



Multi-Day Energy Reserve Product – UPDATED

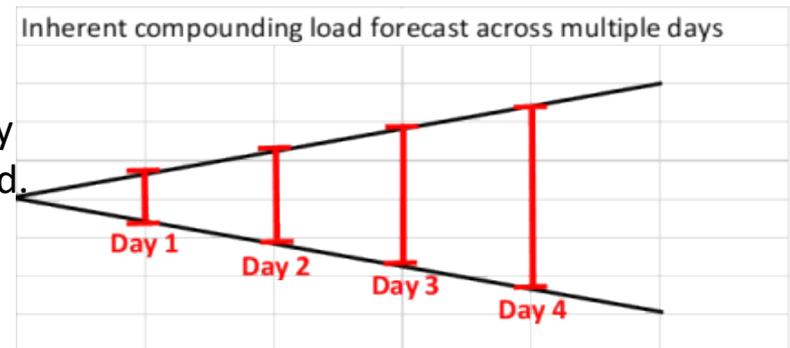
Aug 15, 2023 EGCSTF

An Energy Assurance Challenge Unique to Weekends

- Poor coordination between electric system operations and weekend gas markets may create *energy assurance* challenges unique and distinct from capacity shortfalls.
- Gas does not trade as readily on weekends and under certain conditions daily purchases on a weekend may not be available.
- Gas priced on Friday is subject to value erosion by Monday (or Tuesday) due to load forecast error.
- Creates a unique and negatively-biased financial risk for most gas-fired generators and elevated system reliability risks across some weekends.
- Markets do not offer a sufficient risk/reward framework to incent *marginal generators* to contract for gas across an entire weekend.

A Closer Inspection of the Risk/Reward Framework

- Examination is of marginal generators. CCGT may have incremental financial risk but have sufficient price signals to purchase a weekend gas package.
- Marginal generators:
 - Typically receive revenues sufficient only to cover their production costs – i.e., potential for inframarginal rents is low in most cases.
 - In infrequent scenarios where scarcity pricing is high, fuel costs are also high and fuel may be scarce – i.e., high risk, relatively low reward.
- If a gas-fired resource other than a baseload resource wants to purchase a weekend gas package it must:
 - Step 1: Match it's run profile with the load forecast for each day
 - Step 2: Sum expected gross margin and losses for each day and iterate over Step 1 until acceptable risk/reward balance is achieved.
- Gas-fired generators must make this prediction across multiple days, and the *net load* forecast error inherently increases for each additional day – i.e., holiday weekend.
- For peakers, the optimal risk/reward balance is to procure gas intraday when the RTO calls on them.



A Novel Product that Addresses Only the Weekend Energy Assurance Concern

- Acknowledges that net load forecast error is an inherent error, independent of generator-specific performance, and cannot easily or cheaply be mitigated by individual facilities.
- Tailored to minimize costs to load, mitigate risks to generators, and increase total firm energy available, which maximizes total societal welfare.
- It is an energy product, specifically an energy reserve product, denominated in MWh designed to address an energy shortfall.
- Non-discriminatory - open to all resource types capable of providing incremental energy reserves over the course of the designated weekend period.

High-Level Design Concepts

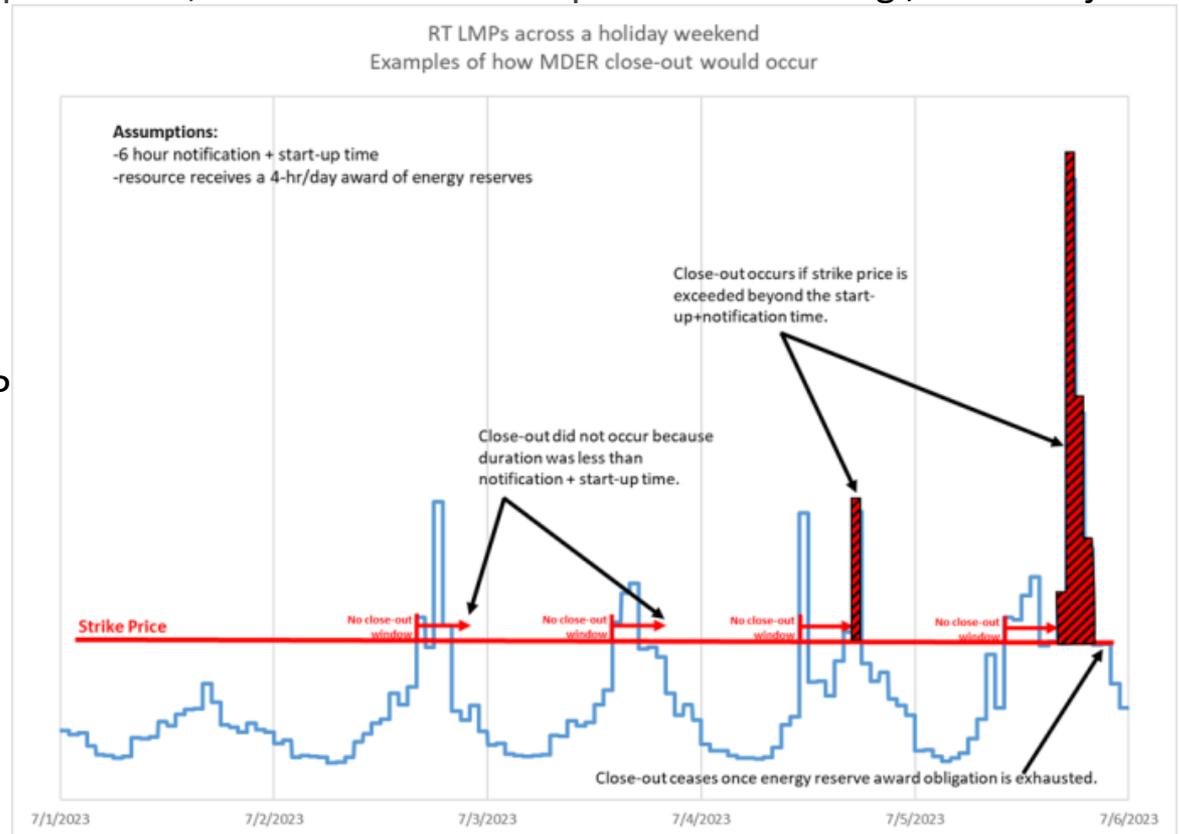
- Suppliers receive a fixed payment in exchange for procuring fuel and delivering energy at or below the strike price – i.e., a call option on energy.
- PJM determines the:
 - conditions when auctions would be held based on number of days in the weekend and forecasted reserve margin throughout the weekend;
 - quantity, denominated in MWh, to procure and informed by load forecast error; and
 - strike price, set in \$/MWh, equal to the highest forecasted LMP over the period.
- Suppliers submit \$/MWh price pair offers concurrent with DAM offer window deadline on Friday and PJM clears these offers independently of the DAM and announces awards by 11:00am.
- Auction clears on a vertical demand curve with a modest cost cap.
- Suppliers awarded an energy reserve obligation must submit evidence of fuel procurement by 3pm Friday and are assessed an administrative penalty if they don't.

Energy Offer and Settlement Procedures

- Suppliers submit DA and RT energy offers, commencing Saturday through the weekend, with an offered quantity of (a) no less than the energy reserve MWh award, and (b) such quantity priced [for discussion: (i) at no greater than the cost of the fuel procured, or (ii) the strike price].
- Pipeline operator limitations and constraints not known at the time the supply offer is made are respected – e.g., ratable take requirements, or result in excused performance – e.g., force majeure events, etc.

- All other energy and capacity market rules and requirements remain in force.

- Financial close-out occurs during intervals when the RT LMP exceeds the strike price after the unit parameters of the generator are taken into consideration and up to the energy reserve quantity awarded to the supplier.



Additional Considerations

■ Mitigation:

- Expected small quantity of demand relative to supply pool creates competitive outcomes
- Cost cap limits opportunities for the exercise of market power by generators *and gas suppliers*.

■ Benefits to Load Serving Entities

- Forward auction with cost cap allows for early price discovery and pursuit of possibly cheaper alternatives – e.g., slow starting units, bias towards spinning reserves, etc.
- Incremental firm energy going into a constrained weekend creates more reliable outcomes and less price volatility.
- Does not shield generators from performance risk or making poor fuel procurement decisions.

■ Benefits to Generators

- Segregates performance risk from net load forecast risk; the latter is not cheaply or easily hedged
- Reduces risk of PAI events
- Reduces non-performance risk during PAI events.

Conclusion

- Proposed a paradigm for a unique weekend risk – i.e., long-range net load forecasting.
- Provided an explanation for why marginal generators do not respond to current market signals.
- Offered a narrowly targeted solution that creates incentives for marginal generators to mitigate the net load forecast risk without diluting generators' performance risk.
- Provided a non-discriminatory platform to allow RTOs to determine the most optimal set of resources to meet energy reserve/weekend reliability requirements.
- Described ancillary benefits of potentially mitigating the exercise of gas supply market power through forward price discovery, which allows the RTO to consider alternative courses of action before a scarcity event unfolds.