Energy Price Circuit Breaker Joint Stakeholder Package

November 16, 2022

Goal of the Issue Charge

- Explore potential “circuit breaker(s)” or other stop loss approach(es) that could limit extreme pricing whose cost likely far exceeds the value of any contribution to preserving grid reliability

Historic Prices in PJM

- Joint Stakeholder package trigger is average LMP over a day or week
- Historic observations of total LMP reviewed for context
- Observation period of data is 2011 through June 2022
- Only reviewed real-time pricing for most extreme price observations
- $35.11 – average real-time total LMP for a day
- $35.10 – average real-time total LMP for a week

	Date	Week/Year	LMP ($/MWh)
Highest Average Week	1/5/2014	2nd/2014	$167.74
Highest Average Day	1/7/14	2nd/2014	$675.77
Highest Average Hour	6/13/22, 1600	25th/2022	$2,642.58

Historic Prices in PJM

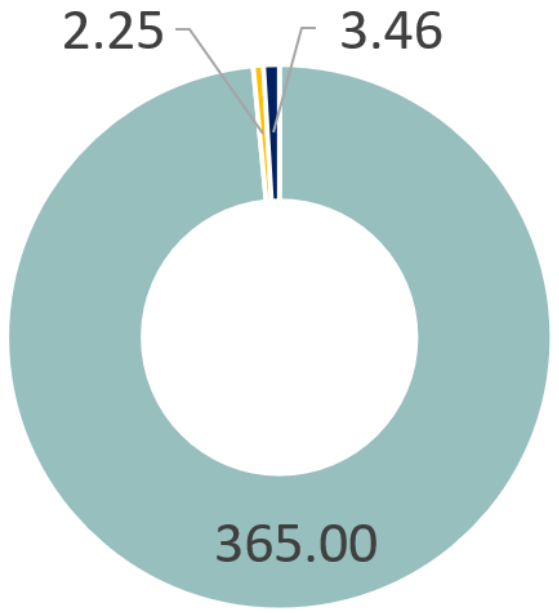
Year	Highest Average RT LMP Day	Highest Average RT LMP Week	Average RT LMP Day	Average RT LMP Week
2011	$196.95	$87.96	$42.84	$42.59
2012	$113.55	$54.94	$33.11	$33.06
2013	$119.56	$78.89	$36.55	$36.46
2014	$675.77	$167.74	$48.22	$48.23
2015	$191.76	$129.31	$33.39	$33.24
2016	$61.43	$41.56	$27.57	$27.46
2017	$109.75	$91.40	$29.42	$30.42
2018	$230.98	$159.82	$35.75	$35.89
2019	$110.34	$39.48	$26.02	$25.91
2020	$50.67	$33.68	$20.66	$20.66
2021	$108.20	$74.89	$38.18	$37.92
Thru June 2022	$361.10	$130.62	$64.42	$63.10

Example - Small LSE

- Prices can spike to $5,700/MWh with high cost-based offers, reserve shortages, and a $2,000/MWh (TCPF) Transmission Constraint Penalty Factor
  - $3,700/MWh with just the high cost-based offers and reserve shortages even without the TCPF
- Prices can spike to consider a load server with 2,000 MW of load and 1,800 MW of generation
  - 90% physical hedge
- Cost to procure that 200 MW at PJM average prices of $35.10, which includes price spikes, is just over $60 million/year
- At $5,700/MWh, annual spend for those 200 MW reached in just 2.25 days
- At $3,700/MWh, annual spend for those 200 MW reached in just under 3.5 days

Example – Small LSE

Load (MW)	Price ($/MWh)	Days	Cost
200	$35.10	365.00	$61,495,200
200	$5,700	2.25	$61,495,200
200	$3,700	3.46	$61,495,200



Example – Generator, Single Day

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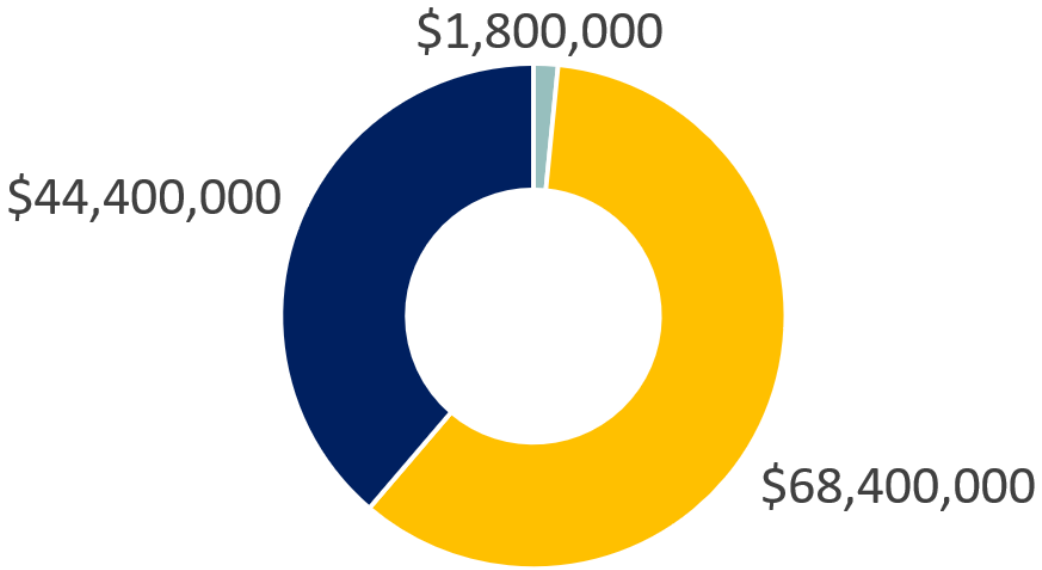
- Consider a generator that has sold 500 MW forward for January at a price of $150/MWh
  - Lots of extreme pricing already built in
- Generator trips offline and the daily nominal position of original value of $1.8 million must be replaced at a cost of:
  - $68.4 million per day at $5,700/MWh
  - $44.4 million per day at $3,700/MWh

Example – Generator, Single Day

Position (MW)	Price ($/MWh)	Daily Value / Replacement
500	$150.00	$1,800,000
500	$5,700	$68,400,000
500	$3,700	$44,400,000



Joint Stakeholder Package

Circuit Breaker Trigger

- Energy price, average total LMP over a defined interval in the RTO or Active Subzone
- PJM Discretion to invoke the circuit breaker methodology during other Emergency Procedures
- PJM shall not have discretion to prevent the circuit breaker
- Both day-ahead and real-time markets may trigger the circuit breaker
- Once triggered, circuit breaker is deployed immediately – next 5-minute interval
- Notification
  - Stakeholder email communication
  - Addition of circuit breaker Status Icon to PJM Markets & Operations landing page and Data Viewer
  - Much like a PAI notice, the circuit breaker will be noticed on the Emergency Procedures page for informational purposes

Joint Stakeholder Package

LMP-Based Circuit Breaker Components

- Total LMP in RTO or Active Subzone is the triggering mechanism
- Trigger level
  - $1,000/MWh average LMP for any single rolling 24-hour period (aka day)
  - $850/MWh average LMP for any rolling 168-hour period (aka week)
- Methodology – administratively cap total LMP at $850/MWh for the RTO or Active Subzone
- Settlements - scheduled and committed resources with verified cost offers above the relevant circuit breaker pricing levels would recover costs via current uplift methodology
- Termination – a circuit breaker cap will automatically terminate after 5 business days in the event the circuit breaker cap has not been utilized

Contact to Join or with Questions

Adrien Ford

ODEC

aford@odec.com

+1-215-251-2427

John Rohrbach

ACES on behalf of SMECO

jrohrbach@acespower.com

+1-317-344-7216

Mike Dailey

NOVEC

mdailey@novec.com

+1-703-392-1578