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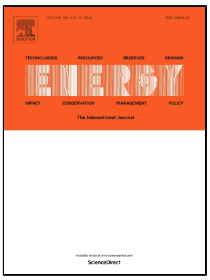

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Optimizing Renewable based Generations in AC/DC Microgrid system using Hybrid Nelder-Mead – Cuckoo Search Algorithm

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ABSTRACT

This paper proposes a Hybrid Nelder-Mead and Cuckoo Search (HNMCS) algorithm to minimize the power loss in hybrid AC/DC microgrid systems by optimizing the output power of Renewable Energy Distributed Generators (REDG). The non-linear power loss minimization problem is solved by the proposed HNMCS to optimize the size of REDG. So far, the REDG sizing is determined by considering generator output as variable whereas in the proposed technique, the area required for the operation of REDG in hybrid AC/DC microgrid is taken as variable. The microgrids are developed by categorizing the existing distribution system to multiple zones. A hybrid AC/DC microgrid is developed with AC grids supported by substation and DC grids operated by their individual REDG units. The suitable location for REDG units including the combination of solar-photovoltaic modules and fuel cells in DC grid is identified by Loss Reduction Sensitivity Factor (LRSF). A standard 33-bus and 69-bus radial distribution system is modeled as a hybrid AC/DC microgrid system. The system is analyzed for its performance in stand-alone system and extended to zone cataloging as residential, industrial and commercial zones. The proposed HNMCS algorithm identifies the optimal solution for REDG sizing with improved convergence rate and reduced simulation time.

Keywords: Hybrid AC/DC microgrid system, Distributed generation, Renewable Energy Distributed Generators, Cuckoo Search, Hybrid Nelder-Mead – Cuckoo Search.

1. INTRODUCTION

The bulk availability of renewable energy sources are effectively utilized in providing uninterruptable power supply to islanded regions. Distribution local grid comprising of renewable energy generators to satisfy load demand and support the main grid is termed as micogrid [1], they can possibly operate as an independent grid under favorable conditions. Based on the type of power flow and load demands, microgrid can be classified as AC microgrid and DC microgrid. The flow of reactive power, harmonic current, unbalanced

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