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The Grand Coulee Turbine Rehab Experience

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Abstract

In 1997, the US Department of Interior, Bureau of Reclamation (Reclamation) awarded contracts to four (4) turbine manufacturers for competitive model testing for the largest U.S. rehabilitation project, the Grand Coulee Left & Right Powerhouses. The contract comprises 18 Francis turbines (120 MW each) and consisting into three (3) different runner designs. For the replacement runners, high efficiency gains were targeted and strongly evaluated. A consortium formed of VA Tech, MCE and GE Hydro (now all ANDRITZ HYDRO) was awarded the contract after a successful competitive model test for U#1-6.

Throughout the project execution, numerous challenges were faced by both, the owner and the electro-mechanical equipment manufacturer. Amongst these, elaborated technical solutions were developed for the hydraulic passageways, the stationary components and the replacement runners, manufacturing of new runners with cold pressed austenitic steel plate blades, shaft alignment in 3 segments, existing generator thrust bearings deficiencies, and accurate unit efficiency measurement. In the latter case, a detailed CFD study of penstock was performed and many tests were performed with different arrangement of ultra-sonic flow measurement paths. Besides, the project management had to deal with the long contract lifetime due to the large number of units, the continuity in supplier base, the application of cost escalation clause and the schedule acceleration.