



Community members work to reinstate their heritage hydro power plant

Community-Owned Renewable Energy Mullumbimby (COREM), a volunteer association in northern New South Wales, is looking to reinstate a heritage hydro-electric power station to supply 100% of the town's electricity through renewable energy.

Supported by the NSW Government, COREM carried out a pre-feasibility study that found the hydro-electric power station could be partially recommissioned and a pumped-storage reservoir added. Water can be transferred from the river to the reservoir and then used to produce electricity even if river flows are low. This would generate year-round power and make supply for the region more secure. This type of mini hydro plant combined with pumped storage will be the first of its kind in Australia. The study explored some of the challenges and potential solutions for the project.

COREM is trying to get a licence to access water for the plant by working with key stakeholders and reviewing regulatory requirements. The results of this pre-feasibility study will allow COREM to consider a full feasibility study, including final designs to implement the project. In the future, COREM hopes that the Mullumbimby Mini-Hydro project will become a test case for mini-hydro projects around the country.

Fast facts



Project costs

\$38,000
(\$22,000 from NSW Government)



Potential number of homes that can be powered

240



Potential annual energy generation

Total: 1,230 MWh
Daytime: 400 MWh
Night-time: 830 MWh

Background

Located in Byron Shire in the Northern Rivers region of New South Wales (NSW), Mullumbimby has big renewable energy ambitions and aims to run on 100% renewable energy by 2027. The driving force behind this goal is COREM, a volunteer association helping the town transition to renewables.

COREM understands that to reach this target, Mullumbimby needs to diversify its renewables and boost supply security. Adding hydro to Mullumbimby's energy resources is a preferred solution because there is already infrastructure in place.

Officially opened in 1926, the heritage-listed Mullumbimby Hydro-electric Power Station was decommissioned in 1990, leaving parts of its infrastructure in place. Now, COREM wants to revive the power station to provide dispatchable renewable power, and so the Mullumbimby Mini-Hydro project was born.

Journey

To build support for the Mullumbimby Mini-Hydro project, COREM has spent the last few years establishing relationships with key stakeholders. COREM maintained regular communication with Essential Energy, the owner of the decommissioned power station and the operator of the local electricity network, to gain its support. COREM also consulted Byron Shire Council and community members to gauge interest in the project.

To assess the pre-feasibility of the project, COREM involved power and water consulting

firm, Entura, to serve as the technical consultant and prepare a pre-feasibility study.

One of the main challenges identified in the study was accessing the water required for a mini-hydro project. Under the current *Water Act 1912* (NSW), all water allocations have been made. The only way to access water is to buy back water allocated for consumption, which is expensive for a hydro-electric application.

The study also looked at the technical and economic implications of reinstating the two decommissioned 144-kilowatt turbines at the power station, versus purchasing new equipment. COREM then consulted Essential Energy to get its feedback on the turbine options.

The pre-feasibility study also considered three methods of generation:

- Run-of-the-river—using natural river flows in the wet seasons.
- Pumped storage hydro (PSH)—adding a pumping station and storage reservoir for use during periods of low river flow. This option can also help Byron Shire balance its electricity network—in the daytime, excess solar electricity generated from the shire can be used for pumping, and at night, the hydro-electric plant can generate electricity.
- Hybrid run-of-the-river/PSH design—using run-of-the-river for generation during the wet season, and the PSH solution for the remainder of the year.

‘Community energy projects often find it hard to progress when they don’t have the necessary relationships, so it’s vital to gain stakeholder support early on.’

Svea Pitman, Project Manager, Mullumbimby Mini Hydro Project

Table 1. Challenges and potential solutions

Challenges	Potential solutions
No access to water for mini-hydro plants	Create a new definition in the <i>Water Act 1912</i> for 'dispersive' water use as opposed to 'consumptive' use
Increased investment cost due to the addition of a pumping station and storage reservoir	<ul style="list-style-type: none"> Using staged implementation Research other technologies and funding options
Lack of examples of hybrid run-of-the-river/PSH designs for mini-hydro projects in Australia	<ul style="list-style-type: none"> Consult industry experts for detailed feasibility design Leverage learnings from international projects

Outcomes

With an ever-increasing amount of excess solar energy generated in the region, a hybrid run-of-the-river/PSH design would be the best option — using excess solar to pump water into the top reservoir during the day. This would allow for year-round generation, stabilising local grid voltages, and increasing Byron Shire's energy self-reliance. This type of hybrid mini-hydro project would be the first of its kind in Australia.

This project is an excellent opportunity for legislative reform. There is currently no legal pathway to access water for a project where it is transferred or dispersed within a river system or catchment. This occurs in a mini-hydro project, so a new definition in the *Water Act 1912* is needed.

The study found that the existing turbines at the hydro-electric power station could be overhauled and reused. However, Essential Energy prefers installing new turbines to ensure compatibility with its current technology. The study also considered implementing the project in two stages to reduce the upfront capital costs of a hybrid run-of-the-river/PSH design. The first stage would be to replace the turbines and use natural river flows, and the second stage would be to install tanks and PSH services.

Table 2 summarises each generation option, along with the key benefits.

Table 2. Generation options and benefits

Method of generation	Energy generation and consumption	% of year in use	Key benefits
Run of the river hydro Using natural river flows	1,230 MWh generation	45%	Fastest and cheapest option
Pumped storage hydro (PSH) Day: pumping into storage tank Night: generating power	2,980 MWh pumping demand 1,260 MWh generation	100%	Store energy from solar for use at night
Hybrid run-of-river + PSH Wet season (45% of year): generating power day & night Dry season: day—pumping into storage; night—generating power	1,010 MWh pumping demand 1,660 MWh generation	100%	Year-round generation and solar storage benefits

Findings

- A hybrid run-of-the-river/pumped storage design could generate year-round electricity, boosting the energy security of the region while using renewable sources.
- Stakeholder participation is essential to the success of a community energy initiative such as the Mullumbimby Mini-Hydro Project.
- Legislative reforms would be required, as the *Water Act 1912* does not give mini-hydro projects access to water.
- The pumping scheme—together with a large-scale, community-owned solar system—could balance the local electricity grid, increasing the viability and sustainability of the project.

Next steps

To take the mini-hydro project to the next phase, COREM needs to conduct a full feasibility study to explore the technical and economic requirements of the project in more detail.

Another crucial step will be to create a new definition for water use in mini-hydro projects. This legislative reform would allow COREM to get a licence and access water for the mini-hydro plant. COREM is working with government bodies to continue this reform.

COREM is also exploring Entura's other recommendations, which include:

- repairing the headrace channel, which would convey water to the turbines
- determining the condition of the pipeline
- confirming requirements for reconditioning the turbines and generators
- finding additional historical flow data for the creek that is the water source for the project.

The project has excellent potential to become a test case for the design of a mini-hydro

plant, despite encountering regulatory, technical and stakeholder challenges. Once COREM overcomes these challenges, the group is confident that the Mullumbimby Mini-Hydro project will pave the way for more mini-hydro plants across NSW.

'This hybrid run-of-the-river/pumped storage hydro design is one of a kind in Australia, paving the way for more communities to benefit from having their own small-scale hydro schemes.'

Svea Pitman, Project Manager, Mullumbimby Mini Hydro Project

About the initiative

The NSW Clean Energy Knowledge Sharing Initiative supports the NSW Government's objective to achieve net zero emissions in the state by 2050. The Initiative gives innovators and early adopters an opportunity to test and trial new clean energy solutions. To find out more or learn about similar projects, visit www.energy.nsw.gov.au/clean-energy-initiative.

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