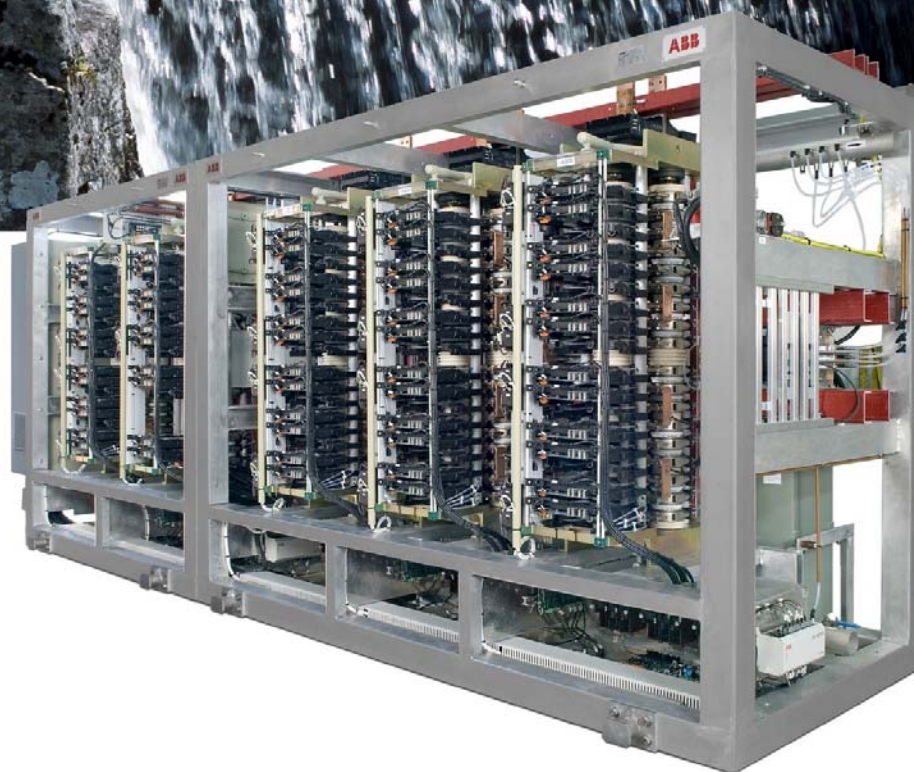


PCS 8000 AC Excitation

AC Excitation for hydro pump energy storage plants

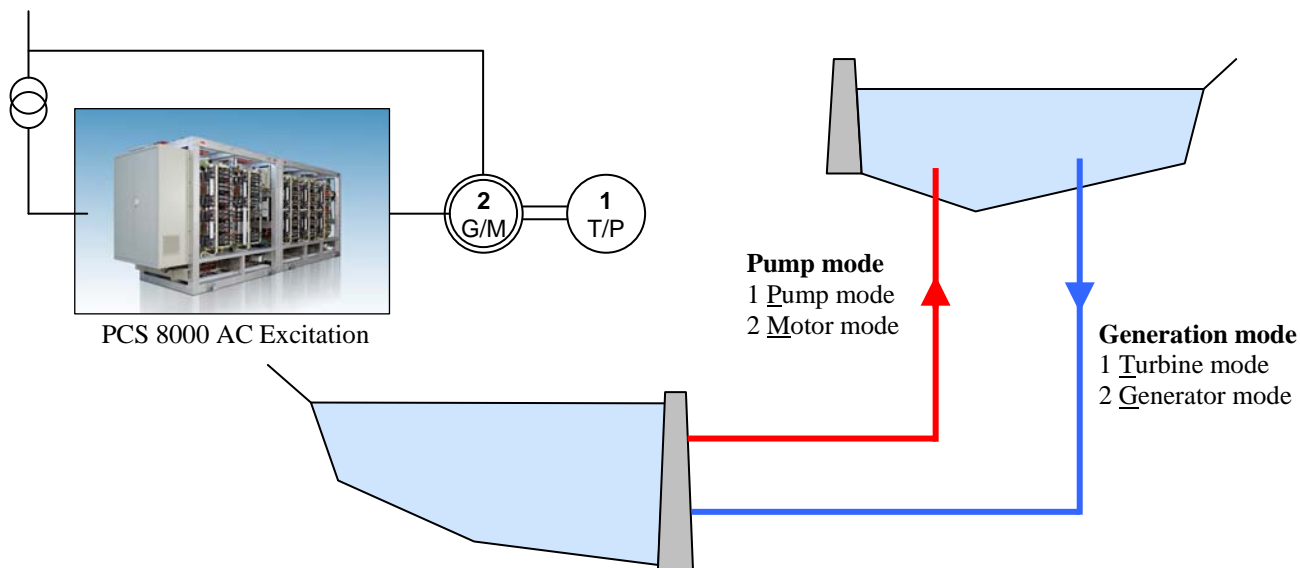


PCS 8000 AC Excitation



Introduction and Main Technical Features

Pumped Hydro Energy Storage Plants have an essential role in electric power grids. They provide spinning reserve and permit the operation of base load power plants at their optimal efficiency by consuming power during low load times to pump up the water to the reservoir at higher altitudes.



Customer's challenge

A drawback of conventional Pumped Hydro plants with pump-turbines is the operation at constant speed when the motor-generator is a synchronous machine. This results in a lower than necessary overall efficiency because the design allows for one optimized operation point only. The reasons are: Optimal speed for pumping is higher than optimal speed for turbinning and speed adjustment to adapt to varying heads is not possible. An additional drawback is that power/frequency control is not possible in the pumping mode. The possibility of speed adjustment eliminates those drawbacks.

Solution

Using a wound rotor induction machine for the motor-generator and controlling the slip frequency of the rotor with a power electronics converter makes the necessary speed variation possible. Operation at maximum hydraulic efficiency is enabled in both, turbinning and pumping mode, over a larger range of head variation and power/frequency control is possible in the pumping mode as well. Since the power needed in the rotor is only a fraction of the machine rating (roughly proportional to the slip), the rating of the converter and therefore its cost as well as its space demand is minimized. Because of the semiconductor loss optimizing design of the PCS 8000 it is the ideal converter for this kind of application.



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Benefits

- ✓ Operation at optimal efficiency in turbine **and** pump mode
- ✓ Speed adoption to varying heads for additional efficiency improvement
- ✓ Enabling power/frequency control during pumping operation

Reliability runs in the family

The PCS 8000 AC Excitation is a further development of ABB's PCS 6000 family which are used for a wide range of applications. The standardization of these power electronic modules delivers substantial advantages in terms of cost and quality.

MV converter

PCS 8000 converter units are based on three-level IGCT phase modules. The IGCT (Integrated Gate Commutated Thyristor) is the state-of-the-art semiconductor element for this power range. The converter units are connected by a medium voltage DC link (intermediate circuit). The converter modules are water cooled with a virtually maintenance free closed loop water system equipped with redundant circulating pumps.

Key facts

Application:	AC Excitation
Type:	PCS 8000 AC Excitation
Installation:	Indoor or Container
Nominal output power:	project specific
Nominal frequency:	50 / 60 Hz
Nominal voltage:	project specific
Ambient temperatures:	-25 ... 40 °C