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Hossam A Gabbar

University of Ontario Institute of Technology, Canada

Interconnected micro energy grids with gas-power and renewable technologies for sustainable infrastructures

This talk will explore recent research to design interconnected micro energy grids with gas-power and renewable energy technologies for sustained energy and transportation infrastructures. Integration of gas and renewable energy technologies will be presented in view of regional energy demands and target reduction in cost and GHG emissions. Different design configuration and control scenarios for regional deployment will be evaluated using component and system KPIs. Operational planning model will be presented of the electricity and natural gas networks with DGs/CHPs based on natural gas. The models will be evaluated in view of investment and operational costs for both electricity and natural gas as independent networks. Benefits will be discussed for utilities to own both systems as customers can benefit via electricity or/and natural gas tariffs. Accurate operational planning model will be discussed, taking into consideration the interdependency between gas and electricity networks and demands such as concurrent electricity and gas price signals. Policies and regulations will be discussed, including governmental incentives for purchasing power from renewable resources. Technical and operational constraints such as maximum power transfer, thermal limits will be elaborated in view of the proposed interconnected micro energy grids. Optimization techniques will be presented to achieve high-performance energy supply in view of local demand and energy requirements. Advances in design and control methods will be illustrated to achieve high performance interconnected micro energy grids with integrated flywheel-based energy storage platforms and their applications on energy and transportation infrastructures. Methods and technologies of waste-to-energy systems will be discussed to provide clean energy and hybrid fuel supply to meet regional demands. Safety design and resilience analysis will be discussed to ensure sustained energy supply to meet target energy demand.

Biography

Hossam A Gabbar is a Professor at the University of Ontario Institute of Technology (UOIT) in the Faculty of Energy Systems and Nuclear Science and cross-appointed in the Faculty of Engineering and Applied Science. He is the recipient of the Senior Research Excellence Aware for 2016, UOIT, for his scholarly research in the areas of smart energy grids, gas-power systems, resilient transportation infrastructures, and plasma-based waste-to-energy technologies. He obtained his B.Sc. degree in 1988 with the first class of honor from Alexandria University. In 2001, he obtained his Ph.D. degree from Okayama University. In 2001, he joined Tokyo Institute of Technology (Japan), and from 2004, he joined Okayama University. He has been successful in attracting national and international funds where his research is widely recognized and reflected to more than 220 publications, including patents, books, chapters, and journal and conference papers. He is the founder and chair of Smart Energy Grid Engineering Annual Conference (SAGE).

hossam.gabbar@uoit.ca

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