

# Switzerland

**D**ue to its mountainous landscape and the presence of numerous rivers and streams, Switzerland can be described as the water tower of Europe.

Today, Switzerland has 565 hydropower plants of a power equal to or greater than 300 kW, which produce an average of 35,870 GWh every year. Around 47% of these are run-of-river power plants, 49% are storage power plants and there is about 4% of pumped-storage power plants. Two thirds of all electricity produced in Switzerland comes from the alpine counties of Bern, Uri, Graubünden, Ticino and Valais. In order to ensure sufficient water supply for the power plants, Switzerland has built numerous dams and water-storage structures, the earliest of which dates back as far as the 19<sup>th</sup> century. In total, 83% of Switzerland's dams are intended for hydraulic power supply.



▲ View on HPP's Innertkirchen & Handeck at Rätichsbodensee



▲ ANDRITZ HYDRO in Vevey, which celebrates the 150 year anniversary of the first hydro turbine

The former company Ateliers de Constructions Mécaniques de Vevey, a predecessor of ANDRITZ HYDRO, manufactured the first hydraulic turbine in Switzerland back in 1863 exactly 150

years ago. This anniversary was duly celebrated on 27 and 28 September 2013 in Vevey. On this occasion, the region's most important politicians and businessmen met on Friday evening for a buffet dinner in the hydraulic laboratory, the event's main location.

The local population and staff from ANDRITZ HYDRO Switzerland were invited to visit the test rigs. With these models, the real conditions under which turbines normally operate are being simulated. The hydraulic laboratory is the Center of Competence for Pelton turbines. People of all ages were able to get to know what we do, by means of various demonstrations.

This event was a great moment of exchange and cordial togetherness, which will be remembered for a long time.

## **HPP Innertkirchen 1 (INN1E) & HPP Handeck 2 (HA2A)**

ANDRITZ HYDRO recently received an order from KWO, Kraftwerke Oberhasli AG, for two turbine lots and one generator lot as part of the Innertkirchen 1 power plant and Handeck 2 power plant upgrading projects. The order includes the delivery, installation and commissioning of two vertical 6-nozzle Pelton turbines with outputs of 150 MW and 90 MW respectively, as well as a vertical synchronous generator with an output of 165 MVA.

These power plants, built over 60 years ago, are being upgraded in line with present-day considerations. The construction of a second turbine water channel, which runs parallel to the existing one, will reduce the water's flow



▲ Verzasca dam

rate, thus also reducing the friction losses in the pressure lines. This allows the power plants to obtain more energy from the water they are using. At the same time, it becomes possible to install an additional machine in each of two ancillary caverns to be situated directly beside the two power plants, thus increasing the total output by 280 MW in all.

With this upgrade of the power plants, KWO is helping to meet the rising demand for peak energy and balancing power to compensate wind and solar energy which normally cannot be planned easily. The additional energy obtained amounts to 70 GWh per annum, thus covering the requirements of more than 14,000 households.

### HPP Gordola

In an initial phase, ANDRITZ HYDRO received an order from Verzasca SA, Officina Idroelettrica, Lugano, to overhaul the three vertical-axis Francis turbines at the Gordola power plant. This order is part of an upgrading project and encompasses the dismantling, installation and commissioning of the machines. It also covers the delivery of new components, such as turbine

shafts and intermediate shafts with new coupling components, coupling covers and labyrinth rings. The core of the order consists of the delivery of three new Francis runners and a reserve wheel with an improved hydraulic contour for increased efficiency.

In a second phase, ANDRITZ HYDRO also received an order for the conversion of the three generators – increasing the output by 14%, from 33.3 MVA to 38 MVA. The delivery includes completely new stators, refurbishment of the poles, replacement of the pole windings, new fans, new drive shafts for the intermediate shafts, new coupling fastenings and a complete shaft assembly analysis.

With this power plant upgrade, Verzasca SA (two-thirds of which is owned by the city of Lugano and one-third by the canton of Ticino) is helping to meet the rising demand for peak energy and balancing power and is not so dependent on variable output wind and solar energy. The increased efficiency enables the production of around 6 GWh of additional energy.

Doris Marbacher  
Phone: +41 (41) 329 5617  
doris.marbacher@andritz.com



▲ Machine hall at HPP Gordola

### TECHNICAL DATA

#### Innertkirchen 1:

Output: 150 MW / 165 MVA

Voltage: 13 kV

Head: 665 m

Speed: 375 rpm

Runner diameter: 3,485 mm

#### Handeck 2:

Output: 90 MW

Head: 457 m

Speed: 333 rpm

Runner diameter: 3,200 mm

#### Gordola:

Output: 38.8 MW / 38 MVA

Voltage: 10 kV

Head: 255 m

Speed: 600 rpm

Runner diameter: 1,670 mm

