Motivation

In April 2003, FERC proposed a new market design for U.S. wholesale power markets. About 50% of U.S. electric power generation capacity now operates under a variant of the FERC market design. These restructured wholesale power markets are extremely complicated, involving:

- Physical constraints
- Institutional arrangements
- Behavioral dispositions of human participants

It is difficult to model and study these markets using standard analytical and statistical tools. Lack of full transparency regarding market operations for market participants is another potential problem for the new market design.

AMES Introduction

AMES is a wholesale power market test bed populated by interacting software “agents.” AMES means Agent-based Modeling of Electricity Systems.

AMES incorporates, in simplified form, core features of the wholesale power market design proposed by FERC (2003). It permits the systematic experimental study of strategic trading in restructured wholesale power markets operating over AC transmission grids subject to congestion. In particular, it permits the systematic experimental testing of:

- the FERC market design as currently implemented (e.g., in MISO)
- new/modified market design features

AMES(V2.02) has been released as open-source software. For downloads, manuals, publications, and other resources related to AMES, see:

AMES Homepage: www.econ.iastate.edu/tesfatsi/AMESMarketHome.htm

Agent-Based Electricity Market Research: www.econ.iastate.edu/tesfatsi/aelectric.htm

EPRC MISO Project Homepage: www.econ.iastate.edu/tesfatsi/MISOenergygroup.htm

Illustrative Experimental Results

Fig.4 Initial Learning Calibration Experiments: GenCo “Sweet Spot” Learning (red → highest net earnings)

Fig.5 Average LMP and LI Levels as Demand-Bid Price Sensitivity Varies from R=0.0 (0%) to R=1.0 (100%), With & Without GenCo Learning

Research to Date

- Effects on GenCo dispatch levels, LMPs, market power, and market efficiency from changes in:
  - Learning methods
  - Price-sensitivity of demand
  - Supply offer price caps
- GenCo economic and physical capacity withholding
- Spatial correlations among GenCo supply offers and LMPs
- Security issues – inclusion of SCUC using mixed integer linear programming

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