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Review

Hybrid fuel cells technologies for electrical microgrids

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ABSTRACT

Hybrid systems are characterized by containing two or more electrical generation technologies, in order to optimize the global efficiency of the processes involved. These systems can present different operating modes. Besides, they take into account aspects that not only concern the electrical and thermal efficiencies, but also the reduction of pollutant emissions. There is a wide range of possible configurations to form hybrid systems, including hydrogen, renewable energies, gas cycles, vapour cycles or both. Nowadays, these technologies are mainly used for energy production in electrical microgrids. Some examples of these technologies are: hybridization processes of fuel cells with wind turbines and photovoltaic plants, cogeneration and trigeneration processes that can be configured with fuel cell technologies, etc. This paper reviews and analyses the main characteristics of electrical microgrids and the systems based on fuel cells for polygeneration and hybridization processes.

Contents

1. Introduction

One of the main objectives of energy policy is to ensure a secure and continuous power supply coupled with the reduction of emissions associated with climate change. The achievement of this objective requires the development of renewable energy sources, alternative fuels for transportation and an increase in the energy efficiency of production, transmission and consumption processes. Besides, electricity market liberalization and environmental restrictions configure a future directed to energy diversification, with a significant increase in the use of clean energies.

Within the context of Distributed Generation some emergent technologies for electrical generation, cogeneration and trigeneration have to be considered, such as: fuel cells, gas microturbines, Stirling motors, low cost photovoltaic systems, wind generators, etc. These technologies participate as active devices in electrical

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