

# Response to the 2017 State of the Market Report

May 11, 2018

PJM Interconnection



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## Executive Summary

This document presents PJM Interconnection's response to the *2017 State of the Market Report for PJM*<sup>1</sup> issued by the PJM Independent Market Monitor (IMM), Monitoring Analytics, LLC. The annual *State of the Market Report for PJM* provides an independent assessment of market performance, offering valuable conclusions and recommendations aimed at enhancing PJM's markets. PJM agrees with the IMM conclusion that PJM's markets produce competitive results, and that some markets could benefit from continued evolution.

Since 1997, PJM has successfully used competitive market principles to reinforce the reliability of the bulk electric grid. The market performance during the past 21 years has demonstrated the value of markets in promoting innovation, transparent prices, and efficient entry and exit. By virtually any measure, this accomplishment represents a success story and, in itself, an unprecedented innovation. However, during this period, significant changes in the industry landscape have brought new challenges and opportunities to the integrated market and grid resilience. Beyond 2017, PJM believes that maintaining a proper balance between fundamentally sound principles and the constantly shifting reality is critical to ensure continued success.

This report is organized into two main sections. The first section provides a broad PJM view of the state of the market, covering three topics: (1) setting the stage, (2) key developments in 2017 and (3) going forward.

The second section provides PJM's response to each of the IMM recommendations contained in the *2017 State of the Market Report for PJM*, paralleling the IMM's report structure in each subject area.

### Report Highlights

- PJM and the IMM agree that the PJM markets have produced competitive results.
- Rapidly shifting industry trends are testing market price formation and long-term viability. These trends include historically low prices, which are economically challenging certain types of generators, and public policy concerns that have triggered government actions in various states to preserve local generation.
- Key developments in 2017 include energy price formation, proposed changes to the capacity market, financial transmission rights and market resilience.
- To combat these issues, PJM has initiated a market evolution that is intended to enhance market resilience within an increasingly robust, interconnected construct of energy, reserve, capacity and financial transmission rights markets, including a diverse resource portfolio with fuel security.

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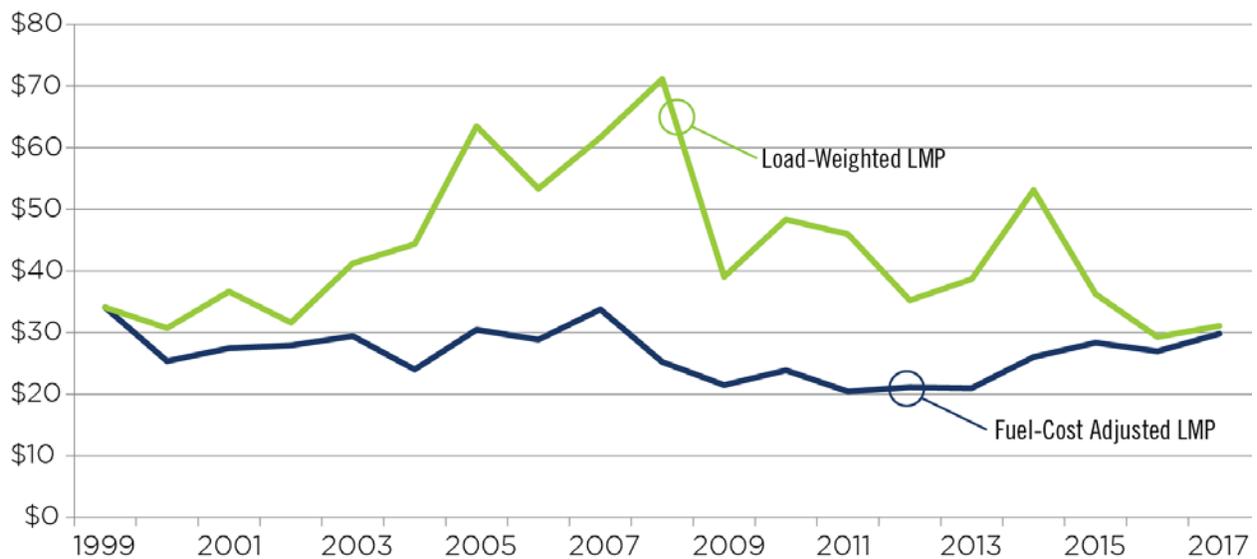
<sup>1</sup>*2017 State of the Market Report for PJM: Volume 2: Detailed Analysis*, March 8, 2018 ("2017 SOM Report"), [http://www.monitoringanalytics.com/reports/PJM\\_State\\_of\\_the\\_Market/2017.shtml](http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017.shtml)

## Introduction

### Setting the Stage

PJM agrees with the IMM that the PJM markets have produced competitive results. As illustrated in Figure 1, since 1998, the PJM markets have been producing stable fuel-adjusted energy prices. During the past 10 years, the PJM markets have also been undergoing a significant transition. The markets have seen an unprecedented fuel and technology switch from coal resources to advanced, efficient natural gas resources. The broad shift is attributable to a number of factors, including the fast growth of low-cost shale gas, efficiency improvements of combined-cycle gas turbines, energy efficiency improvements, increase of renewable energy penetration from wind and solar power, and the stagnant growth of electricity demand. During this period, the markets have incented competitive entry and exit, attracting a net 25 GW of new resources to ensure reliability while producing historically low energy prices.

**Figure 1. Annual Fuel-Cost Adjusted and Load-Weighted LMP**



Low prices are consistent with competitive market results. By themselves, low prices should not be a cause for alarm. However, as certain types of generation are economically challenged in the current environment, the trend toward low market prices raises serious concern among some stakeholders. Some argue that, if it continued, this trend would make it harder for existing suppliers to continue operation or for new investors to raise capital to enter the market, both of which would create uncertainties for future market evolution. Additionally, public policy concerns with socioeconomic impacts such as carbon emissions, local jobs and taxes have triggered government actions in various states to preserve local generation. These developments test market price formation and long-term viability.

### Market Principles

Among market-traded commodities, electricity is unique in its need to maintain a constant balance between supply and demand. For this reason, system operators such as PJM are needed to determine the dispatch of electric generation plants, balancing available generation with demand at all times. For more than 20 years, PJM has utilized market principles to reinforce the reliability of the bulk electric system; a market approach to pricing has worked successfully on an unprecedented scale. In practice, the fundamental principles of energy market pricing transparently reflect the cost of serving demand while minimizing the need for out-of-market uplift payments.

To gain a better understanding of market evolution, it is useful to review developments that have shaped the market principles for electricity.

The first development is the general market equilibrium theory. This theory provided a fundamental framework for how the price system could use the “invisible hand” to send market signals and economic incentives so that demand and supply reach balance based on self-interest.<sup>2</sup> One of the most brilliant minds of the 20th century, the late Stanford Professor and winner of the Nobel Memorial Prize in Economic Sciences Kenneth Arrow, set out the precise conditions under which competitive markets are efficient. Arrow’s theorems show that under convex conditions,<sup>3</sup> market prices would ensure that each consumer’s surplus and each producer’s surplus is maximized in equilibrium, where the social welfare or market surplus is at maximum. However, when the convex condition is violated, this result does not hold, and market equilibrium may not even exist.

The second development is the auction theory, owing much to the pioneering work of the late Columbia Professor and winner of the Nobel Memorial Prize in Economic Sciences William Vickrey, who introduced the innovative auction rule now named after him (Vickrey auction).<sup>4</sup> Vickrey’s work has been extended to uniform price auctions, and it foreshadows the separation between the dispatch run and the pricing run as reflected in the PJM energy price formation proposal based on extended locational marginal pricing.

The third development is the homeostatic control theory, pioneered by the late Massachusetts Institute of Technology Professor of Electrical Engineering Fred Schweppe. He laid the foundation for integrating market principles into the electric grid based on locational marginal pricing (LMP).

In 1997, building on the contract network framework for LMP and financial transmission rights advanced by Harvard Professor William Hogan, PJM translated these market principles into actual market rules, responding to the landmark Federal Energy Regulatory Commission Orders 888 and 889 for electricity market restructuring.

At the time, the bidding structure issue attracted significant attention, competing with other important issues, including demand participation, forward contracting and resource adequacy. While a one-part bid structure was generally considered simpler and more consistent with the marginal-cost pricing principle, a three-part bid structure would provide essential information that would be needed for efficient commitment and dispatch decisions. However, a three-part bid structure has limitations because it creates a non-convex optimization problem that complicates the LMP calculation. At the time, simplifications were considered necessary, and the current LMP pricing was deemed an acceptable approximation of the fundamental principles for achieving efficient pricing.<sup>5</sup> Given the knowledge accumulated and technological advances made since the market’s inception, enhancements to the LMP calculation that would reflect the cost of serving demand more transparently while minimizing out-of-market uplift payments are now possible.

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<sup>2</sup> The invisible hand is a metaphor introduced by Adam Smith in his book *An Inquiry into the Wealth of Nations* for how, in a free market economy, individuals driven by self-interest would promote the general benefit of society at large.

<sup>3</sup> Under convex conditions, the aggregate production cost function is smooth, units are flexible, not lumpy, and the marginal cost is non-decreasing. This means that the price does not fall when the demand increases.

<sup>4</sup> In a Vickrey auction, bidders submit sealed bids without knowing others’ bids in the auction. The highest bidder wins but the price paid is the second-highest bid. This separation of the selection rule and the pricing rule is the signature feature of the Vickrey auction that creates strong incentives for bidding truthfully.

<sup>5</sup> See “Regulatory Evolution, Market Design and Unit Commitment,” by R. O’Neill, U. Helman, P. Sotkiewicz, M. Rothkopf, W. Stewart Jr. in “The Next Generation of Electric Power Unit Commitment Models,” (Eds) by B. Hobbs, M. Rothkopf, R. O’Neill and H. Chao; Kluwer Academic Publisher, Boston (2001).

Figure 2 illustrates how the aggregate supply curve in PJM has changed in recent years. PJM has noted that over time, the supply curve is flattening, and incremental movements in LMP are becoming less effective in incenting units to reduce outputs to follow dispatch or serve as operating reserves. Additionally, resources using natural gas as their primary fuel tend to acquire gas on an inflexible basis, reducing their economic incentive to follow PJM dispatch signals. Diminishing energy market returns also increase the role of the capacity market in resource entry and exit decisions.

**Figure 2. Average PJM Aggregate Real-Time Generation Supply Curves in Summer 2014, 2016 and 2017**

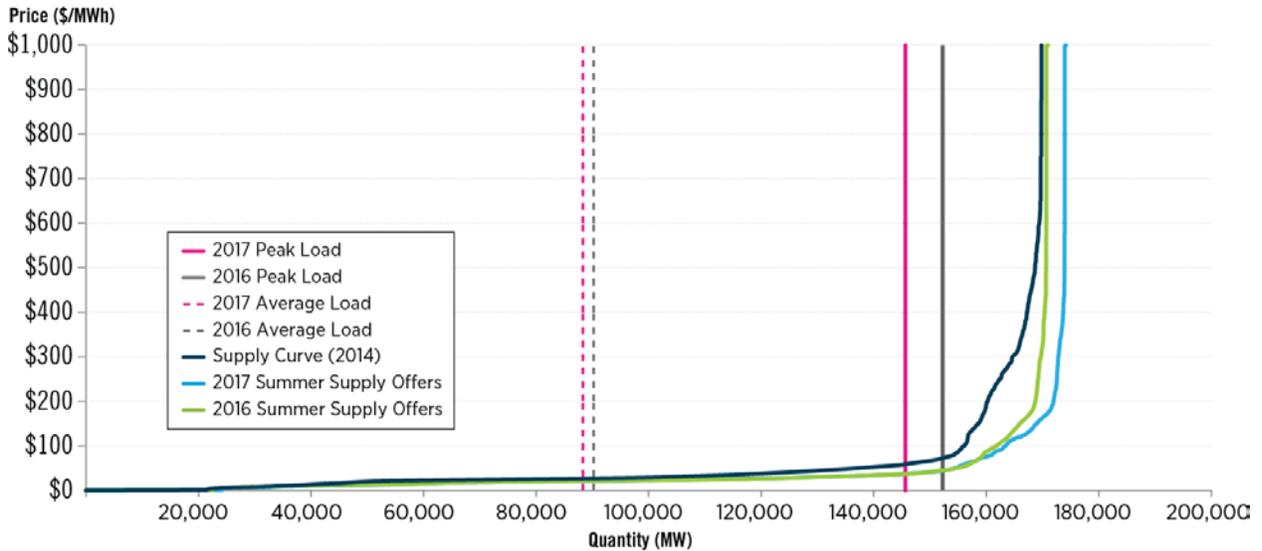
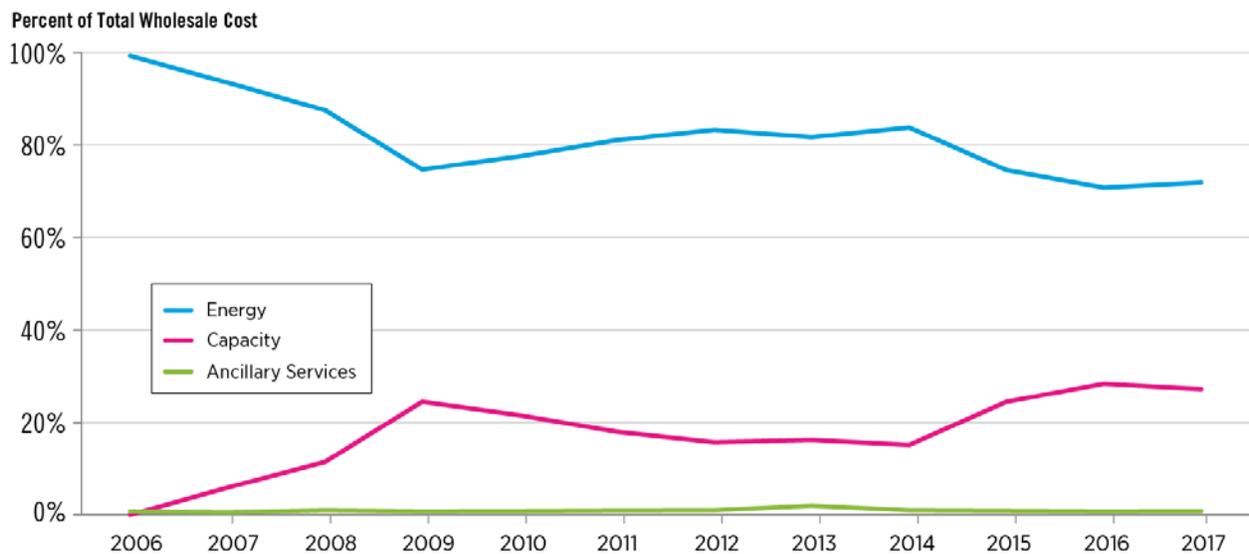


Figure 3 shows the trend of market revenue distribution. Energy market revenue dropped from 74 percent of total revenues in 2015 to 70.8 percent in 2016 and then rose to 71.9 percent in 2017. During the same periods, capacity market revenue rose from 24.5 percent (2015) to 28.4 percent (2016) and then dropped slightly to 27.2 percent (2017). The total payments for ancillary services represent 0.9 percent of total generation revenue in 2015, then 0.8 percent in both 2016 and 2017.

**Figure 3. Market Revenue Distribution**



By design, the capacity market ensures resource adequacy and revenue sufficiency. In other words, the capacity market is a competitive construct to ensure revenue adequacy and to attract entry and exit. When the net revenue from energy and ancillary services is adequate to recover the investment costs with competitive returns, the capacity market becomes less important. On the other hand, when net revenue is expected to be deficient due to, for example, declining energy prices, the capacity market grows in importance.

A sustainable market construct built on a sound foundation of efficient price formation is essential in the long term. Price formation determines the distribution of the economic rent, which incents operational performance and rewards efficient investment. To enhance the sustainable performance of the competitive market construct for the long term, PJM is pursuing opportunities to enhance energy price formation that better embody fundamental market design principles.

These enhancements are essential to ensure that resources that are necessary to meet demand efficiently, subject to transmission constraints, are appropriately valued through the market and that market prices accurately reflect the true costs to serve the system's needs. PJM agrees with the IMM recommendation that scarcity pricing would improve price signals and revenue adequacy. PJM also believes that enhancements to the LMP calculation must be pursued. Market evolution is an incremental transitional process, balancing fundamental principles and real-life situations to ensure continued success.

## Key Developments in 2017

This subsection highlights key developments in 2017 concerning energy price formation, the capacity market, financial transmission rights and market resilience.

### *Energy Price Formation*

In June 2014, the Federal Energy Regulatory Commission (FERC) initiated a Price Formation Docket (AD14-14) to evaluate issues regarding price formation and settlement in the energy and ancillary service markets. In 2016, the FERC issued Notices of Proposed Rulemaking and orders to enhance energy price formation.

In 2017, PJM responded to the price formation issues, drawing on the strength of sound principles and operational excellence. With stakeholder approval, on December 21, 2017, PJM launched an energy price formation initiative for improving the LMP calculation and scarcity pricing in energy and reserve markets, including changes to its approach to pricing electricity to better reflect the costs of all resources needed to serve load. The objective of the initiative is to improve market efficiency and resilience to support social and policy objectives. These changes may be especially valuable in a market in which zero-marginal cost renewables are increasingly available for dispatch.

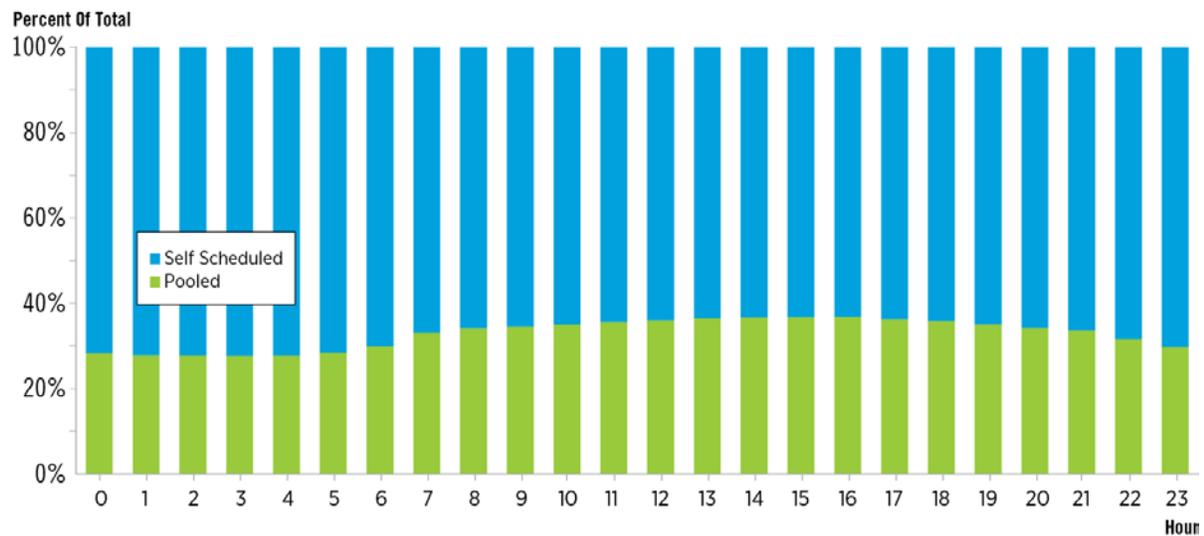
### **Gaps in the Markets**

Since the implementation of LMP, there have always been circumstances in which prices could not reflect everything relevant to sending the right market signals. Solutions that were precluded when the markets were first launched are now possible given growing knowledge and experience. In theory, the current LMP pricing method works only in a pure convex model, in which there would be no uplift, no "missing money," no revenue inadequacy, no incentive for self-scheduling, no reward for inflexibility, and no fall in prices when demand increases.

In reality, the electricity markets have significant gaps:

- **Price suppression.** Nearly 20 percent of the time, the price falls when demand increases, a paradox that does not exist in a well-founded market. The price suppression effects cause shifts of market revenue from the energy market to the capacity market estimated at \$2.7 billion (30 percent of capacity market revenue).<sup>6</sup>
- **Uplift.** Uplift payments have been persistent and, accumulated, equal more than \$5 billion over the past 10 years.
- **No incentive for flexibility.** More than 900 MW of inflexible combustion turbines scheduled in the energy market daily bid in unit parameters that are less flexible than the original equipment manufacturer data. These units have no economic incentive to offer flexibility to the market.
- **Self-scheduling.** Figure 4 shows that, on average, more than two-thirds of units are regularly self-scheduled. Even excluding nuclear power plants, more than 60 percent of generating units are regularly self-scheduled in all hours, accounting for more than 30 percent of the output in the energy market. Excessive self-scheduling could reduce market efficiency and system reliability.

Figure 4. Pool-Scheduled vs. Self-Scheduled Units, Jan. 1, 2016, through Mar. 14, 2018



Under non-convex conditions, price formation problems can occur when the current dispatch and pricing methods are applied to lumpy, inflexible resources.<sup>7</sup>

In a convex world, the system operator would dispatch generation smoothly, starting with the cheapest resource and including more expensive resources until demand is fully met (after considering constraints imposed by the transmission system and generator constraints such as minimum run times), with all generation paid at the price of the marginal cost of the most expensive resource dispatched. The system needs would be served at the lowest possible cost, and no generation would have an incentive to bid manipulatively. Each unit would receive the greatest possible profit by bidding in

<sup>6</sup> Proposed Enhancements to Energy Price Formation, PJM Interconnection LLC, November 15, 2017. <http://www.pjm.com/-/media/library/reports-notices/special-reports/20171115-proposed-enhancements-to-energy-price-formation.ashx>

<sup>7</sup> "Lumpy" resources are those with minimum outputs. "Inflexible" resources are those that cannot adjust their output.

a way that honestly reflects its costs and operating constraints, while consumers would benefit from market-driven innovation and operational efficiency that keep the lights on at all times at the lowest possible prices.

However, this ideal world does not exist, which could in some circumstances lead to inefficient results. If the next-cheapest unit available to the system operator is lumpy and inflexible and dispatching it would result in over-production of electricity, the system operator may have to skip up to a more expensive flexible resource in order to perfectly match demand. The result is a higher price overall, and (more problematically) lumpy, skipped-over resources that have an incentive to offer in a manner that maximizes a potential uplift payment (for example, by claiming a longer minimum run time) while ensuring they are deployed.

Although this bidding behavior may be rational for each individual actor, collectively, it can result in collapsing prices that must be corrected through out-of-market payments (i.e., uplift), leaving the market trapped in a kind of “prisoner’s dilemma”<sup>8</sup> that benefits neither consumers nor generators.

The potential for these kinds of problems has been known since the beginning of the energy markets, but they were long thought to be minor, theoretical deviations, not a real threat to market performance. This may be changing, however, as the lumpy resources are pushed up the dispatch order with a flattening supply curve, zero-marginal cost renewable energy and other changes, putting them at the margin more frequently. PJM does not know how much market distortion has resulted. Indications of the influence of these kinds of imperfections can be seen in certain counterintuitive market developments, for example, prices falling as demand increases or large numbers of generating units self-scheduling, indicating they plan to run at any price rather than submitting a price-based bid.

### **PJM’s Energy Price Formation Proposals**

PJM has proposed to address two categories of issues regarding how prices are formed in the energy and reserve markets. Both categories are equally important to ensuring that energy and reserve price formation is as effective as possible.

The first category deals with how reserves are procured and priced in the day-ahead and real-time markets. PJM believes that co-optimized energy and reserve markets with scarcity pricing and operating reserve demand curves (ORDCs) are critical elements of energy market price formation. The term co-optimization refers to the algorithm used to dispatch the system and calculate prices optimizing more than one product simultaneously. The use of energy and reserve co-optimization along with ORDCs allows for the reflection of reserve shortages in the energy price.

Specifically, PJM proposes to develop more dynamic reserve requirements to better reflect operator actions to maintain reliability, enhance the procurement of synchronized reserves to address performance incentive issues, implement a 30-minute reserve product to more transparently reflect the value of these reserves, and enhance the ORDCs so that they better reflect the value of system reliability and provide transparent and efficient price signals to the market. This is especially important when the operating state of the system is under stressed conditions.

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<sup>8</sup> Prisoner’s dilemma: “In game theory, a situation in which, if each of the individuals involved chooses the most rational option for gaining his or her own ends, the least desirable outcome for all will necessarily result.” Webster’s New World College Dictionary, [http://www.yourdictionary.com/prisoner-s-dilemma#websters?direct\\_search\\_result=yes](http://www.yourdictionary.com/prisoner-s-dilemma#websters?direct_search_result=yes)

This approach incentivizes market participants to act in a way that promotes the system reliability, and in the long term, will reduce the reliance on the capacity market to attract investment in reliability attributes. A co-optimized energy reserve market construct provides the foundation that is needed to reinforce the reliability of the bulk electric grid.

The second category deals with how energy prices are calculated. PJM's proposal, building on the extended LMP approach, leaves existing dispatch processes in place but would add a separate pricing run intended to optimize prices and their incentive effects. That separate pricing run would use a mathematical technique called "integer relaxation" to allow prices to reflect the costs of all resources needed to serve load.

The PJM proposal would not introduce any new inefficiencies into the market, nor would it negatively affect consumer and producer surplus. The total market surplus is determined by the commitment and dispatch process, and the PJM proposal would not change the process that minimizes bid production cost and maximizes total market surplus. Through a separate pricing run, the PJM proposal would produce market signals that accurately reflect true costs and scarcity values in order to support an efficient commitment and dispatch solution that maximizes market surplus. This pricing run would reduce uplift payments and incentivize efficient behavior and reliability attributes.

Table 1 provides a qualitative assessment of alternative LMP pricing methods based on sound design criteria. Among the three methods assessed, the extended LMP method with integer relaxation that PJM proposes is close to the ideal extended LMP method (convex hull relaxation) and is computationally feasible.

Table 1. Assessment of Alternative LMP Pricing Methods

Design Criteria	Restricted LMP Method (Current method)	Extended LMP Method (Proposed method, integer relaxation)	Extended LMP Method (Convex hull relaxation)
Efficient commitment and dispatch	High	High	High
Solutions supported by prices and settlements	Medium	High	High
Incentive-compatible conditions	Low	High	High
Minimized uplift payments	Low	Medium	High
Computationally feasible	High	Medium	Low

Enhanced energy price formation would benefit the market with a more effective "invisible hand." Any transition to enhanced energy price formation would be guided by sound principles and neutral to fuel sources and technologies. These enhancements are expected to improve market transparency, reduce revenue shifts to capacity markets, improve scarcity pricing, and improve incentives for investment, demand participation and system reliability.

### Fast-Start Pricing

On December 21, 2017, the FERC issued a 206 Order on pricing reform for "fast-start" resources. The FERC Order laid out various reform requirements for consideration, and PJM responded in a manner that applies those requirements to the specifics of the PJM system.

The main points of PJM's response were as follows:<sup>9</sup>

- Fast-start resources should be fully dispatchable between zero and their economic maximums in the pricing run. For the reasons stated in its response, PJM proposed to accomplish this through integer relaxation.
- All fast-start resources scheduled by PJM should be eligible to set LMP.
- It is appropriate to alter PJM's real-time processes to execute the dispatch run prior to the pricing run.
- It is appropriate to reflect the commitment costs (i.e., start up and no load) of fast-start resources in prices.
- As PJM has very few resources that meet the FERC's narrow definition of fast-start resources, PJM showed that the FERC's rationale and goals can best be accomplished by restating the fast-start definition as applied to the PJM footprint to consist of resources with start-up and minimum run times of two hours or less.
- It is appropriate to remove the incentive to deviate from dispatch for resources being dispatched down around inflexible fast-start resources. PJM proposed compensating such resources with lost-opportunity-cost credits.

Table 2 compares the current LMP method with the PJM proposal for fast-start pricing. Importantly, allowing fast-start resources to participate in price setting will not introduce any new inefficiencies into the market, nor will it negatively affect consumer and producer surplus. That is because total market surplus is determined by the commitment and dispatch process, and the PJM proposal will not change the process that will minimize bid production cost and maximize total market surplus.

Under the PJM proposal, prices will be calculated in a separate pricing run, along with lost-opportunity-cost and make-whole payments (uplift payments) and will determine the allocation of the market surplus, but not change the total. Therefore, implementation of fast-start pricing does not introduce inefficiencies into the market. However, implementation will result in energy prices that better reflect the cost of the resources operating to serve demand and reduce total uplift payments, thereby better achieving the fundamental principles of energy pricing.

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<sup>9</sup> *PJM Interconnection, L.L.C.*, Order Instituting Section 206 Proceeding and Commencing Paper Hearing Procedures and Establishing Refund Effective Date, Docket No. EL18-34-000 (Dec. 21, 2017) ("206 Order") This proceeding was noticed in the Federal Register on December 28, 2017. 82 Fed. Reg. 61,562 (Dec. 28, 2017).

Table 2. Comparison of Fast-Start Design Principles – Current LMP Method and PJM Proposal

Design Criteria	Current LMP Method	PJM Proposal
<b>Market Efficiency</b>	<ul style="list-style-type: none"> <li>Supports efficient commitment and dispatch</li> <li>Maximizes market surplus</li> </ul>	<ul style="list-style-type: none"> <li>Supports efficient commitment and dispatch</li> <li>Maximizes market surplus</li> </ul>
<b>Market Signal</b>	<ul style="list-style-type: none"> <li>Only flexible resources are eligible to set price.</li> <li>During a shortage event, the price is determined by an administrative price cap.</li> </ul>	<ul style="list-style-type: none"> <li>All fast-start resources, including flexible and inflexible, operating at PJM direction, are eligible to set price.</li> <li>During a shortage event, the price would reflect the scarcity value.</li> </ul>
<b>Incentive</b>	<ul style="list-style-type: none"> <li>Incentivizes units to follow dispatch instructions</li> <li>Incentivizes units to make inflexible offers</li> <li>Uses the Parameter Limited Schedules (PLS) rule to restrict bidding parameters</li> </ul>	<ul style="list-style-type: none"> <li>Incentivizes units to bid truthfully and follow dispatch instructions</li> </ul>
<b>Uplift Payment</b>	<ul style="list-style-type: none"> <li>Uplift reduces market transparency and creates pay-as-bid incentives.</li> </ul>	<ul style="list-style-type: none"> <li>Attains market efficiency and reduced uplift with no tradeoffs</li> </ul>
<b>Market Revenue</b>	<ul style="list-style-type: none"> <li>The energy market revenue is reduced and it is captured in the capacity market.</li> </ul>	<ul style="list-style-type: none"> <li>The energy market revenue is increased, but it is offset by a reduction in the capacity market revenue.</li> </ul>
<b>Market Power Mitigation</b>	<ul style="list-style-type: none"> <li>Disallowing resources with inflexible attributes from setting price would not mitigate market power.</li> <li>Allowing them to set price does not create market power.</li> </ul>	<ul style="list-style-type: none"> <li>Allowing resources with inflexible attributes to set price could improve competitive pricing by increasing the supply that can compete to set price.</li> </ul>

### Capacity Market

In 2017, the 2020/2021 Base Residual Auction of the Reliability Pricing Model cleared 165,109.2 MW of unforced capacity in the RTO, representing a 23.9 percent reserve margin. The auction was the first in which PJM procured 100 percent Capacity Performance resources, which must be capable of sustained, predictable operation and are expected to be available and capable of providing energy and reserves when needed throughout the entire delivery year. As shown in Table 3, the resource clearing price was \$76.53/MW day for the Rest of RTO region, attracting 2,350 MW of new combined-cycle gas resources. The auction resulted in competitive prices while committing resources to significantly increased performance requirements.

Table 3. Resource Clearing Prices for 2020/2021 Base Residual Auction

Capacity Type	Rest of RTO	MAAC	EMAAC	COMED	DEOK
Capacity Performance	\$76.53	\$86.04	\$187.87	\$188.12	\$130.00

Despite relatively flat demand, the PJM markets have resulted in orderly entry and exit, including introduction of highly efficient generation resources and new resource types with wide reliance on innovative financing. The markets have been effective in shifting risks from customers to investors, unavoidably putting financial pressure on some existing resource owners.

This effect can be observed through the forward commitment of resources in the PJM capacity market. In PJM's capacity auctions held from 2010–17, 50,792 MW of new generation capacity has been added, and 39,640 MW of generation capacity has retired or been de-rated.<sup>10</sup> Over 32,000 MW of that new generation has been new highly efficient combined cycle gas-fired plants, along with approximately 7,000 MW of gas-fired combustion turbine plants. By PJM's estimation, over 75 percent of this new entry came from merchants, with the remainder brought in by vertically regulated or public power utilities. The majority of this class of merchant entry over the last 10 years has been funded by private equity. This provides strong evidence of a market expectation that new entry can outcompete and displace older, less-efficient incumbent resources. This kind of investment illustrates precisely how markets unleash competitive forces for the benefit of the consumer.

### **Subsidies and the Capacity Market**

As a consequence of steadily declining energy prices, certain coal and nuclear units in PJM have become economically challenged, and certain states have expressed concern with this result for various reasons, including impacts on the environment of retiring resources that do not emit carbon (in the case of nuclear units), loss of jobs and local tax revenues, and increasing reliance on resources fueled by natural gas. Many state policymakers have, therefore, either acted or are considering the possibility of acting to provide subsidies to nuclear and coal resources to ensure they remain in operation.

If not mitigated, PJM shares the view of the IMM in the *2017 State of the Market Report* that subsidies are contagious and could spread. In effect, subsidies tend to suppress market prices and broaden the financial stresses that triggered subsidies in the first place. If subsidies do become more widespread, they could compromise the ultimate goal of the capacity market to provide investor confidence to attract new entry and assure resource adequacy. Moreover the spread of rent-seeking activities could tear apart the essential fabric of regional coordination in planning gravitating toward integrated resource planning.

Subsidies are generally not the most effective policy instrument to achieve policy goals for dealing with negative externalities. For example, carbon pricing could be a better alternative than state subsidy programs to achieve the carbon emission goals consistently without negatively affecting efficient capacity mix. It also will not have the same distortionary effects on competitive market price formation. PJM has posted a document presenting a conceptual overview of how PJM could facilitate the implementation of a carbon price by some or all of the PJM states.<sup>11</sup>

### **Capacity Market Proposals**

In January 2017, to address the growing concern with the impact of state policy actions on PJM's capacity market, PJM stakeholders endorsed a problem statement and are engaged in a stakeholder process. The Capacity Construct/Public Policy Senior Task Force was created to conduct an assessment of the Reliability Pricing Model (RPM) in an effort to

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<sup>10</sup> 2020/2021 RPM BRA Report at p. 19. <http://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2020-2021-base-residual-auction-report.ashx?la=en>

<sup>11</sup> <http://www.pjm.com/-/media/library/reports-notices/special-reports/20170502-advancing-zero-emission-objectives-through-pjms-energy-markets.ashx>

ensure that the PJM capacity market can continue to support robust supply competition, set price signals to manage resource entry and exit, place risk on those compensated to provide capacity, and promote price transparency.

After extensive stakeholder discussions on this challenging issue between March 6, 2017, and November 21, 2017, two proposals emerged, but neither could gain the two-thirds affirmative sector vote needed for endorsement.

Proposal A, "Capacity Repricing," accommodates state subsidies in a way that avoids impacts on wholesale prices by repricing a subsidized offer after it has cleared at its subsidized level, so that all offers that clear are paid a competitive price. It allows the quantities of those subsidized resources to be recognized as capacity for purposes of meeting the installed reserve margin.

Proposal B, "MOPR-Ex," mitigates the impacts of state subsidies on wholesale prices by repricing subsidized offers through expansion of the Minimum Offer Price Rule. While both proposals work to ensure that capacity market clearing prices will not be suppressed by artificially low offers from subsidized resources, they differ on the basic question of whether a subsidized resource's artificially low offer can be used to qualify it to receive a capacity commitment (as with the Capacity Repricing proposal) or instead require such resources submit and clear a competitive offer in order to receive a capacity commitment (as with the MOPR-Ex proposal).<sup>12</sup>

The PJM Board of Managers concluded that "each approach represents a distinct, just and reasonable policy alternative to address the consequences of state intervention" and the choice between the two approaches in essence presents a federal policy question that "requires a balancing of federal and state interests," i.e., should the PJM wholesale capacity markets accommodate state policy choices to promote and rely upon particular resources while still taking steps to maintain the integrity of the overall clearing price.

In February 2018, the PJM Board of Managers directed PJM to file both the MOPR-Ex proposal and the Capacity Repricing proposal with FERC under Section 205 of the Federal Power Act.<sup>13</sup>

The capacity market is intricately linked to the energy and reserve markets.<sup>14</sup> In principle, the capacity market is intended to solve the revenue deficiency problem to attract competitive resources to meet the reliability requirement. An important observation is that there is a connection between the capacity market and the energy-reserve markets in ways that enhance the resilience of the wholesale electricity market by reflecting the value of reliability and the cost of new entry to the optimal investment and operational decisions. PJM believes that the capacity market construct could benefit from market evolution with enhanced linkage with energy- reserve markets.

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<sup>12</sup> Capacity Repricing/MOPR-Ex Filing: <http://pjm.com/directory/etariff/FercDockets/3576/20180409-er18-1314-000.pdf> . This filing also contains a more extensive discussion regarding the negative impacts of subsidies on market outcomes.

<sup>13</sup> *Letter from Andrew L. Ott to Members and Stakeholders of PJM*, PJM Interconnection, L.L.C., 1 (Feb. 16, 2018) <http://www.pjm.com/-/media/aboutpjm/who-we-are/public-disclosures/20180216-letter-from-pjm-president-and-ceo-on-behalf-of-the-board-of-managers-regarding-capacity-market-reforms.ashx>.

<sup>14</sup> As the standard peak-load pricing theory suggests, the optimal capacity planning under uncertain conditions determines the optimal capacity mix as well as the optimal level of total resource investment required to meet an optimal reliability target. With scarcity pricing, the real-time energy price would supposedly be equal to the value of loss load (VOLL) under shortage conditions. In competitive equilibrium, the cost of new entry (CONE) for the peaking technology would be equal to the expectation of peak energy rent, i.e.,  $CONE = LOLP \times (VOLL - MVC)$ , where LOLP is the Loss of Load Probability and MVC is the marginal variable cost. Revenue deficiency or "missing money" is created when the a price cap is below the VOLL. In competitive equilibrium, the capacity market price equals the expectation of the revenue deficiency equals the Net-CONE of the competitive peaking technology. Scarcity pricing would redistribute market revenues from the capacity market to the energy-reserve markets.

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## Financial Transmission Rights

Following the landmark FERC Orders 888 and 889, the financial transmission right (FTR) was introduced as a critical element in the wholesale power market design to serve as the financial equivalent of physical transmission rights, removing barriers to open access to transmission service.<sup>15</sup> One of the fundamental market design principles is that an efficient, LMP spot market is necessary to provide a locational price reference to support forward contracting (including self-supply and bilateral transactions). Conversely, forward contracting fosters competition in spot trading (including the day-ahead and real-time markets) and should form the bulk of trades settled in the LMP market. At PJM, on average, 78 percent of the day-ahead load obligation is met predominantly through self-supply and bilateral contracts and 22 percent is traded in the spot market. The FTR/Auction Revenue Right (ARR) construct allows market participants to hedge their exposure to the short-term, hourly locational price differences in forming bilateral contracts.

An FTR awards its holders the difference in the congestion LMPs between two nodes, working as a hedge against transmission congestion. The FTR facilitates transactions in the day-ahead energy markets to support the wholesale electricity market to achieve the ultimate market efficiency objective – maximizing the market surplus. PJM believes that the objective of the FTR/ARR design should not be narrowly characterized as returning congestion revenue to customers as suggested in the *2017 State of the Market* report.

In principle, any market design should be neutral and impartial to sub-stakeholder groups. FERC confirmed that in a 2017 FTR Order: “We reject the arguments that the sole purpose of FTRs is to return congestion revenue to load ... FTRs were designed to serve as the financial equivalent of firm transmission service and play a key role in ensuring open access to firm transmission service by providing a congestion hedging function.”<sup>16</sup> PJM agrees with this characterization. Introduced in 2003, the ARR supplements the FTR design by giving firm transmission owners and customers additional options to receive the benefits of the prior transmission investments. An ARR entitles the holder to receive the revenues from the Annual FTR Auction or to collect the congestion revenues through self-scheduling the FTRs.

On September 15, 2016, FERC directed PJM to allocate balancing congestion costs on a pro rata basis to real-time load and exports. Balancing congestion refers to the settlement imbalance in real time that arises from the differences between the real-time and day-ahead market positions. Prior to the FERC directive, balancing congestion was allocated pro rata to FTR holders. This allocation methodology challenged FTR efficacy because FTRs were valued based on day-ahead market positions but settled based on both day-ahead and real-time market positions (an “apples to orange” evaluation), introducing an inappropriate shift in costs.

FERC’s directive addressed this flaw in market design head on. This change was implemented beginning in the 2017/18 planning period. Furthermore, this reform enabled PJM to allocate more Stage 1 ARRs, and as a result, PJM awarded 2,244 MWs of additional Stage 1 ARRs in 2018/19 compared to 2017/18.

PJM and the IMM agree that the FTR and day-ahead surplus should be returned back to ARR holders. In 2018, PJM filed FPA Order 205 revisions to its Tariff and operating agreement, allocating FTR and day-ahead market surplus to ARR holders.

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<sup>15</sup> In 2005, Congress amended the FPA, adding Section 2175 through the 2005 Energy Policy Act to include, as relevant here, provisions to ensure native load service obligations of Load Serving Entities (LSEs) were adequately protected through allocation of firm transmission rights or equivalent tradable or financial transmission rights to such LSEs. (Energy Policy Act of 2005, Pub. L. No. 109-58, §1233, 119 Stat. 957, 2005).

<sup>16</sup> FERC ORDER on Rehearing and Compliance, January 31, 2017 <http://www.pjm.com/directory/tariff/FercOrders/2048/20170131-el16-6-002,%20003,er16-121-001.pdf>.

Table 4 shows the results of a simulation study comparing the FTR and ARR congestion payout ratios before and after the proposal. The ARR percentage indicates the percentage of total congestion revenues returned to load if ARRs were 100 percent self-scheduled.

**Table 4. Simulation Results of FTR and ARR Payout Ratio Impacts**

Planning Period	Before Change		After Change	
	FTR %	ARR %	FTR %	ARR %
2016/17	111%	80%	100.0	92%
2017/18*	114%	85%	100.0	99%

\*As of Jan 1, 2018

PJM believes that there is potential to improve the FTR/ARR design and is working with the IMM on pursuing enhancements to the long-term FTR market. PJM believes that the long-term FTR market should continue to provide one-year term FTRs up to three years in the future, and that it needs to recognize ARR holders' entitled rights.

### Market Resilience

#### Resource Diversity and Fuel Security

In the 2017 report, "PJM's Evolving Resource Mix and System Reliability,"<sup>17</sup> and the recent PJM Comments and Responses to the FERC Order on Grid Resilience in RTOs/ISOs,<sup>18</sup> PJM highlighted the need to foster grid resilience. Consistent with this broad goal, market resilience is advanced via a structurally sound, interconnected market construct that produces effective price signals for mutually beneficial spot and forward trading opportunities throughout the PJM footprint. In the 2018 report, "Valuing Fuel Security," PJM detailed a three-step process through which PJM will analyze the issue of fuel security in its region and take definitive steps to ensure that PJM's markets recognize the value of resources that ensure fuel security of its resource portfolio into the future.<sup>19</sup>

#### Distributed Energy Resources and Storage Technology

Distributed energy resources (DERs) comprise a wide range of energy sources such as small back-up diesel engines, batteries, energy storage, natural gas combustion turbines, large combined heat and power or cogeneration applications and demand response resources.

PJM has integrated a significant amount of DERs as demand response resources (16 percent or 1,288 MW, predominately comprising behind-the-meter generation in the demand response program) into wholesale markets, providing capacity, energy and/or ancillary services. Approximately 300 MW of battery and flywheel technologies have actively participated in PJM's regulation market. Additionally, many DERs participate in PJM as front-of-the-meter resources. As DERs continue to grow more prevalent, PJM will seek ways to foster innovation and will provide input into any policies aimed at advancing storage and other emerging technologies.

<sup>17</sup> PJM's Evolving Resource Mix and System Reliability: <http://www.pjm.com/-/media/library/reports-notices/special-reports/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx?a=en>

<sup>18</sup> Comments and Responses of PJM Interconnection, L.L.C., FERC Order Docket No. AD18-7-000, March 9, 2018. PJM defines grid resilience as: "The ability to withstand and or reduce the magnitude or duration of disruptive events, which includes the capability to identify vulnerabilities and threats, and plan for, prepare for, mitigate, absorb, adapt to, and/or timely recover from such an event."

<sup>19</sup> Valuing Fuel Security: <http://www.pjm.com/-/media/library/reports-notices/special-reports/2018/20180430-valuing-fuel-security.ashx>

Participation of energy storage and DERs likely will have operational and jurisdictional impacts on the retail and wholesale markets, particularly those behind-the-meter resources that seek to inject power past the applicable retail meter and onto the transmission or distribution system. PJM believes it is necessary to work carefully with its stakeholders and states to develop technical requirements and methods to separate retail and wholesale transactions in order to ensure that behind-the-meter resources are eligible to provide the full array of retail and wholesale services that they are capable of providing. PJM must also guarantee that such resources are not “double compensated” or “double charged” for services in the wholesale and retail markets and further guarantee that retail and wholesale market jurisdiction and integrity are respected.

Ideally, PJM should have a more coordinated approach, in which price-responsive demand stays on the demand side in the energy market, demand response on the supply side participates in the reserve markets, and DERs with additional capability beyond the host load can provide this surplus power to the market. PJM will contribute to public conversations about possible roles for these resources and how they might enhance market and grid resilience.

### *Going Forward*

PJM is confident that the market results of 2017 reflect a market construct built on fundamentally sound principles and competitively disciplined market behavior. PJM looks forward to working with the IMM and stakeholders to advance market design to address the issues and recommendations contained in the *2017 State of the Market Report*. Going forward, PJM anticipates continued opportunities for market evolution to enhance market resilience within an increasingly robust, interconnected construct of energy, reserve, capacity and FTR markets with diverse resource portfolio and fuel security.

## PJM Response to IMM Recommendations from the 2017 State of the Market Report

Some IMM recommendations are repeated from past State of the Market Reports. Some of these recommendations already have been addressed or are being actively discussed within the stakeholder process. Several recommendations have been discussed by stakeholders in the past and have not been adopted or the FERC has decided in a different direction. A more-detailed PJM response to the conclusions and recommendations from the *2017 State of the Market Report* is provided below. PJM has either implemented or is in the process of addressing approximately half of the recommendations. In this section, PJM provides a response to each of the IMM's recommendations, including explanations when the status of a particular recommendation is not agreed on by PJM and the IMM.

Table 1. Summary of PJM Status of IMM Recommendations

PJM Status	Description	Number of Recommendations	Percent
Implemented	These recommendations have been implemented.	59	33%
Stakeholder Process	These recommendations are under active discussion in the PJM stakeholder process or other stakeholder forum.	15	8%
Pending before the FERC	These recommendations are being considered by the FERC.	6	3%
Action Planned	PJM expects to take action or initiate a stakeholder discussion on this recommendation in 2018.	13	7%
No Further Action Planned	PJM has reviewed this recommendation but does not plan to act on this issue in the near future due to No Stakeholder Consensus (37%), Rejected by the FERC (18%), PJM concerns (37%), or this recommendation is Outside of PJM Control (7%).	67	38%
Low Priority	These issues have low impact to the markets and PJM stakeholders. No action is planned in the near future because there are other issues with more significant potential to impact the markets.	18	10%

### *New Recommendations Introduced in 2017*

**IMM Recommendation:** The MMU recommends that PJM increase the interaction of outage and operational restriction data submitted by Market Participants via eDART/eGADS and offer data submitted via Markets Gateway.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** The Generator Availability Data System (eGADS) supports the submission and processing of generator outage and performance data for after-the-fact reporting. PJM has internally investigated linking the eGADS and Markets Gateway systems. Due to complexity and feasibility, PJM has not developed an efficient way to accomplish this.

**IMM Recommendation:** The MMU recommends that PJM offer to sell back capacity in incremental auction only at the BRA clearing price for the relevant delivery year.

**IMM Status:** Not adopted

**PJM Status:** Pending Before the FERC

**PJM Response:** In March 2018, PJM made FERC filing for proposed revisions to Incremental Auction rules and structure. The IMM recommendation was part of the filed changes.

**IMM Recommendation:** The MMU recommends that PJM clear the capacity market based on nodal capacity resource locations and the characteristics of the transmission system consistent with actual electrical facts of the grid. The current nested LDA structure used in the capacity market does not adequately represent all the capacity transfers that are feasible among LDAs. Absent a fully nodal capacity market clearing process, the MMU recommends that PJM use a non-nested model for all LDAs and specify a VRR curve for each LDA and exchanges from neighboring LDAs up to the transmission limit. LDAs should price separate if that is the result of the LDA supply curves and the transmission constraints.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM and the IMM don't agree with this particular recommendation. The current nested LDA structure is exactly consistent with the determination of the CETL of an LDA. The CETL equals the total imports into the LDA (measured as the net MW flow across all tie lines) at the point where a transmission constraint is reached, preventing further imports into the LDA from anywhere outside of the LDA.

**IMM Recommendation:** The MMU recommends that the RPM market power mitigation rule be modified to apply offer caps in all cases when the three pivotal supplier test is failed and the sell offer is greater than the offer cap. This will ensure that market power does not result in an increase in make whole payments.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM and the IMM don't agree with this particular recommendation. Market Power Mitigation should apply as under existing rules when the resource in question has an impact on the clearing price.

**IMM Recommendation:** The MMU recommends that PJM develop a forward-looking estimate for the expected number of Performance Assessment Hours (H) to use in calculating the Non-Performance Charge Rate. The MMU recommends that PJM develop a forward looking estimate for the Balancing Ratio (B) during Performance Assessment House to use in calculating the default offer cap. Both H and B parameters should be included in the annual review of planning parameters for the Base Residual Auction.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** This recommendation is currently being discussed at the Market Implementation Committee stakeholder sessions.

**IMM Recommendation:** The MMU recommends that when expected H and B are not the same as the assumed levels used to calculate the default market seller offer cap of  $\text{Net CONE} \times B$ , the offer cap be recalculated for each BRA using the fundamental economic logic for a competitive offer of a CP resource.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** This recommendation is currently being discussed at the Market Implementation Committee stakeholder sessions.

**IMM Recommendation:** The MMU recommends elimination of the cost service recovery rate in OATT Section 119, and that RMR service should be provided under the deactivation avoidable cost rate in Part V. The MMU also recommends specific improvements to the DACR provisions.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the IMM believes this is a higher priority issue, PJM recommends the IMM bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other ongoing initiatives. PJM also notes that regardless of whether the PJM Tariff specifically states so, PJM believes that a market seller requested to operate a deactivating resource beyond its desired deactivation date can always file with the FERC for approval of a cost of service rate. Historically, the MMU has typically been a party to those proceedings.

**IMM Recommendation:** The MMU recommends that the maximum offer for demand resources be the same as the maximum offer for generation resources.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** FERC Order 831 established the DR maximum offer price. The Economic DR offer price is capped at \$1,000/MWh unless incremental cost can support a higher offer. Emergency and Pre-Emergency DR is price-capped based on lead time and will stay in effect based on the FERC rejection of PJM's compliance filing and as explicitly stated in the Order to keep existing price caps in place.

**IMM Recommendation:** The MMU recommends the Relative Root Mean Squared Test be required for all demand resources with a CBL.

**IMM Status:** Partially adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** RRMSE test is not required for default Emergency/Pre-Emergency DR registrations. In 2015 the default CBL was changed to more accurate and robust method. A default CBL is always needed for such registrations in order to determine load reduction.

**IMM Recommendation:** The MMU recommends that PRD be required to respond during a PAH to be consistent with all CP resources.

**IMM Status:** Not adopted

**PJM Status:** Action Planned; Stakeholder Process

**PJM Response:** PJM worked with stakeholders to update trigger for PRD response to PAH and energy prices above PRD price threshold. Stakeholders put voting on hold until end of 2019 because of the tie to seasonal capacity.

**IMM Recommendation:** The IMM recommends that for oil tanks that are shared with other resources only a proportionate share of the minimum tank suction level (MTSL) be allocated to black start service. The IMM further recommends that the PJM Tariff be updated to clearly state show MTSL will be calculated for black start units sharing oil tanks.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM worked with the IMM to bring this recommendation to the PJM stakeholders but there was no consensus.

**IMM Recommendation:** The IMM recommends that capability to operate under the proposed deadband (+/- 0.036HZ) and droop (5 percent) settings be mandated as a condition of interconnection and that such capability be required of both new and existing resources. The IMM recommends that no additional compensation be provided as the current PJM market design provides adequate compensation.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** This is currently being discussed in the Primary Frequency Response Senior Task Force.

**IMM Recommendation:** The IMM recommends that PJM limit the scope of supplemental projects that can obtain exceptions to the Order No. 1000 process, to ensure maximum competition.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM is supportive of competition and continues to work on improvements to its competitive process. Supplemental projects are not subject to competition for several reasons. Supplemental projects are not required to meet PJM or NERC criteria and are planned by transmission owners. Supplemental projects are located entirely in one zone and cost-allocated to one zone, and therefore are exempted from competition per Order 1000. Additionally, any project that is an upgrade to its facility is exempt from competition per Order 1000.

**IMM Recommendation:** The IMM recommends that Long Term FTRs be modified to include only a one year ahead FTR.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** PJM and the IMM do not agree on this particular recommendation. PJM disagrees with removing YR2 and YR3 Long Term FTR products. PJM and its stakeholders are discussing enhancements to the LT FTR model that will address the concern of selling FTRs prior to the allocation of ARRs.

**IMM Recommendation:** The MMU recommends that the full transmission capacity of the system be allocated as ARRs prior to sale as FTRs. (The MMU recommends that all requested ARR rights for each delivery year be reserved for ARR holders during the Long Term FTR Auction)

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** PJM agrees with the underlying concern and is currently discussing with stakeholders enhancements to the LT FTR model that will address these concerns.

### *Recommendations That Changed Status in 2017*

Each year PJM performs a detailed review and response for every recommendation published in the State of the Market report. Over time, recommendations are modified and PJM statuses change. There were eight recommendations that appeared in the 2017 report that were introduced in years past, but not included as part of the 2016 report. Since PJM's Response to the 2016 State of the Market was published last May, PJM updated statuses for 30 recommendations. Of the 178 recommendations listed in the 2017 report, the IMM agrees that PJM has partially adopted or fully adopted 32 of the recommendations listed below.

### *Energy Market Recommendations*

**IMM Recommendation:** The MMU recommends that the market rules should explicitly require that offers into the Day-Ahead Energy Market be competitive, where competitive is defined to be the short run marginal cost of the units. The short run marginal cost should reflect opportunity cost when and where appropriate. The MMU recommends that the level of incremental costs includable in cost-based offers not exceed the short run marginal cost of the unit.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** PJM does not agree that only short run marginal costs should be included in a generators' cost-based offer. As specified in the final FERC Order on Hourly Offers, Docket ER16-372-002, PJM agrees that incremental maintenance costs, incremental labor costs, and maintenance adders should all be included in a generator's cost-based offer. PJM addressed the Variable Operations and Maintenance cost allocation recommendation in special sessions of the Market Implementation Committee (MIC). The VOM packages that remain in the stakeholder process clearly define these Maintenance Costs as those expenses incurred as a result of electric production and exclude maintenance costs included in the unit's capacity offer, such as routine maintenance on auxiliary equipment and preventative maintenance that would be performed even if the unit did not generate electricity.

**IMM Recommendation:** The MMU recommends that PJM require every market participant to make available at least one cost schedule with the same fuel-type and parameters as that of their offered price schedule.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** Upon further review, PJM believes that the MMU solution does not address the problem as proposed. PJM is willing to work with the MMU on alternative approaches to resolve the issue. The Market Monitor can bring forward a problem statement if they wish to discuss in the stakeholder process.

**IMM Recommendation:** The MMU recommends that PJM require that all fuel cost policies be algorithmic, verifiable and systematic.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** This MMU recommendation was rejected by the FERC in the hourly offers order, Docket ER16-372-002.

**IMM Recommendation:** The MMU recommends that Manual 15 be replaced with a straightforward description of the components of cost offers based on short run marginal costs and the correct calculation of cost offers.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** PJM recommends the MMU work with PJM to develop a problem statement and work with stakeholders to evaluate the priority relative to other on-going initiatives.

**IMM Recommendation:** The MMU recommends removal of all use of the FERC System of Accounts in the Cost Development Guidelines.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** This issue was addressed in the PJM Stakeholder Process at the Market Implementation Committee and the proposal to remove FERC accounts was not endorsed. PJM requires any resources that use FERC accounts to remove labor costs.

**IMM Recommendation:** The MMU recommends the removal of all use of cyclic starting and peaking factors from the Cost Development Guidelines.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** This recommendation was considered at the Market Implementation Committee and PJM and Stakeholders elected not to remove cyclic starting and peaking factors.

**IMM Recommendation:** The MMU recommends the removal of all labor costs from the Cost Development Guidelines.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** This recommendation was rejected by the FERC in the hourly offers order, Docket ER16-372-002.

**IMM Recommendation:** The MMU recommends changing the definition of the start heat input for combined cycles to include only the amount of fuel used from firing each combustion turbine in the combined cycle to the breaker close of each combustion turbine.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the MMU believes this is a higher priority issue, PJM recommends the MMU bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other on-going initiatives.

**IMM Recommendation:** The MMU recommends the removal of nuclear fuel and nonfuel operations and maintenance costs that are not short run marginal costs from the Cost Development Guidelines.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Variable Operations & Maintenance Costs Special Session of the MIC, and stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends revising the pumped hydro fuel cost calculation to include day-ahead and real-time power purchases.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the IMM believes this is a higher priority issue, PJM recommends the IMM being a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other ongoing initiatives.

**IMM Recommendation:** The MMU recommends revisions to the calculation of energy market opportunity costs to incorporate all time based offer parameters and all limitations that impact the opportunity cost of generating unit output.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the MMU believes this is a higher priority issue, PJM recommends the MMU bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other ongoing initiatives.

**IMM Recommendation:** The MMU recommends removing the catastrophic designation for force majeure fuel supply limitations in Schedule 2.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM believes that the only valid fuel supply limitation for a year should be because of catastrophic Force Majeure. PJM included this language in the Capacity Performance filing and the FERC accepted it.

**IMM Recommendation:** The MMU recommends that the rules governing the application of the TPS test be clarified and documented.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** PJM provided the rules governing the application of the three pivotal supplier test in the Hourly Offers filing (Docket No. ER16-372-002).

**IMM Recommendation:** The MMU recommends, in order to ensure effective market power mitigation when the TPS test is failed, that markup be constant across price and cost offers, that there be at least one cost-based offer using the same fuel as the available price-based offer.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. The MMU raised this issue in the FERC docket on hourly offers, and while the FERC did not require PJM to implement it, the FERC indicated we could further explore through the stakeholder process. If the MMU would like to address this issue, PJM recommends the MMU bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other on-going initiatives.

**IMM Recommendation:** The MMU recommends that in order to ensure effective market power mitigation when the TPS test is failed, the operating parameters in the cost-based offer and the price-based parameter limited schedule (PLS) offer be at least as flexible as the operating parameters in the available non-PLS price-based offer, and that the price-MW pairs in the price based PLS offer be exactly equal to the price based non PLS offer.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. The MMU raised this issue in the FERC docket on hourly offers, and while the FERC did not require PJM to implement it, FERC indicated we could further explore through the stakeholder process. If the MMU would like to address this issue, PJM recommends the MMU bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other on-going initiatives.

**IMM Recommendation:** The MMU recommends that capacity performance resources and base capacity resources (during the June through September period) be held to the OEM operating parameters of the capacity market CONE reference resource for performance assessment and energy uplift payments and that this standard be applied to all technologies on a uniform basis.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** This request was rejected by the FERC in the Capacity Performance rehearing. The FERC responded that PJM must honor "actual constraints" for operating parameters.

**IMM Recommendation:** The MMU recommends that under the Capacity Performance construct, PJM recognize the difference between operational parameters that indicate to PJM dispatchers what a unit is capable of during the operating day and the parameters that are used for capacity performance assessment as well as uplift payments. The parameters which determine non-performance charges and the amount of uplift payments to those generators should reflect the flexibility goals of the capacity performance construct.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** In 2016, PJM implemented Real-Time Values, which allows capacity suppliers to submit parameters that reflect the actual, physical operating capabilities of the unit. This was reviewed at the Operating Committee meetings for stakeholder input and the details were added to Manual 11 Section 2.3.4.

**IMM Recommendation:** The MMU recommends that PJM retain the \$1,000 per MWh offer cap in the PJM energy market except when cost-based offers exceed \$1,000 per MWh, and retain other existing rules that limit incentives to exercise market power.

**IMM Status:** Partially adopted

**PJM Status:** Implemented

**PJM Response:** FERC Order 831 caps a resource's incremental energy offer used for purposes of calculating LMPs in day-ahead and real-time energy markets at the higher of \$1,000/MWh or that resource's cost-based incremental energy offer. It also imposes an overall \$2000 offer cap for the purpose of setting LMP. PJM's current rules are consistent with the order and PJM's compliance filing with the FERC has been accepted.

**IMM Recommendation:** The MMU recommends that PJM not allow nuclear generators that do not respond to prices or that only respond to manual instructions from the dispatcher to set the LMPs in the real-time market.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** Treating nuclear generators in this manner would be inconsistent with the way other generators are treated in this setting. How well a unit follows dispatch is not part of the LMP pricing methodology.

**IMM Recommendation:** The MMU recommends that PJM document how LMPs are calculated when demand response is marginal.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** In response to the 2016 recommendation, PJM provided an explanation of Locational Marginal Pricing in Excess of \$1,800/MWh, and posted supporting materials to the MC Webinar on October 23, 2017.

**IMM Recommendation:** The MMU recommends that PJM explicitly state its policy on the use of transmission penalty factors including: the level of the penalty factors, the triggers for the use of the penalty factors, the appropriate line ratings to trigger the use of penalty factors; the allowed duration of the violation; the use of constraint relaxation logic; and when the transmission penalty factors will be used to set the shadow price.

**IMM Status:** Not adopted

**PJM Status:** Stakeholder Process

**PJM Response:** This recommendation is currently under consideration in the stakeholder process. Additionally, the FERC has included as part of the Uplift Cost Allocation and Transparency Final Rule several requirements around Transmission Constraint penalty factors to improve transparency for market participants.

**IMM Recommendation:** The MMU recommends that Market Sellers not be allowed to designate any portion of an available Capacity Resource's ICAP equivalent of cleared UCAP capacity commitment as a Maximum Emergency offer at any time during the delivery year.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** This MMU recommendation was rejected when the FERC approved the Reforms to the Reliability Pricing Market ("RPM") and Related Rules in the PJM Open Access Transmission Tariff ("Tariff") and Reliability Assurance Agreement Among Load Serving Entities ("RAA"), Docket ER15-623-000.

**IMM Recommendation:** The MMU recommends that PJM update the outage impact studies, the reliability analyses used in RPM for capacity deliverability and the reliability analyses used in RTEP for transmission upgrades to be consistent with the more conservative emergency operations (post contingency load dump limit exceedance analysis) in the energy market that were implemented in June 2013.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the MMU believes this is a higher priority issue, PJM recommends the MMU bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other ongoing initiatives.

**IMM Recommendation:** The MMU recommends that the roles of PJM and the transmission owners in the decision-making process to control for local contingencies be clarified, that PJM's role be strengthened and that the process be made transparent.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM concerns

**PJM Response:** PJM believes that Section B.9 of Manual 38 adequately addresses the MMU's concerns.

**IMM Recommendation:** The MMU recommends that PJM include in the appropriate manual an explanation of the initial creation of hubs, the process for modifying hub definitions and a description of how hub definitions have changed. There is currently no PJM documentation in the tariff or manuals explaining how hubs are created and how their definitions are changed.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** Hubs are created at the suggestion of, and following discussion with, stakeholders. As such, the methodology for creating a particular hub is documented as it is created. Once a hub is created, hub definitions are not changed, and as such, there is no need to document the methodology.

**IMM Recommendation:** The MMU recommends that all buses with a net withdrawal be treated as load for purposes of calculating load and load-weighted LMP. The MMU recommends that during hours when a load bus shows a net injection, the energy injection be treated as generation, not negative load, for purposes of calculating generation and load-weighted LMP.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM disagrees with this recommendation and believes that when a generation bus is showing a net withdrawal, the payment should be the responsibility of the generation owner rather than affecting the load serving entities. While the State Estimator solution can occasionally result in injections at certain load buses, by definition there is no generator modeled at such a bus, and therefore no Market Seller to which to attribute actual generation injection. As such, the only feasible method by which to include such cases in the market settlements is to treat them as negative load at the particular load bus location.

**IMM Recommendation:** The MMU recommends that PJM remove non-specific fuel types such as "other" or "co-fire other" from the list of fuel types available for market participants to identify the fuel type associated with their price and cost schedules.

**IMM Status:** Partially adopted

**PJM Status:** Implemented

**PJM Response:** All non-specific sub-fuel-types such as “Other” were removed from Markets Gateway incrementally between Mar 9, 2017 and May 10, 2017.

**IMM Recommendation:** The MMU recommends that PJM routinely review all transmission facility ratings and any changes to those ratings to ensure that the normal, emergency and load dump ratings used in modeling the transmission system are accurate and reflect standard ratings practice.

**IMM Status:** Partially adopted

**PJM Status:** Implemented

**PJM Response:** The Transmission Owners Agreement-Administrative Committee (TOA-AC) created a subgroup to address this recommendation. The subgroup developed a detailed presentation on the Transmission Owner (TO) internal compliance process to satisfy the existing NERC FAC-008-3 standard. TOs have demonstrated strict processes and controls are already in place to ensure facility ratings used in PJM operation are determined based on technically sound principles. PJM is satisfied with the current TO facility rating development and update process.

**IMM Recommendation:** The MMU recommends that PJM identify and collect data on available behind the meter generation resources, including nodal location information and relevant operating parameters.

**IMM Status:** Partially adopted

**PJM Status:** Implemented

**PJM Response:** In 2015, PJM collected information regarding behind-the-meter (BtM) generation with a capability over two MWs and made this information available to PJM dispatchers. BtM generation (Name, MW, and closest substation) is displayed geographically within the Dispatcher Interactive Mapping Application (DIMA). PJM has also drafted manual changes (PJM Manual 3A) to incorporate EMS modeling guidelines for available behind-the-meter generation resources.

**IMM Recommendation:** The MMU recommends that PJM continue to enhance its posting of market data to promote market efficiency.

**IMM Status:** Partially adopted

**PJM Status:** Action Planned

**PJM Response:** PJM is committed to enhancing data postings specifically related to Market Operations and Uplift transparency. Over the past year, PJM has worked with stakeholders to provide education and information for increased transparency into system conditions and operator actions that result in prices and other settlement results such as uplift. PJM introduced a new “Drivers of Uplift” page on [pjm.com](http://pjm.com). Additionally, PJM will implement Order 844 - Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators, which provides the appropriate transparency level for uplift payments and operator-initiated commitment that the FERC sought.

**IMM Recommendation:** The MMU recommends that PJM require all generating units to identify the fuel type associated with each of their offered schedules.

**IMM Status:** Adopted, 2014

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2014.

**IMM Recommendation:** The MMU recommends that PJM increase the interaction of outage and operational restriction data submitted by Market Participants via eDART/eGADS and offer data submitted via Markets Gateway.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** The Generator Availability Data System (eGADS) supports the submission and processing of generator outage and performance data for after-the-fact reporting. PJM has internally investigated linking the eGADS and Markets Gateway system. Due to complexity and feasibility PJM has not developed an efficient way to accomplish this.

### *Energy Uplift Recommendations*

**IMM Recommendation:** The MMU recommends that PJM not use closed loop interface constraints to artificially override the nodal prices that are based on fundamental LMP logic in order to: accommodate rather than resolve the inadequacies of the demand side resource capacity product; address the inability of the power flow model to incorporate the need for reactive power; accommodate rather than resolve the flaws in PJM's approach to scarcity pricing; or for any other reason.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM establishes interfaces such as ATSI to ensure the correct pricing signal is sent to the market and to have the price of the marginal resource properly reflected. PJM believes it is critical for appropriate

prices to be reflected in market outcomes. The issue was presented to the Market Implementation Committee and resulted in rule changes regarding when closed loop interfaces could be used.

**IMM Recommendation:** The MMU recommends that PJM not use price setting logic to artificially override the nodal prices that are based on fundamental LMP logic in order to reduce uplift

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns; **Pending before the FERC**

**PJM Response:** PJM does not agree with the MMU's position or characterization of this recommendation. PJM does not override nodal prices. Changes to the LMP calculation are currently under review in the PJM Stakeholder Process and at the FERC.

**IMM Recommendation:** The MMU recommends that if PJM believes it appropriate to modify the price setting logic, PJM initiate a stakeholder process to create transparent and consistent modifications to the rules and incorporate the modifications in the PJM tariff.

**IMM Status:** Not adopted

**PJM Status:** **Stakeholder Process; Pending before the FERC**

**PJM Response:** PJM agrees with this recommendation and changes to the LMP calculation are currently under review in the PJM Stakeholder Process and at the FERC.

**IMM Recommendation:** The MMU recommends that PJM initiate an analysis of the reasons why some combustion turbines and diesels scheduled in the Day-Ahead Energy Market are not called in real time when they are economic.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** An analysis of combustion turbine lost opportunity cost was completed and statistics were presented to PJM stakeholders at the April 23rd, 2015 Markets and Reliability Committee (MRC) meeting. Subsequently, PJM has implemented procedures to closely monitor the long-lead time combustion turbines and diesels, and more consistently commit them in real time. PJM reviews unit commitment choices daily.

**IMM Recommendation:** The MMU recommends the elimination of the day-ahead operating reserve category to ensure that units receive an energy uplift payment based on their real-time output and not their day-ahead scheduled output.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends reincorporating the use of net regulation revenues as an offset in the calculation of balancing operating reserve credits.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends not compensating self-scheduled units for their startup cost when the units are scheduled by PJM to start before the self-scheduled hours.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends calculating LOC based on 24 hour daily periods or multi-hour segments of hours for combustion turbines and diesels scheduled in the Day-Ahead Energy Market, but not committed in real time.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends that units scheduled in the Day-Ahead Energy Market and not committed in real time should be compensated for LOC based on their real-time desired and achievable output, not their scheduled day-ahead output.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends that units scheduled in the Day-Ahead Energy Market and not committed in real time be compensated for LOC incurred within an hour.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends that only flexible fast start units (startup plus notification times of 30 minutes or less) and short minimum run times (one hour or less) be eligible by default for LOC compensation to units scheduled Day-Ahead Energy Market and not committed in real time. Other units should be eligible for LOC compensation only if PJM explicitly cancels their day-ahead commitment.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation. PJM continues to monitor CT commitments for units (startup plus notification times of 120 minutes or less) and short minimum run time (two hour or less) to minimize CT lost opportunity cost payments.

**IMM Recommendation:** The MMU recommends that up to congestion transactions be required to pay energy uplift charges for both the injection and the withdrawal sides of the UTC.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** Pending Before the FERC

**PJM Response:** This recommendation was approved by PJM stakeholders but rejected by the FERC. PJM has filed a re-hearing and is waiting on a response from FERC.

**IMM Recommendation:** The MMU recommends eliminating the use of internal bilateral transactions (IBTs) in the calculation of deviations used to allocate balancing operating reserve charges.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** Pending Before the FERC

**PJM Response:** This recommendation was approved by stakeholders but rejected by the FERC. PJM has filed a re-hearing and is waiting on a response from FERC.

**IMM Recommendation:** The MMU recommends allocating the energy uplift payments to units scheduled as must run in the Day-Ahead Energy Market for reasons other than voltage/reactive or black start services as a reliability charge to real-time load, real-time exports and real-time wheels.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends that the total cost of providing reactive support be categorized and allocated as reactive services. Reactive services credits should be calculated consistent with the operating reserve credits calculation.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the MMU believes this is a higher priority issue, PJM recommends the MMU bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other on-going initiatives.

**IMM Recommendation:** The MMU recommends including real-time exports and real-time wheels in the allocation of the cost of providing reactive support to the 500 kV system or above, which is currently allocated solely to real-time RTO load.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends enhancing the current energy uplift allocation rules to reflect the elimination of day-ahead operating reserves, the timing of commitment decisions and the commitment reasons.

**IMM Status:** Not adopted; Stakeholder process

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was considered by the Energy Market Uplift Senior Task Force (EMUSTF) but stakeholders elected not to adopt this recommendation.

**IMM Recommendation:** The MMU recommends modifications to the calculation of lost opportunity costs credits paid to wind units. The lost opportunity costs credits paid to wind units should be based on the lesser of the desired output, the estimated output based on actual wind conditions and the capacity interconnection rights (CIRs). In addition, the MMU recommends PJM allow and wind units submit CIRs that reflect the maximum output wind units want to inject into the transmission system at any time.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the MMU wishes to address this recommendation, PJM recommends the MMU bring a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other on-going initiatives.

**IMM Recommendation:** The MMU recommends that PJM revise Manual 11 attachment C consistent with the tariff to limit compensation to offered costs. The Manual 11 attachment C procedure should describe the steps market participants should take to change the availability of cost-based energy offers that have been submitted day ahead. The MMU recommends that PJM eliminate the Manual 11 attachment C procedure with the implementation of hourly offers (ER16-372-000).

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM disagrees with this recommendation and believes that there are scenarios in which Attachment C in Manual 11 will be needed even after the implementation of Hourly Offers.

**IMM Recommendation:** The MMU recommends that PJM clearly identify and classify all reasons for incurring operating reserves in the Day-Ahead and Real-Time Energy Markets and the associated operating reserve charges in order for to make all market participants to be made aware of the reasons for these costs and to help ensure a long term solution to the issue of how to allocate the costs of operating reserves.

**IMM Status:** Adopted, 2015

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2015. PJM will also implement FERC Order 844, which provides the appropriate transparency level for uplift payments and operator-initiated commitment that the FERC sought.

**IMM Recommendation:** The MMU recommends that PJM revise the current operating reserve confidentiality rules in order to allow the disclosure of complete information about the level of operating reserve charges by unit and the detailed reasons for the level of operating reserve credits by unit in the PJM region.

**IMM Status:** Partially Adopted

**PJM Status:** Action Planned

**PJM Response:** PJM will implement FERC Order 844 - Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators, which provides the appropriate transparency level for uplift payments and operated-initiated commitment that the FERC sought.

**IMM Recommendation:** The MMU recommends that the lost opportunity cost in the energy market be calculated using the schedule on which the unit was scheduled to run in the energy market.

**IMM Status:** Adopted, 2015

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends including no load and startup costs as part of the total avoided costs in the calculation of lost opportunity cost credits paid to combustion turbines and diesels scheduled in the Day-Ahead Energy Market but not committed in real time.

**IMM Status:** Adopted, 2015

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends using the entire offer curve and not a single point on the offer curve to calculate energy lost opportunity cost.

**IMM Status:** Adopted, 2015

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2015.

### *Capacity Market Recommendations*

**IMM Recommendation:** The MMU recommends the enforcement of a consistent definition of capacity resource. The MMU recommends that the requirement to be a physical resource be enforced and enhanced. The requirement to be a physical resource should apply at the time of auctions and should also constitute a commitment to be physical in the relevant Delivery Year. The requirement to be a physical resource should be applied to all resource types, including planned generation, demand resources and imports.

**IMM Status:** Not adopted; Pending before FERC

**PJM Status:** **Implemented**; **Stakeholder Process**

**PJM Response:** PJM agrees with the enforcement of a consistent definition of a capacity resource and this aspect of the recommendation and it was implemented as part of Capacity Performance. A problem statement regarding the physicality of a resource was approved and the topic is currently being considered by the PJM stakeholders in the Incremental Auction Senior Task Force.

**IMM Recommendation:** The MMU recommends that the definition of demand side resources be modified to ensure that such resources be fully substitutable for other generation capacity resources. Both the limited and the Extended Summer DR products should be eliminated in order to ensure that the DR product has the same unlimited obligation to provide capacity year round as generation capacity resources.

**IMM Status:** Adopted, 2015

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends that the test for determining modeled Locational Deliverability Areas (LDAs) in RPM be redefined. A detailed reliability analysis of all at risk units should be included in the redefined model.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** PJM has studied at-risk units as part of the RTEP process over the past several years and has provided that information to stakeholders. PJM has also made substantive changes to LDA modeling

assumptions to improve coordination between RPM and RTEP process. PJM currently identifies at-risk units and models LDAs where retirement of at-risk units would result in exceeding Capacity Emergency Transfer Limit (CETL) values. PJM will continue working with both the IMM and the stakeholders on refining the models.

**IMM Recommendation:** The MMU recommends that the net revenue calculation used by PJM to calculate the net Cost of New Entry (CONE) VRR parameter reflect the actual flexibility of units in responding to price signals rather than using assumed fixed operating blocks that are not a result of actual unit limitations. The result of reflecting the actual flexibility is higher net revenues, which affect the parameters of the RPM demand curve and market outcomes.

**IMM Status:** Not adopted

**PJM Status:** **Action Planned**

**PJM Response:** The peak-period dispatch is a tariff-defined method of estimating the net energy and ancillary service revenues for the reference resource. PJM is not convinced that the IMM proposed method would provide a more accurate estimate of net energy and ancillary service revenues for a new combustion turbine. However, changes to this method could be investigated and considered as part of the quadrennial review process. PJM recommends that the IMM present analysis showing their proposed method provides a more accurate estimate than the current method prior to the next quadrennial review so that stakeholders can determine if this should be included as part of the scope of the next quadrennial review.

**IMM Recommendation:** The MMU recommends that Energy Efficiency Resources (EE) not be included on the supply side of the capacity market because PJM's load forecasts now account for future EE, unlike the situation when EE was first added to the capacity market. However, the MMU recommends that the PJM load forecast method should be modified so that EE impacts immediately affect the forecast without the long lag times incorporated in the current forecast method. If EE remains not included on the supply side, there is no reason to have an add-back mechanism. If EE remains on the supply side, the implementation of the EE add back mechanism should be modified to ensure that market clearing prices are not affected.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** The PJM load forecast method has already been modified to reflect both past and future EE impacts based on explicit EE "forecasts" therefore the "lag time" has been eliminated. With EE now explicitly represented in the load forecast and with EE remaining a supply-side resource, the EE add-back mechanism ensures that market clearing prices are not suppressed by double-counting. Therefore, PJM believes that this has been implemented.

**IMM Recommendation:** The MMU recommends that PJM reduce the number of incremental auctions to a single incremental auction held three months prior to the start of the delivery year and reevaluate the triggers for holding conditional incremental auctions.

**IMM Status:** Not adopted

**PJM Status:** Pending Before the FERC

**PJM Response:** In March 2018, PJM made FERC filing for proposed revisions to IA rules and structure. The filing changes reduce the number of Incremental Auctions from 3 to 2, and the IMM supported this change.

**IMM Recommendation:** The MMU recommends that PJM offer to sell back capacity in incremental auction only at the BRA clearing price for the relevant delivery year.

**IMM Status:** Not adopted

**PJM Status:** Pending before the FERC

**PJM Response:** In March 2018, PJM made FERC filing for proposed revisions to Incremental Auction rules and structure. The IMM recommendation was part of the filed changes.

**IMM Recommendation:** The MMU recommends that the use of the 2.5 percent demand adjustment (Short Term Resource Procurement Target) be terminated immediately. The 2.5 percent should be added back to the overall market demand curve

**IMM Status:** Adopted, 2015

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends changing the RPM solution method to explicitly incorporate the cost of make whole payments in the objective function.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM disagrees with this recommendation because PJM's existing solution method determines the final solution in accordance with the OATT provisions regarding make-whole. The recommendation is irrelevant because it has no bearing on the final RPM auction solution results but is merely a recommendation for a different computational approach to get to these same final auction results.

**IMM Recommendation:** The MMU recommends that PJM clear the capacity market based on nodal capacity resource locations and the characteristics of the transmission system consistent with actual electrical facts of the grid. The current nested LDA structure used in the capacity market does not adequately represent all the capacity transfers that are feasible among LDAs. Absent a fully nodal capacity market clearing process, the MMU recommends that PJM use a non-nested model for all LDAs and specify a VRR curve for each LDA and exchanges from neighboring LDAs up to the transmission limit. LDAs should price separate if that is the result of the LDA supply curves and the transmission constraints.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM and the IMM don't agree with this particular recommendation. The current nested LDA structure is exactly consistent with the determination of the CETL of an LDA. The CETL equals the total imports into the LDA (measured as the net MW flow across all tie lines) at the point where a transmission constraint is reached preventing further imports into the LDA from anywhere outside of the LDA.

**IMM Recommendation:** The MMU recommends the extension of the minimum offer price rule (MOPR) to all existing and proposed units (MOPR-Ex) in order to protect competition in the capacity market from external subsidies.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** The Capacity Construct/Public Policy Senior Task Force (CCPPSTF) was created to conduct an assessment of the Reliability Pricing Model (RPM) in an effort to ensure potential state public policy initiatives and RPM objectives are not at odds. This group will identify both the characteristics of a well-functioning capacity construct, as well as potential public policy initiatives states could take regarding resource adequacy, fuel diversity, public, and environmental policies. Based on the identified factors, the group will discuss whether modifications are required to RPM. The IMM recommendation fits within the scope of this task force.

**IMM Recommendation:** The MMU recommends that, as part of the MOPR unit specific standard of review, all projects be required to use the same basic modeling assumptions. That is the only way to ensure that projects compete on the basis of actual costs rather than on the basis of modeling assumptions.

**IMM Status:** IMM Status - Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** The Capacity Construct/Public Policy Senior Task Force (CCPPSTF) was created to conduct an assessment of the Reliability Pricing Model (RPM) in an effort to ensure potential state public policy initiatives and RPM objectives are not at odds. This group will identify both the characteristics of a well-functioning capacity construct, as well as potential public policy initiatives states could take regarding resource adequacy, fuel

diversity, public, and environmental policies. Based on the identified factors, the group will discuss whether modifications are required to RPM. The IMM recommendation fits within the scope of this task force.

**IMM Recommendation:** The MMU recommends that modifications to existing resources not be treated as new resources for the purposes of market power related offer caps or MOPR offer floors.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** The Capacity Construct/Public Policy Senior Task Force (CCPPSTF) was created to conduct an assessment of the Reliability Pricing Model (RPM) in an effort to ensure potential state public policy initiatives and RPM objectives are not at odds. This group will identify both the characteristics of a well-functioning capacity construct, as well as potential public policy initiatives states could take regarding resource adequacy, fuel diversity, public, and environmental policies. Based on the identified factors, the group will discuss whether modifications are required to RPM. The IMM recommendation fits within the scope of this task force.

**IMM Recommendation:** The MMU recommends that the RPM market power mitigation rule be modified to apply offer caps in all cases when the three pivotal supplier test is failed and the sell offer is greater than the offer cap. This will ensure that market power does not result in an increase in make whole payments.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM and the IMM don't agree with this particular recommendation. Market Power Mitigation should apply as under existing rules when the resource in question has an impact on the clearing price.

**IMM Recommendation:** The MMU recommends that PJM develop a forward looking estimate for the expected number of Performance Assessment Hours (H) to use in calculating the Non-Performance Charge Rate. The MMU recommends that PJM develop a forward looking estimate for the Balancing Ratio (B) during Performance Assessment House to use in calculating the default offer cap. Both H and B parameters should be included in the annual review of planning parameters for the Base Residual Auction.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** This recommendation is currently being discussed at the Market Implementation Committee stakeholder sessions.

**IMM Recommendation:** The MMU recommends that when expected H and B are not the same as the assumed levels used to calculate the default market seller offer cap of  $\text{Net CONE} \times B$ , the offer cap be recalculated for each BRA using the fundamental economic logic for a competitive offer of a CP resource.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** This recommendation is currently being discussed at the Market Implementation Committee stakeholder sessions.

**IMM Recommendation:** The MMU recommends that a unit which is not capable of supplying energy consistent with its day-ahead offer should reflect an appropriate outage.

**IMM Status:** Not adopted; Pending before FERC

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** As part of the Capacity Performance filing, PJM proposed that capacity performance resources should not be allowed to offer in the day-ahead market as emergency only. However, this aspect of the Capacity Performance filing was rejected by the FERC.

**IMM Recommendation:** The MMU recommends that retroactive replacement capacity transactions associated with a failure to perform during a PAH not be allowed and that, more generally, retroactive replacement capacity transactions not be permitted.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was presented and discussed at the Under-Performance Risk Management Senior Task Force in 2016. PJM does not agree with this recommendation and there was no stakeholder support to move forward with this recommendation.

**IMM Recommendation:** The MMU recommends that Generation Capacity Resources be paid on the basis of whether they produce energy when called upon during any of the hours defined as critical. One hundred percent of capacity market revenue should be at risk rather than only fifty percent.

**IMM Status:** Adopted, 2015

**PJM Status:** [Implemented](#)

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends that PJM eliminate all OMC outages from the calculation of forced outage rates used for any purpose in the PJM Capacity Market.

**IMM Status:** Adopted, 2015

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends that PJM eliminate the broad exception related to lack of gas during the winter period for single-fuel, natural gas-fired units.

**IMM Status:** Adopted, 2015

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends that there be an explicit requirement that capacity resource offers in the Day-Ahead Energy Market be competitive, where competitive is defined to be the short run marginal cost of the units.

**IMM Status:** Not adopted

**PJM Status:** **No Further Action Planned; PJM Concerns**

**PJM Response:** PJM disagrees with this recommendation. In the PJM market, capacity resources that are deemed to present a local market power risk (i.e. those that fail the three pivotal supplier test) are subject to market power mitigation and limited to cost-based offers. PJM believes this recommendation would extend offer mitigation to all operating hours for any capacity resource, even when the resource has passed very conservative market power screens. PJM believes offer capping resources that have been deemed to satisfy market power screens is inconsistent with the FERC's authority and action to grant market-based rates for resources in the energy market. PJM notes the analysis of market-based offers presented in the 2015 State of the Market Report does not appear to support or justify this recommendation.

**IMM Recommendation:** The MMU recommends that all capacity imports be required to be pseudo tied prior to the relevant Delivery Year in order to ensure that imports are full substitutes for internal, physical capacity resources.

**IMM Status:** Adopted, 2015

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends that all capacity imports be required to be deliverable to PJM load prior to the relevant delivery year to ensure that they are full substitutes for internal, physical capacity resources. Pseudo ties alone are not adequate to ensure deliverability.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** The External Capacity changes associated with the External resource filing should address the IMM recommendations. The External Capacity filing that was approved by the FERC.

**IMM Recommendation:** The MMU recommends that all costs incurred as a result of a pseudo tied unit be borne by the unit itself and included as appropriate in unit offers in the capacity market.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** The External Capacity changes associated with the External resource filing should address the IMM recommendations. The External Capacity filing that was approved by the FERC.

**IMM Recommendation:** The MMU recommends that all capacity imports have firm transmission to the PJM border prior to offering in an RPM auction.

**IMM Status:** Adopted, 2015

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends that all resources importing capacity into PJM accept a must offer requirement.

**IMM Status:** Adopted, 2015

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends clear, explicit and detailed rules that define the conditions under which PJM will and will not recall energy from PJM capacity resources and prohibit new energy exports from PJM capacity resources. The MMU recommends that those rules define the conditions under which PJM will purchase emergency energy while at the same time not recalling energy exports from PJM capacity resources. PJM has modified these rules, but they need additional clarification and operational details.

**IMM Status:** Partially adopted

**PJM Status:** Low Priority

**PJM Response:** These protocols were developed in 2012 and are established in Manual 11. PJM believes these protocols are sufficient and has discussed them with IMM. PJM notes that the new protocols have never been exercised in real-time operations.

**IMM Recommendation:** The MMU recommends that the notification requirement for deactivations be extended from 90 days prior to the date of deactivation to 12 months prior to the date of deactivation and that PJM and the MMU be provided 60 days rather than 30 days to complete their reliability and market power analysis.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** PJM has implemented a requirement that any generation seeking to have their facility excused from participation in an RPM base residual auction make that request by the beginning of December in the year prior to the base residual auction for the future delivery year. PJM would also support an increase in the length of time allowed for the study of requests for deactivation.

**IMM Recommendation:** The MMU recommends that RMR units recover all and only the incremental costs, including incremental investment costs, required by the RMR service that the unit owner would not have incurred if the unit owner had deactivated its unit as it proposed. Customers should bear no responsibility for paying previously incurred costs, including a return on or of prior investments.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the IMM believes this is a higher priority issue, PJM recommends the IMM being a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other on-going initiatives.

**IMM Recommendation:** The MMU recommends elimination of the cost service recovery rate in OATT Section 119, and that RMR service should be provided under the deactivation avoidable cost rate in Part V. The MMU also recommends specific improvements to the DACR provisions.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** PJM believes this is a low priority issue. If the IMM believes this is a higher priority issue, PJM recommends the IMM being a problem statement to the PJM stakeholders so that they may evaluate the priority relative to other on-going initiatives. PJM also notes that regardless of whether the PJM Tariff specifically states so, PJM believes that a market seller requested to operate a deactivating resource beyond its desired deactivation date can always file with FERC for approval of a cost of service rate. Historically, the MMU has typically been a party to those proceedings.

### *Demand Response Recommendations*

**IMM Recommendation:** The MMU recommends, as a preferred alternative to including demand resources as supply in the capacity market, that demand resources be on the demand side of the markets, that customers be able to avoid capacity and energy charges by not using capacity and energy at their discretion, that customer payments be determined only be metered load, and that PJM forecasts immediately incorporate the impacts of demand side behavior.

**IMM Status:** Not adopted

**PJM Status:** Action Planned

**PJM Response:** As outlined in PJM DR Strategy, PJM believes DR in the capacity market is better suited on the supply side of the market but agrees energy should be incorporated into the demand side of the market in the future. PJM is exploring potential forecast adjustment for demand side load response that will not create reliability issues.

**IMM Recommendation:** The MMU recommends that the option to specify a minimum dispatch price (strike price) for demand resources be eliminated and that participating resources receive the hourly real-time LMP less any generation component of their retail rate.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** Reinforced by the Supreme Court ruling in the EPSA case, energy market compensation for demand resources at full LMP has been deemed just and reasonable and PJM does not intend to challenge that ruling at this time. PJM believes demand resources should set LMP when the resources are marginal to establish the correct price signal in the market, especially during emergency conditions.

**IMM Recommendation:** The MMU recommends that the maximum offer for demand resources be the same as the maximum offer for generation resources.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** FERC Order 831 established the DR maximum offer price. The Economic DR offer price is capped at \$1,000/MWh unless incremental cost can support a higher offer. Emergency and Pre-Emergency DR is price-capped based on lead time stay in effect based on the FERC rejection of PJM's compliance filing and as explicitly stated in the Order to keep existing price caps in place.

**IMM Recommendation:** The MMU recommends that the demand resources be treated as an economic resource, responding to economic price signals like other capacity resources. The MMU recommends that demand resources not be treated as emergency resources, not trigger a PJM emergency and not trigger a Performance Assessment Hour.

**IMM Status:** Not adopted

**PJM Status:** Implemented; No Further Action Planned; PJM Concerns

**PJM Response:** PJM partially agrees with this recommendation and has created a pre-emergency demand response category for any demand resource that does not require an emergency condition to respond. Pre-emergency demand response resources are dispatched to prevent full emergency conditions which may include loading maximum emergency generation. PJM believes these should trigger a Performance Assessment Interval (PAI) because the grid is expected to be short on reserve during this future time period.

**IMM Recommendation:** The MMU recommends that the Emergency Program Energy Only option be eliminated because the opportunity to receive the appropriate energy market incentive is already provided in the Economic Program.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This recommendation was discussed with stakeholders and there was no support to eliminate this demand response participation option.

**IMM Recommendation:** The MMU recommends that a daily energy market must offer requirement apply to demand resources, comparable to the rule applicable to generation capacity resources.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM does not believe that a day-ahead, economic, must-offer requirement is necessary for demand resources because demand resources do not have the incentive to exert market power through physical withholding like generation resources do. The vast majority of demand resources only want to be dispatched if needed to prevent system emergencies and therefore will have a day-ahead price offer at the energy offer cap. If most demand resources are priced at the cap, it negates any significant benefit from participation in the Day-Ahead Energy Market and could complicate actual use of demand resources by dispatcher's discretion to manage emergency system conditions. Stakeholders discussed this as part of the Capacity Performance changes and determined this change was not necessary.

**IMM Recommendation:** The MMU recommends that demand resources be required to provide their nodal location, comparable to generation resources.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** FERC's DR aggregation requirements make nodal dispatch unlikely to adopt. Further, CSPs do not know the nodal location of customers and some EDCs consider this confidential information. As outlined in PJM DR Strategy, PJM will consider this approach in the future if there is significantly more value than current subzonal dispatch approach through zip codes.

**IMM Recommendation:** The MMU recommends that PJM require nodal dispatch of demand resources with no advance notice required or, if nodal location is not required, subzonal dispatch of demand resources with no advance notice required.

**IMM Status:** Not adopted

**PJM Status:** Implemented; No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM implemented rules by which it can create a sub-zone with no advance warning but can only assess capacity penalty if a sub-zone is created prior to the operating day. A nodal requirement was discussed with stakeholders during the demand response operational efficiency changes and it was decided by stakeholders with PJM agreement that sub-zonal dispatch for load management resources is adequate for PJM dispatch.

**IMM Recommendation:** The MMU recommends that PJM eliminate the measurement of compliance across zones within a compliance aggregation area (CAA). The multiple zone approach is less locational than the zonal and subzonal approach and creates larger mismatches between the locational need for the resources and the actual response.

**IMM Status:** Not adopted

**PJM Status:** Implemented; No Further Action Planned; PJM Concerns

**PJM Response:** Compliance aggregation areas were eliminated as part of Capacity Performance changes. The Capacity Performance changes still allow demand response to aggregate performance. PJM does not agree that aggregation should be limited to a zone and that performance aggregation should be limited to an emergency action area, if resources from one part of the grid will not help the issue in another part of the grid.

**IMM Recommendation:** The MMU recommends that measurement and verification methods for demand resources be modified to reflect compliance more accurately.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** PJM continues to enhance measurement and verification protocols and is considered a world leader in this area. The FERC recently approved the PJM filed changes to modify the determination of winter load reductions for CP DR resources. The IMM recommendation is not clear as to what other improvements are proposed.

**IMM Recommendation:** The MMU recommends that compliance rules be revised to include submittal of all necessary hourly load data, and that negative values be included when calculating event compliance across hours and registrations.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM currently requires hourly meter load data be submitted for all participants. PJM does not agree with penalizing demand response participants when consumption is above the amount of capacity allocated since non-participants may also consume above the amount of capacity allocated. This would discriminate against those customers that participate as a demand response resource compared to those customers that do not participate. PJM has already implemented measurement and verification changes to only recognize reduction when load is below the amount of capacity allocated in the summer months.

**IMM Recommendation:** The MMU recommends that PJM adopt the ISO-NE five-minute metering requirements in order to ensure that dispatchers have the necessary information for reliability and that market payments to demand resources be calculated based on interval meter data at the side of the demand reductions.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** As part of the 5 minute settlement process, the FERC ordered that DR does is not required to change metering infrastructure to participate in the wholesale market. Accordingly, PJM will not require resources to buy new metering equipment at this time. Retail participants currently do not have five-minute metering and are settled on a one-hour basis. It is not necessary for all resources to deploy new metering and support systems unless there is a clear and quantifiable benefit. Demand response resources currently report their hourly load reduction capability which is used to make dispatch decisions.

**IMM Recommendation:** The MMU recommends that demand response event compliance be calculated for each hour and the penalty structure reflect hourly compliance for the base and capacity performance products.

**IMM Status:** Partially adopted

**PJM Status:** **Implemented**

**PJM Response:** This was implemented as part of the Capacity Performance rule changes adopted by the FERC.

**IMM Recommendation:** The MMU recommends that load management testing be initiated by PJM with limited warning to CSPs in order to more accurately represent the conditions of an emergency event.

**IMM Status:** Not adopted

**PJM Status:** **Action Planned**

**PJM Response:** As outlined in PJM DR Strategy paper, PJM believe DR testing rules should be evaluated to ensure they reasonably represent performance during an actual event.

**IMM Recommendation:** The MMU recommends that shutdown cost be defined as the cost to curtail load for a given period that does not vary with the measured reduction or, for behind the meter generators, be the start cost defined in Manual 15 for generators.

**IMM Status:** Not adopted

**PJM Status:** **No Further Action Planned; PJM Concerns**

**PJM Response:** The majority of demand response resources do not have a shutdown cost. The IMM has access to all PJM information and may always contact curtailment service providers to gain more information about shutdown cost if the IMM needs more information to support the values. Shutdown costs are defined in Manual 11.

**IMM Recommendation:** The MMU recommends that the Net Benefits Test be eliminated and that demand response resources be paid LMP less any generation component of the applicable retail rate.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** The Supreme Court of the United States upheld the FERC's ability to regulate demand response in the wholesale market. The commission has determined that energy market consumption at full LMP is just and reasonable based upon the net benefits test as currently designed. PJM does not expect to challenge this decision in the near term.

**IMM Recommendation:** The MMU recommends that the tariff rules for demand response clarify that a resource and its CSP, if any, must notify PJM of material changes affecting the capability of the resource to perform as registered and to terminate registrations that are no longer capable of responding to PJM dispatch directives because load has been reduced or eliminated, such as in the case of bankrupt and/or out of service facilities.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** Curtailment Service Providers (CSPs) are currently obligated to withdraw registrations if a customer facility no longer has electricity service before the start of the delivery year. If a customer facility has no electricity service during the delivery year the CSPs may not report load reductions considering there is no electricity service at the facility. CSPs are required to report to PJM expected real-time load reductions so that PJM dispatchers can incorporate into dispatch decisions. The DRS has a proposed solution which includes a provision to require CSP to terminate registration as appropriate based on IMM suggestion.

**IMM Recommendation:** The MMU recommends that PJM not remove any defined subzones and maintain a public record of all created and removed subzones.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM does not feel it is necessary to maintain the posting of subzones that are no longer used. PJM removes subzones that are invalid and have no intention of being used in the future.

**IMM Recommendation:** The MMU recommends that there only be one demand response product in the capacity market, with an obligation to respond when called for all hours of the year.

**IMM Status:** Partially adopted

**PJM Status:** **Implemented**; No Further Action Planned; PJM Concerns

**PJM Response:** PJM partially agrees with this recommendation which led to the elimination of seasonal capacity products and 100 percent of the Capacity Performance requirement for 2020/2021 Delivery Year and beyond. PJM is currently working on a long-term DR strategy which includes DR's participation in all PJM markets.

**IMM Recommendation:** The MMU recommends that the lead times for demand resources be shortened to 30 minutes within an hour minimum dispatch for all resources.

**IMM Status:** Partially adopted

**PJM Status:** **Implemented**

**PJM Response:** PJM has implemented these changes, effective 2014. Demand resources can request an exception from the 30-minute and 1-hour requirements for physical reasons.

**IMM Recommendation:** The MMU recommends setting the baseline for measuring capacity compliance under winter compliance at the customers' PLC, similar to GLD, to avoid double counting.

**IMM Status:** Partially adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** This recommendation is contrary to what stakeholders adopted under the Capacity Performance changes and is contrary to PJM and FERC arguments to support Capacity Performance changes. This recommendation would be contrary to the rules adopted by the FERC.

**IMM Recommendation:** The MMU recommends the Relative Root Mean Squared Test be required for all demand resources with a CBL.

**IMM Status:** Partially adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** RRMSE test is not required for default Emergency/Pre-Emergency DR registrations. In 2015 the default CBL was changed to more accurate and robust method. A default CBL is always needed for such registrations in order to determine load reduction.

**IMM Recommendation:** The MMU recommends that PRD be required to respond during a PAH to be consistent with all CP resources.

**IMM Status:** Not adopted

**PJM Status:** Action Planned; Stakeholder Process

**PJM Response:** PJM worked with stakeholders to update trigger for PRD response to PAH and energy prices above PRD price threshold. Stakeholder put voting on hold until end of 2019 because of the tie to seasonal capacity.

**IMM Recommendation:** The MMU recommends capping the baseline for measuring compliance under GLD, for the limited summer product, at the customers' PLC

**IMM Status:** Adopted, 2015

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2015.

**IMM Recommendation:** The MMU recommends that demand resources whose load drop method is designated as "Other" explicitly record the method of load drop.

**IMM Status:** Adopted, 2014

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2014.

### *Environmental Recommendations*

**IMM Recommendation:** The MMU recommends that renewable energy credit markets based on state renewable portfolio standards be brought into PJM markets as they are an increasingly important component of the wholesale energy market.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Outside of PJM Control

**PJM Response:** PJM believes this issue is part of the larger discussion regarding state-specific out-of-market subsidies. The recent proliferation of proposals for zero-emission credits and other types of economic support for non-economic generation creates a situation that could undermine appropriate price formation in the wholesale markets. It will be important for state and federal regulators to work together with all stakeholders to determine appropriate solutions to value important attributes of specific generators. However, the specifics of this recommendation focus on state-level markets that are outside PJM's control.

### *Interchange Transactions Recommendations*

**IMM Recommendation:** The MMU recommends that PJM implement rules to prevent sham scheduling. The MMU recommends that PJM apply after the fact market settlement adjustments to identified sham scheduling segments to ensure that market participants cannot benefit from sham scheduling.

**IMM Status:** Not adopted; Stakeholder process.

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This issue was brought through the stakeholder process (MIC) with no consensus to change the way transactions are scheduled and settled.

**IMM Recommendation:** The MMU recommends that PJM implement a validation method for submitted transactions that would prohibit market participants from breaking transactions into smaller segments to defeat the interface pricing rule by concealing the true source or sink of the transaction.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This issue was brought through the stakeholder process (MIC) with no consensus to change the way transactions are scheduled and settled.

**IMM Recommendation:** The MMU recommends that PJM implement a validation method for submitted transactions that would require market participants to submit transactions on market paths that reflect the expected actual power flow in order to reduce unscheduled loop flows.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** This issue was brought through the stakeholder process (MIC) with no consensus to change the way transactions are scheduled and settled.

**IMM Recommendation:** The MMU recommends that PJM end the practice of maintaining outdated definitions of interface pricing points, eliminate the NIPSCO, Southeast and Southwest interface pricing points from the Day-Ahead and Real-Time Energy Markets and, with VACAR, assign the transactions created under the reserve sharing agreement to the SouthIMP/EXP pricing point.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** PJM has removed, or is in the process of removing, all outdated interface pricing points. PJM agrees this is low priority.

**IMM Recommendation:** The MMU recommends that PJM eliminate the IMO interface pricing point, and assign the transactions that originate or sink in the IESO balancing authority to the MISO interface pricing point.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented a new IMO (Ontario-Independent Electric Market Operator) interface price definition and created a new Ontario aggregate pricing point on June 1, 2015, that resolves this concern. The IMM recommendation would result in inconsistent pricing for transactions to/from IMO that do not flow entirely through MISO. PJM chose to let existing FTRs sourced at IMO expire and not issue any new ones instead.

**IMM Recommendation:** The MMU recommends that PJM monitor, and adjust as necessary, the weights applied to the components of the interfaces to ensure that the interface prices reflect ongoing changes in system conditions. The MMU also recommends that PJM review the mappings of external balancing authorities to individual interface pricing points to reflect changes to the impact of the external power source on PJM tie lines as a result of system topology changes. The MMU recommends that this review occur at least annually.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** PJM agrees in concept with both recommendations and does review mappings as necessary. In addition, PJM and MISO have jointly developed an interface pricing solution at the Joint and Common Market Stakeholder process to resolve the misalignment of the pricing of transactions between PJM and MISO. Finally, PJM has or is in the process of removing all outdated interface pricing points.

**IMM Recommendation:** The MMU requests that, in order to permit a complete analysis of loop flow, FERC and NERC ensure that the identified data are made available to market monitors as well as other industry entities determined appropriate by FERC.

**IMM Status:** Not adopted

**PJM Status:** **No Further Action Planned; Outside of PJM Control**

**PJM Response:** PJM supports the IMM's request that all identified data needed to conduct a complete loop flow analysis be made available to the market monitors as well as other industry entities determined appropriate by the FERC.

**IMM Recommendation:** The MMU recommends that PJM explore an interchange optimization solution with its neighboring balancing authorities that would remove the need for market participants to schedule physical transactions across seams. Such a solution would include an optimized, but limited, joint dispatch approach that uses supply curves and treats seams between balancing authorities as constraints, similar to other constraints within an LMP market.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** The Joint and Common Market initiative continues to look for opportunities to enhance the operation and coordination of markets across seams. Coordinated transaction scheduling was implemented with NYISO in November 2014 and with MISO in October 2017.

**IMM Recommendation:** The MMU recommends that PJM permit unlimited spot market imports as well as unlimited non-firm point-to-point willing to pay congestion imports and exports at all PJM interfaces in order to improve the efficiency of the market.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM has reviewed the Spot-in Transmission Service issue in great detail at the Market Implementation Committee and stakeholders have expressed concern permitting unlimited and non-firm point-to-point spot-in transmission imports. The proposal that came out of the discussions was to move the spot-in transmission commitment time from 9:00 a.m. to 10:00 a.m. on all interfaces, but due to concerns raised by stakeholders that the move to 10:00 a.m. would adversely impact other seams, the Committee deferred voting this item. Interested stakeholders have indicated they will work to develop a more comprehensive approach to address market issues across all seams.

**IMM Recommendation:** The MMU recommends that PJM immediately provide the required 12-month notice to Duke Energy Progress (DEP) to unilaterally terminate the Joint Operating Agreement.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM does not agree with the recommendation to terminate the PJM/PEC Joint Operating Agreement prior to renegotiating a new joint agreement. PJM concurs that updates and improvements to the agreement may be required and will continue to seek opportunities to work with Duke Energy Progress to update the agreement.

**IMM Recommendation:** The MMU recommends that PJM Settlement Inc. immediately request a credit evaluation from all companies who engaged in up to congestion transactions between September 8, 2014 and December 31, 2015. If PJM has the authority, PJM should ensure that the potential exposure to uplift for that period be included as a contingency in the companies' calculations for credit levels and/or collateral requirements. If PJM does not have the authority to take such steps, PJM should request guidance from FERC.

**IMM Status:** Not adopted

**PJM Status:** Pending Before the FERC

**PJM Response:** PJM does not agree that additional credit evaluations or "contingency" credit requirements are appropriate for this matter before the commission rules on the FERC-initiated docket on potential uplift charges on up-to-congestion transactions. PJM Settlement already performs ongoing credit evaluations of all PJM members participating in the markets PJM administers. PJM's credit policy in Attachment Q of the tariff does not authorize PJM Settlement to include a "contingency" in members' credit requirements. PJM Settlement does have the ability to modify a member's credit requirement to reflect "known and measurable" changes in the activity or expected charges or credits for a member. PJM is monitoring the open FERC docket that may result in additional fees being charged to up-to-congestion transactions, with the potential of retroactive action dating back to the fall of 2014, and has filed a joint letter with the IMM requesting action from the FERC in this docket. In the opinion of PJM Settlement, the possible outcomes of this FERC docket are not yet "known and measurable." It is not known when the FERC will rule in this docket, what the FERC ruling might be, what uplift fees might be assigned to up-to-congestion transactions, or whether any such potential fees would be applied retroactively or prospectively. PJM Settlement will continue to monitor this FERC proceeding, review the FERC ruling in this docket when issued, and modify members' credit requirements as appropriate for the implications of the order.

**IMM Recommendation:** The MMU recommends that the emergency interchange cap be replaced with a market based solution.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** Although PJM is supportive of this recommendation, this item is currently low priority.

**IMM Recommendation:** The MMU recommends that the submission deadline for real-time dispatchable transactions be modified from 1800 on the day prior, to three hours prior to the requested start time, and that the minimum duration be modified from one hour to 15 minutes. These changes would give PJM a more flexible product that could be used to meet load in the most economic manner.

**IMM Status:** Partially adopted, 2015

**PJM Status:** Implemented

**PJM Response:** This topic has been addressed within the Coordinated Transaction Scheduling (CTS) product and the minimum duration has already been modified to 15 minutes as a result of PJM's response to FERC Order 764.

**IMM Recommendation:** The MMU recommends that PJM and MISO work together to align interface pricing definitions, using the same number of external buses and selecting buses in close proximity on either side of the border with comparable bus weights.

**IMM Status:** Adopted, 2017

**PJM Status:** **Implemented**

**PJM Response:** PJM and MISO have jointly developed an interface pricing solution at the Joint and Common Market stakeholder process to resolve the misalignment of the pricing of transactions between PJM and MISO. A common interface was implemented on 6/1/17.

### *Ancillary Services Recommendations*

**IMM Recommendation:** The MMU recommends that the Regulation Market be modified to incorporate a consistent application of the marginal benefit factor (MBF) throughout the optimization, assignment and settlement process. The MBF should be defined as the Marginal Rate of Technical Substitution (MRTS) between RegA and RegD.

**IMM Status:** Not adopted, Pending before the FERC

**PJM Status:** **Action Planned**

**PJM Response:** FERC rejected PJM's 205 filing. PJM and the IMM are evaluating the next steps.

**IMM Recommendation:** The MMU recommends that the lost opportunity cost in the ancillary services markets be calculated using the schedule on which the unit was scheduled to run in the energy market.

**IMM Status:** Not adopted, Pending before the FERC

**PJM Status:** **Action Planned**

**PJM Response:** FERC rejected PJM's 205 filing. PJM and the IMM are evaluating the next steps.

**IMM Recommendation:** The MMU recommends that the LOC calculation used in the Regulation Market be based on the resource's dispatched energy offer schedule, not the lower of its price or cost offer schedule.

**IMM Status:** Pending before the FERC

**PJM Status:** Action Planned

**PJM Response:** FERC rejected PJM's 205 filing. PJM and the IMM are evaluating the next steps.

**IMM Recommendation:** The MMU recommends that all data necessary to perform the Regulation Market three pivotal supplier test be saved so that the test can be replicated.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM consulted with its software vendor and determined that additional data did not need to be stored as the three pivotal supplier test can be replicated with current data.

**IMM Recommendation:** The MMU recommends that, to prevent gaming, there be a penalty enforced in the Regulation Market as a reduction in performance score and/or a forfeiture of revenues when resource owners elect to deassign assigned regulation resources within the hour.

**IMM Status:** Not adopted, Pending before the FERC

**PJM Status:** Action Planned

**PJM Response:** FERC rejected PJM's 205 filing. PJM and the IMM are evaluating the next steps.

**IMM Recommendation:** The MMU recommends the use of a single five minute clearing price based on actual five minute LMP and lost opportunity cost to improve the performance of the Regulation Market.

**IMM Status:** Adopted, 2012

**PJM Status:** Implemented

**PJM Response:** This recommendation was implemented in 2012.

**IMM Recommendation:** The MMU recommends that PJM be required to save data elements necessary for verifying the performance of the Regulation Market.

**IMM Status:** Not Adopted

**PJM Status:** Implemented

**PJM Response:** PJM believes that sufficient data to verify Regulation Market performance is already maintained, but is supportive of saving additional Regulation data if requested. If the MMU wishes to address this

recommendation, PJM recommends the MMU provide clarification as to what specific Regulation Market data elements are necessary for verification before PJM can take action.

**IMM Recommendation:** The MMU recommends enhanced documentation of the implementation of the Regulation Market design.

**IMM Status:** Pending before the FERC

**PJM Status:** **Action Planned**

**PJM Response:** FERC rejected PJM's 205 filing. PJM and the IMM are evaluating the next steps.

**IMM Recommendation:** The MMU recommends that the rule requiring that tier 1 synchronized reserve resources are paid the tier 2 price when the non-synchronized reserve price is above zero be eliminated immediately and that, under the current rule, tier 1 synchronized reserve resources not be paid the tier 2 price when they do not respond.

**IMM Status:** Not adopted

**PJM Status:** **Stakeholder Process**

**PJM Response:** This recommendation is being discussed in the Energy Price Formation Senior Task Force.

**IMM Recommendation:** The MMU recommends that the tier 2 synchronized reserve must offer requirement be enforced. The MMU recommends that PJM define a set of acceptable reasons why a unit can be made unavailable daily or hourly and require unit owners to select a reason in Markets Gateway whenever making a unit unavailable either daily or hourly or setting the daily offer MW to 0 MW.

**IMM Status:** Partially adopted

**PJM Status:** **Stakeholder Process**

**PJM Response:** This recommendation is being discussed in the Energy Price Formation Senior Task Force.

**IMM Recommendation:** The MMU recommends that PJM be explicit about why tier 1 biasing is used in defining demand in the Tier 2 Synchronized Reserve Market. The MMU recommends that PJM define rules for estimating tier 1 MW, define rules for the use of tier 1 biasing and identify the rule based reason for each instance of biasing.

**IMM Status:** Not adopted

**PJM Status:** **Action Planned**

**PJM Response:** PJM is currently evaluating the current Tier I estimate and Tier I response.

**IMM Recommendation:** The MMU recommends that the single clearing price for synchronized reserves be determined based on the actual five minute LMP and actual LOC and not the forecast LMP.

**IMM Status:** Adopted, 2016

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2016.

**IMM Recommendation:** The MMU recommends that no payments be made to tier 1 resources if they are deselected in the PJM market solution. The MMU also recommends that documentation of the Tier 1 synchronized reserve deselection process be published.

**IMM Status:** Adopted, 2014

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2014.

**IMM Recommendation:** The MMU recommends that a reason code be attached to every hour in which PJM market operations adds additional DASR MW.

**IMM Status:** Not adopted

**PJM Status:** **Low Priority**

**PJM Response:** PJM believes this will likely add little value. PJM increases the Day-Ahead Scheduling Reserve Market requirement when a hot weather alert, cold weather alert or escalated emergency conditions, or if dispatchers have scheduled additional resources for reserves in anticipation of such conditions. PJM has only increased the requirement during a hot weather or cold weather alert. These requirements are documented in the PJM Manual 13: Emergency Procedures. In addition, PJM staff reviews occurrences of increased DASR at the Operating Committee.

**IMM Recommendation:** The MMU recommends that PJM modify the DASR Market to ensure that all resources cleared incur a real-time performance obligation.

**IMM Status:** Not adopted

**PJM Status:** **Low Priority**

**PJM Response:** PJM is considering a 30 minute reserve product that could address the IMM's recommendation.

**IMM Recommendation:** The MMU recommends that the three pivotal supplier test and market power mitigation be incorporated in the DASR Market.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** Given the near-zero clearing prices and minimal impact of the Day-Ahead Scheduling Reserve Market, PJM believes this is a low priority.

**IMM Recommendation:** The MMU recommends that separate payments for reactive capability be eliminated and the cost of reactive capability be recovered in the capacity market.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** The Market Monitor brought forward this issue in the PJM Stakeholder process with no consensus.

**IMM Recommendation:** The MMU recommends that for oil tanks which are shared with other resources only a proportionate share of the minimum tank suction level (MTSL) be allocated to black start service. The MMU further recommends that the PJM Tariff be updated to clearly state show MTSL will be calculated for black start units sharing oil tanks.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM worked with the Market Monitor to bring this recommendation to the PJM Stakeholders but there was no consensus.

**IMM Recommendation:** The IMM recommends that capability to operate under the proposed deadband (+/- 0.036HZ) and droop (5 percent) settings be mandated as a condition of interconnection and that such capability be required of both new and existing resources. The MMU recommends that no additional compensation be provided as the current PJM market design provides adequate compensation.

**IMM Status:** Not adopted

**PJM Status:** Stakeholder Process

**PJM Response:** This is currently being discussed in the Primary Frequency Response Senior Task Force.

### *Planning Recommendations*

**IMM Recommendation:** The MMU recommends that PJM continue to incorporate the principle that the goal of transmission planning should be the incorporation of transmission investment decisions into market driven processes as much as possible.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** Planning considers investment decisions made in the market by including generation and merchant transmission investment decisions once Interconnection Service Agreements have been executed. Additionally, PJM is committed to improving the quality and timeliness of available information so that the market can make investment decisions given the uncertainty and long lead times involved in both transmission and resource planning.

**IMM Recommendation:** The MMU recommends the creation of a mechanism to permit a direct comparison, or competition, between transmission and generation alternatives, including which alternative is less costly and who bears the risk associated with each alternative.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM agrees and is supportive of direct resource competition. PJM is committed to improving the available information so the market can have the best information to make investment decisions given the uncertainty and long-lead times involved in resource planning. This concept was examined during stakeholder discussions related to FERC Order 1000 but stakeholders had no strong interest in exploring this concept further.

**IMM Recommendation:** The MMU recommends that rules be implemented to permit competition to provide financing for transmission projects. This competition could reduce the cost of capital for transmission projects and significantly reduce total costs to customers.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Outside of PJM Control

**PJM Response:** Such a construct would require careful consideration to prevent any unintended consequences. A change of this nature is not a short-term fix but instead a long-term effort that will require many years to

implement and would have to be undertaken by the FERC. PJM is currently reviewing lessons learned from the current implementation of FERC Order 1000 including the use of cost containment options. PJM will continue to consider all options to improve the process.

**IMM Recommendation:** The MMU recommends that rules be implemented to require that project cost caps on new transmission projects be part of the evaluation of competing projects.

**IMM Status:** Not adopted

**PJM Status:** **Implemented;** Action planned

**PJM Response:** Project cost caps are part of the evaluation of competing proposals. Further discussion is currently underway through the stakeholder process as to the specific treatment of cost caps in the decision-making process.

**IMM Recommendation:** The MMU recommends that barriers to entry be addressed in a timely manner in order to help ensure that the capacity market will result in the entry of new capacity to meet the needs of PJM market participants and reflect the uncertainty and resultant risks in the cost of new entry used to establish the capacity market demand curve in RPM.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM agrees that unjust and unreasonable impediments to entry of new generating resources should be eliminated to the extent possible. Unfortunately, labeling a market feature as a “barrier” does not specify or provide the analysis to determine if a particular market design feature is unjust and unreasonable. PJM notes the IMM did not provide specific concerns related to this recommendation; specific details and analysis supporting the recommendation would be helpful to PJM and stakeholders seeking to understand the issue. PJM is committed to working with the IMM and the PJM membership to reduce any potential barriers to new generation entry.

**IMM Recommendation:** The MMU recommends that the question of whether Capacity Injection Rights (CIRs) should persist after the retirement of a unit be addressed. Even if the treatment of CIRs remains unchanged, the rules need to ensure that incumbents cannot exploit control of CIRs to block or postpone entry of competitors.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** The Interconnection Process Senior Task Force implemented several rule modifications that reduced or eliminated issues relating to existing capacity injection rights (CIRs). The revised CIR transfer rules

reduced the period of time that incumbent CIR holders can hold onto them without acting from three years to one year after deactivation. The new CIR transfer rules struck a balance between reducing the time an incumbent can hold their existing rights while still allowing the incumbent CIR holders the ability to continue to use their rights through timely entering the interconnection queue process to add new generation using those rights, or modifying their existing facility to reuse the CIRs. PJM does not feel any further changes are warranted at this time.

**IMM Recommendation:** The MMU recommends outsourcing interconnection studies to an independent party to avoid potential conflicts of interest. Currently, these studies are performed by incumbent transmission owners under PJM's direction. This creates potential conflicts of interest, particularly when transmission owners are vertically integrated and the owner of transmission also owns generation.

**IMM Status:** Not adopted

**PJM Status:** Action Planned

**PJM Response:** PJM disagrees with the IMM's characterization of the responsibilities in this area. Facilities Studies are always performed by PJM. PJM generally contracts with transmission owners, per Tariff section 210, to provide the upgrades necessary to correct any violations found during the studies. PJM is currently discussing with some transmission owners the feasibility of contracting this work to a third party. Use of third party studies may improve timing requirements are met, but the results will not be less controversial. Independent third parties must make assumptions that can also lead to conflicts. Ultimately, the transmission owner must assume ownership and operations after the upgraded or new facilities are completed. Therefore, PJM cannot make the process devoid of transmission owner input. PJM continues to investigate methods to improve timing and accuracy of Facilities Study reports.

**IMM Recommendation:** The MMU recommends that PJM establish fair terms of access to rights of way and property, such as at substations, in order remove any barriers to entry and permit competition between incumbent transmission providers and merchant transmission providers in the RTEP.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Outside of PJM Control

**PJM Response:** This recommendation addresses issues of property rights and legal matters beyond PJM's purview. PJM has no ability to compel transmission owners to forgo their legally established property rights. PJM is not aware of any issues in 2017 that this recommendation would have addressed had it been implemented. PJM will continue further discussion with the IMM to understand specific concerns.

**IMM Recommendation:** The MMU recommends that PJM enhance the transparency and queue management process for merchant transmission investment. Issues related to data access and complete explanations of cost impacts should be addressed. The goal should be to remove barriers to competition from merchant transmission.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** PJM worked with the IMM to develop modeling information for IARR projects. Planning modeling was already available to customers. Cost information was already provided as part of New Services Request study process.

**IMM Recommendation:** The MMU recommends consideration of changing the minimum distribution factor in the allocation from .01 to .00 and adding a threshold minimum usage impact on the load on the line.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Outside of PJM Control

**PJM Response:** Changing the minimum distribution factor is within the purview of the transmission owners. Generally, PJM does not agree that the distribution factors threshold should be eliminated. There may be some combination of thresholds that could be effective, but PJM cannot implement such changes.

**IMM Recommendation:** The MMU recommends that PJM reevaluate all transmission outage tickets as on time or late as if they were new requests when an outage is rescheduled and apply the standard rules for late submissions to any such outages.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** PJM currently reviews rescheduled transmission outages to verify they do not cause congestion or reliability issues or violate on-time submittal rules. PJM re-studies all the rescheduled outage requests during the near-term outage study process, which includes three-day-ahead study, two-day-ahead study and one-day-ahead study. If an outage is rescheduled to a future month, it will also be re-studied during PJM's one-month-ahead study process. PJM only approves "on time" outages if they do not jeopardize the reliability of the PJM system. PJM makes the final outage approval decision two days before the requested start of the outage.

**IMM Recommendation:** The MMU recommends that PJM draft a clear definition of the congestion analysis required for transmission outage requests to include in Manual 3 after appropriate review.

**IMM Status:** Not adopted

**PJM Status:** Implemented

**PJM Response:** PJM drafted language describing PJM transmission outage study congestion analysis and added it to M38 Section B.6 effective February 1, 2017.

**IMM Recommendation:** The MMU recommends that PJM modify the rules to reduce or eliminate the approval of late outage requests submitted or rescheduled after the FTR auction bidding opening date.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** The current PJM outage submission rules require all long-duration transmission outages (exceeding 30 days during the following planning year) be submitted before February 1. For long-duration outages submitted after February 1, in addition to the normal outage congestion analysis, there is an internal PJM process for Operations Planning to notify Market Simulation to perform further FTR evaluation on those specific outage requests. PJM will not approve any late long-duration outage requests if they have negative impacts on FTR.

**IMM Recommendation:** The MMU recommends that PJM not permit transmission owners to divide long duration outages into smaller segments to avoid complying with the requirements for long duration outages.

**IMM Status:** Not adopted

**PJM Status:** **Implemented**

**PJM Response:** PJM discussed having multiple scheduled outages on the same equipment with PJM stakeholders in 2015. After the discussion, PJM recognized there are legitimate situations when outages on the same equipment cannot be planned in advance as a single outage. In lieu of rule changes, PJM has begun monitoring outage scheduling behavior and applying appropriate outage frequency tests on a periodic basis. If questionable outage scheduling behavior is noticed, PJM will work with the transmission owner and/or IMM to address the issue.

**IMM Recommendation:** The MMU recommends improvements in queue management including that PJM establish a review process to ensure that projects are removed from the queue if they are not viable, as well as a process to allow commercially viable projects to advance in the queue ahead of projects which have failed to make progress, subject to rules to prevent gaming.

**IMM Status:** Partially adopted

**PJM Status:** **No Further Action Planned; No Stakeholder Consensus**

**PJM Response:** Provided that a project is meeting the financial milestones required, PJM has limited information to know when a project is no longer planned to be completed by the developer. The Earlier Queue Submittal Task Force addressed speculative queue requests by tightening the requirements for site control necessary to enter the queue. The Tariff was modified to require two years for small generation requests and three years for large generation request at the time of queue submittal. More time is needed to see if this alters the queue entry to completion success rate.

**IMM Recommendation:** The MMU recommends an analysis of the study phase of PJM's transmission planning to reduce the need for postponements of study results, to decrease study completion times, and to improve the likelihood that a project at a given phase in the study process will successfully go into service.

**IMM Status:** Partially adopted

**PJM Status:** **Implemented**

**PJM Response:** PJM's stakeholders analyzed the study phase of the interconnection process and found that a good portion of study delays were attributable to large quantities of incomplete interconnection requests received by PJM in the last days of each six month queue submittal window. An Earlier Queue Submittal Task Force (EQSTF) established changes filed and approved by the FERC, and the PJM Open Access Transmission Tariff was modified effective October 31, 2016. Two queues with the EQSTF changes in effect, AC2-queue and AD1-queue, both showed about a 70 percent reduction in last day queue submittals. PJM also observed an increase in the prior months, which was the intended behavioral change desired. Additional time and queue study processing will be needed to determine the full effectiveness of these changes.

**IMM Recommendation:** The MMU recommends that PJM limit the scope of supplemental projects that can obtain exceptions to the Order No. 1000 process, to ensure maximum competition.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM is supportive of competition and continues to work on improvements to its competitive process. Supplemental projects are not subject to competition for several reasons. Supplemental projects are not required to meet PJM or NERC criteria and are planned by transmission owners. Supplemental projects are located entirely in one zone and cost-allocated to one zone, and therefore are exempted from competition per Order 1000. Additionally, any project that is an upgrade to its facility is exempt from competition per Order 1000.

### *Financial Transmission Rights and Auction Revenue Right Recommendations*

**IMM Recommendation:** The MMU recommends that the ARR/FTR design be modified to ensure that the rights to all congestion revenues are assigned to load.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** The FERC, in its recent compliance order to address long standing FTR market issues, did not suggest that PJM's ARR/FTR design needs to be modified to return all congestion revenues to load. In that order, FERC said, "We reject the arguments that the sole purpose of FTRs is to return congestion revenue to load..."

FTRs were designed to serve as the financial equivalent of firm transmission service and play a key role in ensuring open access to firm transmission service by providing a congestion hedging function.”

**IMM Recommendation:** The MMU recommends that Long Term FTRs be modified to include only a one year ahead FTR.

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** PJM and the IMM do not agree on this particular recommendation. PJM disagrees with removing YR2 and YR3 Long Term FTR products. PJM and its stakeholders are discussing enhancements to the LT FTR model that will address the concern of selling FTRs prior to the allocation of ARR.

**IMM Recommendation:** The MMU recommends that the full transmission capacity of the system be allocated as ARRs prior to sale as FTRs. (The MMU recommends that all requested ARR rights for each delivery year be reserved for ARR holders during the Long Term FTR Auction)

**IMM Status:** Not adopted

**PJM Status:** [Stakeholder Process](#)

**PJM Response:** PJM agrees with the underlying concern and is currently discussing with stakeholders enhancements to the LT FTR model that will address these concerns.

**IMM Recommendation:** The MMU recommends that all FTR auction revenue from the sale of Long Term FTRs, be distributed to ARR holders.

**IMM Status:** Not adopted

**PJM Status:** [Pending before the FERC](#)

**PJM Response:** PJM has filed revisions to the OATT and OA stating all Day-ahead and FTR market surplus must be returned to ARR holders once FTRs are fully funded. PJM believes IMM's recommendation to return excess revenues from Long Term FTRs to ARR holders is mostly addressed through PJM's recent filing.

**IMM Recommendation:** The MMU recommends that FTR auction revenues not be used to buy counter flow FTRs for the purpose of improving FTR payout ratios.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM stakeholders approved the use of FTR auction revenues to buy counterflow FTRs in 2014 to help improve FTR Revenue adequacy as it gives PJM the ability to reduce or remove infeasible rights by allowing additional counter-flow FTRs to clear in an auction.

**IMM Recommendation:** The MMU recommends that historical generation to load paths be eliminated as a basis for allocating ARRs.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** A recent FERC ruling required PJM to replace inactive gen to load paths. PJM therefore retains all active gen to load paths and replaced inactive gen to load paths.

**IMM Recommendation:** The MMU recommends that counter flow FTRs be eliminated.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; PJM Concerns

**PJM Response:** PJM disagrees with this recommendation. Counterflow FTRs are important to the market as they provide liquidity and an offset to prevailing flow FTRs used by load to hedge congestion. However, rather than sourcing and sinking at individual load locations where load is not settled, PJM believes a beneficial design change would be to align FTR sources and sinks to nodes where generation, load or interchange transactions are settled, or at trading hubs. This change would better align the use of FTRs from non-LSEs with anticipated, physical, transmission system usage in the Day-Ahead Market.

**IMM Recommendation:** The MMU recommends that PJM eliminate portfolio netting to eliminate cross subsidies among FTR marketplace participants.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; Rejected by the FERC

**PJM Response:** The FERC rejected PJM's proposal to eliminate portfolio netting.

**IMM Recommendation:** The MMU recommends that PJM eliminate subsidies to counter flow FTRs by applying the payout ratio to counter flow FTRs in the same way the payout ratio is applied to prevailing flow FTRs.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM believes that charging negatively valued FTRs more than 100 percent of their negative value would amount to those negatively valued FTRs subsidizing the payments to positively valued FTRs. PJM does not believe such a subsidy is justified.

**IMM Recommendation:** The MMU recommends that PJM eliminate geographic cross subsidies.

**IMM Status:** Not adopted

**PJM Status:** No Further Action Planned; No Stakeholder Consensus

**PJM Response:** PJM disagrees with this recommendation. In recommending the elimination of cross-geographic subsidies, the IMM is suggesting that FTR underfunding be allocated to those FTR holders whose FTRs are across paths where the constraints causing the underfunding occurred. Changing the allocation mechanism for FTR underfunding such that revenue inadequacy was allocated to participants whose FTRs impacted transmission constraints that drove the underfunding would be directly akin to “undoing” the ARR allocation(s) and/or FTR auction(s) through which the ARRs and FTRs were allocated or sold. PJM stakeholders considered this recommendation and did not approve implementing it.

**IMM Recommendation:** The MMU recommends that PJM apply the FTR forfeiture rule to up to congestion transactions consistent with the application of the FTR forfeiture rule to increment offers and decrement bids.

**IMM Status:** Adopted, 2017

**PJM Status:** Implemented

**PJM Response:** PJM implemented this recommendation in 2017.

**IMM Recommendation:** The MMU recommends that PJM examine the mechanism by which self-scheduled FTRs are allocated when load switching among LSEs occurs throughout the planning period.

**IMM Status:** Not adopted

**PJM Status:** Low Priority

**PJM Response:** Although self-scheduled FTRs do not follow load shifts, ARRs do shift between LSEs when load shifts. Therefore, PJM believes this is low priority with small impact.

**IMM Recommendation:** The MMU recommends that PJM improve transmission outage modeling in the FTR auction models, including the use of probabilistic outage modeling.

**IMM Status:** Partially adopted

**PJM Status:** **Implemented**

**PJM Response:** Both PJM & IMM believe this is a low priority issue. PJM is open to discuss this recommendation via stakeholder process and therefore welcome the IMM to bring a problem statement and a solution proposal to the for PJM and stakeholder consideration.

**IMM Recommendation:** The MMU recommends that PJM reduce FTR sales on paths with persistent overallocation of FTRs including clear rules for what defines persistent overallocation and how the reduction will be applied.

**IMM Status:** Partially adopted

**PJM Status:** **Implemented**

**PJM Response:** The PJM Tariff already provides PJM with the necessary authority to model the transmission system with the reduced capability necessary to minimize underfunding of FTRs. Therefore, PJM already reduces the capability modeled in the FTR auctions on historically constrained and underfunded paths to the greatest extent possible. These modeling changes have resulted in improved FTR revenue adequacy.

**IMM Recommendation:** The MMU recommends that PJM report correct monthly payout ratios to reduce understatement of payout ratios on a monthly basis.

**IMM Status:** Adopted, 2016

**PJM Status:** **Implemented**

**PJM Response:** PJM implemented this recommendation in 2016.