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Planning for Deregulation of the Illinois Electric Power Market Using Agent-Based Modeling

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Future Challenges in Energy Systems and Networks

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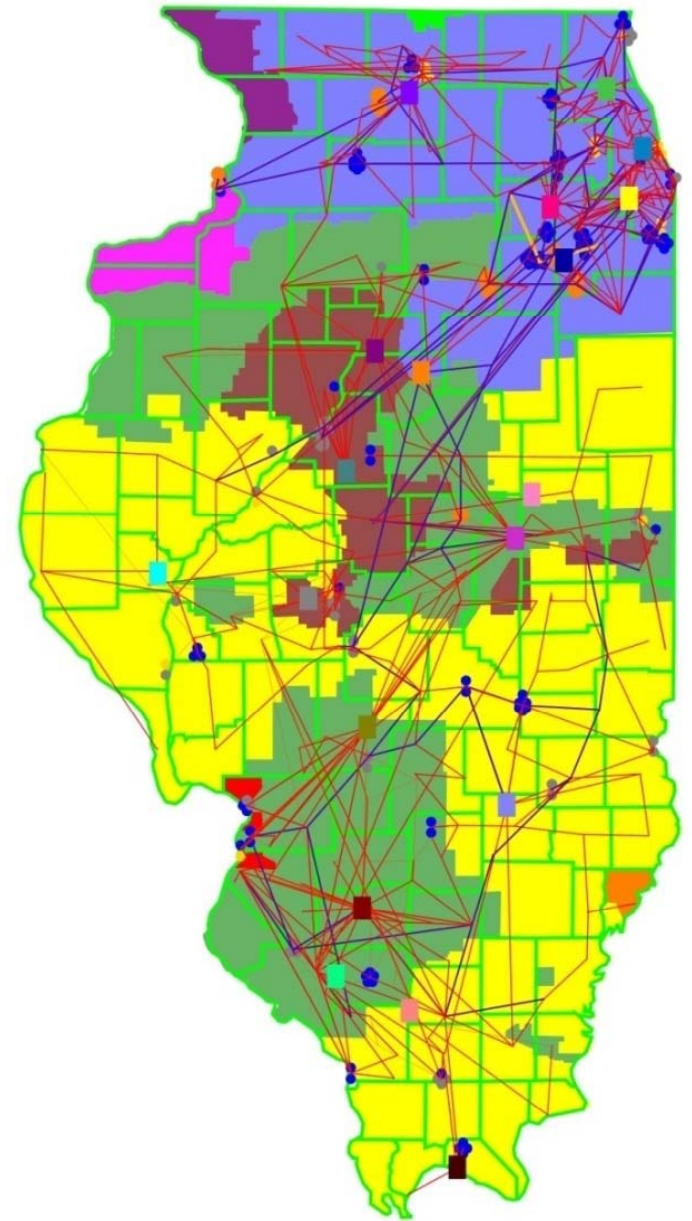
Outline

- Electric Power Deregulation
- Illinois Electric Power System
 - Demand
 - Supply
- Agents
- Modeling the Power Grid
- Results
- Impact
- Conclusions

ELECTRIC POWER DEREGULATION

Electricity Power Deregulation

- Centralization - *Before*
 - Single electricity price for whole state
 - Rate of return regulated by Illinois Commerce Commission (ICC)
- Decentralization – *As of January 1, 2007*
 - Companies free to price their production by bidding into power pools
 - Independent System Operator (ISO) matches supply and demand and clears the market
 - People make their own decisions on consumption
- New ways to calculate electricity prices
 - Locational marginal pricing (LMP)
 - 30 separate pricing zones on the grid
- These issues can only be addressed through agent-based modeling



Illinois electric power transmission grid and service areas

Theory of Electric Power Deregulation

■ Regulated Power Markets

- Good at minimizing costs
- Bad at innovation

■ Deregulated, Decentralized Power Markets

- Good at promoting innovation, more consumer options
- Promote efficiency, lower prices

Illinois Timeline

1997

- In Illinois, electricity restructuring is mandated by the *Electric Service Customer Choice and Rate Relief Law of 1997*.
- The law provides for a transition period up to January 1, 2007, in which the electric power system is to move toward a competitive market.

2000 - 2001

- *California Electricity Crisis* occurs
- Illinois Commerce Commission commissions study with Argonne and the University of Illinois
 - The problems experienced elsewhere in the country emphasize the need for an evaluation of how Illinois might fare under a restructured electricity market.
 - Despite the current adequacy of the generation and transmission system in Illinois, there is concern that the uncertainties of electricity restructuring warrant a more detailed analysis to determine if there might be pitfalls that have not been identified under current conditions.

2003-2006

- Data Collection, EMCAS Model Application, Analysis, Draft Reports

April 2006

- Final Report ()

May 2006

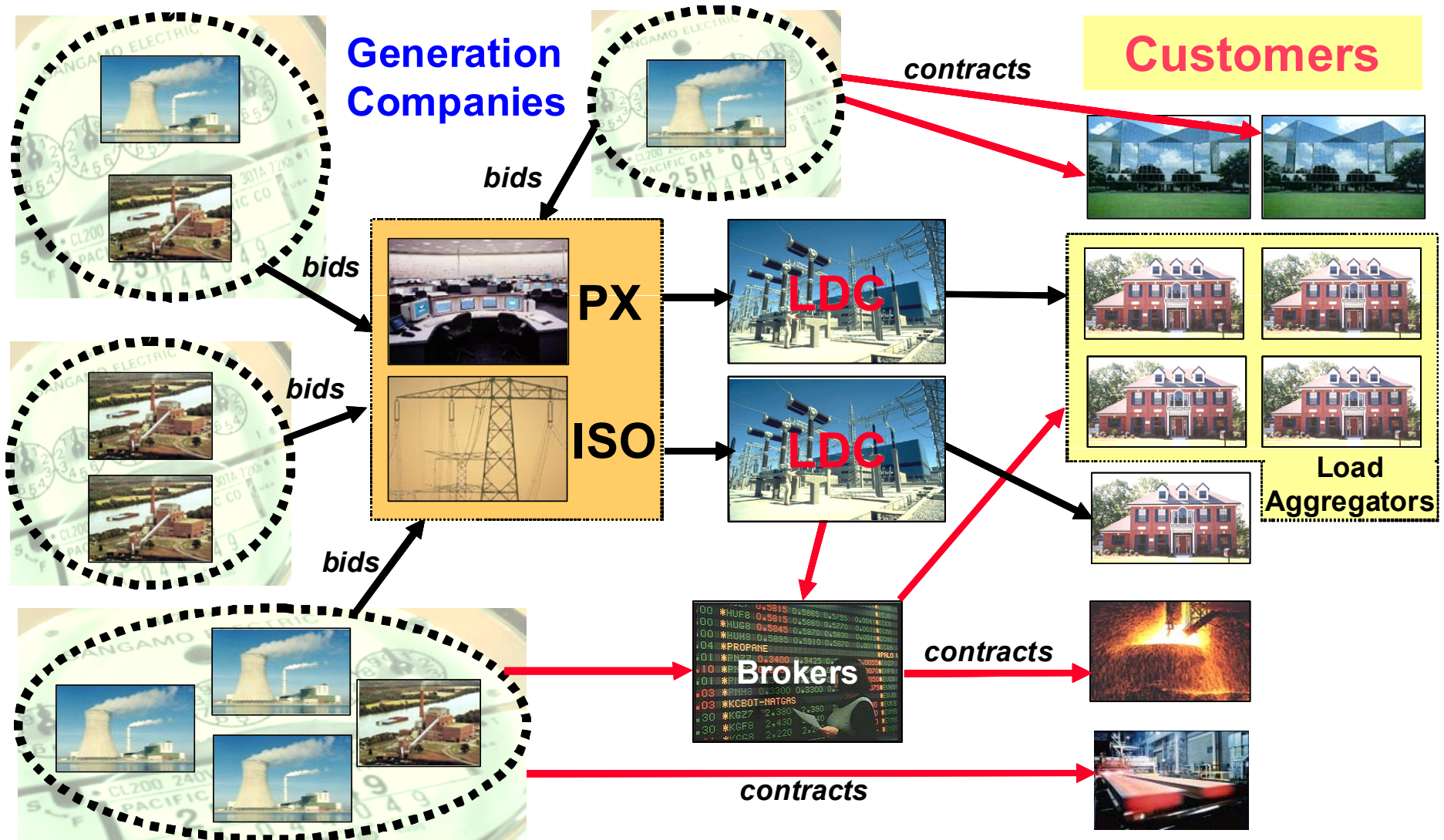
- Testified before the ICC on model results and report

Jan 1, 2007

- Deregulation of the Illinois electric power market completed

**EMCAS: Electricity Market Complex Adaptive Systems Model, developed by Argonne National Laboratory*

Market Structure Under Deregulation



Deregulation Questions

- Electricity Prices?
- Reliability?
- Transferring power across the grid
 - Will power transmission capacity be adequate, or is congestion likely?
 - Will congestion create regional imbalances in supply and demand?
 - Will imbalances create pockets of market power, potentially driving up locational electricity prices?
 - Under what conditions are these situations possible, likely?

