

CASE STUDY

YOUNGS CREEK - Washington, USA



KEY STATISTICS

Customer: PUD NO. 1 Snohomish County, Washington

Location: Southeast of the City of Monroe, Washington USA

Head: 268m

Flow: 3.396 m³/s

Turbine type: 1850 Horizontal Twin Jet Pelton

Speed: 360rpm

Turbine power output: 7983kW

Generator output power: 7775kW

In October 2011, the Snohomish County Public Utility District opened the first new hydroelectric project in Washington State in nearly 20 years. The \$29 million project located south of Sultan generates enough power, on average, for about 2,000 homes.

The Youngs Creek Project gives the PUD greater flexibility with its power supply as it's a locally generated, reliable resource that provides energy at times of the year when it's needed the most.

Gilkes supplied a complete water to wire solution for the project. The turbine was designed in the UK and completely manufactured, assembled and tested in North America. The Pelton runner was manufactured from fully CNC machined forging and all ancillary equipment as far as possible was designed and sourced in the USA.



1. Turbine shaft manufacture



2. Machined Pelton runner



3. Runner installed



4. Turbine Installation

CONTACT

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GILKES

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Gilkes scope of supply

- Inlet piping to connect to penstock
- Turbine inlet valve and bypass system
- One horizontal-shaft twin jet Pelton turbine and inlet piping
- Hydraulic Pressure Unit
- One 6.9KV synchronous generator with brakes.
- Air-blast bearing oil cooling system
- Brushless excitation system, voltage regulator and associated equipment, including instrument transformers.
- Generator switchgear assembly
- Neutral grounding equipment. Surge capacitors and lightning arrestors
- Generator breaker and instrument transformers
- Generator step-up transformer, circuit switcher and disconnect switches
- Station service equipment, including transformer, circuit breaker, AC and DC panel boards, DC station battery system, and inverter
- Auxiliary equipment and station services motor control centre
- Two propane back-up generators with instruments and controls
- Generator and turbine control system, including protective relays, RTU for utility communication, meters, instruments, synchronizing equipment, programmable logic controller (PLC), a panel mounted Human Machine Interface (HMI), and desktop SCADA PC based operator's terminal and monitor
- Intake control panel including PLC and communications equipment for monitoring and remote control of the intake
- RTU and communications equipment
- Shop set-up and assembly of mechanical components prior to shipping
- Factory acceptance testing of turbine, generator, step-up transformer and control panel prior to shipment
- All other related equipment to provide a complete "water to wire" generating system
- Integration and coordination of all equipment and controls to provide a complete system
- All required anchor bolts and foundation plates for mounting of turbine, valves, generator, and ancillary equipment
- Delivery and offloading at the project site
- On site supervision of installation of all above equipment
- Commissioning and start-up services including field-testing
- Operation and troubleshooting of the completed project during a 10-day test period
- Performance testing of the installed turbine/generator

The design of the equipment listed in the scope of supply included the following activities

- Determination of all equipment weights, loads and stresses due to both normal and possible abnormal operating conditions
- Design and preparation of shop drawings detailing all interconnecting electrical wiring between equipment components supplied
- Interconnecting wiring drawings including conductor type and size, terminal strip and conductor connection details and designations.
- Conduit routing drawing and schedule showing all required conduits, their size, starting and ending points, and number and size of conductors required in each conduit.
- A complete instrument list with function, control wiring, and set-points.
- Detailed logic diagrams illustrating the control logic of plant start- up, operation and shutdown logic programming of all plant control, PLC, and remote communications systems
- Testing of PLC programming and remote system operation prior to shipment
- Calculation of protective relay settings through performance of a relay coordination study. All protective relays were then be pre-set at the factory before shipment
- All protective relays were double-checked for proper setting and operation in the field prior to plant start-up
- Calculation of unit stability and frequency control stability parameters, including water hammer analysis, water starting time, unit inertia pipeline pressure rise and initial needle jet controller gain (proportional), integral and derivative settings to keep penstock pressure rise under all load rejection and system operating scenarios to 10% or less

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The logo for Gilkes, featuring the word "GILKES" in a bold, red, sans-serif font. The letters are closely spaced and have a slight shadow effect.