

MGI Pilots New Zealand's First Emrgy Turbines



Sheridan Douglas and Craig Evans at the pilot site. The recent end of the New Zealand irrigation season will enable a dry installation of the Emrgy turbines.

New Zealand irrigation scheme Morven Glenavy Irrigation Company Ltd. (MGI) has gravity-driven water conveyance canals that gradually drop more than 300 feet over the course of their flow. There is significant untapped energy in that flowing water, and in order to take advantage of it, MGI is implementing a pilot project involving three of Emrgy's modular hydropower units. In this interview, MGI CEO Craig Evans and Emrgy Australasia Sales Manager Sheridan Douglas tell us about the prospects for this exciting project.

Irrigation Leader: Please tell us about your backgrounds and how you came to be in your current positions.

Craig Evans: I'm a geologist and have worked over a long period of time in a range of industries. My work as a hydrogeologist in the water industry was how I became involved in irrigation. When I was younger, I did irrigation water wells for farmers, town water supplies, and industry. I then migrated into the oil and gas industry and started doing more environmental management and a bit of hydrogeology. I've been in oil and gas, mining, and water. I've spent time in some of the major mining companies, including Barrick Gold and BHP. I moved from being a geologist in a range of sectors to environmental management and project management. I was a major international project manager, working on \$1 billion-plus projects. Now, I'm in general management as the CEO of a much smaller company in the water industry in New Zealand. I have been at MGI for 6 years now.

Sheridan Douglas: I was looking for an opportunity to take the skills I developed working in the private sector

and return to a rural setting. When I became aware of the technology developed by Emily Morris and the Emrgy team in the United States, I jumped at the chance to lead the deployment into New Zealand, Australia, and the Pacific Islands. Not only are there environmental benefits to Emrgy's clean energy generation, but I see the company's work as a way of contributing to the agricultural sector by reducing electricity expenditures, which for many farmers and irrigation schemes are a significant operating cost.

Irrigation Leader: Please tell us about MGI.

Craig Evans: We irrigate 30,000 hectares (74,132 acres) and contract to manage another 4,000 hectares (9,884 acres) in a nearby region. Within our 30,000-hectare area, we have approximately 165 shareholders and 182 firms of varying sizes. Our shareholders range from a few small lifestyle blocks that are only a couple of hectares in size up to large stations. The largest shareholder we have is 3,100 hectares (7,660 acres). There are over 160 kilometers (100 miles) of canals. We've also got several pump areas. We have five pump stations and about 60 kilometers (37 miles) of pipelines as well.

There are seven full-time employees, including me, as well as a number of contractors. All our full-time employees are a bit overworked, and we are considering hiring more staff because our regulatory burdens are getting worse and worse. The government and the regulatory agencies want us to report more and more data.

Irrigation Leader: What are the primary crops grown on your scheme?



Irrigated pastureland on the MGI scheme.

Craig Evans: About 70 percent of the scheme area is dedicated to dairy farming and grass for cows. The other 30 percent are beef, sheep, and deer farmers. Thirty or forty years ago, a lot of the region was just sheep or beef. It wasn't until irrigation became widespread that the dairy industry took over. There are one or two old-school farmers who still use older irrigation practices. About 15 percent of the land in the north of the scheme is in cropping; some people both crop and have livestock. The majority of the croppers grow wheat and canola.

Irrigation Leader: What are the top issues facing your scheme?

Craig Evans: We're doing a lot of work at the moment on improving scheme efficiency. Since we have a gravity scheme, whatever water enters the scheme and is not used en route spills out the end. We call that bywash. One of our management targets is to reduce bywash as much as possible so that we only take the water out of the river that we need. It's challenging, because the travel time through the scheme can be over 8 hours, and you're always trying to forecast what someone might use.

We also have a certain amount of leakage from some of the older canals. We have canals that were built in the 1930s and others that were built in the 1970s. Back then, the environmental expectations were much different; leakage rates of up to 15 percent were accepted. Today, regulators would like no leakage at all, but they're willing to accept up to 5 percent. We've done a lot of work to address leaky areas and to replace inefficient areas with pipelines. We are doing that now, because in 2028 our resource consents will come up for renewal. Those consents, which are like environmental licenses, are generally required for large pieces of infrastructure and can only be granted for a 30-year term. A lot of the work we're doing now is to prepare ourselves for that renewal.

Irrigation Leader: Please tell us about your canal-lining work.

Craig Evans: Our main race has the highest amount of water flowing at the highest velocity of any of our canals, but it is also our leakiest canal by far. We did a number of flow-gauging surveys to identify where the losses were occurring and pinpointed certain stretches that were worse

than others. We identified a 4-kilometer stretch that leaked in an unacceptable way. The leakage itself did not do any harm, and ironically it did good things, such as feeding little streams and wetlands that flowed back into the river that the water in the canal comes from. Nevertheless, it didn't sit well with our efficiency targets for reducing leaks, so we lined it.

There are a few more lining projects we will likely do in the future. We're working our way down the list and prioritizing them. There will probably come a point when the remaining leaks in our scheme are so minor that it will not be cost effective to do anything about them. We're in an area of New Zealand where water is plentiful. We have a major hydraulic river on our back doorstep, the Waitaki River. We need to be frugal about the water we take, but at the same time, we're not particularly restricted. The hydroelectric companies that operate dams in the upper reaches of the Waitaki release the water that we need to operate with.

Irrigation Leader: Please tell us about your interest in placing hydroelectric turbines in your main race.

Craig Evans: For many decades, MGI's board has been interested in hydroelectric generation, because we have intakes that start at 100 meters (328 feet) above sea level and run all the way to the coast. There is a lot of energy involved in the movement of the water, and it's always been considered a shame that we can't harness that energy efficiently. Most hydroelectric technology requires a dam to be placed at a point where there is a certain drop in the water, but our scheme is at a relatively even grade. That means that when we became aware of Emrgy last year, the board's interest was piqued.

There are some regulatory drivers as well. The New Zealand government is doing a lot of work on climate change and reducing carbon dioxide emissions in accordance with the Paris Agreement targets. The New Zealand government takes it very seriously because it wants to hold itself up as a model citizen in the world by striving for the highest environmental standards. A lot of New Zealand's electricity is generated by hydropower, though a small amount is still generated by coal, which is being phased out. New Zealand is nuclear free, so we can't bring in nuclear fission. Wind and solar generation are not going to

meet the needs of the whole market. Hydroelectric dams are frowned upon because there is so much environmental damage from blocking rivers and inundating land. The public doesn't want nuclear, coal, or more hydroelectric. So then what do you do? There's a real interest in making sure that we're using any energy opportunities that we already have to our advantage. There are a bunch of irrigation schemes in New Zealand like us that flow water from a high place to a low place for the purpose of irrigation, so why not harness it for electricity as it goes? Turbines like Emrgy's are exactly what the market is looking for.

Sheridan Douglas: This installation for MGI will be the first Emrgy installation in New Zealand and the first outside the United States, where our turbines are already producing clean, reliable hydropower in areas where conventional methods of hydropower have been deemed unsuitable or cost prohibitive. Emrgy's turbines are a rapidly deployable, modular alternative to solar and wind. They allow an entire water-to-wire system to be installed seamlessly to harvest energy from flowing water. Our product is specifically designed for canal applications where no impoundments or dams are necessary, and importantly, they maintain the integrity of canals for their intended purpose of agricultural irrigation.

As Craig commented, New Zealand has many canals and diversions suited to this technology. We can assist organizations to tap into an unused energy resource to reduce grid-energy reliance and to lower electricity expenditures. There's definitely a growing interest in our turbines, not only as a potential energy generators but also as a combined solution for environmental stewardship and water conservation.

Irrigation Leader: Please tell us about the project you plan to build.

Craig Evans: It's a relatively small footprint at the moment. We plan to use three units with twin turbines, amounting to six turbines total. The power from these particular units will not be used for the scheme. The scheme has pump stations, but they're not in the right place. Emrgy has given us a proposal to power those pump stations, and that may be what we do next, but for now, the power will go to the nearest farmers. Those farmers will hopefully look at these turbines and consider making themselves self sufficient. They may choose to expand the footprint of these turbines at their own cost. We would not object to that, but we would need to develop protocols for how it would work to have turbines owned and maintained by farmers in our canal infrastructure.

Irrigation Leader: What is the time frame for the pilot project?

Sheridan Douglas: The installation of the three twin turbines is confirmed for mid-August. We've got a great

team together using local skills and expertise. We're casting the concrete flumes with a company near Christchurch and working with the scheme's electrical contractor to ensure that there is a smooth and timely installation. The process itself is relatively simple, and once the irrigation season commences in September, these turbines will be ready to generate clean energy for the local farmers.

We're so pleased to be working with MGI on this first installation, and the project is a testament to Craig's determination to be at the forefront of scheme performance and environmental management. We have a long-term plan, beyond this pilot, to deploy turbines to support the power needs of several pumping stations in the scheme. It is also great to see MGI assisting the farmers to reduce their power bills, and in turn their production costs, which can be significant for agricultural operations.

Irrigation Leader: Is there anything else you'd like to add?

Craig Evans: MGI has always considered itself to be a market leader. We're the first irrigation scheme in the company to adopt new technology. Ten years ago, we were the first irrigation scheme in New Zealand to start farm environment plans, which all farmers are now required to have by law. The plans show that the farmers are meeting targets, dealing with effluent properly, applying the right amount of fertilizer, and so on. Being early adopters of environmentally sound technology sits well with us.

Sheridan Douglas: With the country's strong commitment to clean energy combined with incredible water infrastructure, I see a bright future for Emrgy in New Zealand. I hope to see many of our turbines operating throughout the country in the coming years. Emrgy has also recently received funding to expand the application of our modules and to develop technology for deep water and tidal applications, which will broaden our renewable power generation capabilities. I have no doubt we'll see New Zealand also being an early adopter and playing an important part in future developments. 

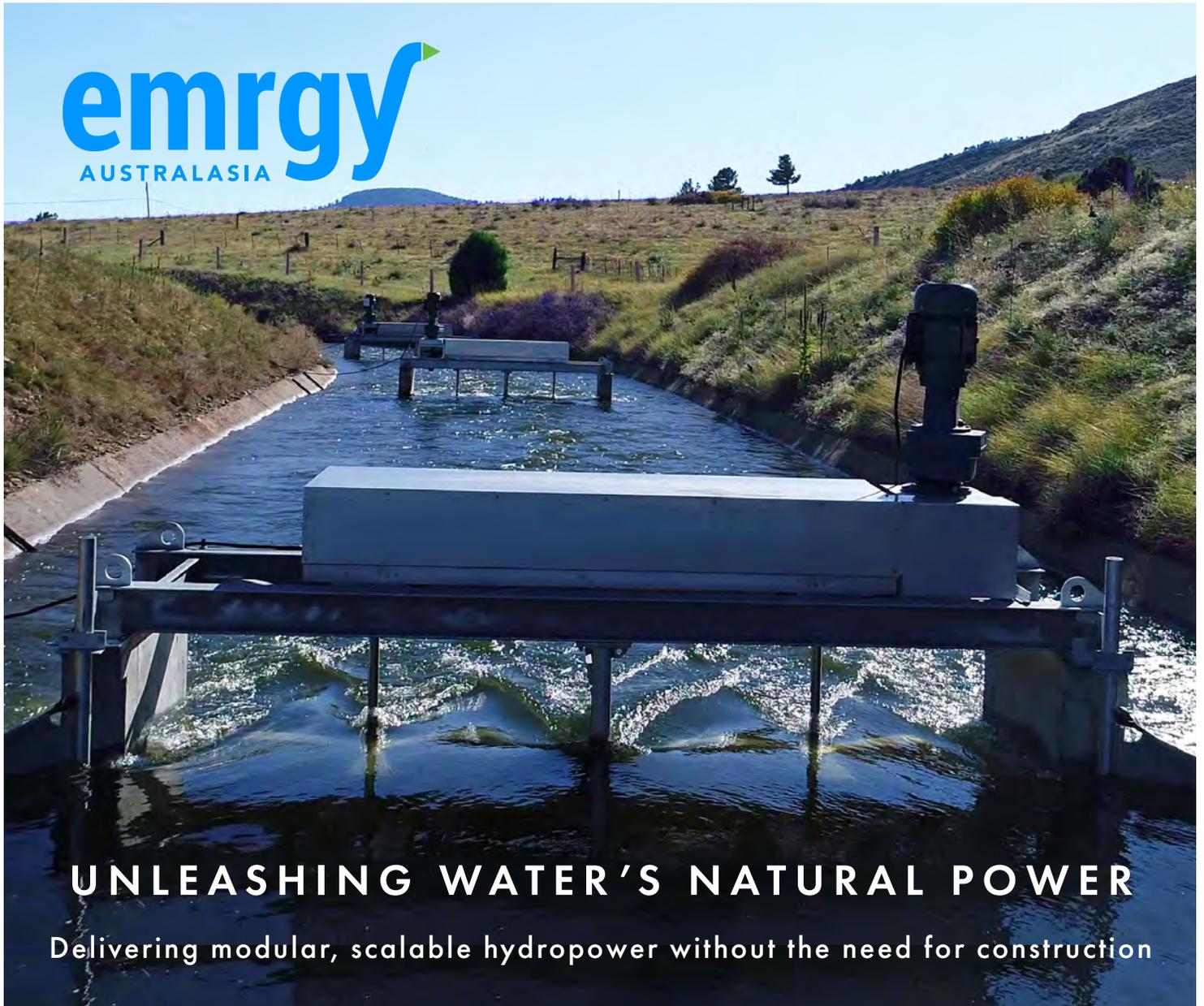


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Emrgy's hydro turbines have been designed, tested and are now being deployed in New Zealand. For further information contact Sheridan Douglas, Sales Manager.