Scarcity Revenue True Up

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Energy Market and Capacity Market

- **The energy and the capacity market together provide the opportunity for generation resources to recover all their costs including a return on and of capital.**
- **A capacity market serves the same function as scarcity pricing: To provide revenues missing when the energy market clears at the short run marginal cost of a peaker.**
- **Capacity market revenue is scarcity revenue.**

Energy Market and Capacity Market

- **The proposed increase in energy and reserve market revenue to generators is a substitute for capacity market revenue.**
- **PJM has not stated that its goal is to increase total compensation for generation.**
- **PJM's apparent goal is to shift revenue from the capacity market to the energy and reserve markets.**
- **The shift of revenue requires additional market design changes to ensure that the shift occurs effectively, equitably and efficiently.**

Energy Market and Capacity Market

- **The impact on the capacity market demand (VRR) curve needs to be addressed because PJM's proposal is changing the location of scarcity pricing to the energy market.**
- **The higher energy and reserve prices will not result in an offsetting capacity market revenue reduction for the first four years.**
- **The higher energy and reserve prices will not result in an offsetting capacity market revenue reduction even after the first four years without specific changes that have not been addressed by PJM.**

First Four Years Under PJM's Proposal

- **PJM's proposal will result in an overpayment of at least $1.5 billion per year for four years or $6.0 billion total during the transition period.**
- **There needs to be a true up for the first four delivery years or a delay in implementation.**
- **This period is likely to remain at four years even if implementation is postponed.**
- **The true up issues would be much smaller if the IMM's proposal were adopted.**

Long Term Under PJM's Proposal

- **If revenues are to be shifted from the capacity market to the energy market, there must be a clear and verifiable mechanism to ensure that the shift occurs effectively, equitably and efficiently.**
- **In the absence of a clear, verifiable and correctly defined mechanism, substantial overpayments will occur long term.**
- **The current VRR curve will result in substantial overpayments unless modified in specific ways.**
- **The increased energy revenues will not result in lower capacity market prices without these modifications.**

Required Changes to VRR Curve

- **A clear, verifiable and correctly defined mechanism should include:**
  - **A forward looking energy and ancillary services offset in the capacity market.**
  - **A calculation of the energy and ancillary services offset revenues that correctly accounts for dispatch costs and dispatch parameters.**
  - **A correct definition of the maximum price on the VRR curve equal to net CONE.**

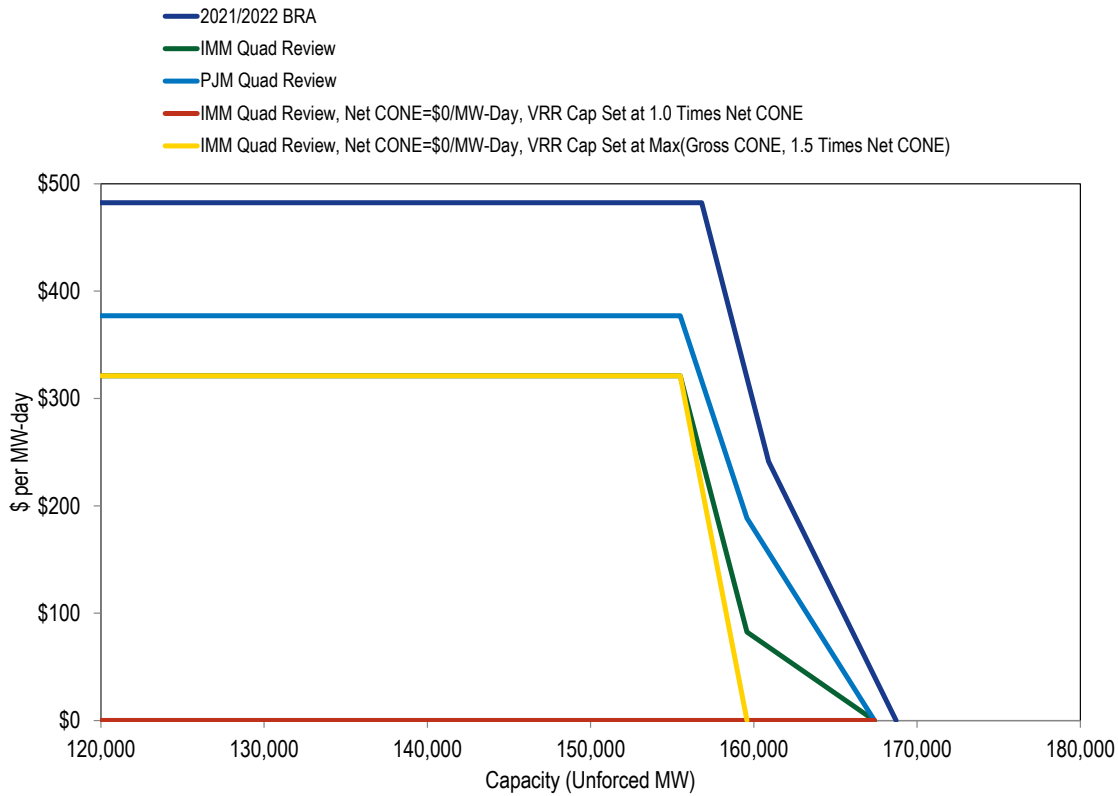
Scarcity Pricing and the VRR Curve

- **Existing shape would become almost vertical with maximum price equal to gross CONE under PJM's proposal**
  - **Increases to the net energy and ancillary services offset would decrease net CONE to relatively low levels.**
  - **If net CONE is zero, existing VRR curve maximum price would equal gross CONE .**
- **The maximum price on the VRR curve should be set at net CONE.**
- **Capacity price could be zero under some conditions.**

VRR Curves

- **VRR curve 1: Actual 2021/2022 VRR**
- **VRR curve 2: IMM Quadrennial Review proposal**
- **VRR curve 3: PJM Quadrennial Review proposal**
- **VRR curve 4: IMM Quad Review; Net CONE = 0; Max price = Gross CONE**
- **VRR curve 5: IMM Quad Review; Net CONE = 0; Max price = Net CONE**

RTO VRR Curve Comparison



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VRR Point Equations

- **Point A Price:** $\frac{Greater\ of\ (Gross\ CONE, 1.5 * Net\ CONE)}{1 - Pool\ Wide\ EFORd}$
- **Point B Price:** $\frac{.75 * Net\ CONE}{1 - Pool\ Wide\ EFORd}$
- **Point C Price:** $\$0.00$
- **Point A Quantity:** $Reliability\ Requirement\ \frac{(1 + IRM - .2\%)}{(1 + IRM)}$
- **Point B Quantity:** $Reliability\ Requirement\ \frac{(1 + IRM + 2.9\%)}{(1 + IRM)}$
- **Point C Quantity:** $Reliability\ Requirement\ \frac{(1 + IRM + 8.8\%)}{(1 + IRM)}$

Scarcity Pricing and the Capacity Market

- **If net CONE = $0 or low value:**
  - **Default offer cap is $0 or low value.**
  - **Net ACR offers may exceed default offer cap.**
  - **Most offers expected to be $0.**
  - **New unit offers can exceed $0.**
  - **Offer caps do not apply to DR.**
  - **Penalty rate/bonus rate = $0 or low value.**
- **Performance incentives significantly affected.**

Forward Looking Offset

- **A forward looking energy and ancillary services offset should:**
  - **Use energy prices from West Hub forward curves with basis differentials to locations based on history.**
  - **Use fuel costs from forward markets with basis differentials to locations based on history.**
  - **Correctly account for dispatch costs and dispatch parameters of the reference unit.**

Forward Looking Offset

	Western Hub				
	Forward Prices		Three Year History		Actual
Calendar Year	Date	Prices	Years	Average RT LMP	Average RT LMP
2016	January 2, 2013	$40.40	2010, 2011, 2012	$41.13	$28.59
2017	January 2, 2014	$37.43	2011, 2012, 2013	$38.26	$29.82
2018	January 2, 2015	$38.13	2012, 2013, 2014	$40.39	$36.57
2019	January 4, 2016	$33.20	2013, 2014, 2015	$40.84	-
2020	January 3, 2017	$29.78	2014, 2015, 2016	$37.93	-
2021	January 2, 2018	$29.89	2016, 2017, 2018	$31.22	-

Forward Looking Offset

Calendar Year	Date of Forwards	Three Year History	Western Hub: Difference Between		
			Forward Prices - Three Year History	Forward Prices - Average RT LMP	Three Year History - Average RT LMP
2016	January 2, 2013	2010, 2011, 2012	($0.72)	$11.81	$12.53
2017	January 2, 2014	2011, 2012, 2013	($0.83)	$7.61	$8.44
2018	January 2, 2015	2012, 2013, 2014	($2.26)	$1.56	$3.82
2019	January 4, 2016	2013, 2014, 2015	($7.64)	-	-
2020	January 3, 2017	2014, 2015, 2016	($8.15)	-	-
2021	January 2, 2018	2016, 2017, 2018	($1.32)	-	-

Forward Looking Offset

- **In January 2013, the forward price for Western Hub for calendar year 2016 was $40.40/MWh**
  - **The three year historical average RT LMP at that time (average of 2010, 2011, and 2012) was $41.13/MWh**
  - **The actual Western Hub average RT LMP for 2016 was $28.59/MWh**

Energy Market and Capacity Market

- **The true up for the first four delivery years should return excess capacity revenues to customers.**
- **In the absence of required modifications to the VRR curve, the true up for the following years should also return scarcity revenues to customers unless a resource's scarcity revenues exceed the scarcity revenues of the reference unit.**

True Up Transition Mechanism

- **Scarcity rents in energy and reserve markets are the portion of revenues directly attributable to the scarcity price adder to LMP.**
- **ORDC scarcity rents were not anticipated in previously cleared capacity auctions.**
- **Calculate scarcity rents for the reference CT using actual delivery year prices to determine what the accurate E&AS offset would have been.**
  - **Calculate cumulative scarcity rents each day and a final number at the end of the delivery year.**
  - **True up delivery year capacity payments by the calculated amount.**

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