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Memorandum

Subject: Capacity Market Design Principles

From: Paul M. Sotkiewicz, Ph.D.

To: PJM Capacity Market Workshop Session 2

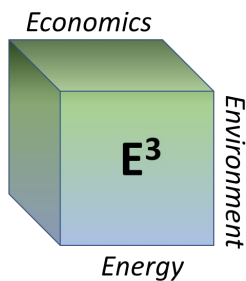
CC:

Date: March 4, 2021

Disclaimer: The views expressed here are my own and do not necessarily reflect the views of clients of E-Cubed Policy Associates, LLC. These views are based on my own experience as a member of FERC Staff putting evaluating and suggesting changes to the ISO/RTO markets, as the former Chief Economist at PJM, and as a consultant working on these issues for clients in PJM, Alberta Electric System Operator Market, NYISO, and ISO-NE.

Historical Background...How Did We Get Here?

- Failure of the old Capacity Credit Market
 - Boom-bust cycles with prices approaching zero by 2003-2004.
 - No locational requirements in a constrained transmission system
 - Environmental policies and EPA consent decrees in transmission constrained areas
 - Vertical demand that did not reflect the value of capacity beyond requirement.
 - Monthly/daily market making it difficult for entry decisions (and exit decisions).
 - Brattle analysis showing large amounts of capacity that could potentially be unable to recover going forward costs.
- State procurements that were intended to drive down prices below competitive levels with above market combined cycle procurement.
 - Before clean energy initiatives
 - NJ, MD, *Hughes-Talen*
 - Now all such initiatives, including clean energy.
- Great Recession and the world changed.
 - Exacerbated loads forecast errors going forward as pre-great recession history is being used.
- Recognition climate change as the challenge of our generation.
 - Beyond previous emissions control initiatives
- Polar Vortex 2014

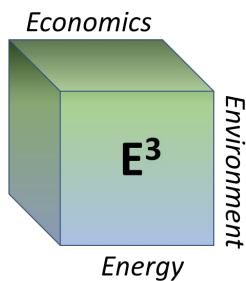


What has Worked?

1. Locational capacity requirements
 - a. Ensure deliverability on a constrained transmission system.
 - b. Can reflect other constraints that may be binding with state policy.
 - c. Reflect regional impacts of federal environmental initiatives (e.g. MATS)
2. Downward sloping demand curve
 - a. Capacity has value beyond the installed reserve margin, albeit lower as more capacity is installed.
 - b. More prices stability that avoids extreme boom-bust cycles in pricing and entry and exit
 - c. Helps mitigate possible exercises in supplier market power.
3. Three-forward commitment
 - a. Provides known cash flows that reduces the value of the “real option” to wait for better information to make entry or retirement decisions.
 - b. Created visibility on retirements as these decisions have been made with a 30-36-month advance notice.
4. Capacity Performance Incentives
 - a. Prior to CP and 2014, EFOR_d were increasing.
 - b. After CP we have seen improved EFOR_d and performance during extreme weather, especially winter.
5. Ability to reflect environmental costs in offers.
 - a. State laws and EPA consent decrees early on in RPM
 - b. MATS...created an orderly transition.

What has Not Worked and Needs Reform Immediately?

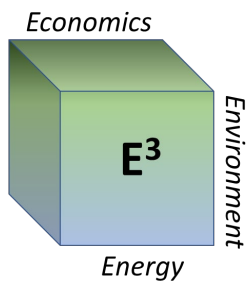
1. Load Forecasting three-years forward
 - a. PJM has made improvements, but the inputs, especially economic inputs, and how the model is parameterized for economics may still need work.
 - b. Has led to high reserve margins and otherwise uneconomic resources to remain in the market when they should retire.
2. Buying “full requirements” three years forward
 - a. Given the load forecast errors and changing nature of power system peaks and total energy has led to “over-procurement” along with the load forecast error.
 - b. Leads to incentives to arbitrage load forecast error.
 - c. In other industries, rarely are available spaces (airlines, hotels, etc.) sell all space forward.



3. Minimum Offer Price Rule (MOPR)
 - a. Need to go back to first principles of mitigation of buyer-side market power to be symmetric with supplier market power.
 - b. Need to eliminate the “price suppression” terminology. Prices may fall due to technological and cost innovations that are expected in markets.
 - c. About ensuring prices are consistent with competitive outcomes, not manipulated to be lower or higher.

Principles

1. Neutrality to resources or methods to ensure resource adequacy (non-discrimination):
 - a. Technology
 - b. Fuel
 - c. Size
 - d. Age
 - e. Supply-side or Demand-side
2. Capacity value based on what can be delivered and not artificially inflated or deflated to fit “policy desires.”
3. Truthful revelation of costs to provide capacity.
 - a. This can be done through market power mitigation on both supply side and demand-side.
4. Least-cost outcomes for providing resource adequacy.
5. Not “over” or “under” procurement, but procurement that is reflective of the actual needs for resource adequacy.
6. Active demand-side to the market...only an active supply side is the sound of one hand clapping.
7. Provide incentives to perform when needed such as CP.
8. Encourage Innovation
 - a. Do not discourage innovation through floors on capacity value for different resources.
 - b. Demand-side ability to not need to buy a certain amount of capacity through PRD that reflects contracting ability in other markets.
9. Robust ability to reflect cost of state and federal environmental policy in markets:
 - a. NO_x and SO₂ Trading programs
 - b. RGGI
 - c. MATS
 - d. Illinois CPS



- e. Maryland Healthy Air Act
 - f. North Carolina Clean Smokestacks Act
10. Risks borne by those best able to manage those risks.
- a. Likely generation resources unless it is load that commits to a firm level of service in which they manage that risk.

Other Possible Design Considerations That Can Be Addressed Later

1. As cited by the IMM, an examination of the Net CONE * B offer cap that is not reflective of the number of hours of CP events.
 - a. This also means revisiting performance penalties to make this symmetric and hold together logically.
2. Bringing carbon pricing into the market design absent state and federal action
 - a. This is tough as neither FERC nor PJM has jurisdiction here and would require a broad-based agreement among states and members.
 - b. This is will likely take years to be done, if it can be done at all, if there is no federal action.
3. Net CONE value
 - a. Empirical Net CONE?
 - b. Combined cycle?
 - c. CT?
4. Others? ELCC holistically??