

## **Estimating the Operating Cost at Pumped-Storage Hydroelectric Power Plants by Exploiting Structural Similarities of Energy Markets and Stochastic Optimization**

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Due to the need for efficiency in terms of resource usage in the energy sector, a precise estimation of the forward-looking operating cost for pumped-storage hydroelectric power plants is needed. We introduce a novel approach that draws a structural parallel between the two-settlement energy markets and the two-stage stochastic optimization modeling paradigm. We model the functioning of energy markets using stochastic optimization, by defining the day-ahead portion as the first-stage and the real-time portion as the second-stage of the optimization, in order to estimate the operating cost of a power plant. We examine the effect of introducing the absolute semideviation and the conditional value-at-risk in the model. We show that the results obtained from the stochastic approach differ from those found using deterministic optimization. We believe these results to be more accurate because they were obtained using an approach that is structurally similar to the operation of energy markets.