

First impounding of Arenal dam in Honduras

Impounding of the Arenal reservoir on the river Yaguala in central Honduras was launched in early November. Filling of the reservoir, which will have a maximum storage capacity of approximately $70 \times 10^6 \text{ m}^3$, is expected to take at least one month, depending on the river discharge, according to the Lombardi Group, Switzerland, who is acting as Owner's Engineer.

Commissioning of the hydropower facilities, totalling 61 MW, is expected in early 2022.

The Arenal I-II project, in the municipalities of Arenal and Olancho in the north central department of Yoro, comprises a 93 m-high, 273 m-long RCC arch gravity dam with a concrete volume of $305\,000 \text{ m}^3$, a 4.6 km-long headrace tunnel with two tunnel adits, two 270 m-long steel penstocks with diameters of 2.40 m, a

94 m-high surge shaft, a main hydro station equipped with two 30 MW vertical axis Francis turbines, and a secondary plant at the toe of the dam with a capacity of 1.12 MW, which will generate power from environmental flows. Power will be supplied to the national grid through a 25 km-long, 230 kV transmission line.

The project is being developed on behalf of Energias Limpias Del Yaguala SA de CV, a subsidiary of one of the leading power producers in Honduras, by an international consortium. The construction of the RCC dam, hydraulic tunnels and related civil works were carried out by Sinohydro. The Chinese state-owned hydropower engineering and construction replaced in 2018 the original civil works contractor, a joint venture of Italian construction groups Astaldi and Ghella, whose

€101 million (US\$ 113 million) contract awarded in 2017 was revoked. A joint venture of GE and STE Energy of Italy supplied the electro-mechanical equipment (GE supplied two 30.7 MW Francis turbines and generators and STE Energy provided a 1 MW Francis turbine and the complete balance of plant). IIA Tecnologías Especializadas of Honduras supplied the hydro-mechanical equipment and Spain's Equinsa supplied the transmission line and HV switchyard. The hydro plant is expected to generate average annual net output of approximately 230 GWh, based on a load factor of around 44 per cent, under a net head of 130 m and a design flow of $51 \text{ m}^3/\text{s}$. Lombardi has been in charge of the engineering services from prefeasibility study to detailed design and site supervision.

Uniper installs further battery systems at Swedish hydro plants

Uniper of Germany has begun installing two new battery systems with a total capacity of 12 MW at the Bodum and Fjällsjö hydropower plants in Jämtland in Sweden. The new batteries, which will be delivered by the engineering and technology company Nidec Industrial Solutions (NIS), part of the Nidec Group, are scheduled to be operating in time for the spring flood next year, according to a company statement on 26 October. "As weather-dependent electricity production is expanded, the need to utilize hydropower's regulatory capacity also increases. With our battery system in Sweden, we can make better use of the flexibility of

hydropower and thus increase the stability of the electricity system", said David Bryson, Chief Operating Officer of Uniper.

Uniper and its majority shareholder, Fortum, the Finnish state utility, have been investing in battery systems to operate in conjunction with hydropower to support the grid. Earlier this year Uniper commissioned two battery systems at the Edsele plant in Ångermanland and the Lövön plant in Jämtland, with a total installed capacity of about 21 MW.

Fortum has similar installations at Forshuvudforsen and Landaforsen, with a total capacity of 6 MW. These investments have made Uniper and

Fortum leading players in hybrid battery-hydropower systems, which allows for electricity storage provided by hydropower reservoirs to be combined with batteries for rapid frequency adjustment. Thanks to hydropower, the battery doesn't need to have such a large storage capacity. "So far, the battery technology has shown great potential and our first operating season has more than met our expectations. Now we are anxious to continue the expansion," Johan Svenningsson, CEO of Uniper Sweden, said. The plan is a broader implementation in Europe where Uniper and Fortum operate large hydropower fleets.

Cantoniera dam to be reinforced in Sardinia, Italy

The Cantoniera dam and reservoir in Italy, where reinforcement work is to take place.



Studio Pietrangeli has signed a contract with Ente Acque Della Sardegna (ENAS), the water authority of Sardinia, for the design and con-

struction supervision of the structural rehabilitation of the Eleonora d'Arborea alla Cantoniera di Busachi (Cantoniera) dam. The aim of the assignment is to improve the safety standards through the structural reinforcement of the lateral segments, ensuring full use of the reservoir's water resources, the company announced in early November. Cantoniera is a 100 m-high buttress concrete gravity dam located on the Tirso river, near Busachi in Sardinia's central province of Oristano.

The dam, which comprises 36 hollow segments, was built by Grassetto Costruzioni, and was commissioned in October 1996. It suffers

from stability problems as a result of the characteristics of the rock mass it is founded on.

Lombardi of Switzerland has been providing owner's services to ENAS since 2004, and is involved in the management and control of the monitoring system of the dam. Using the MIC software developed by the company, Lombardi analyses the monitoring data and regularly produces interpretation reports on a semi-annual basis. These reports are part of the acceptance period of the dam. With a crest length of 580 m, the dam impounds a reservoir with a total storage capacity of $792.84 \times 10^6 \text{ m}^3$ and an active storage volume of $745 \times 10^6 \text{ m}^3$.