

# Small hydro having a major impact

Gilkes Hydro's successful projects in Malawi demonstrate how small hydropower can make a big difference on the continent, from entire countries down to local communities.

**W**ith hydropower accounting for around 17% of electricity generation on the continent, as quoted by the IEA, Africa boasts a strong relationship with this form of renewable energy.

Indeed, hydropower represents an unrivalled opportunity for economic development and, according to the International Hydropower Association (IHA), hydropower potential exceeds current and medium-term energy demand in Africa while also representing one of the cheapest forms of renewable energy resources globally.

While international investment continues to flood in for its development, it is generally the large-scale projects which dominate headlines and the focus of media attention. Generally, this is understandable given the elephantine capital they require and the variety of organisations involved in their delivery, but it does mean that small hydro projects (generally defined as under 50MW) can go under the radar. This is unfortunate because there are numerous benefits to small hydro which makes it an attractive prospect for the continent.

Requiring just enough water flow and head to make energy generation viable (such as streams, small rivers or even manmade sources like wastewater collection), such projects can be constructed in rural or even undeveloped



The Mulosa small hydro project in southern Malawi.

Image Credit: Gilkes

locations. In addition, generally requiring far less capital to bring to development, small hydro offers short return on investments and a long asset life which can even be scaled up. These factors, combined with their tendency to be much simpler to maintain and operate, make them a formidable addition to be incorporated into Africa's energy mix.

This is a lesson which Gilkes is bringing to the energy table and there are few better case studies demonstrating small hydropower value than their projects in Malawi.

## Mulosa River

The first of these is located on the Mulosa River in the Mulanje District of southern Malawi. It was first identified as a suitable location in 2019 by Cedar Energy (which was established for the purpose of developing small hydropower in the country), who swiftly approached Gilkes for guidance.

After being armed with head and flow data from the client, Gilkes' engineering team selected a twin jet Turgo turbine as the most optimum solution for the scheme. This was based on several factors including the turbine's capability to operate effectively on silt laden water – a characteristic shared by many rivers on the continent.

The simplicity of the Turgo turbine means that minimal service and maintenance is required (making it suitable for the remote location) however the Mulosa scheme remains a manned site. Gilkes engineers trained site operators during the commissioning phase and now offer remote support if required.

The 3MW project on the Mulosa River is purely



The simplicity of the machinery at the Mulosa River means that minimal service and maintenance is required.

Image Credit: Gilkes



grid connected and brings much needed, reliable power to the main grid (Gilkes assisted with the transmission team to commission the grid connection having previously fostered a good relationship with Malawi's power and distribution company: ESCOM).

Notably, the project was delivered in just six months after order placement which allowed power generation to start at the beginning of the rainy season. This achievement is all the more impressive as it was delivered during the arrival of the global pandemic.

### Ruo-Ndiza

At the foot of Mt. Malanje, southern Malawi, can be found a second small hydropower project brought online by Gilkes. Carried out on behalf of Mulanje Hydro (MHL) in two phases over two years, the run-of-river project utilises the flow from both the Ruo and the Ndiza rivers to drive dedicated turbines in the same common powerhouse.

The first phase involved the installation and commissioning of a 3.4MW Pelton turbine using the flow from the Ndiza River, which was closely followed by the delivery of another two 3.2MW Pelton Turbines to harness the flow of the Ruo River and complete the second phase.

The civil works and grid connection were carried out and completed by MHL (with the support of Gilkes) and, like its counterpart on the Mulosa River, also supplies power to the national utility but with an average annual output of 22.3GWh. The system has been designed and installed to allow black start and run islanded and provides support to the ESCOM grid while ensuring the Lujeri tea estates (where they are located) can maintain production with a reliable and stable power supply. When running at full power, the system accounts for around 3% of



The Ruo-Ndiza project has operated well since it was brought online.

Image Credit: Gilkes

Malawi's total grid power, according to Gilkes.

The project was completed in early 2020 and matched expectations in terms of estimated generation within its first full year of operations. African Review caught up with a representative from MHL through Gilkes to find out more details on the project and how it has been fairing since.

Explaining some of the most substantial challenges with implementing this, and small hydro projects, the MHL associate noted that with the locations being remote, the terrain can often pose a test and can require new roads to be built. In addition, often they are quite far from major transmission infrastructure which must also be addressed.

In the case of the latter, for the Ruo-Ndiza project it was identified that the electrical network was of poor quality and that voltage fluctuations would cause significant issues with generating capability of the proposed increase in capacity. Therefore, Gilkes assisted with the grid impact study which highlighted areas of concern

and weaknesses. MHL acknowledged intervention was required and assisted with the network upgrade of the local area while Gilkes made design changes to the generators' capability, allowing the new station to assist with the voltage regulation and stability.

The MHL spokesperson noted that electrical network effectiveness is almost always an issue from any project they undertake; often requiring upgrading or refurbishment. But this is something it has come to expect and plan accordingly.

Nevertheless, understanding these drawbacks make them easier to mitigate in the future and the representative from MHL continued by exploring their view on the importance of small hydro in Malawi. They said, "Small hydro has made, and has the potential for a much larger, positive impact in Malawi and other African countries. Particularly, this can be seen in the effect it has on the reduction in load shedding on the network into which it generates, as well as supplying customers whom had not previously had access to electricity. More investment can be attracted by reducing the risk (perceived and actual) to financiers of these projects."

Since commissioning, the projects have had an immense effect on the local Mulanje network, they continued. "Ruo-Ndiza has continued to operate very well, barring a cyclone event, the results of which were very well mitigated. Consumers are no longer load shed at all (previously every week) and the local community has found gainful employment and has benefited from electrification projects carried out by the hydro operators.

"For the wider country – Ruo-Ndiza provides possibly 5% of the country's energy. More importantly, it was a successful test case showing that IPPs could successfully operate in the country, given the right conditions, and thereby attract further investment." ■



The Ruo-Ndiza project utilises the flow from both rivers.

Image Credit: Gilkes