Energy And Reserve Price Capping in other ISOs

EPFSTF

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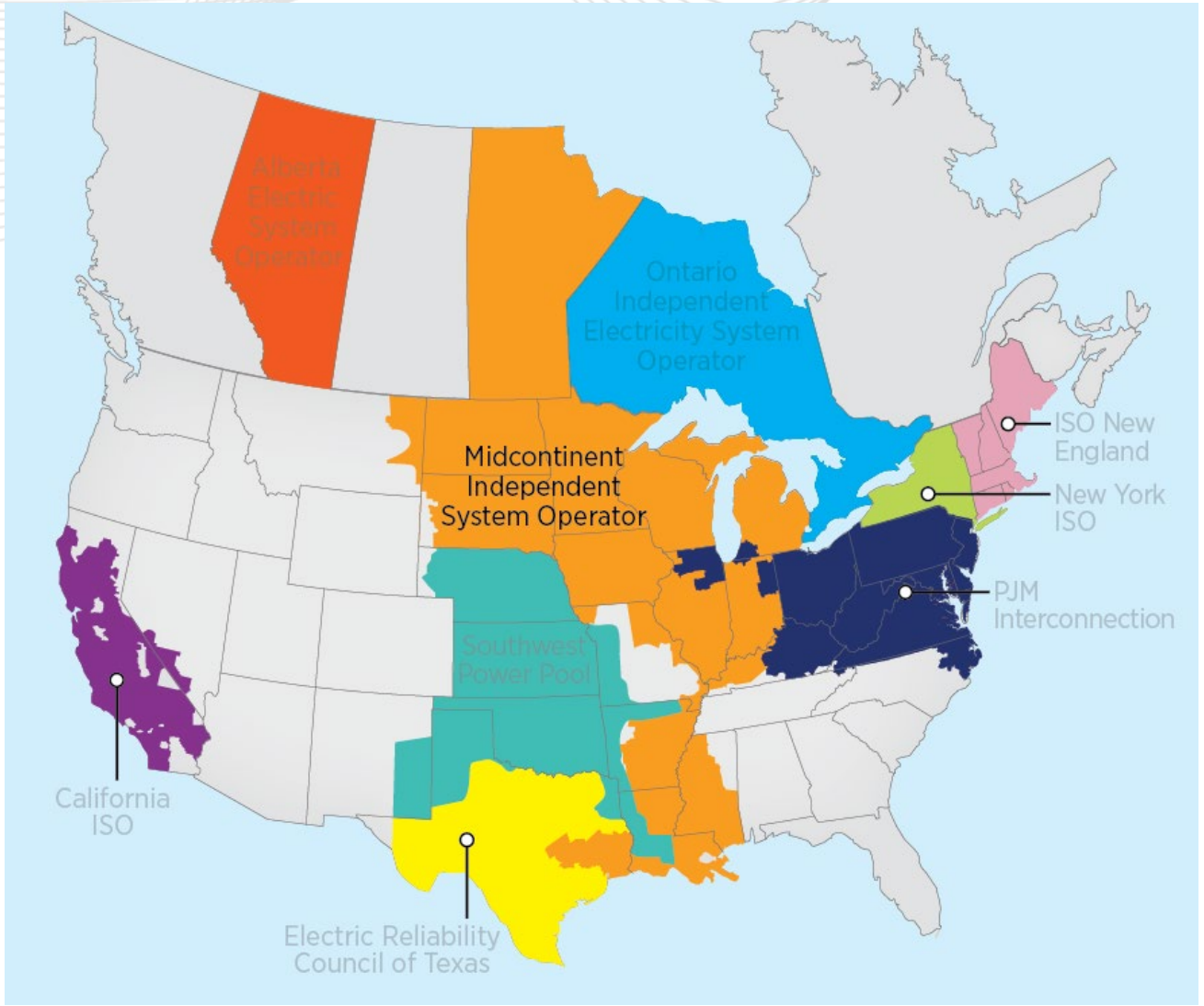
MISO Operating Reserve Products

Reserve Products

- Spinning Reserve (10-minute)
- Supplemental (Non-spinning) Reserve (10-minute)
- Short term (30 minute) reserve product
- Zonal Reserve Requirements

- Day-ahead and real-time reserve products
- Simultaneously co-optimize energy, reserves, and regulation service
- **Cascading prices**
  Regulation ≥ Spinning ≥ Supplemental ≥Short Term



MISO Shortage Pricing

Requirement	Region	Shortage Amount	Value ($/MWh)
Regulation	All	Any	Max(100, peaker commitment cost for 1 hour)
Spinning	MISO	0–10% of requirement	65
		More than 10% of requirement	98
	Reserve Zone	0–10% of requirement	65
		More than 10% of requirement	98
Total Operating Reserves	MISO	0–4% of requirement	200
		4%–96% of requirement	1,100–3,500
		More than 96% of requirement	3,500
	Reserve Zone	0–20% of requirement	200
		20%–90% of requirement	1,100
		More than 90% of requirement	3,500

MISO Price Capping

- MISO's energy and operating reserve market prices, LMPs and MCPs, are capped at the Value of Lost Load (VOLL)
  - VOLL is a measure of maximum price the load is willing to pay for the service (energy).
  - MISO's current VOLL is set at $3,500/MWh and was established in 2009.
    - MISO is reviewing the level that VOLL is currently set at.
  - This prevents prices from rising above VOLL when multiple constraints may be binding or reserves are scarce.

MISO Price Capping (Cont.)

- MISO does have the ability to administratively set prices to VOLL during firm load shedding during capacity emergencies (EEA3 event) in Real Time.

- There are no limitations as to how long the prices are in effect, they are required for the duration of the load shed event.

- Price capping can occur in either the Day Ahead (DA) or Real Time market (RT).

- **System Energy Deficit**
  - All Pricing node LMPs for the Dispatch Interval will be set equal to the VOLL.
  - The Marginal Energy Component (MEC) will be set equal to the VOLL and the marginal loss component (MLC) and marginal congestion component (MCC) of all LMPs will be set to zero.

    [MEC = $3,500, MCC = 0, MLC = 0]

- **Sub-Regional Energy Deficit**
  - All Pricing node LMPs in the affected sub-region for the Dispatch Interval will be set equal to the VOLL.
  - The Marginal Energy Component (MEC) will be set equal to the VOLL and the marginal loss component (MLC) and marginal congestion component (MCC) of all LMPs will be set to zero.

    [MEC = $3,500, MCC = 0, MLC = 0]

- **No Energy deficit (Scenario 1)**
  - The Marginal Energy Component of LMP exceeds VOLL for a given dispatch interval
    - Marginal Energy Component of LMP set to $3,500
    - Marginal Loss Component of LMP as calculated
    - Marginal Congestion Component for each pricing node is adjusted to maintain the LMP at a value <= VOLL
  - MEC Exceeds VOLL [MEC = $3,500, MCC = adjusted to keep LMP at or below $3,500, MLC = as calculated]

- **No energy deficit (Scenario 2)**
  - Marginal Energy Component of LMP does not exceed VOLL but LMP for a given dispatch interval does.
    - Marginal Congestion Component of LMP is adjusted as necessary to maintain LMP at a value <= VOLL
    - Marginal Loss Component of LMP as calculated
  - MEC Does Not Exceed VOLL [MEC = as calculated, MCC = adjusted to keep LMP at or below $3,500, MLC = as calculated]

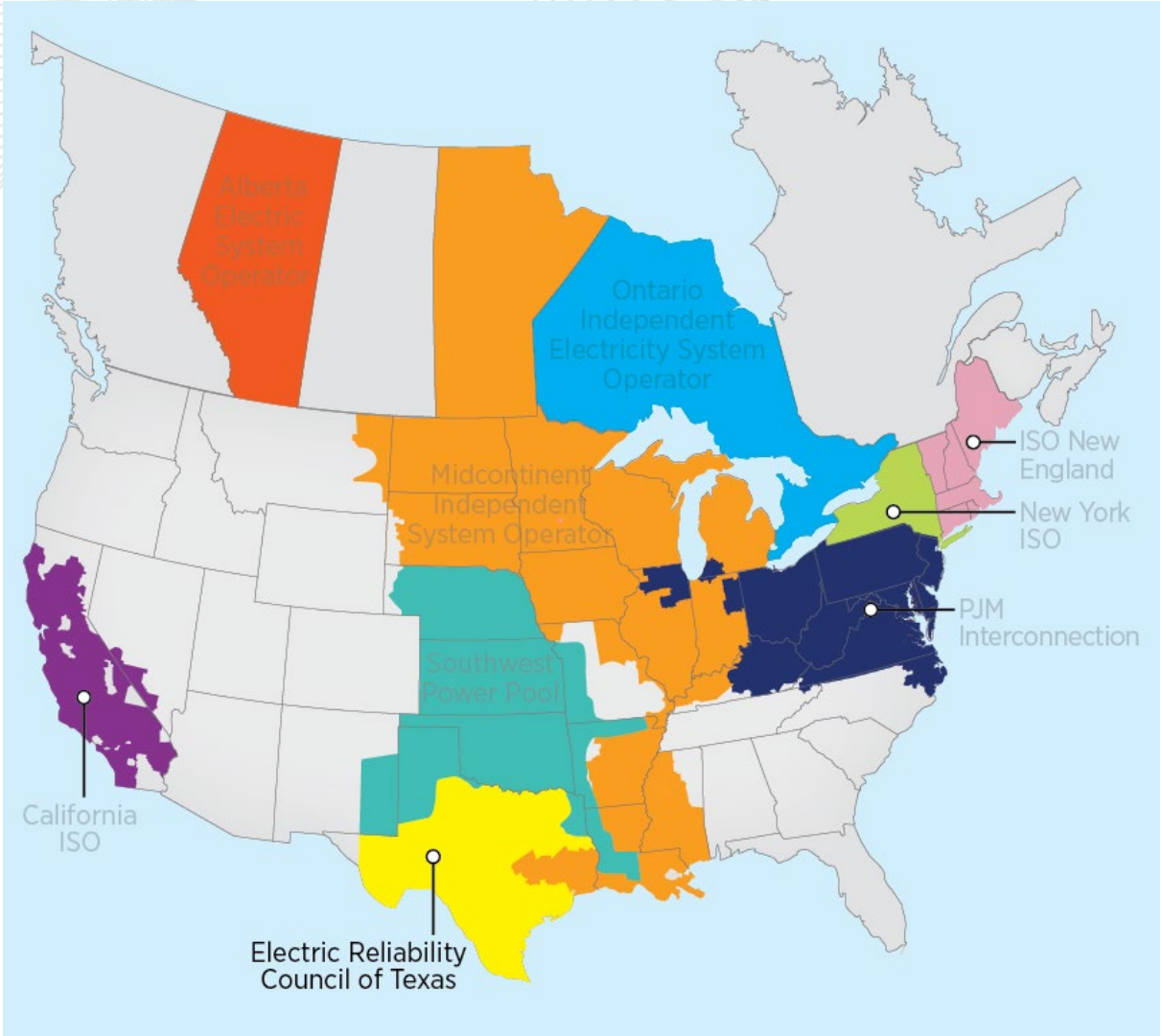
ERCOT Operating Reserve Products

Reserve Products (system-wide only)

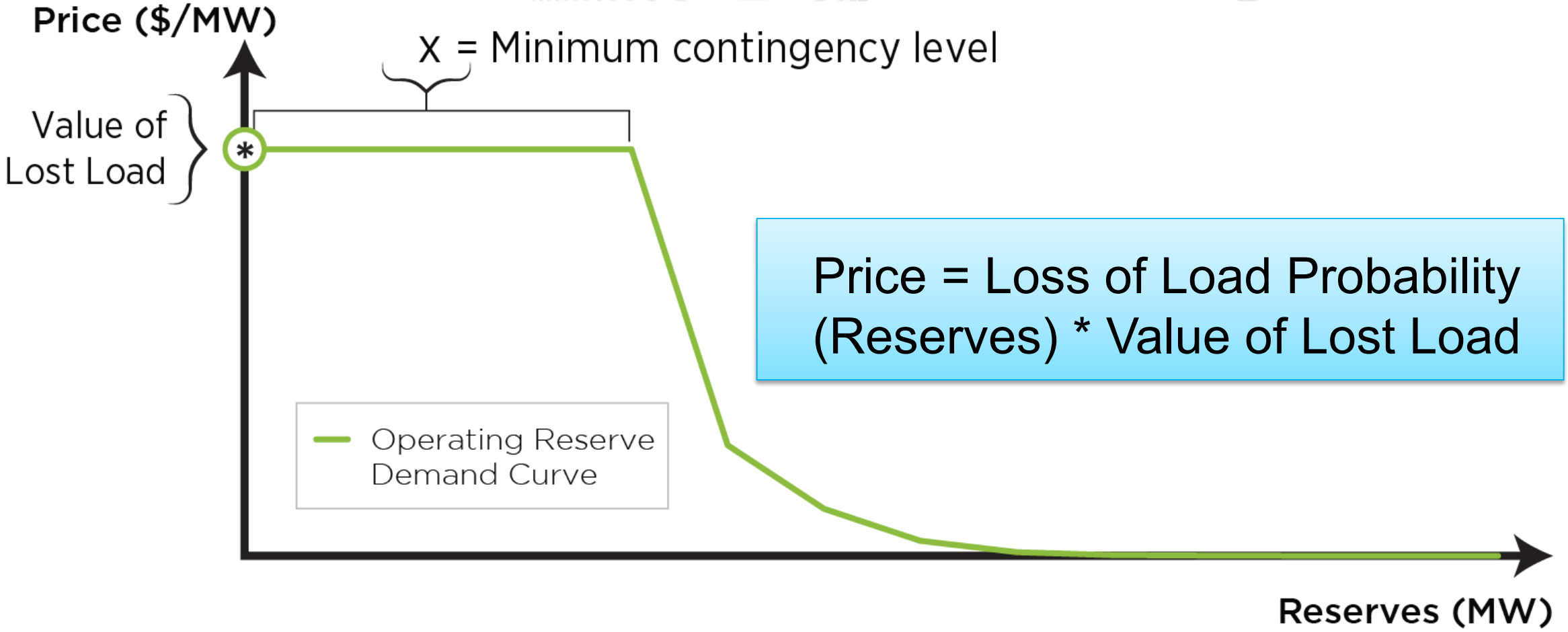
- Responsive Reserve (Spinning)
- Non-spinning Reserve (30-minute)

- Day-ahead and real-time reserve products
- No co-optimization of energy and reserves
- Operating Reserve Demand Curves (ORDCs) used to price reserves in real-time
- **Cascading prices**

  Responsive ≥ Non-Spinning



ERCOT Shortage Pricing



Price = Loss of Load Probability (Reserves) * Value of Lost Load

ERCOT Shortage Pricing

- VOLL approved by ERCOT board
  - Currently at $9,000 per MWh
- X, the minimum contingency level, currently at 2,000 MW

ERCOT Price Capping

- Energy offers can be up to the System-Wide Offer Cap (SWOC)
- At the beginning of the calendar year SWOC is equal to the High System-Wide Offer Cap (HCAP) of $9000 $/MWh
- Each calendar year the HCAP is in effect until the Peaker Net Margin (PNM) threshold is met.
  - PNM Threshold = 3 X Cost of New Entry (CONE)
  - CONE = $105,000 $/MW-year
  - PNM Threshold = $315,000 $/MW-year

ERCOT Price Capping

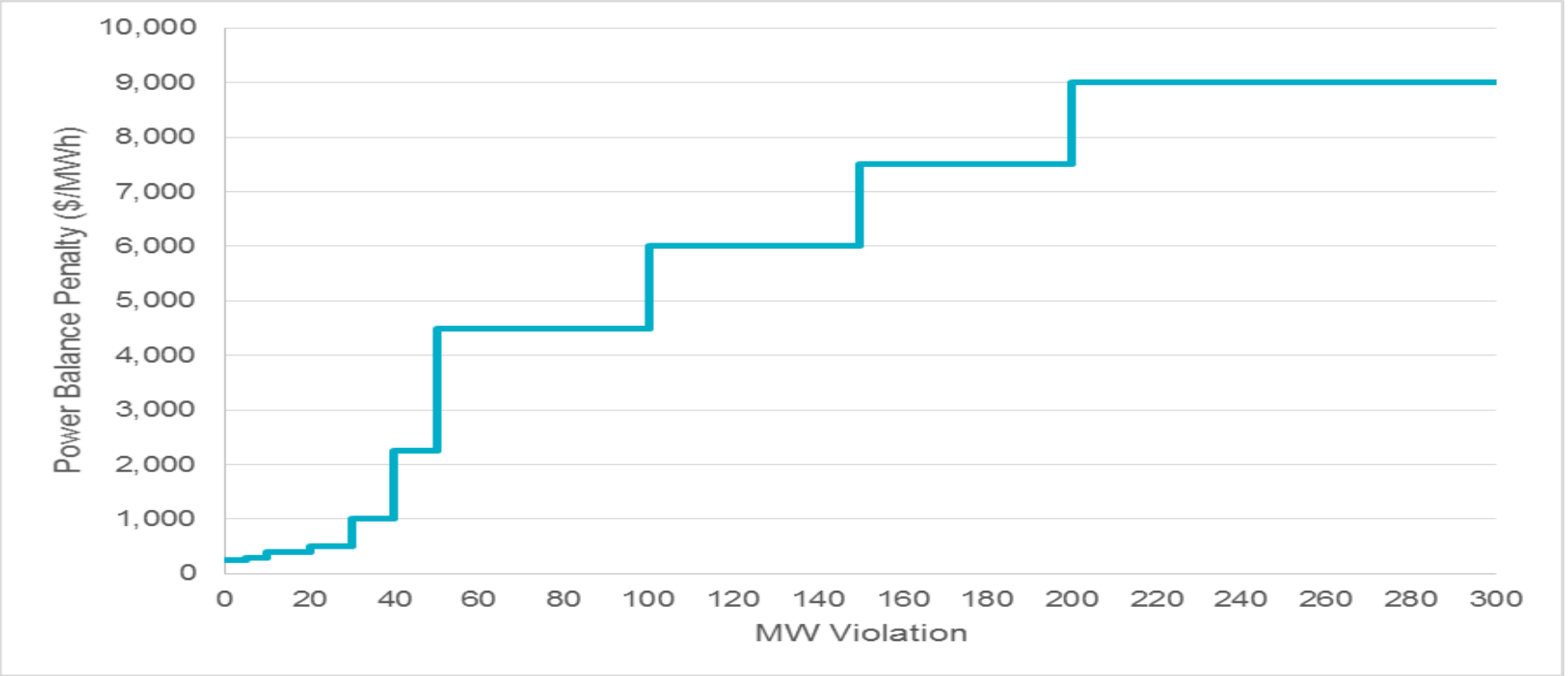
- Determination of Peaker Net Margin
  - ERCOT models a “hypothetical” gas turbine (CT)
  - CT is not “turned on” until the energy price exceeds 10*Fuel Index Price (FIP)
    - FIP is the daily midpoint or average of the prices for natural gas fuel for the Katy area (Katy Hub), expressed in dollars per million British thermal units ($/MMBtu)
  - PNM threshold is compared to the PROFITS (not gross revenue) made by the hypothetical combustion gas turbine
  - Once PNM is met then SWOC is reduced from $9,000$/MWh (HCAP) to Low System-Wide Offer Cap (LCAP)

ERCOT Price Capping Continued

- LCAP is the greater of $2000 $/MWh or 50 X Fuel Index Price (FIP) in $/MWh
- LCAP is applied until the end of the calendar year
- SWOC is also the cap on the system lambda plus ORDC price adder.
  - System Lambda is the energy component of Locational Marginal Price at each Settlement Point in ERCOT
- Reserve pricing is also controlled by HCAP and LCAP following the same timeline

ERCOT Power Balance Penalty Curve

SCED Under-generation Power Balance Penalty Curve



ERCOT Ongoing/Future Work

- Co-optimization of energy and reserves
  - Target date 2024

- Emergency Pricing Program based on the Senate Bill 3 recently signed by the Governor (06/08/2021)
  - https://legiscan.com/TX/text/SB3/2021
  - Public Utility Commission to open a rule making to determine the details of the "emergency pricing program"
  - ERCOT will turn the rule making into ERCOT protocol language and establish procedures
  - Target Date TBD

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Energy Price Formation Senior Task Force, Energy and Reserve Price Capping in other ISOs

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