

## Energy Efficient Microgrid Design with Hybrid Power Systems

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**Abstract :** Today's electrical networks, including microgrids, are evolving into smart grids. The smart grid concept brings the idea that the power comes from various sources (continuous or intermittent), in various forms (AC or DC, high, medium or low voltage, etc.), and it must be integrated into the electric power system in a smart way to guarantee a continuous and reliable supply that complies with power quality and energy efficiency standards and grid code requirements. This idea brings questions for the different players like how the required power will be generated, what kind of power will be more suitable, how to store exceeding levels for short or long-term usage, and how to combine and distribute all the different generation power sources in an efficient way. To address these issues, there has been lots of development in recent years on the field of on-grid and off-grid hybrid power systems (HPS). These systems usually combine one or more modes of electricity generation together with energy storage to ensure optimal supply reliability and high level of energy security. Hybrid power systems combine power generation and energy storage technologies together with real-time energy management and innovative power quality and energy efficiency improvement functionalities. These systems help customers achieve targets for clean energy generation, they add flexibility to the electrical grid, and they optimize the installation by improving its power quality and energy efficiency.

**Keywords :** microgrids, hybrid power systems, energy storage, power quality improvement

**Conference Title :** ICESRET 2020 : International Conference on Energy Systems and Renewable Energy Technologies

**Conference Location :** Singapore, Singapore

**Conference Dates :** July 06-07, 2020