

Potential Circuit Breaker Design Education

EPFSTF

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- This presentation provides education on possible circuit breaker options, and is not meant to advocate a particular final solution
- There are other circuit breaker designs that can be considered apart from price cutting
- Any circuit breaker solution will have pros and cons that need to be considered
 - Stakeholders will need to weigh tradeoffs when considering a circuit breaker solution

- Two potential ways to for applying a Circuit Breaker
 - Set an overall price cap
 - Could be at all times or at certain times
 - Sets a clear “do not exceed” on the price
 - Reduce the penalty factors that impact the prices
 - Reserve penalty factors
 - Transmission constraint penalty factors
 - May significantly reduce prices but may not cap them
- Other options?

Circuit Breaker Option #1: Cut the Penalty Factors in Dispatch and Pricing Engines

- Reduce Reserve Penalty Factors to X level after Y conditions are met.
Applied in both Dispatch and Pricing Engines
 - **Pros:**
 - Simplest to implement
 - SCED dispatch and pricing will align
 - **Cons:**
 - SCED operation could be limited as certain actions are too costly. This could motivate manual operation by dispatchers resulting in additional operational complexity.

- Should we reduce constraint penalty factors during energy shortages?

Circuit Breaker Option #1b: Reduce the Penalty Factors in Pricing Engine

- Reduce Reserve Penalty Factors to X level after Y conditions are met. Applied only in the **Pricing Engine**.
 - **Pros:**
 - Simplest to implement
 - **Cons:**
 - SCED Dispatch and Pricing will not align
- Should we reduce constraint penalty factors during energy shortages?

Circuit Breaker Option #2: Set Price Caps

- Cap total LMP and ASMCPs to X levels after Y conditions are met
- No changes to penalty factors. Cap total LMP and ASMCPs after-the-fact
- Need to decide what component(s) of LMP to reduce to meet X level
 - **Pros:**
 - Arguably the “cleanest” method in that it sets a clear price cap that cannot be exceeded.
 - **Cons:**
 - While it is the cleanest...it is not easy to cut the LMP without side effects
 - LMPs and constraint shadow prices may not align with each other
 - LMPs and ASMCPs may not align with each other
 - FTR values could be impacted arbitrarily depending on how we reduce the LMP
 - Neighboring nodes will have different levels of price reductions depending on original price levels

- What benefits and objectives are we trying to achieve by implementing a circuit breaker?
 - Reducing credit and risk on members?
 - Providing market certainty on maximum prices?
 - Avoiding prices that are inactionable by resources?
 - Limiting uplift during extreme conditions?
 - Allowing the dispatch solution to take all available actions to preserve reliability to minimize manual operator action?
 - Minimizing credit defaults?
 - Others?

- How would we judge whether a circuit breaker was successful following it being triggered?
- What are the appropriate thresholds for triggering the circuit breaker process?
 - Are there certain emergency conditions that should always trigger price cutting?
 - Is there a length of time of continued high prices/shortage conditions that should trigger the circuit breaker?
 - Is there a maximum energy price that should trigger the circuit breaker?
 - Others?

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