Response Accuracy and Tracking Errors with Decentralized Control of Commercial V2G Chargers

There is a growing interest in using the flexibility of electric vehicles (EVs) to provide power system services, such as fast frequency regulation. Decentralized control is advocated due to its reliability and much lower communication requirements. A commonly used linear droop characteristic results in low average efficiencies, whereas controllers with 3 modes (idle, fully charging, fully discharging) result in large reserve errors when the aggregation size is small. To address these issues, we propose a stochastic, decentralized controller with tunable response granularity which minimizes switching actions. The EV fleet operator can optimize the chargers' performance according to the fleet size, the service error requirements, the average switching rate and the average efficiency. We use real efficiency characteristics from EVs and chargers providing fast frequency regulation and we show that the proposed controller can significantly reduce reserve errors and increase efficiency for a given fleet size, while at the same time minimizing the switching actions.

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