M. Davari, H. Nafisi, M.-A. Nasr and F. Blaabjerg, A Novel IGDT-Based Method to Find the Most Susceptible Points of Cyberattack Impacting Operating Costs of VSC-Based Microgrids, in IEEE *Journal of Emerging and Selected Topics in Power Electronics*, vol. 9, no. 3, pp. 3695–3714, June 2021, doi: 10.1109/JESTPE.2020.3015447.

Abstract This article proposes a novel mathematical approach to deal with cyberattacks (CAs) impacting on modernized microgrid's (MMG) tertiary control. MMGs use many entities based on voltage-source converters to form the fully integrated power and energy system (FIPES). Having such a power and energy system for MMGs necessitates engineers considering cybersecurity and addressing its effects from the beginning of designing and building systems. Using innovative mathematical tools based on information gap decision theory (also known as IGDT), this research incorporates the data integrity attacks into tertiary controls of the FIPES of MMGs. The proposed methodology [named CA-tolerant tertiary control (CT 2 C) herein] is able to effectively find the most susceptible points of CA (PoCA) in MMGs when both severe and negligible uncertainties caused by CAs take place. They are able to include both severe data integrity attacks and negligible ones (or undetectable attacks). Here, the most vulnerable PoCA cause the most impactful changes in the tertiary control's principal objective, which is minimizing the operating cost of the whole MMGs. In this regard, this article describes a hypothesis, and in supporting that, comparative simulation results are given. The outcomes generated by the general algebraic modeling system (commonly known as GAMS) environment are able to provide researchers and engineers with appropriate maps for sensitive PoCA. Using the proposed CT 2 C, investments in MMGs cybersecurity will be more accurate and, more importantly, mathematically optimized. Finally, the potential ways to implement the proposed methodology are elaborated.

Keywords Cyberattack (CA), fully integrated power and energy system (FIPES), information gap decision theory (IGDT), modernized microgrid (MMG), operating cost (OC), points of CA (PoCA), tertiary control.

\website\IGT\davari-etal2020abs001.tex 3.6.2021