Ashta 1 & 2: Operational Experiences at the world's largest HYDROMATRIX® plant

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1 General

In the period of 2008 – 2013, ANDRITZ HYDRO played a key role in the successful development and construction of the Ashta 1 & 2 HYDROMATRIX® (HM) plant in Albania. Energji Ashta, a joint venture of VERBUND AG and EVN, has inaugurated the Ashta 1 plant on 18 September 2012. Ashta 2, the second stage of the plant cascade, started commercial operation in December 2012 and was taken over by the customer in June of 2013.

The innovative HM technology as well as professional project development and site management of all involved parties allowed the realization of this hydropower plant and make the Ashta plant a showcase for a successful hydropower project.

Apart of a brief description of the project, the paper outlines the milestones in the development process and key aspects of the design and site works. Based on the experiences made during the project development and construction works at Ashta, the paper summarizes the operational experience with regards to the development and execution of complex hydropower projects.

2 Ashta 1&2 HYDROMATRIX® Plant

2.1 The plant concept

The Ashta 1 & 2 Hydropower Plants are located on the Drin River near the city of Shkodra in Albania. Ashta 1 is located next to the Spathara weir which already existed prior to the construction of the new power plants.

The weir creates the downstream boundary of a tailrace reservoir belonging to the Vau I Dejes hydropower plant which features conventional large Francis turbines.

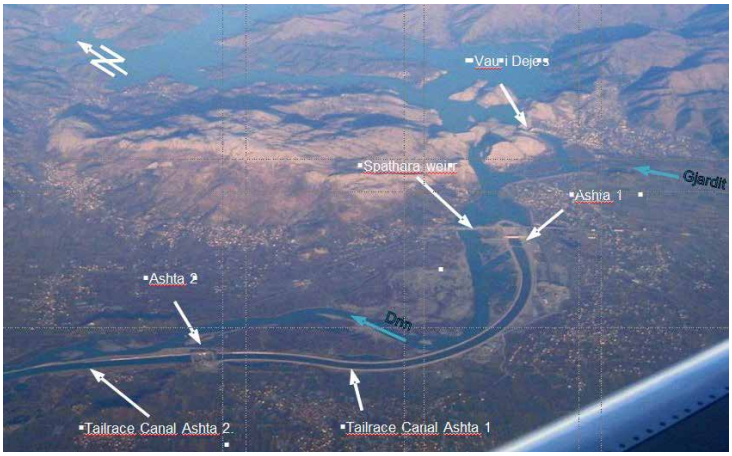

Figure1: Aerial View of Ashta 1 and 2 power plant complex

Figure 1 shows an aerial view of the entire plant complex including the Vau I Dejes plant located upstream.
The Ashta 1 plant stage is located to the left side of the existing weir and equipped with an intake trashrack and associated trashrack cleaning machine (see Figure 2).

Figure2:Upstream View of Ashta 1

The tailrace of Ashta 1 consists of a 6 km long canal connecting it with Ashta 2. A small channel for residual river flow discharge and upstream fish migration connects the tailrace of Ashta 1 with the Drin River.
Adjacent to the intake of the power plant, a fish ladder was created which ends in the residual discharge channel.
Figure 3 shows a plan view of the intake area of Ashta 1.

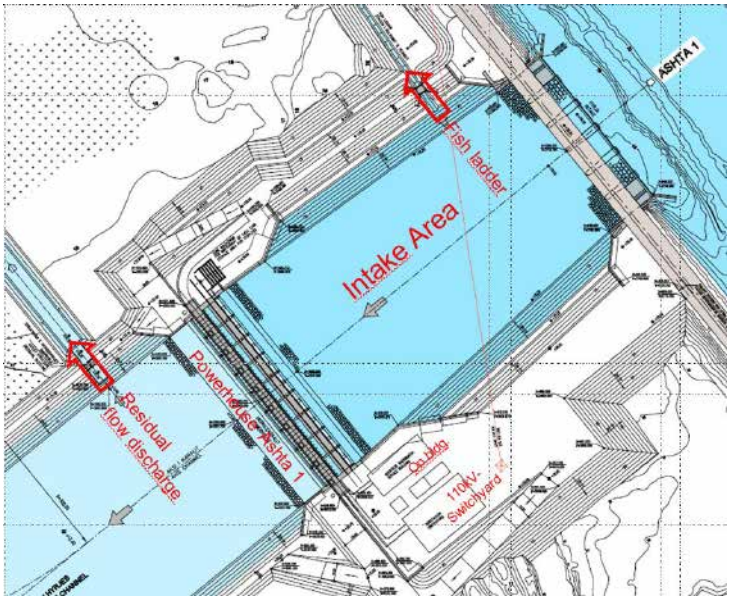

Figure3: Intake Area of Ashta 1 (Plan View)

With the exception of the trashrack, the Ashta 2 plant has a similar plant arrangement to Ashta 1. Its tailrace is connected with to the Drin River via a short canal. Ashta 1 and 2 have been designed as run-of-river plants which primarily use the water discharged by the Vau I Dejes Plant and the Gjardit River. Vau I Dejes is also used for grid control purposes requiring frequent star/stop cycles of one of the large turbines which subsequently lead to frequent start/stop cycles of the Turbine-Generator-Units (TG-Units) at Ashta 1 and 2.

2.2 Electro-mechanical equipment

Each power plant is equipped with forty-five (45) HYDROMATRIX® TG units. The units are arranged in nine (9) sections of five (5) units each in one row at the upstream face of the newly constructed concrete powerhouse. The draft tubes itself are embedded in the powerhouse structure. The hydraulic power units for the operation of the draft tube gates and the generator switchgear and step-up transformers for each individual section are installed in an underground gallery located above the draft tubes. Figure 4 shows a sectional view of the plant arrangement for Ashta 1.

The TG-units are held in their respective operating position by using hooks and can be raised individually for maintenance purposes along guide rails, which are mounted to the upstream face of the powerhouse. The power and signals coming from the TG-Units are transferred to the generator switchgear and control system via underwater cables. The cables are routed inside flexible cable chains to the top of the powerhouse and into the underground gallery via conduits. Figure 5 shows TG-Units at Ashta 2 in raised position with the upstream water level in the channel drawn down.
The water flow through the turbines can be started or stopped separately for each TG-unit by a hydraulically operated sliding gate located on the downstream side of the draft tube.
For lifting of the TG-units into their maintenance position, a 25 ton gantry crane with a 3.2 ton auxiliary hoist is used. The crane can travel across the entire powerhouse length and is also used for setting the downstream stop logs and for servicing the draft tube gates.
The trash rack cleaning machine at Ashta 1 can also be used to place upstream bulkheads which allow the drainage of one intake section for inspection.

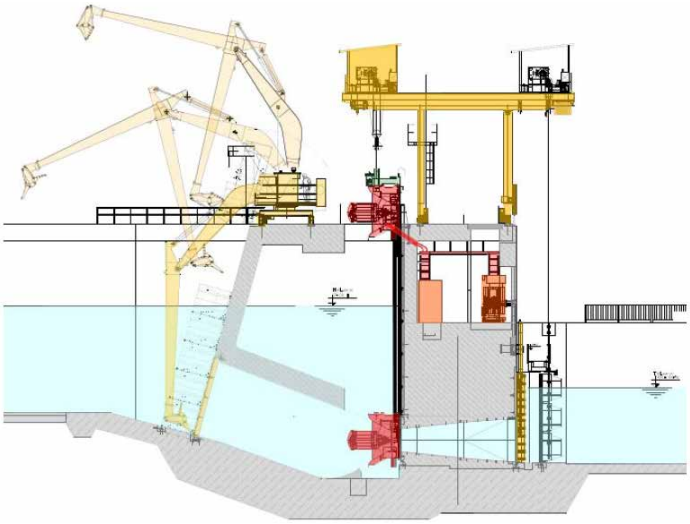

Figure 4: Sectional view of Ashta 1 plant arrangement

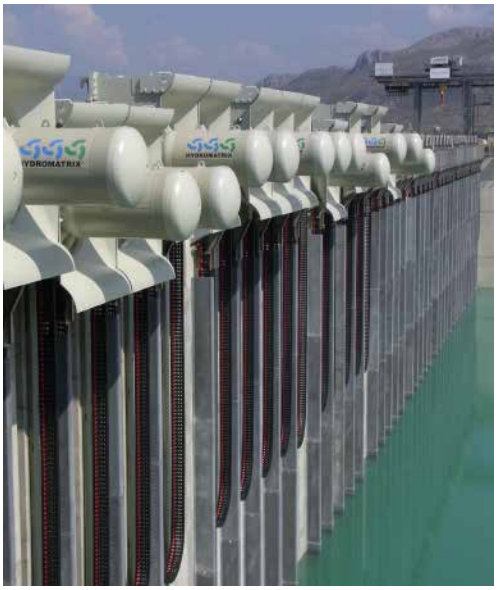

Figure 5: Upstream View of raised TG-Units at Ashta 2

Technical Data	Ashta 1	Ashta 2
Plant capacity:	24.03 MW	45.14 MW
Head:	4.98 m	7.53 m
Speed:	300 rpm	375 rpm
Unit Output:	534 kW	1,003 kW
Runner diameter:	1,320 mm	1,320 mm
Number of units: 5	45	45
Average yearly energy production:	98.5 GWh	145.5 GWh

3 The development process

Over the last decades, the Albanian power grid experienced long and frequent power outages which were caused by drought, the deterioration of the grid system and the subsequent neglect to build new generating capacity. As a result, a large percentage of the power demand in Albania had to be

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