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Renewable Energy and Energy Storage Systems

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Abstract

The use of fossil fuels has contributed to climate change and global warming, which has led to a growing need for renewable and ecologically friendly alternatives to these. It is accepted that renewable energy sources are the ideal option to substitute fossil fuels in the near future. Significant progress has been made to produce renewable energy sources with acceptable prices at a commercial scale, such as solar, wind, and biomass energies. This success has been due to technological advances that can use renewable energy sources effectively at lower prices. More work is needed to maximize the capacity of renewable energy sources with a focus on their dispatchability, where the function of storage is considered crucial. Furthermore, hybrid renewable energy systems are needed with good energy management to balance the various renewable energy sources production/consumption/storage. This work covers the progress done in the main renewable energy sources at a commercial scale, including solar, wind, biomass, and hybrid renewable energy sources. Moreover, energy management between the various renewable energy sources and storage systems is discussed. Finally, this work discusses the recent progress in green hydrogen production and fuel cells that could pave the way for commercial usage of renewable energy in a wide range of applications.

Keywords: renewable energy, energy storage, hybrid renewable energy systems, solar energy, wind energy, biomas

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