

Price Responsive
Demand

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PJM Staff Position Paper
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Section X: Integration of Price Responsive Demand

1. Overview of Price Responsive Demand

The development and implementation of dynamic and time-differentiated retail rates, together with utility investment in Advanced Metering Infrastructure (AMI) has lead an increasing quantity of load in PJM to be responsive to changing wholesale prices. Through enabling technology and behavioral changes, consumers modify their demand as prices change without being centrally dispatched by PJM or bidding demand reductions into the PJM markets. Given the linkage between dynamic retail rate structures and wholesale prices, this price responsiveness is predictable and needs to be accounted for in the wholesale market design and operations. This predictable reduction in consumption in response to changing wholesale prices is known as Price Responsive Demand (PRD). The continued development of Price Responsive Demand requires coordination between the wholesale market and the retail rate design to maximize its benefit to consumers. The deployment of AMI for small commercial and residential customers enables dynamic and time-differentiated retail rate structures linked to wholesale prices. AMI supports dynamic retail rate structures and these types of retail rates provide the exposure to market prices necessary to provide the incentive for retail customers to reduce or shift consumption in response to price.

Although Price Responsive Demand is not directly dispatchable by PJM, automated retail customer response to real time energy prices signals can produce a predictable demand curve as a function of price. Prices typically increase during capacity emergencies and as a consequence demand drops. Price Responsive Demand will therefore be able to reduce the installed capacity required to meet Loss of Load Expectation (LOLE) based reliability standards.

PRD is provided by a PJM Member that represents retail customers that have the capability to reduce load in response to price. PJM Member acting on behalf of such retail customers for the purpose of providing PRD is referred to as the PRD Provider. A PRD Provider for a given retail customer may be the customer's retail Load Serving Entity (LSE). However, PRD may also be provided in the PJM markets by an entity such as an Electric Distribution Company (EDC), or Curtailment Service Provider (CSP) that does not have direct responsibility for serving the retail load but meets all of the eligibility requirements for providing PRD.

In RPM, a PRD Provider may voluntarily make a firm commitment of the quantity of Price Responsive Demand that will reduce its consumption in response to price during a Delivery Year. This committed quantity of PRD (i.e., the Nominal PRD Value) reduces ~~the load forecasts used to determine~~ the RTO and LDA Reliability Requirements and impact the development of the RTO and LDA Variable Resource Requirement curves used in the RPM Auctions for such Delivery Year.

In order to commit PRD for a Delivery Year, a PRD Provider must submit a PRD Plan in advance of the Base Residual Auction or Third Incremental Auction, ~~as specified below~~, for such Delivery Year that demonstrates to PJM's satisfaction that the maximum nominated amount of price responsive demand will be available by the start of the Delivery Year. A PRD Provider must also submit the -MWs that the PRD Provider is willing to commit at different reservation prices (\$/MW-day). These elections by PRD Providers will result in an adjustment of the RTO/LDA VRR Curves used in the RPM Auctions. Based on the MW elections and Resource Clearing Price in the RPM Auction, PJM will determine the Nominal PRD Value committed by each PRD Provider. Those PRD Providers that elected to provide PRD at reservation prices equal to or less than the Resource Clearing Price will have the corresponding value of PRD committed in

the RPM Auction. Those PRD Providers with a committed Nominal PRD Value will be required to register price responsive load prior to the start of the Delivery Year to satisfy their PRD commitment. Failure to register enough price responsive loads to meet their PRD commitment prior to the start of the Delivery Year or failure to maintain enough price responsive loads to meet their PRD commitment throughout the Delivery Year will result in a PRD Commitment Compliance Penalty, as set forth in RAA Schedule 6.1 Section I.

A PRD Provider will also be subject to performance compliance during Maximum Emergency Events during the Delivery Year. Failure to comply during Maximum Emergency Events will result in a PRD Maximum Emergency Event Compliance Penalty, as set forth in RAA Schedule 6.1 Section K.

~~The~~The LSE serving price responsive load registered by a PRD Provider will receive a ~~d~~daily PRD Credit (\$/MW-day) during the Delivery Year. ~~If the PRD Provider is a LSE, the~~ The ~~d~~daily PRD Credit may offset the ~~d~~daily Locational Reliability Charges (\$/day) that are assessed to the LSE serving such price responsive load during the Delivery Year. ~~If the PRD Provider is an EDC or CSP, the Daily PRD Credit may offset the costs of aggregating the retail customers and installing the supervisory controls and advanced metering infrastructure. In both cases, a~~ portion of the credit may be shared with retail customer ~~the retail end-use customers that provided the price responsive loads. A portion of the credit may also be shared with a non-LSE PRD Provider that committed PRD for the load served by the LSE.~~

Comment [LH1]: Revised to conform to RAA Schedule 6.1 G. PRD Providers that are not LSEs, do not receive PRD Credit.

2. Effective Delivery Year

Effective with the 2015/2016 Delivery Year, a LSE PRD Provider may nominate a quantity of Price Responsive Demand prior to the Base Residual Auction or Third Incremental Auction.

Comment [LH2]: Deleted Note from July 20, 2011 Version of PRD Business Rules: "Section 2.1 below would be added should stakeholder proposal to include a transition period be adopted"

2.1 Transition Period

The maximum quantity of PRD that can register for a Delivery Year to participate in the PJM Capacity Market is the following:

2015/2016 Delivery Year	2016/2017 Delivery Year	2017/2018 Delivery Year	2018/2019 Delivery Year	2019/2020 Delivery Year <u>(DY, all future DY)</u>
1,500 MW	2,500 MW	3,500 MW	4,000 MW	No Cap

Comment [LH3]: PJM Suggests clarification

The maximum PRD registered for each Zone would be determined pro-rata based on preliminary zonal peak load forecasts (less load served under FRR). PRD that exceeds the maximum amount during each Delivery Year may participate in the PJM Energy Market.

Comment [LH4]: Highlighted section can be clarified as "PRD will be committed in each Base residual Auction based on the PRD Reservation Prices. If, as a result of the initial auction clearing, total PRD commitments exceed the PJM Region Limit, PJM will apply a pro-rata reduction based on preliminary zonal peak load forecast. Unused portions of the cap in one or more zones will be allocated to zones in which the initial committed amount exceeded the cap. The allocation of PRD within each zone will be based on PRD Reservation Price"

There is no limit on the amount of PRD that can be reflected in the Day-ahead and Real-time Energy Markets.

Comment [LH5]: Revision to conform RAA Schedule 6.1 Section N

During this transition period, annual reviews will be conducted to inform the market of the impact of Price Responsive Demand.

3. Eligibility of Price Responsive Demand

In order for load to be eligible to be considered as Price Responsive Demand, the price responsive load must be:

- served under a dynamic retail rate structure with an LSE or subject to a contractual arrangement with a PRD Provider where such rate or compensation arrangement can change on an hourly basis, is linked to or based upon a PJM real-time LMP trigger at a substation location within a transmission zone as electrically close as practical to the applicable load, and results in predictable response to varying wholesale electricity prices;
- subject to advanced metering capable of recording electricity consumption at an interval of one hour or less; and
- subject to supervisory control to curtail the demand should PJM declare an emergency condition.

Supervisory control of customer load registered as Price Responsive Demand is required on the part of the PRD Provider consistent with any retail regulatory authority requirements. The PRD Provider is required to have the remote capability to decrease the load at each location contained in the PRD Registration to the required service level ~~during when a PJM Maximum Emergency events has been declared, to the extent load was not already reduced based on price~~, and the LMP at the applicable location has exceeded the level at which the load has committed to reduce, ~~to the extent load was not already reduced based on price~~. PRD Providers with committed PRD are required to have automation of PRD that is needed to respond to Real Time LMPs for the PRD Curves that are submitted. Automation of load response to LMP trigger without manual intervention is required to be PRD.

Comment [LH6]: Revised to conform with RAA Section 1.46 A

However, PRD Providers may request an exception to the automation requirement for end-use customers that are a single site, a single location and a single end-use customer with supervisory control over processes with which load reduction would be accomplished. In this case, the end use customer site is eligible for this specific exception from standard automation requirement, but the end-use customer is still required to respond within 15 minutes to Real Time LMPs for the PRD Curves that are submitted- in the PJM Energy Market.

The customer load must be on a dynamic retail rate structure with an LSE or subject to a contractual arrangement with a PRD Provider that results in retail charges or credits to the end use customer that are linked to or based on the Real Time LMP. Multiple retail rates or contractual arrangements could qualify for this requirement, such as a structure where the retail charge or credit to the end-use customer is greater than or equal to the Real-time LMP, or applies only when the Real Time LMP exceeds a preset threshold. Dynamic retail rate structures, based on PJM Real-time LMP, that qualify as Price Responsive Demand may include:

- Critical Peak Pricing that allows retail rates to rise when the wholesale market price exceeds a threshold level;
- Critical Peak Rebate pricing which provides bill credits to consumers who reduce their usage below a baseline quantity during periods when the wholesale market price exceeds a threshold level; or
- Real-Time Pricing based on LMP.

4. Submittal of Price Responsive Demand Plan

To properly account for Price Responsive Demand in the Reliability Requirements, ~~Load~~ ~~Forecasts~~ and ~~Load~~ ~~Obligations~~ in RPM, a PRD Provider must submit a PRD Plan indicating the aggregated amount of eligible Price Responsive Demand (i.e., the Nominal PRD Value) by zone and sub-zone (if committing price responsive demand in PSEG-North or DPL-South) and the election of various levels reservation prices for PJM's use in preparing the ~~load forecast~~ RTO/LDA VRR Curves applicable to RPM auctions. ~~The~~ For each PRD Provider, the aggregated amount of the Price Responsive Demand by Zone/LDA is determined based only aggregating the PRD Provider's Zonal Expected Peak Load and Maximum Emergency Service Level values documented Nominal PRD Value for such Zone/LDA in the PRD Plan the sub-zones/zones that constitute the LDA.

The PRD Plan must detail the price responsive characteristic of the customer load at a zonal or sub-zonal (if load is in PSEG-North or DPL-South) level. If known, the PRD Plan should detail the price responsive characteristics at a substation level. The price responsive characteristic of such customer loads must be provided in terms of the quantity of load that will continue to consume at various levels of price.

The PRD Plan must detail the price responsive characteristic of the customer load at a zonal or sub-zonal (if load is in PSEG-North or DPL-South) level. If known, the PRD Plan should detail the price responsive characteristics at a substation level. The price responsive characteristic of such customer loads must be provided in terms of the quantity of load that will continue to consume at various levels of price.

The Zonal Expected Peak Load Value of PRD is the expected contribution of such PRD Provider's price responsive load to the Delivery Year's Zonal Peak Load Forecast if such load were not to be reduced in response to price. The substation/sub-zonal/zonal Zonal Expected Peak Load Value of PRD will be aggregated to determine the Zonal/LDA Zonal Expected Peak Load Value of PRD quantity for the PRD Provider in such Zone/ LDA.

The Maximum Emergency Service Level (MESL) is the level to which the price-responsive load will be reduced during the Delivery Year when a Maximum Emergency Event is declared. The quantity of load that will be consumed at a price equal to the applicable energy market offer cap to the relevant delivery year represents the MESL. The locational MESL quantities (at substation/sub-zonal/zonal) will be aggregated to determine the Zone/LDA MESL quantity for the PRD Provider in such Zone/LDA.

Comment [LH7]: Deleted Note from July 20, 2011 Version of PRD Business Rules:

"based on stakeholder discussion since the April PJM Board meeting, the above provision would be changed such that the price-quantity pairs submitted as part of a PRD curve could not exceed the applicable energy market offer cap if the stakeholder proposal in this regard is adopted"

The PRD Provider's Nominal PRD Value for a Zone/LDA is the difference between the PRD Provider's Zonal/LDA Expected Peak Load Value of PRD and MESL for such Zone/LDA.

A PRD Provider must submit a PRD Plan to PJM by email via the RPM Hotline at rpm_hotline@pjm.com no later than January 15, ~~prior to the Base Residual Auction or Third Incremental Auction in order to commit PRD for the Base Residual Auction or Third Incremental Auction last preceding the Base Residual Auction for the Delivery Year for which such PRD is committed; any submitted plan that does not contain, by such January 15, all information required hereunder shall be rejected.~~ Once received by PJM, the PRD Provider will receive a confirmation that the plan has been received and will be reviewed. PJM will review the content of a PRD Plan to ensure the PRD Plan contains all the necessary detail and information. Once PRD Plan reviews and approvals are completed by PJM, PJM adjusts ~~the Zonal Peak Load Forecasts PJM adjusts the RTO/LDA VRR Curves~~ considering all approved PRD Plans and will post the resulting ~~RTO/LDA VRR Curves load forecasts~~ with the planning parameters prior to conducting the relevant Base Residual Auction or relevant Third Incremental Auction. An approved PRD Plan represents a firm commitment by the PRD Provider to provide Price Responsive Demand for the relevant Delivery Year.

Comment [LH8]: Revised to conform to RAA Schedule 6.1 Section C

Additional PRD may participate in the Third Incremental Auction only if the LDA final peak load forecast for the Delivery Year (as known prior to the approval of PRD Plans submitted in advance of Third Incremental Auction) increases relative to the LDA preliminary peak load forecast used for BRA. If the total additional Nominal PRD Value submitted by PRD Providers in the LDA exceeds the increase in peak load forecast in such LDA, the nominations from PRD Providers will be accepted in order of the lowest to highest price level set to implement PRD, up to a Nominal PRD Value in an LDA that equals to the increase in peak load forecast in such LDA. ~~A PRD Provider may submit a PRD Plan, or a modified PRD Plan, by the January 15 last preceding the Third Incremental Auction for such Delivery Year requesting approval of additional Price Responsive Demand but only in the event, and to the extent, that the final peak load forecast for the relevant LDA for such Delivery Year exceeds the preliminary peak load forecast for such LDA and Delivery Year.~~

Comment [LH9]: Revised to conform to RAA Schedule 6.1 Section C

5. PRD Plan Timeline

Nomination of PRD load for a Base Residual Auction must be made by January 15, ~~3 years~~ prior to the Delivery Year for relevant Base Residual Auction. Nomination of additional PRD load for a Third Incremental Auction when LDA peak load forecast increases may be made by January 15, ~~prior to Third Incremental Auction for such Delivery Year. 4 months prior to the Delivery Year.~~ Approved PRD will be used to adjust the planning parameters to be posted by February 1 prior to relevant Base Residual Auction and by Third Week of January prior to relevant Third Incremental Auction.

Comment [LH10]: Deleted to conform with RAA 6.1 C

Comment [LH11]: Deleted to conform with RAA 6.1 C

To help a PRD Provider plan for PRD and submit a PRD Plan ~~by January 15 in accordance with deadlines stated above,~~ the following information will be made available ~~by PJM:~~

- Prior year summer weather normalized Zonal peak loads ~~posted by PJM~~ by October 31. The summer weather normalized Zonal peak loads include any add backs due to PRD for hours that load is reduced in response to price.
- Customer PLCs developed by EDCs based on prior year summer weather normalized Zonal peak loads ~~posted by PJM~~ by December 31.

- Zonal Scaling Factors (Ratio of Delivery Year Zonal Peak Load Forecast to prior year summer weather normalized Zonal peak load) [posted by PJM](#) by January first week.

A PRD Provider with a PJM approved PRD Plan will be required to register price responsive load in a PJM software application prior to the start of the Delivery Year and maintain the registration of enough price responsive load throughout the Delivery Year to satisfy their PRD commitment.

6. Price Responsive Demand (PRD) Plan

The PRD Plan is a document submitted by the PRD Provider that defines and provides data to support a PRD Provider's Nominal PRD Value in a Zone/LDA. The PRD plan must identify any methods and techniques that will be used to determine and verify the quantity of load consumed at varying wholesale price levels. A single PRD Plan may be submitted to cover multiple Zone/LDA locations, provided that the price-demand curves are submitted on a Zone/LDA level. All of the assumptions, procedures, and data for the PRD Plan should be clearly documented. The data included should be sufficient for a third party to audit the procedures and verify the PRD Provider's Nominal PRD Value in a Zone/LDA.

6.1 Requirements of Price Responsive Demand (PRD) Plan

A Price Responsive Demand (PRD) Plan submitted to PJM must include each of the following:

- (1) Company name
- (2) Submission date
- (3) Company address and contact information
- (4) Location of Price Responsive Demand by applicable electrical location within a transmission zone (i.e., PNODE), if available at the time of submittal of PRD Plan, or by Sub-zone/Zone/LDA. At the time of the submittal of PRD Plan, the PRD Provider may provide a point data at the smallest LDA level, but- the PRD Provider is required to provide final locational detail (i.e., PNODE) prior to Delivery Year.
- (5) Zonal Expected Peak Load Value of PRD by applicable electrical location, if available, or by Sub-zone/Zone/LDA
- (6) Maximum Emergency Service Level (MESL) of Price Responsive Demand by applicable electrical location, if available, or by Sub-zone/Zone/LDA
- (7) Nominal PRD Value by applicable electrical location, if available, or by Sub-zone/Zone/LDA
- ~~(8)~~ PRD Reservation Price; default value equals zero
 - a. The PRD Provider may elect a Reservation Price that is an RPM Auction clearing price identified in a PRD Plan for Price Responsive Demand load below which the PRD Provider desires not to commit the identified load as Price Responsive Demand.
 - b. If applicable, the PRD Provider may elect a range of up to ten pairs of PRD commitment levels and associated minimum RPM Auction clearing prices
 - c. If PRD Provider does not elect a price, default value equals zero
- ~~(9)~~ (9) -Price-Demand curves at the applicable electrical location, (PNODE)/Sub-zone/LDA/Zone level that detail the base consumption level as well as the decreasing consumption levels at increasing prices.

Comment [LH12]: Deleted Note from July 20, 2011 Version of PRD Business Rules:

"Given stakeholder discussions since the April PJM Board meeting, should the proposal to require that PRD Providers submit a reservation price along with their PRD elections be adopted, section 6.1 below will be augmented to provide for such submission requirement. Stakeholders also proposed that an annual review should be conducted to determine whether rule changes should be considered to allow PRD Providers to submit curves with price-quantity pairs that are higher than \$1,000/MWh, and that evaluation of such a rule change may be in concert with evaluation of a rule change raising the offer cap for all resources."

Comment [LH13]: PJM suggests adding language for clarification in areas throughout appropriate sections to indicate that the lowest level of detail for Capacity Market purposes can be at the subzonal level

Comment [LH14]: Language revised to conform with RAA Section 6.1 D (vii)

~~(9)~~(10) A description of the methodologies, analysis, or pilot programs used to determine the Zonal Expected Peak Load Value of PRD, Maximum Emergency Service Level (MESL) value, and Price-Demand Curves

~~(10)~~(11) Specifications of the equipment used to meet the advanced metering and supervisory control requirements, including a project plan and timeline with the milestones that demonstrates that the AMI and supervisory control will be available and operational for the start of the Delivery Year.

~~(11)~~(12) If the PRD Provider is an LSE, documentation, conforming to Section 6.3 below, ~~verifying~~ that the LSE has Relevant Electric Retail Regulatory Authority ("RERRA") approval:

(a) Where LSE is under the jurisdiction of a RERRA, documentation ~~verifying~~ that the RERRA has approved the LSE's PRD Program including the time varying retail rate structure required to implement the program.

(b) Whether or not the LSE is under the jurisdiction of a RERRA, documentation verifying that such rate ~~shall~~ conform to PRD implementation standards documented in either as specified in the PJM RAA, PJM Operating Agreement, PJM OATT or PJM Manuals, which pertain to PRD (such standards appear in sections 3 and 6.3 of these proposed rules).

~~(12)~~(13) If the PRD Provider is not a LSE, documentation conformation to Section 6.4 below, ~~verifying~~ that the contractual arrangement with relevant end-use customers establishing a time-varying retail rate structure that conforms to any RERRA requirements and adheres to PRD implementation standards documented in either as specified in the PJM RAA, PJM Operating Agreement, PJM OATT and PJM Manuals, which pertain to PRD (such standards appear in sections 3 and 6.4 of these proposed rules).

~~(13)~~(14) Automated Metering Infrastructure (AMI) is required in support of the PRD installation:

(a) In jurisdictions where the PRD program is under the jurisdiction of a RERRA, the PRD Provider shall use the AMI infrastructure in conformance with RERRA requirements. Furthermore, the AMI system shall be designed to allow for full implementation of PRD including metering reading requirements, supervisory control requirements, and all other requirements developed under the PJM RAA, PJM Operating Agreements, OATT and PJM Manuals as they pertain to PRD.

(b) In jurisdictions where PRD Provider is not required to obtain RERRA approval for the PRD program, the PRD Provider shall use an automated metering infrastructure that effects the needed operational requirements for PRD. Furthermore, the metering infrastructure shall be designed to allow for full implementation of PRD including metering reading requirements, supervisory control requirements, and all other requirements developed under the PJM RAA, PJM Operating Agreements, OATT and PJM Manuals as they pertain to PRD.

(c) The meter utilized to measure consumption for the purpose of retail billing shall also be the meter utilized to measure consumption for the purpose of PRD participation.

Comment [LH15]: Language revised to conform with RAA Schedule 6.1 D (i)

~~A PRD Provider must submit a PRD Plan to PJM by email via the RPM Hotline at no later than January 15, prior to the Base Residual Auction or Third Incremental Auction in order to commit PRD for the Base Residual Auction or Third Incremental Auction. Once received by PJM, the PRD Provider will receive an email confirmation that their plan has been received and will be reviewed by PJM. PJM will review the content of the PRD Plan and will notify the PRD Provider within 10 days of receipt of the PRD Plan and indicate whether or not the PRD Plan is approved or rejected. PJM may reject a PRD Plan if the submitted PRD Plan is incomplete or falls short of the meeting the requirements.~~

Comment [LH16]: PJM recommends that this section be deleted for redundancy, since it is already covered in Section 4 above

A PRD Provider must submit a PRD Plan no later than January 1, prior to a Base Residual Auction or Third Incremental Auction if the PRD Provider wants PJM to conduct an advance review of their PRD Plan. PJM will review the content of the PRD Plan and will notify the PRD Provider within 10 days of receipt of the PRD Plan if the submitted PRD Plan is approved or rejected. If the PRD Plan is rejected, PJM will provide to the PRD Provider a list of the areas in the PRD Plan that were not adequate. PRD Plans that are denied by PJM in an advance review may be corrected and resubmitted no later than January 15, prior to the Base Residual Auction or Third Incremental Auction.

Comment [LH17]: PJM recommends moving to this paragraph Section 4 and conform RAA Schedule 6.1 C

Alternately, PJM may approve a lower Nominal PRD Value supported by the PRD Plan.

6.2 Determination of the Nominal PRD Value

The following steps may be followed by a PRD Provider to estimate the Nominal PRD Value in their PRD Plan:

Step A: PRD Provider may analyze the PLC data available for existing and potential customers and the Zonal Scaling Factors provided by PJM for the Delivery Year to determine the anticipated load growth to the Delivery Year. The growth may also be based on discussions with specific end-use customers. The LSE should aggregate the end-use customer forecasted demands to determine the Zonal Expected Peak Load Value of PRD for the Delivery Year. The Zonal Expected Peak Load Value of PRD is the expected contribution of such PRD Provider's price responsive load to the Delivery Year's Zonal Peak Load Forecast if such load were not to be reduced in response to price.

The Zonal Expected Peak Load Value for PRD should be determined consistent with the 50/50 load forecast that is the input to the RPM auctions and weather-sensitive loads should consider the Zonal Weighted Temperature Humidity Index Standard for each Zone as posted by PJM on its web site.

The substation/sub-zonal/zonal Zonal Expected Peak Load Value of PRD will be aggregated to determine the Zonal Expected Peak Load Value of PRD quantity for the PRD Provider in such Zone/LDA.

Step B: The PRD Provider estimates the demand reduction as a function of price based on a pilot study conducted by the PRD Provider or based on data from other pilot studies for classes of customers. Demand reduction as a function of price for specific large customers may be based on discussions and agreements with those customers. The PRD Provider must include the Expected Peak Load Value and the MESL Value in a Price-Demand curve at the locational level (sub-station/sub-zonal/zonal/~~LDA~~ level). The Price-Demand curve must detail the base consumption level (Zonal Expected Peak Load Value) as

well as the decreasing consumption levels at increasing prices. A Price-Demand Curve must be monotonically decreasing.

The MESL will be the MW value at the highest priced point on the Price-Demand Curve. The highest price on the price-consumption curve must be less than or equal the energy offer cap applicable to the relevant Delivery Year.

If one or more of the variables that will be measured or monitored and/or assumptions that will be used in the determination of the MESL are not known at the time the PRD Provider submits its PRD Plan to PJM for review and approval, the PRD Provider may provide alternative information and/or forecasts and indicate the portion of the MESL associated with such measurement and monitoring variables and/or assumptions and explain the basis for such forecasts.

The Price-Demand curves for all PRD customers are aggregated to determine the PRD Provider's aggregate Price-Demand curve at a locational level (at substation/sub-zonal/zonal). The locational Price-Demand curves (at substation/sub-zonal/zonal) are aggregated to determine the Zonal/LDA Price-Demand curves in such Zone/LDA. The aggregated quantity of demand that will consume at a price equal to the energy offer cap represents the MESL in such Zone/LDA.

Step C: A PRD Provider's Nominal PRD Value in Zone/LDA is calculated as

Nominal PRD Value in Zone/LDA = Zonal Expected Peak Load Value in Zone/LDA – MESL in Zone/LDA

6.3 Verification of Retail Rate Structure with LSE

Before PJM will approve a LSE's PRD Plan, PJM will require that the LSE verify that it has received Relevant Electric Retail Regulatory Authority ("RERRA") approval of its time-varying retail rate structure for the referenced load. An LSE that seeks to assert that the RERRA approves or conditionally approves (which condition the LSE asserts has been met) its time varying retail rate structure for the referenced load, shall provide to PJM, within ten (10) business days of PJM's request, either: (a) an order, resolution or ordinance of the RERRA, approving or conditionally approving (which condition the LSE asserts has been met) the LSE's time varying retail rate structure for the referenced load, or (b) an opinion of the Relevant Electric Retail Regulatory Authority's legal counsel attesting to existence of a RERRA order, resolution or ordinance approving or conditionally approving (which condition the RERRA legal counsel or the LSE asserts has been met) the LSE's time varying retail rate structure for the referenced load. ~~In the absence of a response by the LSE if the LSE fails to provide the required documentation to PJM~~ within the referenced ten business days, PJM shall reject the LSE's PRD Plan.

Comment [s18]: PJM recommends this revision to be consistent with the requirements for documentation submittal by non-LSE PRD Providers. See Schedule 6.1 (D)(i).

In RERRA jurisdictions where a LSE is not required by the RERRA to seek approval from the RERRA for its time varying retail rate structure for the referenced load, the LSE shall provide to PJM, within ten (10) business days of PJM's request, an opinion of either the LSE's legal counsel or the RERRA's legal counsel attesting that the LSE does not need to obtain approval from the RERRA for the LSE's time varying retail rate structure for the referenced load, and that the LSE's time-varying retail rate structure for the referenced load adheres to any guidelines established by the RERRA. ~~In the absence of a response by the LSE if the LSE fails to provide the required documentation to PJM~~ within the referenced ten business days, PJM shall reject the LSE's PRD Plan.

Comment [s19]: PJM recommends this revision to be consistent with the requirements for documentation submittal by non-LSE PRD Providers. See Schedule 6.1 (D)(i).

6.4 Verification of Contractual Arrangement with PRD Provider

In the case where the PRD Provider is not a LSE, PJM will require the PRD Provider to provide documentation, within ten (10) business days of PJM's request, that attests- verifies that their contractual arrangement with the relevant end-use customers establishing a time-varying retail rate structure that conforms to any RERRA requirements and adheres to PRD implementation standards documented as specified in the PJM RAA, the PJM Operating Agreement, the PJM OATT and the PJM Manuals which pertain to PRD. The PRD Provider shall provide to PJM, within ten (10) business days of PJM's request, a copy/copies of their standard applicable contracts with end-use customers (including any proposed contracts) capable of reducing load in response to price. In the absence of a response by If the PRD Provider fails to provide any of the required documentation, including but not limited to end-use customer contracts, within the referenced ten business days of PJM's request, PJM shall reject the PRD Provider's PRD Plan.

Comment [s20]: Schedule 6.1 (D)(i), at the outset, requires documentation evidencing each of the requirements therein.

Comment [s21]: Schedule 6.1 (D)(i) requires contracts to be submitted within ten business days of PJM's request. Additional revisions are made to conform.

In RERRA jurisdictions where a PRD Provider is not required by the RERRA to seek approval from the RERRA for its contractual arrangement for the referenced load, the PRD Provider shall provide to PJM, within ten (10) business days of PJM's request, an opinion of either the PRD Provider's legal counsel or the RERRA's legal counsel attesting that the PRD Provider does not need to obtain approval from the RERRA for the PRD Provider's contractual arrangement for the referenced load, and that the PRD Provider's contractual arrangement for the referenced load adheres to any guidelines established by the RERRA. In the absence of a response by the PRD Provider fails to provide the required documentation within the referenced ten business days, PJM shall reject the PRD Provider's PRD Plan.

Comment [LH22]: Schedule 6.1 (D)(i), at the outset, requires documentation evidencing each of the requirements therein. Additional revisions are made to conform

7. Registration of Price Responsive Demand

Each PRD Provider that commits Price Responsive Demand through an accepted PRD Plan must, no later than one day before the tenth business day prior to the start of the Delivery Year for which such PRD is committed, register with PJM, in the form and manner specified below, sufficient PRD-eligible load at a PRD Substation level to satisfy its Nominal PRD Value commitment. All information required in the PRD Plan to be at a PRD Substation level if available at the time of submission of the PRD Plan that was not provided at the time of submission of such plan must be provided with the registration. PJM shall provide notification of such PRD registrations to the applicable electric distribution company (ies) and load serving entity(ies).

Comment [LH23]: Revision included to conform with RAA Schedule 6.1 E

A- PRD Provider will be required to register price responsive load in a PJM software application prior to the start of the Delivery Year and maintain the registration of enough price responsive load throughout the Delivery Year to satisfy their PRD commitment.

Only load that meets all the eligibility requirements of PRD can be registered as PRD. The PRD Provider must specify the smaller of the zone or sub-zone in which the PRD is located at the time of the initial submittal of the PRD Plan. The final registration of price responsive load must be identified on a locational basis at the substation location within a transmission zone as electrically close as practical to the applicable load (i.e. PNODE) and shall include the applicable EDC and LSE. This level of detail is necessary for Day-Ahead & Real-Time Market operation processes to ensure that the PJM dispatch software recognizes the price-consumption characteristic of the PRD on a locational basis. This recognition by electrical location is necessary such that the dispatch algorithms recognize that at pre-defined price levels the demand required to be served at specific locations on the system will decrease. Failure to recognize this characteristic on a

Comment [LH24]: Revision included to conform with RAA Schedule 6.1 E. Additional revisions are made to conform

locational basis would result in the software's inability to maintain power balance while correctly solving for transmission constraints.

If during the Delivery Year, the load no longer meets all the eligibility requirements of PRD, the PRD Provider must terminate the initial registration on the date the load no longer meets the eligibility requirements. The PRD Provider may also register new customers throughout the Delivery Year to cover loss of PRD load when customers drop out of the PRD Provider's program.

~~The portion of any customer load that is registered and committed as Price Responsive Demand cannot also be offered as Energy Efficiency or DR in RPM Auctions, or registered as Economic Load Response applicable to the Delivery Year for which it is committed as PRD.~~

Comment [LH25]: PJM suggests language be replaced with language in RAA Schedule B (ii)

~~End-use customer loads identified in a PRD Plan or PRD registration for a Delivery Year as Price Responsive Demand may not, for such Delivery Year, (i) be registered as Economic Load Response or Emergency Load Response; (ii) be used as the basis of any Demand Resource Sell Offer or Energy Efficiency Resource Sell Offer in any RPM Auction; or (iii) be identified in a PRD Plan or PRD registration of any other PRD Provider~~

Comment [LH26]: Revised to conform to RAA 6.1 B (ii):

The PJM software applications will be used to verify registrations in order to monitor and track the level of Price Responsive Demand registered at the zonal/sub-zonal level to allow adjustments to the zonal/sub-zonal unrestricted load forecasts. The application will also be used to verify registrations in order to monitor and verify the level of eligible Price Responsive Demand at the end-use customer level to ensure that the PLC calculation to the end-use customer will be based on an adjustment for Price Responsive Demand. The market deadlines for PRD registration will be consistent with registration deadlines for Demand Response registrations.

~~Each registration must identify following data elements: the LSE serving the load at the site; PLC; MESL; EDC, EDC-assigned loss factor; PNODE, and whether the load is being served by the LSE under the RPM or the FRR Alternative.~~

Comment [LH27]: PJM recommends adding language to describe the data elements that will be submitted in eLRS for a registration

PJM will receive data to validate the PLC calculation of any EDC who is also an LSE that has registered PRD for a given year.

~~For a PRD Provider, the MW amount of PRD that is registered by the PRD Provider at the time of PRD Plan submittal may be considered as Existing PRD and not be subject to an RPM Credit Requirement.~~

8. ~~Adjustments to RPM Peak Load Forecasts~~

Comment [LH28]: Section 8 revised to conform with OATT Attachment D, 5.10 D. Additional detailed provided to describe procedure in "PJM Manuals"

PJM produces *annual peak load forecasts* for the RTO and individual transmission zones for use in the RPM auction clearing processes and for planning purposes. In RPM, the load forecasts are used to determine the RTO and LDA Reliability Requirements ~~which are used to develop the RTO and LDA VRR Curves.~~

~~PJM determines the Zonal Peak Load Forecasts considering Price Responsive Demand that is committed by PRD Providers in each Zone prior to conduct of RPM Auctions.~~

The Preliminary RTO Peak Load Forecast and the Preliminary Zonal Peak Load Forecasts for the Delivery Year are determined by PJM in accordance with the *Load Data Systems Manual (M-19)* and are ~~adjusted for Price Responsive Demand that is nominated and approved in advance of the Base Residual Auction. The Preliminary RTO Peak Load Forecast and the Preliminary Zonal Peak Load Forecasts for the Delivery Year that are determined by PJM are reduced by the total amount of Nominal PRD Values in the RTO and the applicable zone, respectively, approved in advance of the Base Residual Auction, published in the Annual PJM Load Report issued in January immediately prior to the Delivery Year's Base Residual Auction. (The forecast is included in the table titled "Summer Coincident Peak Load (MW) for each PJM Zone, Locational Deliverability Area, and RTO" in the Annual PJM Load Report and includes the note "This table will be used for the Reliability Price Model".)~~

The ~~Final Updated~~ RTO Peak Load ~~Forecast and the Final Zonal~~ Forecasts ~~and Updated Zonal Peak Load Forecasts~~ for the Delivery Year are determined by PJM in accordance with the Load Data Systems Manual (M-19) and are ~~adjusted for Price Responsive Demand that is nominated and approved~~ published in ~~advance~~ the Annual PJM Load Report issued immediately prior to each of the ~~Base Residual Auction and any additional Price Responsive Demand that is nominated and approved in advance of~~ three scheduled Incremental Auctions.

~~The Updated Zonal Peak Load Forecasts prior to the Third Incremental Auction. The Final RTO Peak Load Forecast and will be the Final Zonal Peak Load Forecasts for the Delivery Year that are determined by PJM are reduced by the total amount of Nominal PRD Values in the RTO and the applicable zone, respectively, approved in advance of the Base Residual Auction and Third Incremental Auction. Year for use in determining the Final Zonal UCAP Obligations.~~

In order to allow PJM to determine an unrestricted load forecast, PRD load that is reduced in response to price is added back similar to adding back load reduced due to load management (DR) as defined in PJM Manuals. As a result, the load charges to LSEs will be based on PLCs adjusted for Price Responsive Demand.

9 Adjusting Variable Resource Requirement (VRR) Curve for PRD

~~Price Responsive Demand from approved PRD Plans, including any amount elected with associated Reservation Prices, will be reflected in the derivation of the RTO/LDA Variable Resource Requirement (VRR) Curves in Base Residual Auctions and Updated RTO/LDA VRR Curves in scheduled Incremental Auctions.~~

~~The Preliminary RTO/LDA Peak Load Forecasts will be reduced by the amount of Nominal PRD Value submitted at zero Reservation Price in the determination of the RTO/LDA Reliability Requirement that is used in the Preliminary Market Structure Screen performed by the Independent Market Monitor and in the determination of the Short-term Resource Procurement Target and the Minimum Annual and Minimum Extended Summer Resource Requirements for the Base Residual Auction.~~

~~PJM determines the adjustments needed to the BRA RTO/LDA VRR Curves considering the PRD elected by Providers' PRD for the Delivery Year's Base Residual Auction. An initial VRR Curve with no PRD considered and the VRR Curve as adjusted by PRD will be posted with the Base Residual Auction planning parameters. The PRD-adjusted VRR Curve is developed by subtracting the MW quantity of the offered PRD from the MW quantity of the initial VRR Curve at points on the curve that correspond with the reservation prices of the PRD Offers.~~

Comment [LH29]: Section 9 added to conform with OATT Attachment D, 5.10 D. Additional detailed provided to describe procedure in "PJM Manuals"

After the Base Residual Auction clearing, PJM will post the Adjusted Base Residual Auction RTO/LDA Reliability Requirements for the Delivery Year which reflects a reduction due to actual committed Zonal Nominal PRD Values in the Base Residual Auction.

Updated RTO/LDA Reliability Requirements and Updated RTO/LDA VRR Curves for the First and Second Incremental Auctions will be based on Updated Zonal Peak Load Forecasts which are reduced by the actual committed Zonal Nominal PRD Values in the Base Residual Auction. The Updated RTO/LDA Reliability Requirements for the First Incremental will be compared with the Adjusted Base Residual Auction RTO/LDA Reliability Requirements in determining the capacity to be procured or released in the First Incremental Auction. The Updated RTO/LDA Reliability Requirements for the Second Incremental Auction will be compared with the Updated RTO/LDA Reliability Requirements for the First Incremental Auction in determining the capacity to be procured or released in the Second Incremental Auction.

Updated RTO/LDA Reliability Requirements and Updated RTO/LDA VRR Curves for the Third Incremental Auction will be based on Updated Zonal Peak Load Forecasts which are reduced by the actual committed Zonal Nominal PRD Values in the Base Residual Auction. The Updated RTO/LDA Reliability Requirements for the Third Incremental Auction will be compared with the Updated RTO/LDA Reliability Requirements for the Second Incremental Auction in determining the capacity to be procured or released in the Third Incremental Auction. PJM determines the adjustments needed to the Updated RTO/LDA VRR Curves considering the additional PRD Elections in the Delivery Year's Third Incremental Auction in the development of an Adjusted RTO/LDA VRR Curve Increment used to determining PJM Buy Bid prices in the Third Incremental Auction.

10 Performance Requirements of Price Responsive Demand

Comment [LH30]: Language revised to conform with RAA Section 6.1

Once a PRD Provider commits PRD for the Delivery Year, the PRD Provider will be subject to both commitment compliance and performance compliance during Maximum Emergency Events during the Delivery Year.

A PRD Provider must register enough PRD prior to the start of the Delivery Year and maintain enough Price Responsive Demand registrations throughout the Delivery Year to satisfy their PRD commitment in each sub-zone or zone. PJM will determine the actual Daily Nominal PRD Value based on the information provided in the registration system. If the actual Daily Nominal PRD Value in each sub-zone or zone is less than their committed Nominal PRD Value in each sub-zone or zone, the PRD Provider will be subject to a Daily PRD Commitment Compliance Penalty.

Committed PRD is required to reduce to a level based on the MESL in each sub-zone or zone in the registration system upon PJM declaration of a Maximum Emergency Event during that Delivery Year. During the Delivery Year, PRD Providers for which committed Price Responsive Demand does not respond consistent with the commitment during emergency conditions will be subject to a PRD Maximum Emergency Event Compliance Penalty.

Once committed ~~by virtue of being included in the load forecast for an RPM auction~~ a Base Residual Auction or Third Incremental Auction, Price Responsive Demand may not be uncommitted or replaced by available capacity resources or Excess Commitment Credits.

9.1 PRD Transfers (Bilaterals)

~~A PRD Provider may transfer the obligation to provide PRD bilaterally to another PRD Provider during the Delivery Year. The bilateral transfer must specify the amount to be transferred, the zone or sub-zone in which the PRD is registered, and the auction for which the PRD was committed. As a result of the transfer, the transferee PRD Provider that is assuming the transferor PRD Provider's obligation will receive the Daily PRD Credit and be subject to performance requirements and any penalties (PRD Commitment Compliance and PRD Maximum Emergency Event Compliance Penalty) during the term of the transfer.~~

Comment [LH31]: PJM suggests language be replaced with language in RAA 6.1 H

A PRD Provider may transfer all or part of its PRD commitment for a Delivery Year in a Zone (or sub-Zonal LDA) to another PRD Provider for its use in the same Zone or sub-Zonal LDA, through notice of such transfer provided by both the transferor and transferee PRD Providers to the Office of the Interconnection in the form and manner specified in the PJM Manuals. From and after the effective date of such transfer, and to the extent of such transfer, the transferor PRD Provider shall be relieved of its PRD commitment and credit requirements, shall not be liable for PRD compliance charges, and shall not be entitled to a Price Responsive Demand Credit; and the transferee PRD Provider, to the extent of such transfer, shall assume such PRD commitment, credit requirements, and obligation for compliance charges and, if it is a Load Serving Entity, shall be entitled to a Price Responsive Demand Credit.

Comment [LH32]: Section 9.1 Revised to conform with RAA 6.1 H

11. Measurement & Verification of Performance of Price Responsive Demand

Measurement and Verification of PRD is based on the committed load's actual consumption under specific conditions during the Delivery Year. Verification of Price Responsive Demand is conducted whenever PJM declares a Maximum Emergency Event. PRD Providers are responsible for the submittal to PJM of all information required to complete this verification for each PJM Maximum Emergency Event during the Delivery Year. PJM will establish and communicate reasonable deadlines for the timely submittal of data to expedite reviews. Reviews are completed as soon after a Maximum Emergency Event as possible, with the expectation that reviews of each event will be completed within ~~two~~three months of the end of the month in which the event took place. PJM requires that the load reduction meter data be submitted to PJM within 60 days of the event, with accountability if for failure to do so.

Comment [LH33]: PJM is recommending clarifying language to define deadlines comparable to ng DR compliance.

For Price Responsive Demand, compliance is assessed upon declaration of a PJM Maximum Emergency Event and when the 5-minute real-time LMP has reached the applicable point on their submitted PRD curve in the PJM Energy Market by comparing hourly integrated actual load to an adjusted MESL value. This evaluation is completed for every, full clock hour for which the Event was in effect. In addition, for any partial clock hours during which the Event was in effect, at the PRD Provider's option, PJM will verify either that the load was reduced to the adjusted MESL level within 15 minutes of the emergency procedures notification regardless of the response rate submitted, or that the hourly integrated value of the load was at or below the adjusted MESL. If not verified, the PRD Provider is penalized as if the load exceeded the adjusted MESL for a whole hour. In order to account for the fact that actual load can be greater than the PJM 50/50 load forecast during emergency events, the MESL is adjusted by a ratio equal to the amount by which the actual zonal load during the event exceeded the PJM load forecast for the Delivery Year. PRD Providers must submit actual customer load levels for all hours during the PJM Emergency Event. No additional credit is provided for any load reduction below the MESL. in the registration. The compliance results of the PRD Provider's PRD registrations in a sub-zone/zone that were expected to respond are aggregated to determine a PRD Provider's sub-zonal/zonal shortfall during a Maximum Emergency Event.

Comment [LH34]: PJM suggests adding language for clarification in areas throughout appropriate sections to indicate that the lowest level of detail for Capacity Market purposes can be at the subzonal level

12. Penalties for Non-Performance of Price Responsive Demand

~~1123~~.1 PRD Commitment Compliance Penalty

Given that nomination of PRD prior to an RPM auction could occur three years ahead of the actual Delivery Year for which the PRD is being committed, a PRD Provider may not actually have the AMI or supervisory control in place or have customer agreements fully executed to know the exact customers that will be price responsive at the time of PRD Plan submittal. When the installation of Advanced Metering and Supervisory Controls are delayed beyond the start of the Delivery Year, or when a PRD Provider has not demonstrated that it has subscribed enough load to be Price Responsive Demand throughout the Delivery Year, the PRD Provider will be subject to a PRD Commitment Compliance Penalty.

PRD commitment compliance will be evaluated on a daily basis throughout the Delivery Year. PJM will determine the actual Daily Nominal PRD Value of the PRD Provider in a Sub-Zone/Zone based on the information provided in the registration system. If a PRD Provider's actual Daily Nominal PRD Value in a Sub-Zone/Zone is less than their committed Nominal PRD Value in Sub-Zone/Zone, the PRD Provider will be subject to a Daily PRD Commitment Compliance Penalty in the Sub-zone/Zone.

The Daily PRD Commitment Compliance Penalty is equal to the MW shortfall in the Sub-zone/Zone * [Forecast Pool Requirement] * [Weighted Final Zonal Capacity Price in \$/MW-Day + Higher of 0.2 * Weighted Final Zonal Capacity Price or \$20/MW-day].

A PRD Provider's Weighted Final Zonal Capacity Price is the average of the Final Zonal Capacity Price and the price component of the Final Zonal Capacity Price due to the Third Incremental Auction, weighted by the Nominal PRD Values committed by such PRD Provider in Base Residual Auction and Third Incremental Auction.

The MW Shortfall in Sub-zone/Zone is the Daily Nominal PRD Value committed in BRA and/or Third IA minus the Daily Nominal PRD Value determined as a result of registration process.

~~1123~~.2 PRD Maximum Emergency Event Compliance Penalty

PRD event compliance is assessed upon declaration of a PJM Maximum Emergency event ~~in zone or sub-zone~~. The PRD compliance event hours are those hours for which a PJM Maximum Emergency Event was in place.

The penalty applicable to a PRD Provider for which load committed as Price Responsive Demand and the load does not respond consistent with its daily commitment ~~in zone or sub-zone~~ at the first ME event is

MW shortfall * [Forecast Pool Requirement] * [Weighted Final Zonal Capacity Price in \$/MW-Day + Higher of 0.2 * Final Zonal Capacity Price or \$20/MW-day] * 365 days.

A PRD Provider's Weighted Final Zonal Capacity Price is the average of the Final Zonal Capacity Price and the price component of the Final Zonal Capacity Price due to the Third Incremental Auction, weighted by the Nominal PRD Values committed by such PRD Provider in ~~BRA~~ Base Residual Auction and Third ~~I~~ Incremental Auction.

The same penalty rate will be applied to the subsequent Maximum Emergency Events in zone/sub-zone based on MW shortfall exceeding the maximum shortfall in any of the prior Maximum Emergency Events.

The MW shortfall will be based on MESL identified at the time of the PRD registration, except that the MESL will be increased by the ratio of actual Zonal peak load at the time of the Maximum Emergency Event to the Final Zonal Peak Load Forecast. That is:

MW shortfall = [highest hourly integrated aggregate metered load for the PRD Provider's PRD load in the Sub-zone/Zone] – {(aggregate MESL for Sub-zone/Zone)*Higher of 1.0 or [(actual Zonal load – actual total PRD load in Zone) / (Final Zonal Peak Load Forecast – final Zonal Expected Peak Load Value of PRD in total for all PRD load in Zone)]}

To avoid double-counting of penalties, the MW shortfall for PRD event compliance may be adjusted downward if the PRD Provider is also assessed a Daily PRD Commitment Compliance Penalty.

The MW Shortfall for any portion of the Emergency event that is less than a full clock hour shall be treated as a shortfall for a full clock hour unless either: (i) the load was reduced to the adjusted MESL level within 15 minutes of the emergency procedures notification, regardless of the response rate submitted, or (ii) the hourly integrated value of the load was at or below the adjusted MESL. Such MW shortfall shall not be reduced through replacement of the Price Responsive Demand by any Capacity Resource or Excess Commitment Credits; provided, however, that the performance and MW Shortfalls of all PRD-eligible load registered by the PRD Provider, including any additional or replacement load registered by such PRD Provider, provided that it meets the price condition specified above, shall be reflected in the calculation of the overall MW Shortfall. Any greater MW Shortfall during a subsequent Emergency for such Zone or sub-Zonal LDA during the same Delivery Year shall result in a further charge hereunder, limited to the additional increment of MW Shortfall. As appropriate, the MW Shortfall for non-compliance during an Emergency shall be adjusted downward to the extent such PRD Provider also was assessed a compliance penalty for failure to register sufficient PRD to satisfy its PRD commitment

Comment [LH35]: Language revised to conform with RAA Section 6.1 K

A PRD Provider cannot use Replacement Capacity to reduce a PRD MW shortfall for commitment compliance or for failure to perform during a Maximum Emergency Event. However, a PRD Provider can use Replacement Demand by registering register additional PRD throughout the Delivery Year to cure a daily commitment compliance shortfall or avoid additional event compliance shortfalls.

Comment [LH36]: "Replacement Demand" was not a term that was defined in the final agreement language.

Penalty funds are allocated to all RPM Resource Providers with commitments for the Delivery Year in proportion to their net RPM Revenues (i.e., RPM Auction revenue net of any RPM resource performance penalties accrued) for the delivery year.

PRD Providers that do not meet their PRD commitments in a given year with the amount of load reduction for which they are committed as PRD, need to justify their Nominal PRD Value or revise the Nominal PRD Value estimate for the purposes of the next Delivery Year for which an RPM auction has not yet occurred.

13. Credit Requirements

PRD Providers that nominate Price Responsive Demand that has satisfied the eligibility requirements (i.e., already installed the required AMI and supervisory control and have customers that are being served under a retail rate structure or contractual arrangement that changes on an hourly basis in response to PJM real-

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time LMP at the substation location applicable to the load) as demonstrated by approved registrations in the PJM software application at the time of the PRD Plan submittal , are not required to establish credit for the RPM Auctions as defined in OATT Attachment Q-

PRD Providers that nominate Price responsive Demand that are in the process of installing the required equipment and subscribing customers to become eligible, must establish an RPM Credit Limit prior to an RPM Auction on the same basis as Planned Demand Resources as defined in ***Section 4 of PJM Manual M18: PJM Capacity Market.***

14. Testing of Advanced Metering and Supervisory Controls

Testing requirements for PRD ~~will be~~ are comparable to testing requirements and penalties for Load Management resources as defined in *Section 8 of PJM Manual 18: PJM Capacity Markets*; as detailed in RAA Section 6.1 L and in the next section.

Annual testing is required to ensure that the PRD Provider has the ability to achieve the committed Maximum Emergency Service Level (MESL) via either:

- Responding to the Real-time LMP signal; or
- Reducing load in response to a supervisory control signal

Tests must be executed simultaneously for all Price Responsive Demand in a given transmission zone/sub-zone. Tests must be conducted at least one time a year.

During testing PRD is required to demonstrate compliance for a one hour period.

PJM requires that the load reduction meter data for testing purposes be submitted to PJM within 60 days of the event, with accountability if for failure to do so.

Comment [LH37]: PJM is recommending clarifying language to define deadlines comparable to DR compliance rules and procedures.

14.1 PRD Testing Requirements for PRD

If PJM does not declare during the relevant Delivery Year a Maximum Generation Emergency that requires the registered PRD to reduce to the Maximum Emergency Service Level then such registered PRD must demonstrate that it was tested for a one-hour period during any hour when a Maximum Generation Emergency may be called during June through October or the following May of the relevant Delivery Year. If a Maximum Generation Emergency that requires the registered PRD to reduce to the Maximum Emergency Service Level is called during the relevant Delivery Year, then no PRD Test Failure Charges will be assessed.

Comment [LH38]: Sections 14.1 & 14.2 added to conform with RAA Section 6.1 L

All PRD registered in a zone must be tested simultaneously except that, when less than 25 percent (by megawatts) of a PRD Provider's total PRD registered in a Zone fails a test, the PRD Provider may conduct a re-test limited to all registered PRD that failed the prior test, provided that such re-test must be at the same time of day and under approximately the same weather conditions as the prior test, and provided further that all affiliated registered PRD must test simultaneously, where affiliated means registered PRD that has any ability to shift load and that is owned or controlled by the same entity. If less than 25 percent of a PRD Provider's total PRD registered in a Zone fails the test and the PRD Provider chooses to conduct a retest, the PRD Provider may elect to maintain the performance compliance result for registered PRD achieved during the test if the PRD Provider: (1) notifies PJM 48 hours prior to the re-test under this election; and (2) the PRD Provider retests affiliated registered PRD under this election.

14.2 PRD Test Failure Charge

A PRD Provider that failed to reduce the load in the zone/sub-zone to the aggregate MESL for the zone or sub-zonal LDA, shall be assessed a PRD Test Failure Charge equal to the net PRD capability testing shortfall in a Zone during such test in the aggregate of all of such PRD Provider's registered PRD in such Zone times the PRD Test Failure Charge Rate. The net capability testing shortfall in such Zone shall be the following megawatt quantity, converted to an Unforced Capacity basis using the applicable Forecast Pool Requirement:

MW Shortfall = [highest hourly integrated aggregate metered load for such PRD Provider's PRD load in the Zone or sub-Zonal LDA] - {(aggregate MESL for the Zone or sub-Zonal LDA) * the higher of [1.0] or [(actual Zonal load - actual total PRD load in Zone) / (Final Zonal Peak Load Forecast - final Zonal Expected Peak Load Value of PRD in total for all PRD load in Zone)]}.

The net PRD capability testing shortfall in such Zone shall be reduced by the PRD Provider's summer daily average of the MW shortfalls for commitment compliance charges in such Zone.

The PRD Test Failure Charge Rate shall equal such PRD Provider's Weighted Final Zonal Capacity Price in such Zone plus the greater of (0.20 times the Weighted Final Zonal Capacity Price in such Zone or \$20/MW-day) times the number of days in the Delivery Year.

A PRD Provider's Weighted Final Zonal Capacity Price is the average of the Final Zonal Capacity Price and the price component of the Final Zonal Capacity Price due to the Third Incremental Auction, weighted by the Nominal PRD Values committed by such PRD Provider in BRA and Third IA.

The PRD Test Failure Charge shall be assessed daily and charged monthly (or otherwise in accordance with customary PJM billing practices in effect at the time); provided, however, that a lump sum payment may be required to reflect amounts due, as a result of a test failure, from the start of the Delivery Year to the day that charges are reflected in regular billing.

The revenue collected from assessment of the PRD Test Failure Charges shall be distributed on a pro-rata basis to all entities that committed Capacity Resources in the RPM Auctions for such Delivery Year, pro rata based on each such entity's revenues from Capacity Market Clearing Prices in such auctions, net of any compliance charges incurred by such entity.

14. Fixed Resource Requirement (FRR) Alternative

The ~~above~~ rules for Price Responsive Demand are also applicable to participants in the FRR alternative of PJM Capacity Markets- except that a Reservation Price is not applicable to PRD nominated based on load served under FRR alternative. In this case, the Preliminary Daily Unforced Capacity Obligation of an FRR Entity is calculated based on the FRR Entity's preliminary zonal peak load forecast reduced by the ~~approved~~ Nominal PRD Value ~~submitted~~ approved by PJM in advance of a Base Residual Auction.- During the transition period, the amount of Nominal PRD Value approved by PJM for FRR Entity may be adjusted to enforce the RTO cap on amount of PRD committed.

The Final Daily Unforced Capacity Obligation of an FRR Entity is calculated based on the FRR Entity's final zonal peak load forecast reduced by the ~~approved~~ Nominal PRD Values ~~submitted~~ approved by PJM in advance of a Base Residual Auction and Third Incremental Auction.

Comment [LH39]: Language revised to conform with RAA Section 6.1

Comment [LH40]: PJM is suggesting language to complement clarifying language suggested in Section 2.1 above.

In the case of FRR Entities, penalties for non-performance will be based on the Final Zonal Capacity Price for the Zone encompassing the FRR Entities Zone.

15. RPM Settlement/PRD Credit

Comment [LH41]: Language revised to conform with RAA Section 6.1 G

The use of Nominal PRD Value to modify the RTO/LDA VRR CurveCurves used in RPM auctions reduces the resources to be procured and as a result reduces the clearing price in RPM Auctions. All LSEs may benefit from this reduction in RPM Auction clearing prices.

The settlement steps are summarized below:

Determine the

- The Final RTO Unforced Capacity Obligation for the Delivery Year is the total amount of MWs cleared in Base Residual Auction plus the unforced capacity obligations satisfied through BRA and MWs cleared in PJM Buy bids across all Incremental Auctions. Unforced capacity satisfied in an less the total amount of MWs cleared in PJM Sell Offers across all Incremental Auctions. The Final RTO Unforced Capacity Obligation for the Delivery Year is allocated to the zones on a pro-rata basis based on Final Zonal Peak Load Forecasts made one month prior to known in advance of the Third Incremental Auction to determine Final Zonal Unforced Capacity Obligations. The Final Zonal Peak Load Forecasts used in the allocation are not adjusted for the approved Nominal PRD in the zone.
- The Final Zonal Unforced Capacity Obligations are allocated to LSEs daily based on the LSE daily Obligation Peak Loads. The same method is used for LSE that is serving price responsive demand (either committed by the same LSE or an alternate PRD Provider) and the LSE's daily unforced capacity obligation is based on PLCs that are not reduced by Nominal PRD Values.

The Load Serving Entity (LSE) identified in the PRD Provider's registration will receive a Daily LSE PRD Credit = (each day that the PRD registration is effective).

- $$\text{LSE PRD Credit} = \left[\left(\frac{\text{Share of Zonal Nominal PRD Value committed in Base Residual Auction}}{\text{Final Zonal RPM Scaling Factor} * \text{FPR} * \text{Final Zonal Capacity Price}} \right) + \left(\frac{\text{Share of Zonal Nominal PRD Value committed in Third Incremental Auction}}{\text{Final Zonal RPM Scaling Factor} * \text{FPR} * \text{Final Zonal Capacity Price} * \text{Third Incremental Auction Component of Final Zonal Capacity Price stated as a Percentage}} \right) \right] * \text{FZPLDY}$$
- Where, FZPLDY = Final Zonal Peak Load Forecast for Delivery Year; and;

$$\frac{\text{Share of Zonal Nominal PRD Value Committed in Base Residual Auction}}{\text{Total Zonal Nominal PRD Value of all Price Responsive Demand}}$$

registered by the PRD Provider of such registration * Zonal Nominal PRD Value committed in the Base Residual Auction by the PRD Provider of such registration.

Share of Zonal Nominal PRD Value Committed in Third Incremental Auction = Nominal PRD Value for such registration/Total Zonal Nominal PRD Value of all Price Responsive Demand registered by the PRD Provider of such registration * Zonal Nominal PRD Value committed in the Third Incremental Auction by the PRD Provider of such registration.

FZPLDY = Final Zonal Peak Load Forecast for such Delivery Year; and

FZWNSP = Zonal Weather-Normalized Peak Load for the summer concluding prior to the commencement of such Delivery Year.

When the PRD registration is associated with a sub-Zone, the Share of the Nominal PRD Value Committed in Base Residual Auction or Third Incremental Auction will be based on the Nominal PRD Values committed and registered in a sub-Zone.

A Load Serving Entity will receive a LSE PRD Credit for each approved Price Responsive Demand registration that is effective and applicable to load served by such Load Serving Entity on a given day. The total daily credit to an LSE in a Zone shall be the sum of the credits received as a result of all approved registrations in the Zone for load served by such LSE on a given day. Although the PRD Credit is assessed to the LSE of record in the registration, all PRD performance penalties are assessed to the PRD Provider associated with such registration.

The PRD Credit provided to the LSE may help towards covering the costs of installing the Advanced Metering and Supervisory Control infrastructure and aggregating customers. A portion of the PRD Credit may also be shared with the actual end-use customers. If the PRD Provider is a LSE, the Daily PRD Credit may offset the Daily Locational Reliability Charges that are assessed to the LSE serving such price responsive load during the Delivery Year. If PRD is committed and registered in an FRR Service Area, the FRR Service Area's load obligation will be reduced instead of providing a PRD Credit to the LSE. The reduction in load obligation is a direct benefit if the PRD Provider is also the FRR Entity that serves the load. PRD may be committed and registered by an alternate PRD Provider, such as a CSP, under an agreement for financial compensation from the FRR Entity serving the load in the FRR Service Area. In either case, the PRD performance penalties are applicable to the PRD Provider.

Note:

16. Price-Demand Curves in the Energy Market

Price Responsive Demand that is committed in RPM for a Delivery Year will bid in the PJM Energy Market per the business rules below. Price Responsive Demand that is not committed in RPM for a Delivery Year has the option to bid in the Energy Market as an "Energy Only" bid.

If PRD is bid into the market as "Energy Only", the Maximum Emergency segments that are not committed MW of capacity may submit a bid price -up to the energy market offer cap for the respective delivery year.

Comment [LH42]: Deleted Note from July 20, 2011 Version of PRD Business Rules

" Given stakeholder discussion since the April PJM Board meeting, if the stakeholder proposal to limit the PRD Credit payment to only the LSE, the above section of the Business Rules will be adjusted accordingly. PJM staff notes that if this proposal is adopted, any PRD penalties would still accrue to the PRD Provider as the registering entity."

1619.1 Characteristics of Price-Demand Curves in PJM Energy Market

The Price-Demand Curves (PRD Curves) for Price Responsive Demand ~~C~~Committed in RPM for a Delivery Year will have the following characteristics and can be submitted in the PJM Energy Market on a daily basis:

- PRD Curves accepted at the time of PRD registration, will be used as default Price Responsive Demand bids in the Day Ahead Market clearing process. Updates to the default curves may be submitted into the DA market on a daily basis by 1200 at the closing of the Day-ahead bid period
- PRD Curves in the Energy Market will be modeled in the real-time dispatch algorithms and can set Real-Time LMP. Price Responsive Demand will set Real-Time LMP based on offer price on the PRD curve, as described in next section. If a PRD Curve is marked as "unavailable", the PRD curve is ineligible to set Real-Time LMP. PRD Curves in the Energy Market must be submitted locationally; identified at the substation location within a transmission zone as electrically close as practical to the applicable load ~~(i.e.,~~ PNODE). PJM will provide assistance to EDCs to post mapping files that map PNODES to geographic locations such as zip codes.
- PRD curves will include the following parameters:
 - a) Availability Flag
 - b) Response Rate
- PRD Curves in the Energy Market must be non-increasing and can have up to 10 price-quantity segments for each hour.
- PRD Providers with committed PRD are required to have automation of PRD that is needed to respond to Real Time LMPs for the PRD Curves that are submitted.
- The maximum bid price of the PRD Curve is the applicable ~~up to the~~ energy market offer cap

~~1619.1.1 Business Rule Changes to Generation Market Seller Offers~~

~~h.~~

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19.1.2 Business Rule Changes to Price Sensitive Demand Bids

- Participants may indicate in Price Sensitive Demand Bids if the bids are available to be used in the Real Time Market.

Comment [LH43]: Deleted Note from July 20, 2011 Version of PRD Business Rules:
based on stakeholder discussion since the April PJM Board meeting, some stakeholders proposed that the price-quantity pairs submitted as part of a PRD curve could not exceed the applicable energy market offer cap. Section 16 of the Business Rules will be adjusted accordingly if the stakeholder proposal in this regard is adopted.

1619.2 Price-Demand Curves in Real-time Energy Market Operations

During normal Economic conditions:

- PRD Curves will be included in Security Constrained Energy Dispatch (SCED)
- Price Responsive Demand can set Real-time LMP up to the energy market offer cap

During Emergency conditions:

- Price Responsive Demand must be curtailed once PJM has:
 - a) declared and loaded Max Emergency Generation; or
 - b) loaded emergency purchases; or
 - c) initiated a voltage reduction;

and the real-time LMP at the applicable location meets or exceeds the price on the submitted PRD curve at which the load has committed to curtail.

- PJM will issue an emergency procedures notification to clearly indicate when PRD must be reduced to its committed value based on the MESL, as follows: "At this time, PRD Providers are required to take all actions, including use of supervisory control if necessary, to reduce Price Response Demand (PRD) down to the Maximum Emergency Service Level (MESL)"



- During Emergency conditions, PJM will use real-time data submitted by PRD Providers to determine the availability and actual response of PRD, per the rules for Load Management Operational Reporting.

1619.3 Balancing Operating Reserves Deviations

In general, while PJM will not send dispatch signals to PRD load, PRD load that reduces consumption in real time in response to price will be viewed as having "followed dispatch instructions" and therefore not accrue Balancing Operating Reserve (BOR) deviations for the reduced demand.

- PJM will sum an LSE's total fixed and price sensitive demand cleared in the Day-Ahead market in each zone.
- PJM will sum the LSE's total real time load in each zone.
- If the LSE has PRD load in a given zone, the Real-Time LMP at the PNODEs where such PRD was modeled for a given hour is higher than the Day-ahead LMP at those PNODEs for that hour and the LSE's real time load minus its Day-Ahead fixed demand was less than the LSE's Day-Ahead cleared price sensitive demand in that zone, then the LSE will not accrue

BOR deviations for the amount by which the Day-Ahead cleared price sensitive demand exceeded the real time load minus the Day-Ahead fixed demand.

1619.4 PRD Curves Submitted by Curtailment Service Providers (CSPs)

- PRD Curves may be submitted by PRD Providers without direct load responsibility in the PJM energy market by 1200 at the closing of the Day-ahead bid period.
- PRD Curves submitted by PRD Providers without direct load responsibility will be identified as CSP-PRD bids in the Day-ahead Market software and user interface.
- CSP-PRD bids will be modeled in the Real-time Energy market only, and will be modeled in the real-time dispatch algorithms. CSP-PRD bids will not be modeled in the Day-ahead Market Clearing process.
- ~~CSP-PRD bids will be~~ not result in any energy market charges or credits to the CSP. Any energy market settlements associated with the load represented by CSP-PRD bids will accrue to the LSE responsible for serving the load.

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