Interactions between Capacity and Energy Markets

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RCSTF

PJM's Capacity and Energy Markets work together to provide revenues to resources to ensure grid reliability and financial viability.

ENERGY & ANCILLARY SERVICES	CAPACITY
Pays resources for *real-time* energy production or capability/services they are providing in real-time.	Pays resources for their *future* availability/capability to provide energy and ancillary services to the system when needed.

These are complementary revenue streams and directionally putting money into one area takes money out of the other area. In which market the revenue is represented is a design decision.

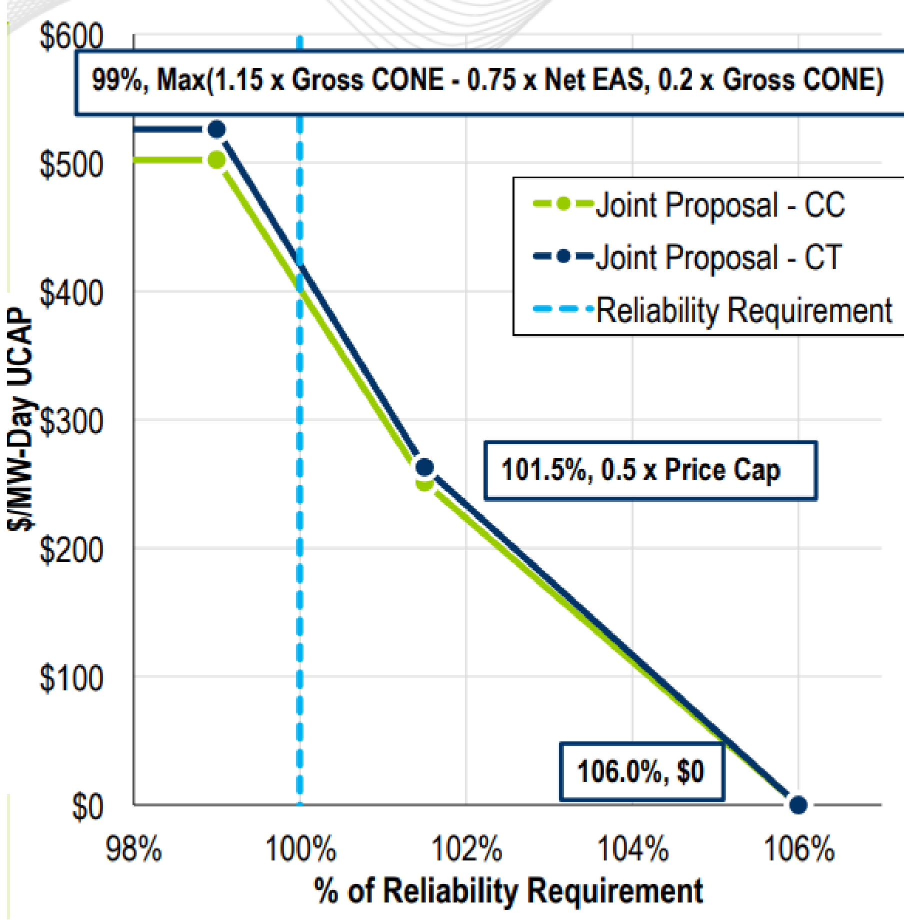
By example, putting more revenues in the Energy and Ancillary Services markets puts downward pressure on revenues in the Capacity Market.

- Changes to PJM’s markets are needed to attract and maintain required flexibility services and to shape the generation fleet of the future. If this does not happen, it may lead to significantly more price volatility without a timely recourse to bring needed flexibility online.

- Tenants of the Capacity Market and Price Formation
  - An Administrative Demand Curve (“VRR Curve”) is used in RPM
    - Objective to procure sufficient capacity to maintain resource adequacy
    - Centered around a target point with a quantity corresponding to the resource adequacy requirement and a price given by estimated Net Cost of New Entry (“Net CONE”) for a defined reference resource
  - Net CONE
    - Net CONE = Gross CONE – **Net Energy & Ancillary Services**
- As Energy Revenues increase, Net CONE will decrease --- reducing the upward pressure on capacity prices and shifting costs to the timeframe in which they are incurred

- Endorsed by stakeholders and approved by FERC, PJM's Updated VRR curve design sets:
  - Price Cap = Max(1.15 x Gross CONE - **0.75 x Net EAS**, 0.2 x Gross CONE)
  - Point B = .5*Price Cap

Accounting for 75% of Net E&AS decreases the price cap volatility and lowers the price cap in high Net CONE areas



Introducing more robust operating reserve demand curves (ORDCs) and scarcity pricing in the Energy and Reserve Markets will tend to put more money in the E&AS markets, particularly when the system is tight or short the needed operational reserves.

- These updates are needed to value the essential reliability services the system needs to continue operating reliably

Reforming the ORDCs should not be viewed as "just increasing costs." This is shifting revenues into the Energy Market and will put downward pressure on revenues in the Capacity Market.

This allows PJM to value resource attributes and optimize dispatch based on the system reliability needs commensurate with the operational time horizon

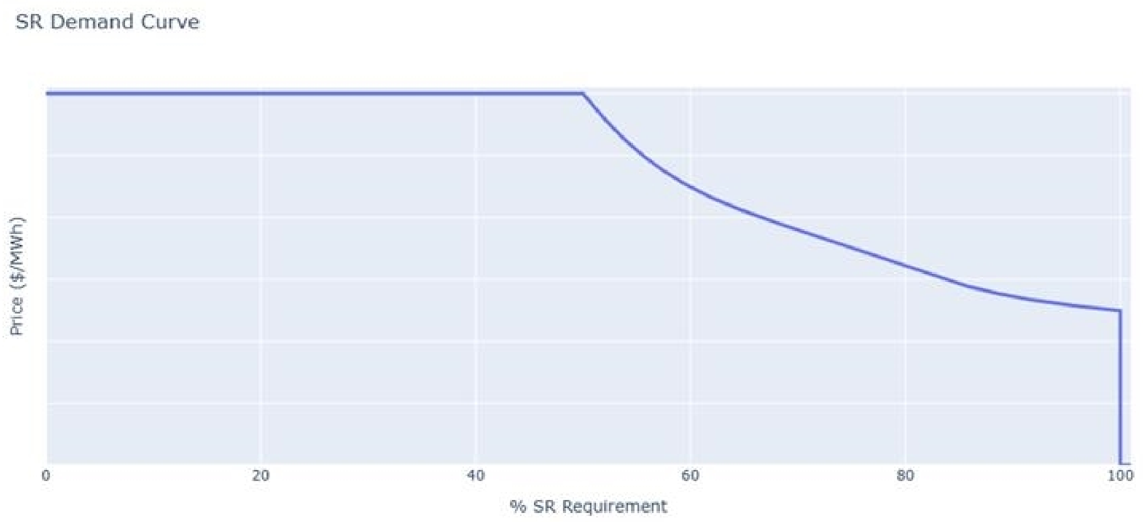
Transition for RCSTF Reforms

PJM will need to propose a transition on the E&AS calculation for unit specific offers

PJM will need to determine if a transition in needed for the offset on the VRR Curve

Given the offset on the VRR curve is using forwards, the EAS offset may not need reforms but will be reviewed for consideration to ensure we are best capturing expected market outcomes.

- PJM's original thinking on the Synch Reserve ORDC increased the values of scarcity as the Synch Reserve requirement was not met (increasing Synch Reserve shortage).
- PJM believes this continues to be an important market design feature but could be more comprehensively addressed in the investment incentives and market design review effort
  - PJM will be removing this specific design component from the RCSTF proposal



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Acronyms

Acronym	Term & Definition
VRR	A **Variable Resource Requirement** curve is a downward-sloping demand curve used in clearing the Reliability Pricing Model capacity auction.
ORDC	An **Operating Reserve Demand Curve** is an administrative pricing curve that represents the markets willingness to pay for reserves at different reserve levels.
CONE	**Cost of New Entry** for PJM's reference capacity resource.
E&AS	**Energy and Ancillary Services** referring to PJM's Day-Ahead and Real-Time Markets.


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