Circuit Breaker Proposal

Calpine

September 2021

ORDC Stacking

Currently to Be Implemented 5/1/2022

- When short, $2,000 reserve adders to system energy component of LMP at the reference bus that can stack to:
  - **$14,050/MWh** reference bus LMP under DAM & RTO nesting
  - $20,050/MWh reference bus LMP under new reserve zone actuation by PJM ops prior to an event, we think??

Yesterday/2021 (prior to recent ORDC approval)

- Stacking additive effect to LMP capped at 2x shortage penalty factor
  - 2 x $850 = $1,700 adders: $2,750/MWh reference bus LMP under price-based offers
  - 2 x $850 = $1,700 adders: $3,750/MWh reference bus LMP under cost-based offers

Targets of This Proposal

- Problem is extreme scenarios events with prolonged shortage situations of multiple products across encapsulate reserve zones in a “stacking” fashion
- Prevent significantly higher costs for non-performance under the new system than under current $850 shortage pricing rules
  - For prolonged shortage conditions
- Prevent prolonged extreme pricing where benefits of the price signal might be less than the harmful market impacts on market participants in aggregate
  - Not trying to protect market participants that made poor operational decisions, such as failure to winterize or hedge prudently

Methodology Change (Applies to all normal events)

- General ORDC Change:
  - ORDC stacking across nested reserve zones and products capped at 2x shortage penalty factor, which is $4,050/MWh adder
  - $6,050/MWh cap at LMP reference bus

- Stacking across products and zones remains in accordance with approved 2022 rules as long as the total penalty factor adder to energy prices at the reference bus does not exceed 2x shortage penalty factor ($6,050)
  - All three products can stack
  - Additionally, both reserve zones/areas can stack
  - Total stacking cannot exceed $4,050/MWh adder to LMP at reference bus

Methodology for Circuit Breaker (Extreme Event)

- Goal: Prevent significantly higher costs during extreme prolonged events for non-performance under the new system than under yesterday's (2021) $850/MWh shortage pricing rules

- Prolonged Event:
  - Shortage Event of 9 hours or longer (initial Prolonged Event)
    - or 9 hours of total shortage events in an op day if non-consecutive hours
  - Any subsequent events during the DY to the initial "Prolonged Event" of length of 3 hours or longer

1. Recognizing that new ORDC products can stack 3x rather than 2x
   - Current stacking reserve adder to LMP is capped at 2 x 850 = 1700
   - Proposed: 3 x 566 ~= 1700 (after Prolonged Event trigger)
     - Closely matches the right-hand side of new ORDC curves
2. Remove stacking across nested reserve zones after "Prolonged Event" trigger

Detailed Comparison:
Proposed Circuit Breaker to Today's (2021) Shortage Pricing

Prolonged Extreme Pricing Situation (90 hour event)

Calpine Proposed Circuit Breaker

Hours Ending		ORDC Prices						ORDC Adder Limited Stack Penalty	Ref Bus LMP	(1 MW) Exposure Cost
		RTO			DAM					
Start	End	30 Min Res	Prim Res	Sync Res	30 Min Res	Prim Res	Sync Res			
1	9	2,000	2,000	2,000	2,000	2,000	2,000	6,050	8,050	72,450
10	90	566	566	566	566	566	566	1,748	3,748	303,588
										376,038

Today (2021) Shortage Pricing scenario

Hours Ending		ORDC Prices						ORDC Adder Limited Stack Penalty	Ref Bus LMP	(1 MW) Cost
		RTO			DAM					
Start	End	30 Min Res	Prim Res	Sync Res	30 Min Res	Prim Res	Sync Res			
1	90		850	850		850	850	1,750	3,750	337,500

2022 Approved ORDC scenario

Hours Ending		ORDC Prices						ORDC Adder Unlimited Stack Penalty	Ref Bus LMP	(1 MW) Cost
		RTO			DAM					
Start	End	30 Min Res	Prim Res	Sync Res	30 Min Res	Prim Res	Sync Res			
1	90	2,000	2,000	2,000	2,000	2,000	2,000	12,050	14,050	1,264,500

Summary Comparison:
Proposed Circuit Breaker to Today's (2021) Shortage Pricing

Prolonged Extreme Pricing Situation (90 hour event)

Scenario Summary (Exposure / Max Energy Cost) -- at Reference Bus

	1 MW	50 MW	100 MW	600 MW	% Δ
2022 Approved ORDC	$1,264,500	$63,225,000	$126,450,000	$758,700,000	
Baseline Scenario					0%
Calpine Circuit Breaker	$376,038	$18,801,900	$37,603,800	$225,622,800	
Delta: Calpine to Today (2021)	-$888,462	-$44,423,100	-$88,846,200	-$533,077,200	-70%
Today Shortage Pricing (2021)	$337,500	$16,875,000	$33,750,000	$202,500,000	
Delta: AppORD to Yesterday (2021	-$927,000	-$46,350,000	-$92,700,000	-$556,200,000	-73%