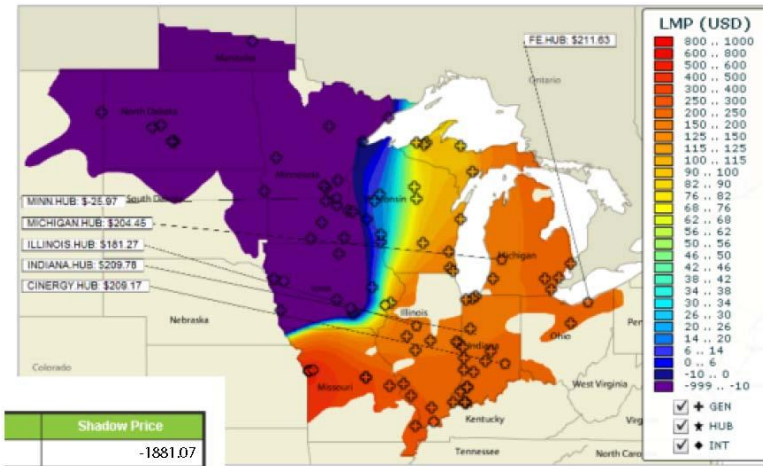


EECS 598 Special Topic Electricity Networks and Markets

Wednesday and Friday, 10:30am-12:00pm
Fall 2013



This course covers the principles and practices that underpin reliable and economical operation of power systems. Power system networks and modeling will be discussed, and an overview of closed-loop controls and basic stability concepts will be provided. System control centres will be considered, primarily in terms of supervisory control and data acquisition (SCADA) and energy management system (EMS) requirements. Power system state estimation will be presented,

along with techniques for on-line evaluation of system reliability. The course will investigate optimal generation scheduling and dispatch, including unit commitment, economic dispatch, optimal power flow, and automatic generation control (AGC). Electricity market structures and mechanisms will be presented, with consideration given to the roles of day-ahead and real-time markets, energy and capacity markets, bilateral trading, and markets for ancillary services. The issues that arise from trading over transmission networks will be considered. A comparison of various markets, including MISO, PJM, AEMO, and the failed Californian market will be undertaken. Issues arising from the variability and uncontrollability of renewable generation will be explored.

Syllabus:

1. Power system structure: networks, closed-loop controls, stability concepts.
2. Control centres: SCADA, EMS, critical infrastructure vulnerability.
3. Reliability assessment: power flow, state estimation, contingency analysis.
4. Optimal generation scheduling and dispatch: unit commitment, economic dispatch, optimal power flow (OPF), automatic generation control (AGC).
5. Electricity markets: day-ahead and real-time markets, bilateral trading, energy and capacity markets, ancillary service markets, trading over transmission networks.
6. Comparison of markets: MISO, PJM, AEMO, failed Californian market.
7. Incorporating renewable generation into electricity markets.

Prerequisites: EECS 463 (or Permission of Instructor).

Course Director: Prof Ian Hiskens, Electrical Engineering and Computer Science.
For additional information contact <hiskens@umich.edu>.