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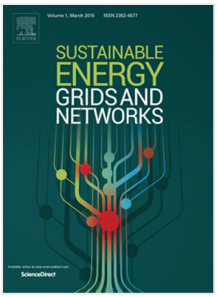

Optimal scheduling of interconnected micro energy grids with multiple fuel options

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Optimal scheduling of interconnected micro energy grids with multiple fuel options

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Abstract: Micro Energy Grid (MEG) represents a natural step in the evolution to smart grids. In future, distribution system will operate according to interconnected micro energy grids. In MEG, both operational cost and emissions are, mainly, dependent on the types of distributed energy resources (DERs) used. Using DERs with multiple fuel options can reduce the generation costs and increase the reliability in power systems. This paper presents an approach to interconnected MEGs generation scheduling with multiple fuel options. The scheduling approach determines the optimal outputs of DERs on the basis of multi-objective genetic algorithm (GA) optimization compromising between the operational cost and emission of the entire interconnected MEGs system. DERs operate within their respective capacity limits and economically satisfy both electrical and heat demands. The global economic scheduling scheme coordinates power transactions among MEGs and between each MEG and the main electrical grid. Results show that power sharing among MEGs and between each MEG and the main electrical grid can reduce the total operational cost and emissions of the entire interconnected MEGs system.

Keywords—MEG, scheduling, multi-objective, multiple fuel options, genetic algorithm, distributed energy resources.

1. INTRODUCTION

Future distribution systems are composed of interconnected MEGs, which can be regarded as relatively small-scale localized energy networks with loads, control systems and sets of energy resources such as generators and energy storage devices [1,2]. MEG is widely recognized as an alternative generating system which can compete with traditional centralized electricity plant [3]. MEG paradigms represent a natural step in the evolution to smart grids as they facilitate the implementation of smart technology for the optimal monitoring and management of a power system [4]. MEG depends mainly on local energy resources with minimum energy transmission from/to remote regions. Hence, energy loss, capital and running cost of a transmission network and the risk of energy supply failure are minimized.

Recently, power utilities increased the penetration level of DERs. This penetration level has been mainly driven by environmental awareness, intention to diversifying the nature of energy resources, improving reliability, power quality, and economics of a system [5]. In an electrical power system, it is always purposed to achieve high operating efficiency to produce cheap electricity [6-7].

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