Abstract

Continuous researching effort to improve the power systems quality problems and to meet the increasing power demand has been done. Hybrid power generation systems (HPGS) considered one from the suggested solutions; these systems are combined from different power sources. Wind turbine (WT), photovoltaic (PV), storage battery (SB), fuel cell (FC), and gas turbine (GT) considered the most common power sources and the main elements of HPGS. There are two main modes for the HPGS; a stand-alone mode and the utility connected mode. This paper presents the optimal design of the HPGS for the two modes, where each mode is discussed for two scenarios, one for the winter and the other for the summer. Modern Meta-heuristic optimizations techniques have been used to keep the results effectiveness and efficiency. Moth-flame optimization (MFO) and multi-verse optimization (MVO) have been used to obtain the optimal design and sizing of the above mentioned power sources. This paper also presents a detailed comparison between the two scenarios for each mode, considering the total
annual cost, emission, and the system reliability are the most important common factors for the
detailed comparison.

References

   on a Modified Particle Swarm Optimization Algorithm", IEEE Transactions on Energy
2. L. Liqun and L. Chunxia, "Feasibility analyses of hybrid wind-PV-battery power system in
   -Wind-Diesel Power System for Rural Electrification Using Imperialist Competitive Algorithm",
4. T. Tahri, A. Bettahar, and M. Douani, " Optimization of a Hybrid Wind-PV-Diesel
   Standalone System: Case Chlef, Algeria " International Journal of Mathematical, Computational,
5. Q. A. J. Jawad1, K. K. Gasem, M. R. Jawad "Design and Simulation of Hybrid System for
   Electricity Generation in Iraqi Rural Regions", Diyala Journal of Engineering Sciences, Vol. 06,
   No. 02, pp. 38-56, 2013.
6. T. Jima, "Simulation and Optimization of Wind Turbine, Solar PV, Storage Battery and
   Diesel Generator Hybrid Power System for a Cluster of Micro and Small Enterprises Working on
   Wood and Metal Products at Welenchity Site", M.Sc. Thesis, Addis Ababa Institute of
   Technology, 2013.
7. A. Bhowmik, Design and scheduling of a Hybrid Power System consisting of Wind
   Turbine, PV Generator, Battery Bank and Diesel Generator using 'area based observe and
8. M. Sekar, S. Arunkumar, and V. Balasubramanian, "PV-Wind Hybrid Systems for
   Supplying Power to Remote Locations", International Journal of Advanced Technology &
   Engineering Research (IJATER), ISSN No: 2250-3536, 2014.
9. H. M. Farghally, F. H. Fahmy, and M. A. H.EL-Sayed, "Control and Optimal Sizing of
   PV-Wind Powered Rural Zone in Egypt", the Online Journal on Power and Energy Engineering
10. P. Gajbhiye, and P. Suhane, "Methodology for Optimal Sizing & Power Management of
    Engineering, Vol. 03, No. 02, pp. 7-12, 2014
    hybrid system: Techno-economic analysis and optimization", Elsevier, Renewable and
12. A.M. Eltamaly, and M. A. Mohamed, "A Novel Design and Optimization Software for
    Autonomous PV/Wind/Battery Hybrid Power Systems", International Journal of Photoenergy,
    Analysis of PV/Wind/ Battery Hybrid Energy Conversion" International Journal of Electrical,
14. A. Maleki, and A. Askarzadeh, " Optimum Configuration of Fuel Cell-Batteries PV/Wind
    Hybrid System using A Hybrid Meta Heuristic Technique", International Journal of Engineering
19. Gas Pressure Regulator Series 850 VARIFLO Catalog, RMG, 2010

Index Terms

Computer Science

Applied Sciences

Keywords

Hybrid generation system, multi-criteria design, renewable energy sources, distributed generation, moth-flame optimization, multi-verse optimization, cuckoo search, flower pollination algorithm.