Mohamad-Amin Nasr, Abbas Rabiee, Innocent Kamwa, 2020, MPC and robustness optimisation-based EMS for microgrids with high penetration of intermittent renewable energy, *IET Generation, Transmission & Distribution*, Vol. 14 Iss. 22, pp. 5239–5248.

Abstract This study develops a three-stage energy management system (EMS) for renewable energy microgrid operation. The core of this framework is based on a unit commitment problem integrated with model predictive control (MPC) to address the problem of uncertainty in renewable sources. Meanwhile, it is shown that an MPC approach may be insufficient to fully address the hurdles for optimal and safe operation of wind power-integrated energy systems due to the severity of wind speed fluctuations within even short time intervals. Spinning reserve resources can have a positive impact to ensure a reliable operation, yet their availability is highly dependent on the existence and capacity of dispatchable energy sources, such as diesel generators, in energy systems. Consequently, a supplementary Constrained Information Gap Decision Theory approach is utilised in this study to optimise the system's robustness against severe uncertainty of wind generations. In order to evaluate the presented framework, a descriptive index is first introduced, and then the model is applied to an isolated microgrid. The results indicate that by deploying these three stages, the renewable energy support index increases, ensuring an optimal, reliable, and safe operation.

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