CASE STUDY
INVERLAEL, SCOTLAND

Key Statistics

Head: 120m
Flow: 1200 l/s
Turbine type: 2 x 500 G130 Francis
Speed: 1000 rpm
Output power: 1250kW

Inverlael is a run of river hydroelectric scheme which is located within the Lael Forest at the South end of Loch Broom, 10 miles from Ullapool in Wester Ross, Scotland. Gilkes was selected to supply the generating equipment for this scheme. Inverlael Hydro Scheme takes water from a catchment area of approximately 16km2, including water flowing off Beinn Dearg and surrounding summits. Water is abstracted at two intake weirs on the River Lael and Allt Mor which feeds into 3.2km of buried pipelines to a powerhouse containing two turbines and generators as well as a transformer and associated equipment. The turbine discharges combine through a short buried tailrace pipe back to the River Lael before its discharge into the north side of Loch Broom. There is no reservoir storage so the turbines only use the water available in the rivers at the time.

The scheme was consented under Section 36 of the Electricity Act 1989 by the Scottish Executive in July 2007, took 13 months to construct at a cost of just under £5M, and became operational in May 2009.

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GILKES

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Generating Equipment

The hydro generation equipment was designed, manufactured and installed by Gilkes. There are two horizontally shafted Francis type turbines directly coupled to two 415 volt, three phase synchronous electrical generators. The turbine is controlled by a et of 20 guide vanes mounted in the spiral casing which direct the water onto the runner, causing it to rotate at 1000rpm to drive the generator. After passing through the turbines the water is discharged down through the draft tube into the tailrace pipe and back into the river through a special fish friendly screen.

Control

When in operation the turbines are controlled automatically via the control panels in the powerhouse using level sensing equipment at the intakes. The turbines have a gross head of 120m and use between 0.4 and 2.9 cubic meters per second of water between them, supplied roughly equally from each intake, and can generate between 300 and 2,500kW of power, depending on the water available in the river.

Grid Connection

A station transformer converts the output from the generators from 415 to 33,000 volts which is then delivered to Scottish Hydro Electric Power Distribution's local electrical distribution 33kV network via a buried cable and short overhead line. As this is near to the end of a spur feeding Ullapool, the output from the plant is tightly controlled to prevent it from interfering with the stability of local supplies.

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