Circuit Breaker Proposal

Gregory Pakela
DTE Energy Trading, Inc.

Analysis

- The PJM proposal could result in the energy revenues of $5 billion (Slide 4,) an amount that would be roughly 25% of historic total annual energy market revenues in one day (Slide 5.) Multiple days of shortage pricing could result in energy revenues approaching or exceeding the historical energy revenues for the entire year.
- Slide 6 shows that at prices around the existing offer caps of $1,000 and $2,000, respectively, energy market revenues would still be at $2 billion to $6 billion for the day.
- Slide 7 shows a much lower total daily energy bill, assuming only 3% of load is exposed to the Real Time balancing market. However, if shortage conditions persist over multiple days, shortage prices could be reflected in the Day Ahead market, resulting in revenues in the billions.
- This circuit breaker proposal retains the ORDC if the energy price does not fully indicate shortage conditions, but if energy prices rise to the existing $1,000 and $2,000 caps, not including congestion, the ORDC is disabled for longer term, multi-hour pricing.

Circuit Breaker Proposal

- After 1 hour of full ORDC pricing under shortage conditions, the circuit breaker would set the ORDC = $1,000 – Energy, unless Energy = or > $1,000, then the ORDC = $0.
- Under shortage conditions, the energy price is likely to reflect shortage conditions either through very high fuel costs at the margin, or Demand Response setting the price.

Analysis Findings – Scenario 3: Day-Ahead Shortage

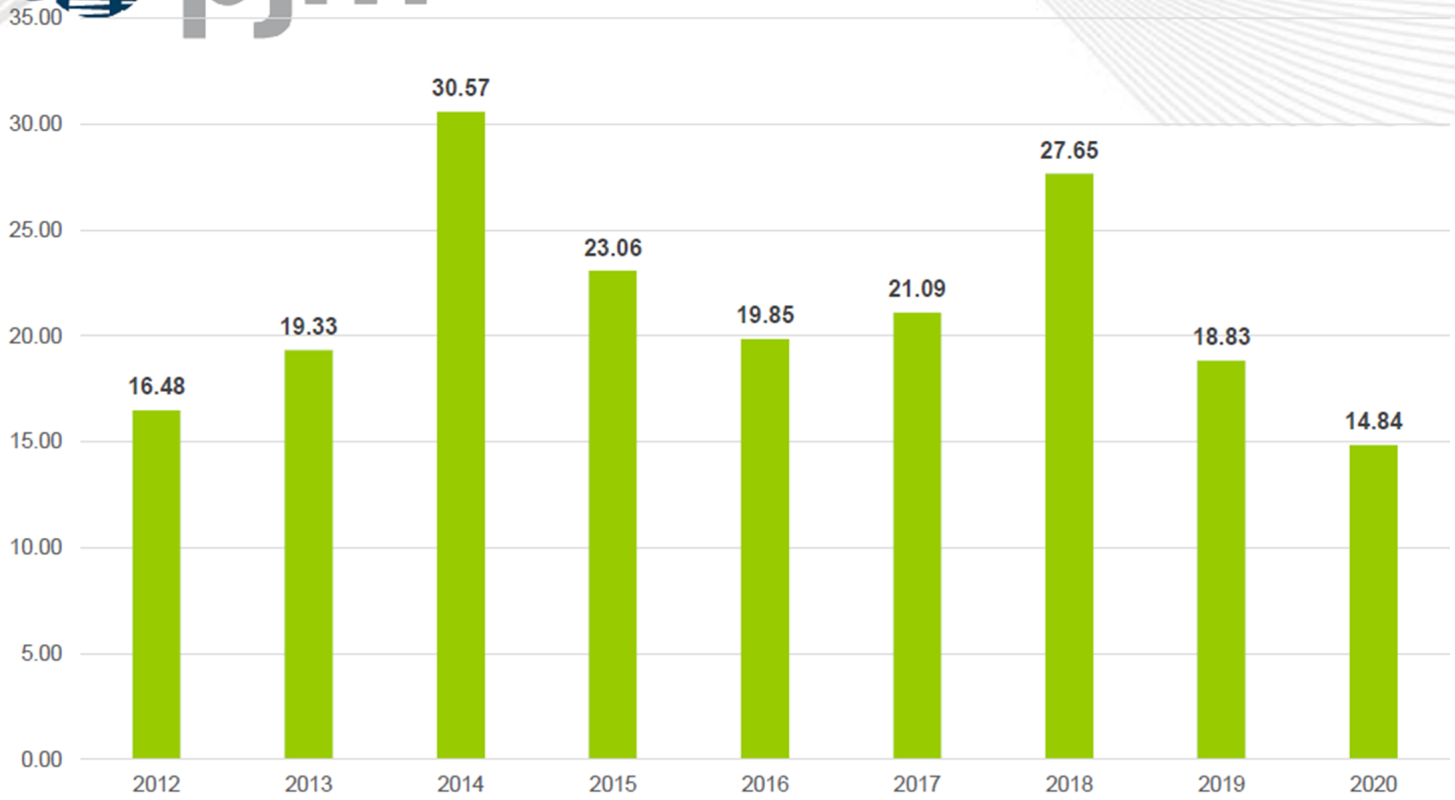
Shortage Event Triggered in Day-Ahead Market for all 24 Hours and Circuit Breaker Applied all 24

Assumed Max Energy Price	Estimated Cost without Circuit Breaker	Estimated Cost with Circuit Breaker	Reduction in Day-Ahead Billing
$3,750	$11.4 Billion	$5.1 Billion	55%
$6,300	$16.0 Billion	$5.1 Billion	68%
$12,000	$30.5 Billion	$5.1 Billion	83%

Takeaways: If there is a shortage in day-ahead:

- DA circuit breaker has a significant impact, even at existing price caps.
- Likelihood of DA shortage is low, as load not likely to bid into DA Market at the maximum price.

Circuit Breaker Trigger- Revenue Based



- PJM annual energy market billing since 2012
- Average annual billing is ~21B
- Jan 2014 billing was 1/3 of annual billing (Polar Vortex)

Circuit Breaker Trigger- Revenue Based

PEAK LOAD CONDITIONS

MWh	LMP	Market Total
3,500,000	$3,700.00	$12.9B
	$2,000.00	$7.0B
	$1,000.00	$3.5B
	$ 500.00	$1.7B
	$ 50.00	$0.17B
3,000,000	$3,700.00	$11.1B
	$2,000.00	$6.0B
	$1,000.00	$3.0B
	$ 500.00	$1.5B
	$ 50.00	$0.15B

Jan 5, 2018
~3M MWh

AVERAGE LOAD CONDITIONS

MWh	LMP	Market Total
2,500,000	$3,700.00	$9.2B
	$2,000.00	$5.0B
	$1,000.00	$2.5B
	$ 500.00	$1.2B
	$ 50.00	$0.12B
2,000,000	$3,700.00	$7.4B
	$2,000.00	$4.0B
	$1,000.00	$2.0B
	$ 500.00	$1.0B
	$ 50.00	$0.1B

PJM Av. Load
~2.1M MWh

Analysis Findings – Scenario 1: Real-Time Load Risk

3% of Real-Time Load Exposed to Shortage Pricing for 14 Hours

Assumed Max Energy Price	RT Load Billing without Circuit Breaker	RT Load Billing with Circuit Breaker	Total Daily Billing*	Benefit to Exposed RT Load	%Total Daily Billing
$3,750	$224 Million	$195 Million	$972 Million	13%	3%
$6,300	$368 Million	$297 Million	$1.11 Billion	19%	6%
$12,000	$691 Million	$526 Million	$1.44 Billion	24%	11%

*Total Daily Billing = DA Energy Charges (97% Hourly Metered Load * Actual DA LMP) + RT Load Billing without Circuit Breaker

Takeaway: When shortage conditions only exist in real-time, the circuit breaker has a smaller benefit to load because of the small portion of load that is exposed to RT LMP.