Mohamad-Amin Nasr, Ehsan Nasr-Azadani and Hamed Nafisi, 2019, Assessing the effectiveness of weighted information gap decision theory integrated with energy management systems for isolated microgrids, IEEE *Transactions on Industrial Informatics,* to appear.

Abstract In the context of microgrid, renewable energy variations are still a major concern for operators, especially in industrial applications in which microgrids are typically located in remote areas and are operated autonomously. Information Gap Decision Theory (IGDT) is a non-probabilistic method utilized to appraise various levels of risk without the availability of statistical data, such as probability density functions of uncertain parameters. Despite such a rewarding feature, the IGDT in its current form is unable to obtain time-varying robustness bands, meaning that it does not take into consideration the system risk imposed by renewable energy injections at each individual time interval in a short-term operation horizon. To overcome this issue, this paper presents a modified version of the IGDT named Weighted Information Gap Decision Theory (W-IGDT), yielding risk-based time-varying robustness bands rather than time-independent ones. This paper also proposes a W-IGDT-based Energy Management System (EMS) based on a linked Unit Commitment-Optimal Power Flow (UCOPF) framework, which simultaneously incorporates the generating units on/off status as well as power flow limits into the optimization procedure. In order to illustrate the performance of the proposed EMS, a CIGRE microgrid benchmark is utilized, and the results indicate the effectiveness of the W-IGDT-based EMS in terms of optimal operation and addressing the intermittency of renewable energy sources.

Keywords Energy Management System (EMS), microgrid, optimal power flow, unit commitment, Weighted Information Gap Decision Theory (W-IGDT), wind power uncertainty.

\website\IGT\nasr-etal2019abs001.tex 20.2.2020