

Introduction to the Markets, Policy, and Computation Minitrack, Electric Energy Track

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Environmental concerns regarding global warming and the adverse health effects of emissions produced by fossil fuel generation have led to a greater reliance on renewable sources of generation that are inherently variable and uncertain. This trend is accompanied by increased proliferation of distributed resources, storage and smart grid technologies that facilitate demand response and greater observability of the grid. As a result the electric power industry faces new challenges in planning and operation of the power system that require new market mechanisms and computational optimization tools to achieve productive and allocative efficiencies. Flexibility of the conventional generation resource portfolio as well as demand side flexibility are key elements of a new electricity system paradigm that can accommodate massive integration of renewables and distributed resources. Harnessing such flexibility in planning and operations imposes vast computational challenges due to the increased numbers of decision variables and the need to account for uncertainty and respond adaptively to rapidly changing conditions. Hence the central theme of this mini track revolves around identifying requirement and remuneration schemes for flexibility, characterizing market products and public policies that incentivizes flexibility and optimizing resource use to meet flexibility needs so as to assure system reliability in face of uncertainty at least cost.

This minitrack continues a long standing tradition that evolved over the last two decades since the onset of restructuring the electric power industry in the US. Over that period HICSS has become a leading forum for discussion and outlet for research and new developments that focused on the interface between market design for the restructured

electricity industry and computational tools enabling the efficient and reliable operation of a market based power system. The minitrack consists of two sessions. The first session focuses on Market Design and Analysis. It addresses the role of marginal cost in the design of capacity markets, market based intraday coordination of electricity and gas system operation and the joint expansion planning of electricity and gas supply. This session facilitates comprehensive discussion of market constructs and their implications in electric energy systems.

The second session focuses primarily on New Frontiers in Power Systems Optimization and state estimation. The use of reserves from controllable demand is also discussed. The evolution of the electric power system with increased data and information being available for planning, operations and control is presenting new computational challenges. Furthermore, the proliferation of distributed generation, intermittent variable resources, storage and demand response, requires new analytic tools. Such tools must be capable of handling far greater levels of both temporal and spatial data and dealing with uncertainty and variability on the supply and demand side. On the other hand, recent progress in optimization theory and software development complimented by dramatic increases in the capability of low cost computer hardware opens the door for a new generation of software for Electric Power Systems that can address the above challenges.