Energy and Reserve Pricing & Interchange Volatility

September 29, 2014

Interchange Volatility Solution Overview

Interchange Volatility Matrix

#	Design Components	Proposed Solution
1	Conditions triggering implementation of an interchange cap	Only applied while Hot Weather Alerts, Cold Weather Alerts, Max Emerg Gen Alerts/Actions, Weather / Environmental Emergency conditions, Sabotage / Terrorism Emergency conditions or more severe Emergency Procedures are effective AND operators have made firm resource commitments and anticipated interchange schedules are sufficient to meet projected load
2	Hours to which cap applies	Forecasted peak hour(s) and several hours on either side (will likely differ for summer and winter peaks)
3	Transactions to which the interchange cap applies	Spot imports and hourly non-firm point to point interchange (imports and exports)
4	Cap granularity	Hourly, but can be adjusted intra-hour for reliability reasons once within the operating hour
5	Cap frequency	Calculated one to two hours in advance of the operating hour
6	Locations to which cap applies	RTO wide (not interface based)

Interchange Volatility Matrix

#	Design Components	Proposed Solution
7	Calculation	Dispatcher interchange expectation at the time firm resource commitments are being made plus 700 MW margin to accommodate for potential loss of generation or load deviation
8	Notifications	
8a	Timing	Notification of potential for an interchange cap made day ahead. Notification of cap implementation (with cap level and hour to which it applies) made as soon as cap is determined (one to two hours in advance).
8b	Notification Method(s)	ExSchedules banner notification (spring 2015) plus 'special notification' message in Emergency Procedures, which creates an alert in eData Same notification methods when cap is lifted
9	Changes to 'RT with Price' transactions	Change submission timing from 12:00 day ahead to 18:00 day ahead

Implementation Timeline

The Interchange Volatility proposal will be implemented in two phases:

- Winter 2015 via manual curtailment of transactions violating interchange cap
  - Operators will use a report highlighting hourly service that was scheduled after the implementation of the cap
  - Operators will curtail hourly service above the cap on a last in / first out basis

- Spring 2015 via automated denial of transactions violating interchange cap at time of submission

Manual Revision Summary

- Manual 11: Energy and Ancillary Service Operations
  - Section 7 – added interchange cap business rules
  - Other clean up changes related to ExSchedule implementation

- Regional Practices
  - Section 2.1.2.2 – updated submission timeline for real time with price transactions to 18:00 day-ahead
  - Section 2.1.2.6 – new section to reference interchange cap rules in M11.

Energy and Reserve Pricing Solution Overview

Energy and Reserve Pricing Solution

The proposed Energy and Reserve Pricing Solution is comprised of three parts

- Day Ahead resource commitment changes
- Day Ahead Scheduling Reserve requirement changes
- Synchronized Reserve and Primary Reserve requirement changes

Energy and Reserve Pricing Matrix: DA Commitment Changes

#	Design Components	PJM Proposal
6	Treatment of long lead time units in DA Energy market	Commit long lead time units scheduled by operators based on schedule dictated by PJM operations
7	Trigger for committing long lead time units in DA Energy market	Hot Weather Alert, Cold Weather Alert, Max Emerg Gen Alert, Weather / Environmental Emergency, Sabotage / Terrorism Emergency AND long lead resources have been scheduled and are still needed for the operating day

Energy and Reserve Pricing Matrix: DASR Changes

#	Design Components	PJM Proposal
1	Clear DASR based on Emerg Max or Eco Max of resources	currently uses Emergency Max, change market to clear using Eco Max
2	Eligible DASR capability from offline units (no proposed change to calculation of DASR capability from online units)	min[EcoMax,EcoMin + ((30- (Startup + NotificationTime))*DA Default RampRate]
3	DASR Locations	RTO only, leave flexibility in manual / tariff language to implement a reserve sub-zone if needed

Energy and Reserve Pricing Matrix: DASR Changes

#	Design Components	PJM Proposal	Option B
4	Reserve Requirement Increase		
4a	Trigger	Hot Weather Alert, Cold Weather Alert, Max Emerg Gen Alert, Weather / Environmental Emergency, Sabotage / Terrorism Emergency	
4b	Increase DASR Req by:	Difference between submitted fixed demand bids and forecasted RT load for each hour Plus additionally scheduled reserves	
4c	On/Off Peak Differentiation	Amount to be added to the DASR requirement will be calculated individually for each hour	
5	Cost Allocation	Two part allocation: - Charges for base requirement allocated to real-time load - Charges for additional DASR requirement allocated to differences in Day-ahead demand and Real-time load when Day-ahead demand is less than Real-time load	Status quo - Allocate entire amount of DASR to real-time load

Cost Allocation Options

1. Status Quo
   - Allocate all charges to real-time load

2. Modified Allocation
   - Two buckets
     1. Charges for base requirement are allocated to real-time load
     2. Charges for additional DASR requirement resulting from differences in Day-ahead fixed demand and RT load are allocated to differences in Day-ahead demand and Real-time load when Day-ahead demand is less than Real-time load
        - Day-ahead demand is the sum of fixed demand bids

Energy and Reserve Pricing Matrix: Real Time Changes

#	Design Components	PJM Proposal
8	Method of capturing additional reserves in RT pricing	Increase existing RT reserve requirements
9	Reserve Products Impacted	Synchronized Reserve (SR) and Primary Reserve (PR)
10	Trigger	Hot Weather Alert, Cold Weather Alert, Max Emerg Gen Alert, Weather / Environmental Emergency, Sabotage / Terrorism Emergency AND/OR additional intraday resources have been intentionally scheduled
11	Calculation of updated SR and PR requirements	Existing SR / PR requirement plus sum of additional intraday resources that have been committed
12	On/Off Peak Differentiation	requirements would only be increased during on peak hours, for only those hours where additional intraday resources are scheduled

Energy and Reserve Pricing Matrix: Real Time Changes

#	Design Components	PJM Proposal
13	Locations	Synch Reserve and Primary Reserve continue to be cleared for RTO and MAD If anticipating reserve deliverability issues, then the requirements for the sub-zone(s) in which the additional resources are located are increased (ex. resources in MAD increase both MAD and RTO requirements, resources in non-MAD portion of RTO only increase the RTO requirement) If not anticipating deliverability issues, then only the RTO requirements are increased
14	Frequency of Reserve Requirement Change	SR and PR requirements are updated as needed as additional intraday resources are scheduled and released
15	Capacity eligible to meet SR and PR requirements	existing synch reserve and non-synch reserve capability
16	Capability	no change to SR or PR capability

Energy and Reserve Pricing Matrix: Real Time Changes

#	Design Components	PJM Proposal
17	Must Offer Obligation	status quo
18	Offers	status quo
19	Market Mitigation	status quo
20	Demand Curve Shape & Level	two step demand curve - reliability requirement priced at $850, extended requirement priced at $300 (for DY 2015/2016 and beyond)
21	Clearing	status quo
22	Method for communicating reserve requirement change and reason	Message in eMKT upon log in indicating new requirement and reason for change plus emergency procedures 'special notification' (which prompts eData alert)
23	Exit Criteria	Hot Weather Alert, Cold Weather Alert, Max Emerg Gen Alert, Weather / Environmental Emergency, Sabotage / Terrorism Emergency no longer effective AND/OR additional intraday resources have been released

Energy and Reserve Pricing Matrix: Real Time Changes

#	Design Components	PJM Proposal
24	Settlements	
24a	SR and PR Credits	status quo
24b	BOR Offset	status quo
24c	Cost Allocation	status quo

Implementation Timeline

- Energy and Reserve Pricing Solution (DA and RT reserve changes)
  - Implemented for Winter 2015, with the exception of changes requiring tariff revisions
  - Changes requiring tariff revisions to be implemented no later than Spring 2015
    - DASR cost allocation (assuming different allocation for additional DASR requirement)
    - Additional lower step on SR / PR demand curves

Manual Revision Summary

- Manual 11: Energy and Ancillary Service Operations
  - 2.3.6 – Added commitment of long lead resources in the day-ahead market
  - 2.5 – Added details on second step on Synchronized Reserve and Primary Reserve demand curves *(becomes effective only after approval of associated FERC filing)*
  - 2.8 – Clarified first step on demand curve is used in pricing when in voltage reduction / load dump action
  - 2.9 – Clarified first step on demand curve is used when calculating max possible energy price
  - 4.2.2 – Added business rules on the increase to the Synchronized Reserve and Primary Reserve Requirements
  - 4b.2.2 – updated reference to single step demand curve

Manual Revision Summary

- Manual 11: Energy and Ancillary Service Operations, continued
  - 11.2.1 - Added business rules on the increase to the DASR Requirement
  - 11.2.3 – Updates to the calculation of the DASR Offer quantity
  - 11.2.8 – Referenced separate cost allocation for the base and additional DASR quantities *(becomes effective only after approval of associated FERC filing)*
  - Other minor revisions to clean up formatting and references to retired applications

- Manual 28: Operating Agreement Accounting
  - Section 19 – Added DASR cost allocation changes

Questions or suggested revisions to the manual language may be sent to lisa.morelli@pjm.com