

## Overview of Different Approaches Used in Optimal Operation Control of Hybrid Renewable Energy Systems

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**Abstract :** A hybrid energy system is a combination of renewable energy sources with back up, as well as a storage system used to respond to given load energy requirements. Given that the electrical output of each renewable source is fluctuating with changes in weather conditions, and since the load demand also varies with time; one of the main attributes of hybrid systems is to be able to respond to the load demand at any time by optimally controlling each energy source, storage and back-up system. The induced optimization problem is to compute the optimal operation control of the system with the aim of minimizing operation costs while efficiently and reliably responding to the load energy requirement. Current optimization research and development on hybrid systems are mainly focusing on the sizing aspect. Thus, the aim of this paper is to report on the state-of-the-art of optimal operation control of hybrid renewable energy systems. This paper also discusses different challenges encountered, as well as future developments that can help in improving the optimal operation control of hybrid renewable energy systems.

**Keywords :** renewable energies, hybrid systems, optimization, operation control

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