

Industrial energy hubs with electric, thermal and hydrogen demands for resilience enhancement of mobile storage-integrated power systems

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Abstract-

In recent decades, climate change has severely increased the concerns over the resilience of demand response programs are also used to decrease involuntary demand shed in system and enhance system resilience. A stochastic mixed-integer linear programming model is developed considering the uncertainties in damaged transmission lines, hurricane time and repair time. Case study is a modified IEEE 24-bus power system with EHs. The studied EH receives gas from a gas network, exchanges power with power system, includes electrolyzer, boiler, hydrogen storage system and feeds electric, heat and hydrogen demands. Expected load not supplied (ELNS) is used as resilience metric. The results approve significant impact of EH in improvement of power system resilience. In scenarios in which the bus connected to EH is isolated, EH supplies the power system demand located at that bus and thereby improves system resilience; on the other hand, in other scenarios, EH typically behaves as an electricity consumer of power system. According to the results, mobile energy storage causes a 2.4% improvement in ELNS. The results also show that demand response program improves ELNS by 7.1%.

Index Terms- Power system resilience; Energy hub; Hydrogen; Mobile storage; Heat & power & hydrogen; Demand response

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Citation:

Iqbal, A.; Jordehi, A.R.; Jurado, F.; Mansouri, S.A.; Marzband, M.; Tostado-Véliz, M. "Industrial energy hubs with electric, thermal and hydrogen demands for resilience enhancement of mobile storage-integrated power systems", International Journal of Hydrogen Energy, vol.50, no.Part B, pp.77-91, January, 2024.