

# **The Alchemy of the Engineer: Taranaki Hydro-electricity**

Unlike the alchemists of old, engineers, from the late 19<sup>th</sup> century on, have been able to turn one substance into another. The mechanics of changing falling water into electricity has been a New Zealand speciality for many decades.

Taranaki was at the forefront of the early development of hydro-electricity in New Zealand.

Of the first 14 publicly available electricity supplies in New Zealand, seven were in Taranaki. Most of these were hydro-electric schemes, based on the seasonally consistent water supply provided by Taranaki/ Mt 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 as well as 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 started at the beginning of the 20<sup>th</sup> century.

With the privatisation of the electrical industry, the demand for, and cost of, electricity has increased and the supply has become even more subject to the vagaries of rainfall and purely commercial considerations. There has recently been a revival of interest in small hydro schemes and some of the remaining structures on our rivers have been assessed for possible re-commissioning.

Taranaki's first venture was at Stratford in 1898. This initial scheme was followed by the one installed at Parihaka near Pungarehu. The marae committee installed a water-driven Pelton wheel there in 1899.

Then followed the systems for Patea (Kakaramea, 1902), Hawera (Waingongoro River, 1903), Inglewood (Ngatoro Stream, 1904), Waitara (1905) and New Plymouth (Waiwakaiho River, 1906).

**During the 1880s a number of private electricity generators were established around New Zealand. These were usually steam or gas engines or Pelton wheel schemes which supplied electricity to individual mills, shops, factories or other commercial enterprises.**

**The first 14 public electrical supplies in New Zealand were:**

Reefton 1888

Wellington 1889

Gore 1894 (Steam)

**Stratford 1898**

**Parihaka 1899**

Outram 1899

Rotorua 1901

**Patea 1902**

Christchurch 1903 (Steam)

**Hawera 1903-04**

Bluff 1903 (Steam).

**Inglewood 1904**

**Waitara 1905 (Suction/gas)**

**New Plymouth 1906**

These were followed by dozens of others including:

**Waverley 1916**

**Kaponga 1916**

**Opunake 1922-23**

**Tariki 1924**

**Motukawa 1927**

**Mangamahoe 1931**

**Patea River 1984**

## **STRATFORD - PATEA RIVER**

A private company installed the first of Taranaki's electricity generators in 1898 on the Patea 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.

The company was later bought and operated by the Stratford Borough Council until the completion of the Motukawa power station in 1927.

## PATEA – KAKARAMEA

Patea's electricity plant (1902) was the first in the country to be run, from the start, by a local authority – the Patea 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 (Hawera). It was abandoned in the late 1950s.

## HAWERA – WAINGONGORO RIVER

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

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

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

Access Don Glass' text

Website: <http://www.kaitiaki.co.nz>

## INGLEWOOD – NGATORO STREAM.

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

## 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 the Supreme Court and Privy Council 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 which is based on the old TEPB territory.

**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 separation of generators, distributors 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 supplementary station was built in 1925 with the assistance of the Kaponga Co-operative Dairy Factory.

## NEW PLYMOUTH - MANGOREI

New Plymouth's hydro scheme still operates as TrustPower's Mangorei Power Station alongside the Waiwakaiho 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 first scheme was just a 1200-metre water supply piped directly from the Waiwakaiho 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 Mangamahoe Stream in 1916. A new intake was also constructed a little further up the Waiwakaiho River and a 420-metre open water race led to the dam. This second intake proved nearly impossible to maintain as it frequently became blocked with boulders, gravel and timber which then had to be removed by hand. The piles of debris removed over the years of its operation may still be seen near the intake. The first dam was washed out in 1917 and replaced by the surviving, picturesque, but now unused, low-head dam a few metres downstream.

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

<http://www.trustpower.co.nz/content/generation/hydro/mangorei.aspx>

Web site: [www.trustpower.co.nz](http://www.trustpower.co.nz)

## OPUNAKE

Although consideration had been given to a hydro scheme on the Waiaua River at Opunake as early as 1899 the proposal did not go ahead and 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 on the town's southern boundary and then to the generating station on the foreshore. It began operating in 1922-23.

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 tons 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 and in 1997 the station was sold to TrustPower.

It was bought in 2000 by New Zealand Energy Ltd a family company which also runs small generators at Raetihi, Fox and Haast.

#### 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. This involved a Manganui River intake, a five kilometre water-race to the storage lake at Ratapiko and then, 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.

<http://www.trustpower.co.nz/content/generation/hydro/motukawa.aspx>

Web site: [www.trustpower.co.nz](http://www.trustpower.co.nz)

#### PATEA – PATEA DAM

In the early 1980s an earth-fill dam was built on the Patea River, east of Hawera, 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.

<http://www.trustpower.co.nz/Content/Generation/Hydro/Patea.aspx>

Website: [www.trustpower.co.nz](http://www.trustpower.co.nz)

#### DAWSON FALLS POWER STATION

The power station on the Kapuni River behind Dawson Falls Lodge on Taranaki/Mt Egmont supplies electricity to the complex. The plant has one of the oldest surviving operating generators in the world (as far as known)

The station, run by a Pelton wheel, was installed in 1935. The generator, though, was manufactured around 1896 by General Electric Company and was first used in Tasmania. It is reputed to have then been brought to New Zealand to generate power for the Trentham Military Camp during World War I.

Website: <http://www.dawson-falls.co.nz>

## **POWER TO THE DAIRY INDUSTRY:**

Many of the dairy factories established in Taranaki during the late 19<sup>th</sup> and early 20<sup>th</sup> 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.

## **SWINGBRIDGE WEIRS, CARDIFF**

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 Centennial Walkway**, Opunake Road, 6 km west of Stratford is a walk of about 3 km along the banks of the Waingongoro River. Site map and more details ????

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.

<http://www.techhistory.co.nz/Electricity/Hydro.htm>

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