CASE STUDY

BLUE LAKE EXPANSION PROJECT, City of Sitka, Alaska

GILKES HYDROPOWER SYSTEMS

KEY STATISTICS

Customer: City and Borough of Sitka
Net Head: 356 ft
Flow: 255 cfs
Turbine type: Francis G150
Number of Turbines: 3
Power (kW): 7.140 MW Each
Runner Mean Diameter: 1050mm
Speed: 514.3 rpm
Date of Commissioning: 2014

SCOPE OF SUPPLY

- 3 x 1050mm G150 Francis reaction turbines fitted with hydraulic actuators.
- Set of inlet pipework up to the flange of the main inlet valve.
- Main inlet valve, double flanged 1400mm butterfly valve, weight to close hydraulic actuator to open. Inc. bypass system.
- Weld prepped Inlet Pipe upstream of MIV.
- 9511 kVA Synchronous Generator, with the turbine runner supported on flange end overhung shaft. Inc. PMG, brake, flywheel and cover.
- Individual control panels, Individual hydraulic power units.
- Individual cooling water and pressure sensing panels.
- Full set of O&M manuals.
- Additional 'Fish Valve Unit' 1625 kW Francis Turbine.

The City of Sitka is situated on the west side of Baranof island in the southeast panhandle of Alaska. Sitka receives almost three times more rain than Seattle and this water is used in two hydro electric power plants to supply 100% of the required electricity to the town. In recent years, Sitka has experienced load growth due to rising oil prices and as the oil prices continue to rise, the small island town of approx. 10,000 residents, relies more on electric heat.

The two existing Blue Lake hydro power turbines would no longer supply enough power to the city and additional power sources were explored. To satisfy the additional and future power requirements of the city it was decided that a new, larger hydro power scheme would be installed to replace the existing two units.

In 2010 Gilkes were awarded the contract to supply the new turbines and associated equipment. Primarily the arrangement would be 3 x 7.140 MW Francis units but also a smaller 1625 kW Francis unit would be installed to utilise the water that must be pumped into the river down from the Blue Lake dam to conserve the Salmon population.

The project was reliant on a vast civil project that was undertaken by the City. The height of the dam had to be increased by 83', there was to be a new power house, new intake, new penstock and new surge chamber.

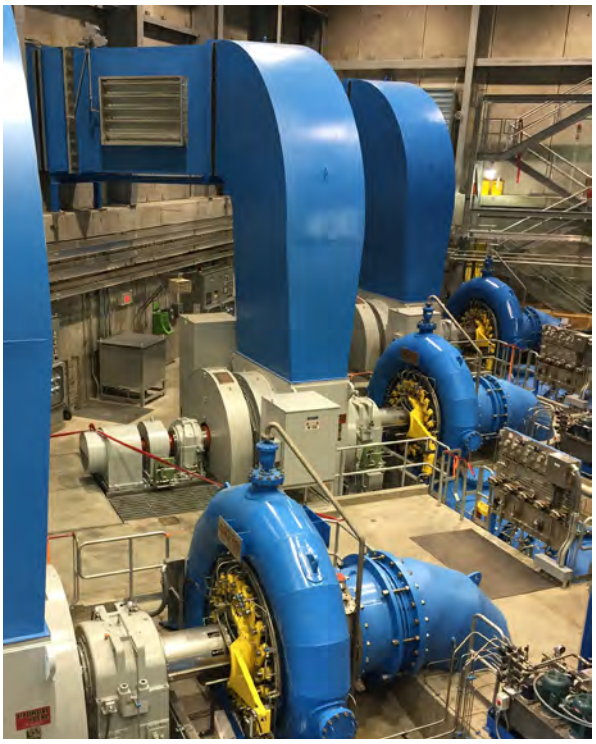
With the City of Sitka scheme being an islanded system, grid stability was a major factor in the whole design. The output has to be governed to the load requirement of the city, rather than feeding in to a national grid. To help combat this stability issue, all three units were designed with the ability to run as a Synchronous Motor to help stabilise fluctuations.

To aid efficiency, Gilkes upgraded the runner design as well as increasing the number of segments that made up the turbine case. Different elements of the supply were procured from specialist suppliers from around the globe, including the UK, Canada, Italy and USA which resulted in high quality equipment to a very high specification.

The installation of the turbines commenced in February 2014. During this installation process, the two existing units continued to run to provide power for as long as possible into the installation/commissioning process.

Once Commissioning of New Units commenced the water supply to the existing turbines would be permanently cut off and the new penstock would be pressurised. Other turbines and Diesel Generators would be utilised to compensate the loss of Generation but would be limited by the draining Lake Level at the Green Lake Hydro Site and the high cost of diesel. Commissioning time had to kept to an absolute minimum.

Commercial Operation Started November 2014 and since then the units have exceeded their guaranteed average efficiency value by over 4%. Another major success of the equipments performance is how stable the grid now is, so much so that the units have yet to even run in their synchronous condenser mode.



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DESIGN / ENGINEERING / MANUFACTURE / INSTALLATION / COMMISSIONING
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