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Distributed predictive secondary control for economic dispatch in hybrid AC/DC microgrids

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Hybrid AC/DC microgrids (H-MGs) are a prominent solution for integrating distributed generation and modern AC and DC loads. However, controlling these systems is challenging as multiple electrical variables need to be controlled and coordinated. To provide flexibility to the control system, these variables can be regulated to specific values or within secure bands. This work proposes a set of distributed model predictive control schemes for the secondary control level to control both variables to specific values and within secure bands into H-MGs. Specifically, optimal dispatch of active and reactive power is achieved while frequency and voltages are regulated within secure bands in H-MGs. Dynamic models of AC generators, DC generators and interlinking converters along with their novel multi-objective cost functions are developed in constrained distributed predictive optimisation problems to simultaneously achieve the aforementioned objectives via information sharing. To the best of the authors'knowledge, this is the first work presenting a distributed predictive scheme at the secondary control level to address these objectives considering soft constraints in H-MGs. Extensive simulation work validates the performance of this proposal.

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