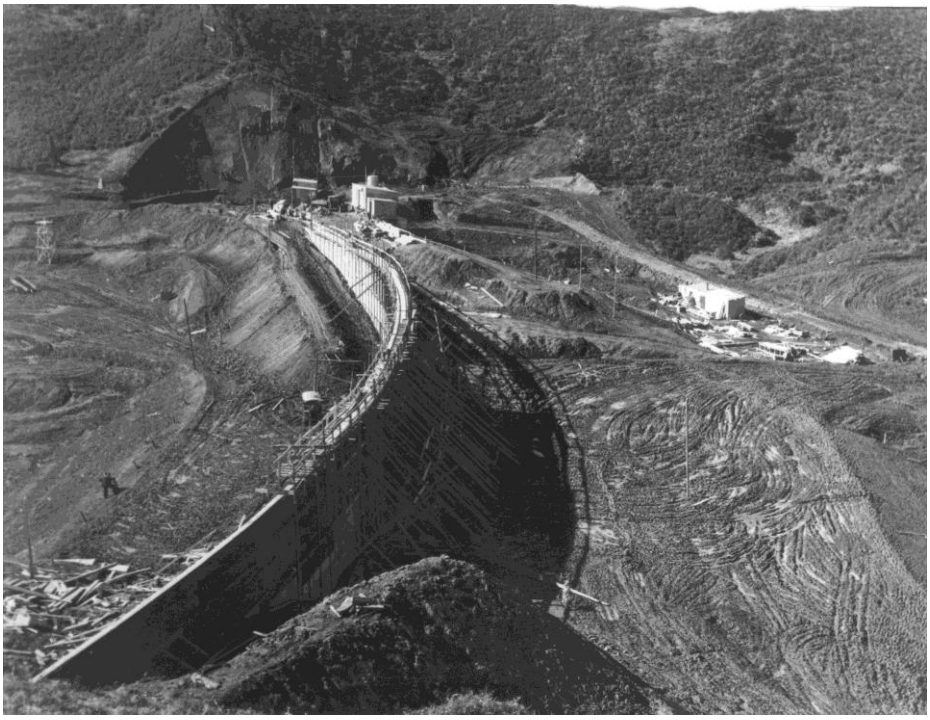


1914 (closest) and 1917-18 Dams on the Māngamāhoe Stream
during a draining of the lake about 1950. Waiwhakaiho River is in the distance.
Photo: J. A. Austin

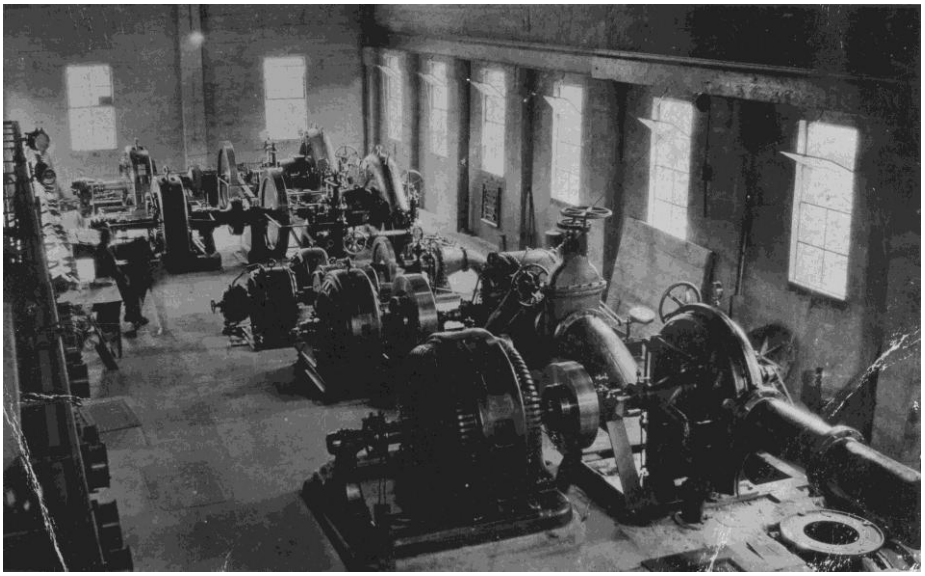
The present concrete-cored earth dam was built in 1931 to form Lake Māngamāhoe and its water, taken from the Waiwhakaiho River and the Mangamahoe Stream, is conveyed through tunnel and penstocks to the power station. TrustPower now operates the complex.

Māngamāhoe Dam -2013

Māngamāhoe Intake - 2002



Mangamahoe Dam construction - 1930



Low Head Generators at Mangorei

Mangorei Power Station - 2007

OPUNAKE

Although consideration had been given to a hydro scheme on the Waiaua River at Opunake as early as 1899 the proposal was not proceeded with. In 1907 the Town board installed an acetylene gas plant instead.

The Opunake Electric Power Board was constituted in 1921 under the Electric Power Boards Act 1918 and began construction of the Opunake scheme immediately. The Waiaua River was dammed and a 300-metre tunnel diverted water to a small storage lake and then to the generating station on the foreshore. It began operating in 1922-23.

Opunake Generators
Photo: Feaver, 1926

It seems to be the lot of hydro schemes to be regularly devastated by floods and Opunake's was no exception. In 1936 a gigantic flood entirely filled the head race and lake entry with thousands of tonnes of silt and rocks which were removed by gangs of local farmers.

In the 1960s Opunake amalgamated with South Taranaki to form the Egmont EPB. As far as I know the scheme is still operating, at least at times of high use.

Opunake Power Station - 2007

TARANAKI – MOTUKAWA.

The Taranaki Electric Power Board began a hydro scheme in 1923-24. It was designed by the engineering firm, H.W. Climie and Sons. The first step was the building of a weir and turbine on the Manganui River near Tariki. This small generator supplied a few surrounding farmers as well as providing power for the construction of the main scheme.

1923-24 Surgetank and outflow - 2002

Tariki Dam -2002

Tariki Intake to Race

This involved a Manganui River intake, a five kilometre water-race to the storage lake at Ratapiko and then, supply by tunnel and penstocks, to the Motukawa generating station at Tarata on the Waitara River, 122 metres lower. The powerhouse began operating in January 1927. The station operates now as a part of TrustPower.

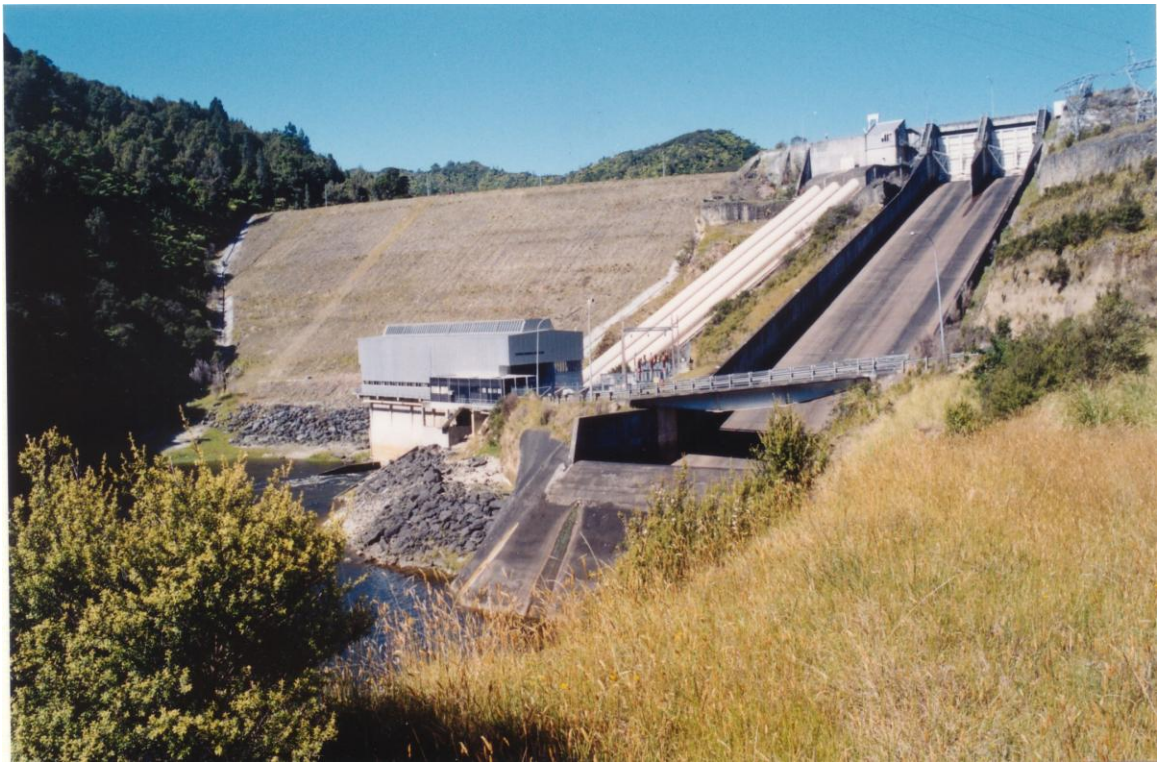
The construction of the water-race through the Ratapiko swamp was something of a local engineering feat. One section started out as a tunnel through the mud, slush and buried logs. Any buildup of marsh gas from the decaying peat had to be checked before the men began work each morning. The tunnel collapsed on a number of occasions and it was finally converted to an open race.

Motukawa Penstocks

Motukawa Powerstation

PĀTEA – PĀTEA DAM

In the early 1980s an earth-fill dam was built on the Pātea River, east of Hāwera, to form Lake Rotorangi and to power a 30-megawatt electricity-generating station. It began operating in 1984. The station is now part of the generating company, TrustPower.



Pātea Dam, Penstocks and Generating Station

DAWSON FALLS POWER STATION

The small power station on the Kāpuni River behind Dawson Falls Lodge supplies electricity to the complex. The installation, run by a Pelton wheel, was opened in 1934.

It is one of the oldest continuously-operating power stations in the world.

The generator, though, was manufactured around 1898-99 by General Electric Company in the USA. It was sold by the New Zealand Defence Department to the Kelburn and Karori Tramway Company in 1918 and the Egmont National Park Board acquired it from the Kelburn cable car winding house in the early 1930s.

POWER TO THE DAIRY INDUSTRY:

Many of the dairy factories established in Taranaki during the late 19th and early 20th centuries had often to ensure their own consistent power supply. This could either be by mechanical waterwheel, Pelton wheel or small turbine and generator. The method chosen usually depended on the size and wealth of the co-operative.

The story of the Kaupokonui Dairy Co-operative is one that illustrates many in the local industry. The factory was established in 1897. In 1900, the company began a water supply and electricity scheme with a dam across the Kaupokonui Stream two kilometres or so above the factory. A tunnel and concrete race brought water to two turbines and generators. In 1940 the generators were replaced and continued to operate until the closure of the factory in the 1970s.

The original weir was damaged in a flood about 1941 and the present structure was constructed by Alois (Lou) Butler of Inglewood.

Kaupokonui Dairy Co. Weir -2002

Turbine @ Kaupokonui Factory - 2002

SWINGBRIDGE WEIRS, CARDIFF WALKWAY

Two water supply weirs for the Cardiff Co-operative Dairy Factory on the Waingongoro River are now a feature on the Cardiff Centennial Walkway.

Cardiff Walkway Weirs - 2015

Many of the dams and weirs built to provide these essential services to the communities and fledgling commercial enterprises of Taranaki have been abandoned for many years. Taking their historical value into account, these structures are presently the focus of a Taranaki Regional Council programme, *Rights of Passage*, to ensure that they do not unnecessarily hinder the movement of native fish species in our rivers.

Ron Lambert
2015