

The Design and Simulation Studies of Hybrid Power Generation Systems Based on Wind, Photovoltaic, Electrolyzer, and PEM Fuel Cells

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Abstract

In latest years, the need to reduce environmental effects and increase flexibility in the energy sector has led to increased penetration of renewable energy and sources and the shift from concentrated to decentralized generation. A fuel cell is an instrument that can produce the electricity by chemical reactions. Fuel cells are a capable technology for ultimate energy conversion and energy generation. We can see this system is integrated, where we find that the wind and photovoltaic energy system is complementary between them, because not all the days are sunny, windy or night, so we can see this system has higher reliability to provide permanent generation. At low load hours, PV and electrolysis units produce additional power. After being compressed, hydrogen is stored in tanks. The purpose of this article is to separate the Bahr AL-Najaf Area from the main power grid and make it an independent network. The PEM fuel cells were analyzed and designed, and it is were found that one layer is equal to 570.96 Watt at 0.61 volts and 1.04 A/Cm². The number of layers in one stack is designed to be equal to 13 layers, so that the total power of one stack is equal to 7422.48 Watt. That is, the number of stacks required to generate the required energy from the fuel cells is equal to 203 stk. This study provides an analysis of the hybrid system to envelop the electricity demand in the Bahr AL-Najaf region of 1.5 MW, the attained hybrid power generation system TNPC cost was about 9,573,208 USD, whereas the capital cost and energy cost (COE) were about 7,750,000 USD and 0.169 USD/kWh respectively.

Biography:

Lama Mikhaeel, an engineer and researcher in the field of renewable energy, I published the aforementioned research and I am currently working on researching water heating by means of a hybrid system that relies on solar and electric heating in combination with electromagnetic heating to reduce the load from the grid. Utilizing renewable energy and using innovative technologies to reduce electricity expenditures.

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