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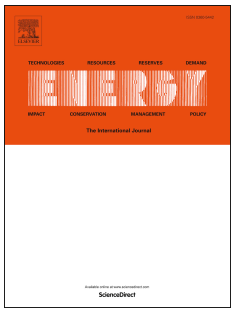

An analysis of different pumped storage schemes from a technological and economic perspective

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An analysis of different pumped storage schemes from a technological and economic perspective

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Abstract

Installed wind and solar power has widely increased in the last decade and is assumed to continue to do so in the future. The increasing solar power reduces the span between peak and base price and permits an economic feasibility of storage applications. The target of this work is to maximize the earnings of pumped storage plants (PSPs) considering the Austrian-German spot market and Austrian balancing energy market within the years 2012 to 2015. As common PSP schemes, binary and ternary configurations are considered as well as fixed and variable speed schemes. Operating ranges and efficiency values depend on water way losses, pump/turbine characteristics, electric losses and gross-head dependent plant losses. Finally, an optimization algorithm is presented, including the market and plant models, where the objective function is the earning in each scenario such that the model can be used to determine the best operation strategy among the markets.

It is found that earnings from the balancing energy market exceed earnings from

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