Pumped-storage power plant with fast ramp-up

Access new energy markets with a hybrid pump-turbine

CONTEXT

The pumped storage plants (PSP) are considered as the most mature and reliable technology for bulk storage energy. Besides their ability to store energy in large quantities, one of their drawbacks is their low time response. The hybridization of the plant with a stand-alone energy storage system (ESS), such as super-capacitor banks, can answer the need of a better responsiveness in terms of delivered power. By taking advantage of the rapidity of the ESS combined with the long charge/ discharge duration capability of a PSP, we make the perfect storage system for the grid: both responsive and durable. In order to improve the market penetration of the power generation systems including an energy storage system, it is important to keep its cost and footprint as low as possible.

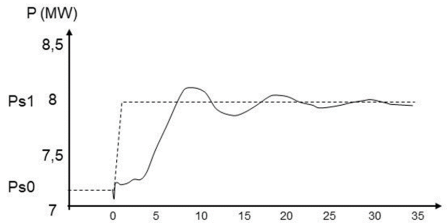
TECHNOLOGY DESCRIPTION

The solution provided by Supergrid Institute relies on a non intrusive add-on enabling the fast power ramp-up of a conventional hydro-electric power plant at low capex. It includes :

⇒ Tailored to your needs, a custom design integrating the architecture of the existing plant and an optimal sizing of the ESS. The optimality ensures maximization of revenues, taking into account the capital and operation expenditure.

⇒ The optimization of the performance is based on a model predictive control for the electric power that is generated by the turbine system, successive working parameters of the turbine controller are determined, in order to have the instant electric power reach the electrical power setpoint with a minimum quantity of complementary energy provided by the ESS.

⇒ The capability of the hybrid system to provide fast response (<2s) according grid codes and requirements of the so called Fast Frequency Response markets



APPLICATION DOMAIN

Hydropower production
Pumped-storage
Fast frequency response
Transition time

ADVANTAGES

Innovative idea

Adjustable solution

Increase flexibility

Possible refurbishment

TRL SCALE

1 2 3 4 5 6 7 8 9

TRL5 : Concept validated on scale model PHIL

DELIVERABLES

Control algorithms validated on scale model Power Hardware In the Loop

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