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Key activities to improve energy management in DC microgrids connected by urban traction

Abstract. *DC MicroGrids (MG) must have Energy Management Systems to guarantee efficient, dependable, and environmentally friendly electricity. The application of Model Predictive Control (MPC), proved to be helpful due to its adaptability and capacity to use non-linear models. This paper, based on an extensive literature review, identifies and discusses the three key activities to improve the characteristics of DC MGs, i.e.: the use of Energy Storage Systems (ESSs), the implementation of Demand Side Management, and the use of MPC.*

Keywords: Energy Management, DC Traction Systems, DC microgrids Energy Storage Systems,.

The suggested Model

This paper suggests a multi-objective optimization model to optimize the control system of the MG. The goal is to offer a low-cost, dependable, and resilient energy supply system using a Hybrid Energy Storage System (HESS) with Demand Response (DR) and Adaptive Model Predictive Control (AMPC). The DR and AMPC enable the DC MG to better manage its load and energy supply in response to changes in demand, while the HESS allows for more efficient use of energy resources and provides additional reliability and resilience to the MG. This combination of technologies helps customers save money, reduce their environmental impact, and improve their energy reliability. The suggested MG system's general configuration, shown in Figure 1, is a source allocation control strategy with an AMPC-based EMS to handle model non-linearity.

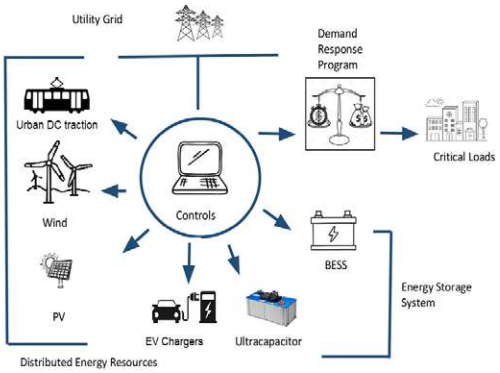

Fig. 1. Conceptual illustration of the considered MG system

Conclusion

To compensate for nonlinear or time-varying plant features, AMPC adjusts its prediction model at run time. This qualifies it for MGs that use hybrid energy storage systems and renewable energy. This paper discusses the integration of different approaches to creating an optimal MG system. The discussed methods include Hybrid Energy Storage System, a Demand Response Program, and Adaptive Module Predictive Control. Finally, these methods will be used together to create an optimal MG DC system, especially one connected to a urban DC traction network.

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Literature

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