TAJIKISTAN'S POWER GENERATION BACKBONE

PROJECT STORY — NUREK, TAJIKISTAN

Nurek, Tajikistan - The largest hydropower plant in Central Asia is being rehabilitated and modernized by ANDRITZ with an increase of power output to 3,400 MW.

The Nurek hydropower plant, located about 75 km from the Tajik capital, Dushanbe, has been providing clean, renewable energy to the region since 1972. It is the largest hydropower plant in Central Asia and when built had a generating capacity of 3,000 MW. It covers more than 70% of the national electrical energy demand and also provides irrigation for more than 700 km² of agricultural land in the region. In addition, Nurek supports the neighboring countries of Uzbekistan, Afghanistan and Pakistan, supplying them with energy during the peak seasons over the year. A special grid project called "CASA 1000" connects the countries and was established for this purpose.

More than 40 years since its commissioning, no major rehabilitation of the hydromechanical and electrical equipment had been undertaken at Nurek.

"After modernization, the installed capacity of the generating units will be increased by about 12%."

As the plant is of the utmost importance for the security of energy supply not only for Tajikistan itself but for the whole region, in 2018 the "Nurek Hydropower Rehabilitation Project" was launched. The objective of this program is to rehabilitate and restore the capacity of all nine power generating units, improve their efficiency, and enhance the safety of the Nurek dam. Furthermore, after the refurbishment, the total generating capacity will be increased to 3,400 MW.

MODERNIZING A KEY ENERGY ASSET

In 2018, ANDRITZ received a contract for the modernization of the entire electromechanical equipment of the Nurek hydropower plant, including the inspection and repair of the nine penstocks.
The ANDRITZ scope of supply comprises comprehensive modernization of the existing generating units by supplying and installing new 375 MW Francis turbines, new generators, new transformers, as well as the electrical and mechanical auxiliary equipment within

the powerhouse. After modernization, the installed capacity of the generating units will be increased by about 12%.

The rehabilitation work will be executed in two phases. In the first, three units with their auxiliary equipment and transformers will be replaced as well as executing improvements for the dam safety. This first phase is planned to last for five years, from 2019 to 2023. The second phase of the project covers the reconstruction of six remaining units and auxiliary equipment of the station and will be implemented over six years from 2024 to 2030.

The design of the new units considers the plant's annual storage operations and will, therefore, be suitable for operation with a wide range of hydraulic heads. This refurbishment project will also optimize water storage management on the Vaksh River cascade, ensuring a significant increase in electrical energy production, as well as meeting changing grid demands. ANDRITZ' contract also stipulates that environmental conservation measures and water management requirements must be incorporated.

The rehabilitation of Nurek will safeguard the electrical energy supply in the Republic of Tajikistan and make an important contribution toward the strategic use of renewable energy from hydropower in Central Asia. It also offers interesting opportunities for exporting energy to neighboring countries with related economic benefits for the countries concerned.

RECOGNIZING NUREK REFURBISHMENT RESULTS

Work at Nurek is making good progress. In April 2022, after refurbishment of the

"As part of the modernization program, the world's largest spherical valves to date were rehabilitated in Nurek."

world's largest spherical valve – with a diameter of 4,200 mm and a remarkable total weight of 780 tons – it was lifted on to its foundation and could be successfully re-installed. Following the filling of

Installation of the turbine shaft and the guide apparatus on Unit A-1

Installation of the generator rotor into the pit of Unit A-1

Housing of the main inlet spherical valve after refurbishment

the penstock in May 2022, the synchronization of the first fully rehabilitated unit with the Tajik power grid was carried out in June 2022. The unit produced its full power of 375 MW for the first time and thus helped to cover the high national energy demand seen during this period.

In October 2022, the President of the Republic of Tajikistan, Emomali Rahmon, visited the Nurek construction site and officially commissioned the first rehabilitated machine, Unit A1. The President was informed about the progress of the project and was more than satisfied with ANDRITZ' professional rehabilitation work.

The Nurek hydropower plant is of major importance to the region and is an impressive example of the value of renewable energy. It is also a testament to the power of engineering, and the dedication and expertise of ANDRITZ in providing clean energy to the people of Tajikistan. Refurbishment of the plant will improve the lives of many people in the area for decades to come.

TECHNICAL DETAILS

Total output: ~ 3,400 MW
Unit rated power: 9 × 375 MW vertical Francis
Max. head: 265 m
Rated discharge: 170 m^3/s
Runner diameter: 4,700 mm
Valve diameter: 4,200 mm
Av. annual energy production: 11,250 GWh

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ANDRITZ site team together with the installation company TGEM

Site Manager Nelson Sequeira and Project Manager Hubert Schönberner on site during the official inauguration of Unit A-1.