Abstract

The purpose of this paper is to evaluate the cost benefit of a self-optimized solar-wind-hydro hybrid energy supply and to compare the outcome with a similar optimization done with the HOMER software. In reality HOMER optimization software has long been used for hybrid system optimization and many do consider it as the reference software for any optimization related to hybrid energy systems. However, due to some few lack of flexibility in the setting-up of constraints and also the ignorance of the true optimization approaches used by the HOMER, it has become necessary to develop self-optimized algorithms based on rigorous mathematical models. One of these self-optimized models, developed in a previous study, was presented in this paper and was tested with data collected at Accra, Ghana. Results show that the cost of electricity proposed by the HOMER, 0. 307$/kWh, is slightly lower than the one obtained through the self-optimized method, 0. 442$/kWh. Moreover looking at the dynamism of selecting different sources to achieve the optimization at a lower rate for the user, more credit is given to the developed method than the HOMER because the self-optimization method gives more priority to the wind turbine than the solar plant due to the higher electricity cost of solar (0. 64$/kWh). It was however observed that the HOMER software does the opposite in terms of
priority. Moreover the probability of unmet load is lower with the self-optimized method than the HOMER result which consists of a big contribution because it is a major quality measure for hybrid systems to always satisfy the load request.

References

Cost Benefit Analysis of Self-Optimized Hybrid Solar-Wind-Hydro Electrical Energy Supply as compared to HOMER Optimization


Index Terms

Computer Science  Information Science

Keywords

Solar Energy  Wind Energy  Hydro Energy  Cost optimization  Matlab Simulation  HOMER optimization