

Learning Outcomes from the Industrial Visit to Sabarigiri Hydro Electric Power Station on 17th December, 2025.

- Arya P R

The Sabarigiri Hydroelectric Project has a total installed capacity of 340 MW, comprising six generating units with diversified ratings. Units 1, 3, and 5 are each rated at 55 MW; Units 4 and 6 at 60 MW each; and Unit 2 at 65 MW. This mix of unit capacities enables operational flexibility and ensures reliable power generation under varying load and hydrological conditions. Power generated at the station is evacuated through six outgoing feeders, comprising one Theni feeder, three Edamon feeders, one Pallom feeder, and one Ambalamukal feeder.

A key feature of the project is the pumped storage operation at the Pampa Dam, which significantly supports peak load management and grid stability. Surplus energy during off-peak hours is utilised to pump water to the upper reservoir, which is later released for generation during peak demand. This approach enhances system efficiency and ensures optimal utilisation of available energy resources.

The station is equipped with Pelton turbines, well suited for high-head and low-discharge conditions. During the visit, critical turbine components such as the runner, buckets, needle and nozzle arrangement, and deflector (splitter) mechanism were observed. The precise movement of the needle regulates the water jet, allowing efficient control of turbine output.

The turbine governing system comprises a Governor Local Control Panel (LCP) and an RTU-based Unit Control Board (UCB). This system maintains turbine speed and grid frequency by accurately controlling water flow. Integration with automation and SCADA facilitates real-time monitoring, remote operation, and improved operational reliability.

On the electrical side, the project employs on-load tap changing transformers with ratings above 10 MVA, enabling voltage regulation under load without supply interruption. This ensures stable voltage at the generator–grid interface and supports continuous, reliable grid-connected operation.

The hydraulic and electro-mechanical systems include splitter/deflector mechanisms to safely divert water jets during sudden load rejection, preventing turbine overspeed. Oil-operated valves, along with needle position sensors and LVDTs, provide precise feedback for accurate turbine control.

The plant is equipped with various sensors and measuring instruments to ensure safe, reliable, and efficient operation. These devices play a crucial role in monitoring electrical and mechanical parameters and in protecting major equipment.

Analog transducers are used to convert electrical quantities such as voltage and current into standardized signals. These signals are utilized for continuous monitoring, control, and protection of the electrical system.

Displacement sensors are installed to measure the movement of turbine components, particularly the needle position. Accurate measurement of displacement helps in precise regulation of water flow and stable turbine operation.

Vibration sensors continuously monitor the mechanical vibrations of the turbine and generator. By detecting abnormal vibration levels at an early stage, these sensors help prevent mechanical failures and ensure long-term equipment reliability.

Pole strainers are provided in the hydraulic system to filter debris and foreign particles. Their use prevents clogging and protects critical hydraulic components, thereby ensuring smooth and uninterrupted operation of the plant.

Overall, the visit offered valuable practical insight into the integrated functioning of mechanical, electrical, hydraulic, and control systems in a large hydroelectric project. The role of automation, pumped storage, and advanced governing mechanisms in improving efficiency, safety, and grid support was clearly understood.