

Q3.5 : as the number of controlling systems has increased, how has this impacted the power plant reliability index?

What would be the percentage increase in cost compared to that of the turbine-generator unit?

Q3.5 relates to hybrid demonstrator where a battery system (BESS) operates in smart tandem with a Run of River Kaplan hydro unit.

A – About reliability issue

First of all, let's note that the hybrid unit described in the paper is a demonstrator, therefore its full-time operation as hybrid was not a top priority.

However, being implemented on an industrial unit generating more than 150GWh per year, the hybrid system was requested to keep the hydro unit in operation whatever the situation may be on the battery side.

Hence, the hybrid controller design includes an automatic fallback solution, returning the unit to its stand alone historic operating mode in case the hybrid mode should switch off.

From 1 year experience so far, it was noticed that the fallback solution operates as intended. The few BESS tripping occurred during periods where improved protection was implemented to detect loss of modbus communication, until proper protection settings were tuned. Otherwise, the main power train (battery, inverter, switchgear) have never been source of trouble.

B- About Hybrid Unit extra cost

It is a known fact that BESS do not come cheap, so that the return of investment may be questioned. It is one of the key goals of the hybrid demonstrator to provide factual numbers in order to support an answer to this question.

First of all, the hybridization concept developed for the demonstrator is a “micro hybrid” design, requiring low CAPEX; power is 1/5 of what would be required for a full hybrid device transferring the whole FCR burden to the battery system.

The RoR unit is 35MW and delivers FCR up to 3.5MW; the micro hybrid concept requires a 650kW BESS with 300kWh useful energy.

Hence the required investment for purchase and installation at site represents around 4% of the whole hydro generator.

BESS payback is based on wear and tear reduction (maintenance OPEX), FCR remuneration, efficiency improvement of turbine thanks to more stable on cam operation. These payback components are currently under investigation.