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Virtual Power Plants Based on Energy Storage Systems

Simplifying the coordination of vast numbers of Energy Storage (ES) Systems by clustering them dynamically into Virtual Power Plants (VPPs). The main technical challenge caused by massive penetration of different types of ES is the coordination of vast numbers of ES systems, bringing together various types and capacities of ES systems, individual customer behaviour, connections and disconnections of ES systems and potential power network changes.

Competitive advantage

- Expertise in developing distributed multi-agent control strategies for ES systems and their aggregation into virtual power plants based on operating requirements and ES system properties.

Impact

- VPPs can reduce network costs by improving the utilisation of the network asset and providing opportunities, through technical innovation, for peer-to-peer trading in the future
- VPPs can help reduce a roadblock associated with limited hosting capacities on feeders

Successful applications

- Development of algorithms for on-line peer-to-peer based distributed aggregation of ES systems into virtual power plants.

Capabilities and facilities

- One of the largest Real Time Digital Simulators (RTDS) in academic and research institutions globally. The RTDS allows:
- Real-time verification of algorithms and simulation of power networks together with accurate models of energy storage systems and power converters
- Hardware-in-the-loop simulation, which is the final step before field verification. This presents the opportunity for rapid research, development and verification necessary for translating theoretical advances in multi-agent cooperative control and aggregation algorithms into new strategies suitable for deployment in power system networks

Our partners

- ABB Corporate Research, Sweden ARUP

More Information

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