MIP-based Unit Commitment Implementation in PJM Markets

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Evolution of MIP at PJM

Timeline of MIP Implementation in Production systems

- **Day Ahead Market and Reliability Commitment**: December 2004
- **Real Time and Ancillary Services Markets**: August 2006
- **RPM (Capacity Mkt)**: March 2007
- **Perfect Dispatch Concept**: March 2008
Benefits of MIP Implementation

1. Global optimality
2. More accurate solution
3. Improved modeling of security constraints
4. Enhanced resource modeling capability
   a) Generation
   b) Demand response
   c) Transmission Devices
5. More adaptable problem definition
Market Benefits of MIP Implementation

Lower cost to maintain operational reliability

Lower uplift payments

PJM Day Ahead Market uplift Costs 2003-2007 ($/MWh Load)
1. MIP tends to solve faster with more complete transmission model, LR had significant performance issues with transmission constraints

2. Conditional constraints initially created performance problems for MIP

3. Combined cycle model, Hydro unit commitment, etc. - very difficult to implement in LR. MIP handles relatively easily

4. MIP solution speed has improved dramatically
1. Distributed resources
2. Dispatchable demand response
3. Non-traditional regulating resources
4. Interregional coordination
5. Transmission device operation