

Techno-economic viability of a hybrid wind and solar power system for electrification of a commercial building in Shiraz, Iran

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Abstract. In this paper, techno-economic viability of a hybrid Wind/PV system with a battery and inverter was performed using the HOMER® international optimization model. A commercial building in Shiraz, Iran was selected as a case study to analyze the feasibility study of installing the proposed hybrid Wind/PV system. Before the optimization process, different key parameters such as the monthly wind and solar resource, monthly and daily electrical load consumption, economic constraints such as interest rate and project lifetime, the components features such as the battery or inverters sizes and costs and other related information were collected and imported into HOMER®. The optimization results suggested that the most efficient and economical hybrid energy system is a combination of 9 kW photovoltaic panel, 1 wind turbine (10 kW), 5 batteries and 5 kW converter. The total net present cost (NPC) and the cost of energy (COE) for this system were estimated to be \$89,884 and \$0.619/kWh. The final results of the study concluded that the employment of the proposed hybrid energy system for electrification of the studied commercial building in Shiraz is highly recommended.

Keywords: renewable energy; hybrid system; PV array; wind turbine; HOMER®

1. Introduction

Electricity is a major commodity for the socio-economic development of any country. It plays vital role in all activities of human beings in the present scenario. The major part of electricity is developed mainly from the fossil fuel like coal, oil, and gas. These fossil fuels have severe impact over the atmosphere in various aspects. Stock of these fossil fuels is limited and will last hardly till the middle of this century.

A growing interest in renewable energy resources has been observed for several years due to their pollution-free nature, availability all over the world, and continuity. These facts make these energy resources attractive for many applications (Kumaravel and Ashok 2012, Nedaei 2012). Since the oil crisis in the early 1970s, utilization of the solar and wind power has increased significantly. In recent years, hybrid PV/wind systems have become viable alternatives to meet

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