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Abstract The emerging concept of integrated demand response (IDR) is a promising platform for promoting the utilization of renewable energy sources (RES) and improving energy efficiency in multi-energy systems. In this paper, a robust scheduling model for a power, cool, and hydrogen-based islanded microgrid (MG) in the presence of hydrogen fueling stations (HFSs) and EV parking lots (EVPLs) is proposed. Additionally, the impact of power and cooling-based IDR is investigated in reducing the operating cost of the proposed system. The proposed multi-energy MG is equipped with power generation, wind turbine, electrical, cooling and hydrogen storage systems, power to hydrogen (P2H) facility and an electrical chiller to meet power, cooling, and hydrogen demands simultaneously. In order to deal with wind power generation uncertainty, a robust optimization approach is employed without the need for probability density function (PDF) or scenario generation, which strengthens the optimal operation of the proposed multi-energy MG against the wind power uncertainty and allows the operator to apply a risk-averse approach. Numerical results demonstrate that the establishment of IDR in the presence of storage systems reduces the total operating costs by 5.6%.

Keywords Electric vehicles parking lot; Hydrogen fueling station; Integrated demand response; Multi-energy microgrid; Power to hydrogen technology.