Minitrack Introduction:
Integrating Distributed and Renewable Resources

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As society continues to seek solutions to the problem of climate change, the electric power industry has set ambitious objectives for integration of renewable sources of energy, facilitated through intelligent devices, storage technologies, microgrids, and flexible and responsive loads. The targeted transformation of the electric power industry also requires the development of new operational tools and paradigms. This minitrack seeks to explore both development and integration of these modern resources, but also the operations, control and market structures required to support the envisaged structure.

The topic of renewables first appeared in the electric power systems track nearly two decades ago, as individual papers considered renewables and the challenges variable resources would pose for existing power systems and markets. For the first time in 2010, the Electric Power Systems track included a minitrack focused on the integration of "non-conventional" resources. In the intervening years, the minitrack has been a consistent part of the Electric Power Systems track. More recently, this minitrack has focused on integration, control and management of distributed and renewable resources at all levels including transmission, distribution, and microgrid systems.

In the coming years, research and development projects are anticipated to continue embracing distributed resources and demand-side flexibility. In particular, it is expected that demand-side resources will play an increasingly prominent role in the power system through their ability to balance the variable generation from wind and solar technologies as well as lower consumer costs.

The HICSS-52 Integrating Distributed and Renewable Resources minitrack discusses these resources, systems and trends through two sessions. The first session focuses on the integration of variable resources into large scale power systems. A first paper "Demand Response for Reducing Coincident Peak Loads in Data Centers" considers the capability of low-power density datacenters as responsive loads. The second and third papers, entitled "Analysis of Wind Ramping Product Formulations in a Ramp-constrained Power Grid" and "Enhanced AC Quasi-steady State Cascading Failure Model for Grid Vulnerability Analysis under Wind Uncertainty", focus on the impact of large scale wind resources on power system operations and reliability. The session concludes with "Physics-informed Machine Learning Method for Forecasting and Uncertainty Quantification of Partially Observed and Unobserved States in Power Grids" presenting a new approach to forecasting uncertainty. The second session turns to the considerations of distribution system operations. The first two papers "Grid-Aware versus Grid-Agnostic Distribution System Control: A Method for Certifying Engineering Constraint Satisfaction" and "Autonomous Multi-Stage Flexible OPF for Active Distribution Systems with DERs" provide new approaches to distribution operational optimization models. The third paper "The Value of Distributed Energy Resources (DER) to the Grid: Introduction to the concepts of Marginal Capital Cost and Locational Marginal Value" will consider spatially differentiated value of distributed resources. The final paper "Impact of Large Distributed Solar PV Generation on Distribution Voltage Control", considers the impact of intermittent renewables on distribution systems.