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Executive Summary — Defining Capacity Performance

PJM Interconnection appreciates stakeholders’ level of engagement in the process to develop solutions to address the identified issues documented in PJM’s August 1, 2014, problem statement. PJM also appreciates the thoughtful stakeholder comments and discussion on the various aspects of the initial proposal issued on August 20, 2014, and has made substantive revisions to the proposal based on the comments and on discussions with stakeholders.

PJM is seeking to develop a more robust definition of Capacity Resources to incorporate stronger performance incentives and more operational availability and diversity during peak power system conditions. To do so, PJM is proposing to add an enhanced capacity product – Capacity Performance – to its capacity market structure and to reinforce the existing definition of the annual capacity product to ensure that the reliability of the grid will be maintained through the current industry fuel transition and beyond.

PJM believes the transition to the more robust Capacity Performance product is necessary to improve resource performance and to set clear standards and expectations for Capacity Resources. This enhanced product definition also is necessary to articulate fuel security and operational availability standards for new resource investment, which will provide investment signals for natural gas infrastructure necessary to support reliable and flexible gas-fired generation development.

Capacity Market Sellers that offer and are committed to provide the Capacity Performance product would be required to meet additional eligibility qualifications and obligations designed to ensure better performance.

Under this enhanced structure, there would be two products – Capacity Performance and Base Capacity.

Objectives

The objectives for the Capacity Performance product are to provide PJM with:

• Fuel security through a dependable fuel source;
• Enhanced operational performance assurance during peak-demand periods;
• High availability of generation resources;
• Flexible resource operational parameters; and
• Operational diversity.

Eligibility

Under the updated proposal, in order to qualify as Capacity Performance, generation resources generally will need to be capable of sustained, predictable operation that allows the resource to be available to provide energy during both summer and winter peak-load conditions. Based on stakeholder comments, PJM has modified the proposal to
simplify the eligibility requirements for resources to choose to offer as Capacity Performance resources. The updated proposal no longer includes an officer certification. Instead, the proposal is to include a provision in the PJM Tariff indicating that, by offering into the auction as Capacity Performance, the Capacity Market Seller is representing that it has taken sufficient actions to ensure the resource has the capability to provide energy when needed during both summer and winter peak-load conditions and extreme weather events. Based on stakeholder input, PJM also has eliminated many of the stated eligibility requirements and instead depends on stringent performance standards to allow resources to manage their own participation approaches. PJM believes these changes offer market incentives for innovations and avoid the potential for inadvertent barriers to participation.

**Performance Assurance**

To ensure performance, a Capacity Performance resource must deliver energy in all hours if scheduled by PJM or if self-scheduled when PJM has declared a Hot or Cold Weather Alert and/or declared a Maximum Emergency Generation Alert (Max Gen). In response to stakeholders’ comments and discussion, to reduce risk uncertainty, PJM has modified the non-performance penalty structure to be a function of Net Cost of New Entry (CONE) rather than Locational Marginal Price (LMP). The modified proposal also includes a stop-loss provision of 1.5 times Net CONE and a single outage event exposure limited to 0.5 times Net CONE.

**High Availability and Flexibility**

In response to stakeholder comments, PJM has revised and simplified the flexibility requirements for Capacity Performance resources. PJM has eliminated the concept of “resource classes” in the proposal and instead based flexibility requirements on demonstrated physical capabilities of each resource.

**Demand Response and Energy Efficiency**

In any market, the participation of consumer demand response to price is essential to healthy and competitive market outcomes. This axiom holds true for wholesale electric markets as with any other market. The more that demand actively participates in our wholesale electricity markets, the more competitive and robust the market. Given the pendency and uncertainty around the Court of Appeals decision in Electric Power Supply Association v. FERC (EPSA), Case No. 11-1486, PJM proposes an alternative incorporation of demand response in the capacity market. PJM continues to believe that it is critical for wholesale demand to indicate its preferences with respect to the price it is willing to pay for capacity but above which it does not wish to purchase capacity and instead commits to limiting its consumption when PJM approaches emergency conditions.

**Transition Mechanism**

PJM appreciates that the transition mechanism is a difficult issue and believes the stakeholder comments provided helpful insights into various methods to deal with transition. PJM recognizes the need to develop a balanced transition mechanism that provides incremental improvements to address the issues while recognizing the need to allow time for investment, transition of contracts and transition cost management. PJM has modified the transition proposal to be more incremental and to include a more gradual phase-in approach.
I. Introduction

The purpose of this document is to provide details regarding PJM's updated proposed solution to the issues that were described in its August 1, 2014, whitepaper entitled "Problem Statement on PJM Capacity Performance Definition." PJM posted its initial solution on August 20, 2014, to begin detailed dialogue with stakeholders on these important issues. PJM held three open stakeholder meetings to discuss its initial proposal and received stakeholder comments on that proposal. This document reflects the evolution of PJM's proposal from its initial posting given the input received and additional discussion held with stakeholders.

As described in PJM’s August 1 whitepaper and August 20 initial proposal, the circumstances of the winter of 2014 indicate that a more robust capacity product definition is required to provide enhanced performance incentives and additional operational availability and diversity during peak conditions. Therefore, within the existing Reliability Pricing Model (RPM) capacity market structure, PJM proposes to add an enhanced product, called the Capacity Performance product, which is based on winter peak-load requirements. As described below, this enhanced product includes additional eligibility requirements and obligations on Capacity Market Sellers that elect to commit in this product category. PJM further proposes to consolidate the other existing capacity products into a single product called Base Capacity.

The overall design objectives for the Capacity Performance product are to address the concerns highlighted in PJM's August 1 whitepaper including the observed generation performance issues, winter peak operations issues and the operational characteristics of resources that are needed to ensure that system reliability will be maintained throughout the current industry transformation and beyond. The design objectives include mechanisms to incent or require the following characteristics:

- Fuel security through a dependable fuel source;
- Enhanced operational performance assurance during peak periods;
- High availability of generation resources;
- Flexible resource operational parameters; and
- Operational diversity.

The following sections of this document provide a detailed description of the PJM's updated proposal. Specifically, the sections below are organized as follows:

- **Section II – Capacity Products**: The capacity products PJM proposes to be eligible to offer into RPM auctions or commit to a Fixed Resource Requirement (FRR) Capacity Plan, including the new Capacity Performance product and enhancements to the current definitions of the existing products;
• **Section III – Demand Response and Energy Efficiency:** The proposed mechanism by which Demand Response and Energy Efficiency Resources may participate in RPM given the pendency and uncertainty around the May 23, 2014, decision of the U.S. Court of Appeals for the District of Columbia Circuit on FERC Order 745 in EPSA.

• **Section IV – Methodology for Establishing Maximum Product Quantities:** The analysis PJM will conduct in order to establish the required quantity of the new Capacity Performance product to be procured;

• **Section V – Unforced Capacity (UCAP) Calculations and Installed Reserve Margin (IRM):** Description of the UCAP calculation, the relationship with the new product and the impact to the calculation of PJM's IRM;

• **Section VI – Capacity Performance Availability and Flexibility Requirements:** The eligibility, performance, availability and flexibility requirements for the new and existing capacity products;

• **Section VII – Changes to Base Capacity Requirements:** The changes to existing annual capacity product requirements, which PJM proposes to rename Base Capacity;

• **Section VIII – Peak Period Performance Assurance:** The penalties PJM proposes to apply to the new and existing capacity products;

• **Section IX – Product Offer Requirements:** The rules PJM proposes with respect to offers to provide the new Capacity Performance product in RPM auctions;

• **Section X – Cost Allocation:** Options as to how the costs of the new Capacity Performance product could be allocated;

• **Section XI – Application to FRR Entities:** PJM’s proposal for applying the revised capacity product definitions to FRR entities;

• **Section XII – Short-Term Resource Procurement Target:** PJM’s proposed changes to the Short-Term Resource Procurement Target; and

• **Section XIII – Transition Auction Mechanism for Delivery Years 2015/16, 2016/17, 2017/18:** Description of a transitional mechanism to address reliability requirements for Delivery Years 2015/16, 2016/17, 2017/18.

II. **Capacity Products**

The two capacity products proposed to participate in RPM include: Capacity Performance and Base Capacity. PJM believes the market should ultimately transition to being 100 percent Capacity Performance product but recognizes the need to transition legacy assets over time to moderate transition costs. Therefore, as explained below, PJM proposes that a maximum of 20 percent of the capacity procured in the 2018/19 RPM Base Residual Auction (BRA) is Base Capacity and the remaining 80 percent is required to be Capacity Performance. PJM proposes that all
planned resources be required to be Capacity Performance. PJM seeks stakeholder comment on this transitional approach, the length of time required and the any perceived need or benefit to maintain Base Capacity as an alternative.

In recognition of the ongoing nature of the Court of Appeals decision in the EPSA case, as part of this Capacity Performance proposal and more fully described below, PJM proposes a long-term solution for maintaining demand response as an important part of the capacity market. The proposal includes provisions that permit a Load Serving Entity to reduce its demand by submitting Capacity Performance or Base Capacity demand response or energy efficiency as demand bids. While PJM has included in this proposal a potential, long-term solution for demand response in order to more fully describe how it would integrate with Capacity Performance, PJM recognizes that, depending on the Federal Energy Regulatory Commission’s response to the court decision and the FERC’s direction regarding a long-term solution, this approach may be modified. Any potential PJM filings at the FERC related to Capacity Performance may or may not include changes to demand response related to the court decisions based on the evolving circumstances.

**Capacity Performance Product**

Capacity Resources may be eligible to be considered Capacity Performance so long as the applicable resource meets the following criteria.

Under the proposal, in order to qualify as Capacity Performance, generation resources will need to be capable of sustained, predictable operation that allows the resource to be available to provide energy during both summer and winter peak-load conditions. Based on stakeholder comments, PJM has modified the proposal to simplify the eligibility requirements for resources to choose to offer as Capacity Performance resources. By offering into the auction, a Capacity Market Seller will be representing it has made, or will make, depending on whether a resource clears and is committed as a Capacity Performance resource, the necessary investment to ensure the resource has the capability to provide energy when needed during both summer and winter peak-load conditions and extreme weather events.

1. It is expected that a Capacity Performance resource has taken or will take sufficient steps and has made or will make the necessary investment to ensure fuel availability and availability of the resource to operate during extreme weather events when PJM declares a Hot or Cold Weather alert or more severe emergency procedure during the Delivery Year. Moreover, it is expected that Capacity Market Sellers will have made the appropriate investments in Operations and Maintenance (O&M) and weatherization to ensure that the Generation Capacity Resource can operate as required above through extreme hot or cold weather conditions. Examples of such investments include, but are not limited to, improvements to the resources made for the purpose of ensuring stored fuel on-site does not freeze, conveyors do not freeze, or valves and piping operate properly.

2. Generation Capacity Resources are capable of operating according to the minimum flexibility requirements defined in Section VI.
Generation Capacity Resources that have long notification and start times or have inflexible operating parameters run the risk of not being available when the system needs them most without incurrence of additional costs and should not be eligible to be committed as the Capacity Performance product unless they are willing to accept the cost of self-scheduling to ensure availability during compliance periods. The requirement is necessary because, to ensure these resources are available when needed, PJM may need to commit such inflexible resources out of economic merit order and incur operating reserve (uplift) costs. Consequently, to ensure availability at the least cost to the system, Capacity Performance resources will be required to meet minimum flexibility requirements.

3. Environmentally Limited Generation Capacity Resources must be able to perform to the equivalent of at least an annual 8-percent capacity factor.

Not all Generation Capacity Resources have unlimited run hours in a year. Many peaking resources such as combustion turbines (CTs) or gas and oil steam resources are subject to an air permit or regulation-determined limit on the number of run hours or fuel throughput that effectively limits operation. Historically, such limits have rarely been binding since CTs and gas and oil steam resources operate at low capacity factors based on economic dispatch over the Delivery Year. While such resources may be run-time-limited, they may otherwise be capable of meeting the remaining criteria to be a Capacity Performance resource. An eight percent capacity factor was chosen because historically the number of hours in a year for which Cold and Hot Weather Alerts have been called has rarely exceeded 700 hours, which is 8 percent of the hours in a year.

4. External Generation Capacity Resources must meet Capacity Import Limit Exception criteria.

An external Generation Capacity Resource must meet all criteria for an exemption from the Capacity Import Limits (CIL) as well as the criteria that apply to Generation Capacity Resources described above to qualify as a Capacity Performance resource. This does not mean that external resources need to actually request or receive an exemption from the CIL in order to qualify as Capacity Performance, but they must meet the same criteria. External Generation Capacity Resources that do not meet the qualifications for an exemption to the CIL may qualify as Base Capacity resources but not as Capacity Performance resources.

This requirement will ensure that any resources that are physically external to the PJM footprint are effectively electrically part of PJM in the same way an internal resource is in order to qualify as Capacity Performance.

By submitting a Capacity Resource offer into a BRA or Incremental Auction for the Delivery Year, the Capacity Market Seller will be representing that the resource in question will satisfy the above criteria applicable to the resource to be a Capacity Performance product.

In addition to the above Capacity Performance criteria, resources committed as Capacity Performance have the following obligations:
1. Generation Capacity Resources must provide market-based and cost-based non-emergency energy offers into the PJM Day-ahead Energy Market up to the committed UCAP value of the resource every day during the Delivery Year unless the resource is unavailable due to a forced or scheduled outage.

2. To the extent a Generation Capacity Resource has operational run-time limitations, it may not make itself available as emergency-only but must use the available energy market opportunity-cost mechanism to make economic offers in a way that best allocates available run hours. Availability as emergency-only will be treated for performance measurement purposes as subject to the penalties applicable to Capacity Performance resources.

3. In the case of a Generation Capacity Resource, the resource must have the ability to deliver energy to load on the PJM system at all times, especially during system peak and emergency conditions, as demonstrated through a generation deliverability analysis.

4. The resource must provide energy output to PJM if needed to maintain reliable operations during emergency conditions, which include PJM recall rights for off-system energy sales for committed resources.

5. Generation Capacity Resources must avoid scheduled outages during peak-load periods and providing outage data to PJM.

6. Generation Capacity Resources must make available to PJM upon request sufficient documentation to detail the steps the unit owner has taken to ensure that the unit can meet the above obligations.

Generation Capacity Resources that satisfy the Capacity Performance criteria are eligible to offer into the RPM auctions and be committed as Capacity Performance and receive the Capacity Performance resource clearing price.

**Base Capacity Product**

Capacity Resources that satisfy the current annual resource product requirements as defined in the PJM Tariff and Manuals generally would qualify as Base Capacity with the proposed enhancements discussed below.

In this proposal, PJM clarifies that for Base Capacity resources, during PJM declared Hot and Cold Weather Alerts, Capacity Market Sellers with Base Capacity resources will be required to offer into the energy market based on their physical operating parameters, unless on a forced or approved maintenance outage, just like Capacity Performance resources. However, penalties for non-delivery by Base Capacity resources will apply during only a subset of the conditions under which they will apply to Capacity Performance resources. Base Capacity resources may submit emergency offers into the energy market when the resource’s operation is restricted to only emergency conditions as defined in section 1.10.1A(d) of Attachment K – Appendix of the Tariff and the parallel provision of Schedule 1 of the Operating Agreement.
## Summary of Capacity Products

<table>
<thead>
<tr>
<th>Category</th>
<th>Availability Expectations</th>
<th>Deployment Limitations</th>
<th>Penalties</th>
<th>Penalty Window</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity Performance</td>
<td>All hours of the year</td>
<td>None</td>
<td>Net CONE x 365/350 in non-shortage hours or $2,700/MWh in shortage hours for all resources (generation, cleared DR, PRD and EE demand bids)</td>
<td>Year Round – Hot Weather Alert / Cold Weather Alert / Max Emergency Generation Alerts and Events</td>
</tr>
<tr>
<td>Base Capacity</td>
<td>For generators - All hours of the year</td>
<td>None</td>
<td>Net CONE x 365/350 in non-shortage hours or $2,700/MWh in shortage hours for all resources (generation, cleared DR and EE demand bids)</td>
<td>For Generators, and cleared DR and EE demand bids – Max Emergency Generation Loaded in summer only</td>
</tr>
<tr>
<td></td>
<td>For DR and EE, summer hours as indicated in Section III.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specific Resource Types and Coupling

#### Storage Resources

Capacity Market Sellers with storage resources, including pumped storage hydroelectric power plants, battery resources, flywheels, etc., may choose to offer these resources as the Capacity Performance product. However, such resources are expected to be available for sustained operation for more than 10 hours during peak load conditions for multiple consecutive days and may be requested to demonstrate they meet this criteria. Storage resources that are offered and clear as Capacity Performance will be required to follow the dispatch direction of the PJM operators during Hot and Cold Weather Alerts and other emergency procedures conditions. Should insufficient opportunity exist for a Capacity Performance storage resource to pump/charge in order to provide energy to the system when needed by PJM, the hourly penalty applicable to Capacity Performance resources shall apply.

Capacity Market Sellers with storage resources that choose not to offer some or all of their capability as Capacity Performance may offer those resources as Base Capacity instead. Such storage resources will be required to follow the direction of the PJM operators during Hot Weather Alerts or other emergency procedures conditions during hot weather periods. The same penalty applied to other Base Capacity resources will be assessed to storage resources should they be unable to provide energy to the system when needed by PJM. Moreover, as noted below, PJM’s proposal is intended to make clear that energy storage resources may join their capacity with other resources, such as intermittent resources, in order to meet the required attributes of either the Base Capacity or Capacity Performance product.

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1 In this proposal, “shortage hours”, “shortage conditions”, “shortage pricing event” and “shortage event” refer to conditions under which PJM experiences a shortage of Primary and/or Synchronized Reserve or other event triggering shortage pricing, as described in Section 2.5 (d) of the Attachment K – Appendix of the PJM Tariff and Section 2.5 (d) of Schedule 1 of the PJM Operating Agreement.
Intermittent Resources

Intermittent resources currently are eligible to offer up to their calculated UCAP value into RPM auctions and, if committed, are not penalized for producing less than the committed value. If the UCAP value is reduced due to lower output during peak periods prior to the Delivery Year for which the resource cleared, then the resource must replace the difference or be subject to the Capacity Resource Deficiency Charge. PJM proposes to continue this treatment for intermittent resources that offer and clear as Base Capacity resources. PJM proposes to allow intermittent resources to offer a portion of their qualified UCAP as Capacity Performance if they desire to do so. The remainder of the qualified UCAP could then be offered as Base Capacity. Any portion of an intermittent resource’s UCAP value that is committed as Capacity Performance would be subject to the same penalties as any other generation resource (up to the UCAP amount) and any remaining capability committed as Base Capacity would be subject to Capacity Resource Deficiency Charges, but would not be subject to performance penalties. For example, a given 100 MW wind resource with a 13 percent UCAP value could choose to offer five of its 13 MW of UCAP as Capacity Performance. If the five MW clears as Capacity Performance, then, any time the resource is not producing at least five MW during any of the Capacity Performance penalty hours, it would be charged the Capacity Performance penalty for any shortfall below the five MW. The remaining eight MW could clear as Base Capacity and would not be subject to performance penalties. PJM also proposes to make clear in the rules for calculating the UCAP value for intermittent generators that storage resources may be co-located and “married up” with intermittent resources in order to result in an increased UCAP value by firming up the net output of the overall resource during the peak hours.

PJM proposes to allow run-of-river hydroelectric resources, with or without ponding capability, the option to offer into RPM auctions either with the UCAP values as they are currently determined consistent with other types of traditional generation resources or with a UCAP value determined consistent with that of an intermittent resource. If a run-of-river hydroelectric resource chooses to offer with a UCAP value as historically determined, then the resource will be subject to performance penalties that would otherwise apply to Capacity Performance or Base Capacity resources depending on the category in which the resource clears. If the resource chooses to offer based upon a UCAP value determined through the intermittent resource calculation, then any portion of that UCAP capability that clears as Capacity Performance would be subject to the Capacity Performance penalties, and any portion that clears as Base Capacity would not be subject to penalties for non-performance (but would be subject to Capacity Resource Deficiency Charges), consistent with other intermittent resources.

Qualifying Transmission Upgrades

PJM proposes that Qualifying Transmission Upgrades (QTU) can be offered into the RPM auctions only as the Capacity Performance product. PJM reasons that, because the megawatt value of capacity provided by a QTU is based directly upon the increase in the Capacity Emergency Transfer Limit (CETL) into a Locational Deliverability Area (LDA), such an increase in CETL can only be implemented such that it both impacts the Capacity Performance requirement for the LDA in question and at the same time reduces the Base Capacity requirements, as described in

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2 Other types of resources with similar fuel supply that resembles the uncertainties common to intermittent resource types could be considered for this option as well, such as landfill gas generation resources.
more detail below. Therefore, the only way to incorporate QTUs is to offer them as the Capacity Performance product. Therefore, PJM also proposes that, for a QTU that is not in service during the Delivery Year for which it is committed and for which sufficient replacement Capacity is not procured in the sink LDA for the QTU, the non-performance penalty be the same as that which would apply to a Capacity Performance generation resource located in the sink LDA.

Resource Coupling

Currently, demand response with the potential to qualify as two or more RPM product types may be submitted as part of separate but coupled Sell Offers for each product type for which it qualifies at different Sell Offer prices and the auction clearing algorithm will select the Sell Offer that yields the least-cost solution. Separate resources are modeled in the eRPM system for each product type. PJM proposes to apply this coupled offer concept to Capacity Performance and Base Capacity offers going forward. Under these proposed Capacity Performance rules, PJM proposes that resources be permitted to submit coupled offers for Base Capacity and Capacity Performance. The bid price of the Capacity Performance resource offer must be at least $0.01/MW-day greater than the Sell Offer price of the coupled Base Capacity resource offer.

Other Issues Related to Capacity Products

Base Capacity Resource Constraint

In the current RPM auction clearing algorithm, the greater reliability value associated with the less-limited Demand Resources and annual Capacity Resources are recognized by establishing and enforcing a maximum quantity on the commitment of more-limited products. The sub-annual resource constraints set the maximum level of more-limited resources to be procured in RPM auctions for the Delivery Year.

PJM proposes to set Base Capacity Resource Constraints (defined below) for the RTO and each modeled LDA. The process by which PJM proposes to establish these maximum quantities is described in Section IV of this document. The auction clearing process will clear Base Capacity and Capacity Performance resources based on the demand established by the Variable Resource Requirement (VRR) curve.

The Base Capacity Reliability Constraint is the maximum amount of Base Capacity resources allowed to clear that PJM determines to be consistent with continued reliability. The Base Capacity Resource Constraint is established in UCAP for the RTO and for each modeled LDA.

Auction Clearing Mechanism

The RPM auction clearing software is based on an optimization algorithm. This algorithm has the objective of minimizing capacity procurement costs given the supply offers, VRR curve(s), locational constraints and Base Capacity Resource Constraints.
The optimization algorithm determines the Capacity Resource Clearing Price for each LDA. As more fully described in Section IV of this document, PJM proposes to establish the maximum amount of Base Capacity resources that can be committed and, therefore, clear in RPM auctions.

The Capacity Resource Clearing Price within each LDA is the sum of:

- The marginal value of system capacity;
- Base Capacity Resource price decrement, if any; and
- Locational Price Adder(s), if any, relevant to such LDA.

The marginal value of system capacity is the clearing price for the Capacity Performance resources in the unconstrained area of the PJM region.

The Capacity Resource Clearing Price for an external source zone is the sum of:

- The marginal value of system capacity;
- Base Capacity Resource price decrement, if any; and
- Locational price decrement(s), if any, relevant to the external source zone.

A locational price decrement is applicable when a region-wide Capacity Import Limit or CIL for an external source zone is binding.

In the event that the Sell Offers forming the supply curve do not result in an intersection with the VRR curve, the marginal value of system capacity will be set along the VRR curve by extending the supply curve vertically from its end point until it intersects the VRR curve.

**Multi-Year Investment Signal**

Stakeholders commented that the current structure does not support multi-year investments because the RPM auction results cover only one year and investments necessary to support Capacity Performance are generally multiple-year investments. Some stakeholders have suggested a longer-term, multi-year forward auction design to address this issue. PJM stakeholders have discussed longer-term auctions in the past and could not reach consensus due to a variety of concerns. However, it may be beneficial to increase long-term price certainty to lower the overall investment risk, which will benefit consumers and achieve reliability at lower cost. To achieve the price-certainty benefit of a multi-year auction commitment, a limit could be placed on the percentage price change year-over-year between RPM auctions. This surrogate mechanism would improve multi-year price certainty without the complexity and credit risk issues related to a multi-year auction structure. PJM proposes to incorporate such a mechanism in the clearing of Capacity Performance.
III. Demand Response and Energy Efficiency

Given the pendency and uncertainty around the D.C. Circuit Court of Appeals decision in the EPSA case, PJM proposes an alternative incorporation of demand response (DR) and Energy Efficiency (EE) into RPM. PJM continues to believe that it is critical for wholesale demand to indicate its preferences with respect to the price it is willing to pay for capacity, but above which it does not wish to purchase capacity and instead commits to limiting its consumption when PJM approaches emergency conditions. In recognition of the implications of the appellate court decision on FERC Order 745 in EPSA, PJM proposes, beginning with the May 2015 BRA for the 2018/2019 Delivery Year, to transition DR and EE to participate in RPM auctions on the demand side of the equation as opposed to the current supply side. As a consequence of transitioning from supply-side DR to demand-side DR in which demand participation is via bids indicating reductions in capacity demand, such bids must be submitted by Load Serving Entities (LSE) as the parties responsible for purchasing capacity on behalf of their retail loads. As noted in the Demand Response white paper issued contemporaneously with this updated proposal, PJM recognizes that the implications of the EPSA decision will require significant action by the FERC and will be informed by the state of the appellate court litigation and any intermediate FERC action at the time that PJM might make any filing related to Capacity Performance. As a result, PJM reserves the right to modify the timing and approach of its proposal for allowing demand response participation in RPM auctions based on subsequent actions of the courts and the FERC. While PJM respects those processes, it also notes the need for these issues to be addressed in a timely way given the forward commitments already incurred by DR resources and their impact on PJM’s overall reliability needs.

Demand Bidding Process

The demand bidding process will be similar to the Price Responsive Demand (PRD) process as described in Section 3A in PJM Manual 18. LSEs voluntarily participate in a BRA on the demand side by submitting demand bids to reduce demand by DR and EE, either as Capacity Performance or Base Capacity product, and the Resource Clearing Prices at which the demand bids will be implemented. The demand bids will be modeled in the auction by effectively shifting the VRR Curve left and reducing the Reliability Requirement. The cleared demand bids would be commitments by LSEs for the Delivery Year. Additional demand bids may be submitted by the LSEs to increase their bids if the final zonal peak load forecast used in the Third Incremental Auction increases relative to the forecast used for the BRA.

The end-use customer registration process to meet the DR commitments in the cleared demand bids will be similar to the PRD process. The compliance with the EE commitments in the cleared demand bids will be based on the Post-Installation Measurement & Verification Report submitted prior to the Delivery Year for PJM approval. The DR and EE commitments cannot be reduced by replacement capacity from an available Generation Capacity Resource, Cleared Buy Bids from an Incremental Auction, or Excess Commitment Credits to relieve the obligation to reduce load. However, in the case of DR, additional end-use customers can be registered any time during the Delivery Year to replace the customers lost due to retail access. Alternately, LSE may transfer the demand reduction obligation to another LSE in a bilateral transaction.

LSE’s Daily Unforced Capacity Obligation will be adjusted down based on the cleared demand bids.
Capacity Performance – DR and EE

LSEs that commit to limiting wholesale consumption commensurate with the availability required of Generation Capacity Resources that qualify as Capacity Performance can submit bids to reduce demand. Effectively, any such DR must be capable of providing load reduction over all Capacity Performance compliance hours of operation during any day. This requirement effectively means DR must be available for curtailment in summer and winter, during periods when PJM has declared a Hot or Cold Weather Alert and/or Max Generation Alerts and/or Events and must be capable of such curtailment for multiple consecutive days.

DR as Capacity Performance will have capacity compliance determined in the non-summer months (October through May) based on the real-time energy load reductions. The real-time energy load reductions will be determined based on the standard economic customer baseline (CBL) unless there is a more accurate alternative CBL as identified through the Relative Root Mean Square Error test. The expectation is to leverage the energy reduction approach used to determine emergency energy settlements for capacity compliance purposes during the non-summer months. PJM believes this approach will achieve results similar to implementing a non-summer Peak Load Contribution (PLC) and non-summer Firm Service Level (FSL) such that the demand resource dispatched in the non-summer period reduces load when dispatched. PJM will maintain the same aggregation rules for compliance results in the non-summer and summer period and the only difference would be how the load reduction is determined for capacity compliance purposes.

DR also could face direct permit or regulatory limitations if backup generation is utilized to ensure that wholesale consumption does not exceed the committed level during emergency conditions. All DR must be capable of limiting wholesale consumption to the equivalent of at least an 8-percent capacity factor to qualify as Capacity Performance to ensure it can be available during all potential hours in which Cold and Hot Weather Alerts and/or declaration of Max Gen are in place. Consistent with Capacity Performance generation resources, cleared Capacity Performance demand bids will be subject to the non-performance penalties for not sufficiently reducing demand consistent with the cleared demand bid regardless of whether the failure is due to the potential exceedance of such regulatory limitations.

EE plans that meet all current requirements in the Tariff and PJM Manuals M18 and M18B can qualify as Capacity Performance as long as Measurement & Verification Plan and Post-Installation Measurement & Verification Report meet an additional M&V requirement to demonstrate that the EE resource provides load reduction during Capacity Performance EE Hours between the hour ending 6:00 a.m. Eastern Prevailing Time (EPT) and the hour ending 10:00 p.m. EPT anytime during the Delivery Year. The Nominated EE Value is the average demand reduction during the Capacity Performance EE Hours relative to the baseline without the EE measures. Additionally, augmentation of Nominated EE Value by use of interactive factors would not be applicable for non-summer load reductions. Interactive factors are secondary impacts of EE installations that serve to further increase the demand reduction impact of those installations during the summer months. For example, the fact that more efficient lighting that generates less heat is installed in a building may also reduce the air conditioning needs of the building and further reduce the electrical load. Such interactive factors do not apply in the winter.
Base Capacity — DR and EE

DR and EE that is not able to ensure that wholesale consumption does not exceed committed levels all year round may choose to submit Base Capacity demand bids. DR and EE commitments made through cleared Base Capacity demand bids will be required to perform only in the summer. Cleared Base Capacity DR demand bids must be available for an unlimited number of interruptions during the summer period of June through September and must be capable of maintaining each such interruption for at least a 10-hour duration between the hours of 10:00 a.m. to 10:00 p.m. EPT. EE resources for which the demand reduction in the non-summer period is less than the demand reduction in the summer period qualify as Base Capacity bids. Examples may include air conditioning and measures that optimize building controls that impact only the summer period. Base Capacity EE Hours are between the hour ending 10:00 a.m. EPT and the hour ending 10:00 p.m. EPT during June through September. The Nominated EE Value is the average demand reduction during the Base Capacity EE Hours relative to the base line without the EE measures.

PJM will establish a limit on the total quantity of Base Capacity DR and EE that can be accepted as part of the RPM auction process. If the limit on the acceptable quantity of Base Capacity DR and EE would otherwise be exceeded based on the DR and EE demand bids received in a given BRA, then the auction will economically clear DR and EE Base Capacity demand bids according to their bid prices until the quantity that clears is equal to the established limit. As a result, if the DR and EE limit within the Base Capacity category binds in an auction, the constraint shadow price and cleared Base Capacity DR and EE quantities will be reflected in the Final Zonal Capacity Price.

Proposed Changes to EE Eligibility

PJM proposes changes in the EE installation periods that would be eligible for EE-based demand bids as specified in the Tariff. The Tariff defines EE as the demand reduction “that is not reflected in the peak load forecast prepared for the Delivery Year for which the Energy Efficiency Resource is proposed.” PJM proposes that EE that is installed by the summer preceding an RPM auction and, thus, is reflected in the load forecast used for the upcoming auction will be ineligible for including in the demand bid. This process would avoid double counting a reduction in the load forecast associated with EE (that may result in releasing capacity in the auction) and EE as a demand bid that reduces the capacity to be procured. This proposal is illustrated below for 2018/2019 Delivery Year:


- **Eligible for Third Incremental Auction held in 2018**: 2017/2018 EE installations (any additional 2014/2015, 2015/2016, 2016/2017 installations are not eligible because they would be reflected in the load forecast used for 2018/2019 Delivery Year).

Price Responsive Demand

PJM proposes to retain PRD as an available option under this proposal. Cleared PRD bids in RPM auctions would result in reductions of Capacity Performance obligations for the associated LSE submitting the PRD bid. PJM
proposes that the penalty for non-performance of PRD be changed to the hourly penalty for all other Capacity Performance resources as described in this proposal. PRD as Capacity Performance will have capacity compliance determined in the non-summer months (October through May) based on the real-time energy load reductions similar to DR as Capacity Performance. PJM proposes to eliminate the Maximum Emergency Service Level adjustment procedure (see Manual 18, Section 3A) when the actual peak load exceeds the forecast. PJM also proposes to replace the PRD credit provision with a reduction in LSE Daily Unforced Capacity Obligation.

IV. Methodology for Establishing Maximum Product Quantities

PJM proposes that Base Capacity be subjected to a restriction on the maximum quantity of the product that can clear in RPM auctions. PJM further proposes that the quantity of DR and EE demand bids as Base Capacity also be limited within the Base Capacity product. The rationale for setting these restrictions is the limitation on flexibility and the availability of the Base Capacity product and Base Capacity DR and EE demand bids in comparison with the Capacity Performance product and Capacity Performance DR and EE demand bids. Since the calculation of the reliability requirement (to be procured in the RPM auctions) assumes that all resources are available on an annual basis (as is the Capacity Performance product), it is necessary to establish the maximum amount of Base Capacity, including Base Capacity DR and EE demand bids, that can clear while being consistent with the Reliability Requirement.

With the introduction of the Base Capacity product and the proposed implementation of demand bids for DR and EE within the Base Capacity product, PJM must establish limits on the overall Base Capacity product as well as the amount of DR and EE Base Capacity demand bids that can clear based on the associated reliability impact. This method will calculate the amount of Capacity Performance resources that can be displaced by the Base Capacity product and how much Base Capacity obligations can be reduced by Base Capacity DR and EE demand bids until there is a 10 percent increase in the PJM Loss of Load Expectation (LOLE).

Figure 1 below illustrates the general approach used to establish the maximum product quantities for the Base Capacity products. The top black line represents the total ICAP procured in the RPM auction and is assumed to be equal to the IRM. (The black line is slightly higher in the non-summer periods to reflect the slightly higher resource ratings in the spring, fall and winter seasons.) The blue area represents the eight months of the year during which Base Capacity DR and EE are unavailable, and the pink area represents the peak winter week during which Base Capacity generation is likely to be unavailable. The remaining yellow area is the amount of actual ICAP reserves that are available each week of the Delivery Year. The purpose of the analysis is to determine the size of the pink and blue areas such that the PJM system maintains an LOLE of 0.11 events/year (or a 10 percent increase in the target LOLE of 0.1 events/year).
To perform the analysis, PJM used its LOLE software, PRISM, which compares probabilistic distributions of load and available capacity on a weekly basis. The Base Capacity products were modeled based on their availability requirements:

- Base Capacity DR and EE were assumed to be available from June 1 – September 30 and unavailable from October 1 through the following May 31.

- Base Capacity generation was assumed to be fully available in all weeks of the year except the winter peak week. In the winter peak week, Base Capacity generation was assumed to be available up to the 90th percentile winter peak load. For the 90/10 winter peak load and above, Base Capacity generation was assumed to be unavailable.

The allowable 10 percent increase in LOLE risk was allocated in equal parts to the Base Capacity DR and EE product and the Base Capacity generation product. Therefore, the limitation on each of the two products is based on a 5 percent increase in LOLE risk such that the combined risk increase is 10 percent.

The methodology to compute the limitation on the Base Capacity DR and EE product is consistent with the current methodology used for the Extended Summer DR product with two changes:

- Unlike Extended Summer DR, Base Capacity DR and EE are modeled as unavailable in May and October.

- Base Capacity DR and EE can increase the LOLE risk by only 5 percent, whereas Extended Summer DR currently can increase the LOLE by the full 10 percent.
To compute the Base Capacity generation limitation, PJM made two additional changes to its model:

- Wind generation was modeled at a 36 percent capacity factor in the winter (rather than at the 13 percent summer capacity factor). The 36 percent value is based on actual winter performance over the last three winters.

- The ratio of the winter rating to the summer rating of all PJM generators expected to be Capacity Performance generators was modeled at 1.03. This change is intended to reflect the greater output many generators produce in colder ambient conditions.

Based on the assumptions described above, PJM examined the 2017/2018 Delivery Year and computed the following limitations on the Base Capacity products:

- Base Capacity DR and EE demand bids <= 8.3 percent
- Base Capacity DR and EE demand bids and generation supply resources <= 20.0 percent

These limitations are expressed as a percentage of the RTO peak load forecast. Both constraints must be satisfied to ensure that the PJM LOLE does not exceed 0.11 events/year (or a 10 percent increase in the target LOLE of 0.1 events/year).

PJM will update these values with data applicable to the 2018/2019 Delivery Year and post them with the Planning Parameters for the May 2015 BRA by February 1, 2015. PJM will also compute maximum product quantities for Base Capacity Resources and Base Capacity DR and EE demand bids for any individual LDA that is modeled separately in an RPM auction. The methodology for this computation will be similar to the methodology described above for the PJM Region. A base LOLE will be established for the LDA based on an LDA reserve margin equal to the sum of the LDA’s internal generation and its expected capacity assistance from adjacent zones. The LDA limitations on the Base Capacity resources and Base Capacity DR and EE demand bids will then be computed such that the LDA’s LOLE does not increase by greater than 10 percent of its base LOLE.

V. UCAP Calculations and IRM

ICAP vs. UCAP and Calculation of UCAP

Generating Resource

ICAP can be thought of as the “nameplate” capability of a generating resource. ICAP represents the summer net capability of a resource, meaning the output level the resource can dependably achieve during summer conditions. UCAP is the ICAP value of the resource reduced by its recent actual equivalent forced outage rate (EFORd). UCAP is calculated as:

\[ \text{UCAP} = \text{ICAP} \times (1 - \text{EFORd}) \]
EFORd is based on forced outage data for the October through September period that occurs immediately prior to the Delivery Year. (See PJM Manual M18, Section 4.2.5.)

Historically, PJM has allowed generation resources to remove forced outages that were defined as Outside Management Control (OMC) from the forced outage rate that determined the amount of UCAP that could be sold into RPM auctions. As part of this Capacity Performance proposal, PJM proposes that Outside Management Control outages no longer be taken into consideration in the calculation of UCAP except for those outages resulting from physical damage to the surrounding transmission and/or distribution network that do not permit the operation of the resource. That is, when the electric transmission and/or distribution facilities necessary to allow the generator to deliver energy to the PJM system are physically unavailable such that the generator cannot operate, the performance penalties in this proposal will not apply, and the generator’s forced outage will continue to be considered OMC. On the other hand, when the generator is unable to obtain fuel needed to produce energy it was obligated to deliver to the PJM system, the performance penalties in this proposal will apply since the inability to obtain fuel will not be considered an OMC event.

Interruption Generation (No Change)

EFORd is not applicable to intermittent generation such as wind and solar. UCAP value is based on average of June through August peak-hour output over three calendar years. (See PJM Manual M21.)

Qualifying Transmission Upgrades (no change)

UCAP value for a QTU is equal to the incremental import capability of an LDA as certified by PJM.

Implications of PJM Proposal on IRM

PJM anticipates that some stakeholders may question whether strengthening the performance requirements for Capacity Resources in PJM should enable PJM to reduce the IRM as a result of the increased level of resource performance that can be assumed in the IRM calculation. There is no need to reduce the IRM. Calculation of the IRM already assumes an average forced outage rate. As recent history has shown, the actual forced outage rate of Capacity Resources can be, and actually has been, much worse than the average on peak days. Therefore, because the IRM assumes a better level of performance by Capacity Resources than has actually been observed, the current IRM calculation is expected to better align with actual operating conditions during the most stressed times of the year via the PJM proposal. Improving Capacity Resource performance during the peak periods in actual operations, which is the goal of this Capacity Performance proposal, will bring the actual resource performance more in line with the assumption used in the IRM calculation, meaning no change to the current calculation would be required.

VI. Capacity Performance Availability and Flexibility Requirements

General

The proposed operational requirements of committed Capacity Performance resources are described in this section. These proposed requirements are based on the operational flexibility PJM needs from supply and demand resources
to most efficiently meet system needs on a peak load day. More specifically, winter peak-load days pose a unique operational challenge because they have two daily peaks whereas a summer day only has one.

Figure 2: Summer vs. Winter Load Shape

The following requirements are common to all Generation Capacity Resources which clear as Capacity Performance resources:

- They must have a startup and notification time of less than 24 hours. Resources that are unable to achieve a 24-hour notice must be made unavailable and put on forced outage until they can proceed along the startup cycle sufficiently to achieve the 24-hour startup time.

- The cleared UCAP amount of the resource must be offered into the Day-Ahead Energy Market as economic (i.e. not emergency), excluding periods when the resource is on an outage for which a ticket was submitted and approved.

- During periods for which Hot or Cold Weather Alerts are in effect, offer parameters submitted with a Day-Ahead Energy Market offer and used in real time must be based solely on the physical limitations of the resource. This requirement applies for all schedules, regardless of whether they are market-based schedules or cost-based schedules, submitted for a given resource. PJM proposes to determine these physically achievable operating parameters for each individual resource on the basis of the physical operating characteristics with which the resource has historically performed. These parameters include:
  - economic minimum
  - economic maximum
  - startup time
  - minimum run time
  - minimum down time
  - maximum run time
A Capacity Performance resource is expected to be staffed and ready to be operated at all times except during an approved planned outage. Therefore, during periods for which a Hot or Cold Weather Alert is in effect, the notification time for any Capacity Performance resource may not exceed one hour. If a Capacity Performance resource operates outside of its physically determined parameter limitations due to external requirements such as fuel delivery arrangements, then it will not be made whole for such operation when not dispatched by PJM.

During periods when a Hot or Cold Weather Alert is in effect, all Generation Capacity Resources that cleared as Capacity Performance resources must submit an offer into the Day-Ahead Energy Market with a startup plus notification time of no more than 14 hours. This threshold permits these resources to be committed in the Day-Ahead Energy Market with enough time to be online following dispatch by 6:00 a.m. the following morning to meet a winter morning load pickup. Such Capacity Performance resources with startup plus notification times that typically exceed 14 hours will be expected to take necessary preparations steps, such as begin the start cycle, to shorten the startup and notification times without a request to do so or further compensation from PJM.

Flexibility Requirements

Due to the dual-peaked nature of the winter load curve, PJM values resource flexibility especially on peak winter days. The goal on a winter day is to schedule resources to meet the morning peak, either cycle them or reduce them to their minimum output during the afternoon valley, and then be able to re-start them or increase their output back up to their maximum output for the evening peak. The ability for resources to be flexible throughout an operating day is integral to efficiently dispatching the system and minimizing uplift.

Storage resources and external Generation Capacity Resources may also qualify as Capacity Performance resources. The requirements for those resources are as follows:

Storage Resources

- Storage resources, including pumped storage hydroelectric, batteries, flywheels, etc. may choose to offer as Capacity Performance. However, it is expected such resources will be capable of sustained operation for multiple consecutive days. PJM will request output from such resources whenever necessary during Hot and Cold Weather Alerts or other emergency performances conditions, and, if a storage resource is unable to provide the requested energy because pumping/charging could not be accommodated due to system conditions, then the resource is subject to the same penalties as any other Capacity Performance resource.

- Startup and notification time less than or equal to one hour

- Minimum down time less than or equal to one hour

External Generation Capacity Resources

External Generation Capacity Resources must meet the established requirements for an exemption to the Capacity Import Limits for RPM auctions effective with 2017/2018 Delivery Year documented in PJM Manual 18, Section 2.3. Such resources must also meet same requirements as internal Capacity Performance generation resources as detailed on page 22.
VII. Changes to Base Capacity Requirements

Changes to Current Capacity to Meet Base Capacity Requirements

Flexibility

Base Capacity resources should have a startup and notification time of less than 48 hours. Resources that are unable to achieve a 48 hour notice must be made unavailable and put on forced outage until they can achieve the 48 hour startup time.

Resources must have operational availability of a minimum of 100 run hours per year to be considered a Base Capacity resource. This minimum is regardless of any emissions or environmental limitations. Base Capacity generation resources may be offered as emergency energy except during periods when PJM Hot or Cold Weather Alerts are in effect. Furthermore, during Hot and Cold Weather Alert periods, Base Capacity resources must be offered based upon their physical operating characteristics and with no more than a one-hour notification time and other parameters based upon their physical capabilities.

Storage Resource Eligibility

Capacity Market Sellers with storage resources that choose not to offer some or all of their capability as Capacity Performance may offer as Base Capacity resources instead. Such resources committed as Base Capacity will be required to follow the direction of the PJM operators during Hot Weather Alerts or other emergency conditions during hot weather periods and will be subject to the same penalty as other Base Capacity resources should they be unable to provide energy to the system when needed by PJM.

VIII. Peak Period Performance Assurance

Proposed Performance Requirement

PJM proposes that all Generation Capacity Resources with a Capacity Performance commitment must offer into the Day-Ahead Energy Market with at least the committed quantity of UCAP available as non-emergency. In other words, a Capacity Performance committed Generation Capacity Resource must offer into the PJM Day-Ahead Energy Market with an economic maximum quantity at least as great as the committed UCAP value if not on either a forced or approved planned outage. As detailed in other sections of this paper, for periods when Hot or Cold Weather Alerts are in effect, the parameters associated with offers for generation resources must be at least as flexible as the historically achieved values for each individual resource. The expectation for the Capacity Performance product is that it will be available to provide energy at all times that resources are needed to ensure system reliability regardless of the time of year. PJM proposes that the definition of these times be all hours of those days when either a Hot or Cold Weather Alert is in effect or for which PJM declares a Max Gen Alert and/or Event, in either the entire PJM Region or for the portion of the PJM Region in which the resource is located.
**Exceptions from Penalties for Non-Performance**

This performance standard would require delivery of energy during all such hours if a Generation Capacity Resource was scheduled by PJM or self-scheduled to operate. The only exception from application of the penalty would be those instances when: (1) the electric transmission and/or distribution facilities necessary to allow the generator to deliver energy to the PJM system are physically unavailable such that the generator cannot operate; or (2) PJM did not schedule a resource for reasons other than the resource’s inflexible operating parameters, or when the resource was on line but dispatched down by PJM. The reasons PJM would dispatch a resource down could include dispatch to provide ancillary services or to control power balance or transmission constraints. If PJM did not schedule a resource entirely because of transmission constraint, the resource would not be subject to performance penalties under this proposal.

**Non-Performance Penalty Calculation**

The penalty calculation PJM proposes is intended to be straightforward, transparent and predictable, thus lending itself to ready valuation by market participants for the purposes of developing RPM offers and financing resource development in PJM. The calculation is based upon the ISO-New England model, which the FERC already has accepted.

The non-performance penalty would apply for each hour when energy is scheduled, as described above, and not delivered. The hourly penalty would be calculated as follows:

\[
\text{Hourly Non-Performance Penalty} = \frac{\text{Net CONE} \times 365 \text{ days}}{350 \text{ hours}} - \text{Shortage Hours} \times 2,700 \text{ MWh}
\]

PJM proposes that the penalty apply to the lower of the quantity of (1) the megawatts scheduled by PJM or (2) the resource’s committed UCAP value. For example, assume a resource with a 100-MW UCAP commitment is scheduled to operate by PJM and dispatched by PJM to 75 MW for a given hour. If the resource produces only 25 MW, then the penalty would be the 50 MW difference between the scheduled quantity and the amount produced, times the applicable penalty price for that hour. Assuming the same resource with the 100-MW UCAP commitment was scheduled by PJM to produce 100 MW in a given hour and the resource produced no megawatts, the penalty would be calculated as the full 100-MW UCAP commitment times the applicable penalty price for that hour. The applicable penalty price would be Net CONE for the CONE region in which the resource is located times 365 days divided by 350 hours for any hour PJM is in a Hot or Cold Weather Alert or other emergency procedure but not in shortage conditions, or $2,700/MWh for hours when PJM is in shortage conditions. PJM chose 350 hours in the calculation of the Net CONE penalty rate because on average for the last four Delivery Years, PJM has experienced
Hot or Cold Weather Alert conditions in some part of the PJM system for 642 hours per year. Since PJM proposes to limit the application of the penalty to a maximum of 12 hours per operating day, the penalty rate was calculated using a number of hours that represents roughly half of that value.

For resources that were scheduled to operate by PJM and operated for at least part of the period scheduled by PJM, but were not on line for a particular hour when PJM scheduled them and, therefore, did not have an economic dispatch calculated in the PJM Security Constrained Economic Dispatch system, the scheduled quantity for any given hour will be determined by applying the hourly integrated LMP for that hour to the resource’s applicable offer curve. The maximum duration for which the penalty can apply to any resource would be 12 hours. Therefore, for resources that would have been scheduled to operate by PJM but were forced out for the operating day, the penalty would be applied for up to a 12-hour period of the day for which the Hot or Cold Weather Alert was issued. Similarly, resources called on by PJM to operate at any time during a day on which a Hot or Cold Weather Alert was issued but failed to start would be assessed the penalty for up to the same 12-hour period. If shortage conditions occurred, then the shortage period penalty would apply for the number of hours when shortage conditions persisted, and the non-shortage penalty for the remainder of the up to 12-hour penalty period.

PJM proposes that the penalty also apply for self-scheduled Capacity Performance resources. For resources that are self-scheduled at a fixed output quantity, the penalty for any hour will be calculated as the committed UCAP quantity minus the resource’s actual output (not less than 0 MW) times the applicable penalty price for that hour. For resources that are self-scheduled at a minimum output value and then dispatchable by PJM above that value, the penalty for any given hour will be calculated the same as for resources scheduled by PJM as described above.

The table below provides the maximum possible penalties under this proposal for 1 MW of Capacity Performance committed in each Zone for each of the last three Delivery Years. The values are calculated under the assumption that the Capacity Performance resource was unavailable for all Hot and Cold Weather Alert and shortage pricing hours applicable to each Zone. The maximum penalty values were calculated by summing the Net CONE penalty rate for all hours when a Hot or Cold Weather Alert was in effect, limited to a maximum of 12 hours in any single operating day, except for hours where shortage pricing was in effect, in which case the $2,700/MWh shortage penalty rate was substituted for the Net CONE penalty rate. For reference, a unit that cleared in RPM at a Capacity Resource Clearing Price of $120/MW-day would receive $43,800/MW-year in Capacity revenue.
Figure 3: Maximum Non-Performance Penalties Three Prior Delivery Years

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Non-Performance Penalty Offset

PJM proposes that a Capacity Market Seller may offset the penalties applied to its Capacity Resources via energy production from uncommitted resources, which PJM would define as a resource in the same constrained LDA for which all or part of the resource’s capability does not have an RPM commitment as either a Capacity Performance or Base Capacity for the Delivery Year. For resources that are partially committed, that is, only a portion of the resource’s capability is committed as either Base Capacity or Capacity Performance, only energy produced above the ICAP equivalent of the committed UCAP value may be used as a penalty offset for other resources. Energy produced by uncommitted resources or portions of uncommitted resources during periods when the above described penalty applies to committed resources in the Capacity Market Seller’s portfolio would be used to net against those penalty amounts. The offset would be determined on a megawatt-for-megawatt basis, such that every megawatt of excess output from non-committed resources would offset a megawatt of non-performance by committed resources. The sum of these penalty-offset megawatts would not be allowed to exceed the total megawatt penalties applied to a given Capacity Market Seller’s portfolio such that the net penalty applied cannot be less than zero.

PJM notes that Market Participants may bilaterally transact uncommitted resources that have the ability to offset performance penalties. Once a Capacity Market Seller bilaterally procures a given uncommitted resource and enters
that transaction in eRPM, that resource will appear in that Capacity Market Seller’s portfolio and, therefore, would be available to offset penalties accrued by other resources in that Capacity Market Seller’s portfolio.

**Deficiency Penalty vs. Non-Performance Penalty**

In the event that a given resource has a Capacity Performance commitment but does not achieve commercial operation by the beginning of a Delivery Year or experiences an increase in EFORD value (and therefore a decrease in available UCAP compared to the committed value) and does not secure and submit sufficient replacement capacity prior to the start of the Delivery Year, the total penalty applied for the period until such time as either commercial operation is achieved or replacement capacity is procured will be the greater of the Capacity Resource Deficiency Charge or the Non-Performance Penalty. The application of the higher of these two penalty amounts is necessary to ensure that Capacity Market Sellers do not choose to remain in a deficiency as opposed to achieving commercial operation or obtaining replacement capacity to avoid the risk of a Non-Performance Penalty.

**Cleared Capacity Performance Demand Resource and Energy Efficiency Demand Bids**

DR that meets the specific qualifications, as well as EE resources that meet their specific qualifications, may submit demand bids in the RPM auctions to reduce Capacity Performance obligations. Cleared Capacity Performance DR demand bids will face the same hourly energy penalty applied to Capacity Performance generation resources for failure to sufficiently reduce demand when called upon during Capacity Performance hours. Similarly, cleared EE Capacity Performance demand bids that either fail to achieve installation by the start of the Delivery Year or fail to achieve the required level of load reduction will be charged the hourly penalty applied to Capacity Performance generation resources for the Delivery Year.

**Base Capacity Resource Penalties**

For Base Capacity generation resources and for cleared Base Capacity DR and EE demand bids, PJM proposes to apply the hourly energy penalty described above for non-delivery but limited to those periods when PJM has loaded Maximum Emergency Generation or any more severe emergency procedure during the months of June through September. PJM proposes the elimination of the current Peak Hour Period Availability (PHPA) penalty and associated “EFORp” calculations and Peak Season Maintenance penalty for both Capacity Performance and Base Capacity generation resources.

**Penalty Caps**

PJM proposes to institute an overall performance penalty cap whereby the total performance penalty applied to a committed Capacity Performance resource for any Delivery Year cannot exceed 1.5 times the Delivery Year Net CONE for the CONE region in which the resource is located.

PJM further proposes a stop-loss provision whereby the penalty to be applied for any single outage event cannot exceed an escalating value based upon the duration of a single outage event during which a Capacity Performance
resource is rendered unable to meet its Capacity Performance obligations. The total penalty for any single outage event lasting up to 30 days would not exceed 25 percent of the Capacity revenues received by the Capacity Performance resource for the Delivery Year during which the outage occurs. The total penalty for any single outage event lasting up to 60 days would not exceed 50 percent of the Capacity revenues received by the Capacity Performance resource for the Delivery Year in which the outage occurs. The total penalty for any single outage event lasting up to 90 days would not exceed 75 percent of the Capacity revenues received by the Capacity Performance resource for the Delivery Year in which the outage occurs. The total penalty for any single outage event lasting 120 days or more would not exceed 100 percent of the Capacity revenues received by the Capacity Performance resource for the Delivery Year in which the outage occurs. However, if a shortage pricing event occurs during the first 30 days of the outage event, the maximum penalty for that single outage event would be increased to 50 percent of the Capacity revenue received by the Capacity Performance resource for the Delivery Year in which the outage occurs, regardless of the length of the outage event. If a single outage event lasts more than 30 days, and one or more shortage pricing events occur during both the first 30 days and later in the outage event, the maximum penalty for that single outage event would be increased to 100 percent of the Capacity revenue received by the Capacity Performance resource for the Delivery Year in which the outage occurs regardless of the length of the outage event. Because under this proposal in no event can the penalty applied to a Capacity Performance resource exceed the Capacity revenue received by that resource for non-performance due to a single outage event, PJM believes that no further force majeure provisions are necessary as part of this proposal.

**Allocation of Penalties Collected**

PJM proposes to allocate the penalties collected to LSEs, to Capacity Market Sellers with Base Capacity resources that exceed their committed quantities at PJM’s request during the winter period, and to cleared Base Capacity DR and EE demand bids that perform at PJM’s request during the winter period. Specifically, any penalties collected during Hot Weather Alerts would be allocated pro-rata to LSEs by ratio share of their Locational Reliability Charges for the month in which the penalties were incurred. Penalties collected during Cold Weather Alerts would be allocated to LSEs, Capacity Market Sellers with Base Capacity resources that provided energy in excess of their Base Capacity commitments at PJM’s request and Capacity Market Sellers with cleared Base Capacity DR and EE demand bids that performed at PJM’s request. The allocation of penalties collected during Cold Weather Alerts to Base Capacity generation resource and cleared Base Capacity demand bids would be up to Net CONE for the CONE region in which those resources are located times 365 days divided by 350 hours times the number of megawatt-hours with which the resources or demand responded. Any remaining penalty funds would be allocated pro-rata to load by ratio share of their Locational Reliability Charges for the month in which the penalties were incurred.

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3 PJM notes that penalties during outage events can be avoided through the procurement of replacement capacity and submission of a replacement transaction that replaces the commitment on the originally committed Capacity Performance resource.
Credit Requirements

Given that PJM proposes to eliminate the current PHPA penalty associated with EFORp and replace it with the non-performance penalties described above, PJM would propose to change the billing process by which penalties are assessed to Capacity Market Sellers. Rather than billing penalties well after the conclusion of a Delivery Year, as is currently done given the timing of the completion of EFORp calculations, PJM proposes to begin billing penalties during the Delivery Year, very shortly after non-performance actually occurred. Therefore, PJM would be able to withhold any remaining RPM revenues, and, if necessary other revenues, to offset penalty charges as the Delivery Year progressed. PJM also notes that the Tariff already provides that inability of a Capacity Market Seller to pay RPM penalties does not result in a default allocation because PJM would only allocate the penalty dollars actually collected. As a result, while the potential magnitude of the penalties will increase under PJM’s proposal, most significantly for Capacity Performance resources, PJM does not propose to change RPM-related credit requirements from today’s levels due to the offsetting impacts of the change in the timing with which those penalties could be assessed. PJM proposes to adjust credit requirements for QTUs to make them commensurate with those that will apply to Planned Generation Capacity Resources that offer into RPM as Capacity Performance resources, consistent with the above indication that PJM proposes to adjust the penalty provisions for QTUs to be consistent with that for Capacity Performance resources in the sink LDA for the QTU.

PJM will continue to monitor the impact of capacity performance on the default risk of the PJM members for purposes of reviewing whether any credit changes are needed in the future.

IX. Product Offer Requirements

PJM proposes the current must-offer requirement and market mitigation rules would apply for the generation resources offering the Base Capacity product with the addition of a performance risk adder to reflect the increased penalty exposure for Base Capacity resources requirement.

Based on comments received regarding the issues of Capacity Performance risk and concerns over withholding, PJM proposes to adopt the Independent Market Monitor’s (IMM) proposal regarding must-offer requirements and mitigation for the Capacity Performance product. Under this approach, generation resources with the following characteristics will be required to submit an offer as Capacity Performance resource:

- A generator that has on-site fuel (or dual-fuel backup capability) for at least 16 hours of continuous operation per day for three consecutive days at an output equal to its quantity of UCAP capability.

- A single-fueled gas-fired generator that is capable of obtaining a secured fuel supply delivered to its generation facility with some combination of firm transport, firm commodity and/or access to storage or equivalent service to provide flexible operation during peak gas-usage conditions in sufficient quantity to operate for 16 continuous hours at the facility’s UCAP capability for three consecutive days.

The Capacity Performance resource’s offer may be a coupled offer with a Base Capacity alternative. Base on the IMM’s proposed approach, PJM proposes to implement a “safe harbor” offer value for the Capacity Performance
resource offer equal to the Net CONE established for the CONE Area in which a given resource resides. Under this approach, any Capacity Performance offers up to the Net CONE value will not be subject to mitigation based on the individual resource’s Avoidable Cost Rate.

Capacity Market Sellers must be able to reflect in their Sell Offers, specifically with respect to the Market Seller Offer Caps for Generation Capacity Resources, the costs of ensuring performance during system peaks. In general, investments and costs related to improved O&M practices are already accounted for with the Avoidable Cost Rate that goes into determining Market Seller Offer Caps under Section 6.8 of Attachment DD of the Tariff. Investment related to dual-fuel capability and weatherization can already be accounted for within the Allowance for Project Investment Recovery, and the carrying costs associated with holding fuel inventories are accounted for in Avoidable Cost Rate. Currently the Tariff is silent on the ability to reflect the cost of firm gas pipeline transportation and other costs associated with ensuring natural gas availability and delivery, which also could include storage, the cost of balancing agreements with the pipeline that allow for flexibility in takes from the pipeline, and/or park and loan services. PJM proposes to add these items as allowable costs.

Because Capacity Market Sellers must have the ability to reflect performance risk, PJM proposes to add details to the Tariff regarding specification of these risks.

X. Cost Allocation

Current Methodology

Currently capacity costs are allocated to LSEs as Locational Reliability Charges. The LSE Locational Reliability Charge is calculated as the LSE Daily Unforced Capacity Obligation times the Final Zonal Capacity Price.

The LSE Daily Unforced Capacity Obligation is an allocation of the Zonal Unforced Capacity Obligation to LSEs based on the LSE Obligation Peak Loads. The Zonal Unforced Capacity Obligations are allocations of capacity procured in the PJM Region to Zones pro rata based on zonal summer peak load forecasts. (See M-18, Section 7.)

The Zonal Capacity Price is calculated as the sum of (System Marginal Price + Locational Price Adder) for annual capacity, adjusted for (Limited DR and Extended Summer) product price decrements, price decrements for external Capacity resources, and make-whole payments.

PJM Proposed Cost Allocation – Retain the Existing Method

The proposed changes to create a Capacity Performance product are primarily to assure better availability of capacity in winter. However, the concept of “critical period” penalty should assure better availability of capacity in summer also. PJM proposes to retain the existing cost allocation method. There would be no change in calculating the Unforced Capacity Obligations. The Zonal Capacity Price would be calculated as the sum of (System Marginal Price + Locational Price Adder) for the Capacity Performance product, adjusted for any Base Capacity product price decrements, price decrements for external capacity resources, and make-whole payments.
XI. Applicability to FRR Entities

PJM proposes to make the Capacity Performance requirements equally applicable to Fixed Resource Requirement (FRR) Entities. Specifically, when FRR Entities submit their FRR Capacity Plans, an equivalent proportion of their resources must be identified as Capacity Performance resources and Base Capacity resources as PJM determines are necessary to clear in RPM auctions. FRR Capacity Plans may also include Capacity Performance and Base Capacity DR and EE demand bids that would reduce the Daily Unforced Capacity Obligation of the FRR Entity. The Base Capacity demand bids will be subject to a cap. Those resources that are identified as each type would be subject to penalties associated with each type. Resources within an FRR Entity’s portfolio that are not committed as either RPM resources or as part of the entity’s FRR Plan may also be used to cure resources that would otherwise be subject to those penalties. PJM proposes to provide FRR Entities with the option to accept any resulting penalties either in the same monetary form as described above for RPM committed resources or as physical penalties requiring commitment of additional resources to the FRR Plan. Should the FRR Entity opt for the financial penalties, then the offsets to those penalties provided by uncommitted resources would be calculated identically to RPM resources as described above. Should the FRR Entity opt for the physical penalty, then the offsets would apply on a megawatt-for-megawatt basis where megawatts provided by an uncommitted resource would directly offset the megawatt shortfall incurred by a committed resource.

In order to determine the penalty for FRR Entities that opt for the physical alternative, PJM would determine the maximum net shortfall (shortfall megawatts minus excess megawatts provided by uncommitted resources) of Capacity Performance resources for any hour during each Hot and Cold Weather Alert or other applicable emergency condition other than actual shortage conditions. For each megawatt of net shortfall during the maximum net shortfall hour, the FRR Entity would be required to add 0.2 MW of Capacity Performance resources to its FRR Plan. The same determination would be made for any hour when PJM was in shortage conditions. For every megawatt of net shortfall for the maximum shortage condition shortfall hour, the FRR Entity would be required to add 0.5 MW of Capacity Performance resources to its FRR Plan. The additional megawatt of Capacity Performance resources would be required to be added to the plan as of the first of the month that occurs at least 15 days after the day on which the shortfall occurred and continue for 12 full months. Additional physical penalty megawatts would accrue for maximum net shortfall quantities during successive events that exceeded the prior maximum net shortfalls within the same Delivery Year. The shortfall evaluation would include all Capacity Resources during hot weather events and only Capacity Performance resources during cold weather events.

For example, during a Hot Weather Alert event with no shortage conditions on August 10, an FRR Entity experiences a 50-MW maximum net shortfall, all associated with Capacity Performance resources. The FRR Entity would be required to add 10 MW of Capacity Performance resources to its FRR Plan beginning on September 1 and maintain the additional megawatts of Capacity Performance resources in its FRR Plan through the following August. If on the following January 10, during a shortage event, the FRR Entity experiences a 100-MW maximum net shortfall, because that shortfall exceeded the prior shortfall by 50 MW, the FRR Entity would be required to add an additional 25 MW of Capacity Performance resources to its FRR Plan on February 1, for a total of 35 MW additional through the following August, dropping to an additional 25 MW from September through January.
XII. Short-Term Resource Procurement Target

PJM notes the IMM has recommended elimination of the Short-Term Resource Procurement Target, commonly known as the “2.5% holdback” in the RPM auction process. PJM agrees with the IMM that continuation of the 2.5 percent holdback would dilute capacity price signals and risk insufficient and inefficient levels of investment on a long-term basis. Given the pendency and uncertainty around the Court of Appeals decision in the EPSA case and the issues raised in the Capacity Performance discussion, PJM proposes to eliminate the Short-Term Resource Procurement Target. One of the primary objectives of the Capacity Performance proposal is to procure the necessary quantity of resources that will possess the required fuel security, reliability and flexibility necessary to efficiently meet the reliability needs of the system for the applicable Delivery Year. To ensure that investment in resources occurs such that they provide these necessary characteristics, the forward price signal generated by the RPM auctions must reflect the complete procurement of these resources based on the entirety of the system’s needs. As noted in the Demand Response white paper issued contemporaneously with this updated proposal, PJM recognizes that the implications of the EPSA decision will require significant action by the FERC and will be informed by the state of the appellate court litigation and any intermediate FERC action at the time that PJM might make any filing related to Capacity Performance. As a result, PJM reserves the right to modify the timing and approach of its proposal for addressing the Short-Term Resource Procurement Target.

XIII. Transition Auction Mechanism for Delivery Years 2015/16, 2016/17, 2017/18

In response to comments received from stakeholders, PJM recognizes the need to develop a balanced transition mechanism that provides incremental improvements to address the issues while recognizing the need to allow time for investment, transition of contracts and transition cost management. Based on the reliability analysis PJM has performed and reported in the Capacity Performance August 1 problem statement whitepaper, PJM’s analysis shows that a comparable rate of generator outages in the winter of 2015/2016, coupled with extremely cold temperatures and expected coal retirements, likely would prevent PJM from meeting its peak load requirements. For the 2015/2016 Delivery Year, PJM acknowledges stakeholder comments that it may not be feasible to begin implementation of Capacity Performance transition due to the short time available for investment in winterization, dual-fuel capability, firm fuel contracts, etc. Therefore, PJM proposes an incremental approach to addressing 2015/2016 Delivery Year shortfalls. This approach includes:

- Improve gas/electric market coordination by addressing gas and electric market timing issues through FERC process;
- Make Tariff, Operating Agreement and/or PJM Manual changes to allow gas units to update offers intraday;
- Address the $1,000/MWh cost-based offer limitation to reduce uncertainty and ensure cost recovery for resources operated to maintain reliability;
• Incrementally procure up to 10,000 MW of additional Capacity Resources for the winter season (December 2015 – March 2016); and

• Work with generators to seek extension of deadlines for generation scheduled to retire for MATS compliance if necessary.

For the 2016/2017 and 2017/2018 Delivery Years, PJM believes it is necessary to begin the transition to Capacity Performance standards to ensure investment in resources that can perform during extreme weather events and peak demand conditions. In order to address the reliability shortfall caused by fuel security, winter availability limitations and performance shortfalls, PJM proposes to hold an incremental auction for these Delivery Years to procure a sufficient amount of capacity that adheres to a transitional version of the performance standards and requirements of the Capacity Performance product described in the preceding sections of this document.

For the 2016/2017 Delivery Year, PJM will hold an auction to procure a transitional version of the Capacity Performance product with the following characteristics:

• Availability and flexibility requirements as described in Section VI of this paper; and

• Performance penalty structure as described in Section VIII; the magnitude of non-performance penalties reduced to 33.3 percent of the values described in Section VIII; the maximum penalty exposure reduced to 0.5 times Net CONE.

The incremental auction process will establish a required amount of Capacity Performance product that is targeted to be procured and a price cap of 0.5 times RTO Net CONE will be applied. Resource offers will be capped at 0.5 times RTO Net CONE. If a resource that already has an RPM commitment for the Delivery Year clears as Capacity Performance, the Capacity Performance commitment replaces its previous commitment. This means its capacity payment for the year is the Capacity Performance clearing price instead of the previous RPM auction clearing price.

The clearing price for Capacity Performance will set by the marginal resource offers. If the target amount of capacity performance is not cleared, the clearing price will be capped at 0.5 times RTO Net CONE.

For the 2017/2018 Delivery Year, PJM will hold an auction to procure a transitional version of the Capacity Performance product with the following characteristics:

• Availability and flexibility requirements as described in Section VI of this paper; and

• Performance penalty structure as described in Section VIII; magnitude of non-performance penalties reduced to 66.6 percent of the values described in Section VIII; maximum penalty exposure reduced to 0.75 times Net CONE.

The incremental auction process will establish a required amount of Capacity Performance product that is targeted to be procured and a price cap of 0.6 times RTO Net CONE will be applied. Resource offers will be capped at 0.6 times RTO Net CONE. If a resource that already has an RPM commitment for the Delivery Year clears as Capacity Performance, the Capacity Performance commitment replaces its previous commitment. This means its capacity payment for the year is the Capacity Performance clearing price instead of the previous RPM auction clearing price.

The clearing price for Capacity Performance will set by the marginal resource offers. If the target amount of capacity performance is not cleared, the clearing price will be capped at 0.6 times RTO Net CONE.
Performance, the Capacity Performance commitment replaces its previous commitment. This means its capacity payment for the year is the Capacity Performance clearing price instead of the previous RPM auction clearing price.

The clearing price for Capacity Performance will set by the marginal resource offers. If the target amount of capacity performance is not cleared, the clearing price will be capped at 0.6 times RTO Net CONE.