HUMP ENERGY STORAGE MODE

Can a low-head pumped hydrostorage unit operate in the hump region? The pump mode of the low-head pumped hydrostorage unit (pump-turbine) may operate in the hump region under extreme conditionsdue to the influence of water level variation,and the resulting energy conversion instability will seriously threaten the safety of the unit.

How much energy does a guide vane hump lose? Meanwhile,the guide vane cascade demonstrates an energy loss of 42.62 %,slightly exceeding that of the impeller. Therefore,it is imperative to consider the energy losses in both the impeller and the guide vane cascade when investigating the beginning of the hump.

Why does a pump turbine hump? Particularly,when pump turbine operates under part load in pump mode,the presence of various unstable flow structureswill trigger the formation of the hump region on the performance curve,which will result in notable vibration and noise,posing a critical risk to the safe and stable operation of the unit [11,12].

Does a pump turbine have a hump region? By utilizing particle image velocimetry (PIV) measuring equipment,Xue et al. conducted an experimental study on the rotating stall of a pump turbine in pump mode and demonstrated that the rotating stall in the guide vane region was not a sufficient condition for the occurrence of the hump region.

Does hump instability occur at 0.80 qdes? Meanwhile,0.80 QDes is around the beginning stages of hump instability. Hence,the follow-up study aims to investigate the mechanism of flow structures within the impeller at 0.80 QDes.

Can hump instability be captured by numerical simulation? In brief,more flow details can be captured through numerical simulationafter considering the compressibility of water at the beginning of the hump instability (0.80 QDes),and the results are closer to the experimental values than without

considering the compressibility.

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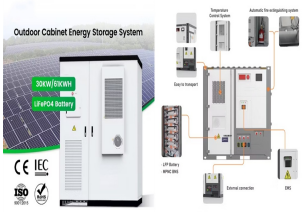
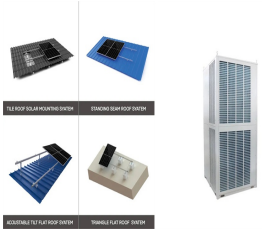
This article investigates the transient characteristics and operation regulation of grid???connected variable speed pumped storage (VSPS)???wind???solar hybrid power system ???



bine mode to generate electrical energy during peak power consumption in the power grid, while the electricity consumption in the power grid is low, the unit enters into pump mode for energy ???

To investigate the adverse effects of rotating stalls on the pressure pulsation characteristics of a pump-turbine in pump mode, an unsteady numerical simulation was carried out by applying the partially averaged Navier???Stokes ???



Currently, the pumped storage power plant is known as the only reliable and commercial method for energy storage, ref. playing an important role in peak load shifting. When a pump turbine strays into the hump region at ???

Variable-speed technology is a new and critical direction for the development of PSPs. In pump mode, variable-speed pumped storage units (VSPSUs) have wider power regulation ranges and more flexible power ???

Therefore, the hydraulic design of the pump turbine in pump mode is crucial for the properties of energy, cavitation and stability of the whole unit. A model runner (runner A) ???