Research Title: An isolated microgrid stabilization included with intermittent renewable energy sources by electrolyzer control based on optimal fuzzy logic controller using bee colony optimization

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ABSTRACT

This paper proposes the optimal fuzzy logic based-proportional-integral- derivative (FLPID) controller design of the electrolyzer (EZ) by a bee colony optimization (BCO) for microgrid (MG) stabilization. The study MG system consists of wind power (WP), photovoltaic (PV), fuel cell (FC) equipped with EZ, diesel generator, and load. The intermittent power generations from WP and PV cause the severe power fluctuation in the MG. To alleviate power fluctuation, the EZ which is normally used to produce the hydrogen input for FC, can be applied. By control of active and reactive powers absorbed by EZ, the power fluctuation can be stabilized. The structure of active and reactive power controllers of EZ is the FLPID which consists of scale factors (SCs), membership functions (MFs), and control rules (CRs). Without trial and error, SCs, MFs, and CRs of the FLPID controller are automatically optimized by a BCO. Simulation study confirms that the proposed EZ with an optimal FLPID controller is much superior to the EZ with a conventional FLPID controller or an optimal PID controller in terms of stabilizing effect and robustness against various loading conditions and severe disturbances.

Keywords : microgrid, electrolyzer, fuzzy logic, bee colony method