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A novel stochastic framework for optimal scheduling of smart cities as an energy hub

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Abstract-

Smart cities consist of various energy systems and services that must be optimally scheduled to improve energy efficiency and reduce operation costs. The smart city layout comprises a power distribution system, a thermal energy system, a water system, and the private and public transportation systems. Additionally, several new technologies such as reconfiguration, regenerative braking energy of the metro, etc. are considered. This study is one of the first to consider all these technologies together in a smart city. The proposed power distribution system is a grid-connected hybrid AC–DC microgrid. The biogeography-based optimization algorithm was utilized to seek the best solution for scheduling micro-turbines, fuel cells, heat pumps, desalination units, energy storage systems, AC–DC converters, purchasing power from the upstream, distributed energy resources, and transferring power amongst electric vehicle parking stations and metro for the next day. Also, the reduced unscented transformation layout was used to capture the system's uncertainty. The suggested layout is implemented on an enhanced IEEE 33-bus test system to show the efficiency of the suggested method. The results show that costs and environmental pollution are reduced. By comparing the proposed smart city with other studies, the efficiency and completeness of the proposed smart city are shown.

Index Terms- Smart cities, Energy hub, BBO algorithm, Microgrid, Hybrid AC-DC

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