

System 800xA

Multisystem integration future-proofing New Zealand's hydro resources



When Genesis Energy needed to replace the control system of a hydro electric power network covering five power stations in remote locations around New Zealand's North Island, ABB delivered an advanced 800xA control system including multisystem integration to take this crucial electricity generator into the future.

Genesis Energy owns and operates 1,996 MW of electricity generation. They are New Zealand's largest energy retailer, supplying 19 percent of the nation's electricity. A key part of their overall generation capacity is supplied by their renewable energy group consisting of Tongariro and Waikaremoana hydro electric power schemes. These two schemes consist of a total of five power stations – two in the Tongariro scheme and three in the Waikaremoana scheme – with a total capacity of just over 500 MW.

Challenging locations and conditions

To add to the challenges that this upgrade presented, the upgrade work and system implementation would have to be carried out over a wide geographical area. The Tongariro and Waikaremoana schemes are situated approximately 330 km apart. Within each scheme, the power plants are positioned in isolated and sometimes difficult locations.

In the Tongariro scheme, the Tokaanu Power Station, with its four 60 MW turbines, is located on the slopes of Mount Tihia, near Turangi, in the central North Island. The Rangipo Power Station, with two 60 MW turbines, is situated underground in the Kaimanawa Forest Park. Meanwhile, the Waikaremoana scheme is located between one of New Zealand's most inaccessible areas, Te Urewera National Park, and Wairoa.

The three stations in this scheme, the Tuai Power Station (three 20 MW turbines), the Kaitawa Power Station (two 21 MW turbines) and the Piripaua Station (two 22 MW turbines), are located along the Waikaretaheke River.

Taking on the challenge

In 2008, ABB embarked on the three-year project. ABB were responsible for system design, electrical design, panel build, installation and commissioning.

Prior to the commencement of the project, Genesis Energy were invited to visit the ABB research centre in Västerås, Sweden, to see ABB's feeder factory and the facilities there. Genesis brought with them a very low bandwidth modem that they were planning to utilise in the control system upgrade. The technicians at the research centre tested the modem with the 800xA system, achieving perfect results. During the visit, the client also saw the ergonomically-designed EOW control console for the first time, and the advantages of the unit quickly became clear.

Ground-breaking implementation

The Genesis Energy upgrade was one of the first in the world to utilise ABB multisystem integration with low bandwidth connections between remote sites. Three 800xA core systems were supplied for the project. The system at the Tokaanu station is configured as the subscriber system and the systems at Rangipo and Waikaremoana are configured as provider systems.



1 The Tokaanu Power Station and control centre, located on the slopes of Mount Tihia in New Zealand's central North Island. | 2 Motor control centre including ABB variable speed drives. | 3 New generator control panel.

The Multisystem integration between the Tokaanu station and the provider systems at Rangipo and Waikaremoana are provided by redundant system servers connected on redundant communications links.

“ABB's 800xA Multisystem Integration (MSI) functionality provided a great solution for integrating the remote stations provider systems into the Genesis Hydro Main Control Centre for monitoring and control,” says Robert Woods, Senior Project Engineer. “The configuration and setup of MSI was an easy process, and MSI met the low bandwidth WAN requirements for the project for a smooth and robust implementation.”

The ABB-designed solution provides a number of new benefits. At the Tokaanu control room, information from the entire system is now available through 800xA. This displays real-time data from motor controllers, protection relays, vibration monitors and third-party devices such as power meters and governors from all sites centrally at the Tokaanu control centre. Information alarms and control of all sites are seamlessly integrated using multisystem integration. The operator can easily retrieve and access secure historical plant data from all sites. The system also has integrated automatic generation control (AGC) facilitating automatic control dispatches from Transpower, the operator of New Zealand's national power grid.

Delivering on the project

Throughout the project, ABB were required to meet an aggressive schedule and budget. Work had to be completed within scheduled fixed window outages, and as the project progressed, additional projects were rolled out within the fixed timeframe of each outage. Despite the challenges

this imposed, ABB completed all outages successfully within their allocated times.

Vetti Bala, Genesis Energy's project manager for the upgrade, worked alongside ABB. “From the outset, Genesis Energy worked hard to develop and foster a good working relationship with ABB. We were aware the upgrade of our hydro control systems would span a number of years and that the investment would be considerable. The hydro control systems upgrade provided a huge challenge for the project team from both a technical and geographical point of view. Genesis Energy designed and implemented the complex LAN and WAN infrastructure as the platform for the new control system. The challenges included constraints from resource consenting around water flow and flooding which required close monitoring,” says Bala.

Into the future

The new control system is already proving its worth and the careful future-proofing and ease of expansion that ABB designed into the new technology, is being put to use. Electricity generator, Meridian Energy, are transferring their Tekapo A and Tekapo B South Island power stations to Genesis Energy's control. A project is now underway to integrate control and monitoring of these stations into the Tokaanu control room some 1000 kms away – proving that ABB's system is not only equipped to handle multisystem integration between two schemes within an island, but between islands as well.

Equipped with new ABB technology, Genesis Energy's hydro electric system is now ready to face the future.



Tokaanu control centre featuring Extended Operator Workplace (EOW).

ABB's supply

Tokaanu (MSI subscriber)

- 800xA system with seven operator workplaces, three engineering stations
- Extended operator workplace
- Six AC800M controllers
- 2600 tags

Rangipo (MSI provider)

- 800xA with three operator workplaces
- Four AC800M controllers
- 1500 tags

Waikaremoana (MSI provider)

- 800xA with five operator stations, four engineering stations
- Thirteen AC800M controllers
- 3600 tags

All sites

- MCM800 vibration monitors, UMC22 motor controllers and ABB variable speed drives
 - all controlled via profibus.
- Serial communications to third party devices

Genesis Energy hydro generation

Tokaanu (240 MW total)

- 4 x 60 MW generators

Rangipo (120 MW total)

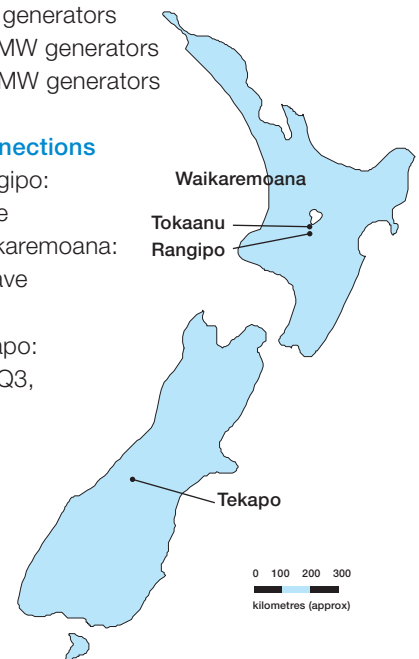
- 2 x 60 MW generators

Waikaremoana (146 MW total)

- Tuai 3 x 20 MW generators
- Kaitawa 2 x 21 MW generators
- Piripaua 2 x 22 MW generators

Bandwidth of connections

- Tokaanu to Rangipo: 4 MB microwave
- Tokaanu to Waikaremoana: 256 kB microwave and telecoms
- Tokaanu to Tekapo: commissioning Q3, 2011



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