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A NOVEL MULTI-OBJECTIVE CHAOTIC CRAZY PSO ALGORITHM FOR OPTIMAL OPERATION MANAGEMENT OF DISTRIBUTION NETWORK WITH REGARD TO FUEL CELL POWER PLANTS

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Abstract. *This paper presents an efficient Multi-objective Crazy Chaotic Particle Swarm Optimization (MCCPSO) evolutionary algorithm to solve the Multi-objective Optimal Operation Management (MOOM) considering Fuel Cell Power Plants (FCPPs) in distribution network. The objective functions of the MOOM problem are to decrease the total electrical energy losses, the total electrical energy cost and the total pollutant emission produced by sources. For the multi-objective optimization problem, the use of weights to form a composite objective function reduces a multiple problem to a single problem. However, it also obviously loses some information in the conversion and this strategy is not expected to provide a robust solution or even help trace the efficient frontier of solutions. Our main thrust is to facilitate a string of solutions of the problem without converting to the original problem to a simpler case. This paper presents a new MCCPSO algorithm for the MOOM problem. The proposed algorithm maintains a finite-sized repository of non-dominated solutions, which gets iteratively updated in the presence of new solutions. Since the objective functions are not the same, a fuzzy clustering technique is used to control the size of the repository within the limits. The proposed algorithm is tested on a distribution test feeder and the results demonstrate the capabilities of the proposed approach to generate true and well-distributed Pareto optimal non-dominated solutions of the MOOM problem.*

Keywords: Chaotic crazy particle swarm optimization (CCPSO), Optimal operation management (OOM), Multi-objective optimization, Fuel cell power plant (FCPP)

1. Introduction.

In recent years, with power system restructuring, public environmental policy, and expanding power demand, distributed generators have an important role in order to satisfy on-site customer energy needs. Major improvements in the economic, operational, and environmental performance of small, modular units have been achieved through decades of intensive research. The fuel cell, one of important distributed generations, has the advantages such as operations on multiple fuels with low emissions, high efficiency and high reliability [1,2].

Because of their low noise and high power quality, fuel cell systems are ideal for use in hospitals or IT centers, or for mobile applications. Its structural modularity allows for simple construction and operation with possible applications for distributed and portable