

Technical and Economic Analysis of Smart Micro-Grid Renewable Energy Systems: An Applicable Case Study

Authors : M. A. Fouad, M. A. Badr, Z. S. Abd El-Rehim, Taher Halawa, Mahmoud Bayoumi, M. M. Ibrahim

Abstract : Renewable energy-based micro-grids are presently attracting significant consideration. The smart grid system is presently considered a reliable solution for the expected deficiency in the power required from future power systems. The purpose of this study is to determine the optimal components sizes of a micro-grid, investigating technical and economic performance with the environmental impacts. The micro grid load is divided into two small factories with electricity, both on-grid and off-grid modes are considered. The micro-grid includes photovoltaic cells, back-up diesel generator wind turbines, and battery bank. The estimated load pattern is 76 kW peak. The system is modeled and simulated by MATLAB/Simulink tool to identify the technical issues based on renewable power generation units. To evaluate system economy, two criteria are used: the net present cost and the cost of generated electricity. The most feasible system components for the selected application are obtained, based on required parameters, using HOMER simulation package. The results showed that a Wind/Photovoltaic (W/PV) on-grid system is more economical than a Wind/Photovoltaic/Diesel/Battery (W/PV/D/B) off-grid system as the cost of generated electricity (COE) is 0.266 \$/kWh and 0.316 \$/kWh, respectively. Considering the cost of carbon dioxide emissions, the off-grid will be competitive to the on-grid system as COE is found to be (0.256 \$/kWh, 0.266 \$/kWh), for on and off grid systems.

Keywords : renewable energy sources, micro-grid system, modeling and simulation, on/off grid system, environmental impacts

Conference Title : ICAEERE 2018 : International Conference on Applications of Energy Engineering and Renewable Energy

Conference Location : Bangkok, Thailand

Conference Dates : December 13-14, 2018