

A Novel Energy Management System using Ant Colony Optimization for Micro-grids

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Abstract—Micro-grids have spread in many distribution systems worldwide. They offer safe and reliable operation for their consumers by managing the micro-grids' power generation and trading with the main grid. Furthermore, micro-grids can help in integrating and promoting for Renewable Energy Sources (RES) and reducing the environmental impacts of traditional centralized generation. This paper proposes a novel Energy Management System (EMS) in micro-grids using Ant Colony Optimization (ACO) technique to solve the generation dispatch problem. A combined cost optimization scheme is investigated to minimize both operational cost and emission levels while satisfying the micro-grid's load demand. Furthermore, the proposed EMS is used to evaluate promoting RES implementation in micro-grids despite of their high capital cost using the combined economic emission dispatch problem. The proposed EMS was implemented using MatLab and tested on two case studies with and without RES-WindTurbine (WT). The obtained results from the proposed technique are compared with those calculated using two other Techniques; Lagrange and Gradient to evaluate the proposed method. The outcomes are evaluated and discussed. Finally, conclusions are reported.

Index Terms- Ant Colony Optimization, combined economic emission dispatch problem, energy management system, microgrid.