

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Centralized Capacity Markets in
Regional Transmission Organizations
and Independent System Operators

Docket No. AD13-7-000

Comments of James F. Wilson
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My name is James F. Wilson. I am an economist with thirty years of consulting experience in the electric power and natural industries. With respect to resource adequacy and capacity markets, I have been continuously involved with the many issues around PJM's Reliability Pricing Model ("RPM") capacity construct since it was first proposed over eight years ago. I have also been involved in capacity market issues in New England, California, MISO, and other regions. More information about my experience is available at www.wilsonenec.com.

My work on resource adequacy and capacity markets has generally been on behalf of load-serving entities and representatives of consumers – consumers being the parties that are directly affected if resource adequacy is not maintained, and who also bear the cost of the policies to achieve resource adequacy. However, today I am providing my own views and I am not speaking on behalf of any party or client.

This technical conference focuses on the centralized capacity market constructs in New England, New York and PJM. I will take the liberty of also mentioning the Midcontinent Independent System Operator's ("MISO") resource adequacy construct. While the circumstances are quite different in the MISO region, MISO's construct has many of the same fundamental elements as the three eastern RTOs' constructs.

The subject of this panel is "Considerations for the Future" and the Supplemental Notice asks:

- What are the challenges regarding resource adequacy and capacity markets going forward?
- Should centralized capacity markets be designed to meet additional or different goals?
- Are there new mechanisms that could prospectively augment, supplement, or substitute for typical capacity market design elements?

The Commission has rejected a "one size fits all" approach to the design of capacity constructs, and the mechanisms in place in New England, New York, PJM, and MISO are very different, reflecting settlements, stakeholder compromises, regional differences, and perhaps other causes. While the designs differ in many ways, all have been the subject of ongoing controversy around various design elements. The high level of controversy reflects that the capacity prices and

payments tend to be highly sensitive to the various auction rules, administrative parameters, and also market participants' actions such as plant retirements,¹ while the vast majority of the capacity payments are made to resources that are economic and will operate the same without regard to the magnitude of the capacity payment they receive. While it is appropriate for capacity payments to be available to resources on a non-discriminatory basis, it is recognized that for most resources, whether they receive \$1 or \$20 or \$400/MW-day as a capacity payment would have little or no impact on their performance during the delivery year. Many of the controversies are around design elements or parameters whose impact on the magnitude of the capacity prices and payments may be fairly clear, while any impact on resource adequacy may be complex to forecast and/or based on theories to which not all parties subscribe.

As I will discuss further, the scope for such controversies is especially wide because the capacity market designs rest upon some faulty concepts that create a disconnect between the goals and expectations for the constructs and the realistic performance of the actual designs. Consequently, rethinking the goals of the centralized capacity markets, as the Commission is doing through this docket, could result in a better alignment between expectations and actual performance, and go a long way toward reducing the level of controversy around these capacity constructs.

I. Summary of Comments

Centralized capacity markets are an intervention to maintain resource adequacy. The appropriate role for these constructs is to provide a residual spot capacity auction to acquire additional capacity to meet resource adequacy targets. The goal should be for the role of these constructs to shrink over time as the energy and ancillary services markets develop, the demand side becomes more active, and forward contracting returns.

Some of the expectations for these constructs were unrealistic and are now disproven by years of actual operation. In particular, it was expected that new power plants would be offered at prices based on "Net CONE". Instead, new plants acting competitively will generally wish to offer into residual spot capacity auctions that offer just one-year commitments as "price takers." Rather than determine which new plants will and will not be built, the spot capacity auctions mainly determine which of the many other incremental/decremental resources (such as existing plants that may retire, higher cost demand response, existing plant uprates, and the like) are needed and will be called upon to provide capacity in the delivery year. Clarifying the role as that of a residual spot capacity auction, and correctly identifying the types of resources that are marginal in the auctions, has important implications for performance expectations and various design elements.

The centralized capacity market designs should accommodate use-limited resources such as hydroelectric and some demand response in order to meet capacity requirements in the most efficient manner. The designs should not be extended to attempt to procure capacity with certain operational attributes – this should be accomplished through new ancillary services. Nor should centralized capacity markets be modified to offer multi-year commitments, which cannot be done in an efficient and non-discriminatory manner.

¹ For instance, PJM's sensitivity analyses of the most recent RPM base residual auction for the 2016/2017 delivery year show that had the amount of annual resources offered in the RTO region been about four percent lower, the clearing price would have more than doubled. PJM, *Sensitivity Scenario Analysis Results*, scenario 3.

II. Centralized Capacity Markets – An Intervention to Ensure Resource Adequacy

As a preliminary observation, let's recall that capacity markets were not part of the original vision of competitive wholesale electricity markets. They are an administrative intervention imposed as a transitional measure due to concern that, under the prevailing circumstances, wholesale markets might not attract and retain enough capacity to meet the widely-accepted (if very conservative²) "one day in ten years" loss of load criterion.

While capacity is intrinsically a long-term product normally acquired or contracted under long-term arrangements, due to electric restructuring and retail choice in some areas, many load-serving entities are no longer in a position to build or contract for capacity to meet future peak loads within their service territories. At the same time, the short-term energy and ancillary services ("E&AS") markets may not provide adequate incentives to attract new capacity due to shortcomings in the pricing mechanisms and the lack of an active demand side.

However, these "in the meanwhile" circumstances are changing. In PJM, for instance, in the coming years demand response will be about nine percent of peak load, and over time the demand response will increasingly become a more operational resource,³ dispatched at a range of prices and more frequently price-setting in E&AS markets. New shortage pricing rules, in combination with an increasingly active demand side, should result in many more hours when E&AS prices clear at prices well above the marginal costs of generation. Over time, the so-called "missing money" should go away, and with it, the justification for administrative capacity markets. In addition, when there are demand-side offers at prices up to and even above the value assigned to involuntary load drop (the Value of Lost Load, or "VOLL"), the value distinction between voluntary and involuntary load drop is eliminated, and a Loss of Load Expectation criterion such as "one day in ten years", based on that distinction, loses meaning.⁴

In the meanwhile, there is reportedly very little long-term contracting for capacity in the eastern RTO regions, and we have RPM, FCM, and the like, with all the complexity, controversy, and cost that these highly administrative mechanisms entail. As changes to capacity construct design elements are considered, we should not lose sight of the fundamental goal that the roles of these mechanisms wither away as the E&AS markets and active demand side further develop and voluntary forward contracting returns. We are far from this goal at this time; in PJM, for instance, the parameters set for the most recent RPM auction assume that a new power plant would have to rely on the capacity market for a majority of its required revenue, and would expect to receive only a fraction through the E&AS markets.⁵

² Wilson, James F., *Reconsidering Resource Adequacy, Part 1: Has the one-day-in-10-years criterion outlived its usefulness?* Public Utilities Fortnightly, April 2010; available at www.wilsonenec.com.

³ A stakeholder process is currently underway to change market rules to allow more granular and economic dispatch of demand resources. See PJM, *Problem Statement: Demand Response as an Operational Capacity Resource*, Markets and Reliability Committee, June 27, 2013.

⁴ Wilson, James F., *Reconsidering Resource Adequacy, Part 2: Capacity planning for the smart grid*, Public Utilities Fortnightly, May 2010; available at www.wilsonenec.com.

⁵ PJM, *2016/2017 RPM Base Residual Auction Planning Period Parameters*, Table 4.

III. Centralized Capacity Markets – Rethinking the Goals and Role

Resources have been adequate or excess in the regions with centralized capacity markets over recent years, a period characterized by a recession and very little peak load growth. A transition in the capacity mix is now underway due to increasing demand response, coal retirements, low natural gas prices, and state and federal policies encouraging renewable resources. Increasing penetration of variable energy resources such as wind and solar will create new operational challenges. As I will discuss further below, I concur with other commenters that this challenge should be addressed through ancillary services design and not by modifying the centralized capacity constructs to procure capacity with certain operational attributes.

Instead, I recommend that the goal of the centralized capacity markets continue to be to acquire sufficient megawatts as needed to meet resource adequacy criteria, and that the role is clarified to be that of a residual spot capacity market.

The centralized capacity markets should be understood as spot capacity markets because while new capacity is typically built in units with 20 year useful lives (in the case of power plants), the capacity markets offer only one-year commitments. Holding the spot capacity auctions years forward does not change the fact that one-year capacity transactions are best understood as spot capacity transactions.

In a residual spot capacity auction, the majority of long-term resources will not participate (if they are owned or long-term contracted resources), or they will participate in the auction as “price takers” offering at low prices reflecting their low avoided or opportunity cost of accepting a capacity obligation. For the majority of resources, the residual spot capacity auction will, at most, only determine the price such resources will receive for their capacity; it will generally not determine whether or not they will provide capacity.

However, there are other resources offered into the spot capacity auctions at prices such that they are not price takers, and the auction result determines whether or not they clear and take on a capacity obligation. Existing plants near retirement or in need of substantial investment, higher-cost demand response, and potential upgrades to existing plants are examples of the types of resources that are offered at higher prices such that they clear only if needed through the auction; these are the resources actually asking, through the auction, “Do you need me or not?” Over ten RPM delivery years, about two-thirds of the incremental capacity clearing in RPM has been various types of resources that likely have short lead times and require relatively little if any investment (demand response, energy efficiency, deferred retirements, existing plant uprates, incremental imports), and one-third has been new power plants.⁶

Supply and demand, entry and exit, and load growth determine how many of these marginal, incremental/decremental resources do and do not clear, and how high the spot capacity price must rise to clear a sufficient quantity of these resources. The auction clearing prices are generally set by the offer of one of these resources, not that of a new plant. Note that these resources generally have the flexibility to provide, or not provide capacity in the delivery year, and offer into the spot capacity auction at prices such that the auction determines whether they clear.

It has been seen that new power plants typically offer into the spot capacity auctions as price takers -- at low or zero prices reflecting the avoided or opportunity cost of accepting a capacity obligation

⁶ PJM, 2016/2017 RPM Base Residual Auction Results, Tables 8 and 10.

through the auction, given that the proponents have decided to move forward with construction and may have a contract (or, at least have decided to take on a capacity obligation for now). Decisions to build new power plants are based upon long-term analysis of revenue and cost, and do not hinge upon the outcome of an auction that determines only a capacity payment for a single year.

Unfortunately, the expectations for how these centralized capacity auctions would work, upon which many design elements have been based, were incorrect, and essentially “inside out” – it was expected that the offers at the margin in the auctions would be from new power plants. Specifically, it was expected that new power plants would voluntarily offer into the auctions at prices based on their “Net CONE” (usually meaning the levelized construction cost of the new entry, or “CONE”, minus an estimated long-term average of net earnings from E&AS markets). Such offers were expected to result in stable auction clearing prices near Net CONE when there was load growth and new entry. Under the two designs with multi-year forward auctions (New England and PJM), it was hoped that the auctions would thereby create a “long-term price signal” relevant to decisions to build new power plants. These expectations may have reflected the original proposed designs for centralized capacity markets that involved multi-year commitments,⁷ and also different industry circumstances, including much stronger load growth.

The notion that merchant and other new power plants would be offered into auctions for one-year commitments at Net CONE has always been criticized,⁸ and now there is accumulated experience showing that this is not what happens.⁹

The residual spot capacity auctions mainly select among the marginal, incremental/decremental resources, rather than determining which new power plants will be committed, since those choices are generally made outside the auctions based on long-term considerations. Recent changes to the MOPR rules in PJM have begun to recognize this reality; new exemptions were added for new plants entering either as merchant capacity or self-supply, permitting them to offer as they wish to offer, as price takers.

⁷ The idea of a forward capacity market was first worked out in detail in a report by NERA Economic Consulting for PJM, NYISO and ISO New England: *Central Resource Adequacy Markets for PJM, NY-ISO and NE-ISO, Final Report*, February 2003 (“CRAM Report”). That report recommended three-year commitments (p. 3).

⁸ See, for instance, *Affidavit of James F. Wilson on Behalf of the Public Power Association of New Jersey*, Docket Nos. ER05-1410 and EL05-148, October 19, 2005, pp. 15-17; *Affidavit of James F. Wilson on Proposed Changes to the Reliability Pricing Model in Support of Protest of RPM Load Group*, Docket No. ER09-412-000, January 9, 2009, PP 194-201; Wilson, James F., *Forward Capacity Market CONEFusion*, *Electricity Journal*, Vol. 23 Issue 9, November 2010, section V.

⁹ See, for instance, The Brattle Group, *Second Performance Assessment of PJM’s Reliability Pricing Model*, report prepared for PJM Interconnection, LLC, August 26, 2011, p. 93 (acknowledging that new plants generally offer into RPM at a wide range of prices, and often at very low prices, rather than at Net CONE, and that “offers seem to reflect a wide range of different bidding, hedging, and market-timing strategies”). Auction results provide some indication of the offer prices of new plants. I have requested from PJM further detail about new entry offer price ranges; however such information has not been provided even in aggregate, summary form.

IV. Realistic Expectations for a Residual Spot Capacity Auction

Accepting that the centralized capacity markets are residual spot capacity markets designed to acquire additional megawatts as needed to satisfy resource adequacy objectives, how should we expect them to perform? The usual state of capacity in any region is a little long. This has always been the case, because utilities always planned conservatively. This will also typically be the case at the present time in the regions with centralized capacity constructs, because the various relatively high-cost resources, such as higher-cost demand response and older, less efficient plants near retirement, will offer into the auctions at prices that might or might not clear and accept capacity obligations only if the auction must clear at a price that accepts their offers. We've seen that year after year, there is a substantial quantity of such marginal resources offered into RPM. Prices in spot capacity auctions will usually be relatively low, due to the excess capacity, but will sometimes rise to higher levels to clear sufficient capacity to meet the established reserve requirement.

The Commission has long recognized the value of long-term contracting, and the goal should be for most capacity to be transacted and priced on a voluntary, forward basis, with a relatively small quantity actually cleared and priced through the residual spot capacity market. A residual spot capacity market with a small cleared quantity can contribute to resource adequacy by 1) clearing additional quantities from among the available incremental/decremental resources as needed, while 2) encouraging buyers and sellers alike to transact forward. A residual spot capacity market encourages sellers to transact forward due to its generally low prices reflecting the usual state of excess capacity; and it encourages buyers to transact forward due to the uncertain quantity available, uncertain prices that could spike to high levels, and risk of deficiency penalties if needed quantities are unavailable through the auction. In addition, if the quantities actually cleared and priced through the auction are small, neither sellers nor buyers will have much incentive to attempt to exercise market power or otherwise manipulate the prices, mitigating one of the most troublesome problems around capacity markets.

Accepting the somewhat modest role of a residual spot capacity market suggests reconsidering the following expectations that are sometimes expressed for the centralized capacity constructs.

- We should place little importance on the spot capacity clearing price as a “price signal” for new entry. Especially if the quantities are small, as they should be if buyers and sellers both prefer to transact forward, the prices might often clear in the range of the offers of existing plants near retirement and higher-cost demand response, and also be volatile at times. Since substantial information about capacity supply and demand is available to market participants, including capacity requirements, retirements, planned new plants, and transmission enhancements, the actual auction price outcome adds little additional useful market information.
- We should not hope or expect that spot capacity prices over time will average any particular level, such as Net CONE. If buyers and sellers generally transact forward and spot capacity market cleared quantities are small, the time average of such spot prices, based on small cleared quantities and potentially volatile at times, is a rather meaningless value from a commercial perspective.
- We should not expect prices to rise to a new plant's Net CONE when new capacity is “needed”, however that might be determined. Prices will generally be set based on the offers of the various marginal resources while most new plants will offer as price takers.

- Nor should we expect (or require, through MOPR rules) new entrants to wait until spot capacity prices rise to Net CONE to enter. Entry decisions will be based on long-term analysis that reflects future expected earnings from all markets, and the timing may be quite insensitive to current spot capacity prices.
- We should not assume that a comparison of the spot capacity auction's clearing price to a new plant's Net CONE tells us whether or not the new plant is "economic". As a clear example of the flaw in this logic, in MISO's recent spot capacity auction clearing prices were very low, reflecting the excess capacity in the MISO region at the present time.¹⁰ However, MISO projects that due to coal retirements, the region's excess capacity will disappear by 2016 and new capacity beyond what is currently under construction will be needed to meet resource adequacy targets.¹¹ It should be hoped that new plants will enter and allow the retirements to occur in an orderly fashion when the capacity is no longer needed, rather than the retirements occurring and causing prices to rise signaling apparent shortages, with new construction only as a reaction.
- We should not imagine that the residual spot capacity auction selects the optimal resources from a total cost perspective. The offers into a residual spot capacity auction will reflect the avoided or opportunity cost of accepting a one-year commitment, and perhaps other considerations such as incremental auction buy/sell opportunities and market power incentives. The auction selects the lowest cost offers, but this ordering will bear little relationship to the overall long-term cost or value of the various resources available. For this same reason, we should not imagine that the residual spot capacity auction optimally coordinates retirement decisions. The auction will result in some plants that are, and others that are not, cleared in the auction; but these commitments will not reflect relative cost and value, and in any case the commitments can be modified closer to the delivery year.

V. The Residual Spot Capacity Market Role: Implications for Design Elements

Accepting that centralized capacity constructs are residual spot markets for capacity – whose primary role is to clear or not clear the various incremental/decremental, short-term resources rather than new entry – suggests the following with regard to some key capacity market design elements.

1. Forward period. A spot capacity auction is most efficient if held close to the delivery year. A years-forward auction will introduce inefficiencies in both demand and supply that will most likely lead to excessive prices. The demand in a years-forward auction will likely be overstated primarily due to inaccurate load forecasts and conservative reserve margin determinations. Supply will be understated because some resources, such as older plants that may retire or face potential operational problems, will find it risky to participate years in advance, while some short-lead time resources will not be in a position to offer into an auction held years in advance. Where spot

¹⁰ MISO, *Resource Adequacy: 2013-2014 Planning Resource Auction (PRA) Results*, presentation to the Supply Adequacy Working Group, April 15, 2013.

¹¹ See, for instance, MISO, *Queue Update Resource Adequacy Preview*, MISO Board of Directors System Planning Committee, August 21, 2013, slide 5, showing a forecast capacity deficit in 2016.

capacity auctions are held close to the delivery year, forward visibility of future capacity balances can be obtained through informational processes.

Where years-forward auctions are in place, the inefficiencies can be mitigated by offering additional, “incremental” auctions closer to the delivery year, as both PJM and New England do. The mechanisms will be most efficient if there is a high degree of price convergence between the various forward auctions for a delivery year, which will occur if there is some limited ability for entities lacking market power to arbitrage away unwarranted price differences between the auctions.

2. Commitment period. The appropriate commitment period for a residual spot capacity auction is one year, or less if seasonal obligations are defined. Longer commitment periods would move away from the concept of a spot auction, introduce additional complexity, and increase the time between the auction and delivery year.

3. Seller market power mitigation. While seller market power mitigation is necessary in capacity auctions, to the extent the auctions clear small quantities and there is an active forward market, mitigation is less important and can be more flexible.

4. Policies to prevent “uneconomic” entry; buyer market power mitigation. Similarly, buyer side mitigation is also less needed if the clearing quantities are small. As described above, accepting the residual spot market role entails letting go of efforts to achieve certain price outcomes in the auctions, which goals have been reflected in the minimum offer price rules.

VI. Comments on Possible Extensions to Centralized Capacity Constructs

There has been some discussion that centralized capacity constructs might be modified to accommodate use-limited resources such as hydroelectric, demand response, and energy storage; or to procure capacity with desired operational characteristics, such as fast ramping ability; or to offer multi-year commitments and prices. This section discusses these three topics.

A. Should centralized capacity constructs accommodate use-limited resources?

Yes, they should. The fundamental objective of the centralized capacity constructs is to acquire sufficient capacity to meet resource adequacy targets. Use-limited resources such as hydroelectric and demand response can help meet peak day requirements in the most efficient and cost-effective manner.

In most areas of the country, resources are planned based on the forecast median peak load; but loads at or near this level occur only a few hours per year, if at all. Therefore, use-limited resources in limited quantities can contribute to meeting resource adequacy objectives.

In PJM, for instance, “Limited Demand Response”, which is required to perform up to ten times per year and up to six hours each time called, can be used to meet up to 4.8% of the peak load, and more Limited Demand Response can clear if excess capacity is cleared.¹² Under the RPM auction design, Limited Demand Response is paid a lower capacity price if the limits are binding in the auction.

¹² PJM, *Planning Period Parameters for the 2016/2017 Base Residual Auction*, Limited Demand Resource Reliability Target value for the RTO region.

B. Should centralized capacity markets be designed to procure resources with specific operational attributes, for instance, as may be needed to integrate variable energy resources?

No, this is unlikely to be efficient. RTOs will require different types and quantities of ancillary services in the future to operate reliably with a high penetration of variable energy resources. RTOs should focus on defining the ancillary services (ramping, load following, regulation, etc.) that they will procure, forecasting the amounts they expect to need, and making it clear that they will appropriately compensate the resources that provide these services.

Centralized capacity markets should remain focused on acquiring capacity to meet peak day requirements, as described above. It would be complex to define one or more standard operational products in the form of a commodity that could be acquired through a capacity auction. The product design would have to address how much of each product different resources with different attributes would be eligible to provide and the manner in which actual performance would be evaluated and rewarded/penalized; the design would necessarily be complex. Because very different types of resources can provide these attributes and products (flexible generation, demand response, storage, etc.) the design would likely also have a discriminatory impact. The various defined products would likely be substitutes in both production and consumption, which would have to be recognized in the auction design. While similar determinations are necessary for ancillary services design, they are more straightforward because they are closely tied to specific operational needs.

For forward procurement, the quantities needed of the various operational products would be difficult to forecast. The RTO might end up procuring operational attributes that are different from what is actually needed, or in quantities that are very different from what is actually needed. Forward procurement may result in obtaining the attributes from existing resources when new, emerging technologies may be able to provide them more efficiently, but are not in a position to offer into forward capacity markets.

If, instead, the focus is on ancillary services, market participants will make their own assessments of what resources and resource attributes will be needed and valuable in future years to provide these services, and plan and invest accordingly.

C. Should centralized capacity constructs be modified to offer multi-year commitments?

I do not believe this can be done in a manner that would be economically efficient and in the interest of consumers. While some stakeholders imagine offering multi-year commitments only to new resources, the Commission has rejected such proposals as discriminatory. Accordingly, to offer multi-year commitments and prices through a centralized capacity construct, the multi-year commitments would either have to be available to all resources on a non-discriminatory basis, or the prices in any such multi-year commitments would have to be price-setting within the zone where any such arrangement occurs. PJM stakeholders have attempted to agree on an approach to multi-year pricing under the RPM construct four times over the past seven years, with the most recent effort abandoned only recently.

The RPM auctions (and those of the other centralized capacity constructs) are designed around information for a single delivery year. The demand, supply, and price information is all for a single delivery year, and, accordingly, the auction clearing price reflects the demand/supply

balance of the particular delivery year. To allow some or all resources to lock in the clearing price for multiple years would be arbitrary and subject to potential gaming. For instance, if the demand/supply balance is tight one year but it is known that additional resources or transmission facilities will become available the following year and will lower prices, it would be advantageous to lock in the current price for multiple years; however, that price would not reflect market conditions and the value of capacity in the subsequent years.

Another approach would be to modify the centralized capacity construct more fundamentally to operate auctions based on multi-year periods. For instance, it could be determined that a fixed portion of the reliability requirement, say ten percent, would be satisfied with five-year commitments, and an auction would be held to meet the requirement based on voluntary offers to enter into five-year commitments. There are multiple problems with this approach. First, the cost of these commitments would have to be allocated to loads, and this would become problematic if the costs were to prove higher than in the spot capacity market. Second, the auction would presumably be price-only, but the existing and new resources that would offer into the auction would differ along many dimensions about which consumers, load-serving entities, RTOs, regulatory authorities and other stakeholders are not indifferent, such as environmental attributes, operating characteristics, specific location, and fuel and fuel transportation arrangements, to name a few. By ignoring these attributes, the auctions would seem to pre-empt state policies and bilateral markets where preferences over such attributes could be considered within a procurement process.