Joint Optimization of Energy Storage Sizing and Transmission Line Capacities for an Island System

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Abstract

In this work, we present a stochastic mixed-integer programming model to optimize the sizes of two different kinds of energy storage systems and the capacity of the transmission lines for an island system. We consider an island where the main generation source is wind and alternative source is diesel. The primary aim of this study is to investigate the investment decisions in storage and to determine energy capacities and power rates of the storage systems while minimizing the construction, O&M, and diesel costs. By deploying two different storage types at different places, we investigate the circumstances where installation decisions change. Stochastic renewable energy generation and demand are taken into account by considering different scenarios which are reproduced based on real data. First-order Markov chain is used to generate monthly wind power time series. Numerical experiments are conducted to investigate the effect of the cost parameters on the system design.

Keywords
Energy storage system, Sizing, Isolated areas, Renewable generation.

Biographies

Arya Sevgen received her B.S and M.Sc. degrees in Industrial Engineering, İzmir University of Economics, İzmir, Turkey, in 2014, and 2016, respectively. She is currently pursuing the Ph.D. degree in Management at the Sabanci University, Istanbul, Turkey. Her research interests are operations management, supply chain management, and their applications in renewable energy and energy storage systems.

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