Hydro Review: Small Islands of Samoa Lead Renewable Energy Efforts

Two small hydro projects constructed in Samoa have increased electricity supply and helped boost hydro capacity to meet a goal of supplying 20% of the total demand of the islands via hydropower.

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Halfway between Hawaii and New Zealand in the vast Paci□c Ocean rests the island nation of Samoa. This nation is one of the □rst to feel the impacts of climate change, with warmer temperatures intensifying El Nino patterns and creating higher-intensity storm events. As a necessary result, Samoa is becoming a leader in renewable energy generation, spearheading the drive in the Paci□c for 100% renewable energy to be achieved.

Most recently, renewable energy supply on the two islands that make up Samoa has increased by 34%, taking the total renewable energy contribution to 46,158 MWh. The increase is both from private development often via independent power producer (IPP) arrangements and from the various donor parties, including the New Zealand Government, European Union and Asian DTS via independent Zeala1 .E angements and from DTS via independent

projects involved a short spur line of the existing transmission, were undertaken by EPC.

design and construction of the projects was their resilience to natural disasters and climate change.

For resilience to natural disasters, the 3.5-km-long penstock for the Ta□toala-Fausaga scheme was placed below ground and the powerhouse was waterproofed up to 1 m from its □nished □oor level. Much of the decision to integrate such measures in the design for the Ta□toala-Fausaga scheme were direct results of lessons learnt from the damages caused by Cyclone Evan in 2012, whereby the damage to EPC's hydropower infrastructure was concentrated on its aboveground steel penstock pipes and direct □ooding of the powerhouse.

In addition, turbine runner erosion due to sedimentation is an ongoing issue in Samoa. Traditionally, sedimentation has been removed from water via large desanding basins, which require constant maintenance through □ushing and can be costly. As an alternative, 1-mm Coanda screens were used for these new schemes. This alternative approach allowed for the screening of sediments at the intake, reducing the risk to the turbines and the need for constant operation and maintenance. To our knowledge, the use of these types of screens was a Paci□c □rst. Since going into commission, the intakes are achieving their design objective.

Considering the pipeline for small hydro can account for between 40% and 60% of the overall capital cost, GRP is a very cost-effective solution for small hydropower. The key to success is having the skills and resources to install the pipe. In addition, there are advantages to a coupler-type arrangement over other alternatives, such as welding, which require strict quality assurance. The joint venture team of Pernix and MAP brought their previous experience of working with GRP in New Zealand to the Samoan projects, which was critical to achieving successful testing.

While it was desirable to place most of the pipes underground, it was not possible on every occasion. The Faleata scheme could only be accessed via a walkway up the river, making machine access to the intake and initial section of pipeline impossible. Thus, construction of a trench was out of the question. The Pernix/MAP JV team developed an innovative technique of manually handling and installing pipes up to the