

Assuring Transient Safety in Inverter-Based Microgrids via Local Control Adjustments

Occurrences of transient excursions in grid frequencies and voltages beyond their operational safety limits are expected to be more frequent and severe with the growth in penetration of inverter-based generation, and consequent decrease in rotational inertia. State-of-the-art operational practices in inverter-based microgrids, such as economic dispatch and optimal power-flow, lack the spatiotemporal granularity required to proactively prevent transient safety violations which are often local and fast-evolving in nature. In this talk, we will discuss the problem of transient safety in microgrids with grid-forming inverters, and present strategies to proactively assure transient safety via online adjustment of inverter control set-points. In particular, we discuss the design of transient safety filters which are locally deployable at the inverter terminal, and act as a buffer between the network operational layer and the inverter-control layer, modifying the dispatched control set-points as necessary to robustly satisfy safety specifications under bounded disturbances. Robust safety assurance is engineered via the construction of state-inclusive bounds on the allowable control set-points, using distributed barrier certificates.