Analysis of Price Formation
Compromise Proposal

MC
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Joe Bowring
Catherine Tyler
Elements of Compromise Proposal

- No scarcity true up mechanism in the capacity market
- Penalty factor rises from $1,000 per MWh to $2,000 per MWh during hot and cold weather alerts
- Two year phase in of penalty factor
- ORDC slope adjustments
  - 30 to 20 minute uncertainty
  - Removed outlier units in forced outage risk calculation
- Reserve price cap of $4,000
- Increase in DR participation limit in synchronized reserve market
Scarcity True Up Mechanism

• The scarcity true up mechanism is necessary for an efficient, effective, and equitable transfer of scarcity revenues from the capacity market to the energy market.

• The compromise proposal creates a windfall to generators.

• The compromise proposal does not support a long term transition to the energy market as a daily source of scarcity rents.
Penalty Factor

- Hot and cold weather alerts are the wrong trigger for raising the penalty factor from $1,000 per MWh to $2,000 per MWh.
- Greater than $1,000 per MWh is only needed when PJM approves cost-based offers over $1,000 per MWh.
- Hot and cold weather alerts are much more frequent.
- Hot and cold weather alerts may only apply to a subsection of the PJM footprint.
- Hot and cold weather alerts may only apply for a portion of the day, creating sudden intraday market transitions.
Penalty Factor and Revenues

- The penalty factor is not directly proportional to the reserve or energy price impact of the ORDC.
- Prices result from both supply and demand.
- Lowering the demand curve does not decrease prices by the dollar or percent amount of the decrease.
Penalty Factor and Revenues

Supply Curve

Proportional Price Change

Actual Price Change

$2,000

$1,000
ORDC Slope Forecast Time Horizon

- Forecast error is not a good predictor of operator actions.
- The relevant forecast error for 10 minute reserves is no greater than 15 minutes.
- The compromise proposal does not address the time horizon for 30 minute reserves.
• PJM’s approach to the inclusion of forced outages in the ORDC is not accurate.
• PJM’s approach overstates the forced outage MW and the ORDC.
• PJM’s approach assumes that all units are always online.
• PJM’s approach misses the fact that there is a significant probability of zero outages for each 30 minute time horizon.
• Removing 30 units from PJM’s calculation does not correct the problem.
Forced Outage Distributions

Forced outage probability based on empirical data for Summer Time Block 5 (each column represents 20 MW of capacity)

Forced outage probability based on PJM capacity resource fleet with seasonal load adjustment to Summer Time Block 5 (each column represents 20 MW of capacity)
Forced Outage Distributions

Forced outage probability based on empirical data for Winter Time Block 4 (each column represents 20 MW of capacity)

Forced outage probability based on PJM capacity resource fleet with seasonal load adjustment to Winter Time Block 4 (each column represents 20 MW of capacity)
Forced Outage Distributions

- Forced outage probability based on empirical data for Spring Time Block 2 (each column represents 20 MW of capacity)
- Forced outage probability based on PJM capacity resource fleet with seasonal load adjustment to Spring Time Block 2 (each column represents 20 MW of capacity)
PJM ORDC with Corrected Forced Outage Rate

Price ($ per MWh)

Reserves (MW)

- PJM ORDC SR (Summer, Time Block 5)
- ORDC SR based on empirical forced outage distribution (Summer, Time Block 5)
PJM ORDC with Corrected Forced Outage Rate

Price ($ per MWh)

Reserves (MW)

PJM ORDC SR (Winter, Time Block 4)

ORDC SR based on empirical forced outage distribution (Winter, Time Block 4)
PJM ORDC with Corrected Forced Outage Rate

Price ($ per MWh) vs Reserves (MW)

- **PJM ORDC SR (Spring, Time Block 2)**
- **ORDC SR based on empirical forced outage distribution (Spring, Time Block 2)**
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Demand Response

- There should be no cap on demand response participation in any reserve market.
- The compromise proposal to increase participation up to 50 percent only applies to synchronized reserve.
- The compromise proposal does not allow 30 minute capacity DR to participate in 30 minute reserves.