



PJM Interconnection, L.L.C.  
2750 Monroe Boulevard  
Audubon, PA 19403

Thomas DeVita  
Senior Counsel  
T: (610) 635-3042 | F: (610) 666-8211  
Thomas.DeVita@pjm.com

October 30, 2020

The Honorable Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E. Room 1A  
Washington, D.C. 20426

Re: *PJM Interconnection L.L.C., Docket No. ER21-278-000*  
*Effective Load Carrying Capability Construct*

Dear Secretary Bose,

Pursuant to section 205 of the Federal Power Act (“FPA”),<sup>1</sup> and part 35 of the Federal Energy Regulatory Commission’s (“FERC” or the “Commission”) regulations,<sup>2</sup> PJM Interconnection, L.L.C. (“PJM”) hereby submits for filing proposed revisions to the Reliability Assurance Agreement Among Load-Serving Entities in the PJM Region (“RAA”) and PJM’s Open Access Transmission Tariff (“Tariff”)<sup>3</sup> to create and implement an Effective Load Carrying Capability (“ELCC”) construct for determining the relative amount of capacity that variable, limited duration, and combination resources may offer in PJM’s capacity market (known as the “Reliability Pricing Model” or “RPM”) or provide in a Fixed Resource Requirement (“FRR”) capacity plan.

---

<sup>1</sup> 16 U.S.C. § 824d.

<sup>2</sup> 18 C.F.R. part 35.

<sup>3</sup> The RAA and the Tariff are currently located under PJM’s “Intra-PJM Tariffs” eTariff title. *See PJM Interconnection, L.L.C. - Intra-PJM Tariffs*, <https://etariff.ferc.gov/TariffBrowser.aspx?tid=1731> (last visited Oct. 30, 2020). Terms not otherwise defined herein shall have the same meaning as set forth in the RAA, the Tariff, and the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. (“Operating Agreement”).

Implementation of the ELCC construct, as proposed in this filing, would be an upgrade in PJM's approach to evaluating the capacity capability of its evolving resource mix. ELCC will replace the current 10-hour rule for storage resources as well as the class-average approach for wind and solar, and provide a means for evaluating hybrid resources (e.g., a resource composed of a solar component and a battery storage component). While this FPA section 205 filing is, in part, in response to the Commission's April 2020 Order,<sup>4</sup> which held in abeyance an ongoing FPA section 206<sup>5</sup> paper hearing<sup>6</sup> regarding the 10-hour performance rule for storage resources,<sup>7</sup> PJM and its stakeholders developed this proposal to ensure that non-traditional resources are able to participate fully in meeting the region's capacity needs. Under this proposal, PJM will be better positioned to ensure the PJM Region maintains reliability through a resource adequacy paradigm that recognizes the benefits and limitations of each resource.<sup>8</sup>

However, it is important to understand the purpose and limitations of the ELCC analysis. The primary objective of the ELCC construct is to ensure that non-traditional resources, as a group, cannot offer to provide more capacity than their aggregate reliability value. As such, the ELCC analysis acts as a reliability backstop, preventing the PJM Region from over-relying on such resources at the expense of system reliability. The ELCC thus sets the *maximum* level of capacity a subject resource may offer; but, sellers

---

<sup>4</sup> *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,015 (2020) ("April 2020 Order").

<sup>5</sup> 16 U.S.C. § 824e.

<sup>6</sup> See generally Docket No. EL19-100-000.

<sup>7</sup> April 2020 Order at ordering para. (C).

<sup>8</sup> As explained below, through this FPA section 205 filing, PJM has satisfied the conditions in the April 2020 Order.

are not required to offer at that maximum level and are free to offer capacity up to that amount, as the seller prefers.<sup>9</sup>

The ELCC methodology is a technology-neutral approach that is based on loss-of-load probability, and is designed to determine a resource's effective contribution to resource adequacy.<sup>10</sup> Through the ELCC analysis, PJM will be able to estimate the amount of load that, on average, each resource can serve when the system is stressed (or, stated another way, how many megawatts ("MW") of capacity the resource can be expected to provide), while also considering load uncertainty and the probabilistic nature of generation shortfalls and random forced outages as driving factors of those stressed system conditions. Further, ELCC analyses are currently used to varying extents for determining resource reliability values by the Midcontinent Independent System Operator, Inc.,<sup>11</sup> the New York Independent System Operator, Inc.,<sup>12</sup> and the California Independent System Operator Corporation.<sup>13</sup>

PJM respectfully requests an effective date of June 1, 2021, for the proposed RAA and Tariff revisions. However, PJM also asks the Commission to issue and order on this

---

<sup>9</sup> In this regard, the ELCC does not establish a new must-offer obligation on resources. Rather, the current rules allowing non-traditional resources to offer up to their capacity capability remain in place; only the mode of determining the capacity capability of a non-traditional resource is changing.

<sup>10</sup> L.L. Garver, *Effective Load Carrying Capability of Generating Units*, IEEE Transactions on Power Apparatus and Systems, vol.PAS-85, issue no.8, Aug. 1966, at 910-919.

<sup>11</sup> See, e.g., *Business Practice Manual: Resource Adequacy, Manual No. 011*, Midcontinent Independent System Operator, Inc., section 4.2.3.2 (rev. 23, Mar. 31, 2020), <https://cdn.misoenergy.org/BPM%20011%20-%20Resource%20Adequacy110405.zip>; *MISO Report for Planning Year 2019-2020: Wind and Solar Capacity Credit*, Midcontinent Independent System Operator, Inc. (Dec. 2018), <https://cdn.misoenergy.org/2019%20Wind%20and%20Solar%20Capacity%20Credit%20Report303063.pdf>.

<sup>12</sup> See, e.g., *N.Y. Indep. Sys. Operator, Inc.*, 170 FERC ¶ 61,033, at PP 80, 113-17 (2020).

<sup>13</sup> See, e.g., *Qualifying Capacity Methodology Manual Adopted 2017*, California Public Utilities Commission (Nov. 2017), <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442455533>.

filing by January 1, 2021, which is more than 60 days from the date of this filing. To that end, PJM has assigned an effective date of January 1, 2021, to a revised tariff record.<sup>14</sup> While PJM is requesting an order by such date, PJM proposes to implement the ELCC construct starting with the 2023/2024 Delivery Year.<sup>15</sup> As Dr. Patricio Rocha Garrido explains in his affidavit, the ELCC model is complex with numerous historical and forecasted inputs, and it must provide outcomes that are consistent with PJM's longstanding reliability metric of a 1-in-10 year loss of load expectation (i.e., 0.1 Loss of Load Expectation ("LOLE")).<sup>16</sup> Accordingly, PJM requires sufficient time (five to six months) from Commission approval to audit, validate, implement, and check the accuracy of the model for the accepted approach<sup>17</sup> before PJM can provide ELCC outputs assessing resources' reliability values in a timeframe consistent with the pre-auction activities for the 2023/2024 Base Residual Auction.<sup>18</sup>

Given the needed implementation time, PJM is proposing to employ the ELCC approach starting with the 2023/2024 Delivery Year. This will provide PJM and sellers sufficient time to perform the ELCC analysis and determine the maximum capacity that

---

<sup>14</sup> Specifically, PJM has assigned an effective date of January 1, 2021, to the Attachment DD title tariff record. No substantive changes are being made to this section.

<sup>15</sup> In the enclosed RAA and Tariff revisions, PJM is including language specifying that the ELCC construct will apply starting with the 2023/2024 Delivery Year. *See* proposed RAA, Schedule 9.1, section I ("Starting with the 2023/2024 Delivery Year, Accredited UCAP values for the applicable Delivery Year shall establish the maximum Unforced Capacity that an ELCC Resource can physically provide or offer to provide in the applicable Delivery Year.").

<sup>16</sup> Affidavit of Dr. Patricio Rocha Garrido on Behalf of PJM Interconnection, L.L.C. ¶ 18 ("Rocha Garrido Aff.").

<sup>17</sup> PJM continues to work with its outside consultant, Energy+Environmental Economics, to review and validate all aspects to the ELCC methodology, including model inputs, algorithms, and model outputs.

<sup>18</sup> In particular, ELCC model outputs are required to provide preliminary default MOPR Floor Offer Prices for ELCC Resources that are Capacity Resources with State Subsidy, and such default prices must be posted 150 days before the conduct of a Base Residual Auction.

each affected resource may offer into the 2023/2024 Base Residual Auction. In other words, PJM does *not* propose to implement ELCC for the next Base Residual Auction, which is for the 2022/2023 Delivery Year.

## **I. BACKGROUND**

### **A. Procedural History**

In the October 2019 Order,<sup>19</sup> the Commission accepted PJM's Order No. 841<sup>20</sup>-related revisions to the Tariff and Operating Agreement. As relevant here, the Commission also: (i) initiated a separate FPA section 206 proceeding in Docket No. EL19-100-000, and directed PJM to submit Tariff provisions reflecting its "minimum run-time" rules and procedures for every resource type; and (ii) initiated a paper hearing in Docket No. EL19-100-000 to investigate whether PJM's "minimum run-time" rules and procedures are unjust, unreasonable, unduly discriminatory or preferential, as applied to Capacity Storage Resources.<sup>21</sup>

On December 12, 2019, PJM submitted a compliance filing addressing the Commission's first directive in Docket No. ER20-584-000, and proposed to incorporate PJM's rules for determining capacity values of all resource types into RAA, Schedule 9.<sup>22</sup>

On November 26, 2019, PJM moved in Docket No. EL19-100-000 for a 90-day extension of time to file its initial brief in the paper hearing contemplated by the

---

<sup>19</sup> *PJM Interconnection, L.L.C.*, 169 FERC ¶ 61,049 (2019) ("October 2019 Order").

<sup>20</sup> *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 841, 162 FERC ¶ 61,127 (2018), *order on reh'g*, Order No. 841-A, 167 FERC ¶ 61,154 (2019), *aff'd sub nom. Nat'l Ass'n of Regul. Util. Comm'rs v. FERC*, 964 F.3d 1177 (D.C. Cir. 2020).

<sup>21</sup> October 2019 Order at PP 140-143.

<sup>22</sup> *PJM Interconnection, L.L.C.*, Compliance Filing Regarding Minimum Run Duration Requirements, Docket No. ER20-584-000 (Dec. 12, 2019) ("December 2019 Compliance Filing").

Commission's second directive.<sup>23</sup> In its November 2019 Motion, PJM expressed its belief that "it is prudent to re-engage with the storage community, along with any other interested stakeholders, on these questions prior to filing the initial brief on the application of the minimum duration rules to Capacity Storage Resources," and that "[s]uch dialogue will allow PJM to explore potential alternative approaches, as well as to ensure that all sides better understand each other's respective positions."<sup>24</sup> On December 6, 2019, the Commission granted PJM's November 2019 Motion and extended the deadline to file initial briefs in Docket No. EL19-100-000 up to and including March 11, 2020.<sup>25</sup>

After additional consultations with its stakeholders, PJM moved on February 27, 2020,<sup>26</sup> to hold the proceedings in Docket Nos. EL19-100-000 and ER20-584-000 in abeyance until January 29, 2021, to allow time for PJM and its stakeholders to develop and file a just and reasonable ELCC construct that would address the issues identified by the Commission in its October 2019 Order initiating the paper hearing in Docket No. EL19-100-000.<sup>27</sup>

---

<sup>23</sup> *PJM Interconnection, L.L.C.*, Motion for Extension of Time of PJM Interconnection, L.L.C., Docket Nos. EL19-100-000, ER19-469-000, ER19-469-001 (Nov. 26, 2019) ("November 2019 Motion").

<sup>24</sup> *Id.* at 3.

<sup>25</sup> *PJM Interconnection, L.L.C.*, Notice of Extension of Time, Docket No. EL19-100-000 (Dec. 6, 2019).

<sup>26</sup> *PJM Interconnection, L.L.C.*, Motion of PJM Interconnection, L.L.C. to Hold Proceedings in Abeyance and for Shortened Comment Period and Expedited Action, Docket Nos. EL19-100-000 and ER20-584-000 (Feb. 27, 2020).

<sup>27</sup> October 2019 Order at P 141 ("Further, the record in this proceeding raises concerns that PJM's application of its minimum run-time rules and procedures to Capacity Storage Resources may be unjust, unreasonable, unduly discriminatory or preferential. For example, commenters argue that: (1) it is unduly discriminatory to apply a 10-hour minimum run-time requirement to Capacity Storage Resources, while only applying a 4-hour minimum run-time requirement to intermittent resources; (2) PJM's 10-hour minimum run-time requirement is not based on a sound consideration of physical and operational characteristics of Capacity Storage Resources; and (3) multiple PJM Tariff provisions differ in the treatment of Capacity Storage Resources and Generation Capacity Resources, even though PJM contends in its Data Request Response that Capacity Storage Resources are Generation Capacity Resources.").

In the April 2020 Order, the Commission: (i) consolidated Docket Nos. EL19-100-000 with ER20-584-000; (ii) expanded the paper hearing in Docket No. EL19-100-000 to include the justness and reasonableness of PJM's methodologies to determine the capability of all types of Generation Capacity Resources; and (iii) granted PJM's motion to hold the proceedings in abeyance in part, holding the consolidated paper hearing procedures in Docket No. EL19-100-000 with ER20-584-000 in abeyance until October 30, 2020. The Commission specified that if PJM filed, pursuant to FPA section 205, a proposed methodology or methodologies to determine the capability of all resource types for Capacity Resource qualification purposes on or before October 30, 2020, the consolidated proceedings would be held in abeyance pending Commission action on that FPA section 205 filing. Through this FPA section 205 filing, PJM has satisfied the conditions in the April 2020 Order.<sup>28</sup>

***B. PJM Stakeholder Process***

On March 29, 2020, the PJM Markets and Reliability Committee ("MRC") authorized the creation of a new task force called the Capacity Capability Senior Task Force ("CCSTF"), which was charged with developing an ELCC construct. The CCSTF met a total of 13 times from April through September 2020 as it worked with PJM staff to develop and vet multiple proposals.

On September 17, 2020, the PJM MRC endorsed a solution package in a sector-weighted vote of 3.98/5.0. On that same day, the PJM Members Committee ("MC")

---

<sup>28</sup> If PJM did not make this FPA section 205 filing, then the consolidated paper hearing procedures in Docket No. EL19-100-000 to address issues raised in Docket Nos. ER20-584-000 and EL19-100-000 would resume, with PJM's initial brief in these proceedings due October 30, 2020, responses due November 20, 2020, and replies to those responses due December 7, 2020. April 2020 Order at ordering para. (C).

endorsed the solution package in a sector-weighted vote of 4.05/5.0. The RAA and Tariff revisions submitted herein effectuate the solution package endorsed by the PJM MRC and MC.

***C. Authorization of the PJM Board of Managers***

Section 16.4 of the RAA specifies that the RAA “may be amended only by action of the PJM Board.” On September 23, 2020, the PJM Board conditionally accepted the substance of the stakeholder-endorsed package, pending finalization of the proposed RAA language by PJM staff. The PJM Board was subsequently notified upon the satisfaction of the conditions and finalization of the RAA revisions developed to implement the stakeholder package in accordance with the Board’s approval and direction.

**II. THE ELCC CONSTRUCT ADVANCES PJM’S ABILITY TO MAINTAIN RELIABILITY WHILE FACILITATING PARTICIPATION OF NON-TRADITIONAL RESOURCES IN MEETING PJM’S CAPACITY NEEDS.**

***A. Overview of PJM’s Proposed ELCC Construct***

The ELCC analysis will allow PJM to assign the maximum quantity of Unforced Capacity (“UCAP”) that can be offered or provided by those Generation Capacity Resources that are unable to maintain output at a stated capability continuously on a daily basis without interruption, i.e., “ELCC Resources.” There are three types of resources that qualify as ELCC Resources: (1) Variable Resources (e.g., Intermittent Resources, such as wind and solar power); (2) Limited Duration Resources (e.g., battery storage resources); and (3) Combination Resources (e.g., resources with a wind or solar component and a storage component). ELCC Resources are divided into these three groups based on their operating characteristics, as discussed below. Generation Capacity Resources that are not ELCC Resources are “Unlimited Resources,” so denoted because they can maintain energy



output throughout an operating day and include typical fossil fuel-based resources and nuclear resources. As explained below, PJM does not propose to alter the current approaches for determining the capacity capability of Unlimited Resources, since the existing rules for such resources adequately account for their periodic unavailability in a way that is comparable to ELCC. Further, PJM does not propose to alter the current approach to determining the capacity capability of Demand Resources or Energy Efficiency Resources, as explained below. Thus, the ELCC analysis will be used only to determine the capacity capability of ELCC Resources.

Using probabilistic modeling, the ELCC analysis evaluates a generator's contribution to system reliability; the analysis distinguishes among generators with differing levels of reliability, size, and hourly output profiles to determine an ELCC rating for a given resource or a class of resources (an "ELCC Class Rating"). Resources that are able to consistently produce energy during hours with a high risk that load exceeds supply have a higher ELCC rating than resources less able to do so. Under the ELCC construct, the applicable capacity value is sensitive to resource deployment levels and to load shapes, and so the analysis and accreditation is updated annually.

An ELCC Resource's capacity capability will be termed "Accredited UCAP" to denominate that the amount is administratively assigned based on the ELCC analysis, and is not solely a function of the resource's installed capacity and historical performance (i.e.,  $\text{MW} * [1 - \text{EFORd}]$ , which is used for Unlimited Resources). As discussed in section II.B.5.h below, an ELCC Resource's Accredited UCAP is based on the output of the ELCC analysis (by way of the class rating), the resource's performance relative to other members of the ELCC Resource's class, and the maximum physical output capability of the resource.

Finally, PJM is including a transition mechanism to establish floor values (for the class rating of each ELCC Class) for rating ELCC Resources to provide ELCC Resources with a minimum capacity value that may be assigned to their ELCC Resource for each of the first 13 Delivery Years. The floor values limit the effective uncertainty in future ELCC values by setting a conservative lower limit on the class rating used to calculate the Accredited UCAP of subject resources. Because the floor values apply only to the class rating, the floors do not set a lower limit on the Accredited UCAP, which can vary based on individual resource performance.

PJM does not propose to alter the current approach for determining the capacity capability of Unlimited Resources, which is memorialized by the RAA revisions submitted in Docket No. ER20-584.<sup>29</sup> The current approach for such resources, which involves testing the maximum output capability, adjusting those test results to match conditions expected during peak load conditions, and application of an Equivalent Demand Forced Outage Rate (“EFORD”)-based performance adjustment based on historical unavailability over several years, provides a reliability result that is comparable to the ELCC value at quantifying the expected amount of output that can serve load during conditions of extremely tight supply. The ELCC analysis also will not be used to determine the Unforced Capacity level of Demand Resources and Energy Efficiency Resources, as RAA, Schedule 6 already provides detailed rules tailored to such resources, and the Commission has found such rules to be just and reasonable.<sup>30</sup>

---

<sup>29</sup> See December 2019 Compliance Filing.

<sup>30</sup> *Id.* at 5 n.17.

PJM is proposing to amend RAA, Schedule 9 to introduce a new Schedule 9.1 that will set forth the rules for how PJM will “determine the capability of ELCC Resources to meet a Load Serving Entity’s obligations under the [RAA] using an effective load carrying capability analysis.”<sup>31</sup> Schedule 9.1 will thus embody the rules for performing the ELCC analysis and determining the Accredited UCAP values for ELCC Resources, and a number of important new defined terms. PJM also is making conforming changes to RAA, Schedule 9 (as submitted in Docket No. ER20-584) and the RPM rules in the Tariff.

***B. Description and Justification for ELCC Construct***

*1. PJM’s proposed ELCC construct provides an appropriate assessment of the potential reliability contribution of ELCC Resources.*

As proposed herein, the ELCC construct presents a just and reasonable alternative to the status quo for measuring and accrediting capacity capability for the subject resource types. It provides a single cohesive analytic framework for diverse resource types with distinct output profiles, including wind, solar, storage, hybrids, and hydropower resource types. While each class of ELCC Resources offers unique capabilities in various configurations, a comprehensive, uniform approach is necessary to ensure comparable capacity accreditations across diverse resource types.

The ELCC methodology recognizes and accounts for the unique characteristics of diverse resource types. It compares the expected hourly output of a resource (or resource class) against expected hourly load for all hours of a planned year. It captures variations in hourly variable resource availability, any correlation in hourly output with load patterns, seasonal variations, and the limited duration characteristic associated with the

---

<sup>31</sup> Proposed RAA, Schedule 9, section D.

dispatchability of the storage component. As Dr. Rocha Garrido explains in his affidavit, PJM's methodology is empirically sound and accounts for this interrelationship between the output of different resources within distinct categories, resources outside of those categories, and load.

Accordingly, PJM's proposed ELCC construct ensures that PJM has a more accurate understanding of the reliability contribution of each resource on its system and can appropriately plan resource adequacy to sustain the 0.1 LOLE standard.

2. *PJM's proposed ELCC construct supports the Commission's longstanding objective of removing barriers to entry and provides a unified, cohesive analytic framework for diverse resource types.*

PJM's proposed ELCC construct is consistent with the Commission's longstanding objective of removing barriers to entry for all resource types, as recently reaffirmed in Order Nos. 841 and 2222.<sup>32</sup> By measuring and assigning the maximum reliability contribution that can be provided by Capacity Resources supported by new technologies, like battery storage, wind, solar, and hybrid resources, PJM is taking a large step forward in removing barriers and further integrating these resource types into PJM's markets. Facilitating participation of these resource types will enhance competition while maintaining a fair accreditation value and system reliability.

---

<sup>32</sup> Order No. 841 at P 10 ("[T]he Commission noted that it has observed that market rules designed for traditional resources can create barriers to entry for emerging technologies. The Commission explained that it was proposing to require the RTOs/ISOs to address barriers to the participation of electric storage resources in the RTO/ISO markets."); *Participation of Distributed Energy Resource Aggregations in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 2222, 172 FERC ¶ 61,247, at P 1 (2020) ("[W]e find that existing RTO/ISO market rules are unjust and unreasonable in light of barriers that they present to the participation of distributed energy resource aggregations in the RTO/ISO markets, which reduce competition and fail to ensure just and reasonable rates."); *see also Demand Response Compensation in Organized Wholesale Energy Markets*, Order No. 745, 134 FERC ¶ 61,187, at P 113 (2011) ("[T]his Final Rule is designed to remove barriers to demand response participation in the organized wholesale energy markets.").

PJM's proposed ELCC methodology will provide an appropriate measure of an ELCC Resource's actual reliability contribution, using a detailed framework that considers the simultaneous reliability contribution of all resources, and recognizes the complementary and antagonistic interactions among resources expected to be able to provide capacity in a given Delivery Year.

Because ELCC recognizes the potential diminishing returns associated with greater levels of deployment for most of the ELCC Resource types (as explained below), it will help ensure that the PJM Region does not become over-dependent on a single resource type with inherent limitations, which could contribute to inadequate system reliability. As future installments of these resource types observe the diminishing returns in reliability contribution (and their ability to earn capacity revenues decreases), market forces could induce technological advancements that offset or actually increase their reliability contribution. At the same time, ELCC recognizes the synergistic relationship among distinct resource types, thus potentially facilitating greater provision of reliability from the various resource classes pooled together across the PJM Region than what those same classes could provide in isolation. ELCC also evolves with a changing load shape, which may be a feature of a future grid that could see greater electrification of heating and transportation.

3. *PJM's proposed ELCC construct appropriately measures and accredits capacity capability of storage resources.*

Because ELCC reflects the characteristics and attributes of storage resource when measuring their potential capacity capability, PJM proposes to replace the existing rule of evaluating how much continuous output a storage resource may provide over a 10-hour period with the ELCC construct. As Dr. Rocha Garrido explains, use of the actual load

shapes since 2012, and forecasted load shapes, in the ELCC model enhances PJM's ability to properly assess a storage resource's capacity capability.<sup>33</sup>

In addition, PJM's proposed ELCC methodology provides capacity accreditations for storage resources in various duration classes, including those that can provide continuous energy for a period as short as four hours. In fact, the ELCC construct can measure and assign the reliability contribution that can be provided by storage resources with maximum durations of 4-hours, 6-hours, 8-hours, and 10-hours. The proposed approach provides that a storage resource (or any Limited Duration Resource) may choose to join any established duration class corresponding to the power output the resource can provide over the characteristic duration of that class. For example, a 2-hour storage resource can join the 4-hour class by using an Effective Nameplate Capacity of 50 percent of the maximum power rating, since such a resource could run for four hours at half power. PJM's approach recognizes that 4-hour storage resources provide less reliability than resources with a 6-hour duration, and that increasing build-out of 4-hour storage resources has diminishing returns, all else being equal.<sup>34</sup> However, the ELCC analysis also reveals the "diversity benefit" when storage and complementary resource types (like solar and wind) are simultaneously added to the system, such that the total benefit may exceed the sum of the parts.<sup>35</sup>

---

<sup>33</sup> Rocha Garrido Aff. ¶ 14(a).

<sup>34</sup> See Energy+Environmental Economics, *Practical Considerations for Application of Effective Load Carrying Capability*, PJM Capacity Capability Senior Task Force Meeting, at 6 (Aug. 7, 2020), <https://www.pjm.com/-/media/committees-groups/task-forces/ccstf/2020/20200807/20200807-item-04-e3-allocating-elccmw-from-portfolio-to-classes.ashx> ("E3 CCSTF Presentation").

<sup>35</sup> See, e.g., E3 CCSTF Presentation at 7.

4. *As part of the ELCC construct, ELCC Resources will be grouped into three resource-type categories based on their physical operating characteristics.*

An ELCC approach to resource adequacy helps capture the reliability contributions of distinct “classes” of resources, and how different resource classes within a portfolio interact to meet resource adequacy needs. For example, an ELCC methodology can capture both the diminishing returns of a specific resource class (e.g., solar) as its build-out increases, and the synergistic (as illustrated by solar and storage) or antagonistic (hydropower and batteries) interactions among diverse resource types as their respective build-outs progress.

As referenced above, PJM proposes a resource taxonomy that begins with three broad categories: (i) Variable Resources; (ii) Limited Duration Resources; and (iii) Combination Resources, which are defined based on their practical operational characteristics. Specifically, a Variable Resource is a Generation Capacity Resource with output that can vary as a function of its energy source, such as wind, solar, run of river hydroelectric power without storage, and landfill gas units without an alternate fuel source. A Limited Duration Resource is a Generation Capacity Resource, such as an Energy Storage Resource, that is not capable of running continuously at Maximum Facility Output for 24 hours or longer, and that is neither a Variable Resource nor a Combination Resource. A Combination Resource is a Generation Capacity Resources that has a component with the characteristics of a Limited Duration Resource combined with either a component that has the characteristics of an Unlimited Resource or a component that has the characteristics of a Variable Resource. Combination Resources, for example, might be solar-battery hybrids or Hydropower With Non-Pumped Storage.

PJM likewise proposes to define “Effective Nameplate Capacity”—a key value in determining ELCC Class Rating and Accredited UCAP values—by recognizing the practical operational characteristics of resource categories. Specifically, PJM proposes to designate the Effective Nameplate Capacity of Variable and Combination Resources as their Maximum Facility Output,<sup>36</sup> and for Limited Duration Resources, as the sustained level of output that the unit can provide and maintain over a continuous period (whereby the duration of that continuous period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, to the extent that such conditions impact such resource’s capability).<sup>37</sup>

Within the framework of these three overarching categories (Variable Resources, Limited Duration Resources, and Combination Resources), PJM proposes to group ELCC Resources into distinct ELCC Classes. PJM will define each ELCC Class such that resources in that class will share a common set of operational characteristics and will be reasonably homogenous both in character and with respect to their impact on system resource adequacy. ELCC Resources within an ELCC Class will share a common method of calculating the ELCC Resource Performance Adjustment—a critical component in the calculation of Accredited UCAP values.

---

<sup>36</sup> For the installed capacity determination of a Combination Resource (other than Hydropower With Non-Pumped Storage), PJM will use “the lesser of the Maximum Facility Output or the sum of the equivalent Effective Nameplate Capacity values of the resource’s constituent components considered on a stand-alone basis.” Proposed RAA, Schedule 9.1, section F.

<sup>37</sup> PJM proposes that the installed capacity of a Limited Duration Resource will be “based on the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, as described in the PJM Manuals.” Proposed RAA, Schedule 9.1, section F.



As explained further below, PJM will use the ELCC analysis method to assign each ELCC Class a unique ELCC Class UCAP and a corresponding ELCC Class Rating for use by individual resources within the class.

Outside of an express stipulation that ELCC Classes be defined for Limited Duration Resources with 4-hour, 6-hour, 8-hour, and 10-hour duration (with matching durations for Combination Resources that are composed in part of one or more such ELCC Classes), PJM proposes to define the specific ELCC Classes in its Manuals. This is in part an acknowledgement that innovation and technological change may considerably alter the kinds of resources participating in PJM's ELCC construct in the coming years, thereby making recitation of all of possible ELCC Class permutations in the RAA impracticable, as they are not "realistically susceptible of specification."<sup>38</sup>

5. *PJM will employ an ELCC analysis to determine the capacity capability, i.e., Accredited UCAP, for ELCC Resources.*

ELCC quantifies the potential reliability contribution of specific resources to resource adequacy. The ELCC analysis utilizes probabilistic modelling that assesses PJM system needs and the ability of each ELCC Resource to meet these needs. Dr. Rocha Garrido explains in detail how the ELCC analysis determines the additional load that the system can supply with an ELCC Resource with no change in reliability.<sup>39</sup> Stated another way, the ELCC analysis compares the hourly simulated output of resource classes against hourly simulated load in order to determine the MWs of capacity a resource class can, on

---

<sup>38</sup> *City of Cleveland v. FERC*, 773 F.2d 1368, 1376 (D.C. Cir. 1985) ("As we observed earlier, there is an infinitude of practices affecting rates and service. The statutory directive must reasonably be read to require the recitation of only those practices that affect rates and service *significantly*, that are realistically *susceptible* of specification, and that are not so generally understood in any contractual arrangement as to render recitation superfluous.").

<sup>39</sup> Rocha Garrido Aff. ¶ 20.

average, provide during shortage or near-shortage hours. The proposed RAA, Schedule 9.1 sets forth the guidelines and principles for performing the ELCC analysis, while the implementation details regarding such analysis will be set forth in the PJM Manuals.<sup>40</sup>

- a. PJM's ELCC analytical methodology recognizes that ELCC Resources will provide capacity simultaneously.

While PJM's ELCC analysis methodology is set forth in detail below and in Dr. Rocha Garrido's affidavit, at a high level, an illustration of an ELCC analysis is as follows: the PJM system is modeled on a base case of the MWs of "Unlimited Resources with no outages"<sup>41</sup> that meets the 0.1 LOLE. Then, an ELCC Resource is added to the system and the model is re-run, and more load is added until the 0.1 LOLE metric is met. The MW of additional load required to maintain 0.1 LOLE represent the subject resource's capacity capability, i.e., Accredited UCAP.

This is obviously a simplified description of the ELCC methodology set forth above, as it applies only to a single resource. But, it raises an essential implementation

---

<sup>40</sup> Proposed RAA, Schedule 9.1, section G. PJM's proposed structure of including in the Tariff the principles and guidelines for the ELCC analysis and placing the implementation details in the PJM Manuals is consistent with the Commission's "rule of reason" "to determine what rules, standards, and practices significantly affect transmission service and, as a result, must be included in the transmission provider's OATT." *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, 118 FERC ¶ 61,119, at P 1649, *order on reh'g*, Order No. 890-A, 121 FERC ¶ 61,297 (2007), *order on reh'g & clarification*, Order No. 890-B, 123 FERC ¶ 61,299 (2008), *order on reh'g & clarification*, Order No. 890-C, 126 FERC ¶ 61,228, *order on clarification*, Order No. 890-D, 129 FERC ¶ 61,126 (2009). The Commission has held that an RTO's business practice manuals are needed "to implement the filed rate and provide technical details, in light of the multitude of occasions in tariff administration that require the exercise of technical or operational expertise." *ISO New England Inc.*, 137 FERC ¶ 61,112, at P 19 (2011). The Commission understands that "study assumptions and parameters are likely to change over time as planners gain experience in implementing the new planning procedures. Thus, rigid specifications or formulas set out in the Tariff would likely lead to less reliable assessments due to the inability of planners to adapt to changing circumstances." *Sw. Power Pool, Inc.*, 136 FERC ¶ 61,050, at P 37 (2011).

<sup>41</sup> See Proposed RAA, Schedule 9.1, section B. PJM's ELCC approach of using "Unlimited Resources with no outages" for its base case is akin to the "perfect generation resource" approach for ELCC modelling. Under this approach a "perfect generator" is assumed to have no transmission constraints, immediate start-up and shut-down, infinite ramping capability, no use limitations, and no outages.

question: how to measure and accredit resources for their specific contributions to reliability. PJM proposes to do so on an aggregate basis. That is, PJM will perform the ELCC analysis on a portfolio of classes “of ELCC Resources that share a common set of operational characteristics” i.e., an “ELCC Class.”<sup>42</sup> Dr. Rocha Garrido observes that “[d]eveloping an adequate methodology to calculate the Accredited UCAP value” of ELCC Resources “requires estimating the performance of these resources during system reliability events, while taking into account that the penetration level of these resources may cause some of the system reliability events.”<sup>43</sup> Dr. Rocha Garrido concludes that “[t]o achieve this, it is necessary to simulate the PJM system under a given portfolio of resources as well as multiple load scenarios and resource performance scenarios.”<sup>44</sup>

In fact, it is preferable to perform the ELCC analysis on a whole ELCC Class and not on a resource-specific basis.<sup>45</sup> One reason for this is that the reliability contribution of a single resource is difficult to determine accurately. Resource-specific determinations are very sensitive and small changes in study parameters (e.g., the resource’s generation profile, load forecast, weather, or the amount of capacity in the subject region) can greatly affect the accuracy of the study outcome. Studying a portfolio of resources on an aggregate basis reduces the chance (and magnitude) of error.

Perhaps more importantly, PJM proposes to study ELCC Resources on a class basis because resources of a similar type have similar limitations resulting in diminishing returns

---

<sup>42</sup> Proposed RAA, Article 1 – Definitions.

<sup>43</sup> Rocha Garrido Aff. ¶ 9.

<sup>44</sup> Rocha Garrido Aff. ¶ 9.

<sup>45</sup> The determination of an ELCC Resource’s Accredited UCAP value will include a resource-specific adjustment that accounts for the resource’s historical performance.

from each incremental MW added from such resource type. Thus, for example, a system with just one solar resource providing reliability benefits during the early afternoon (when load is high and solar irradiance remains relatively high) derives a relatively high reliability benefit from that solar output profile. However, addition of solar resources with the same general output pattern yields diminishing reliability benefit because reducing the degree of risk in the late afternoon peak can shift the daily peak risk to the early evening, when solar resource output begins a rapid decline. The same potential phenomenon of diminishing reliability value generally holds true for other ELCC Resource types. During the stakeholder process, for example, PJM's consultant, Energy+Environmental Economics, illustrated the diminishing capacity value of 4-hour storage resources, when periods of peak risk are at levels that are sustained for more than four hours, but more MWs of 4-hour storage are added to the system.<sup>46</sup>

PJM also properly proposes to model simultaneously *all* ELCC Resources expected for the Delivery Year to account for complementary and antagonistic interactions between different ELCC Resource types. The concurrent presence of certain resource types can create a “diversity benefit,” such that the combined reliability benefit exceeds each resource type's individual reliability benefit if studied separately.<sup>47</sup> For example, solar and wind resources may be complementary because wind resources generally produce more energy during the night when solar is not available, while solar resources produce more energy during the mid-day hours. In this way, ELCC values for a resource can actually increase with time when there is greater buildout in other, complementary classes. By

---

<sup>46</sup> See E3 CCSTF Presentation at 6.

<sup>47</sup> See E3 CCSTF Presentation at 7.

contrast, some resource types have an antagonistic relationship because they have similar performance limitations. For example, battery storage and hydropower resources with water storage are both energy limited, and thus each might be working to reduce a similar duration peak risk period as the other type. Once that peak risk period is addressed, the reliability value of both resource types diminishes. Through this portfolio approach, PJM can avoid errors in the reliability analysis, such as not recognizing that increased solar penetration may meet peak afternoon demands, but may leave the region susceptible to a loss of load event in the evening.

In a given event or Delivery Year, all resources with capacity commitments provide reliability benefits simultaneously. Accordingly, PJM's proposed approach to modelling classes of ELCC Resources assigns the aggregate reliability benefit of the class across all class members. This ensures that the total reliability benefit is allocated among the members of the class, and that the members, in aggregate, are compensated for that quantity at the applicable clearing price.

As a result, PJM's ELCC analysis will help determine the: (1) ELCC Portfolio UCAP value; (2) ELCC Class UCAP values; and (3) ELCC Class Rating values.<sup>48</sup> As explained below, the ELCC Portfolio UCAP and ELCC Class UCAP values are used to determine the ELCC Class Rating, which is a direct input in the determination of each ELCC Resource's Accredited UCAP.

---

<sup>48</sup> Proposed RAA, Schedule 9.1, section A.

- i. PJM and stakeholders selected the “adjusted class average” approach over the “marginal” approach.*

During the stakeholder process, PJM and its stakeholders explored two primary paths—a “marginal” approach, and an “adjusted class average” approach. PJM and stakeholders elected the “adjusted class average” approach. In a “marginal” accreditation framework, resources are credited based on their marginal contribution to system resource adequacy needs—i.e., given the target resource mix with many other ELCC Resources present as a baseline, based on the change in reliability of adding or subtracting a small increment of the class. Generally speaking, a marginal ELCC framework can use the ELCC analysis to develop an economically efficient signal to the market for entry and exit of capacity resources. However, the marginal framework does not generally credit a *portfolio* of resources for its total contribution to resource adequacy. This is because the marginal ELCCs of resources will generally be different from the average reliability contribution, since the marginal value changes with a changing resource mix. In particular, holding all else equal in the resource mix, increasing buildout of one class will decrease the marginal reliability value within that class.

An “adjusted class average” accreditation framework consists of two primary steps. First, the administrator calculates a portfolio ELCC reliability value in MW (what PJM is defining below as the “ELCC Portfolio UCAP”). Second, the administrator allocates that ELCC portfolio value to each class (defined in PJM’s proposal as the “ELCC Class UCAP”), so that the sum of all classes matches total portfolio ELCC value. This method ensures a correct total ELCC, and thereby provides an accurate measure of total reliability contribution. It also ensures that each resource is responsible for and compensated for their

share of the total reliability contribution of the class, without changing the basic tenets of the capacity market, such as performance obligations, offer structures, and auction clearing.

With both a marginal and an adjusted class average approach, complications may arise with increasingly segmented classes that may be developed to capture distinctions between resources (e.g., distinctions based on renewable technology differentiations, storage duration, or hybrid resource configurations). Depending on how such classes are defined, uniform allocation of portfolio UCAP to all ELCC Resource classes can present challenges in adequately accounting for the interactive effects of the resource mix, or in appropriately capturing the nature of all such interactions. Therefore, the definition of ELCC classes must be done carefully to avoid meaningless artifacts in the allocation of ELCC Portfolio UCAP to ELCC Class UCAP.

After thoroughly discussing the benefits and costs of each approach, PJM and its stakeholders ultimately decided to proceed with an adjusted class average approach. This decision was based on several considerations. The purpose of PJM's proposed ELCC is to establish the physical capability of resources in the capacity market. This allows resource providers the opportunity to provide capacity up to the appropriate level, while preventing resources from being offered at a greater level of reliability than they are physically capable of providing. Thus, the ELCC construct is not being established to determine signals for entry and exit to the market—the auction clearing process and Capacity Performance obligations already accomplish that objective. Further, an adjusted class average approach appropriately places ELCC in a reliability “backstop” role, by virtue of the fact that resources cannot offer more in aggregate than their total reliability value as a class. This ensures that reliability will remain the primary objective against which the enhanced

market efficiencies gained from an ELCC construct will be measured. Thus, an adjusted class average approach appropriately allows Capacity Market Sellers to determine the potential risk/reward of offering a certain amount of UCAP into the capacity market, which is consistent with the Commission-approved Capacity Performance construct.<sup>49</sup>

b. Inputs to PJM's ELCC analysis

The ELCC analysis includes the following six primary data sources:

1. Historical weather and load data;
2. Historical output of existing Variable Resources;
3. Estimates of putative historical output for planned Variable Resources;
4. Forced outage patterns for Unlimited Resources;
5. Resource deployment forecast; and
6. Modeling parameters for Limited Duration Resources and Combination Resources.<sup>50</sup>

In other words, PJM will include the data for all existing and forecasted Unlimited Resources, Variable Resources, Limited Duration Resources, and Combination Resources. PJM will rely on “resource deployment forecasts” and “on available information based on” RPM Auctions offers or FRR Capacity Plans “for the applicable Delivery Year” to determine the quantity of deployed resources included in the analysis.<sup>51</sup> Consistent with other resource adequacy studies, such as PJM’s Reserve Requirement Study,<sup>52</sup> the analysis does not consider energy-only resources—that is, capacity that does not participate in the capacity market. This aligns with the principle that PJM should not count on PJM energy-

---

<sup>49</sup> See *PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,208, at P 355 (2015).

<sup>50</sup> Proposed RAA, Schedule 9.1, section A.

<sup>51</sup> Proposed RAA, Schedule 9.1, section G. PJM will omit energy-only resources from the ELCC analysis, as such resources have no obligation to provide capacity and therefore cannot be relied on to meet reliability needs. Proposed RAA, Schedule 9.1, section G.

<sup>52</sup> As Dr. Rocha Garrido explains, PJM uses the Reserve Requirement Study model to calculate the Forecast Pool Requirement, a key input to derive the Variable Resource Requirement Curve in the Reliability Pricing Model. See Rocha Garrido Aff. ¶ 31.



only resources to be available for resource adequacy purposes, since by definition they have no obligation or commitment to do so. To the extent that an ELCC Resource is expected to provide capacity at a level less than its Accredited UCAP (e.g., if it is partially pseudo-tied elsewhere), PJM will consider in the analysis only the proportion of the resource equal to the “expected quantity offered or delivered divided by the Accredited UCAP.”<sup>53</sup>

To ensure a significant and representative data set for these quantities, PJM will utilize “actual values for load and actual and putative values for Variable Resource output” from June 1, 2012, “through the most recent Delivery Year for which complete data exist.”<sup>54</sup> “Putative values” will be used for Variable Resources for Delivery Years in which the Variable Resource included in the analysis was not in service since June 1, 2012, and such values are “an estimate of the hourly output that resource would have produced in a historical hour if that resource had existed in that hour,” based on historical weather data “consistent with the [resource’s] particular site conditions.”<sup>55</sup>

In addition to these inputs, PJM performs the ELCC analysis to ensure PJM targets its longstanding reliability metric of a 0.1 LOLE,<sup>56</sup> which equates to an expectation of a loss of load event 1-day-in-10 years.<sup>57</sup> In PJM’s model, “a loss of load occurs when the hourly load is greater than the hourly output of all the resources considered available in the

---

<sup>53</sup> Proposed RAA, Schedule 9.1, section G.

<sup>54</sup> Proposed RAA, Schedule 9.1, section G.

<sup>55</sup> Proposed RAA, Schedule 9.1, section G. The implementation details for determining the putative values will be set forth in the PJM Manuals.

<sup>56</sup> See *PJM Interconnection, L.L.C.*, 155 FERC 61,157, at P 32 (2016) (“As the Capacity Performance Order recognized, the primary purpose of PJM’s capacity market is to procure sufficient capacity to meet its reliability objective, which currently is a loss of load expectation of 1-day-in-10-years.”).

<sup>57</sup> Rocha Garrido Aff. ¶ 18.

simulation.”<sup>58</sup> As Dr. Rocha Garrido notes, this “provide[s] consistency with other parameters used in RPM and with PJM’s planning standards.”<sup>59</sup>

- c. Performing PJM’s ELCC analysis and simulating the output of Variable Resources, Limited Duration Resources, and Combination Resources appropriately accounts for their reliability value and operational realities.

As Dr. Rocha Garrido explains, with these data and parameters in place, PJM will model “a range of future system conditions,” which Dr. Rocha Garrido denominates “as ELCC Scenarios.”<sup>60</sup> Because “[e]ach one of the ELCC Scenarios has a probability of occurrence associated with it,” “the ELCC methodology is probabilistic in nature.”<sup>61</sup>

Due to data availability and software capabilities, PJM will use an hourly interval in performing the ELCC analysis,<sup>62</sup> “compar[ing] expected hourly load levels (based on historical weather)” with the expected output of the “expected future resource mix” for each hour to “identify the relative resource adequacy value of” the portfolio of all ELCC Classes and each individual ELCC Class, as compared to Unlimited Resources with no outages.<sup>63</sup> The proposed RAA language specifies that the ELCC analysis “shall compare hourly values for: (i) expected load based on historical weather; (ii) expected Variable Resource output; and (iii) expected output of Limited Duration Resources and of

---

<sup>58</sup> Rocha Garrido Aff. ¶ 19.

<sup>59</sup> Rocha Garrido Aff. ¶ 18.

<sup>60</sup> Rocha Garrido Aff. ¶ 12.

<sup>61</sup> Rocha Garrido Aff. ¶ 12.

<sup>62</sup> Rocha Garrido Aff. ¶ 13.

<sup>63</sup> Proposed RAA, Schedule 9.1, section G.

Combination Resources.”<sup>64</sup> Stated another way, PJM will model for two broad types of uncertainty—load uncertainty and resource performance uncertainty.<sup>65</sup>

To model for load uncertainty, PJM will derive a “range of future Hourly Load Shapes [] . . . consistent with: (i) actual weather experienced during historical years; and (ii) the most recent PJM load forecast model;” i.e., “the actual weather during the historical years will be input into the PJM load forecast model to derive [Hourly Load Shapes] for a future target delivery year.”<sup>66</sup> Because “wind and solar performance is dependent on weather in the same way that load is dependent on weather,” PJM is preserving in the model, to the extent practicable, “the correlation between load and wind/solar performance.”<sup>67</sup> For each Hourly Load Shape, PJM will assess the probability of occurrence to determine the most representative cluster of summer and winter peaks for each of the approximately 300 modeled weather scenarios.<sup>68</sup>

To model for resource output uncertainty, PJM will simulate “the hourly output of each resource associated with each Hourly Load Scenario,” using approaches specific to each class i.e., Unlimited Resources, Variable Resources, Limited Duration Resources, and Combination Resources.<sup>69</sup> For Unlimited Resources, PJM will use “Monte Carlo sampling to derive the availability/unavailability patterns related to forced outages and a

---

<sup>64</sup> Proposed RAA, Schedule 9.1, section G.

<sup>65</sup> Rocha Garrido Aff. ¶ 12.

<sup>66</sup> Rocha Garrido Aff. ¶ 14(a).

<sup>67</sup> Rocha Garrido Aff. ¶ 14(a). Dr. Rocha Garrido explains that because the ELCC analysis “provides a means to simulate the performance of [Variable] resources during system reliability events while taking into account the fact that the penetration level of these resources may cause some of the system reliability events,” “the modeling of resource performance for Variable Resources in the ELCC model should strive to capture the relationship between the output of Variable Resources and load conditions in the system.” *Id.* ¶ 15(b).

<sup>68</sup> Rocha Garrido Aff. ¶¶ 14(b)(i)-(iv).

<sup>69</sup> Rocha Garrido Aff. ¶ 15.

deterministic scheduling algorithm to derive the availability/unavailability patterns related to planned and maintenance outages.”<sup>70</sup> For Variable Resources, PJM will “derive Hourly Output Shapes [] for Variable Resources based on the historical actual and historical putative performance of the Variable Resources for the same set of historical years considered in the Hourly Load Scenarios creation,” and, therefore, “the historical relationship between the output of Variable Resources and load conditions in the system is not lost in the ELCC model.”<sup>71</sup>

The output simulation of Limited Duration Resources and Combination Resources should not be based directly on historical performance but rather their behavior “should be reflective of the rest of system conditions (load, other resources’ performance) simulated in the ELCC model.”<sup>72</sup> This is because “these resource categories can vary their output based on system conditions,”<sup>73</sup> in contrast to Variable Resources, which generally produce the maximum available energy unless curtailed. The simulated scenarios “are *based* on historical weather/load data and resource performance data for some resource categories, but they do not represent identical system conditions as those experienced historically,”<sup>74</sup> e.g., because the simulated Installed Reserve Margin may be lower in the simulation than it had been historically.

Dr. Rocha Garrido explains that “PJM is not proposing to simulate an economic dispatch in the ELCC model” due to software limitations and other complexities, but PJM

---

<sup>70</sup> Rocha Garrido Aff. ¶ 15(a).

<sup>71</sup> Rocha Garrido Aff. ¶ 15(b).

<sup>72</sup> Rocha Garrido Aff. ¶ 15(c).

<sup>73</sup> Rocha Garrido Aff. ¶ 15(c).

<sup>74</sup> Rocha Garrido Aff. ¶ 15(c).

will use the following four principles to govern its simulation.<sup>75</sup> First, PJM will simulate the dispatch of all economic generation resources, including Limited Duration Resources and Combination Resources, before deploying Demand Resources, and then only to maintain adequate Primary Reserves.<sup>76</sup> This is because, unless the Demand Resource has been registered as an Economic Load Participant resource, it does not participate in the energy and ancillary services markets, and is called upon only in pre-emergency and emergency events. Since the analysis omits energy-only resources, and since Economic Load Participant registrations are by definition energy-only, such resources are omitted from the model. Simulated Primary Reserves will be assigned to economic resources, with Limited Duration Resources and Combination Resources assigned reserves on a pro rata basis according to their Effective Nameplate Capacity.<sup>77</sup> Thus, the model adheres to Tariff rules and operational reality.

Second, because of imperfect foresight, “the simulated dispatch for Limited Duration Resources and Combination Resources [in a specific simulated hour] is not dependent on the ELCC model’s simulated system conditions in the future.”<sup>78</sup> In other words, the model does not simulate any foresight across hours of a simulated day, and so does not unreasonably assume greater reliability value than is possible in operating reality in light of imperfect forecasts of future load, variable energy resource output, generation

---

<sup>75</sup> Rocha Garrido Aff. ¶ 15(c).

<sup>76</sup> See Rocha Garrido Aff. ¶ 15(c).

<sup>77</sup> Proposed RAA, Schedule 9.1, section H. Demand Resources are Capacity Resources and generally participate in PJM’s Emergency Load Response Program. However, to participate in the energy and ancillary services markets, sellers of demand response resources must register as Economic Load Response Participants.

<sup>78</sup> Rocha Garrido Aff. ¶ 15(c)(ii).

outages, and prices. As a result, the model conservatively simulates the behavior of Limited Duration Resources and Combination Resources.

Third, PJM will simulate the output of Limited Duration Resources and Combination Resources “in hours in which all output from Unlimited Resources and available output from Variable Resources is insufficient to meet load,” based on the physical parameters of the expected Limited Duration Resources and Combination Resources, including limited storage capability.<sup>79</sup> Dr. Rocha Garrido explains that this principle “recognizes that to take advantage of the flexibility provided by Limited Duration Resources and Combination Resources, and thus maximize their reliability benefit to the PJM system, it is essential to dispatch these resources after Unlimited Resources and Variable Resources.”<sup>80</sup>

Finally, PJM recognizes that some individual resources are so unique and include parameters that “impact[] their potential dispatch . . . [and] therefore, do not lend themselves to be modeled, for simulated dispatch purposes, in an aggregate fashion.”<sup>81</sup> For example, and as discussed in detail below, Hydropower With Non-Pumped Storage resources are too distinct from one another for them to be modeled as a class, and PJM proposes to model them in a resource-specific ELCC analysis.

---

<sup>79</sup> Proposed RAA, Schedule 9.1, section H.

<sup>80</sup> Rocha Garrido Aff. ¶ 15(c)(iii).

<sup>81</sup> Rocha Garrido Aff. ¶ 15(c)(iv).

- d. The determination of Accredited UCAP, i.e. how much capacity an ELCC Resource may provide, relies on the ELCC analysis outputs.

PJM's approach employs a hierarchical method to determine the Accredited UCAP of each ELCC Resource, as explained below. At the top is the ELCC Portfolio UCAP, which "establishes the Effective UCAP value of the entire set of ELCC Resources under evaluation."<sup>82</sup> At the mid-level are the ELCC Class UCAP values, which each "establishes the Effective UCAP value for the entire set of resources that are members of an ELCC Class."<sup>83</sup> At the bottom are the ELCC Class Rating factors, which in turn contribute to setting (in conjunction with resource-specific performance adjustments) the Accredited UCAP values, establishing the maximum Effective UCAP value that can be provided from each ELCC Resource.

- e. Using the ELCC analysis outputs to determine ELCC Class Ratings

The ELCC analysis will yield an ELCC Portfolio UCAP for the subject Delivery Year. ELCC Portfolio UCAP represents the sum of the capacity capability of all ELCC Resources modeled in the ELCC analysis (i.e., all ELCC Resources expected to offer into an RPM Auction or otherwise provide capacity in a given Delivery Year).<sup>84</sup> As stated in proposed RAA, Schedule 9.1, section B, the ELCC Portfolio UCAP for a given Delivery Year shall be: "the aggregate installed capacity 'X' of a group of Unlimited Resources with no outages [which] yields the same [0.1 LOLE] as the one produced by the scenario with

---

<sup>82</sup> Rocha Garrido Aff. ¶ 23.

<sup>83</sup> Rocha Garrido Aff. ¶ 23.

<sup>84</sup> Proposed RAA, Article 1 – Definitions ("ELCC Portfolio UCAP' shall mean the aggregate Effective UCAP that all modeled ELCC Resources are capable of providing in a given Delivery Year.").

all ELCC Resources that are expected to offer in a given RPM Auction, or otherwise provide capacity.”<sup>85</sup>

While the objective is to determine the capacity capability of individual ELCC Resources for a given Delivery Year, PJM must first determine the aggregate capacity capability of each ELCC Class. As discussed, ELCC Classes are comprised of ELCC Resources that are “reasonably homogeneous in character and with respect to impact on system resource adequacy.”<sup>86</sup> For example, all solar resources (both tracking and fixed-tilt) might share a class, or all 4-hour storage resources. PJM will utilize an ELCC analysis to allocate the ELCC Portfolio UCAP among the ELCC Classes, “such that the aggregate of all ELCC Class UCAP values is equal to the ELCC Portfolio UCAP.”<sup>87</sup> However, as discussed below, the determination of an ELCC Class UCAP is subject to adjustment to the extent the ELCC Class Rating used to determine an ELCC Resource’s Accredited UCAP value is below the posted floor value for such ELCC Class.

The ELCC Class UCAP is conceptually “allocated” among the modeled members of the class using the ELCC Class Rating, which is expressed as a percentage. However, it bears emphasis that the ELCC Class UCAP does not set a limit on the aggregate UCAP of all *actual* resources of a class for which an Accredited UCAP is calculated. Rather, the ELCC Class UCAP is based only on the resources represented within the model (i.e., resources *expected to* provide capacity in the modeled Delivery Year), and is used in the calculation of the ELCC Class Rating, which in turn is used to determine the Accredited

---

<sup>85</sup> Proposed RAA, Schedule 9.1, section B.

<sup>86</sup> Proposed RAA, Article 1 – Definitions (ELCC Class).

<sup>87</sup> Proposed RAA, Schedule 9.1, section C.



UCAP for all applicable *actual* resources, regardless of whether more or fewer such actual resources are accredited relative to what has been anticipated in the model. The ELCC Class Rating is analogous to the “capacity factor” for wind and solar resources that is referred to in PJM Manual 21,<sup>88</sup> reflecting the performance characteristics or history of the resource type that PJM has used to de-rate wind and solar resources and determine the maximum Unforced Capacity such resources may provide in a given Delivery Year.<sup>89</sup> The class rating for each ELCC Class is determined based on the ratio of the Effective UCAP allocated to the class and the sum of the Effective Nameplate Capacity of the modeled resources in the class, i.e., (ELCC Class UCAP / [sum of Effective Nameplate Capacity of the ELCC Class]).<sup>90</sup> For example, where an ELCC Class UCAP is 100 MW, and the Effective Nameplate Capacity of all modeled members of the relevant ELCC Class is 150 MW, the ELCC Class Rating for that class would be 66.7 percent, i.e., (100/150).

f. Determination of the resource-specific ELCC Resource Performance Adjustment for Variable Resources and Limited Duration Resources

To determine the Accredited UCAP of a Variable Resource or a Limited Duration Resource for a given Delivery Year, PJM will multiply the ELCC Resource’s Effective

---

<sup>88</sup> *PJM, Manual 21: Rules and Procedures for Determination of Generating Capability*, Appendix B (rev. 14, Aug. 1, 2019), <https://www.pjm.com/-/media/documents/manuals/m21.ashx>.

<sup>89</sup> See, e.g., *PJM Interconnection, L.L.C.*, Second Compliance Filing Concerning Application of the Minimum Offer Price Rule, Docket No. ER18-1314, et al., at 31 (June 1, 2020) (“The conversion of a nameplate \$/MW-day to a UCAP \$/MW-day value requires a capacity factor that reflects the performance characteristics or history of the resource type. To determine New Entry MOPR Floor Offer Price, PJM will use the class average values for the capacity value factor applicable to that resource type. Thus, for example, . . . solar and wind will use their respective class average capacity value factor, . . . . These adjustment factors are not new.”).

<sup>90</sup> Proposed RAA, Schedule 9.1, section D (“The ELCC Class Rating of Variable Resources and Limited Duration Resources shall be the ratio of the applicable ELCC Class UCAP to the aggregate Effective Nameplate Capacity of that ELCC Class that are expected to offer in a given RPM Auction, or otherwise provide capacity, in the Delivery Year being analyzed.”).

Nameplate Capacity by the ELCC Class Rating *and* by a resource-specific performance adjustment (the “ELCC Resource Performance Adjustment”). The resource-specific adjustment is necessary because the ELCC Class Rating is determined on an aggregate basis, and thus does not account for how a resource actually performs. All else being equal, ELCC Resources that contribute more reliability than other members of the class should be allowed to provide more capacity than lower performing members. The proposed methods for determining the performance adjustments broadly align with the ELCC metric itself, so that Accredited UCAP values would be similar to what a resource-specific ELCC analysis would yield.

For some ELCC Resource types, PJM is proposing to use the resource’s EFORD<sup>91</sup> in determining the ELCC Resource Performance Adjustment. This metric is applied to Limited Duration Resources, and as discussed in more detail in the next section below, to Combination Resources with only an Unlimited Resource component and a Limited Duration Resource component, Hydropower With Non-Pumped Storage resources, and the non-Variable Resource component of a Combination Resource with a Variable Resource component. As described above, the output of all such resources is controllable up and down, and is expected to be responsive to modeled future conditions that are distinct from historical conditions. As such, historical measurements of actual output of such resources do not inform a reasonable performance adjustment. Instead, a measurement of unavailability, such as EFORD, is more suited to the characteristics of such resources. A resource that is more unavailable during times of system demand will have a higher EFORD

---

<sup>91</sup> The performance adjustment in such cases is equal to 1 minus EFORD.

and a lower contribution to reliability in a way that is identical to the way UCAP for Unlimited Resources is calculated, and is also broadly consistent with what a resource-specific ELCC analysis would yield for such ELCC Resources if their unavailability were individually simulated within the model.<sup>92</sup>

For Variable Resources, PJM proposes to measure each resource's actual energy output "during the 200 highest coincident peak load hours over the preceding ten years, regardless of the year in which they occur," and "during the 200 highest coincident peak putative net load hours over the preceding ten years, regardless of the year in which they occur, where putative net load is actual load minus the putative hourly output of Variable Resources based on the resource mix of the target year."<sup>93</sup> A resource's performance adjustment is set to the ratio of the above metric to the weighted average of that metric across all resources in the class. Therefore, a resource with identical performance to the class overall would have a performance adjustment of 100 percent; a better resource could have a performance adjustment of e.g., 140 percent, while a worse resource could have an adjustment of e.g., 60 percent.

The proposed ELCC Resource Performance Adjustment for Variable Resources broadly aligns with the ELCC analytical approach as follows. Because ELCC looks at historical values over many years, and because most years do not involve extremely high loads that pose a reliability risk, looking at the top coincident peak conditions over a longer, 10-year period (regardless of the year in which these peak hours occur) is necessary to

---

<sup>92</sup> In contrast to the representation of Unlimited Resources in the model, forced outages of Limited Duration and Combination Resources are not simulated within the ELCC model, so that the effect of a downward UCAP adjustment for such ELCC Resources based on EFORd is not inadvertently double counted.

<sup>93</sup> Proposed RAA, Schedule 9.1, section E(2)(a).

align the performance adjustment with the ELCC analysis—many years will have few or no coincident peak hours, and a few years will contain many or even most such hours. A resource’s historical output during the last 10 years’ gross load hours is analogous to (and roughly proportional to) the resource’s reliability contribution in a hypothetical resource mix consisting entirely of Unlimited Resources (that is, in the absence of other ELCC Resources). The historical output during the last 10 years’ “putative net load” hours is analogous to (and roughly proportional to) the resource’s marginal reliability contribution in a resource mix representative of the target year. Assuming a linear change in marginal reliability contribution with greater deployment, the “average” ELCC value falls halfway between the marginal ELCC value and the ELCC value in the absence of all other ELCC Resources. That is, the average of (a), the reliability contribution in the absence of any other ELCC resources and (b), the marginal reliability contribution under the target resource mix, yields a value (c) that is consistent with the “average ELCC value.” In this way, since PJM proposes an “average” ELCC approach, the proposed performance adjustment is a reasonably straightforward approach that broadly aligns with the ELCC value if calculated for a single resource.

g. Performing the ELCC Analysis for Combination Resources other than Hydropower With Non-Pumped Storage

PJM’s proposed ELCC approach takes comprehensive consideration of the unique aspects of Combination Resources, including solar plus storage hybrids, which are comprising an ever-increasing share of the PJM interconnection queue. In general, the output of such Combination Resources is not identical to the output of two equivalent but separately-sited units comprising each of the Combination Resource’s constituent components. This is because (a) most proposed Combination Resources in the PJM queue

share a power-constrained grid connection point which limits the combined output of the components to less than their individual maximum power ratings, and (b) many proposed Combination Resources are configured such that the storage component cannot charge from the grid, and therefore can only charge during times that the paired resource is producing. For example, a 100 MW Combination Resource might consist of a 100 MW solar component and a 30 MW storage component. If the storage component is producing 30 MW, the solar component cannot produce more than 70 MW. As another example, a solar plus storage resource that cannot charge from the grid would only be capable of charging during daylight hours, while a standalone storage resource might ordinarily charge at night.

Because the hourly profile of Combination Resources can be materially distinct in this way, it is important to accurately model such resources with their unique characteristics, both in order to produce accurate ELCC results for Combination Resources and also to produce model results that are accurate overall for all resources. Specifically, for Combination Resources with a Variable Resource component, PJM proposes to simulate the output of such resources based on: (i) the expected available production of the Variable Resource component; (ii) the expected behavior of the storage component, consistent with the general principles of the simulated output of standalone Limited Duration Resources; and (iii) the physical constraints, such as the constraint limiting the combined output of the two components, and the constraint on certain hybrids that they cannot charge from the grid. For Combination Resources with an Unlimited Resource component, PJM proposes to model the output of the Unlimited Resource component consistent with all other Unlimited Resources in the model (except without forced outage),

and the limited duration component consistent with all other limited duration resources in the model.

Using the hourly output of Combination Resources as described above, the ELCC Class UCAP value is derived as for other classes. However, allocating this class UCAP to individual units (ordinarily accomplished through a single ELCC Class Rating value) is more complicated for Combination Resources with a Variable Resource component, which instead are assigned a pair of class ratings. This is necessary since, even within a single Combination Resource ELCC Class, there will be diversity both in Variable Resource availability (e.g., poor wind sites versus good ones), but also in the power and energy capability of the accompanying storage. PJM will account for the diversity in Variable Resource availability with direct measurement of the Variable Resource output (together with a backcast of what that direct measurement would have been in historical years prior to commercial operations),<sup>94</sup> which is used to calculate a partial ELCC Performance Adjustment for the Variable Resource component.<sup>95</sup> This accounts for a portion of the ELCC Class UCAP. PJM will manage the energy capability diversity by separating Combination Resources into distinct duration classes (e.g., solar plus 4-hour battery storage, solar plus 8-hour battery storage, etc.). And, PJM will address the diversity in storage power capability (that is, the fact that some solar plus battery hybrids may have a small battery system relative to the solar component, others a relatively large one) by allocating a portion of the ELCC Class UCAP on the basis of the actual storage power

---

<sup>94</sup> Proposed RAA, Schedule 9.1, section E(2)(a).

<sup>95</sup> Proposed RAA, Schedule 9.1, section E(2)(d)(1).

rating, and then adjusting that by a factor of 1 minus the applicable EFORD.<sup>96</sup> In effect, the Variable Resource component of the plant has a “component rating” and an ELCC Resource Performance Adjustment that is quantitatively identical to the ELCC Class Rating and ELCC Resource Performance Adjustment for a similar standalone Variable Resource, and the storage component of the plant has a different “component rating” that is functionally similar to, but numerically different from, the ELCC Class Rating for a similar standalone storage resource.

For Combination Resources with an Unlimited Resource component, the performance adjustment is simply based on EFORD.<sup>97</sup>

Notwithstanding the above, Hydropower With Non-Pumped Storage constitutes a special class of Combination Resource with its own unique treatment, as described below.

h. Determination of Accredited UCAP for an ELCC Resource

The final product, and ultimate purpose of the ELCC methodology, is the determination of an ELCC Resource’s Accredited UCAP. The assigned Accredited UCAP sets a maximum amount of capacity an ELCC Resource may offer or provide in a given Delivery Year, subject to the amount of Capacity Interconnection Rights secured for the resource.<sup>98</sup> That is, the amount of capacity an ELCC Resource can provide is the lesser of its capacity capability (i.e., Accredited UCAP) and transmission constraints (i.e., Capacity

---

<sup>96</sup> Proposed RAA, Schedule 9.1, section E(2)(d)(2).

<sup>97</sup> Proposed RAA, Schedule 9.1, section E(2)(c).

<sup>98</sup> Proposed RAA, Article 1 – Definitions (“‘Accredited UCAP’ shall mean the quantity of Unforced Capacity, as denominated in Effective UCAP, that an ELCC Resource is capable of providing in a given Delivery Year.”).

Interconnection Rights). Stated another way, a resource cannot offer more capacity than it is capable of providing nor more capacity than it is capable of delivering.

For Variable Resources and Limited Duration Resources, PJM will calculate the Accredited UCAP value for each ELCC Resource based on the product of: (1) the resource's Effective Nameplate Capacity; (2) the applicable ELCC Class Rating;<sup>99</sup> and (3) the resource's ELCC Resource Performance Adjustment.<sup>100</sup>

The determination of Accredited UCAP for Combination Resources with a Variable Resource component follows a similar principle, but is equal to the sum of the component accreditations. Thus, for example, where the Combination Resource is composed of a Variable Resource component and a Limited Duration Resource component, the Accredited UCAP will be equal to the sum of: (a) for the Variable resource component, which is the product of (1) the applicable Variable Resource ELCC Class Rating, (2) the Effective Nameplate Capacity of the Variable Resource component, and (3) the ELCC Performance Adjustment based on the directly measured output of the Variable Resource component; plus (b) for the Limited Duration Resource component the product of (1) the equivalent effective nameplate of the storage component, and (1 minus the applicable EFORD) for the Limited Duration Resource component and (2) the quotient of (i) the Combination Resource ELCC Class UCAP minus the [product of the Variable Resource ELCC Class Rating and the aggregate Effective Nameplate Capacity of all the Variable Resource components within the subject Combination Resource class] divided by

---

<sup>99</sup> However, for Hydropower With Non-Pumped Storage resources, PJM shall use a resource-specific effective load carrying capability analysis based on the resource's unique parameters in place of an ELCC Class Rating.

<sup>100</sup> See Proposed RAA, Schedule 9.1, section E(1).



(ii) the aggregate equivalent Effective Nameplate Capacity of all the Limited Duration Resource components within the subject Combination Resource class. While this method does borrow the ELCC Class Rating for the corresponding standalone Variable Resource class, by using the Combination Resource ELCC Class UCAP in the latter quotient, this method applies the actual reliability value of the fully-fledged Combination Resource class as identified in the model, rather than inappropriately applying the separately-derived reliability values for the standalone Variable Resource class and the standalone Energy Storage Resource class to the uniquely situated Combination Resources.

- i. Performing the ELCC analysis and determination of Accredited UCAP for Hydropower With Non-Pumped Storage, which has unique physical characteristics and requires unique ELCC treatment.

Hydropower With Non-Pumped Storage resources have physical characteristics that set them apart from other resource classes, and which make each resource sufficiently distinct from other such Hydropower With Non-Pumped Storage resources, so that a resource-specific ELCC treatment is required. These resources generally consist of a dam on a river system that has either pondage or a reservoir in which the owner can store and release water in a controlled fashion across the hours of an Operating Day, making their generation output discretionary and dispatchable, unlike hydro plants without such water storage. Hydropower With Non-Pumped Storage resource can generally exhibit: (i) hourly and monthly variations in incoming streamflow; (ii) potential monthly variations in their maximum water storage capability (and hence effective energy storage capability); (iii) the potential ability to produce extra energy during emergency conditions by reducing pondage

or reservoir levels below normal, hence drawing on an Exigent Storage Capability;<sup>101</sup> (iv) interactions among such generation resources on the same river system, especially with respect to water released from Exigent Water Storage that becomes available to downstream resources; and (v) a potential monthly variation in maximum and/or minimum allowable power levels. Because each resource can and does differ from the others on each of these aspects, it is not feasible to treat each of them as part of a single class. Accordingly, PJM proposes a “resource-specific ELCC” approach for such resources that rationally differs from the treatment of other classes. While PJM will use EFORD to determine the ELCC Resource Performance Adjustment, there is no common ELCC Class Rating that is shared among all members of this class for determining Accredited UCAP. Instead, each resource gets a specific UCAP value as an output of the ELCC model, which is then adjusted by (1 minus EFORD) to determine its Accredited UCAP. This difference between Hydropower With Non-Pumped Storage and the other ELCC classes is reflected in various aspects of this proposal in which Hydropower With Non-Pumped Storage resources have a slightly different or unique treatment.

6. *PJM is proposing reasonable information gathering and process requirements that will allow PJM to perform its ELCC analysis.*

Section I of PJM’s proposed RAA, Schedule 9.1 establishes the process by which the Generation Capacity Resource Provider of each ELCC Resource must submit to PJM the information necessary to perform the ELCC analysis. Given the various permutations

---

<sup>101</sup> PJM is proposing to define Exigent Water Storage as “water stored in the pondage or reservoir of a hydropower resource which is not typically available during normal operating conditions (as those conditions are described in the relevant FERC hydropower license), but which can be drawn upon during emergency conditions (as described in the FERC hydropower license), including in order to avoid a load shed. In an effective load carrying capability analysis, exigent storage capability from an upstream hydro facility can be considered relative to a downstream hydro facility by assessing cascading storage and flows.” Proposed RAA, Article 1 – Definitions.

of information that may be applicable for each resource now and in the future, PJM proposes to define the majority of its specific informational requirements in the PJM Manuals, as they are not “realistically susceptible of specification”<sup>102</sup> in the RAA. However, section I provides customers with important guidelines and principles, including that the required information “may include relevant physical parameters, relevant historical data such as weather data and actual or estimated historical energy output, and documentation supporting such parameters and historical data,” and that “[s]ubmitted parameters must indicate the expected duration for which any submitted physical parameters are valid.”<sup>103</sup> In general, such information requirements will vary by class. All Generation Capacity Resource Providers of each applicable ELCC Resource must submit the required information (if any) to PJM by no later than the July 1 immediately preceding the calendar year in which the ELCC Resource intends to submit a Sell Offer into an RPM Auction or otherwise commit to provide capacity (e.g., through an FRR plan or a bilateral transaction). A notable exception is for Delivery Years prior to the 2026/2027 Delivery Year, whereby the nature and deadlines for such required information must be provided to PJM in accordance with the PJM Manuals. This is necessary because the scheduling of the next four Base Residual Auctions is not yet precisely established, and because it will take time to implement the complete information gathering process, especially associated with Planned Resources in the interconnection queue.

---

<sup>102</sup> *City of Cleveland*, 773 F.2d at 1376 (“As we observed earlier, there is an infinitude of practices affecting rates and service. The statutory directive must reasonably be read to require the recitation of only those practices that affect rates and service *significantly*, that are realistically *susceptible* of specification, and that are not so generally understood in any contractual arrangement as to render recitation superfluous.”).

<sup>103</sup> Proposed RAA, Schedule 9.1, section I.

Once Generation Capacity Resource Providers submit the necessary information to PJM, PJM will evaluate and validate the information. While section I provides PJM with sufficient dexterity in evaluating the potentially wide universe of data it may receive,<sup>104</sup> several important stipulations are explicitly made. First, in evaluating the validity of submitted information, PJM may assess the consistency of such information with observed conditions. Second, in the event that PJM observes that the information provided by the Generation Capacity Resource Provider of the ELCC Resource is inconsistent with observed conditions, PJM will “coordinate with the Generation Capacity Resource Provider of the ELCC Resource to understand the information and observed conditions before making a determination regarding the validity of the applicable parameters.”<sup>105</sup> Third, if necessary, PJM may engage the services of a consultant with technical expertise to evaluate the submitted information. These provisions ensure that PJM communicates and coordinates with Generation Capacity Resource Providers and any necessary consultants to validate the information received, prior to making any determination.

Upon completion of PJM’s evaluation, PJM will notify the Generation Capacity Resource Provider in writing whether the submitted information is considered invalid by no later than September 1, following the submission of the information. The effective date of the valid data, if approved by PJM, will be no earlier than June 1 of the applicable Delivery Year. PJM’s determination on the validity of the submitted information will continue for the applicable Delivery Year and, if requested, for such longer period as PJM may determine is supported by the data.

---

<sup>104</sup> Proposed RAA, Schedule 9.1, section I.

<sup>105</sup> Proposed RAA, Schedule 9.1, section I.

In addition to describing the applicable information submission and evaluation processes, Section I explicitly states the consequences of PJM being unable to validate submitted information. Specifically, in the event that PJM is unable to validate any of the required information, physical parameters, supporting documentation, or other related information submitted by the Generation Capacity Resource Provider of an ELCC Resource, PJM will calculate Accredited UCAP values for that ELCC Resource based only on any information that was able to be validated. Section I further stipulates that such ELCC Resource shall not be permitted to offer or otherwise provide capacity above such Accredited UCAP values until PJM determines new Accredited UCAP values for the resource based on a more complete set of validated information. Given the centrality of validated information to the overall functioning of the ELCC analysis, PJM believes these consequences are appropriate.

7. *PJM will timely publicize the ELCC analysis results, including ELCC Class Ratings, by posting them on its website.*

Proposed RAA, Schedule 9.1, section I requires that PJM post final ELCC Class UCAP and ELCC Class Rating values once per year in a report, which includes appropriate details regarding methodology and inputs. PJM will post this report (and communicate to Generation Capacity Resource Providers their resource's ELCC Resource Performance Adjustment values) no later than five months prior to the start of the target Delivery Year, as described in the PJM Manuals. Section I stipulates that starting with the 2023/2024 Delivery Year, Accredited UCAP values for the applicable Delivery Year will establish the maximum Unforced Capacity that an ELCC Resource can physically provide or offer to provide in the applicable Delivery Year.

Section I also requires that PJM post preliminary ELCC Class Rating values for nine subsequent Delivery Years (to be finalized in advance of the start of each Delivery Year). For any Delivery Year in which a final ELCC Class Rating has not been posted and a preliminary ELCC Class Rating has been posted, the Accredited UCAP of an ELCC Resource for such Delivery Year will be based on the most recent preliminary ELCC Class Rating value for that Delivery Year, together with the most recently posted ELCC Resource Performance Adjustment value for that ELCC Resource. For example, the ELCC Class Ratings for the Delivery Year that starts on June 1, 2026, might be posted in December 2025. Such values would apply to transactions in the third and final Incremental Auction for the 2026/2027 Delivery Year, as well as to actual provision of capacity for that Delivery Year. However, there might also be a Base Residual Auction for the 2029/2030 Delivery Year run in May 2026. Such auction would not use the ELCC Class Rating that applies to the 2026/2027 Delivery Year, but rather a different, preliminary ELCC Class Rating that would also be posted in December 2025 that would explicitly apply for the 2029/2030 Delivery Year. These preliminary ELCC Class Ratings would effectively cap offers into the Base Residual Auctions for later Delivery Years, even though they would ultimately be superseded by final ELCC Class Ratings that might be published in December 2028, before the start of the applicable Delivery Year. PJM proposes to limit the amount of capacity that may be offered into auctions to avoid a scenario in which, under circumstances of continually declining ELCC Class Ratings for a given ELCC Class, Capacity Market Sellers systematically offer more in Base Residual Auctions than they expect to be able to provide in the actual Delivery Year. Such behavior would be unjust

financial arbitrage in a market that is intended only for transactions in physical products, and would unduly suppress prices.

Under PJM's proposal, if final ELCC Class Ratings exceed preliminary ratings for the same Delivery Year, Capacity Market Sellers may have an opportunity to sell additional UCAP in the third Incremental Auction for such Delivery Year. By contrast, if final ELCC Class Ratings are less than preliminary ones, then Capacity Market Sellers might need to buy back any shortfalls in order to avoid applicable Deficiency Charges. This is identical to the process in place today, where an Unlimited Resource's final EFORD is not known until the December before the Delivery Year, and if the EFORD is higher than was what assumed at the time of the Base Residual Auction for the Delivery Year, the seller must make up the shortfall or face Deficiency Charges.<sup>106</sup>

Except as mentioned above, and unless otherwise stipulated in the proposed RAA language or in other provisions, the preliminary ELCC Class Rating values for future years are non-binding and are only for indicative purposes.

Unless an ELCC Resource is subject to a capacity market must-offer obligation, a Generation Capacity Resource Provider can offer or provide capacity from an ELCC Resource at a level less than the Accredited UCAP for such resource.

#### *8. Description of process leading to annual ELCC report*

PJM intends to review and manage the ELCC methodology, assumptions, inputs, and administrative procedures through an annual stakeholder cycle similar to that used to manage the Reserve Requirement Study, and post an annual report on the ELCC

---

<sup>106</sup> Tariff, Att.DD, section 8.

construct.<sup>107</sup> Currently, the Resource Adequacy Analysis Subcommittee meets several times per year to review and debate relevant details and proposed changes to the Reserve Requirement Study. Similarly, prior to posting of the annual ELCC report, the Resource Adequacy Analysis Subcommittee (or a similar stakeholder body) would review and discuss draft methodology, assumptions, inputs, and other relevant details of the ELCC construct. As part of that process, PJM would propose any material changes to give sufficient time for review, debate, and any necessary approvals. In many cases, PJM may find it appropriate to post preliminary results for discussion.

In administering and documenting the ELCC construct, PJM strives to provide sufficient transparency that interested parties have the opportunity to reproduce ELCC results to a sufficient degree of accuracy that they can anticipate future ELCC values, especially for the purposes of investment decisions. Thus, a substantial amount of data on the hourly inputs discussed above will be posted in each annual cycle, along with a significant degree of detail on the precise methodology.

#### 9. *Transition Mechanism*

The ELCC revisions include a transition mechanism in proposed RAA, Schedule 9.1, section J, to be reviewed for continued retention, possible elimination, or revisions no later than the 2026 quadrennial review, designed to put a conservative lower bound on the inherent year-to-year volatility in ELCC determinations that result in Accredited UCAP calculations for individual resources. This means that *some* ELCC resources, for some years, could receive an Accredited UCAP *higher* than the value the ELCC method, standing alone, would produce. The transition also includes an offsetting mechanism to

---

<sup>107</sup> Proposed RAA, Schedule 9.1, section I.



reduce the Accredited UCAP for certain *other* ELCC resources to a level *lower* than the value the ELCC method, standing alone, would produce for those resources. This approach provides some limited protection to individual resources against major downward variations in Accredited UCAP, while still assuring that, on an ELCC Portfolio basis (if not, in most cases, on an ELCC Class basis) the ELCC resource adequacy calculated as appropriate for the year is preserved on at least a portfolio (if not also on a class) basis.

a. Source of volatility

Resource adequacy values for any given resource are inherently more variable under the ELCC method than they are under capability measurements that are solely focused on individual resource characteristics. In simplest terms, ELCC looks as much at what the system needs, as at what the resource can provide (although that remains an important consideration). More specifically, ELCC determinations depend on projections of expected load, projections of resource portfolio mix, and projections of expected contributions from each of the numerous resource classes. Each of those many projections, and the assumptions that go into those projections, can vary over the course of any multi-year period for which such projections are made. More significantly, those projections and assumptions can (and almost certainly will) change each year as PJM updates its projections, taking new facts and new expected policy changes into account. As a result of the ELCC method, those changes in projections and assumptions will filter down to changes over time in the Accredited UCAP calculated for individual ELCC Resources.

b. Concerns raised by the expected volatility in Accredited UCAP determinations.

Accredited UCAP helps determine the maximum level (leaving aside auction clearing prices and possible Capacity Performance bonuses) of compensation a Capacity

Resource Seller can receive for committing its Capacity Resource to the resource adequacy needs of the PJM Region. Because the ELCC method can change an ELCC Resource's Accredited UCAP each year, the maximum capacity commitment for which the resource seller can be compensated will change (perhaps significantly) from year to year. ELCC Resource providers, some of whom will likely initially receive higher UCAP values under ELCC than they would obtain under the current resource-focused methods, appropriately should bear some (if not all) of the volatility risk inherent in the ELCC approach. As ELCC methods are adopted in the PJM Region and elsewhere around the country, project developers and financing entities will gain experience with that volatility and deeper understanding of the factors that influence ELCC UCAP level volatility, allowing them to develop financing and contract terms by which the market, in effect, allocates that volatility risk at a project level.

PJM's proposal may raise concerns among some parties that, with little current practical experience with ELCC methods, Accredited UCAP calculations under an ELCC approach could change in substantial and unexpected ways. With no bounds on the future volatility in a given resource's compensable capacity commitment value, financing entities may err on the side of over-pricing the volatility risk, and individual resources could be placed in financial distress if their Accredited UCAP is severely and unexpectedly reduced in a future year. From a system or policy level, over-priced volatility risk for ELCC resources could lead to higher resource adequacy costs for PJM Region consumers.

In PJM's view, this concern is reasonably expected to be mitigated or reduced as parties gain experience with changing UCAP determinations under the ELCC method. Therefore (as discussed in more detail below), while the proposed RAA revisions do not

state a sunset date for the UCAP floor rules described here, PJM firmly views them as transitional, and is committed to an informed, rigorous review of these provisions (based on the experience gained) by no later than the 2026 quadrennial review.

c. Defining a lower bound on Accredited UCAP changes.

The filed approach to this issue appropriately leaves most risk of individual resource UCAP changes with the resource provider, and protects that provider only against large downward swings in class ratings. In particular, because much of the inherent volatility in the ELCC method stems from uncertainty in the future resource adequacy contributions from numerous different resource classes, the approach proposed here calculates UCAP floor values based on an alternative ELCC scenario of large variances—doubling or halving of growth over the course of a decade, based on the likely direction of the influence—in the build-out of particular ELCC resource classes relative to the baseline projection of those classes’ penetration levels.<sup>108</sup> For any given ELCC resource class, the resulting scenario is particularly adverse, and thus sets the UCAP floor at a level materially below that expected from routine variability.

An example helps illustrate how this approach sets the UCAP floor at a conservative level, i.e., a level that is in the realm of possibility, but not probable. Two principles provide the context for these conservative scenario analyses. First, greater build-out of an ELCC resource class can diminish the resource adequacy of that class, all else equal. Higher penetration by solar resources, for example, can shift the daily peak risk window into the evening; adding more solar resources at that point will not help reduce that evening peak risk. Similarly, higher penetration by 4-hour battery storage yields

---

<sup>108</sup> Proposed RAA, Schedule 9.1, section J(3)(d).

diminishing value as they “flatten” the daily risk window to ever longer durations. Second, different resource classes can be antagonistic or synergistic to one another in an ELCC analysis. When increased penetration by one resource class tends to *reduce* the resource adequacy value of a second class, the two classes are said to be *antagonistic*. By contrast, when increased penetration by one resource class tends to *increase* the resource adequacy value of a second class, the two classes are said to be *synergistic*. So, for example, solar and 4-hour batteries can be synergistic, because the batteries can be deployed effectively to address the short-duration evening peak risk window that results from high solar penetration. By contrast, increased penetrations by hydro and storage resources can become antagonistic beyond a certain level, as their energy limitations both require longer and longer durations to provide effective contributions to resource adequacy. Their antagonistic effects are similar to, and mutually reinforce, the diminishing value of greater hydro penetration by itself, and greater penetration of limited duration storage by itself.

The proposed conservative scenarios *double* any projected increase after 10 years in the penetration of the resource class for which the floor value is being calculated;<sup>109</sup> *double* any expected increase after 10 years in the projected penetration of resource classes that produce antagonistic effects on the subject class;<sup>110</sup> and *halve* any expected increase after 10 years in the projected penetration of resource classes that have synergistic effects

---

<sup>109</sup> See Proposed RAA, Schedule 9.1, section J(3)(d)(i) (stating, more precisely, that “[a]ny expected increase in deployment of ELCC Resources in the given subject class in each year shall be accelerated in an exponential fashion such that the increase in deployment after 10 years shall be twice the value in the expected forecast”).

<sup>110</sup> See Proposed RAA, Schedule 9.1, section J(3)(d)(iii) (stating, that “any expected increase in deployment in an antagonistic class shall be accelerated in an exponential fashion such that the increase in deployment after ten years shall be twice the value in the expected forecast”). Correspondingly, “any expected decrease in deployment in a complementary ELCC Class shall be accelerated in an exponential fashion such that the decrease in deployment after ten years shall be twice the value in the expected forecast.” Proposed RAA, Schedule 9.1, section J(3)(d)(ii).

on the subject class.<sup>111</sup> So, using the examples above (and assuming each has an increasing trend), the floor value calculation for the 4-hour battery resource class would (among other class changes): (i) double the increase in penetration (relative to the baseline forecast adopted in the ELCC analysis) of 4-hour storage; (ii) double the increase in penetration of hydro; and (iii) halve increase in the penetration of solar. That scenario could substantially reduce the resource adequacy value of 4-hour storage, or could lessen the extent of increase in its resource adequacy value, and thus calculate a fairly low aggregate UCAP value for that resource class, and correspondingly low class rating floors for the individual resources in that class.

One could envision scenarios in which each of these penetration rate changes is plausible for a given class. In particular, federal and state policies have had profound effects on the current penetration levels of wind and solar resources, and are providing support and encouragement for battery storage development and deployment. Consequently, future positive or negative policy changes could dramatically aid or impair the rate of continued growth and development in the renewable and storage sectors. Significant future policy changes likely also constitute the single most uncertain, and least controllable, exogenous factor affecting future ELCC calculations; the floor calculation thus could be seen as a rough proxy for the uncertainty of significant future policy changes.

Admittedly (even though the conservative scenario focuses on changes in penetration rate, as opposed to changes in overall penetration levels), the simultaneous combination of adverse changes in the rate of penetration for the subject class, synergistic

---

<sup>111</sup> See Proposed RAA, Schedule 9.1, section J(3)(d)(ii) (stating that “any expected increase in deployment in a complementary ELCC Class shall be decelerated in an exponential fashion such that the increase in deployment after ten years shall be half the value in the expected forecast”).

classes, and antagonistic classes produces a relatively low-probability scenario. This is compatible, however, with the purpose of the conservative scenario, as essentially a judgment about a level of tolerance for allowing an ELCC Resource to have an Accredited UCAP *higher* than the ELCC method—which is equally applied to all ELCC Resources—would otherwise produce. To put it simply, that level of tolerance is, and should be, low. The floor-value adjustment is thus best viewed as protecting individual ELCC Resources from relatively low likelihood, seriously adverse, unexpected changes in the conditions and assumptions that govern the ELCC calculations.

d. Preservation of ELCC Portfolio and Class UCAP assignments when ELCC Class Rating floor values bind.

For any given Delivery Year, ELCC Resources will be assigned an Accredited UCAP based on the higher of the ELCC Class Rating floor value or the ELCC Class Rating calculated under the standard ELCC methodology, times the applicable ELCC Resource Performance Adjustment.<sup>112</sup> Absent a corrective measure, this means that when a floor binds, the entire ELCC Portfolio UCAP would be assigned an aggregate UCAP above the limit PJM’s ELCC analysis found appropriate to rely on ELCC Resources for resource adequacy, and that the ELCC Class UCAP quantity from each ELCC Class for which a floor bound would likewise be above the limit PJM found appropriate to rely on from that class. This would make the PJM Region over-reliant on ELCC Resources, i.e., straying into a circumstance in which ELCC Resources may be counted on to provide more value than they are physically capable of providing.

---

<sup>112</sup> Proposed RAA, Schedule 9.1, section J(3)(e)(i).

Accordingly, as a necessary part of the transitional UCAP floor proposal, PJM must reduce the ELCC Class Rating of other ELCC Resources, to offset the increase in the ELCC Class Rating for ELCC Resources for which the floor bound, and thus preserve the ELCC Portfolio UCAP and ELCC Class UCAP values determined in PJM's ELCC analysis.<sup>113</sup>

To broaden the base for spreading these offsetting adjustments (and thus lessen the impact on any individual resource), PJM will work with stakeholders to group classes that have similar relevant physical characteristics (e.g., 4-hour and 6-hour storage), to produce groups that are (and likely will be) broad enough to include a significant fraction of the ELCC Portfolio UCAP.<sup>114</sup> PJM will then sum the aggregate ELCC Class UCAP assigned to those classes of the group under the standard ELCC analysis, and subtract from that sum the floor-determined ELCC Class Rating for each ELCC Resource in any of those classes for which the floor bound. This calculation yields for the ELCC Classes in the group a lower aggregate UCAP assignment (compared to the standard ELCC determination) to be allocated among the ELCC Resources in the group for which the floor did not bind. PJM will allocate that residual UCAP quantity among those resources pro rata, based on Effective Nameplate Capacity and Performance Adjustment.<sup>115</sup>

As a fallback, if ELCC Class Rating floor values have bound to such an extent that there are not sufficient offsets available from other resources in the group (i.e., without

---

<sup>113</sup> See Proposed RAA, Schedule 9.1, section J(3)(e)(ii).

<sup>114</sup> See Proposed RAA, Schedule 9.1, section J(3)(e)(iii), (iv). As with the ELCC classes themselves, PJM will define the groups in the PJM manuals, applying the principles specified in the RAA. *Id.*

<sup>115</sup> See Proposed RAA, Schedule 9.1, section J(3)(e)(ii)(1), (2).

pushing *those* resources below the floor), PJM will perform the same type of offsetting calculation on a total ELCC portfolio basis.<sup>116</sup>

e. Defining the time period for ELCC Class Rating floor values.

Under the proposed transition mechanism, PJM will calculate and post during each calendar year ELCC Class Rating floor values for each ELCC Class for the following<sup>117</sup> 10 Delivery Years, supplemented with floor values for the eleventh, twelfth, and thirteenth Delivery Years (relative to the initial posting time) in the first, second, and third following calendar years (respectively).<sup>118</sup> The resulting 13 Delivery Years defines a “cohort” of ELCC Class Rating floor values, named after the calendar year of the first posting.<sup>119</sup> Setting floor values for 13 years ensures that, in general, all resources, including planned resources that typically would not be placed in service for up to three years after PJM’s posting, receive floor values for at least 10 Delivery Years of expected service. Thirteen years also is consistent with National Renewable Energy Laboratory data showing debt financing periods of 12 to 20 years for new large—scale solar resources.<sup>120</sup> As can be seen, while each cohort ultimately includes 13 Delivery Years, PJM will not calculate floor

---

<sup>116</sup> See Proposed RAA, Schedule 9.1, section J(3)(e)(ii)(3), (4).

<sup>117</sup> As noted in footnote 119 below, the first two cohorts depart from this rule slightly by including the Delivery Year that begins in the calendar year of the posting

<sup>118</sup> See Proposed RAA, Schedule 9.1, section J(2).

<sup>119</sup> See Proposed RAA, Schedule 9.1, section J(2). The first cohort will be the 2021 cohort, and will include all Existing Generation Capacity Resources as of year-end 2021 (or those that, before year-end 2021, meet specified new services queue milestones, and attest their intent to provide capacity to the PJM Region). The 2021 posting for that cohort will provide a draft table of floor values for the 2021/2022 through 2030/2031 Delivery Years, supplemented with floor values for the 2031/2032 Delivery Year, 2032/2033 Delivery Year, and 2033/2034 Delivery Year posted in 2022, 2023, and 2024, respectively. The 2022 cohort will begin with the 2022/2023 Delivery Year, and will be posted in 2022.

<sup>120</sup> David Feldman and Paul Schwabe, *Terms, Trends, and Insights on PV Project Finance in the United States, 2018*, National Renewable Energy Laboratory, <https://www.nrel.gov/docs/fy19osti/72037.pdf>.



values more than 10 years in advance, given the increased uncertainty for ELCC forecasts made 11, 12, or 13 years in advance.

f. Limited ability to change posted floors.

As noted, PJM will initially post preliminary floor values.<sup>121</sup> These preliminary floor values will become final within 120 days of their initial posting, which allows a period of time for PJM to identify any potential errors in the initially posted values, and to determine (following Market Participant consultation) whether to modify any of the initially posted floor values.<sup>122</sup> Specifically, PJM must notify Market Participants of any identified errors no later than 60 days after the initial posting. PJM must then, within 45 days of identifying an error, consult with Market Participants and provide supporting documentation.<sup>123</sup> If PJM determines to correct a draft value, it must provide notice of that intent no later than 45 days after PJM's notification of identification of the error.<sup>124</sup> PJM then has a deadline of 120 days after posting the draft values to make the correction.<sup>125</sup> If any of these deadlines passes without PJM taking the described action, the originally posted preliminary floor values become final.<sup>126</sup>

These provisions are designed to ensure that PJM has an avenue for correcting errors in the posted floor values, while putting a clear time limit on those corrections, and providing affected Market Participants an opportunity for consultation and review of

---

<sup>121</sup> See Proposed RAA, Schedule 9.1, section J(2)(c).

<sup>122</sup> See Proposed RAA, Schedule 9.1, section J(2)(c).

<sup>123</sup> See *id.*

<sup>124</sup> See *id.*

<sup>125</sup> See *id.*

<sup>126</sup> See Proposed RAA, Schedule 9.1, section J(2)(c).

supporting data. As such, these provisions ensure that ELCC Resource providers can rely on the floor values as they seek financing arrangements.

In the same vein, PJM can revise posted final floor values under only limited circumstances, including if PJM ceases to perform the ELCC analysis, or if PJM no longer determines Accredited UCAP before conducting an RPM Auction.<sup>127</sup> Both of these scenarios implicitly assume that the RAA and/or Tariff provisions requiring the ELCC analysis or Accredited UCAP determinations have been revised, in accordance with the FPA (or successor authority) and PJM's then-applicable stakeholder process, which is PJM's intent. These limits on changes to final posted floor values recognize that ELCC resource providers may have secured financing that assumes the resource's compensable capacity commitment level will be no lower than the posted floor values for the applicable Delivery Years.

g. Transitional nature of floor methodology.

As noted, PJM views this UCAP floor mechanism as transitional, to help address uncertainty about possible volatility in ELCC UCAP determinations before stakeholders have gained experience with the operation of those provisions in practice. The proposed revisions accordingly provide that this mechanism "can be evaluated at any time and *shall* be evaluated in conjunction with [the RPM] quadrennial periodic review . . . no later than the end of 2026."<sup>128</sup> The Commission has recognized the importance of ongoing review of such ELCC provisions.<sup>129</sup> The proposed RAA prescribes that "[s]uch evaluation shall

---

<sup>127</sup> See Proposed RAA, Schedule 9.1, section J(3)(f).

<sup>128</sup> Proposed RAA, Schedule 9.1, section J(1) (emphasis added).

<sup>129</sup> See, e.g., *N.Y. Indep. Sys. Operator, Inc.*, 170 FERC ¶ 61,033, at P 119.

include an assessment of the efficacy and appropriateness of the transition mechanism and shall make recommendations as to whether some or all aspects of the transition mechanism should be reconsidered through a stakeholder process.”<sup>130</sup>

Importantly, any outcome of that evaluation will not change the fact that “the already-established floor values and associated term duration for each cohort should apply for their entire term,” except in the case of the broader changes to ELCC or RPM noted above.<sup>131</sup>

***C. Conforming Changes to Capacity Market Rules in the Tariff***

To effectively implement the ELCC construct and allow resources to offer up to their respective Accredited UCAP levels in RPM Auctions, PJM is proposing three conforming changes to its capacity market rules. Specifically, PJM is proposing revisions to Tariff, Attachment DD, sections 5.6, 5.10, and 5.14. Because PJM requires time to finalize the model and implementation of the ELCC construct based on the Commission order accepting this proposal, each of these capacity market rule changes specifies that the revisions are effective starting with the 2023/2024 Delivery Year, and the existing rules continue to apply through the 2022/2023 Delivery Year.

In section 5.6, which sets forth the rules for Sell Offers into RPM Auctions, PJM proposes to update the specification for Capacity Storage Resources, Intermittent Resources, Demand Resources, or Energy Efficiency Resources to clarify that, starting with 2023/2024 Delivery Year, a Sell Offer for an ELCC Resource cannot “exceed the

---

<sup>130</sup> Proposed RAA, Schedule 9.1, section J(1).

<sup>131</sup> *Id.*

Accredited UCAP of the resource.”<sup>132</sup> In other words, this change ensures that the RPM Auctions rules implement the core principles of the ELCC construct—all ELCC resources cannot offer more than their aggregate reliability value (denoted in Accredited UCAP) and sellers retain the ability to offer less than the maximum amount based on their assessment of the resource’s conditions and risks.

In section 5.14(h-1), PJM is proposing to update the rules for determining the default MOPR Floor Offer Prices for new and existing ELCC Resources so that the cost of new entry values are appropriately adjusted to reflect the capacity capability of the resource. For New Entry Capacity Resources with State Subsidy, the determination of the default MOPR Floor Offer Price for battery storage, wind, and solar resource types will use the “applicable ELCC Class Rating.”<sup>133</sup> For Cleared Capacity Resources with State Subsidy, the default MOPR Floor Offer Price for solar and wind resource types will be determined using “the resource-specific Accredited UCAP value for solar and wind resource types (with appropriate time-weighting for any winter Capacity Interconnection Rights).”<sup>134</sup> PJM is providing that any resource-specific MOPR Floor Offer Price for an ELCC Resource will use the resource’s Accredited UCAP.<sup>135</sup> Thus, starting with the 2023/2024 Delivery Year, the default MOPR Floor Offer Prices applicable to any ELCC Resource will reflect properly the capacity capability of the resource.

---

<sup>132</sup> Proposed Tariff, Attachment DD, section 5.6.1(h).

<sup>133</sup> Proposed Tariff, Attachment DD, section 5.14(h-1)(2)(A).

<sup>134</sup> Proposed Tariff, Attachment DD, section 5.14(h-1)(2)(B). There is no default value for a Cleared Capacity Resources with State Subsidy that is a battery storage resource because there is no such existing resource.

<sup>135</sup> Proposed Tariff, Attachment DD, section 5.14(h-1)(3).

Finally, PJM is revising Tariff, Attachment DD, section 5.10(a) to add a new subsection (vii) to clarify that the ELCC transition mechanism will be reviewed in conjunction with the quadrennial review of the Variable Resource Requirement (“VRR”) Curve shape no later than December 31, 2026. As stated there, PJM will review the transition mechanism alongside its VRR Curve review process, and “[b]ased on the results of such review, PJM shall prepare a recommendation to either modify or retain the existing ELCC transition mechanism.”<sup>136</sup> Further, like the VRR Curve process, PJM “shall post the recommendation and shall review the recommendation through the stakeholder process to solicit stakeholder input.”<sup>137</sup>

### **III. EFFECTIVE DATE AND IMPLEMENTATION TIMELINE**

PJM requests an effective date of June 1, 2021, for the proposed RAA and Tariff revisions. However, PJM also asks the Commission to issue an order on this filing by January 1, 2021, which is more than 60 days from the date of filing. To that end, PJM has assigned an effective date of January 1, 2021, to one revised tariff record.<sup>138</sup> PJM requests an order by January 1, 2021, to ensure sufficient time to collect and validate the necessary data from providers of ELCC Resources and to complete its review and validation of the ELCC model. Given these time requirements, PJM proposes to implement the ELCC construct starting with the 2023/2024 Delivery Year.<sup>139</sup> That means that PJM does *not*

---

<sup>136</sup> Proposed Tariff, Attachment DD, section 5.10(a)(vii).

<sup>137</sup> Proposed Tariff, Attachment DD, section 5.10(a)(vii).

<sup>138</sup> Specifically, PJM has assigned an effective date of January 1, 2021, to the Attachment DD title tariff record. No substantive changes are being made to this section.

<sup>139</sup> In the proposed RAA and Tariff revisions, PJM included language specifying that the ELCC will apply starting with the 2023/2024 Delivery Year. *See* proposed RAA, Schedule 9.1, section I (“Starting with the 2023/2024 Delivery Year, Accredited UCAP values for the applicable Delivery Year shall establish the maximum Unforced Capacity that an ELCC Resource can physically provide or offer to provide in the

propose to implement it for the next upcoming Base Residual Auction, for the 2022/2023 Deliver Year.

Under an accelerated schedule, PJM requires five to six months from Commission approval to complete the review and validation of the ELCC model and derive ELCC Class Ratings, ELCC Resource Performance Adjustments, Accredited UCAP values for all ELCC Resources existing or reasonably expected to offer to provide capacity for the 2023/2024 Delivery Year. Dr. Rocha Garrido explains that the ELCC analysis is probabilistic in nature, requiring modelling “the performance of resource portfolios under a range of future system conditions,” with each resulting scenario assigned a probability of occurrence.<sup>140</sup> Because PJM is proposing to perform the ELCC analysis on an hourly basis, each scenario will cover 8,760 hours. In short, the model is complex and detailed. PJM and its independent consultant, Energy+Environmental Economics, are still in the process of reviewing, validating, and testing the ELCC model and inputs.

Starting implementation of the ELCC construct with the 2023/2024 Delivery Year is necessitated by the amount of time needed to finalize and run the model, determine the ELCC analysis outputs, and post such values sufficiently in advance of an RPM Auction for the outputs to be useful to Capacity Market Sellers.<sup>141</sup> An important timing consideration is the posting of preliminary default MOPR Floor Offer Prices, which the Tariff specifies must be accomplished 150 days in advance of an RPM Auction,<sup>142</sup> and

---

applicable Delivery Year.”).

<sup>140</sup> Rocha Garrido Aff. ¶ 12.

<sup>141</sup> In general, it would produce undesirable effects to run a Base Residual Auction for a given Delivery Year under the status quo capacity capability determination rules, and then switch to the ELCC construct for subsequent Incremental Auctions. Accordingly, PJM does not propose to use the ELCC construct to determine capacity values for any Incremental Auction for the 2022/2023 Delivery Year.

<sup>142</sup> Tariff, Attachment DD, sections 5.14(h-1)(2)(A) & (B). PJM did not propose to alter this deadline in its

which would require ELCC Class Ratings for their calculation. If the Commission accepts this filing by January 1, 2021, as requested, the first RPM Auction to which the ELCC construct could apply would be at least 10 months in the future (e.g., October 2021, with default preliminary MOPR Floor Offer Prices posted June 1, 2021, given an order by January 1, 2021)—five months for required implementation, and 150 days to meet the deadline for posting preliminary default MOPR Floor Offer Prices. If the 2022/2023 Base Residual Auction were scheduled to meet such timelines, it would conflict with the Commission’s stated desire to avoid further delay in holding the long-delayed 2022/2023 Base Residual Auction, and subsequent delayed auctions.<sup>143</sup>

Accordingly, prudence dictates applying the ELCC construct for the 2023/2024 Base Residual Auction,<sup>144</sup> which would provide sufficient time for the model review process to be completed and for PJM to determine the ELCC outputs.

---

waiver request to accelerate certain deadlines for the delayed RPM Auctions. *PJM Interconnection, L.L.C.*, Compliance Filing Concerning the Minimum Offer Pricing Rule, Request for Waiver of RPM Auction Deadlines, and Request for an Extended Comment Period of at Least 35 Days of PJM Interconnection, L.L.C., Docket No. ER18-1314, et al., at Appendix A (Mar. 18, 2020) (“March 2020 ER18-1314 Filing”).

<sup>143</sup> See, e.g., *Calpine Corp. v. PJM Interconnection, L.L.C.*, 173 FERC ¶ 61,061, at P 361 (2020) (“The [2022/2023 Base Residual Auction] has already been delayed and we agree with commenters arguing that the auction should run as soon as reasonably possible.”); *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153, at P 2 (2020) (“PJM’s compliance filing should therefore present an implementation schedule for the instant revisions that appropriately harmonizes the revisions here with ongoing revisions in the other proceeding while minimizing any auction delays.”);

<sup>144</sup> According to PJM’s Commission-accepted plan for holding the delayed Base Residual Auctions, PJM will hold the 2022/2023 Base Residual Auction 6.5 months after the Commission approves a forward-looking Energy and Ancillary Services Revenues Offset, then serially hold the other delayed Base Residual Auctions every six months. See March 2020 ER18-1314 Filing at 87.

#### **IV. COMMUNICATIONS**

PJM requests that all communications regarding this filing be directed to the following persons:

Craig Glazer  
Vice President – Federal Government Policy  
PJM Interconnection, L.L.C.  
1200 G Street, N.W.  
Suite 600  
Washington, D.C. 20005  
(202) 202-423-4743  
Craig.Glazer@pjm.com

Thomas DeVita  
Senior Counsel  
PJM Interconnection, L.L.C.  
2750 Monroe Boulevard  
Audubon, PA 19403  
(610) 635-3042  
Thomas.DeVita@pjm.com

Paul M. Flynn  
Ryan J. Collins  
Wright & Talisman, P.C.  
1200 G Street, N.W., Suite 600  
Washington, D.C. 20005  
(202) 393-1200 (phone)  
(202) 393-1240 (fax)  
flynn@wrightlaw.com  
collins@wrightlaw.com

#### **V. DOCUMENTS INCLUDED WITH THIS FILING**

In accordance with the requirements of Order No. 714<sup>145</sup> and the Commission's eTariff regulations, PJM hereby submits an eTariff XML filing package consisting of the following materials:

1. This transmittal letter;
2. Attachment A – Revisions to the RAA (marked);
3. Attachment B – Revisions to the RAA (clean); and
4. Attachment C – Affidavit of Dr. Patricio Rocha Garrido on Behalf of PJM Interconnection, L.L.C.

---

<sup>145</sup> *Electronic Tariff Filings*, Order No. 714, 124 FERC ¶ 61,270 (2008), *final rule*, Order No. 714-A, 147 FERC ¶ 61,115 (2014).



## **VI. SERVICE**

PJM has served a copy of this filing on all PJM Members and on all state utility regulatory commissions in the PJM Region by posting this filing electronically. In accordance with the Commission's regulations,<sup>146</sup> PJM will post a copy of this filing to the FERC filings section of its internet site, located at the following link: <http://www.pjm.com/documents/ferc-manuals.aspx> with a specific link to the newly-filed document, and will send an email on the same date as this filing to all PJM Members and all state utility regulatory commissions in the PJM Region<sup>147</sup> alerting them that this filing has been made by PJM today, and is available by following such link.

---

<sup>146</sup> See 18 C.F.R §§ 35.2(e) and 385.2010(f)(3).

<sup>147</sup> PJM already maintains, updates, and regularly uses email lists for all PJM members and affected commissions.

## VII. CONCLUSION

In accordance with the foregoing, PJM respectfully requests that the Commission accept the proposed revisions to the RAA and the Tariff effective as of June 1, 2021, and issue an order on this FPA section 205 submission by no later than January 1, 2021, as discussed herein.

Respectfully submitted,

/s/ Thomas DeVita

Craig Glazer  
Vice President – Federal Government Policy  
PJM Interconnection, L.L.C.  
1200 G Street, N.W.  
Suite 600  
Washington, D.C. 20005  
(202) 202-423-4743  
Craig.Glazer@pjm.com

Thomas DeVita  
Senior Counsel  
PJM Interconnection, L.L.C.  
2750 Monroe Boulevard  
Audubon, PA 19403  
(610) 635-3042  
Thomas.DeVita@pjm.com

Paul M. Flynn  
Ryan J. Collins  
Wright & Talisman, P.C.  
1200 G Street, N.W., Suite 600  
Washington, D.C. 20005  
(202) 393-1200 (phone)  
(202) 393-1240 (fax)  
flynn@wrightlaw.com  
collins@wrightlaw.com

*On behalf of*  
*PJM Interconnection, L.L.C.*

# Attachment A

## Revisions to the PJM Open Access Transmission Tariff and PJM Reliability Assurance Agreement

(Marked / Redline Format)

Section(s) of the  
PJM Open Access Transmission Tariff  
(Marked / Redline Format)

## **ATTACHMENT DD**

### **Reliability Pricing Model**

References to section numbers in this Attachment DD refer to sections of this Attachment DD, unless otherwise specified.

## **5.6 Sell Offers**

Sell Offers shall be submitted or withdrawn via the internet site designated by the Office of the Interconnection, under the procedures and time schedule set forth in the PJM Manuals.

### **5.6.1 Specifications**

A Sell Offer shall state quantities in increments of 0.1 megawatts and shall specify, as appropriate:

a) Identification of the Generation Capacity Resource, Demand Resource, Capacity Storage Resource or Energy Efficiency Resource on which such Sell Offer is based;

b) Minimum and maximum megawatt quantity of installed capacity that the Capacity Market Seller is willing to offer (notwithstanding such specification, the product offered shall be Unforced Capacity), or designate as Self-Supply, from a Generation Capacity Resource;

i) Price, in dollars and cents per megawatt-day, that will be accepted by the Capacity Market Seller for the megawatt quantity of Unforced Capacity offered from such Generation Capacity Resource.

ii) The Sell Offer may take the form of offer segments with varying price-quantity pairs for varying output levels from the underlying resource, but may not take the form of an offer curve with nonzero slope.

c) EFORD of each Generation Capacity Resource offered.

i) If a Capacity Market Seller is offering such resource in a Base Residual Auction, First Incremental Auction, Second Incremental Auction, or Conditional Incremental Auction occurring before the Third Incremental Auction, the Capacity Market Seller shall specify the EFORD to apply to the offer.

ii) If a Capacity Market Seller is committing the resource as Self-Supply, the Capacity Market Seller shall specify the EFORD to apply to the commitment.

iii) The EFORD applied to the Third Incremental Auction will be the final EFORD established by the Office of the Interconnection six (6) months prior to the Delivery Year, based on the actual EFORD in the PJM Region during the 12-month period ending September 30 that last precedes such Delivery Year.

d) The Nominated Demand Resource Value for each Demand Resource offered and the Nominated Energy Efficiency Value for each Energy Efficiency Resource offered. The Office of the Interconnection shall, in both cases, convert such value to an Unforced Capacity basis by multiplying such value by the DR Factor (for Delivery Years through May 31, 2018) times the Forecast Pool Requirement. Demand Resources shall specify the LDA in which the Demand Resource is located, including the location of such resource within any Zone that includes more than one LDA as identified on RAA, Schedule 10.1.

e) For Delivery Years through May 31, 2018, a Demand Resource with the potential to qualify as two or more of a Limited Demand Resource, Extended Summer Demand Resource or Annual Demand Resource may submit separate but coupled Sell Offers for each Demand Resource type for which it qualifies at different prices and the auction clearing algorithm will select the Sell Offer that yields the least-cost solution. For such coupled Demand Resource offers, the offer price of an Annual Demand Resource offer must be at least \$.01 per MW-day greater than the offer price of a coupled Extended Summer Demand Resource offer and the offer price of a Extended Summer Demand Resource offer must be at least \$.01 per MW-day greater than the offer price of a coupled Limited Demand Resource offer.

f) For a Qualifying Transmission Upgrade, the Sell Offer shall identify such upgrade, and the Office of the Interconnection shall determine and certify the increase in CETL provided by such upgrade. The Capacity Market Seller may offer the upgrade with an associated increase in CETL to an LDA in accordance with such certification, including an offer price that will be accepted by the Capacity Market Seller, stated in dollars and cents per megawatt-day as a price difference between a Capacity Resource located outside such an LDA and a Capacity Resource located inside such LDA; and the increase in CETL into such LDA to be provided by such Qualifying Transmission Upgrade, as certified by the Office of the Interconnection.

g) For the 2018/2019 and 2019/2020 Delivery Years, each Capacity Market Seller owning or controlling a resource that qualifies as both a Base Capacity Resource and a Capacity Performance Resource may submit separate but coupled Sell Offers for such resource as a Base Capacity Resource and as a Capacity Performance Resource, at different prices, and the auction clearing algorithm will select the Sell Offer that yields the least-cost solution. Submission of a coupled Base Capacity Resource Sell Offer shall be mandatory for any Capacity Performance Resource Sell Offer that exceeds a Sell Offer Price equal to the applicable Net Cost of New Entry times the Balancing Ratio as provided for in Tariff, Attachment DD, section 6.4. For such coupled Sell Offers, the offer price of a Capacity Performance Resource offer must be at least \$.01 per MW-day greater than the offer price of a coupled Base Capacity Resource offer.

(h) ~~For the 2018/2019 Delivery Year and subsequent Delivery Years, a~~ Capacity Market Seller that owns or controls one or more Capacity Storage Resources, Intermittent Resources, Demand Resources, or Energy Efficiency Resources may submit a Sell Offer as a Capacity Performance Resource in a MW quantity consistent with their average expected output during peak-hour periods but for ELCC Resources, for the 2023/2024 Delivery Year and subsequent Delivery Years, such MW quantity shall not to exceed the Accredited UCAP of the resource. Alternatively, ~~for the 2018/2019 Delivery Year and subsequent Delivery Years,~~ a Capacity Market Seller that owns or controls one or more Capacity Storage Resources, Intermittent Resources, Demand Resources, Energy Efficiency Resources, or Environmentally-Limited Resources may submit a Sell Offer which represents the aggregated Unforced Capacity value of such resources, where such Sell Offer shall be considered to be located in the smallest modeled LDA common to the aggregated resources. Such aggregated resources shall be owned by or under contract to the Capacity Market Seller, including all such resources obtained through bilateral contract and reported to the Office of the Interconnection in accordance with the Office of the Interconnection's rules related to its *Capacity Exchange* tools. *If any of the commercially aggregated resources in such Sell Offer are subject to the Minimum Floor Offer Price pursuant*

*to Tariff, Attachment DD, sections 5.14(h) and 5.14(h-1), the Capacity Market Seller that owns or controls such resources may submit a Sell Offer with a Minimum Floor Offer Price of no lower than the time and MW-weighted average of the applicable MOPR Floor Offer Prices (zero if not applicable) of the aggregated resources in such Sell Offer.*

(i) For the 2020/2021 Delivery Year and subsequent Delivery Years, a Capacity Market Seller that owns or controls a resource that qualifies as a Summer-Period Capacity Performance Resource may submit a Sell Offer as a Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during peak-hour periods, and may submit a separate Sell Offer as a Summer-Period Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during summer peak-hour periods, provided the total Sell Offer MW quantity submitted as both a Capacity Performance Resource and a Summer-Period Capacity Performance Resource does not exceed the Unforced Capacity value of the resource. For the 2020/2021 Delivery Year and subsequent Delivery Years, a Capacity Market Seller that owns or controls a resource that qualifies as a Winter-Period Capacity Performance Resource may submit a Sell Offer as a Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during peak-hour periods, and may submit a separate Sell Offer as a Winter-Period Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during winter peak-hour periods, provided the total Sell Offer MW quantity submitted as both a Capacity Performance Resource and a Winter-Period Capacity Performance Resource does not exceed the Unforced Capacity value of the resource. Each segment of a Seasonal Capacity Performance Resource Sell Offer must be submitted as a flexible Sell Offer segment with the minimum MW quantity offered set to zero.

## **5.6.2 Compliance with PJM Credit Policy**

Capacity Market Sellers shall comply with the provisions of the PJM Credit Policy as set forth in Tariff, Attachment Q, including the provisions specific to the Reliability Pricing Model, prior to submission of Sell Offers in any Reliability Pricing Model Auction. A Capacity Market Seller desiring to submit a Credit-Limited Offer shall specify in its Sell Offer the maximum auction credit requirement, in dollars, and the maximum amount of Unforced Capacity, in megawatts, applicable to its Sell Offer.

## **5.6.3 [reserved]**

## **5.6.4 Qualifying Transmission Upgrades**

A Qualifying Transmission Upgrade may not be the subject of any Sell Offer in a Base Residual Auction unless it has been approved by the Office of the Interconnection, including certification of the increase in Import Capability to be provided by such Qualifying Transmission Upgrade, no later than 45 days prior to such Base Residual Auction. No such approval shall be granted unless, at a minimum, a Facilities Study Agreement has been executed with respect to such upgrade, and such upgrade conforms to all applicable standards of the Regional Transmission Expansion Plan process.

## **5.6.5 Market-based Sell Offers**



Subject to section 6, a Market Seller authorized by FERC to sell electric generating capacity at market-based prices, or that is not required to have such authorization, may submit Sell Offers that specify market-based prices in any Base Residual Auction or Incremental Auction.

#### **5.6.6 Availability of Capacity Resources for Sale**

(a) The Office of the Interconnection shall determine the quantity of megawatts of available installed capacity that each Capacity Market Seller must offer in any RPM Auction pursuant to Tariff, Attachment DD, section 6.6, through verification of the availability of megawatts of installed capacity from: (i) all Generation Capacity Resources owned by or under contract to the Capacity Market Seller, including all Generation Capacity Resources obtained through bilateral contract; (ii) the results of prior Reliability Pricing Model Auctions, if any, for such Delivery Year (including consideration of any restriction imposed as a consequence of a prior failure to offer); and (iii) such other information as may be available to the Office of the Interconnection. The Office of the Interconnection shall reject Sell Offers or portions of Sell Offers for Capacity Resources in excess of the quantity of installed capacity from such Capacity Market Seller's Capacity Resource that it determines to be available for sale.

(b) The Office of the Interconnection shall determine the quantity of installed capacity available for sale in a Base Residual Auction or Incremental Auction as of the beginning of the period during which Buy Bids and Sell Offers are accepted for such auction, as applicable, in accordance with the time schedule set forth in the PJM Manuals. Removal of a resource from Capacity Resource status shall not be reflected in the determination of available installed capacity unless the associated unit-specific bilateral transaction is approved, the designation of such resource (or portion thereof) as a network resource for the external load is demonstrated to the Office of the Interconnection, or equivalent evidence of a firm external sale is provided prior to the deadline established therefor. The determination of available installed capacity shall also take into account, as they apply in proportion to the share of each resource owned or controlled by a Capacity Market Seller, any approved capacity modifications, and existing capacity commitments established in a prior RPM Auction, an FRR Capacity Plan, Locational UCAP transactions and/or replacement capacity transactions under this Tariff, Attachment DD. To enable the Office of the Interconnection to make this determination, no bilateral transactions for Capacity Resources applicable to the period covered by an auction will be processed from the beginning of the period for submission of Sell Offers and Buy Bids, as appropriate, for that auction until completion of the clearing determination for such auction. Processing of such bilateral transactions will reconvene once clearing for that auction is completed. A Generation Capacity Resource located in the PJM Region shall not be removed from Capacity Resource status to the extent the resource is committed to service of PJM loads as a result of an RPM Auction, FRR Capacity Plan, Locational UCAP transaction and/or by designation as a replacement resource under this Tariff, Attachment DD.

(c) In order for a bilateral transaction for the purchase and sale of a Capacity Resource to be processed by the Office of the Interconnection, both parties to the transaction must notify the Office of the Interconnection of the transfer of the Capacity Resource from the seller to the buyer in accordance with procedures established by the Office of the Interconnection and set forth in the PJM Manuals. If a material change with respect to any of the prerequisites

for the application of Tariff, Attachment DD, section 5.6.6 to the Generation Capacity Resource occurs, the Capacity Resource Owner shall immediately notify the Market Monitoring Unit and the Office of the Interconnection.

## 5.10 Auction Clearing Requirements

The Office of the Interconnection shall clear each Base Residual Auction and Incremental Auction for a Delivery Year in accordance with the following:

a) Variable Resource Requirement Curve

The Office of the Interconnection shall determine Variable Resource Requirement Curves for the PJM Region and for such Locational Deliverability Areas as determined appropriate in accordance with subsection (a)(iii) for such Delivery Year to establish the level of Capacity Resources that will provide an acceptable level of reliability consistent with the Reliability Principles and Standards. It is recognized that the variable resource requirement reflected in the Variable Resource Requirement Curve can result in an optimized auction clearing in which the level of Capacity Resources committed for a Delivery Year exceeds the PJM Region Reliability Requirement (for Delivery Years through May 31, 2018, less the Short-Term Resource Procurement Target) or Locational Deliverability Area Reliability Requirement (for Delivery Year through May 31, 2018, less the Short-Term Resource Procurement Target for the Zones associated with such LDA) for such Delivery Year. For any auction, the Updated Forecast Peak Load, and Short-Term Resource Procurement Target applicable to such auction, shall be used, and Price Responsive Demand from any applicable approved PRD Plan, including any associated PRD Reservation Prices, shall be reflected in the derivation of the Variable Resource Requirement Curves, in accordance with the methodology specified in the PJM Manuals.

i) Methodology to Establish the Variable Resource Requirement Curve

Prior to the Base Residual Auction, in accordance with the schedule in the PJM Manuals, the Office of the Interconnection shall establish the Variable Resource Requirement Curve for the PJM Region as follows:

- Each Variable Resource Requirement Curve shall be plotted on a graph on which Unforced Capacity is on the x-axis and price is on the y-axis;
- For the 2015/2016, 2016/2017, and 2017/2018 Delivery Years, the Variable Resource Requirement Curve for the PJM Region shall be plotted by combining (i) a horizontal line from the y-axis to point (1), (ii) a straight line connecting points (1) and (2), (iii) a straight line connecting points (2) and (3), and (iv) a vertical line from point (3) to the x-axis, where:
  - For point (1), price equals: {the greater of [the Cost of New Entry] or [1.5 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)]} divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus the approved PJM Region Installed Reserve Margin (“IRM”)% minus 3%) divided by (100% plus IRM%)], and for Delivery Years

through May 31, 2018, minus the Short-Term Resource Procurement Target;

- For point (2), price equals: (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset) divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 1%) divided by (100% plus IRM%)], and for Delivery Years through May 31, 2018, minus the Short-Term Resource Procurement Target; and
- For point (3), price equals [0.2 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)] divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 5%) divided by (100% plus IRM%)], and for Delivery Years through May 31, 2018, minus the Short-Term Resource Procurement Target;
- For the 2018/2019 Delivery Year and subsequent Delivery Years through and including the Delivery Year commencing June 1, 2021, the Variable Resource Requirement Curve for the PJM Region shall be plotted by combining (i) a horizontal line from the y-axis to point (1), (ii) a straight line connecting points (1) and (2), and (iii) a straight line connecting points (2) and (3), where:
  - For point (1), price equals: {the greater of [the Cost of New Entry] or [1.5 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)]} divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus the approved PJM Region Installed Reserve Margin (“IRM”) % minus 0.2%) divided by (100% plus IRM%)];
  - For point (2), price equals: [0.75 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)] divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 2.9%) divided by (100% plus IRM%)]; and
  - For point (3), price equals zero and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 8.8%) divided by (100% plus IRM%)].
- For the 2022/2023 Delivery Year and subsequent Delivery Years, the Variable Resource Requirement Curve for the PJM Region shall be plotted

by combining (i) a horizontal line from the y-axis to point (1), (ii) a straight line connecting points (1) and (2), and (iii) a straight line connecting points (2) and (3), where:

- For point (1), price equals: {the greater of [the Cost of New Entry] or [1.5 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)]} divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus the approved PJM Region Installed Reserve Margin (“IRM”)% minus 1.2%) divided by (100% plus IRM%)];
- For point (2), price equals: [0.75 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)] divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 1.9%) divided by (100% plus IRM%)]; and
- For point (3), price equals zero and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 7.8%) divided by (100% plus IRM%)].

ii) For any Delivery Year, the Office of the Interconnection shall establish a separate Variable Resource Requirement Curve for each LDA for which:

- A. the Capacity Emergency Transfer Limit is less than 1.15 times the Capacity Emergency Transfer Objective, as determined by the Office of the Interconnection in accordance with NERC and Applicable Regional Entity guidelines; or
- B. such LDA had a Locational Price Adder in any one or more of the three immediately preceding Base Residual Auctions; or
- C. such LDA is determined in a preliminary analysis by the Office of the Interconnection to be likely to have a Locational Price Adder, based on historic offer price levels; provided however that for the Base Residual Auction conducted for the Delivery Year commencing on June 1, 2012, the Eastern Mid-Atlantic Region (“EMAR”), Southwest Mid-Atlantic Region (“SWMAR”), and Mid-Atlantic Region (“MAR”) LDAs shall employ separate Variable Resource Requirement Curves regardless of the outcome of the above three tests; and provided further that the Office of the Interconnection may establish a separate Variable Resource Requirement Curve for an LDA not otherwise qualifying under the above three tests if it finds that such is required to achieve an acceptable level of reliability consistent with the Reliability

Principles and Standards, in which case the Office of the Interconnection shall post such finding, such LDA, and such Variable Resource Requirement Curve on its internet site no later than the March 31 last preceding the Base Residual Auction for such Delivery Year. The same process as set forth in subsection (a)(i) shall be used to establish the Variable Resource Requirement Curve for any such LDA, except that the Locational Deliverability Area Reliability Requirement for such LDA shall be substituted for the PJM Region Reliability Requirement and, for Delivery Years through May 31, 2018, the LDA Short-Term Resource Procurement Target shall be substituted for the PJM Region Short-Term Resource Procurement Target. For purposes of calculating the Capacity Emergency Transfer Limit under this section, all generation resources located in the PJM Region that are, or that qualify to become, Capacity Resources, shall be modeled at their full capacity rating, regardless of the amount of capacity cleared from such resource for the immediately preceding Delivery Year.

For each such LDA, for the 2018/2019 Delivery Year and subsequent Delivery Years, the Office of the Interconnection shall (a) determine the Net Cost of New Entry for each Zone in such LDA, with such Net Cost of New Entry equal to the applicable Cost of New Entry value for such Zone minus the Net Energy and Ancillary Services Revenue Offset value for such Zone, and (b) compute the average of the Net Cost of New Entry values of all such Zones to determine the Net Cost of New Entry for such LDA. The Net Cost of New Entry for use in an LDA in any Incremental Auction for the 2015/2016, 2016/2017, and 2017/2018 Delivery Years shall be the Net Cost of New Entry used for such LDA in the Base Residual Auction for such Delivery Year.

iii) Procedure for ongoing review of Variable Resource Requirement Curve shape.

Beginning with the Delivery Year that commences June 1, 2018, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall perform a review of the shape of the Variable Resource Requirement Curve, as established by the requirements of the foregoing subsection. Such analysis shall be based on simulation of market conditions to quantify the ability of the market to invest in new Capacity Resources and to meet the applicable reliability requirements on a probabilistic basis. Based on the results of such review, PJM shall prepare a recommendation to either modify or retain the existing Variable Resource Requirement Curve shape. The Office of the Interconnection shall post the recommendation and shall review the recommendation through the stakeholder process to solicit stakeholder input. If a modification of the Variable Resource Requirement Curve shape is recommended, the following process shall be followed:

A) If the Office of the Interconnection determines that the Variable Resource Requirement Curve shape should be modified, Staff of

the Office of the Interconnection shall propose a new Variable Resource Requirement Curve shape on or before May 15, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

- B) The PJM Members shall review the proposed modification to the Variable Resource Requirement Curve shape.
- C) The PJM Members shall either vote to (i) endorse the proposed modification, (ii) propose alternate modifications or (iii) recommend no modification, by August 31, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.
- D) The PJM Board of Managers shall consider a proposed modification to the Variable Resource Requirement Curve shape, and the Office of the Interconnection shall file any approved modified Variable Resource Requirement Curve shape with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

iv) Cost of New Entry

- A) For the Incremental Auctions for the 2019/2020, 2020/2021, and 2021/2022 Delivery Years, the Cost of New Entry for the PJM Region and for each LDA shall be the respective value used in the Base Residual Auction for such Delivery Year and LDA. For the Delivery Year commencing on June 1, 2022, and continuing thereafter unless and until changed pursuant to subsection (B) below, the Cost of New Entry for the PJM Region shall be the average of the Cost of New Entry for each CONE Area listed in this section as adjusted pursuant to subsection (a)(iv)(B).

<b>Geographic Location Within the PJM Region Encompassing These Zones</b>	<b>Cost of New Entry in \$/MW-Year</b>
PS, JCP&L, AE, PECO, DPL, RECO (“CONE Area 1”)	108,000
BGE, PEPCO (“CONE Area 2”)	109,700
AEP, Dayton, ComEd, APS, DQL, ATSI, DEOK, EKPC, Dominion, OVEC (“CONE Area 3”)	105,500
PPL, MetEd, Penelec (“CONE Area 4”)	105,500

- B) Beginning with the 2023/2024 Delivery Year, the CONE for each CONE Area shall be adjusted to reflect changes in generating plant construction costs based on changes in the Applicable United States Bureau of Labor Statistics (“BLS”) Composite Index, and then adjusted further by a factor of 1.022 to reflect the annual decline in bonus depreciation scheduled under federal corporate tax law, in accordance with the following:

(1) The Applicable BLS Composite Index for any Delivery Year and CONE Area shall be the most recently published twelve-month change, at the time CONE values are required to be posted for the Base Residual Auction for such Delivery Year, in a composite of the BLS Quarterly Census of Employment and Wages for Utility System Construction (weighted 20%), the BLS Producer Price Index for Construction Materials and Components (weighted 55%), and the BLS Producer Price Index Turbines and Turbine Generator Sets (weighted 25%), as each such index is further specified for each CONE Area in the PJM Manuals.

—————(2) The CONE in a CONE Area shall be adjusted prior to the Base Residual Auction for each Delivery Year by applying the Applicable BLS Composite Index for such CONE Area to the Benchmark CONE for such CONE Area, and then multiplying the result by 1.022.

—————(3) The Benchmark CONE for a CONE Area shall be the CONE used for such CONE Area in the Base Residual Auction for the prior Delivery Year (provided, however that the Gross CONE values stated in subsection (a)(iv)(A) above shall be the Benchmark CONE values for the 2022/2023 Delivery Year to which the Applicable BLS Composite Index shall be applied to determine the CONE for subsequent Delivery Years), and then multiplying the result by 1.022.

—————(4) Notwithstanding the foregoing, CONE values for any CONE Area for any Delivery Year shall be subject to amendment pursuant to appropriate filings with FERC under the Federal Power Act, including, without limitation, any filings resulting from the process described in section 5.10(a)(vi)(C) or any filing to establish new or revised CONE Areas.

- v) Net Energy and Ancillary Services Revenue Offset *up to the 2021/2022 Delivery Year*:

- A) The Office of the Interconnection shall determine the Net Energy and Ancillary Services Revenue Offset each year for the PJM Region as (A) the annual average of the revenues that would have been received by the Reference Resource from the PJM energy markets during a period of three consecutive calendar years preceding the time of the determination, based on (1) the heat rate and other characteristics of such Reference Resource; (2) fuel prices reported during such period at an appropriate pricing point



for the PJM Region with a fuel transmission adder appropriate for such region, as set forth in the PJM Manuals, assumed variable operation and maintenance expenses for such resource of \$6.93 per MWh, and actual PJM hourly average Locational Marginal Prices recorded in the PJM Region during such period; and (3) an assumption that the Reference Resource would be dispatched for both the Day-Ahead and Real-Time Energy Markets on a Peak-Hour Dispatch basis; plus (B) ancillary service revenues of \$2,199 per MW-year.

- B) The Office of the Interconnection also shall determine a Net Energy and Ancillary Service Revenue Offset each year for each Zone, using the same procedures and methods as set forth in the previous subsection; provided, however, that: (1) the average hourly LMPs for such Zone shall be used in place of the PJM Region average hourly LMPs; (2) if such Zone was not integrated into the PJM Region for the entire applicable period, then the offset shall be calculated using only those whole calendar years during which the Zone was integrated; and (3) a posted fuel pricing point in such Zone, if available, and (if such pricing point is not available in such Zone) a fuel transmission adder appropriate to such Zone from an appropriate PJM Region pricing point shall be used for each such Zone.

*v-1) Net Energy and Ancillary Services Revenue Offset for the 2022/2023 Delivery and subsequent Delivery Years:*

- A) *The Office of the Interconnection shall determine the Net Energy and Ancillary Services Revenue Offset each year for the PJM Region as (1) the average of the net energy and ancillary services revenues that the Reference Resource is projected to receive from the PJM energy and ancillary service markets for the applicable Delivery Year from three separate simulations, with each such simulation using forward prices shaped using historical data from one of the three consecutive calendar years preceding the time of the determination for the RPM Auction to take account of year-to-year variability in such hourly shapes. Each net energy and ancillary services revenue simulation is based on (a) the heat rate and other characteristics of such Reference Resource such as assumed variable operation and maintenance expenses of \$1.95 per MWh and \$11,732/start, and emissions costs; (b) Forward Hourly LMPs for the PJM Region; (c) Forward Hourly Ancillary Services Prices, (d) Forward Daily Natural Gas Prices at an appropriate pricing point for the PJM Region with a fuel transmission adder appropriate for such region, as set forth in the PJM Manuals; and (e) an assumption that the Reference Resource*

would be dispatched on a Projected EAS Dispatch basis; plus (2) reactive service revenues of \$2,199 per MW-year.

- B) *The Office of the Interconnection also shall determine a Net Energy and Ancillary Service Revenue Offset each year for each Zone, using the same procedures and methods as set forth in the previous subsection; provided, however, that: (1) the Forward Hourly LMPs for such Zone shall be used in place of the Forward Hourly LMP for the PJM Region; (2) if such Zone was not integrated into the PJM Region for the entire three calendar years preceeding the time of the determination for the RPM Auction, then simulations shall rely on only those whole calendar years during which the Zone was integrated; and (3) Forward Daily Natural Gas Prices for the fuel pricing point mapped to such Zone.*
- C) *“Forward Hourly LMPs” shall be determined as follows:*
- (1) Identify the liquid hub to which each Zone is mapped, as specified in the PJM Manuals.*
  - (2) For each liquid hub, calculate the average day-ahead on-peak and day-ahead off-peak energy prices for each month during the Delivery Year over the most recent thirty trading days as of 180 days prior to the Base Residual Auction. For each of the remaining steps, the historical prices used herein shall be taken from the most recent three calendar years preceding the time of the determination for the RPM Auction:*
  - (3) Determine and add monthly basis differentials between the hub and each of its mapped Zones to the forward monthly day-ahead on-peak and off-peak energy prices for the hub. This differential is developed using the prices for the Planning Period closest in time to the Delivery Year from the most recent long-term Financial Transmission Rights auction conducted prior to the Base Residual Auction. The difference between the annual long-term Financial Transmission Rights auction prices for the Zone and the hub are converted to monthly values by adding, for each month of the year, the difference between (a) the historical monthly average day-ahead congestion price differentials between the Zone and relevant hub and (b) the historical annual average day-ahead congestion price differentials between the Zone and hub. This step is only used when developing forward prices for locations other than the liquid hubs;*

- (4) *Determine and add marginal loss differentials to the forward monthly day-ahead on-peak and off-peak energy prices for the hub. For each month of the year, calculate the marginal loss differential, which is the average of the difference between the loss components of the historical on peak or off peak day-ahead LMPs for the Zone and relevant hub in that month across the three year period scaled by the ratio of (a) the forward monthly average on-peak or off-peak day-ahead LMP at such hub to (b) the average of the historical on-peak or off-peak day-ahead LMPs for such hub in that month across the three year period. This step is only used when developing forward prices for locations other than the liquid hubs;*
- (5) *Shape the forward monthly day-ahead on-peak and off-peak prices to (a) forward hourly day-ahead LMPs using historic hourly day-ahead LMP shapes for the Zone and (b) forward hourly real-time LMPs using historic hourly real-time LMP shapes for the Zone. The historic hourly shapes are based on the ratio of the historic day-ahead or real-time LMP for the Zone for each given hour in a monthly on-peak or off-peak period to the average of the historic day-ahead or real-time LMP for the Zone for all hours in such monthly on-peak or off-peak period. The historical prices used in this step shall be taken from one of each of the most recent three calendar years preceding the time of the determination for the RPM Auction;*
- (6) *For unit-specific energy and ancillary service offset calculations, determine and apply basis differentials from the Zone to the generation bus to the forward day-ahead and real-time hourly LMPs for the Zone. The differential for each hour of the year is developed using the difference between the historical DA or RT LMP for the generation bus and the historical DA or RT LMP for the Zone in which the generation bus is located for that same hour; and*
- (7) *Develop the Forward Hourly LMPs for the PJM Region pricing point. Calculate the load-weighted average of the monthly on-peak and off-peak Zonal LMPs developed in step (4) above, using the historical average load within each monthly on-peak or off-peak period. The load-weighted average monthly on-peak or off-peak Zonal LMPs are then shaped to forward hourly day-ahead and real-time LMPs using the same procedure as defined in step (5) above, except using historical LMPs for the PJM Region pricing point.*

D) *Forward Hourly Ancillary Services Prices shall include prices for Synchronized Reserve, Non-Synchronized Reserve, Secondary Reserve and Regulation and shall be determined as follows. The historical prices used herein shall be taken from one of each of the most recent three calendar years preceding the time of the determination for the RPM Auction:*

- (1) *For Synchronized Reserve, the forward day-ahead and real-time market clearing prices for the Reserve Zone for each hour of the Delivery Year shall be equal to the historical real-time Synchronized Reserve Market Clearing Price for the Reserve Zone for the corresponding hour of the year.*
- (2) *For Non-Synchronized Reserve, the forward day-ahead and real-time market clearing prices for the Reserve Zone for each hour of the Delivery Year shall be equal to the historical real-time Non-Synchronized Reserve Market Clearing Price for the Reserve Zone for the corresponding hour of the year.*
- (3) *For Secondary Reserve, the forward day-ahead and real-time Secondary Reserve market clearing price shall be \$0.00/MWh for all hours.*
- (4) *For Regulation, the forward real-time Regulation market clearing price shall be calculated by multiplying the historical real-time hourly Regulation market clearing price for each hour of the Delivery Year by the ratio of the real-time Forward Hourly LMP at an appropriate pricing point, as defined in the PJM manuals, to the historic hourly real-time LMP at such pricing point for the corresponding hour of the year; and*

E) *Forward Daily Natural Gas Prices shall be determined as follows:*

- (1) *Map each Zone to the appropriate natural gas hub in the PJM Region, as listed in the PJM Manuals;*
- (2) *Map each natural gas hub lacking sufficient liquidity to the liquid hub to which it has the highest historic price correlation;*
- (3) *For each sufficiently liquid natural gas hub, calculate the simple average natural gas monthly settlement prices over*

*the most recent thirty trading days as of 180 days prior to the Base Residual Auction;*

- (4) Calculate the forward monthly prices for each illiquid hub by scaling the forward monthly price of the mapped liquid hub by the average ratio of historical monthly prices at the insufficiently liquid hub to the historical monthly prices at the sufficiently liquid over the most recent three calendar years preceding the time of determination for the RPM Auction;*
- (5) Shape the forward monthly prices for each hub to Forward Daily Natural Gas Prices using historic daily natural gas price shapes for the hub. The historic daily shapes are based on the ratio of the historic price for the hub for each given day in a month to the average of the historic prices for the hub for all days in such month. The daily prices are then assigned to each hour starting 10am Eastern Prevailing Time each day. The historical prices used in this step shall be taken from one of each of the most recent three calendar years preceding the time of the determination for the RPM Auction.*

Curve

vi) Process for Establishing Parameters of Variable Resource Requirement

- A) The parameters of the Variable Resource Requirement Curve will be established prior to the conduct of the Base Residual Auction for a Delivery Year and will be used for such Base Residual Auction.
- B) The Office of the Interconnection shall determine the PJM Region Reliability Requirement and the Locational Deliverability Area Reliability Requirement for each Locational Deliverability Area for which a Variable Resource Requirement Curve has been established for such Base Residual Auction on or before February 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values will be applied, in accordance with the Reliability Assurance Agreement.
- C) Beginning with the Delivery Year that commences June 1, 2018, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the calculation of the Cost of New Entry for each CONE Area.
  - 1) If the Office of the Interconnection determines that the Cost of New Entry values should be modified, the Staff of the

Office of the Interconnection shall propose new Cost of New Entry values on or before May 15, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

- 2) The PJM Members shall review the proposed values.
  - 3) The PJM Members shall either vote to (i) endorse the proposed values, (ii) propose alternate values or (iii) recommend no modification, by August 31, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.
  - 4) The PJM Board of Managers shall consider Cost of New Entry values, and the Office of the Interconnection shall file any approved modified Cost of New Entry values with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.
- D) Beginning with the Delivery Year that commences June 1, 2018, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the methodology set forth in this Attachment for determining the Net Energy and Ancillary Services Revenue Offset for the PJM Region and for each Zone.
- 1) If the Office of the Interconnection determines that the Net Energy and Ancillary Services Revenue Offset methodology should be modified, Staff of the Office of the Interconnection shall propose a new Net Energy and Ancillary Services Revenue Offset methodology on or before May 15, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new methodology would be applied.
  - 2) The PJM Members shall review the proposed methodology.
  - 3) The PJM Members shall either vote to (i) endorse the proposed methodology, (ii) propose an alternate methodology or (iii) recommend no modification, by August 31, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new methodology would be applied.
  - 4) The PJM Board of Managers shall consider the Net Revenue Offset methodology, and the Office of the

Interconnection shall file any approved modified Net Energy and Ancillary Services Revenue Offset values with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

vii) In conjunction with a review of the Variable Resource Requirement Curve shape that commences no later than December 31, 2026, the Office of the Interconnection shall review the ELCC transition mechanism set forth in RAA, Schedule 9.1, section J. Based on the results of such review, PJM shall prepare a recommendation to either modify or retain the existing ELCC transition mechanism. The Office of the Interconnection shall post the recommendation and shall review the recommendation through the stakeholder process to solicit stakeholder input.

b) Locational Requirements

The Office of Interconnection shall establish locational requirements prior to the Base Residual Auction to quantify the amount of Unforced Capacity that must be committed in each Locational Deliverability Area, in accordance with the Reliability Assurance Agreement.

c) Resource Requirements and Constraints

Prior to the Base Residual Auction and each Incremental Auction for the Delivery Years starting on June 1, 2014 and ending May 31, 2017, the Office of the Interconnection shall establish the Minimum Annual Resource Requirement and the Minimum Extended Summer Resource Requirement for the PJM Region and for each Locational Deliverability Area for which the Office of the Interconnection is required under section 5.10(a) above to establish a separate VRR Curve for such Delivery Year. Prior to the Base Residual Auction and Incremental Auctions for the 2017/2018 Delivery Year, the Office of the Interconnection shall establish the Limited Resource Constraints and the Sub-Annual Resource Constraints for the PJM Region and for each Locational Deliverability Area for which the Office of the Interconnection is required under section 5.10(a) above to establish a separate VRR Curve for such Delivery Year. Prior to the Base Residual Auction and Incremental Auctions for 2018/2019 and 2019/2020 Delivery Years, the Office of the Interconnection shall establish the Base Capacity Demand Resource Constraints and the Base Capacity Resource Constraints for the PJM Region and for each Locational Deliverability Area for which the Office of the Interconnection is required under section 5.10(a) above to establish a separate VRR Curve for such Delivery Year.

d) Preliminary PJM Region Peak Load Forecast for the Delivery Year

The Office of the Interconnection shall establish the Preliminary PJM Region Load Forecast for the Delivery Year in accordance with the PJM Manuals by February 1, prior to the conduct of the Base Residual Auction for such Delivery Year.

e) Updated PJM Region Peak Load Forecasts for Incremental Auctions

The Office of the Interconnection shall establish the updated PJM Region Peak Load Forecast for a Delivery Year in accordance with the PJM Manuals by February 1, prior to the conduct of the First, Second, and Third Incremental Auction for such Delivery Year.



## **5.14 Clearing Prices and Charges**

### **a) Capacity Resource Clearing Prices**

For each Base Residual Auction and Incremental Auction, the Office of the Interconnection shall calculate a clearing price to be paid for each megawatt-day of Unforced Capacity that clears in such auction. The Capacity Resource Clearing Price for each LDA will be the marginal value of system capacity for the PJM Region, without considering locational constraints, adjusted as necessary by any applicable Locational Price Adders, Annual Resource Price Adders, Extended Summer Resource Price Adders, Limited Resource Price Decrements, Sub-Annual Resource Price Decrements, Base Capacity Demand Resource Price Decrements, and Base Capacity Resource Price Decrements, all as determined by the Office of the Interconnection based on the optimization algorithm. If a Capacity Resource is located in more than one Locational Deliverability Area, it shall be paid the highest Locational Price Adder in any applicable LDA in which the Sell Offer for such Capacity Resource cleared. The Annual Resource Price Adder is applicable for Annual Resources only. The Extended Summer Resource Price Adder is applicable for Annual Resources and Extended Summer Demand Resources.

The Locational Price Adder applicable to each cleared Seasonal Capacity Performance Resource is determined during the post-processing of the RPM Auction results consistent with the manner in which the auction clearing algorithm recognizes the contribution of Seasonal Capacity Performance Resource Sell Offers in satisfying an LDA's reliability requirement. For each LDA with a positive Locational Price Adder with respect to the immediate higher level LDA, starting with the lowest level constrained LDAs and moving up, PJM determines the quantity of equally matched Summer-Period Capacity Performance Resources and Winter-Period Capacity Performance Resources located and cleared within that LDA. Up to this quantity, the cleared Summer-Period Capacity Performance Resources and Winter-Period Capacity Performance Resources with the lowest Sell Offer prices will be compensated using the highest Locational Price Adder applicable to such LDA; and any remaining Seasonal Capacity Performance Resources cleared within the LDA are effectively moved to the next higher level constrained LDA, where they are considered in a similar manner for compensation.

### **b) Resource Make-Whole Payments**

If a Sell Offer specifies a minimum block, and only a portion of such block is needed to clear the market in a Base Residual or Incremental Auction, the MW portion of such Sell Offer needed to clear the market shall clear, and such Sell Offer shall set the marginal value of system capacity. In addition, the Capacity Market Seller shall receive a Resource Make-Whole Payment equal to the Capacity Resource Clearing Price in such auction times the difference between the Sell Offer's minimum block MW quantity and the Sell Offer's cleared MW quantity. If the Sell Offer price of a cleared Seasonal Capacity Performance Resource exceeds the applicable Capacity Resource Clearing Price, the Capacity Market Seller shall receive a Resource Make-Whole Payment equal to the difference between the Sell Offer price and Capacity Resource Clearing Price in such RPM Auction. The cost for any such Resource Make-Whole Payments required in a Base Residual Auction or Incremental Auction for adjustment of prior capacity commitments shall be collected pro rata from all LSEs in the LDA in which such payments were made, based on their Daily Unforced Capacity Obligations. The cost for any such Resource Make-Whole

Payments required in an Incremental Auction for capacity replacement shall be collected from all Capacity Market Buyers in the LDA in which such payments were made, on a pro-rata basis based on the MWs purchased in such auction.

c) New Entry Price Adjustment

A Capacity Market Seller that submits a Sell Offer based on a Planned Generation Capacity Resource that clears in the BRA for a Delivery Year may, at its election, submit Sell Offers with a New Entry Price Adjustment in the BRAs for the two immediately succeeding Delivery Years if:

1. Such Capacity Market Seller provides notice of such election at the time it submits its Sell Offer for such resource in the BRA for the first Delivery Year for which such resource is eligible to be considered a Planned Generation Capacity Resource. When the Capacity Market Seller provides notice of such election, it must specify whether its Sell Offer is contingent upon qualifying for the New Entry Price Adjustment. The Office of the Interconnection shall not clear such contingent Sell Offer if it does not qualify for the New Entry Price Adjustment.

2. All or any part of a Sell Offer from the Planned Generation Capacity Resource submitted in accordance with section 5.14(c)(1) is the marginal Sell Offer that sets the Capacity Resource Clearing Price for the LDA.

3. Acceptance of all or any part of a Sell Offer that meets the conditions in section 5.14(c)(1)-(2) in the BRA increases the total Unforced Capacity committed in the BRA (including any minimum block quantity) for the LDA in which such Resource will be located from a megawatt quantity below the LDA Reliability Requirement, minus the Short Term Resource Procurement Target, to a megawatt quantity at or above a megawatt quantity at the price-quantity point on the VRR Curve at which the price is 0.40 times the applicable Net CONE divided by (one minus the pool-wide average EFORD).

4. Such Capacity Market Seller submits Sell Offers in the BRA for the two immediately succeeding Delivery Years for the entire Unforced Capacity of such Generation Capacity Resource committed in the first BRA under section 5.14(c)(1)-(2) equal to the lesser of: A) the price in such seller's Sell Offer for the BRA in which such resource qualified as a Planned Generation Capacity Resource that satisfies the conditions in section 5.14(c)(1)-(3); or B) 0.90 times the Net CONE applicable in the first BRA in which such Planned Generation Capacity Resource meeting the conditions in section 5.14(c)(1)-(3) cleared, on an Unforced Capacity basis, for such LDA.

5. If the Sell Offer is submitted consistent with section 5.14(c)(1)-(4) the foregoing conditions, then:

- (i) in the first Delivery Year, the Resource sets the Capacity Resource Clearing Price for the LDA and all cleared resources in the LDA receive the Capacity Resource Clearing Price set by the Sell Offer as the marginal

offer, in accordance with Tariff, Attachment DD, section 5.12(a) and section 5.14(a) above.

- (ii) in either of the subsequent two BRAs, if any part of the Sell Offer from the Resource clears, it shall receive the Capacity Resource Clearing Price for such LDA for its cleared capacity and for any additional minimum block quantity pursuant to section 5.14(b) above; or
- (iii) if the Resource does not clear, it shall be deemed resubmitted at the highest price per MW-day at which the megawatt quantity of Unforced Capacity of such Resource that cleared the first-year BRA will clear the subsequent-year BRA pursuant to the optimization algorithm described in Tariff, Attachment DD, section 5.12(a), and
- (iv) the resource with its Sell Offer submitted shall clear and shall be committed to the PJM Region in the amount cleared, plus any additional minimum-block quantity from its Sell Offer for such Delivery Year, but such additional amount shall be no greater than the portion of a minimum-block quantity, if any, from its first-year Sell Offer satisfying section 5.14(c)(1)-(3) above that is entitled to compensation pursuant to section 5.14(b) above; and
- (v) the Capacity Resource Clearing Price, and the resources cleared, shall be re-determined to reflect the resubmitted Sell Offer. In such case, the Resource for which the Sell Offer is submitted pursuant to section 5.14(c)(1)-(4) above shall be paid for the entire committed quantity at the Sell Offer price that it initially submitted in such subsequent BRA. The difference between such Sell Offer price and the Capacity Resource Clearing Price (as well as any difference between the cleared quantity and the committed quantity), will be treated as a Resource Make-Whole Payment in accordance with section 5.14(b) above. Other capacity resources that clear the BRA in such LDA receive the Capacity Resource Clearing Price as determined in section 5.14(a) above.

6. The failure to submit a Sell Offer consistent with section 5.14(c)(i)-(iii) above in the BRA for Delivery Year 3 shall not retroactively revoke the New Entry Price Adjustment for Delivery Year 2. However, the failure to submit a Sell Offer consistent with section 5.14(c)(4) above in the BRA for Delivery Year 2 shall make the resource ineligible for the New Entry Pricing Adjustment for Delivery Years 2 and 3.

7. For each Delivery Year that the foregoing conditions are satisfied, the Office of the Interconnection shall maintain and employ in the auction clearing for such LDA a separate VRR Curve, notwithstanding the outcome of the test referenced in Tariff, Attachment DD, section 5.10(a)(ii).

8. On or before August 1, 2012, PJM shall file with FERC under FPA section 205, as determined necessary by PJM following a stakeholder process, tariff changes to

establish a long-term auction process as a not unduly discriminatory means to provide adequate long-term revenue assurances to support new entry, as a supplement to or replacement of this New Entry Price Adjustment.

d) Qualifying Transmission Upgrade Payments

A Capacity Market Seller that submitted a Sell Offer based on a Qualifying Transmission Upgrade that clears in the Base Residual Auction shall receive a payment equal to the Capacity Resource Clearing Price, including any Locational Price Adder, of the LDA into which the Qualifying Transmission Upgrade is to increase Capacity Emergency Transfer Limit, less the Capacity Resource Clearing Price, including any Locational Price Adder, of the LDA from which the upgrade was to provide such increased CETL, multiplied by the megawatt quantity of increased CETL cleared from such Sell Offer. Such payments shall be reflected in the Locational Price Adder determined as part of the Final Zonal Capacity Price for the Zone associated with such LDAs, and shall be funded through a reduction in the Capacity Transfer Rights allocated to Load-Serving Entities under Tariff, Attachment DD, section 5.15, as set forth in that section. PJMSettlement shall be the Counterparty to any cleared capacity transaction resulting from a Sell Offer based on a Qualifying Transmission Upgrade.

e) Locational Reliability Charge

In accordance with the Reliability Assurance Agreement, each LSE shall incur a Locational Reliability Charge (subject to certain offsets and other adjustments as described in Tariff, Attachment DD, section 5.14B, Tariff, Attachment DD, section 5.14C, Tariff, Attachment DD, section 5.14D, Tariff, Attachment DD, section 5.14E and Tariff, Attachment DD, section 5.15) equal to such LSE's Daily Unforced Capacity Obligation in a Zone during such Delivery Year multiplied by the applicable Final Zonal Capacity Price in such Zone. PJMSettlement shall be the Counterparty to the LSEs' obligations to pay, and payments of, Locational Reliability Charges.

f) The Office of the Interconnection shall determine Zonal Capacity Prices in accordance with the following, based on the optimization algorithm:

i) The Office of the Interconnection shall calculate and post the Preliminary Zonal Capacity Prices for each Delivery Year following the Base Residual Auction for such Delivery Year. The Preliminary Zonal Capacity Price for each Zone shall be the sum of: 1) the marginal value of system capacity for the PJM Region, without considering locational constraints; 2) the Locational Price Adder, if any, for the LDA in which such Zone is located; provided however, that if the Zone contains multiple LDAs with different Capacity Resource Clearing Prices, the Zonal Capacity Price shall be a weighted average of the Capacity Resource Clearing Prices for such LDAs, weighted by the Unforced Capacity of Capacity Resources cleared in each such LDA; 3) an adjustment, if required, to account for adders paid to Annual Resources and Extended Summer Demand Resources in the LDA for which the zone is located; 4) an adjustment, if required, to account for Resource Make-Whole Payments; and (5) an adjustment, if required to provide sufficient revenue for payment of any PRD Credits, all as determined in accordance with the optimization algorithm.

ii) The Office of the Interconnection shall calculate and post the Adjusted Zonal Capacity Price following each Incremental Auction. The Adjusted Zonal Capacity Price for each Zone shall equal the sum of: (1) the average marginal value of system capacity weighted by the Unforced Capacity cleared in all auctions previously conducted for such Delivery Year (excluding any Unforced Capacity cleared as replacement capacity); (2) the average Locational Price Adder weighted by the Unforced Capacity cleared in all auctions previously conducted for such Delivery Year (excluding any Unforced Capacity cleared as replacement capacity); (3) an adjustment, if required, to account for adders paid to Annual Resources and Extended Summer Demand Resources for all auctions previously conducted for such Delivery Year (excluding any Unforced Capacity cleared as replacement capacity); (4) an adjustment, if required, to account for Resource Make-Whole Payments for all actions previously conducted (excluding any Resource Make-Whole Payments to be charged to the buyers of replacement capacity); and (5) an adjustment, if required to provide sufficient revenue for payment of any PRD Credits. The Adjusted Zonal Capacity Price may decrease if Unforced Capacity is decommitted or the Resource Clearing Price decreases in an Incremental Auction.

iii) The Office of the Interconnection shall calculate and post the Final Zonal Capacity Price for each Delivery Year after the final auction is held for such Delivery Year, as set forth above. The Final Zonal Capacity Price for each Zone shall equal the Adjusted Zonal Capacity Price, as further adjusted to reflect any decreases in the Nominated Demand Resource Value of any existing Demand Resource cleared in the Base Residual Auction and Second Incremental Auction.

g) Resource Substitution Charge

Each Capacity Market Buyer in an Incremental Auction securing replacement capacity shall pay a Resource Substitution Charge equal to the Capacity Resource Clearing Price resulting from such auction multiplied by the megawatt quantity of Unforced Capacity purchased by such Market Buyer in such auction.

h) Minimum Offer Price Rule for Certain *New Generation Capacity Resources that are not Capacity Resources with State Subsidy*

(1) For purposes of this section, the Net Asset Class Costs of New Entry shall be asset-class estimates of competitive, cost-based nominal levelized Cost of New Entry, net of energy and ancillary service revenues. Determination of the gross Cost of New Entry component of the Net Asset Class Cost of New Entry shall be consistent with the methodology used to determine the Cost of New Entry set forth in Tariff, Attachment DD, section 5.10(a)(iv)(A) of this Attachment. *This section only applies to new Generation Capacity Resources that do not receive or are not entitled to receive a State Subsidy, meaning that such resources are not Capacity Resources with State Subsidy. To the extent a new Generation Capacity Resource is a Capacity Resource with State Subsidy, then the provisions in Tariff, Attachment DD, section 5.14(h-1) apply.*

The gross Cost of New Entry component of Net Asset Class Cost of New Entry shall be, for purposes of the 2022/2023 Delivery Year and subsequent Delivery Years, the values indicated in the table below for each CONE Area for a combustion turbine generator (“CT”), and

a combined cycle generator (“CC”) respectively, and shall be adjusted for subsequent Delivery Years in accordance with subsection (h)(2) below. For purposes of Incremental Auctions for the 2021/2022 Delivery Year, the MOPR Floor Offer Price shall be the same as that used in the Base Residual Auction for such Delivery Year. The estimated energy and ancillary service revenues for each type of plant shall be determined as described in subsection (h)(3) below.

Notwithstanding the foregoing, the Net Asset Class Cost of New Entry shall be zero for: (i) Sell Offers based on nuclear, coal or Integrated Gasification Combined Cycle facilities; or (ii) Sell Offers based on hydroelectric, wind, or solar facilities.

	CONE Area 1	CONE Area 2	CONE Area 3	CONE Area 4
CT \$/MW-yr	108,000	109,700	105,500	105,500
CC \$/MW-yr	118,400	122,000	111,900	114,200

(2) Beginning with the Delivery Year that begins on June 1, 2019, the gross Cost of New Entry component of the Net Asset Class Cost of New Entry shall be adjusted to reflect changes in generating plant construction costs in the same manner as set forth for the cost of new entry in Tariff, Attachment DD, section 5.10(a)(iv)(B), provided, however, that the Applicable BLS Composite Index used for CC plants shall be calculated from the three indices referenced in that section but weighted 20% for the wages index, 55% for the construction materials index, and 25% for the turbines index, and provided further that nothing herein shall preclude the Office of the Interconnection from filing to change the Net Asset Class Cost of New Entry for any Delivery Year pursuant to appropriate filings with FERC under the Federal Power Act.

(3) *For the 2021/2022 Delivery Year, for purposes of this provision, the net energy and ancillary services revenue estimate for a combustion turbine generator shall be that determined by Tariff, Attachment DD, section 5.10(a)(v)(A), provided that the energy revenue estimate for each CONE Area shall be based on the Zone within such CONE Area that has the highest energy revenue estimate calculated under the methodology in that subsection. The net energy and ancillary services revenue estimate for a combined cycle generator shall be determined in the same manner as that prescribed for a combustion turbine generator in the previous sentence, except that the heat rate assumed for the combined cycle resource shall be 6.553 MMBtu/Mwh, the variable operations and maintenance expenses for such resource shall be \$2.11 per MWh, the Peak-Hour Dispatch scenario for both the Day-Ahead and Real-Time Energy Markets shall be modified to dispatch the CC resource continuously during the full peak-hour period, as described in *Peak-Hour Dispatch*, for each such period that the resource is economic (using the test set forth in such *definition*), rather than only during the four-hour blocks within such period that such resource is economic, and the ancillary service revenues shall be \$3350 per MW-year.*

*For the 2022/2023 Delivery Year and subsequent Delivery Years, for purposes of this provision, the net energy and ancillary services revenue estimate for a combustion turbine generator shall be that determined by Tariff, Attachment DD, section 5.10(a)(v-1)(A), provided that the energy and ancillary services revenue estimate for each CONE Area shall be based on the Zone within such CONE Area that has the highest energy revenue estimate calculated under the methodology in that subsection. The net energy and ancillary services revenue estimate for a combined cycle generator shall be determined in the same manner as that prescribed for a*

*combustion turbine generator in the previous sentence, except that the heat rate assumed for the combined cycle resource shall be 6.501 MMBtu/MWh, the variable operations and maintenance expenses for such resource shall be \$2.11 per MWh, a 10% adder will not be included in the energy offer, and the reactive service revenues shall be \$3,350 per MW-year.*

(4) Any Sell Offer that is based on *either (i) or (ii), and (iii)*:

i) a Generation Capacity Resource located in the PJM Region that is submitted in an RPM Auction for a Delivery Year unless a Sell Offer based on that resource has cleared an RPM Auction for that or any prior Delivery Year, or until a Sell Offer based on that resource clears an RPM auction for that or any subsequent Delivery Year; or

ii) a Generation Capacity Resource located outside the PJM Region (where such Sell Offer is based solely on such resource) that requires sufficient transmission investment for delivery to the PJM Region to indicate a long-term commitment to providing capacity to the PJM Region, unless a Sell Offer based on that resource has cleared an RPM Auction for that or any prior Delivery Year, or until a Sell offer based on that resource clears an RPM Auction for that or any subsequent Delivery Year;

iii) in any LDA for which a separate VRR Curve is established for use in the Base Residual Auction for the Delivery Year relevant to the RPM Auction in which such offer is submitted, and that is less than 90 percent of the applicable Net Asset Class Cost of New Entry or, if there is no applicable Net Asset Class Cost of New Entry, less than 70 percent of the Net Asset Class Cost of New Entry for a combustion turbine generator as provided in subsection (h)(1) above shall be set to equal 90 percent of the applicable Net Asset Class Cost of New Entry (or set equal to 70 percent of such cost for a combustion turbine, where there is no otherwise applicable net asset class figure), unless the Capacity Market Seller obtains the prior determination from the Office of the Interconnection described in subsection (5) hereof. This provision applies to Sell Offers submitted in Incremental Auctions conducted after December 19, 2011, provided that the Net Asset Class Cost of New Entry values for any such Incremental Auctions for the 2012-13 or 2013-14 Delivery Years shall be the Net Asset Class Cost of New Entry values posted by the Office of the Interconnection for the Base Residual Auction for the 2014-15 Delivery Year.

(5) Unit-Specific Exception. A Sell Offer meeting the criteria in subsection (4) shall be permitted and shall not be re-set to the price level specified in that subsection if the Capacity Market Seller obtains a determination from the Office of the Interconnection or the Commission, prior to the RPM Auction in which it seeks to submit the Sell Offer, that such Sell Offer is permissible because it is consistent with the competitive, cost-based, fixed, net cost of new entry were the resource to rely solely on revenues from PJM-administered markets. The following process and requirements shall apply to requests for such determinations:

i) The Capacity Market Seller may request such a determination by no later than one hundred twenty (120) days prior to the commencement of the offer period for the RPM Auction in which it seeks to submit its Sell Offer, by submitting simultaneously to the

Office of the Interconnection and the Market Monitoring Unit a written request with all of the required documentation as described below and in the PJM Manuals. For such purpose, the Office of the Interconnection shall post, by no later than one hundred fifty (150) days prior to the commencement of the offer period for the relevant RPM Auction, a preliminary estimate for the relevant Delivery Year of the minimum offer level expected to be established under subsection (4). If the minimum offer level subsequently established for the relevant Delivery Year is less than the Sell Offer, the Sell Offer shall be permitted and no exception shall be required.

ii) As more fully set forth in the PJM Manuals, the Capacity Market Seller must include in its request for an exception under this subsection documentation to support the fixed development, construction, operation, and maintenance costs of the planned generation resource, as well as estimates of offsetting net revenues, *or, sufficient data for the Office of the Interconnection and the Market Monitoring Unit to produce such an estimate*. Estimates of costs or revenues shall be supported at a level of detail comparable to the cost and revenue estimates used to support the Net Asset Class Cost of New Entry established under this section 5.14(h). As more fully set forth in the PJM Manuals, supporting documentation for project costs may include, as applicable and available, a complete project description; environmental permits; vendor quotes for plant or equipment; evidence of actual costs of recent comparable projects; bases for electric and gas interconnection costs and any cost contingencies; bases and support for property taxes, insurance, operations and maintenance (“O&M”) contractor costs, and other fixed O&M and administrative or general costs; financing documents for construction-period and permanent financing or evidence of recent debt costs of the seller for comparable investments; and the bases and support for the claimed capitalization ratio, rate of return, cost-recovery period, inflation rate, or other parameters used in financial modeling. Such documentation also shall identify and support any sunk costs that the Capacity Market Seller has reflected as a reduction to its Sell Offer. The request shall include a certification, signed by an officer of the Capacity Market Seller, that the claimed costs accurately reflect, in all material respects, the seller’s reasonably expected costs of new entry and that the request satisfies all standards for an exception hereunder.

The request also shall identify all revenue sources relied upon in the Sell Offer to offset the claimed fixed costs, including, without limitation, long-term power supply contracts, tolling agreements, or tariffs on file with state regulatory agencies, and shall demonstrate that such offsetting revenues are consistent, over a reasonable time period identified by the Capacity Market Seller, with the standard prescribed above.

*For the 2021/2022 Delivery Year*, in making such demonstration, the Capacity Market Seller may rely upon forecasts of competitive electricity prices in the PJM Region based on well defined models that include fully documented estimates of future fuel prices, variable operation and maintenance expenses, energy demand, emissions allowance prices, and expected environmental or energy policies that affect the seller’s forecast of electricity prices in such region, employing input data from sources readily available to the public. Documentation for net revenues also may include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, and ancillary service capabilities. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting



information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.

*For the 2022/2023 Delivery Year and subsequent Delivery Years, in making such demonstration, the Capacity Market Seller may rely upon revenues projected by well defined, forward-looking dispatch models, designed to generally follow the rules and processes of PJM's energy and ancillary services markets. Such models must utilize publicly available forward prices for electricity and fuel in the PJM Region. Any modifications made to the forward electricity and fuel prices must similarly use publicly available data. Alternative forward prices for fuel may be used if accompanied by contractual evidence showing the applicability of the alternative fuel price. Where forward fuel markets are not available, publicly available estimates of future fuel prices may be used. The model shall also contain estimates of variable operation and maintenance costs, which may include Maintenance Adders, and emissions allowance prices. Documentation for net revenues also must include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, capacity factors and ancillary service capabilities.*

*In the alternative, the Capacity Market Seller may request that the Market Monitoring Unit, subject to acceptance by the Office of Interconnection, produce a resource-specific Energy & Ancillary Services Offset value for such resource using the Forward Hourly LMPs, Forward Hourly Ancillary Service Prices, and either Forward Daily Natural Gas Prices for combustion turbines and combined cycle resources, or forecasted fuel prices for other resource types, and plant parameters and capability information specific to the dispatch of the resource, as outlined above. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.*

iii) A Sell Offer evaluated hereunder shall be permitted if the information provided reasonably demonstrates that the Sell Offer's competitive, cost-based, fixed, net cost of new entry is below the minimum offer level prescribed by subsection (4), based on competitive cost advantages relative to the costs estimated for subsection (4), including, without limitation, competitive cost advantages resulting from the Capacity Market Seller's business model, financial condition, tax status, access to capital or other similar conditions affecting the applicant's costs, or based on net revenues that are reasonably demonstrated hereunder to be higher than estimated for subsection (4). Capacity Market Sellers shall be asked to demonstrate that claimed cost advantages or sources of net revenue that are irregular or anomalous, that do not reflect arm's-length transactions, or that are not in the ordinary course of the Capacity Market Seller's business are consistent with the standards of this subsection. Failure to adequately support such costs or revenues so as to enable the Office of the Interconnection to make the determination required in this section will result in denial of an exception hereunder by the Office of the Interconnection.

iv) The Market Monitoring Unit shall review the information and documentation in support of the request and shall provide its findings whether the proposed Sell Offer is acceptable, in accordance with the standards and criteria hereunder, in writing, to the Capacity Market Seller and the Office of the Interconnection by no later than ninety (90) days prior to the commencement of the offer period for such auction. The Office of the Interconnection shall also review all exception requests and documentation and shall provide in writing to the Capacity Market Seller, and the Market Monitoring Unit, its determination whether the requested Sell Offer is acceptable and if not it shall calculate and provide to such Capacity Market Seller, a minimum Sell Offer based on the data and documentation received, by no later than sixty-five (65) days prior to the commencement of the offer period for the relevant RPM Auction. If the Office of the Interconnection determines that the requested Sell Offer is acceptable, the Capacity Market Seller Shall notify the Market Monitoring Unit and the Office of the Interconnection, in writing, of the minimum level of Sell Offer to which it agrees to commit by no later than sixty (60) days prior to the commencement of the offer period for the relevant RPM Auction.

*h-1) Minimum Offer Price Rule for Capacity Resources with State Subsidy*

(1) **General Rule.** *Any Sell Offer based on either a New Entry Capacity Resource with State Subsidy or a Cleared Capacity Resource with a State Subsidy submitted in any RPM Auction shall have an offer price no lower than the applicable MOPR Floor Offer Price, unless the Capacity Market Seller qualifies for an exemption with respect to such Capacity Resource with a State Subsidy prior to the submission of such offer.*

(A) *Effect of Exemption. To the extent a Sell Offer in any RPM Auction is based on a Capacity Resource with State Subsidy that qualifies for any of the exemptions defined in Tariff, Attachment DD, sections 5.14(h-1)(4)-(8), the Sell Offer for such resource shall not be limited by the MOPR Floor Offer Price, unless otherwise specified.*

(B) *Effect of Exception. To the extent a Sell Offer in any RPM Auction for any Delivery Year is based on a Capacity Resource with State Subsidy for which the Capacity Market Seller obtains, prior to the submission of such offer, a resource-specific exception, such offer may include an offer price below the default MOPR Floor Offer Price applicable to such resource type, but no lower than the resource-specific MOPR Floor Offer Price determined in such exception process.*

(C) *Process for Establishing a Capacity Resource with a State Subsidy.*

(i) *By no later than one hundred and twenty (120) days prior to the commencement of the offer period of any RPM Auction conducted for the 2022/2023 Delivery Year and all subsequent Delivery Years, each Capacity Market Seller must certify to the Office of Interconnection, in accordance with the PJM Manuals, whether or not each Capacity Resource (other than Demand Resource and Energy Efficiency Resource) that the Capacity Market Seller intends to offer into the RPM Auction qualifies as a Capacity Resource with a State Subsidy (including by way of Jointly Owned Cross-Subsidized Capacity Resource) and identify (with specificity) any State Subsidy. Capacity Market Sellers that intend to offer a*

*Demand Resource or an Energy Efficiency Resource into the RPM Auction shall certify to the Office of Interconnection, in accordance with the PJM Manuals, whether or not such Demand Resource or Energy Efficiency Resource qualifies as a Capacity Resource with a State Subsidy no later than thirty (30) days prior to the commencement of the offer period of any RPM Auction conducted for the 2022/2023 Delivery Year and all subsequent Delivery Years. All Capacity Market Sellers shall be responsible for each certification irrespective of any guidance developed by the Office of the Interconnection and the Market Monitoring Unit. A Capacity Resource shall be deemed a Capacity Resource with State Subsidy if the Capacity Market Seller fails to timely certify whether or not a Capacity Resource is entitled to a State Subsidy, unless the Capacity Market Seller receives a waiver from the Commission or the Capacity Resource previously received a resource-specific exception pursuant to Tariff, Attachment DD, section 5.14(h-1)(3).*

*(ii) The requirements in subsection (i) above do not apply to Capacity Resources for which the Market Seller designated whether or not it is subject to a State Subsidy and the associated subsidies to which the Capacity Resource is entitled in a prior Delivery Year, unless there has been a change in the set of those State Subsidy(ies), or for those which are eligible for the Demand Resource or Energy Efficiency exemption, Capacity Storage Resource exemption, Self-Supply Entity exemption, or the Renewable Portfolio Standard exemption.*

*(iii) Once a Capacity Market Seller has certified a Capacity Resource as a Capacity Resource with a State Subsidy, the status of such Capacity Resource will remain unchanged unless and until the Capacity Market Seller (or a subsequent Capacity Market Seller) that owns or controls such Capacity Resource provides a certification of a change in such status, the Office of the Interconnection removes such status, or by FERC order. All Capacity Market Sellers shall have an ongoing obligation to certify to the Office of Interconnection and the Market Monitoring Unit a Capacity Resource's change in status as a Capacity Resource with State Subsidy within 5 days of such change.*

**(2) Minimum Offer Price Rule.** *Any Sell Offer for a New Entry Capacity Resource with State Subsidy or a Cleared Capacity Resource with State Subsidy that does not qualify for any of the exemptions, as defined in Tariff, Attachment DD, sections 5.14(h-1)(4)-(8), shall have an offer price no lower than the applicable MOPR Floor Offer Price.*

**(A) New Entry MOPR Floor Offer Price.** *For a New Entry Capacity Resource with State Subsidy the applicable MOPR Floor Offer Price, based on the net cost of new entry for each resource type, shall be, at the election of the Capacity Market Seller, (i) the resource-specific value determined in accordance with the resource-specific MOPR Floor Offer Price process in Tariff, Attachment DD, section 5.14(h-1)(3) below or (ii) if applicable, the default New Entry MOPR Floor Offer Price for the applicable resource based on the gross cost of new entry values shown in the table below, as adjusted for Delivery Years subsequent to the 2022/2023 Delivery Year, net of estimated net energy and ancillary service revenues for the resource type and Zone in which the resource is located.*

<b>Resource Type</b>	<b>Gross Cost of New Entry (2022/2023 \$/ MW-day) (Nameplate)</b>
----------------------	---

<i>Nuclear</i>	<i>\$2,000</i>
<i>Coal</i>	<i>\$1,068</i>
<i>Combined Cycle</i>	<i>\$320</i>
<i>Combustion Turbine</i>	<i>\$294</i>
<i>Fixed Solar PV</i>	<i>\$271</i>
<i>Tracking Solar PV</i>	<i>\$290</i>
<i>Onshore Wind</i>	<i>\$420</i>
<i>Offshore Wind</i>	<i>\$1,155</i>
<i>Battery Energy Storage</i>	<i>\$532</i>
<i>Generation Backed Demand Resource</i>	<i>\$254</i>

*The gross cost of new entry values in the table above are expressed in dollars per MW-day in terms of nameplate megawatts. For purposes of submitting a Sell Offer, the gross cost of new entry values must be converted to a net -cost of new entry by subtracting the estimated net energy and ancillary service revenues, as determined below, from the gross cost of new entry. However, the resultant net cost of new entry of the battery energy storage resource type in the table above must be multiplied by 2.5. The net cost of new entry based on nameplate capacity is then converted to Unforced Capacity (“UCAP”) MW-day. For Delivery Years through the 2022/2023 Delivery Year, ~~to~~ to determine the applicable UCAP MW-day value, the net cost of new entry is adjusted as follows: for thermal generation resource types and battery energy storage resource types, the applicable class average EFORD; for wind and solar generation resource types, the applicable class average capacity value factor; or for Demand Resources and Energy Efficiency Resources, the Forecast Pool Requirement, as applicable to the relevant RPM Auction. For the 2023/2024 Delivery Year and subsequent Delivery Years, to determine the applicable UCAP MW-day value, the net cost of new entry is adjusted as follows: for thermal generation resource types, the applicable class average EFORD; for battery storage, wind, and solar resource types, the applicable ELCC Class Rating; or for Demand Resources and Energy Efficiency Resources, the Forecast Pool Requirement, as applicable to the relevant RPM Auction. The resulting default New Entry MOPR Floor Offer price in UCAP/MW-day terms shall be applied to each MW offered for the Capacity Resource regardless of the actual Sell Offer quantity and regardless of whether the Sell Offer is for a Seasonal Capacity Performance Resource.*

*The default New Entry MOPR Floor Offer Price for load-backed Demand Resources (i.e., the MW portion of Demand Resources that is not supported by generation) shall be separately determined for each Locational Deliverability Area as the MW-weighted average offer price of load-backed Demand Resources from the most recent three Base Residual Auctions, where the MW weighting shall be determined based on the portion of each Sell Offer for a load-backed portion of the Demand Resource that is supported by end-use customer locations on the registrations used in the pre-registration process for such Base Residual Auctions, as described in the PJM Manuals.*

*The default gross cost of new entry for Energy Efficiency Resources shall be \$644/ICAP MW-Day, which shall be offset by projected wholesale energy savings, as well as transmission and*

*distribution savings of \$95/ICAP MW-Day, to determine the default New Entry MOPR Floor Offer Price (Net Cost of New Entry), where the projected wholesale energy savings are determined utilizing the cost and performance data of relevant programs offered by representative energy efficiency programs with sufficiently detailed publicly available data. The wholesale energy savings, in \$/ICAP MW-day, shall be calculated prior to each RPM Auction and be equal to the average annual energy savings of 6,221 MWh/ICAP MW times the weighted average of the annual real-time Forward Hourly LMPs of the Zones of the representative energy efficiency programs, where the weighting is developed from the annual energy savings in the relevant Zones, divided by 365.*

*Commencing with the Base Residual Auction for the 2023/2024 Delivery Year, the Office of the Interconnection shall adjust the default gross costs of new entry in the table above and for load-backed Demand Resources, and post the preliminary estimates of the adjusted applicable default New Entry MOPR Floor Offer Prices on its website, by no later than one hundred fifty (150) days prior to the commencement of the offer period for each Base Residual Auction. To determine the adjusted applicable default New Entry MOPR Floor Offer Prices for all resource types except for load-backed Demand Resources and Energy Efficiency Resources, the Office of the Interconnection shall adjust the gross costs of new entry utilizing, for combustion turbine and combined cycle resource types, the same Applicable BLS Composite Index applied for such Delivery Year to adjust the CONE value used to determine the Variable Resource Requirement Curve, in accordance with Tariff, Attachment DD, section 5.10(a)(iv), and for all other resource types, the “BLS Producer Price Index Turbines and Turbine Generator Sets” component of the Applicable BLS Composite Index used to determine the Variable Resource Requirement Curve shall be replaced with the “BLS Producer Price Index Final Demand, Goods Less Food & Energy, Private Capital Equipment” when adjusting the gross costs of new entry. The resultant value shall then be then adjusted further by a factor of 1.022 for nuclear, coal, combustion turbine, combine cycle, and generation-backed Demand Resource types or 1.01 for solar, wind, and storage resource types to reflect the annual decline in bonus depreciation scheduled under federal corporate tax law. Updated estimates of the net energy and ancillary service revenues for each default resource type and applicable Zone, which shall include, but are not limited to, consideration of Fuel Costs, Maintenance Adders and Operating Costs, as applicable, pursuant to Operating Agreement, Schedule 2 shall then be subtracted from the adjusted gross costs of new entry to determine the adjusted New Entry MOPR Floor Offer Price. The net energy and ancillary services revenue shall be the the average of the net energy and ancillary services revenues that the resource is projected to receive from the PJM energy and ancillary service markets for the applicable Delivery Year from three separate simulations, with each such simulation using forward prices shaped using historical data from one of each of the three consecutive calendar years preceding the time of the determination for the RPM Auction to take account of year-to-year variability in such hourly shapes. Each net energy and ancillary services revenue simulation shall be conducted in accordance with the following and the PJM Manuals:*

*(i) for nuclear resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined by the gross energy market revenue determined by the product of [average annual day-ahead Forward Hourly LMPs for such Zone, times 8,760 hours times the annual average equivalent availability factor of all PJM nuclear resources] minus the total annual cost to produce energy determined by the product of [8,760 hours times the annual average equivalent availability factor of all PJM nuclear resources times \$9.02/MWh*

*for a single unit plant or \$7.66/MWh for a multi-unit plant] where these hourly cost rates include fuel costs and variable operation and maintenance expenses, inclusive of Maintenance Adder costs, plus reactive services revenue of \$3,350/MW-year;*

*(ii) for coal resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined by the Projected EAS Dispatch of a 650 MW coal unit (with heat rate of 8,638 BTU/kWh and variable operations and maintenance variable operation and maintenance expenses, inclusive of Maintenance Adder costs, of \$9.50/MWh) using day-ahead and real-time Forward Hourly LMPs for such Zone and Forward Hourly Ancillary Service Prices, and daily forecasted coal prices, as set forth in the PJM Manuals, plus reactive services revenue of \$3,350/MW-year;*

*(iii) for combustion turbine resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined in a manner consistent with the methodology described in Tariff, Attachment DD, section 5.10(a)(v-1)(B) for the Reference Resource combustion turbine.*

*(iv) for combined cycle resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined in the same manner as that prescribed for a combustion turbine resource type, except that the heat rate assumed for the combined cycle resource shall be 6,501 BTU/kwh, the variable operations and maintenance expenses for such resource, inclusive of Maintenance Adder costs, shall be \$2.11/MWh, plus reactive services revenue of \$3,350/MW-year.*

*(v) for solar PV resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined using a solar resource model that provides the average MW output level, expressed as a percentage of nameplate rating, by hour of day (for each of the 24-hours of a day) and by calendar month (for each of the twelve months of a year). The annual net energy market revenues are determined by multiplying the solar output level of each hour by the real-time Forward Hourly LMP for such Zone and applicable to such hour with this product summed across all of the hours of an annual period, plus reactive services revenue of \$3,350/MW-year. Two separate solar resource models are used, one model for a fixed panel resource and a second model for a tracking panel resource;*

*(vi) for onshore wind resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined using a wind resource model that provides the average MW output level, expressed as a percentage of nameplate rating, by hour of day (for each of the 24-hours of a day) and by calendar month (for each of the twelve months of a year). The annual energy market revenues are determined by multiplying the wind output level of each hour by the real-time Forward Hourly LMP for such Zone applicable to such hour with this product summed across all of the hours of an annual period, plus reactive services revenue of \$3,350/MW-year;*

*(vii) for offshore wind resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined by the gross energy market revenue equal to the product of [the average annual real-time Forward Hourly LMP for such Zone times 8,760 hours times an assumed annual capacity factor of 45%], plus reactive services revenue of \$3,350/MW-year;*

*(viii) for Capacity Storage Resource, the net energy and ancillary services revenue estimate shall be estimated by the Projected EAS Dispatch of a 1 MW, 4MWh resource, with an 85% roundtrip efficiency, and assumed to be dispatched between 95% and 5% state of charge against day-ahead and real-time Forward Hourly LMPs for such Zone and Forward Hourly Ancillary Service Prices, plus reactive services revenue of \$3,350/MW-year; and*

(ix) for generation-backed Demand Resource, the net energy and ancillary services revenue estimate shall be zero dollars.

*Beginning with the Delivery Year that commences June 1, 2022, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the default gross cost of new entry values. Such review may include, without limitation, analyses of the fixed development, construction, operation, and maintenance costs for such resource types. Based on the results of such review, PJM shall propose either to modify or retain the default gross cost of new entry values stated in the table above and the default gross cost of new entry value for Energy Efficiency Resources. The Office of the Interconnection shall post publicly and solicit stakeholder comment regarding the proposal. If, as a result of this process, changes to the default gross cost of new entry values are proposed, the Office of the Interconnection shall file such proposed modifications with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.*

*New Entry Capacity Resource with State Subsidy for which there is no default MOPR Floor Offer Price provided in accordance with this section, including hybrid resources, must seek a resource-specific value determined in accordance with the resource-specific MOPR Floor Offer Price process below to participate in an RPM Auction. Failure to obtain a resource-specific MOPR Floor Offer Price will result in the Office of the Interconnection rejecting any Sell Offer based on such resource for the relevant RPM Auction.*

**(B) Cleared MOPR Floor Offer Prices.**

(i) For a Cleared Capacity Resource with State Subsidy, the applicable Cleared MOPR Floor Offer Price shall be, at the election of the Capacity Market Seller, (a) based on the resource-specific MOPR Floor Offer Price, as determined in accordance with Tariff, Attachment DD, section 5.14(h-1)(3) below, or (b) if available, the default Avoidable Cost Rate for the applicable resource type shown in the table below, as adjusted for Delivery Years subsequent for the 2022/2023 Delivery Year to reflect changes in avoidable costs, net of projected PJM market revenues equal to the resource's net energy and ancillary service revenues for the resource type, as determined in accordance with subsection (ii) below.

<b>Existing Resource Type</b>	<b>Default Gross ACR (2022/2023 \$/MW-day) (Nameplate)</b>
<i>Nuclear - single</i>	<i>\$697</i>
<i>Nuclear - dual</i>	<i>\$445</i>
<i>Coal</i>	<i>\$80</i>
<i>Combined Cycle</i>	<i>\$56</i>
<i>Combustion Turbine</i>	<i>\$50</i>
<i>Solar PV (fixed and tracking)</i>	<i>\$40</i>
<i>Wind Onshore</i>	<i>\$83</i>
<i>Generation-backed</i>	<i>\$3</i>

<i>Demand Response</i>	
<i>Load-backed Demand Response</i>	\$0
<i>Energy Efficiency</i>	\$0

The default gross Avoidable Cost Rate values in the table above are expressed in dollars per MW-day in terms of nameplate megawatts. For purposes of submitting a Sell Offer, the default Avoidable Cost Rate values must be net of estimated net energy and ancillary service revenues, and then the difference is ultimately converted to Unforced Capacity (“UCAP”) MW-day, where the UCAP MW-day value will be determined based on: for Delivery Years through the 2022/2023 Delivery Year, the resource-specific EFORD for thermal generation resource types and battery energy storage resource types, resource-specific capacity value factor for solar and wind generation resource types (based on the ratio of Capacity Interconnection Rights to nameplate capacity, appropriately time-weighted for any winter Capacity Interconnection Rights), or the Forecast Pool Requirement for Demand Resources and Energy Efficiency Resources, as applicable to the relevant RPM Auction, and for the 2023/2024 Delivery Year and subsequent Delivery Years, the resource-specific EFORD for thermal generation resource types and on the resource-specific Accredited UCAP value for solar and wind resource types (with appropriate time-weighting for any winter Capacity Interconnection Rights), or the Forecast Pool Requirement for Demand Resources and Energy Efficiency Resources, as applicable to the relevant RPM Auction. The resulting default Cleared MOPR Floor Offer price in UCAP/MW-day terms shall be applied to each MW offered for the Capacity Resource regardless of actual Sell Offer quantity and regardless of whether the Sell Offer is for a Seasonal Capacity Performance Resource.

Commencing with the Base Residual Auction for the 2023/2024 Delivery Year, the Office of the Interconnection shall adjust the default Avoidable Cost Rates in the table above, and post the adjusted values on its website, by no later than one hundred fifty (150) days prior to the commencement of the offer period for each Base Residual Auction. To determine the adjusted Avoidable Cost Rates, the Office of the Interconnection shall utilize the 10-year average Handy-Whitman Index in order to adjust the Gross ACR values to account for expected inflation. Updated estimates of the net energy and ancillary service revenues shall be determined on a resource-specific basis in accordance with Tariff, Attachment DD, section 6.8(d) and the PJM Manuals.

Beginning with the Delivery Year that commences June 1, 2022, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the default Avoidable Cost Rates for Capacity Resources with State Subsidies that have cleared in an RPM Auction for any prior Delivery Year. Such review may include, without limitation, analyses of the avoidable costs of such resource types. Based on the results of such review, PJM shall propose either to modify or retain the default Avoidable Cost Rate values stated in the table above. The Office of the Interconnection shall post publicly and solicit stakeholder comment regarding the proposal. If, as a result of this process, changes to the default Avoidable Cost Rate values are proposed, the Office of the Interconnection shall file such proposed modifications with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.



*Cleared Capacity Resources with State Subsidy for which there is no default MOPR Floor Offer Price provided in accordance with this section, including hybrid resources, must seek a resource-specific value determined in accordance with the resource-specific MOPR Floor Offer Price process below to participate in an RPM Auction. Failure to obtain a resource-specific MOPR Floor Offer Price will result in the Office of the Interconnection rejecting any Sell Offer based on such resource.*

*(ii) The net energy and ancillary services revenue is equal to forecasted net revenues which shall be determined in accordance with the applicable resource type net energy and ancillary services revenue determination methodology set forth in Tariff, Attachment DD, section 5.14(h-1)(2)(A)(i) through (ix) and using the subject resource's operating parameters as determined in accordance with the PJM Manuals based on (a) offers submitted in the Day-ahead Energy Market and Real-time Energy Market over the calendar year preceding the time of the determination for the RPM Auction; (b) the resource-specific operating parameters approved, as applicable, in accordance with Operating Agreement, Schedule 1, section 6.6(b) and Operating Agreement, Schedule 2 (including any Fuel Costs, emissions costs, Maintenance Adders, and Operating Costs); (c) the resource's EFORD; (d) Forward Hourly LMPs at the generation bus as determined in accordance with Tariff, Attachment DD, section 5.10(a)(v-1)(C)(6); and (e) the resource's stated annual revenue requirement for reactive services; plus any unit-specific bilateral contract. In addition, the following resource type-specific parameters shall be considered; (f) for combustion turbine, combined cycle, and coal resource types: the installed capacity rating, ramp rate (which shall be equal to the maximum ramp rate included in the resource's energy offers over the most recent previous calendar year preceding the determination for the RPM Auction), and the heat rate as determined as the resource's average heat rate at full load as submitted to the Market Monitoring Unit and the Office of the Interconnection, where for combined cycle resources heat rates will be determined at base load and at peak load (e.g., without duct burners and with duct burners), as applicable; (g) for nuclear resource type: anticipated refueling schedule; (h) for solar and wind resource types: the resource's output profiles for the most recent three calendar years, as available; and (i) for battery storage resource type: the nameplate capacity rating (on a MW / MWh basis).*

*To the extent the resource has not achieved commercial operation, the operating parameters used in the simulation of the net energy and ancillary service revenues will be based on the manufacturer's specifications and/or from parameters used for other existing, comparable resources, as developed by the Market Monitoring Unit and the Capacity Market Seller, and accepted by the Office of the Interconnection.*

*A Capacity Market Seller intending to submit a Sell Offer in any RPM Auction for a Cleared Capacity Resource with State Subsidy based on a net energy and ancillary services revenue determination that does not use the foregoing methodology or parameter inputs stated for that resource type shall, at its election, submit a request for a resource-specific MOPR Floor Offer Price for such Capacity Resource pursuant to Tariff, Attachment DD, section 5.14(h-1)(3) below.*

*(3) Resource-Specific Exception. A Capacity Market Seller intending to submit a Sell Offer in any RPM Auction for a New Entry Capacity Resource with State Subsidy or a Cleared Capacity Resource with State Subsidy below the applicable default MOPR Floor Offer Price may, at its election, submit a request for a resource-specific exception for such*

*Capacity Resource. A Sell Offer below the default MOPR Floor Offer Price, but no lower than the resource-specific MOPR Floor Offer Price, shall be permitted if the Capacity Market Seller obtains approval from the Office of the Interconnection or the Commission, prior to the RPM Auction in which it seeks to submit the Sell Offer. The resource-specific MOPR Floor Offer Price determined under this provision shall be based on the resource-specific EFORD for thermal generation resource types, on the resource-specific Accredited UCAP value for ~~and~~ battery energy storage resource types and for ~~resource-specific capacity value factor for~~ solar and wind generation resource types (~~based on the ratio of Capacity Interconnection Rights to nameplate capacity~~, appropriately time-weighted for any winter Capacity Interconnection Rights), or the Forecast Pool Requirement for Demand Resources and Energy Efficiency Resources, as applicable to the relevant RPM Auction and shall be applied to each MW offered by the resource regardless of actual Sell Offer quantity and regardless of whether the Sell Offer is for a Seasonal Capacity Performance Resource. Such Sell Offer is permissible because it is consistent with the competitive, cost-based, fixed, net cost were the resource to rely solely on revenues exclusive of any State Subsidy. All supporting data must be provided for all requests. The following requirements shall apply to requests for such determinations:*

*(A) The Capacity Market Seller shall submit a written request with all of the required documentation as described below and in the PJM Manuals. For such purpose, the Capacity Market Seller shall submit the resource-specific exception request to the Office of the Interconnection and the Market Monitoring Unit no later than one hundred twenty (120) days prior to the commencement of the offer period for the RPM Auction in which it seeks to submit its Sell Offer. For such purpose, the Office of the Interconnection shall post, by no later than one hundred fifty (150) days prior to the commencement of the offer period for the relevant RPM Auction, a preliminary estimate for the relevant Delivery Year of the default Minimum Floor Offer Prices, determined pursuant to Tariff, Attachment DD, sections 5.14(h-1)(2)(A) and (B). If the final applicable default Minimum Floor Offer Price subsequently established for the relevant Delivery Year is less than the Sell Offer, the Sell Offer shall be permitted and no exception shall be required.*

*(B) For a resource-specific exception for a New Entry Capacity Resource with State Subsidy, the Capacity Market Seller must include in its request for an exception under this subsection documentation to support the fixed development, construction, operation, and maintenance costs of the Capacity Resource, as well as estimates of offsetting net revenues.*

*The financial modeling assumptions for calculating Cost of New Entry for Generation Capacity Resources and generation-backed Demand Resources shall be: (i) nominal levelization of gross costs, (ii) asset life of twenty years, (iii) no residual value, (iv) all project costs included with no sunk costs excluded, (v) use first year revenues (which may include revenues from the sale of renewable energy credits for purposes other than state-mandated or state-sponsored programs), and (vi) weighted average cost of capital based on the actual cost of capital for the entity proposing to build the Capacity Resource. Notwithstanding the foregoing, a Capacity Market Seller that seeks to utilize an asset life other than twenty years (but no greater than 35 years) shall provide evidence to support the use of a different asset life, including but not limited to, the asset life term for such resource as utilized in the Capacity Market Seller's financial accounting (e.g., independently audited financial statements), or project financing documents for the*

*resource or evidence of actual costs or financing assumptions of recent comparable projects to the extent the seller has not executed project financing for the resource (e.g., independent project engineer opinion or manufacturer's performance guarantee), or opinions of third-party experts regarding the reasonableness of the financing assumptions used for the project itself or in comparable projects. Capacity Market Sellers may also rely on evidence presented in federal filings, such as its FERC Form No. 1 or an SEC Form 10-K, to demonstrate an asset life other than 20 years of similar asset projects.*

*Supporting documentation for project costs may include, as applicable and available, a complete project description; environmental permits; vendor quotes for plant or equipment; evidence of actual costs of recent comparable projects; bases for electric and gas interconnection costs and any cost contingencies; bases and support for property taxes, insurance, operations and maintenance ("O&M") contractor costs, and other fixed O&M and administrative or general costs; financing documents for construction-period and permanent financing or evidence of recent debt costs of the seller for comparable investments; and the bases and support for the claimed capitalization ratio, rate of return, cost-recovery period, inflation rate, or other parameters used in financial modeling. In addition to the certification, signed by an officer of the Capacity Market Seller, the request must include a certification that the claimed costs accurately reflect, in all material respects, the seller's reasonably expected costs of new entry and that the request satisfies all standards for a resource-specific exception hereunder. The request also shall identify all revenue sources (exclusive of any State Subsidies) relied upon in the Sell Offer to offset the claimed fixed costs, including, without limitation, long-term power supply contracts, tolling agreements, or tariffs on file with state regulatory agencies, and shall demonstrate that such offsetting revenues are consistent, over a reasonable time period identified by the Capacity Market Seller, with the standard prescribed above. In making such demonstration, the Capacity Market Seller may rely upon revenues projected by well-defined, forward-looking dispatch models designed to generally follow the rules and processes of PJM's energy and ancillary services market. Such models must utilize publicly available forward prices for electricity and fuel in the PJM Region. Any modifications made to the forward electricity and fuel prices must similarly use publicly available data. Alternative forward prices for fuel may be used if accompanied by contractual evidence showing the applicability of the alternative fuel price. Where forward fuel markets are not available, publicly available estimates of future fuel prices may be used. The model shall also contain estimates of variable operation and maintenance expenses, which may include Maintenance Adders, and emissions allowance prices. Documentation for net revenues also must include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, capacity factors, and ancillary service capabilities. Any evaluation of net revenues should be consistent with Operating Agreement, Schedule 2, including, but not limited to, consideration of Fuel Costs, Maintenance Adders and Operating Costs, as applicable.*

*In the alternative, the Capacity Market Seller may request that the Market Monitoring Unit, subject to acceptance by the Office of Interconnection, produce a resource-specific Energy & Ancillary Services Offset value for such resource using the Forward Hourly LMPs, Forward Hourly Ancillary Service Prices and either Forward Daily Natural Gas Prices for combustion turbines and combined cycle resources, or forecasted fuel prices for other resource types, plus*

*plant parameters and capability information specific to the dispatch of the resource, as outlined above. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.*

*The default assumptions for calculating resource-specific Cost of New Entry for Energy Efficiency Resources shall be based on, as supported by documentation provided by the Capacity Market Seller: the nominal-levelized annual cost to implement the Energy Efficiency program or to install the Energy Efficiency measure reflective of the useful life of the implemented Energy Efficiency equipment, and the offsetting savings associated with avoided wholesale energy costs and other claimed savings provided by implementing the Energy Efficiency program or installing the Energy Efficiency measure.*

*The default assumptions for calculating resource-specific Cost of New Entry for load-backed Demand Resources shall be based on, as supported by documentation provided by the Capacity Market Seller, program costs required for the resource to meet the capacity obligations of a Demand Resource, including all fixed operating and maintenance cost and weighted average cost of capital based on the actual cost of capital for the entity proposing to develop the Demand Resource.*

*For generation-backed Demand Resources, the determination of a resource-specific MOPR Floor Offer Price shall only consider the resource's costs related to participation in the Reliability Pricing Model and meeting a capacity commitment. The Capacity Market Seller must provide supporting documentation (at the end-use customer level) of the cost associated with participation as a Demand Resource and an attestation from the Demand Resource that all other costs are not related to participation as a Demand Resource, such as the costs associated with installation and operation of the generation unit, and will be accrued and paid regardless of participation in the Reliability Pricing Model. To the extent the Capacity Market Seller includes all costs associated with the generation unit supporting the Demand Resource then demand charge management benefits at the retail level (as supported by documentation at the end-use customer level) may also be considered as an additional offset to such costs. Supporting documentation (at the end-use customer level) may include, but is not limited to, historic end-use customer bills and associated analysis that identifies the annual retail avoided cost from the operation of such generation unit or the business case to support installation of the generator or regulatory requirements where the generator would be required absent participation in the Reliability Pricing Model.*

*(C) For a Resource-Specific Exception for a Cleared Capacity Resource with State Subsidy that is a generation resource, the Capacity Market Seller shall submit a Sell Offer consistent with the unit-specific Market Seller Offer Cap process pursuant to Tariff, Attachment DD, section 6.8; except that the 10% uncertainty adder may not be included in the "Adjustment Factor." In addition and notwithstanding the requirements of Tariff, Attachment DD, section 6.8, the Capacity Market Seller shall, at its election, include in its request for an exception under this subsection documentation to support projected energy and*

*ancillary services markets revenues. Such a request shall identify all revenue sources (exclusive of any State Subsidies) relied upon in the Sell Offer to offset the claimed fixed costs, including, without limitation, long-term power supply contracts, tolling agreements, or tariffs on file with state regulatory agencies, and shall demonstrate that such offsetting revenues are consistent, over a reasonable time period identified by the Capacity Market Seller, with the standard prescribed above. In making such demonstration, the Capacity Market Seller may rely upon revenues projected by well-defined, forward-looking dispatch models designed to generally follow the rules and processes of PJM's energy and ancillary services market. Such models must utilize publicly available forward prices for electricity and fuel in the PJM Region. Any modifications made to the forward electricity and fuel prices must similarly use publicly available data. Alternative forward prices for fuel may be used if accompanied by contractual evidence showing the applicability of the alternative fuel price. Where forward fuel markets are not available, publicly available estimates of future fuel sources may be used. The model shall also contain estimates of variable operation and maintenance expenses, which may include Maintenance Adders, and emissions allowance prices. Documentation for net revenues also must include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, capacity factors, and ancillary service capabilities. Any evaluation of revenues should include, but would not be not limited to, consideration of Fuel Costs, Maintenance Adders and Operating Costs, as applicable, pursuant to Operating Agreement, Schedule 2.*

*In the alternative, the Capacity Market Seller may request that the Market Monitoring Unit, subject to acceptance by the Office of Interconnection, produce a resource-specific Energy & Ancillary Services Offset value for such resource using the Forward Hourly LMPs, Forward Hourly Ancillary Service Prices and either Forward Daily Natural Gas Prices for combustion turbines and combined cycle resources, or forecasted fuel prices for other resource types, plus plant parameters and capability information specific to the dispatch of the resource, as outlined above. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.*

*The resource-specific MOPR Floor Offer Price for a Cleared Capacity Resource with State Subsidy that is a generation-backed Demand Resource will be determined based on only costs associated with the resource participating in the Reliability Pricing Model and satisfying a capacity commitment or, to the extent the Capacity Market Seller includes all costs associated with the generation unit supporting the Demand Resource, then demand charge management benefits at the retail level (as supported by documentation at the end-use customer level) may also be considered as an additional offset to such costs. Supporting documentation (at the end-use customer level) may include but is not limited to, historic end-use customer bills and associated analysis that identifies the annual retail avoided cost from the operation of such generation unit or the business case to support installation of the generator or regulatory requirements where the generator would be required absent participation in the Reliability Pricing Model.*

(D) A Sell Offer evaluated at the resource-specific exception shall be permitted if the information provided reasonably demonstrates that the Sell Offer's competitive, cost-based, fixed, net cost of new entry is below the default MOPR Floor Offer Price, based on competitive cost advantages relative to the costs estimated by the default MOPR Floor Offer Price, including, without limitation, competitive cost advantages resulting from the Capacity Market Seller's business model, financial condition, tax status, access to capital or other similar conditions affecting the applicant's costs, or based on net revenues that are reasonably demonstrated hereunder to be higher than those estimated by the default MOPR Floor Offer Price. Capacity Market Sellers shall demonstrate that claimed cost advantages or sources of net revenue that are irregular or anomalous, that do not reflect arm's-length transactions, or that are not in the ordinary course of the Capacity Market Seller's business are consistent with the standards of this subsection. Failure to adequately support such costs or revenues so as to enable the Office of the Interconnection to make the determination required in this section will result in denial of a resource-specific exception by the Office of the Interconnection.

(E) The Capacity Market Seller must submit a sworn, notarized certification of a duly authorized officer, certifying that the officer has personal knowledge of the resource-specific exception request and that to the best of his/her knowledge and belief: (1) the information supplied to the Market Monitoring Unit and the Office of Interconnection to support its request for an exception is true and correct; (2) the Capacity Market Seller has disclosed all material facts relevant to the request for the exception; and (3) the request satisfies the criteria for the exception.

(F) The Market Monitoring Unit shall review, in an open and transparent manner with the Capacity Market Seller and the Office of the Interconnection, the information and documentation in support of the request and shall provide its findings whether the proposed Sell Offer is acceptable, in accordance with the standards and criteria hereunder, in writing, to the Capacity Market Seller and the Office of the Interconnection by no later than ninety (90) days prior to the commencement of the offer period for such auction. The Office of the Interconnection shall also review, in an open and transparent manner, all exception requests and documentation and shall provide in writing to the Capacity Market Seller, and the Market Monitoring Unit, its determination whether the requested Sell Offer is acceptable and if not it shall calculate and provide to such Capacity Market Seller, a minimum Sell Offer based on the data and documentation received, by no later than sixty-five (65) days prior to the commencement of the offer period for the relevant RPM Auction. After the Office of the Interconnection determines with the advice and input of Market Monitor, the acceptable minimum Sell Offer, the Capacity Market Seller shall notify the Market Monitoring Unit and the Office of the Interconnection, in writing, of the minimum level of Sell Offer to which it agrees to commit by no later than sixty (60) days prior to the commencement of the offer period for the relevant RPM Auction, and in making such determination, the Capacity Market Seller may consider the applicable default MOPR Floor Offer Price and may select such default value if it is lower than the resource-specific determination. A Capacity Market Seller that is dissatisfied with any determination hereunder may seek any remedies available to it from FERC; provided, however, that the Office of the Interconnection will proceed with administration of the Tariff and market rules based on the lower of the applicable default MOPR Floor Offer Price and the resource-specific determination unless and until ordered to do otherwise by FERC.

(4) *Competitive Exemption.*

(A) *A Capacity Resource with State Subsidy may be exempt from the Minimum Offer Price Rule under this subsection 5.14(h-1) in any RPM Auction if the Capacity Market Seller certifies to the Office of Interconnection, in accordance with the PJM Manuals, that the Capacity Market Seller of such Capacity Resource elects to forego receiving any State Subsidy for the applicable Delivery Year no later than thirty (30) days prior to the commencement of the offer period for the relevant RPM Auction. Notwithstanding the foregoing, the competitive exemption is not available to Capacity Resources with State Subsidy that (A) are owned or offered by Self-Supply Entities, (B) are no longer entitled to receive a State Subsidy but are still considered a Capacity Resource with State Subsidy solely because they have not cleared an RPM Auction since last receiving a State Subsidy, or (C) are Jointly Owned Cross-Subsidized Capacity Resources or is the subject of a bilateral transaction (including but not limited to those reported pursuant to Tariff, Attachment DD, section 4.6) and not all Capacity Market Sellers of the supporting facility unanimously elect the competitive exemption and certify that no State Subsidy will be received associated with supporting the resource. A new Generation Capacity Resource that is a Capacity Resource with State Subsidy may elect the competitive exemption; however, in such instance, the applicable MOPR Floor Offer Price will be determined in accordance with the minimum offer price rules for certain new Generation Capacity Resources as provided in Tariff, Attachment DD, section 5.14(h), which apply the minimum offer price rule to the new Generation Capacity Resources located in an LDA where a separate VRR Curve is established as provided in Tariff, Attachment DD, section 5.14(h)(4).*

(B) (i) *The Capacity Market Seller shall not receive a State Subsidy for any part of the relevant Delivery Year in which it elects a competitive exemption or certifies that it is not a Capacity Resource with State Subsidy. In furtherance of this prohibition, if a Capacity Resource that (1) is a New Entry Capacity Resource with State Subsidy that elects the competitive exemption in subsection (4)(A) above and clears an RPM Auction for a given Delivery Year, but prior to the end of that Delivery Year elects to accept a State Subsidy for the associated Delivery Year or an earlier Delivery Year or (2) is not a Capacity Resource with State Subsidy at the time of the RPM Auction for the Delivery Year for which it first cleared an RPM Auction but prior to the end of that Delivery Year receives a State Subsidy for the associated Delivery Year or an earlier Delivery Year, or (3) in the case of Demand Resource, is an end-use customer location MW that receives a State Subsidy and is included in a Demand Resource Registration pursuant to RAA, Schedule 6 to satisfy a Demand Resource commitment that was not designated as a Capacity Resource with State Subsidy at the time it cleared the relevant RPM Auction, then the Capacity Market Seller of that Capacity Resource or end-use customer location MW shall not receive RPM revenues for such resource or end-use customer location MW for any part of that Delivery Year and may not participate in any RPM Auction with such resource or end-use customer location MW, or be eligible to use such resource or end-use customer location MW as replacement capacity starting June 1 of the Delivery Year after the Capacity Market Seller or end-use customer location MW first receives the State Subsidy and continuing for a period of 20 years, except for battery energy storage, for which such participation restriction shall apply for a period of 15 years. A Jointly Owned Cross-Subsidized Capacity Resource that meets the requirements of either of the two preceding subsections (B)(i)(1) or (2), shall not receive RPM revenues for any part of that Delivery Year and may not*



*participate in any RPM Auction or be eligible to be used as replacement capacity starting June 1 of the Delivery Year and continuing for the number of years specified above, after any joint Capacity Market Seller of the underlying facility first receives the State Subsidy. A Capacity Resource with State Subsidy that is the subject of a bilateral transaction that meets the requirements of either of the two preceding subsections (B)(i)(1) or (2) shall not receive RPM revenues for any part of that Delivery Year and may not participate in any RPM Auction or be eligible to be used as replacement capacity starting June 1 of the Delivery Year and continuing for the number of years specified above if any owner or Capacity Market Seller of the facility receives a State Subsidy. The Capacity Market Seller(s) of any such Capacity Resource or Jointly Owned Cross-Subsidized Capacity Resource shall also return to the Office of the Interconnection any revenues paid to such Capacity Resource associated with their capacity commitment for such Delivery Year and shall retain their RPM commitment and associated obligations for such Delivery Year and for any future Delivery Years in which the resource has already secured a capacity commitment, including any Non-Performance Charges relating to the capacity and remain eligible to collect Performance Payments under this Tariff, Attachment DD, section 10A for the relevant Delivery Year and any subsequent Delivery Years for which it already received an RPM commitment. Notwithstanding the foregoing, Capacity Resources that lose their eligibility to participate in RPM pursuant to this section remain eligible for commitment in an FRR Capacity Plan.*

*(ii) If any Capacity Resource that has previously cleared an RPM Auction (1) is a Cleared Capacity Resource with State Subsidy that claims the competitive exemption pursuant to subsection (4)(A) above in an RPM Auction and clears such RPM Auction or (2) was not a Capacity Resource with State Subsidy at the time it cleared an RPM Auction for a given Delivery Year but later becomes entitled to receive a State Subsidy for that Delivery Year, and the Capacity Market Seller subsequently elects to accept a State Subsidy for any part of that Delivery Year, or (3) in the case of Demand Resource, is an end-use customer location that receives a State Subsidy and is included in a Demand Resource Registration pursuant to RAA, Schedule 6 to satisfy a Demand Resource commitment that was not designated as a Capacity Resource with State Subsidy at the time it cleared the relevant RPM Auction, then the Capacity Market Seller of that Capacity Resource or end-use customer location may not receive RPM revenues for such resource or end-use customer location for any part of that Delivery Year, unless it can demonstrate that it would have cleared in the relevant RPM Auction under an offer consistent with the resource-specific exception process outlined above in subsection 5.14(h-1)(3). All Capacity Market Sellers of a Jointly Owned Cross-Subsidized Capacity Resource that meets the requirements of either of the two preceding subsections (B)(ii)(1) or (2) may not receive RPM revenues for any part of that Delivery Year if any joint Capacity Market Seller of the underlying facility accepts a subsidy for that Delivery Year, unless the Capacity Market Seller can demonstrate that the facility would have cleared in the relevant RPM Auction under an offer consistent with the resource-specific exception process outlined above in subsection 5.14(h-1)(3). A Capacity Resource with State Subsidy that is the subject of a bilateral transaction may not receive RPM revenues for any part of that Delivery Year if any owner or Capacity Market Seller of the underlying facility receives a State Subsidy for that Delivery Year, unless the Capacity Market Seller can demonstrate that the facility would have cleared in the relevant RPM Auction under an offer consistent with the resource-specific exception process outlined above in subsection 5.14(h-1)(3), if any owner or Capacity Market Seller of the facility receives a State Subsidy. The Capacity Market Seller(s) of any such Capacity Resources or*



*Jointly Owned Cross-Subsidized Capacity Resource shall return to the Office of the Interconnection any revenues paid to such Capacity Resource associated with their capacity commitment for such Delivery Year and shall retain their RPM commitment and associated obligations for the relevant Delivery Year and remain eligible to collect Performance Payments or to pay Non-Performance Charges, as applicable, pursuant to Tariff, Attachment DD, section 10A.*

*(iii) Any revenues returned to the Office of the Interconnection pursuant to the preceding subsections (i) and (ii) shall be allocated to the relevant load that paid for the State Subsidy (to the extent possible). If the Office of Interconnection cannot identify the relevant load responsible for the State Subsidy, then the returned revenues would be allocated across all load in the RTO that has not selected the FRR Alternative. Such revenues shall be distributed on a pro-rata basis to such LSEs that were charged a Locational Reliability Charge based on their Daily Unforced Capacity Obligations.*

*(5) Self-Supply Entity exemption. A Capacity Resource that was owned, or bilaterally contracted, by a Self-Supply Entity on December 19, 2019, shall be exempt from the Minimum Offer Price Rule if such Capacity Resource remains owned or bilaterally contracted by such Self-Supply Entity and satisfies at least one of the criteria specified below:*

*(A) has successfully cleared an RPM Auction prior to December 19, 2019;*

*(B) is the subject of an interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement executed on or before December 19, 2019; or*

*(C) is the subject of an unexecuted interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement filed by PJM with the Commission on or before December 19, 2019.*

*(6) Renewable Portfolio Standard Exemption. A Capacity Resource with State Subsidy shall be exempt from the Minimum Offer Price Rule if such Capacity Resource (1) receives or is entitled to receive State Subsidies through renewable energy credits or equivalent credits associated with a state-mandated or state-sponsored renewable portfolio standard ("RPS") program or equivalent program as of December 19, 2019 and (2) satisfies at least one of the following criteria:*

*(A) has successfully cleared an RPM Auction prior to December 19, 2019;*

*(B) is the subject of an interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement executed on or before December 19, 2019; or*

(C) *is the subject of an unexecuted interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement filed by PJM with the Commission on or before December 19, 2019.*

(7) *Demand Resource and Energy Efficiency Resource Exemption.*

(A) *A Capacity Resource with State Subsidy that is Demand Resource or an Energy Efficiency Resource shall be exempt from the Minimum Offer Price Rule if such Capacity Resource satisfies at least one of the following criteria:*

(i) *has successfully cleared an RPM Auction prior to December 19, 2019. For purposes of this subsection (a), individual customer location registrations (or for utility-based residential load curtailment program, based on the total number of participating customers) that participated as Demand Resource and cleared in an RPM Auction prior to December 19, 2019, and were submitted to PJM no later than 45 days prior to the BRA for the 2022/2023 Delivery Year shall be deemed eligible for the Demand Resource and Energy Efficiency Resource Exemption; or*

(ii) *has completed registration on or before December 19, 2019; or*

(iii) *is supported by a post-installation measurement and verification report for Energy Efficiency Resources approved by PJM on or before December 19, 2019 (calculated for each installation period, Zone and Sub-Zone by using the greater of the latest approved post-installation measurement and verification report prior to December 19, 2019 or the maximum MW cleared for a Delivery Year across all auctions conducted prior to December 19, 2019).*

(B) *All registered locations that qualify for the Demand Resource and Energy Efficiency Resource exemption shall continue to remain exempt even if the MW of nominated capacity increases between RPM Auctions unless any MW increase in the nominated capacity is due to an investment made for the sole purpose of increasing the curtailment capability of the location in the capacity market. In such case, the MW of increased capability will not be qualified for the Demand Resource and Energy Efficiency Resource exemption.*

(8) *Capacity Storage Resource Exemption. A Capacity Resource with State Subsidy that is a Capacity Storage Resource shall be exempt from the Minimum Offer Price Rule if such Capacity Storage Resource satisfies at least one of the following criteria:*

(A) *has successfully cleared an RPM Auction prior to December 19, 2019;*

(B) *is the subject of an interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement executed on or before December 19, 2019; or*

(C) *is the subject of an unexecuted interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement filed by PJM with the Commission on or before December 19, 2019.*

(9) *Procedures and Remedies in Cases of Suspected Fraud or Material Misrepresentation or Omissions in Connection with a Capacity Resource with State Subsidy. In the event the Office of the Interconnection, with advice and input from the Market Monitoring Unit, reasonably believes that a certification of a Capacity Resource's status contains fraudulent or material misrepresentations or omissions such that the Capacity Market Seller's Capacity Resource is a Capacity Resource with a State Subsidy (including whether the Capacity Resource is a Jointly Owned Cross-Subsidized Capacity Resource) or does not qualify for a competitive exemption or contains information that is inconsistent with the resource-specific exception, then:*

(A) *A Capacity Market Seller shall, within five (5) business days upon receipt of the request for additional information, provide any supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate whether such Capacity Resource is a Capacity Resource with State Subsidy or whether the Capacity Market Seller is eligible for the competitive exemption. If the Office of the Interconnection determines that the Capacity Resource's status as a Capacity Resource with State Subsidy is different from that specified by the Capacity Market Seller or is not eligible for a competitive exemption pursuant to subsection (4) above, the Office of the Interconnection shall notify, in writing, the Capacity Market Seller of such determination by no later than sixty-five (65) days prior to the commencement of the offer period for the relevant RPM Auction. A Capacity Market Seller that is dissatisfied with any determination hereunder may seek any remedies available to it from FERC; provided, however, if the Office of Interconnection determines that the subject resource is a Capacity Resource with State Subsidy or is not eligible for a competitive exemption pursuant to subsection (4) above, such Capacity Resource shall be subject to the Minimum Offer Price Rule, unless and until ordered to do otherwise by FERC.*

(B) *if the Office of the Interconnection does not provide written notice of suspected fraudulent or material misrepresentation or omission at least sixty-five (65) days before the start of the relevant RPM Auction, then the Office of the Interconnection may file the certification that contains any alleged fraudulent or material misrepresentation or omission with FERC. In such event, if the Office of Interconnection determines that a resource is a Capacity Resource with State Subsidy that is subject to the Minimum Offer Price Rule, the Office of the Interconnection will proceed with administration of the Tariff and market rules on that basis unless and until ordered to do otherwise by FERC. The Office of the Interconnection shall implement any remedies ordered by FERC; and*

(C) *prior to applying the Minimum Offer Price Rule, the Office of the Interconnection, with advice and input of the Market Monitoring Unit, shall notify the affected Capacity Market Seller and, to the extent practicable, provide the Capacity Market Seller an opportunity to explain the alleged fraudulent or material misrepresentation or omission. Any filing to FERC under this provision shall seek fast track treatment and neither the name nor any identifying characteristics of the Capacity Market Seller or the resource shall be publicly revealed, but otherwise the filing shall be public. The Capacity Market Seller may submit a*

*revised certification for that Capacity Resource for subsequent RPM Auctions, including RPM Auctions held during the pendency of the FERC proceeding. In the event that the Capacity Market Seller is cleared by FERC from such allegations of fraudulent or material misrepresentations or omissions then the certification shall be restored to the extent and in the manner permitted by FERC. The remedies required by this subsection to be requested in any filing to FERC shall not be exclusive of any other remedies or penalties that may be pursued against the Capacity Market Seller.*

i) Capacity Export Charges and Credits

(1) Charge

Each Capacity Export Transmission Customer shall incur for each day of each Delivery Year a Capacity Export Charge equal to the Reserved Capacity of Long-Term Firm Transmission Service used for such export (“Export Reserved Capacity”) multiplied by (the Final Zonal Capacity Price for such Delivery Year for the Zone encompassing the interface with the Control Area to which such capacity is exported minus the Final Zonal Capacity Price for such Delivery Year for the Zone in which the resources designated for export are located, but not less than zero). If more than one Zone forms the interface with such Control Area, then the amount of Reserved Capacity described above shall be apportioned among such Zones for purposes of the above calculation in proportion to the flows from such resource through each such Zone directly to such interface under CETO/CETL analysis conditions, as determined by the Office of the Interconnection using procedures set forth in the PJM Manuals. The amount of the Reserved Capacity that is associated with a fully controllable facility that crosses such interface shall be completely apportioned to the Zone within which such facility terminates.

(2) Credit

To recognize the value of firm Transmission Service held by any such Capacity Export Transmission Customer, such customer assessed a charge under section 5.14(i)(1) above also shall receive a credit, comparable to the Capacity Transfer Rights provided to Load-Serving Entities under Tariff, Attachment DD, section 5.15. Such credit shall be equal to the locational capacity price difference specified in section 5.14(i)(1) above times the Export Customer's Allocated Share determined as follows:

Export Customer's Allocated Share equals

$(\text{Export Path Import} * \text{Export Reserved Capacity}) /$

$(\text{Export Reserved Capacity} + \text{Daily Unforced Capacity Obligations of all LSEs in such Zone}).$

Where:

“Export Path Import” means the megawatts of Unforced Capacity imported into the export interface Zone from the Zone in which the resource designated for export is located.

If more than one Zone forms the interface with such Control Area, then the amount of Export Reserved Capacity shall be apportioned among such Zones for purposes of the above calculation in the same manner as set forth in subsection (i)(1) above.

### (3) Distribution of Revenues

Any revenues collected from the Capacity Export Charge with respect to any capacity export for a Delivery Year, less the credit provided in subsection (i)(2) for such Delivery Year, shall be distributed to the Load Serving Entities in the export-interface Zone that were assessed a

Locational Reliability Charge for such Delivery Year, pro rata based on the Daily Unforced Capacity Obligations of such Load-serving Entities in such Zone during such Delivery Year. If more than one Zone forms the interface with such Control Area, then the revenues shall be apportioned among such Zones for purposes of the above calculation in the same manner as set forth in subsection (i)(1) above.

#### **5.14A [Reserved.]**

#### **5.14B Generating Unit Capability Verification Test Requirements Transition Provision for RPM Delivery Years 2014/2015, 2015/2016, and 2016/2017**

A. This transition provision applies only with respect to Generation Capacity Resources with existing capacity commitments for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years that experience reductions in verified installed capacity available for sale as a direct result of revised generating unit capability verification test procedures effective with the summer 2014 capability tests, as set forth in the PJM Manuals. A Generation Capacity Resource meeting the description of the preceding sentence, and the Capacity Market Seller of such a resource, are hereafter in this section 5.14B referred to as an “Affected Resource” and an “Affected Resource Owner,” respectively.

B. For each of its Affected Resources, an Affected Resource Owner is required to provide documentation to the Office of the Interconnection sufficient to show a reduction in installed capacity value as a direct result of the revised capability test procedures. Upon acceptance by the Office of the Interconnection, the Affected Resource’s installed capacity value will be updated in the eRPM system to reflect the reduction, and the Affected Resource’s Capacity Interconnection Rights value will be updated to reflect the reduction, effective June 1, 2014. The reduction’s impact on the Affected Resource’s existing capacity commitments for the 2014/2015 Delivery Year will be determined in Unforced Capacity terms, using the final EFORd value established by the Office of the Interconnection for the 2014/2015 Delivery Year as applied to the Third Incremental Auction for the 2014/2015 Delivery Year, to convert installed capacity to Unforced Capacity. The reduction’s impact on the Affected Resource’s existing capacity commitments for each of the 2015/2016 and 2016/2017 Delivery Years will be determined in Unforced Capacity terms, using the EFORd value from each Sell Offer in each applicable RPM Auction, applied on a pro-rata basis, to convert installed capacity to Unforced Capacity. The Unforced Capacity impact for each Delivery Year represents the Affected Resource’s capacity commitment shortfall, resulting wholly and directly from the revised capability test procedures, for which the Affected Resource Owner is subject to a Capacity Resource Deficiency Charge for

the Delivery Year, as described in Tariff, Attachment DD, section 8D, unless the Affected Resource Owner (i) provides replacement Unforced Capacity, as described in Tariff, Attachment DD, section 8.1, prior to the start of the Delivery Year to resolve the Affected Resource's total capacity commitment shortfall; or (ii) requests relief from Capacity Resource Deficiency Charges that result wholly and directly from the revised capability test procedures by electing the transition mechanism described in this section 5.14B ("Transition Mechanism").

C. Under the Transition Mechanism, an Affected Resource Owner may elect to have the Unforced Capacity commitments for all of its Affected Resources reduced for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years to eliminate the capacity commitment shortfalls, across all of its Affected Resources, that result wholly and directly from the revised capability test procedures, and for which the Affected Resource Owner otherwise would be subject to Capacity Resource Deficiency Charges for the Delivery Year. In electing this option, the Affected Resource Owner relinquishes RPM Auction Credits associated with the reductions in Unforced Capacity commitments for all of its Affected Resources for the Delivery Year, and Locational Reliability Charges as described in Tariff, Attachment DD, section 5.14(e) of this Attachment DD are adjusted accordingly. Affected Resource Owners wishing to elect the Transition Mechanism for the 2015/2016 Delivery Year must notify the Office of the Interconnection by May 30, 2014. Affected Resource Owners wishing to elect the Transition Mechanism for the 2016/2017 Delivery Year must notify the Office of the Interconnection by July 25, 2014.

D. The Office of the Interconnection will offset the total reduction (across all Affected Resources and Affected Resource Owners) in Unforced Capacity commitments associated with the Transition Mechanism for the 2015/2016 and 2016/2017 Delivery Years by applying corresponding adjustments to the quantity of Buy Bid or Sell Offer activity in the upcoming Incremental Auctions for each of those Delivery Years, as described in Tariff, Attachment DD, sections 5.12(b)(ii) and 5.12(b)(iii).

E. By electing the Transition Mechanism, an Affected Resource Owner may receive relief from applicable Capacity Resource Deficiency Charges for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years, and a Locational UCAP Seller that sells Locational UCAP based on an Affected Resource owned by the Affected Resource Owner may receive relief from applicable Capacity Resource Deficiency Charges for the 2014/2015 Delivery Year, to the extent that the Affected Resource Owner demonstrates, to the satisfaction of the Office of the Interconnection, that an inability to deliver the amount of Unforced Capacity previously committed for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years is due to a reduction in verified installed capacity available for sale as a direct result of revised generating unit capability verification test procedures effective with the summer 2014 capability tests, as set forth in the PJM Manuals; provided, however, that the Affected Resource Owner must provide the Office of the Interconnection with all information deemed necessary by the Office of the Interconnection to assess the merits of the request for relief.

#### **5.14C Demand Response Operational Resource Flexibility Transition Provision for RPM Delivery Years 2015/2016 and 2016/2017**

A. This transition provision applies only to Demand Resources for which a Curtailment Service Provider has existing RPM commitments for the 2015/2016 or 2016/2017 Delivery

Years (alternatively referred to in this section 5.14C as “Applicable Delivery Years” and each an “Applicable Delivery Year”) that (i) cannot satisfy the 30-minute notification requirement as described in Tariff, Attachment DD-1, section A.2 and the parallel provision of RAA, Schedule 6; (ii) are not excepted from the 30-minute notification requirement as described in Tariff, Attachment DD-1, section A.2 and the parallel provision of RAA, Schedule 6; and (iii) cleared in the Base Residual Auction or First Incremental Auction for the 2015/2016 Delivery Year, or cleared in the Base Residual Auction for the 2016/2017 Delivery Year. A Demand Resource meeting these criteria and the Curtailment Service Provider of such a resource are hereafter in this section 5.14C referred to as an “Affected Demand Resource” and an “Affected Curtailment Service Provider,” respectively.

B. For this section 5.14C to apply to an Affected Demand Resource, the Affected Curtailment Service Provider must notify the Office of the Interconnection in writing, with regard to the following information by the applicable deadline:

- i) For each applicable Affected Demand Resource: the number of cleared megawatts of Unforced Capacity for the Applicable Delivery Year by end-use customer site that the Affected Curtailment Service Provider cannot deliver, calculated based on the most current information available to the Affected Curtailment Service Provider; the end-use customer name; electric distribution company’s account number for the end-use customer; address of end-use customer; type of Demand Resource (i.e., Limited DR, Annual DR, Extended Summer DR); the Zone or sub-Zone in which the end-use customer is located; and, a detailed description of why the end-use customer cannot comply with the 30-minute notification requirement or qualify for one of the exceptions to the 30-minute notification requirement provided in Tariff, Attachment DD-1, section A.2 and the parallel provision of RAA, Schedule 6.
- ii) If applicable, a detailed analysis that quantifies the amount of cleared megawatts of Unforced Capacity for the Applicable Delivery Year for prospective customer sales that could not be contracted by the Affected Curtailment Service Provider because of the 30-minute notification requirement provided in Tariff, Attachment DD-1, section A.2 and the parallel provisions of RAA, Schedule 6 that the Affected Curtailment Service Provider cannot deliver, by type of Demand Resource (i.e. Limited DR, Annual DR, Extended Summer DR) and by Zone and sub-Zone, as applicable. The analysis should include the amount of Unforced Capacity expected from prospective customer sales for each Applicable Delivery Year and must include supporting detail to substantiate the difference in reduced sales expectations. The Affected Curtailment Service Provider should maintain records to support its analysis.

1. For the 2015/2016 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Third Incremental Auction for the 2015/2016 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Third Incremental Auction for the 2015/2016 Delivery Year.

2. For the 2016/2017 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Second Incremental Auction for the 2016/2017 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Second or Third Incremental Auctions for the 2016/2017 Delivery Year.

3. For the 2016/2017 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Third Incremental Auction for the 2016/2017 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision must not have sold or offered to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Second Incremental Auction for the 2016/2017 Delivery Year, and may not sell or offer to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Third Incremental Auction for the 2016/2017 Delivery Year.

C. For the Third Incremental Auction for the 2015/2016 Delivery Year and the First, Second, and Third Incremental Auctions for the 2016/2017 Delivery Year, the Office of the Interconnection shall publish aggregate information on the undeliverable megawatts declared under this transition provision (hereafter, “non-viable megawatts”), by type of Demand Resource and by Zone or sub-Zone, concurrently with its posting of planning parameters for the applicable Scheduled Incremental Auction. Non-viable megawatts for a Scheduled Incremental Auction for an Applicable Delivery Year represent those megawatts meeting the criteria of subsection A above and declared in accordance with subsection B above. Prior to each Third Incremental Auction for an Applicable Delivery Year, the Office of the Interconnection shall apply adjustments equal to the declared non-viable megawatt quantity to the quantity of Buy Bid or Sell Offer activity in the upcoming Scheduled Incremental Auctions for the Applicable Delivery Year, as described in Tariff, Attachment DD, sections 5.12(b)(ii) and 5.12(b)(iii). Prior to the Second Incremental Auction for the 2016/2017 Delivery Year, the Office of the Interconnection shall adjust the recalculated PJM Region Reliability Requirement and recalculated LDA Reliability Requirements, as described in Tariff, Attachment DD, section 5.4(c), by the applicable quantity of declared non-viable megawatts, and shall update the PJM Region Reliability Requirement and each LDA Reliability Requirement for such Second Incremental Auction only if the combined change of the applicable adjustment and applicable recalculation is greater than or equal to the lesser of (i) 500 megawatts or (ii) one percent of the prior PJM Region Reliability Requirement or one percent of the prior LDA Reliability Requirement, as applicable.

D. Prior to the start of each Applicable Delivery Year, the Office of the Interconnection shall reduce, by type of Demand Resource and by Zone or sub-Zone, the capacity commitment of each Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year based on the non-viable megawatts declared by the Affected Curtailment Service Provider under this transition provision. If the Affected Curtailment Service Provider cleared megawatts from multiple Affected Demand Resources of the same type and Zone or sub-Zone, or cleared megawatts in multiple RPM Auctions for the Applicable Delivery Year, the Office of the Interconnection shall allocate the reduction in capacity commitment by type of Demand Resource and by Zone or sub-Zone across the applicable Affected Demand Resources and



relevant RPM Auctions. Such allocation shall be performed on a pro-rata basis, based on megawatts cleared by the Affected Demand Resources in the relevant RPM Auctions.

E. For each Applicable Delivery Year, an Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year relinquishes an Affected Demand Resource's RPM Auction Credits for the amount of capacity commitment reduction as determined under subsection D above. Locational Reliability Charges as described in Tariff, Attachment DD, section 5.14(e) are also adjusted accordingly.

#### **5.14D Capacity Performance and Base Capacity Transition Provision for RPM Delivery Years 2016/2017 and 2017/2018**

A. This transition provision applies only for procuring Capacity Performance Resources for the 2016/2017 and 2017/2018 Delivery Years.

B. For both the 2016/2017 and 2017/2018 Delivery Years, PJM will hold a Capacity Performance Transition Incremental Auction to procure Capacity Performance Resources.

1. For each Capacity Performance Transition Incremental Auction, the optimization algorithm shall consider:

- the target quantities of Capacity Performance Resources specified below;
- the Sell Offers submitted in such auction.

The Office of the Interconnection shall submit a Buy Bid based on the quantity of Capacity Performance Resources specified for that Delivery Year. For the 2016/2017 Delivery Year, the Office of the Interconnection shall submit a Buy Bid, at a price no higher than 0.5 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year, for a quantity of Capacity Performance Resources equal to 60 percent of the updated Reliability Requirement for the PJM Region. For the 2017/2018 Delivery Year, the Office of the Interconnection shall submit a Buy Bid, at a price no higher than 0.6 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year, for a quantity of Capacity Performance Resources equal to 70 percent of the updated Reliability Requirement for the PJM Region.

2. For each Capacity Performance Transition Incremental Auction, the Office of the Interconnection shall calculate a clearing price to be paid for each megawatt-day of Unforced Capacity that clears in such auction. For the 2016/2017 Delivery Year, the Capacity Resource Clearing Price for any Capacity Performance Transition Incremental Auction shall not exceed 0.5 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year. For the 2017/2018 Delivery Year, the Capacity Resource Clearing Price for any Capacity Performance Transition Incremental Auction shall not exceed 0.6 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year.

3. A Capacity Market Seller may offer any Capacity Resource that has not been committed in an FRR Capacity Plan, that qualifies as a Capacity Performance Resource under Tariff, Attachment DD, section 5.5A(a) and that (i) has not cleared an RPM Auction for that Delivery Year; or (ii) has cleared in an RPM Auction for that Delivery Year. A Capacity Market Seller may offer an external Generation Capacity Resource to the extent that such resource: (i) is reasonably expected, by the relevant Delivery Year, to meet all applicable requirements to be treated as equivalent to PJM Region internal generation that is not subject to NERC tagging as an interchange transaction; (ii) has long-term firm transmission service confirmed on the complete transmission path from such resource into PJM; and (iii) is, by written commitment of the Capacity Market Seller, subject to the same obligations imposed on Generation Capacity Resources located in the PJM Region by Tariff, Attachment DD, section 6.6 to offer their capacity into RPM Auctions.

4. Capacity Resources that already cleared an RPM Auction for a Delivery Year, retain the capacity obligations for that Delivery Year, and clear in a Capacity Performance Transition Incremental Auction for the same Delivery Year shall: (i) receive a payment equal to the Capacity Resource Clearing Price as established in that Capacity Performance Transition Incremental Auction; and (ii) not be eligible to receive a payment for clearing in any prior RPM Auction for that Delivery Year.

D. All Capacity Performance Resources that clear in a Capacity Performance Transition Incremental Auction will be subject to the Non-Performance Charge set forth in Tariff, Attachment DD, section 10A.

#### **5.14E Demand Response Legacy Direct Load Control Transition Provision for RPM Delivery Years 2016/2017, 2017/2018, and 2018/2019**

A. This transition provision applies only to Demand Resources for which a Curtailment Service Provider has existing RPM commitments for the 2016/2017, 2017/2018, or 2018/2019 Delivery Years (alternatively referred to in this section 5.14E as “Applicable Delivery Years” and each an “Applicable Delivery Year”) that (i) qualified as Legacy Direct Load Control before June 1, 2016 as described in Tariff, Attachment DD-1, section G and the parallel provision of RAA, Schedule 6; (ii) cannot meet the requirements for using statistical sampling for residential non-interval metered customers as described in Tariff, Attachment DD-1, section K and the parallel provision of RAA, Schedule 6; and (iii) cleared in the Base Residual Auction or First Incremental Auction for the 2016/2017 Delivery Year, cleared in the Base Residual Auction for the 2017/2018 Delivery Year, or cleared in the Base Residual Auction for the 2018/2019 Delivery Year. A Demand Resource meeting these criteria and the Curtailment Service Provider of such a resource are hereafter in this section 5.14E referred to as an “Affected Demand Resource” and an “Affected Curtailment Service Provider,” respectively.

B. For this section 5.14E to apply to an Affected Demand Resource, the Affected Curtailment Service Provider must notify the Office of the Interconnection in writing, with regard to the following information, by the applicable deadline:

- i) For each applicable Affected Demand Resource: the number of cleared megawatts of Unforced Capacity for the Applicable Delivery Year by end-use customer site

that the Affected Curtailment Service Provider cannot deliver, calculated based on the most current information available to the Affected Curtailment Service Provider; electric distribution company's account number for the end-use customer; address of end-use customer; type of Demand Resource (i.e., Limited DR, Annual DR, Extended Summer DR); the Zone or sub-Zone in which the end-use customer is located; and, a detailed description of why the end-use customer cannot comply with statistical sampling for residential non-interval metered customers requirement as described in Tariff, Attachment DD-1, section K and the parallel provision of RAA, Schedule 6.

- ii) If applicable, a detailed analysis that quantifies the amount of cleared megawatts of Unforced Capacity for the Applicable Delivery Year for prospective customer sales that could not be contracted by the Affected Curtailment Service Provider because of the statistical sampling for residential non-interval metered customers requirement as described in Tariff, Attachment DD-1, section K and the parallel provision of RAA, Schedule 6 that the Affected Curtailment Service Provider cannot deliver, by type of Demand Resource (i.e. Limited DR, Annual DR, Extended Summer DR) and by Zone and sub-Zone, as applicable. The analysis should include the amount of Unforced Capacity expected from prospective customer sales for each Applicable Delivery Year and must include supporting detail to substantiate the difference in reduced sales expectations. The Affected Curtailment Service Provider should maintain records to support its analysis.

1. For the 2016/2017 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Second and/or Third Incremental Auction for the 2016/2017 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the matching LDA or sub-LDA where an Affected Demand Resource is located in the Second or Third Incremental Auction for the 2016/2017 Delivery Year.

2. For the 2017/2018 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the First, Second and/or Third Incremental Auction for the 2017/2018 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the matching LDA or sub-LDA where an Affected Demand Resource is located in the First, Second or Third Incremental Auctions for the 2017/2018 Delivery Year.

3. For the 2018/2019 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the First, Second and/or Third Incremental Auction for the 2018/2019 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the matching LDA or sub-LDA where an Affected Demand Resource is located in the First, Second or Third Incremental Auctions for the 2018/2019 Delivery Year.

C. For the Second and Third Incremental Auction for the 2016/2017 Delivery Year, the First, Second, and Third Incremental Auctions for the 2017/2018 Delivery Year, and the First,

Second, and Third Incremental Auctions for the 2018/2019 Delivery Year, the Office of the Interconnection shall publish aggregate information on the undeliverable megawatts declared under this transition provision (hereafter, “non-viable megawatts”), by type of Demand Resource and by Zone or sub-Zone, concurrently with its posting of planning parameters for the applicable Scheduled Incremental Auction. Non-viable megawatts for a Scheduled Incremental Auction for an Applicable Delivery Year represent those megawatts meeting the criteria of subsection A above and declared in accordance with subsection B above. Prior to each Scheduled Incremental Auction for an Applicable Delivery Year, the Office of the Interconnection shall apply adjustments equal to the declared non-viable megawatt quantity to the quantity of Buy Bid or Sell Offer activity in the upcoming Scheduled Incremental Auctions for the Applicable Delivery Year, as described in Tariff, Attachment DD, sections 5.12(b)(ii) and 5.12(b)(iii). Prior to the Second Incremental Auction for the 2016/2017 Delivery Year, the First and Second Incremental Auction for the 2017/2018 Delivery Year, and the First and Second Incremental Auction for the 2018/2019 Delivery Year, the Office of the Interconnection shall adjust the recalculated PJM Region Reliability Requirement and recalculated LDA Reliability Requirements, as described in Tariff, Attachment DD, section 5.4(c), by the applicable quantity of declared non-viable megawatts, and shall update the PJM Region Reliability Requirement and each LDA Reliability Requirement for such Incremental Auction only if the combined change of the applicable adjustment and applicable recalculation is greater than or equal to the lessor of (i) 500 megawatts or (ii) one percent of the prior PJM Region Reliability Requirement or one percent of the prior LDA Reliability Requirement, as applicable.

D. Prior to the start of each Applicable Delivery Year, the Office of the Interconnection shall reduce, by type of Demand Resource and by Zone or sub-Zone, the capacity commitment of each Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year based on the non-viable megawatts declared by the Affected Curtailment Service Provider under this transition provision. If the Affected Curtailment Service Provider cleared megawatts from multiple Affected Demand Resources of the same type and Zone or sub-Zone, or cleared MWs in multiple RPM Auctions for the Applicable Delivery Year, the Office of the Interconnection shall allocate the reduction in capacity commitment by type of Demand Resource and by Zone or sub-Zone across the applicable Affected Demand Resources and relevant RPM Auctions. Such allocation shall be performed on a pro-rata basis, based on megawatts cleared by the Affected Demand Resources in the relevant RPM Auctions.

E. For each Applicable Delivery Year, an Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year relinquishes an Affected Demand Resource’s RPM Auction credits for the amount of capacity commitment reduction as determined under subsection D above. Locational Reliability Charges as described in Tariff, Attachment DD, section 5.14(e) are also adjusted accordingly.

Section(s) of the  
PJM Reliability Assurance Agreement

(Marked / Redline Format)

## ARTICLE 1 – DEFINITIONS

Unless the context otherwise specifies or requires, capitalized terms used herein shall have the respective meanings assigned herein or in the Schedules hereto, or in the PJM Tariff or PJM Operating Agreement if not otherwise defined in this Agreement, for all purposes of this Agreement (such definitions to be equally applicable to both the singular and the plural forms of the terms defined). Unless otherwise specified, all references herein to Articles, Sections or Schedules, are to Articles, Sections or Schedules of this Agreement. As used in this Agreement:

### **Accredited UCAP:**

**“Accredited UCAP” shall mean the quantity of Unforced Capacity, as denominated in Effective UCAP, that an ELCC Resource is capable of providing in a given Delivery Year.**

### **Agreement:**

“Agreement” shall mean this Reliability Assurance Agreement, together with all Schedules hereto, as amended from time to time.

### **Annual Demand Resource:**

“Annual Demand Resource” shall mean a resource that is placed under the direction of the Office of the Interconnection during the Delivery Year, and will be available for an unlimited number of interruptions during such Delivery Year by the Office of the Interconnection, and will be capable of maintaining each such interruption between the hours of 10:00AM to 10:00PM Eastern Prevailing Time for the months of June through October and the following May, and 6:00AM through 9:00PM Eastern Prevailing Time for the months of November through April unless there is an Office of the Interconnection approved maintenance outage during October through April. The Annual Demand Resource must be available in the corresponding Delivery year to be offered for sale or Self-Supplied in an RPM Auction, or included as an Annual Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

### **Annual Energy Efficiency Resource:**

“Annual Energy Efficiency Resource” shall mean a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of Reliability Assurance Agreement, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the summer and winter periods described in such Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention.

### **Applicable Regional Entity:**

“Applicable Regional Entity” shall have the same meaning as in the PJM Tariff.

**Base Capacity Demand Resource:**

“Base Capacity Demand Resource” shall mean, for the 2018/2019 and 2019/2020 Delivery Years, a resource that is placed under the direction of the Office of the Interconnection and that will be available June through September of a Delivery Year, and will be available to the Office of the Interconnection for an unlimited number of interruptions during such months, and will be capable of maintaining each such interruption for at least a 10-hour duration between the hours of 10:00AM to 10:00PM Eastern Prevailing Time. The Base Capacity Demand Resource must be available June through September in the corresponding Delivery Year to be offered for sale or self-supplied in an RPM Auction, or included as a Base Capacity Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Base Capacity Energy Efficiency Resource:**

“Base Capacity Energy Efficiency Resource” shall mean, for the 2018/2019 and 2019/2020 Delivery Years, a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of RAA, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the summer peak periods as described in Reliability Assurance Agreement, Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Base Capacity Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention.

**Base Capacity Resource:**

“Base Capacity Resource” shall have the same meaning as in Tariff, Attachment DD.

**Base Residual Auction:**

“Base Residual Auction” shall have the same meaning as in Tariff, Attachment DD.

**Behind The Meter Generation:**

“Behind The Meter Generation” shall refer to a generating unit that delivers energy to load without using the Transmission System or any distribution facilities (unless the entity that owns or leases the distribution facilities consented to such use of the distribution facilities and such consent has been demonstrated to the satisfaction of the Office of the Interconnection; provided, however, that Behind The Meter Generation does not include (i) at any time, any portion of such generating unit’s capacity that is designated as a Capacity Resource or (ii) in any hour, any portion of the output of such generating unit that is sold to another entity for consumption at another electrical location or into the PJM Interchange Energy Market.

**Black Start Capability:**

“Black Start Capability” shall mean the ability of a generating unit or station to go from a shutdown condition to an operating condition and start delivering power without assistance from the power system.

**Capacity Emergency Transfer Objective (CETO):**

“Capacity Emergency Transfer Objective” or “CETO” shall mean the amount of electric energy that a given area must be able to import in order to remain within a loss of load expectation of one event in 25 years when the area is experiencing a localized capacity emergency, as determined in accordance with the PJM Manuals. Without limiting the foregoing, CETO shall be calculated based in part on EFORD determined in accordance with Reliability Assurance Agreement, Schedule 5, Paragraph C.

**Capacity Emergency Transfer Limit (CETL):**

Capacity Emergency Transfer Limit” or “CETL” shall mean the capability of the transmission system to support deliveries of electric energy to a given area experiencing a localized capacity emergency as determined in accordance with the PJM Manuals.

**Capacity Import Limit:**

For any Delivery Year up to and including the 2019/2020 Delivery Year, “Capacity Import Limit” shall mean, (a) for the PJM Region, (1) the maximum megawatt quantity of external Generation Capacity Resources that PJM determines for each Delivery Year, through appropriate modeling and the application of engineering judgment, the transmission system can receive, in aggregate at the interface of the PJM Region with all external balancing authority areas and deliver to load in the PJM Region under capacity emergency conditions without violating applicable reliability criteria on any bulk electric system facility of 100kV or greater, internal or external to the PJM Region, that has an electrically significant response to transfers on such interface, minus (2) the then-applicable Capacity Benefit Margin; and (b) for certain source zones identified in the PJM manuals as groupings of one or more balancing authority areas, (1) the maximum megawatt quantity of external Generation Capacity Resources that PJM determines the transmission system can receive at the interface of the PJM Region with each such source zone and deliver to load in the PJM Region under capacity emergency conditions without violating applicable reliability criteria on any bulk electric system facility of 100kV or greater, internal or external to the PJM Region, that has an electrically significant response to transfers on such interface, minus the then-applicable Capacity Benefit Margin times (2) the ratio of the maximum import quantity from each such source zone divided by the PJM total maximum import quantity. As more fully set forth in the PJM Manuals, PJM shall make such determination based on the latest peak load forecast for the studied period, the same computer simulation model of loads, generation and transmission topography employed in the determination of Capacity Emergency Transfer Limit for such Delivery Year, including external facilities from an industry standard model of the loads, generation, and transmission topography of the Eastern Interconnection under peak conditions. PJM shall specify in the PJM Manuals the



areas and minimum distribution factors for identifying monitored bulk electric system facilities that have an electrically significant response to such transfers on the PJM interface. Employing such tools, PJM shall model increased power transfers from external areas into PJM to determine the transfer level at which one or more reliability criteria is violated on any monitored bulk electric system facilities that have an electrically significant response to such transfers. For the PJM Region Capacity Import Limit, PJM shall optimize transfers from other source areas not experiencing any reliability criteria violations as appropriate to increase the Capacity Import Limit. The aggregate megawatt quantity of transfers into PJM at the point where any increase in transfers on the interface would violate reliability criteria will establish the Capacity Import Limit. Notwithstanding the foregoing, a Capacity Resource located outside the PJM Region shall not be subject to the Capacity Import Limit if the Capacity Market Seller seeks an exception thereto by demonstrating to PJM, by no later than five (5) business days prior to the commencement of the offer period for the relevant RPM Auction, that such resource meets all of the following requirements:

(i) it has, at the time such exception is requested, met all applicable requirements to be pseudo-tied into the PJM Region, or the Capacity Market Seller has committed in writing that it will meet such requirements, unless prevented from doing so by circumstances beyond the control of the Capacity Market Seller, prior to the relevant Delivery Year;

(ii) at the time such exception is requested, it has long-term firm transmission service confirmed on the complete transmission path from such resource into PJM; and

(iii) it is, by written commitment of the Capacity Market Seller, subject to the same obligations imposed on Generation Capacity Resources located in the PJM Region by Tariff, Attachment DD, section 6.6 to offer their capacity into RPM Auctions; provided, however, that (a) the total megawatt quantity of all exceptions granted hereunder for a Delivery Year, plus the Capacity Import Limit for the applicable interface determined for such Delivery Year, may not exceed the total megawatt quantity of Network External Designated Transmission Service on such interface that PJM has confirmed for such Delivery Year; and (b) if granting a qualified exception would result in a violation of the rule in clause (a), PJM shall grant the requested exception but reduce the Capacity Import Limit by the quantity necessary to ensure that the total quantity of Network External Designated Transmission Service is not exceeded.

#### **Capacity Only Option:**

“Capacity Only Option” shall mean participation in Emergency Load Response Program or Pre-Emergency Program which allows, pursuant to Tariff, Attachment DD and as applicable, a capacity payment for the ability to reduce load during a pre-emergency or emergency event.

#### **Capacity Performance Resource:**

“Capacity Performance Resource” shall have the same meaning as in Tariff, Attachment DD.

#### **Capacity Resources:**

“Capacity Resources” shall mean megawatts of (i) net capacity from Existing Generation Capacity Resources or Planned Generation Capacity Resources meeting the requirements of the Reliability Assurance Agreement, Schedules 9 and Reliability Assurance Agreement, Schedule 10 that are or will be owned by or contracted to a Party and that are or will be committed to satisfy that Party's obligations under the Reliability Assurance Agreement, or to satisfy the reliability requirements of the PJM Region, for a Delivery Year; (ii) net capacity from Existing Generation Capacity Resources or Planned Generation Capacity Resources not owned or contracted for by a Party which are accredited to the PJM Region pursuant to the procedures set forth in such Schedules 9 and 10; or (iii) load reduction capability provided by Demand Resources or Energy Efficiency Resources that are accredited to the PJM Region pursuant to the procedures set forth in the Reliability Assurance Agreement, Schedule 6.

**Capacity Transfer Right:**

“Capacity Transfer Right” shall have the meaning specified in Tariff, Attachment DD.

**Combination Resource:**

“Combination Resource” shall mean a Generation Capacity Resource that has a component that has the characteristics of a Limited Duration Resource combined with (i) a component that has the characteristics of an Unlimited Resource or (ii) a component that has the characteristics of a Variable Resource.

**Compliance Aggregation Area (CAA):**

“Compliance Aggregation Area” or “CAA” shall have the same meaning as in the Tariff.

**Consolidated Transmission Owners Agreement, PJM Transmission Owners Agreement or Transmission Owners Agreement:**

“Consolidated Transmission Owners Agreement,” “PJM Transmission Owners Agreement” or “Transmission Owners Agreement” shall mean that certain Consolidated Transmission Owners Agreement, dated as of December 15, 2005, by and among the Transmission Owners and by and between the Transmission Owners and PJM Interconnection, L.L.C. on file with the Commission, as amended from time to time.

**Control Area:**

“Control Area” shall mean an electric power system or combination of electric power systems bounded by interconnection metering and telemetry to which a common generation control scheme is applied in order to:

(a) match the power output of the generators within the electric power system(s) and energy purchased from entities outside the electric power system(s), with the load within the electric power system(s);

(b) maintain scheduled interchange with other Control Areas, within the limits of Good Utility Practice;

(c) maintain the frequency of the electric power system(s) within reasonable limits in accordance with Good Utility Practice and the criteria of NERC and each Applicable Regional Entity;

(d) maintain power flows on transmission facilities within appropriate limits to preserve reliability; and

(e) provide sufficient generating capacity to maintain operating reserves in accordance with Good Utility Practice.

**Daily Unforced Capacity Obligation:**

“Daily Unforced Capacity Obligation” shall mean the capacity obligation of a Load Serving Entity during the Delivery Year, determined in accordance with the Reliability Assurance Agreement, Schedule 8 or, as to an FRR Entity, in the Reliability Assurance Agreement, Schedule 8.1.

**Delivery Year:**

“Delivery Year” shall mean a Planning Period for which a Capacity Resource is committed pursuant to the auction procedures specified in Tariff, Attachment DD or pursuant to an FRR Capacity Plan under RAA, Schedule 8.1.

**Demand Resource (DR):**

“Demand Resource” or “DR” shall mean a Limited Demand Resource, Extended Summer Demand Resource, Annual Demand Resource, Base Capacity Demand Resource or Summer-Period Demand Resource with a demonstrated capability to provide a reduction in demand or otherwise control load in accordance with the requirements of RAA, Schedule 6 that offers and that clears load reduction capability in a Base Residual Auction or Incremental Auction or that is committed through an FRR Capacity Plan.

**Demand Resource Factor or DR Factor:**

“Demand Resource Factor” or “DR Factor” shall mean, for Delivery Years through May 31, 2018, that factor approved from time to time by the PJM Board used to determine the unforced capacity value of a Demand Resource in accordance with Reliability Assurance Agreement, Schedule 6

**Demand Resource Officer Certification Form:**

“Demand Resource Officer Certification Form” shall mean a certification as to an intended Demand Resource Sell Offer, in accordance with Reliability Assurance Agreement, Schedule 6 and Reliability Assurance Agreement, Schedule 8.1 and the PJM Manuals.

**Demand Resource Registration:**

“Demand Resource Registration” shall mean a registration in the Full Program Option or Capacity Only Option of the Emergency or Pre-Emergency Load Resource Program in accordance with Tariff, Attachment K-Appendix, section 8.

**Demand Resource Sell Offer Plan:**

“Demand Resource Sell Offer Plan” shall mean the plan required by Reliability Assurance Agreement, Schedule 6 and Reliability Assurance Agreement, Schedule 8.1 in support of an intended offer of Demand Resources in an RPM Auction, or an intended inclusion of Demand Resources in an FRR Capacity Plan.

**Effective Nameplate Capacity:**

“Effective Nameplate Capacity” shall mean (i) for each Variable Resource and Combination Resource, the resource’s Maximum Facility Output; (ii) for each Limited Duration Resource, the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that continuous period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, to the extent that such conditions impact such resource’s capability.

**Effective UCAP:**

“Effective UCAP” shall mean a unit of measure that represents the capacity product transacted in the Reliability Pricing Model and included in FRR Capacity Plans. One megawatt of Effective UCAP has the same capacity value of one megawatt of Unforced Capacity.

**ELCC Class:**

“ELCC Class” shall mean a defined group of ELCC Resources that share a common set of operational characteristics and for which effective load carrying capability analysis, as set forth in RAA, Schedule 9.1, will establish a unique ELCC Class UCAP and corresponding ELCC Class Rating. ELCC Classes shall be defined in the PJM Manuals. ELCC Classes shall be defined such that the members of each ELCC Class are reasonably homogeneous in character and with respect to impact on system resource adequacy. ELCC Classes shall be defined for Limited Duration Resources of no less than four hours duration, and shall include 4-hour, 6-hour, 8-hour, and 10-hour duration characteristics, with matching duration classes for Combination Resources composed in part of one or more such ELCC Classes. Members of an ELCC Class shall share a common method of calculating the ELCC Resource Performance Adjustment,

provided that the individual ELCC Resource Performance Adjustment values will generally differ among ELCC Resources.

**ELCC Class Rating:**

“ELCC Class Rating” shall mean the rating factor, based on effective load carrying capability analysis, that applies to ELCC Resources that are members of an ELCC Class as part of the calculation of their Accredited UCAP.

**ELCC Class UCAP:**

“ELCC Class UCAP” shall mean the aggregate Effective UCAP all modeled ELCC Resources in a given ELCC Class are capable of providing in a given Delivery Year.

**ELCC Portfolio UCAP:**

“ELCC Portfolio UCAP” shall mean the aggregate Effective UCAP that all modeled ELCC Resources are capable of providing in a given Delivery Year.

**ELCC Resource:**

“ELCC Resource” shall mean a Generation Capacity Resource that is a Variable Resource, a Limited Duration Resource, or a Combination Resource.

**ELCC Resource Performance Adjustment:**

“ELCC Resource Performance Adjustment” shall mean the performance of a specific ELCC Resource relative to the aggregate performance of the ELCC Class to which it belongs as further described in RAA, Schedule 9.1, section E.

**Electric Cooperative:**

“Electric Cooperative” shall mean an entity owned in cooperative form by its customers that is engaged in the generation, transmission, and/or distribution of electric energy.

**Electric Distributor:**

“Electric Distributor” shall mean a Member that 1) owns or leases with rights equivalent to ownership of electric distribution facilities that are used to provide electric distribution service to electric load within the PJM Region; or 2) is a generation and transmission cooperative or a joint municipal agency that has a member that owns electric distribution facilities used to provide electric distribution service to electric load within the PJM Region.

**Emergency:**

“Emergency” shall mean (i) an abnormal system condition requiring manual or automatic action to maintain system frequency, or to prevent loss of firm load, equipment damage, or tripping of system elements that could adversely affect the reliability of an electric system or the safety of persons or property; or (ii) a fuel shortage requiring departure from normal operating procedures in order to minimize the use of such scarce fuel; or (iii) a condition that requires implementation of emergency procedures as defined in the PJM Manuals.

#### **End-Use Customer:**

“End-Use Customer” shall mean a Member that is a retail end-user of electricity within the PJM Region. For purposes of Members Committee sector classification, a Member that is a retail end-user that owns generation may qualify as an End-Use customer if: (1) the average physical unforced capacity owned by the Member and its affiliates in the PJM region over the five Planning Periods immediately preceding the relevant Planning Period does not exceed the average PJM capacity obligation for the Member and its affiliates over the same time period; or (2) the average energy produced by the Member and its affiliates within the PJM region over the five Planning Periods immediately preceding the relevant Planning Period does not exceed the average energy consumed by that Member and its affiliates within the PJM region over the same time period. The foregoing notwithstanding, taking retail service may not be sufficient to qualify a Member as an End-Use Customer.

#### **Energy Efficiency Resource:**

“Energy Efficiency Resource” shall mean a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of RAA, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the periods described in Reliability Assurance Agreement, Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention. Annual Energy Efficiency Resources, Base Capacity Energy Efficiency Resources and Summer-Period Energy Efficiency Resources are types of Energy Efficiency Resources.

#### **Exigent Water Storage:**

“Exigent Water Storage” shall mean water stored in the pondage or reservoir of a hydropower resource which is not typically available during normal operating conditions (as those conditions are described in the relevant FERC hydropower license), but which can be drawn upon during emergency conditions (as described in the FERC hydropower license), including in order to avoid a load shed. In an effective load carrying capability analysis, exigent storage capability from an upstream hydro facility can be considered relative to a downstream hydro facility by assessing cascading storage and flows.

**Existing Demand Resource:**

“Existing Demand Resource” shall mean a Demand Resource for which the Demand Resource Provider has identified existing end-use customer sites that are registered for the current Delivery Year with PJM (even if not registered by such Demand Resource Provider) and that the Demand Resource Provider reasonably expects to have under a contract to reduce load based on PJM dispatch instructions by the start of the Delivery Year for which such resource is offered.

**Existing Generation Capacity Resource:**

“Existing Generation Capacity Resource” shall mean, for purposes of the must-offer requirement and mitigation of offers for any RPM Auction for a Delivery Year, a Generation Capacity Resource that, as of the date on which bidding commences for such auction: (a) is in service; or (b) is not yet in service, but has cleared any RPM Auction for any prior Delivery Year. A Generation Capacity Resource shall be deemed to be in service if interconnection service has ever commenced (for resources located in the PJM Region), or if it is physically and electrically interconnected to an external Control Area and is in full commercial operation (for resources not located in the PJM Region). The additional megawatts of a Generation Capacity Resource that is being, or has been, modified to increase the number of megawatts of available installed capacity thereof shall not be deemed to be an Existing Generation Capacity Resource until such time as those megawatts (a) are in service; or (b) are not yet in service, but have cleared any RPM Auction for any prior Delivery Year.

**Extended Summer Demand Resource:**

“Extended Summer Demand Resource” shall mean, for Delivery Years through May 31, 2018, and for FRR Capacity Plans Delivery Years through May 31, 2019, a resource that is placed under the direction of the Office of the Interconnection and that will be available June through October and the following May, and will be available for an unlimited number of interruptions during such months by the Office of the Interconnection, and will be capable of maintaining each such interruption for at least a 10-hour duration between the hours of 10:00AM to 10:00PM Eastern Prevailing Time. The Extended Summer Demand Resource must be available June through October and the following May in the corresponding Delivery Year to be offered for sale or Self-Supplied in an RPM Auction, or included as an Extended Summer Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Facilities Study Agreement:**

“Facilities Study Agreement” shall have the same meaning as in Tariff, Part VI, section 206.

**FERC or Commission:**

“FERC” or “Commission” shall mean the Federal Energy Regulatory Commission or any successor federal agency, commission or department exercising jurisdiction over the Tariff, Operating Agreement and Reliability Assurance Agreement.

**Firm Point-To-Point Transmission Service:**

“Firm Point-To-Point Transmission Service” shall have the meaning specified in the Tariff.

**Firm Service Level:**

“Firm Service Level” or “FSL” of Price Responsive Demand for the 2022/2023 Delivery Year and subsequent Delivery Years shall mean the level, determined at a PRD Substation level, to which Price Responsive Demand shall be reduced during the Delivery Year when an Emergency Action that triggers a Performance Assessment Interval is declared and the Locational Marginal Price exceeds the price associated with such Price Responsive Demand identified by the PRD Provider in its PRD Plan. “Firm Service Level” or “FSL” of Demand Resource shall mean the pre-determined level for which an end-use customer’s load shall be reduced, upon notification from the Curtailment Service Provider’s market operations center or its agent.

**Firm Transmission Service:**

“Firm Transmission Service” shall mean transmission service that is intended to be available at all times to the maximum extent practicable, subject to an Emergency, an unanticipated failure of a facility, or other event beyond the control of the owner or operator of the facility or the Office of the Interconnection.

**Fixed Resource Requirement Alternative or FRR Alternative:**

“Fixed Resource Requirement Alternative” or “FRR Alternative” shall mean an alternative method for a Party to satisfy its obligation to provide Unforced Capacity hereunder, as set forth in the Reliability Assurance Agreement, Schedule 8.1.

**Forecast Pool Requirement:**

“Forecast Pool Requirement” or “FPR” shall mean the amount equal to one plus the unforced reserve margin (stated as a decimal number) for the PJM Region required pursuant to this Reliability Assurance Agreement, as approved by the PJM Board pursuant to Reliability Assurance Agreement, Schedule 4.1.

**FRR Capacity Plan or FRR Plan:**

“FRR Capacity Plan” or “FRR Plan” shall mean a long-term plan for the commitment of Capacity Resources and Price Responsive Demand to satisfy the capacity obligations of a Party that has elected the FRR Alternative, as more fully set forth in the Reliability Assurance Agreement, Schedule 8.1.

**FRR Entity:**

“FRR Entity” shall mean, for the duration of such election, a Party that has elected the FRR Alternative hereunder.



**FRR Service Area:**

“FRR Service Area” shall mean (a) the service territory of an IOU as recognized by state law, rule or order; (b) the service area of a Public Power Entity or Electric Cooperative as recognized by franchise or other state law, rule, or order; or (c) a separately identifiable geographic area that is: (i) bounded by wholesale metering, or similar appropriate multi-site aggregate metering, that is visible to, and regularly reported to, the Office of the Interconnection, or that is visible to, and regularly reported to an Electric Distributor and such Electric Distributor agrees to aggregate the load data from such meters for such FRR Service Area and regularly report such aggregated information, by FRR Service Area, to the Office of the Interconnection; and (ii) for which the FRR Entity has or assumes the obligation to provide capacity for all load (including load growth) within such area. In the event that the service obligations of an Electric Cooperative or Public Power Entity are not defined by geographic boundaries but by physical connections to a defined set of customers, the FRR Service Area in such circumstances shall be defined as all customers physically connected to transmission or distribution facilities of such Electric Cooperative or Public Power Entity within an area bounded by appropriate wholesale aggregate metering as described above.

**Full Program Option:**

“Full Program Option” shall mean participation in Emergency Load Response Program or Pre-Emergency Program which allows, pursuant to Tariff, Attachment DD and as applicable, (i) an energy payment for load reductions during a pre-emergency or emergency event, and (ii) a capacity payment for the ability to reduce load during a pre-emergency or emergency event.

**Full Requirements Service:**

“Full Requirements Service” shall mean wholesale service to supply all of the power needs of a Load Serving Entity to serve end-users within the PJM Region that are not satisfied by its own generating facilities.

**Generation Capacity Resource:**

“Generation Capacity Resource” shall mean a Generating Facility, or the contractual right to capacity from a specified Generating Facility, that meets the requirements of RAA, Schedule 9 and RAA, Schedule 10, and, for Generating Facilities that are committed to an FRR Capacity Plan, that meets the requirements of RAA, Schedule 8.1. A Generation Capacity Resource may be an Existing Generation Capacity Resource or a Planned Generation Capacity Resource.

**Generation Capacity Resource Provider:**

“Generation Capacity Resource Provider” shall mean a Member that owns, or has the contractual authority to control the output of, a Generation Capacity Resource, that has not transferred such authority to another entity.

**Generation Owner:**

“Generation Owner” shall mean a Member that owns or leases with rights equivalent to ownership, or otherwise controls and operates one or more operating generation resources located in the PJM Region. The foregoing notwithstanding, for a planned generation resource to qualify a Member as a Generation Owner, such resource shall have cleared an RPM auction, and for Energy Resources, the resource shall have a FERC-jurisdictional interconnection agreement or wholesale market participation agreement within PJM. Purchasing all or a portion of the output of a generation resource shall not be sufficient to qualify a Member as a Generation Owner. For purposes of Members Committee sector classification, a Member that is primarily a retail end-user of electricity that owns generation may qualify as a Generation Owner if: (1) the generation resource is the subject of a FERC-jurisdictional interconnection agreement or wholesale market participation agreement within PJM; (2) the average physical unforced capacity owned by the Member and its affiliates over the five Planning Periods immediately preceding the relevant Planning Period exceeds the average PJM capacity obligation of the Member and its affiliates over the same time period; and (3) the average energy produced by the Member and its affiliates within PJM over the five Planning Periods immediately preceding the relevant Planning Period exceeds the average energy consumed by the Member and its affiliates within PJM over the same time period.

**Generator Forced Outage:**

“Generator Forced Outage” shall mean an immediate reduction in output or capacity or removal from service, in whole or in part, of a generating unit by reason of an Emergency or threatened Emergency, unanticipated failure, or other cause beyond the control of the owner or operator of the facility, as specified in the relevant portions of the PJM Manuals. A reduction in output or removal from service of a generating unit in response to changes in market conditions shall not constitute a Generator Forced Outage.

**Generator Maintenance Outage:**

“Generator Maintenance Outage” shall mean the scheduled removal from service, in whole or in part, of a generating unit in order to perform repairs on specific components of the facility, if removal of the facility qualifies as a maintenance outage pursuant to the PJM Manuals.

**Generator Planned Outage:**

“Generator Planned Outage” shall mean the scheduled removal from service, in whole or in part, of a generating unit for inspection, maintenance or repair with the approval of the Office of the Interconnection in accordance with the PJM Manuals.

**Good Utility Practice:**

“Good Utility Practice” shall mean any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light

of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather is intended to include acceptable practices, methods, or acts generally accepted in the region; including those practices required by Federal Power Act Section 215(a)(4).

### **Hydropower With Non-Pumped Storage:**

“Hydropower With Non-Pumped Storage” shall mean a hydropower facility that can capture and store incoming stream flow, without use of pumps, in pondage or a reservoir, and the Generation Owner has the ability, within the constraints available in the applicable operating license, to exert material control over the quantity of stored water and output of the facility throughout an Operating Day.

### **Incremental Auction:**

“Incremental Auction” shall mean any of several auctions conducted for a Delivery Year after the Base Residual Auction for such Delivery Year and before the first day of such Delivery Year, including the First Incremental Auction, Second Incremental Auction, Third Incremental Auction, or Conditional Incremental Auction. Incremental Auctions (other than the Conditional Incremental Auction), shall be held for the purposes of:

- (i) allowing Market Sellers that committed Capacity Resources in the Base Residual Auction for a Delivery Year, which subsequently are determined to be unavailable to deliver the committed Unforced Capacity in such Delivery Year (due to resource retirement, resource cancellation or construction delay, resource derating, EFORd increase, a decrease in the Nominated Demand Resource Value of a Planned Demand Resource, delay or cancellation of a Qualifying Transmission Upgrade, or similar occurrences) to submit Buy Bids for replacement Capacity Resources; and

- (ii) allowing the Office of the Interconnection to reduce or increase the amount of committed capacity secured in prior auctions for such Delivery Year if, as a result of changed circumstances or expectations since the prior auction(s), there is, respectively, a significant excess or significant deficit of committed capacity for such Delivery Year, for the PJM Region or for an LDA.

### **IOU:**

“IOU” shall mean an investor-owned utility with substantial business interest in owning and/or operating electric facilities in any two or more of the following three asset categories: generation, transmission, distribution.

### **Limited Demand Resource:**

“Limited Demand Resource” shall mean, for Delivery Years through May 31, 2018, and for FRR Capacity Plans Delivery Years through May 31, 2019, a resource that is placed under the direction of the Office of the Interconnection and that will, at a minimum, be available for interruption for at least 10 Load Management Events during the summer period of June through September in the Delivery Year, and will be capable of maintaining each such interruption for at least a 6-hour duration. At a minimum, the Limited Demand Resource shall be available for such interruptions on weekdays, other than NERC holidays, from 12:00PM (noon) to 8:00PM Eastern Prevailing Time. The Limited Demand Resource must be available during the summer period of June through September in the corresponding Delivery Year to be offered for sale or Self-Supplied in an RPM Auction, or included as a Limited Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Limited Duration Resource:**

“Limited Duration Resource” shall mean a Generation Capacity Resource that is not a Variable Resource, that is not a Combination Resource, and that is not capable of running continuously at Maximum Facility Output for 24 hours or longer. A Capacity Storage Resource is a Limited Duration Resource.

**Load Serving Entity or LSE:**

“Load Serving Entity” or “LSE” shall mean any entity (or the duly designated agent of such an entity), including a load aggregator or power marketer, (i) serving end-users within the PJM Region, and (ii) that has been granted the authority or has an obligation pursuant to state or local law, regulation or franchise to sell electric energy to end-users located within the PJM Region. Load Serving Entity shall include any end-use customer that qualifies under state rules or a utility retail tariff to manage directly its own supply of electric power and energy and use of transmission and ancillary services.

**Locational Reliability Charge:**

“Locational Reliability Charge” shall mean the charge determined pursuant to Operating Agreement, Schedule 8.

**Markets and Reliability Committee:**

“Markets and Reliability Committee” shall mean the committee established pursuant to the Operating Agreement as a Standing Committee of the Members Committee.

**Maximum Emergency Service Level:**

“Maximum Emergency Service Level” or “MESL” of Price Responsive Demand for the 2017/2018 through the 2021/2022 Delivery Years shall mean the level, determined at a PRD Substation level, to which Price Responsive Demand shall be reduced during the Delivery Year when a Maximum Generation Emergency is declared and the Locational Marginal Price exceeds

the price associated with such Price Responsive Demand identified by the PRD Provider in its PRD Plan.

**Member:**

“Member” shall have the meaning provided in the Operating Agreement.

**Members Committee:**

“Members Committee” shall mean the committee specified in Operating Agreement, section 8 composed of the representatives of all the Members.

**NERC:**

“NERC” shall mean the North American Electric Reliability Corporation or any successor thereto.

**Network External Designated Transmission Service:**

“Network External Designated Transmission Service” shall mean the quantity of network transmission service confirmed by PJM for use by a market participant to import power and energy from an identified Generation Capacity Resource located outside the PJM Region, upon demonstration by such market participant that it owns such Generation Capacity Resource, has an executed contract to purchase power and energy from such Generation Capacity Resource, or has a contract to purchase power and energy from such Generation Capacity Resource contingent upon securing firm transmission service from such resource.

**Network Resources:**

“Network Resources” shall have the meaning set forth in the PJM Tariff.

**Network Transmission Service:**

“Network Transmission Service” shall mean transmission service provided pursuant to the rates, terms and conditions set forth in Tariff, Part III or transmission service comparable to such service that is provided to a Load Serving Entity that is also a Transmission Owner.

**Nominal PRD Value:**

“Nominal PRD Value” shall mean, as to any PRD Provider, an adjustment, determined in accordance with Reliability Assurance Agreement, Schedule 6.1, to the peak-load forecast used to determine the quantity of capacity sought through an RPM Auction, reflecting the aggregate effect of Price Responsive Demand on peak load resulting from the Price Responsive Demand to be provided by such PRD Provider.

**Nominated Demand Resource Value:**

“Nominated Demand Resource Value” shall have the meaning specified in Tariff, Attachment DD.

**Non-Retail Behind the Meter Generation:**

“Non-Retail Behind the Meter Generation” shall mean Behind the Meter Generation that is used by municipal electric systems, electric cooperatives, and electric distribution companies to serve load.

**Obligation Peak Load:**

“Obligation Peak Load” shall have the meaning specified in Reliability Assurance Agreement, Schedule 8.

**Office of the Interconnection:**

“Office of the Interconnection” shall mean the employees and agents of PJM Interconnection, L.L.C., subject to the supervision and oversight of the PJM Board, acting pursuant to the Operating Agreement.

**Operating Agreement of the PJM Interconnection, L.L.C., Operating Agreement or PJM Operating Agreement:**

“Operating Agreement of the PJM Interconnection, L.L.C.,” “Operating Agreement” or “PJM Operating Agreement” shall mean that agreement, dated as of April 1, 1997 and as amended and restated as of June 2, 1997, including all Schedules, Exhibits, Appendices, addenda or supplements hereto, as amended from time to time thereafter, among the Members of the PJM Interconnection, L.L.C, on file with the Commission.

**Operating Day:**

“Operating Day” shall have the same meaning as provided in the Operating Agreement.

**Operating Reserve:**

“Operating Reserve” shall mean the amount of generating capacity scheduled to be available for a specified period of an Operating Day to ensure the reliable operation of the PJM Region, as specified in the PJM Manuals.

**Ordinary Water Storage:**

“Ordinary Water Storage” shall mean water stored in the pondage or reservoir of a hydropower resource which is typically available during normal operating conditions pursuant to the FERC license governing the operation of the hydropower resource.

**Other Supplier:**

“Other Supplier” shall mean a Member that: (i) is engaged in buying, selling or transmitting electric energy, capacity, ancillary services, Financial Transmission Rights or other services available under PJM’s governing documents in or through the Interconnection or has a good faith intent to do so, and (ii) is not a Generation Owner, Electric Distributor, Transmission Owner or End-Use Customer.

**Partial Requirements Service:**

“Partial Requirements Service” shall mean wholesale service to supply a specified portion, but not all, of the power needs of a Load Serving Entity to serve end-users within the PJM Region that are not satisfied by its own generating facilities.

**Party:**

“Party” shall mean an entity bound by the terms of the Operating Agreement.

**Peak Shaving Adjustment:**

“Peak Shaving Adjustment” shall mean a load forecast mechanism that allows load reductions by end-use customers to result in a downward adjustment of the summer load forecast for the associated Zone. Any End-Use Customer identified in an approved peak shaving plan shall not also participate in PJM Markets as Price Responsive Demand, Demand Resource, Base Capacity Demand Resource, Capacity Performance Demand Resource, or Economic Load Response Participant.

**Percentage Internal Resources Required:**

“Percentage Internal Resources Required” shall mean, for purposes of an FRR Capacity Plan, the percentage of the LDA Reliability Requirement for an LDA that must be satisfied with Capacity Resources located in such LDA.

**Performance Assessment Interval:**

“Performance Assessment Interval” shall have the meaning specified in Tariff, Attachment DD.

**PJM:**

“PJM” shall mean PJM Interconnection, L.L.C., including the Office of the Interconnection as referenced in the PJM Operating Agreement. When such term is being used in the RAA it shall also include the PJM Board.

**PJM Board:**

“PJM Board” shall mean the Board of Managers of the LLC, acting pursuant to the Operating Agreement, except when such term is being used in Tariff, Attachment M, in which case PJM Board shall mean the Board of Managers of PJM or its designated representative, exclusive of any members of PJM Management.

**PJM Manuals:**

“PJM Manuals” shall mean the instructions, rules, procedures and guidelines established by the Office of the Interconnection for the operation, planning and accounting requirements of the PJM Region.

**PJM Region:**

“PJM Region” shall have the same meaning as provided in the Operating Agreement.

**PJM Region Installed Reserve Margin:**

“PJM Region Installed Reserve Margin” shall mean the percent installed reserve margin for the PJM Region required pursuant to Reliability Assurance Agreement, Schedule 4.1, as approved by the PJM Board.

**PJM Tariff, Tariff, O.A.T.T., OATT or PJM Open Access Transmission Tariff:**

“PJM Tariff,” “Tariff,” “O.A.T.T.,” “OATT” or “PJM Open Access Transmission Tariff” shall mean that certain PJM Open Access Transmission Tariff, including any schedules, appendices, or exhibits attached thereto, on file with FERC and as amended from time to time thereafter.

**Planned Demand Resource:**

“Planned Demand Resource” shall mean any Demand Resource that does not currently have the capability to provide a reduction in demand or to otherwise control load, but that is scheduled to be capable of providing such reduction or control on or before the start of the Delivery Year for which such resource is to be committed, as determined in accordance with the requirements of Reliability Assurance Agreement, Schedule 6. As set forth in Reliability Assurance Agreement, Schedule 6 and Reliability Assurance Agreement, Schedule 8.1, a Demand Resource Provider submitting a DR Sell Offer Plan shall identify as Planned Demand Resources in such plan all Demand Resources in excess of those that qualify as Existing Demand Resources.

**Planned External Generation Capacity Resource:**

“Planned External Generation Capacity Resource” shall mean a proposed Generation Capacity Resource, or a proposed increase in the capability of a Generation Capacity Resource, that (a) is to be located outside the PJM Region, (b) participates in the generation interconnection process of a Control Area external to PJM, (c) is scheduled to be physically and electrically interconnected to the transmission facilities of such Control Area on or before the first day of the Delivery Year for which such resource is to be committed to satisfy the reliability requirements



of the PJM Region, and (d) is in full commercial operation prior to the first day of such Delivery Year, such that it is sufficient to provide the Installed Capacity set forth in the Sell Offer forming the basis of such resource's commitment to the PJM Region. Prior to participation in any Base Residual Auction for such Delivery Year, the Capacity Market Seller must demonstrate that it has a fully executed system impact study agreement (or other documentation which is functionally equivalent to a System Impact Study Agreement under the PJM Tariff) or, for resources which are greater than 20MWs participating in a Base Residual Auction for the 2019/2020 Delivery Year and subsequent Delivery Years, an agreement or other documentation which is functionally equivalent to a Facilities Study Agreement under the PJM Tariff), with the transmission owner to whose transmission facilities or distribution facilities the resource is being directly connected, and, as applicable, the transmission provider. Prior to participating in any Incremental Auction for such Delivery Year, the Capacity Market Seller must demonstrate it has entered into an interconnection agreement, or such other documentation that is functionally equivalent to an Interconnection Service Agreement under the PJM Tariff, with the transmission owner to whose transmission facilities or distribution facilities the resource is being directly connected, and, as applicable, the transmission provider. A Planned External Generation Capacity Resource must provide evidence to PJM that it has been studied as a Network Resource, or such other similar interconnection product in such external Control Area, must provide contractual evidence that it has applied for or purchased transmission service to be deliverable to the PJM border, and must provide contractual evidence that it has applied for transmission service to be deliverable to the bus at which energy is to be delivered, the agreements for which must have been executed prior to participation in any Reliability Pricing Model Auction for such Delivery Year. Any such resource shall cease to be considered a Planned External Generation Capacity Resource as of the earlier of (i) the date that interconnection service commences as to such resource; or (ii) the resource has cleared an RPM Auction, in which case it shall become an Existing Generation Capacity Resource for purposes of the mitigation of offers for any RPM Auction for all subsequent Delivery Years.

### **Planned Generation Capacity Resource:**

“Planned Generation Capacity Resource” shall mean a Generation Capacity Resource, or additional megawatts to increase the size of a Generation Capacity Resource that is being or has been modified to increase the number of megawatts of available installed capacity thereof, participating in the generation interconnection process under Tariff, Part IV, Subpart A, as applicable, for which: (i) Interconnection Service is scheduled to commence on or before the first day of the Delivery Year for which such resource is to be committed to RPM or to an FRR Capacity Plan; (ii) for any such resource seeking to offer into a Base Residual Auction, or for any such resource of 20 MWs or less seeking to offer into a Base Residual Auction, a System Impact Study Agreement (or, for resources for which a System Impact Study Agreement is not required, has such other agreement or documentation that is functionally equivalent to a System Impact Study Agreement) has been executed prior to the Base Residual Auction for such Delivery Year; (iii) for any such resource of more than 20 MWs seeking to offer into a Base Residual Auction for the 2019/2020 Delivery Year and subsequent Delivery Years, a Facilities Study Agreement (or, for resources for which a Facilities Study Agreement is not required, has such other agreement or documentation that is functionally equivalent to a Facility Studies Agreement) has been executed prior to the Base Residual Auction for such Delivery Year; and

(iv) an Interconnection Service Agreement has been executed prior to any Incremental Auction for such Delivery Year in which such resource plans to participate. For purposes of the must-offer requirement and mitigation of offers for any RPM Auction for a Delivery Year, a Generation Capacity Resource shall cease to be considered a Planned Generation Capacity Resource as of the earlier of (i) the date that Interconnection Service commences as to such resource; or (ii) the resource has cleared an RPM Auction for any Delivery Year, in which case it shall become an Existing Generation Capacity Resource for any RPM Auction for all subsequent Delivery Years.

**Planning Period:**

“Planning Period” shall mean the 12 months beginning June 1 and extending through May 31 of the following year, or such other period approved by the Members Committee.

**PRD Curve:**

“PRD Curve” shall mean a price-consumption curve at a PRD Substation level, if available, and otherwise at a Zonal (or sub-Zonal LDA, if applicable) level, that details the base consumption level of Price Responsive Demand and the decreasing consumption levels at increasing prices.

**PRD Provider:**

“PRD Provider” shall mean (i) a Load Serving Entity that provides PRD; or (ii) an entity without direct load serving responsibilities that has entered contractual arrangements with end-use customers served by a Load Serving Entity that satisfy the eligibility criteria for Price Responsive Demand.

**PRD Provider’s Zonal Expected Peak Load Value of PRD:**

“PRD Provider’s Zonal Expected Peak Load Value of PRD” shall mean the expected contribution to Delivery Year peak load of a PRD Provider’s Price Responsive Demand, were such demand not to be reduced in response to price, based on the contribution of the end-use customers comprising such Price Responsive Demand to the most recent prior Delivery Year’s peak demand, escalated to the Delivery Year in question, as determined in a manner consistent with the Office of the Interconnection’s load forecasts used for purposes of the RPM Auctions.

**PRD Reservation Price:**

“PRD Reservation Price” shall mean 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.

**PRD Substation:**

“PRD Substation” shall mean an electrical substation that is located in the same Zone or in the same sub-Zonal LDA as the end-use customers identified in a PRD Plan or PRD registration and

that, in terms of the electrical topography of the Transmission Facilities comprising the PJM Region, is as close as practicable to such loads.

**Price Responsive Demand:**

“Price Responsive Demand” or “PRD” shall mean end-use customer load registered by a PRD Provider pursuant to Reliability Assurance Agreement, Schedule 6.1 that have, as set forth in more detail in the PJM Manuals, the metering capability to record electricity consumption at an interval of one hour or less, Supervisory Control capable of curtailing such load (consistent with applicable RERRA requirements) at each PRD Substation identified in the relevant PRD Plan or PRD registration in response to a Maximum Generation Emergency declared by the Office of the Interconnection (prior to 2022/2023 Delivery Year) or a Performance Assessment Interval that triggers a PRD performance assessment (effective with 2022/2023 Delivery Year), and a retail rate structure, or equivalent contractual arrangement, capable of changing retail rates as frequently as an hourly basis, that is linked to or based upon changes in real-time Locational Marginal Prices at a PRD Substation level and that results in a predictable automated response to varying wholesale electricity prices.

**Price Responsive Demand Credit:**

“Price Responsive Demand Credit” shall mean a credit, based on committed Price Responsive Demand, as determined under Reliability Assurance Agreement, Schedule 6.1.

**Price Responsive Demand Plan or PRD Plan:**

“Price Responsive Demand Plan” or “PRD Plan” shall mean a plan, submitted by a PRD Provider and received by the Office of the Interconnection in accordance with Reliability Assurance Agreement, Schedule 6.1 and procedures specified in the PJM Manuals, claiming a peak demand limitation due to Price Responsive Demand to support the determination of such PRD Provider’s Nominal PRD Value.

**Public Power Entity:**

“Public Power Entity” shall mean any agency, authority, or instrumentality of a state or of a political subdivision of a state, or any corporation wholly owned by any one or more of the foregoing, that is engaged in the generation, transmission, and/or distribution of electric energy.

**Qualifying Transmission Upgrades:**

“Qualifying Transmission Upgrades” shall have the meaning specified in Tariff, Attachment DD.

**Relevant Electric Retail Regulatory Authority:**

“Relevant Electric Retail Regulatory Authority” or “RERRA” shall have the meaning specified in the PJM Operating Agreement.

**Reliability Principles and Standards:**

“Reliability Principles and Standards” shall mean the principles and standards established by NERC or an Applicable Regional Entity to define, among other things, an acceptable probability of loss of load due to inadequate generation or transmission capability, as amended from time to time.

**Required Approvals:**

“Required Approvals” shall mean all of the approvals required for the Operating Agreement to be modified or to be terminated, in whole or in part, including the acceptance for filing by FERC and every other regulatory authority with jurisdiction over all or any part of the Operating Agreement.

**Self-Supply:**

“Self-Supply” shall have the meaning provided in Tariff, Attachment DD.

**Small Commercial Customer:**

“Small Commercial Customer” shall have the same meaning as in the PJM Tariff.

**State Consumer Advocate:**

“State Consumer Advocate” shall mean a legislatively created office from any State, all or any part of the territory of which is within the PJM Region, and the District of Columbia established, inter alia, for the purpose of representing the interests of energy consumers before the utility regulatory commissions of such states and the District of Columbia and the FERC.

**State Regulatory Structural Change:**

“State Regulatory Structural Change” shall mean as to any Party, a state law, rule, or order that, after September 30, 2006, initiates a program that allows retail electric consumers served by such Party to choose from among alternative suppliers on a competitive basis, terminates such a program, expands such a program to include classes of customers or localities served by such Party that were not previously permitted to participate in such a program, or that modifies retail electric market structure or market design rules in a manner that materially increases the likelihood that a substantial proportion of the customers of such Party that are eligible for retail choice under such a program (a) that have not exercised such choice will exercise such choice; or (b) that have exercised such choice will no longer exercise such choice, including for example, without limitation, mandating divestiture of utility-owned generation or structural changes to such Party’s default service rules that materially affect whether retail choice is economically viable.

**Summer-Period Demand Resource:**

Summer-Period Demand Resource shall mean, for the 2020/2021 Delivery Year and subsequent Delivery Years, a resource that is placed under the direction of the Office of the Interconnection, and will be available June through October and the following May of the Delivery Year, and will be available for an unlimited number of interruptions during such months by the Office of the Interconnection, and will be capable of maintaining each such interruption between the hours of 10:00AM to 10:00PM Eastern Prevailing Time. The Summer-Period Demand Resource must be available June through October and the following May in the corresponding Delivery Year to be offered for sale in an RPM Auction, or included as a Summer-Period Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Summer-Period Energy Efficiency Resource:**

Summer-Period Energy Efficiency Resource shall mean, for the 2020/2021 Delivery Year and subsequent Delivery Years, a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of Reliability Assurance Agreement, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the summer peak periods as described in Reliability Assurance Agreement, Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Summer-Period Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention.

**Supervisory Control:**

“Supervisory Control” shall mean the capability to curtail, in accordance with applicable RERRA requirements, load registered as Price Responsive Demand at each PRD Substation identified in the relevant PRD Plan or PRD registration in response to a Maximum Generation Emergency declared by the Office of the Interconnection. Except to the extent automation is not required by the provisions of the Operating Agreement, the curtailment shall be automated, meaning that load shall be reduced automatically in response to control signals sent by the PRD Provider or its designated agent directly to the control equipment where the load is located without the requirement for any action by the end-use customer.

**Threshold Quantity:**

“Threshold Quantity” shall mean, as to any FRR Entity for any Delivery Year, the sum of (a) the Unforced Capacity equivalent (determined using the Pool-Wide Average EFORD) of the Installed Reserve Margin for such Delivery Year multiplied by the Preliminary Forecast Peak Load for which such FRR Entity is responsible under its FRR Capacity Plan for such Delivery Year, plus (b) the lesser of (i) 3% of the Unforced Capacity amount determined in (a) above or (ii) 450 MW. If the FRR Entity is not responsible for all load within a Zone, the Preliminary Forecast Peak Load for such entity shall be the FRR Entity’s Obligation Peak Load last determined prior to the Base Residual Auction for such Delivery Year, times the Base FRR Scaling Factor (as determined in accordance with Reliability Assurance Agreement, Schedule 8.1).

**Transmission Facilities:**

“Transmission Facilities” shall mean facilities that: (i) are within the PJM Region; (ii) meet the definition of transmission facilities pursuant to FERC’s Uniform System of Accounts or have been classified as transmission facilities in a ruling by FERC addressing such facilities; and (iii) have been demonstrated to the satisfaction of the Office of the Interconnection to be integrated with the PJM Region transmission system and integrated into the planning and operation of the PJM Region to serve all of the power and transmission customers within the PJM Region.

**Transmission Owner:**

“Transmission Owner” shall mean a Member that owns or leases with rights equivalent to ownership Transmission Facilities and is a signatory to the PJM Transmission Owners Agreement. Taking transmission service shall not be sufficient to qualify a Member as a Transmission Owner.

**Unforced Capacity:**

“Unforced Capacity” shall mean installed capacity rated at summer conditions that is not on average experiencing a forced outage or forced derating, calculated for each Capacity Resource on the 12-month period from October to September without regard to the ownership of or the contractual rights to the capacity of the unit.

**Unlimited Resource:**

“Unlimited Resource” shall mean a generating unit having the ability to maintain output at a stated capability continuously on a daily basis without interruption. An Unlimited Resource is a Generation Capacity Resource that is not an ELCC Resource.

**Variable Resource:**

“Variable Resource” shall mean a Generation Capacity Resource with output that can vary as a function of its energy source, such as wind, solar, run of river hydroelectric power without storage, and landfill gas units without an alternate fuel source. All Intermittent Resources are Variable Resources, with the exception of Hydropower with Non-Pumped Storage.

**Winter Peak Load (or WPL):**

“Winter Peak Load” or “WPL” shall mean the average of the Demand Resource customer’s specific peak hourly load between hours ending 7:00 EPT through 21:00 EPT on the PJM defined 5 coincident peak days from December through February two Delivery Years prior the Delivery Year for which the registration is submitted. Notwithstanding, if the average use between hours ending 7:00 EPT through 21:00 EPT on a winter 5 coincident peak day is below 35% of the average hours ending 7:00 EPT through 21:00 EPT over all five of such peak days, then up to two such days and corresponding peak demand values may be excluded from the

calculation. Upon approval by the Office of the Interconnection, a Curtailment Service Provider may provide alternative data to calculate Winter Peak Load, as outlined in the PJM Manuals, when there is insufficient hourly load data for the two Delivery Years prior to the relevant Delivery Year or if more than two days meet the exclusion criteria described above.

**Zonal Capacity Price:**

“Zonal Capacity Price” shall mean the clearing price required in each Zone to meet the demand for Unforced Capacity and satisfy Locational Deliverability Requirements for the LDA or LDAs associated with such Zone. If the Zone contains multiple LDAs with different Capacity Resource Clearing Prices, the Zonal Capacity Price shall be a weighted average of the Capacity Resource Clearing Prices for such LDAs, weighted by the Unforced Capacity of Capacity Resources cleared in each such LDA.

**Zone or Zonal:**

“Zone” or “Zonal” shall refer to an area within the PJM Region, as set forth in Tariff, Attachment J and RAA, Schedule 15, or as such areas may be (i) combined as a result of mergers or acquisitions or (ii) added as a result of the expansion of the boundaries of the PJM Region. A Zone shall include any Non-Zone Network Load located outside the PJM Region that is served from such Zone under Tariff, Attachment H-A.

**Zonal Winter Weather Adjustment Factor (ZWWAF):**

“Zonal Winter Weather Adjustment Factor” or “ZWWAF” shall mean the PJM zonal winter weather normalized coincident peak divided by PJM zonal average of 5 coincident peak loads in December through February.

## SCHEDULE 9

### PROCEDURES FOR ESTABLISHING THE CAPABILITY OF GENERATION CAPACITY RESOURCES

A. Such rules and procedures as may be required to determine and demonstrate the capability of Generation Capacity Resources for the purposes of meeting a Load Serving Entity's obligations under the Agreement shall be developed by the Office of the Interconnection and maintained in the PJM Manuals.

~~B. The rules and procedures for determining and demonstrating the capability of generating units to serve load in the PJM Region shall be consistent with achieving uniformity for planning, operating, accounting and reporting purposes.~~

~~C. The rules and procedures shall recognize the difference in types of generating units and the relative ability of units to maintain output at stated capability over a specified period of time. Factors affecting such ability include, but are not limited to, fuel availability, stream flow and/or reservoir storage for hydro units, energy storage capability for Energy Storage Resources, energy source variability and intermittency, mechanical limitations, and system operating policies. For this purpose, the basis for determining and demonstrating the capability of a particular generating unit is dependent upon the category (of the three generating unit types listed below) that describes the unit's attributes shall be as described in RAA, Schedule 9.1.~~

~~i. For generating units having the ability to maintain output at stated capability continuously on a daily basis without interruption, the capability of the generating unit is based on the level of output that the unit can provide under the site conditions expected to exist at the time of PJM system peak load where such conditions include, but are not limited to, ambient air temperature, humidity, barometric pressure, intake water temperature, and cooling system performance. Generating units with the ability to operate continuously across all hours of an operating day without interruption if needed include, but are not limited to, nuclear and fossil fired steam units, combined cycle units, combustion turbine units, reciprocating engine units, and fuel cell units.~~

~~ii. Generating units with limited energy capability include, but are not limited to, Energy Storage Resources that receive energy from the grid and store the energy for later injection to the grid (e.g., pumped storage hydro units, compressed air energy storage units, flywheel energy storage units and battery storage units) and hydroelectric generating units with reservoir storage capability. The capability of generating units with limited energy capability is based on the sustained level of output that the unit can provide and maintain over a continuous ten-hour period with consideration given to conditions expected to exist at the time of PJM system peak load to the extent that such conditions impact such capability.~~



~~iii. Generating units with output that varies as a function of an energy source that is non-continuous and that cannot be directly controlled are unable to provide a stated level of output on-demand and are unable to maintain a stated level of output for any specified period of time include, but are not limited to, wind units, solar units, run-of-river hydroelectric units (without reservoir storage capability) and landfill gas units (without alternate fuel capability). The capability of such generating units is based on the level of output that the unit is expected to be reliably producing as a function of its energy source at the time of system peak loads. Specifically, the capability of a wind or a solar generating unit is determined by the unit's average hourly MW output during 368 summer period hours defined by hours ending 15, 16, 17 and 18 of each day of the months of June, July and August.~~**C. Provisions for Unlimited**

### **Resources**

For Unlimited Resources, the capability of the generating unit is based on the level of output that the unit can provide under the site conditions expected to exist at the time of PJM system peak load where such conditions include, but are not limited to, ambient air temperature, humidity, barometric pressure, intake water temperature, and cooling system performance. Generating units with the ability to operate continuously across all hours of an Operating Day without interruption if needed include, but are not limited to, nuclear and fossil-fired steam units, combined cycle units, combustion turbine units, reciprocating engine units, and fuel cell units.

### **D. Provisions for ELCC Resources**

The Office of the Interconnection shall determine the capability of ELCC Resources to meet a Load Serving Entity's obligations under the Agreement using an effective load carrying capability analysis, as set forth in RAA, Schedule 9.1, with additional implementation details provided in the PJM Manuals.

## **SCHEDULE 9.1: EFFECTIVE LOAD CARRYING CAPABILITY ANALYSIS**

### **A. Overview of Effective Load Carrying Capability Analysis**

The inputs of the effective load carrying capability analysis include:

- Historical weather and load data;
- Historical output of existing Variable Resources;
- Estimates of putative historical output for planned Variable Resources;
- Forced outage patterns for Unlimited Resources;
- Resource deployment forecast; and
- Modeling parameters for Limited Duration Resources and Combination Resources.

The outputs of the effective load carrying capability analysis include:

- The ELCC Portfolio UCAP, in MW;
- ELCC Class UCAP values, in MW; and
- ELCC Class Rating values, in percent.

### **B. Calculation of ELCC Portfolio UCAP**

The effective load carrying capability analysis shall identify a scenario in which the aggregate installed capacity “X” of a group of Unlimited Resources with no outages yields the same annual loss of load expectation as the one produced by the scenario with all ELCC Resources that are expected to offer in a given RPM Auction, or otherwise provide capacity, in the Delivery Year being analyzed. The ELCC Portfolio UCAP shall be the value “X”.

### **C. Allocation from ELCC Portfolio UCAP to ELCC Class UCAP**

The ELCC Portfolio UCAP shall be allocated to each ELCC Class UCAP, in accordance with the applicable effective load carrying capability analysis methodology specified in the PJM Manuals, as subject to adjustment in accordance with RAA, Schedule 9.1, section J, such that the aggregate of all ELCC Class UCAP values is equal to the ELCC Portfolio UCAP.

### **D. Calculation of ELCC Class Rating**

(1) The ELCC Class Rating of Variable Resources and Limited Duration Resources shall be the ratio of the applicable ELCC Class UCAP to the aggregate Effective Nameplate Capacity of the modeled ELCC Resources of that ELCC Class that are expected to offer in a given RPM Auction, or otherwise provide capacity, in the Delivery Year being analyzed.

(2) For Combination Resources, there shall be an ELCC Class Rating for each component.

(i) For a Combination Resource with a Limited Duration Resource component and a Variable Resource component, the Limited Duration Resource component ELCC Class Rating shall be equal to the quotient of (1) the Combination Resource ELCC Class UCAP minus the [product of the Variable Resource ELCC Class Rating and the aggregate Effective Nameplate Capacity of all the Variable Resource components within the subject Combination Resource class] divided by (2) the aggregate equivalent Effective Nameplate Capacity of all the Limited Duration Resource components within the subject Combination Resource class, and the Variable Resource component ELCC Class Rating shall be equal to the ELCC Class Rating for the ELCC Class to which the Variable Resource component would belong if it were not a component of the Combination Resource.

(ii) For a Combination Resource with a Limited Duration Resource component and an Unlimited Resource component, the Limited Duration Resource component ELCC Class Rating shall be equal to the ELCC Class Rating for the ELCC Class to which the Limited Duration Resource component would belong if it were not a component of the Combination Resource, and the Unlimited Resource component would not have an ELCC Class Rating.

#### **E. Calculation of Accredited UCAP and ELCC Resource Performance Adjustment**

(1) (a) For Variable Resources and Limited Duration Resources, Accredited UCAP values shall be equal to the product of:

- (i) the Effective Nameplate Capacity;
- (ii) the applicable ELCC Class Rating; and
- (iii) the ELCC Resource Performance Adjustment.

(b) For Combination Resources, Accredited UCAP values shall be equal to the sum of the Accredited UCAP of each component, but not to exceed the Maximum Facility Output of the resource, where:

- (i) The value for a Variable Resource component shall be determined in accordance with subsection (a) above.
- (ii) The value for a Limited Duration Resource component shall be equal to the product of:
  - (A) the Effective Nameplate Capacity determined for the Limited Duration Resource component;

(B) [one minus the EFORD for the Limited Duration Resource component]; and

(C) the applicable Limited Duration Resource component ELCC Class Rating as determined in Section D(2)(i).

(iii) The value for an Unlimited Resource component shall be equal to the product of the installed capacity of the Unlimited Resource component and [one minus the EFORD for the Unlimited Resource component].

(iv) The Accredited UCAP for Hydropower With Non-Pumped Storage, and for each member of an ELCC Class whose members are so distinct from one another that a single ELCC Class Rating fails to capture their physical characteristics, shall be based on a resource-specific effective load carrying capability analysis based on the resource's unique parameters.

(2) The ELCC Resource Performance Adjustment shall be calculated according to the following methods, as further detailed in the PJM Manuals:

(a) For a Variable Resource: based on a metric consisting of the average of (1) actual output during the 200 highest coincident peak load hours over the preceding ten years, regardless of the years in which they occur, and (2) actual output during the 200 highest coincident peak putative net load hours over the preceding ten years, regardless of the years in which they occur, where putative net load is actual load minus the putative hourly output of Variable Resources based on the resource mix of the target year. For Planned Resources or resources less than 10 years old, estimated hypothetical historical output will be used to develop this metric. For a given resource or component, the Performance Adjustment shall equal the ratio of such metric to the average (weighted by the Effective Nameplate Capacity) of such metrics for all units in the applicable Variable Resource ELCC Class.

(b) For Limited Duration Resources: based on EFORD.

(c) For Combination Resources with only an Unlimited Resource component and a Limited Duration Resource component: based on EFORD.

(d) For Combination Resources with a Variable Resource component (except for Hydropower With Non-Pumped Storage): (1) based on the direct metered or estimated output of the Variable Resource component, which is then assessed according to the methodology described in subsection (a) above for Variable Resources and in accordance with the PJM Manuals; and (2) based on the EFORD that is applicable to the Limited Duration Resource component.

(e) For Hydropower With Non-Pumped Storage and other Combination Resources that do not fall into the above categories: based on EFORD.

#### **F. Installed Capacity of ELCC Resources**

Rules and procedures for technically determining and demonstrating the installed capacity of ELCC Resources shall be developed by the Office of the Interconnection and maintained in the PJM Manuals. The installed capacity of a Limited Duration Resource is based on the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, as described in the PJM Manuals. The installed capacity of a Combination Resource (other than Hydropower With Non-Pumped Storage) is based on the lesser of the Maximum Facility Output or the sum of the equivalent Effective Nameplate Capacity values of the resource's constituent components considered on a stand-alone basis.

#### **G. Details of the Effective Load Carrying Capability Methodology**

The effective load carrying capability analysis shall compare expected hourly load levels (based on historical weather) with the expected hourly output of the expected future resource mix in order to identify the relative resource adequacy value of the portfolio of all ELCC Classes, as well of each individual ELCC Class, compared to a group of Unlimited Resources with no outages. In performing this analysis, the model inputs shall be scaled to meet the annual loss of load expectation of the Office of the Interconnection. The effective load carrying capability analysis shall compare hourly values for: (i) expected load based on historical weather; (ii) expected Variable Resource output; and (iii) expected output of Limited Duration Resources and of Combination Resources as described below. These expected quantities are based on actual values for load and actual and putative values for Variable Resource output (standalone or as a component of Combination Resources) after June 1, 2012 (inclusive) through the most recent Delivery Year for which complete data exist. For resources that have not existed each year since June 1, 2012, putative output is an estimate of the hourly output that resource would have produced in a historical hour if that resource had existed in that hour. This putative output estimate is developed based on historical weather data consistent with the particular site conditions for each such resource in accordance with the PJM Manuals.

The effective load carrying capability analysis shall simulate forced outages of Unlimited Resources based on actual historical data, and shall simulate the output of Limited Duration Resources and Combination Resources based on their Office of the Interconnection-validated parameters, including the putative output of the Variable Resource component of Combination Resources, as described above. Forced outages of Limited Duration Resources and Combination Resources shall not be simulated in the effective load carrying capability analysis.

The quantity of deployed resources studied in the analysis shall be based on resource deployment forecasts and, where applicable, on available information based on Sell Offers submitted in RPM Auctions or Fixed Resource Requirement plans for the applicable Delivery Year.

The ELCC Class UCAP and other results of the effective load carrying capability analysis shall be based on the total Effective UCAP of the ELCC Class as a whole.

The ELCC Class UCAP and corresponding ELCC Class Rating values may increase or decrease from year to year as the expected resource mix and load shape change.

Energy Resources are not included in the effective load carrying capability analysis. Generating units that are expected to only offer or otherwise provide a portion of their Accredited UCAP for that Delivery Year are represented in the analysis in proportion to the expected quantity offered or delivered divided by the Accredited UCAP.

#### **H. Methodology to Simulate Output of Certain Resources in the Effective Load Carrying Capability Model**

The effective load carrying capability analysis shall simulate the output of Limited Duration Resources and Combination Resources based on their physical parameters, including limited storage capability, and shall simulate the deployment of Demand Resources. The analysis shall simulate output from the subject Limited Duration Resources and Combination Resources in hours in which all output from Unlimited Resources and available output from Variable Resources is insufficient to meet load. The output of the subject Limited Duration Resources and Combination Resources shall be simulated on an hour-by-hour basis in proportion to their Effective Nameplate Capacity without foresight to future hours. The simulated deployment of Demand Resources shall be such that there is adequate Primary Reserves provided by economic resources, if sufficient simulated Demand Resources are available. Primary Reserves shall be assigned to generation resources in order to maximize simulated reliability, provided that assignments to Limited Duration Resources and Combination Resources shall be pro rata according to their Effective Nameplate Capacity. Primary Reserves shall be exhausted prior to identifying a loss of load event in the analysis. Energy Storage Resource charging is during hours with sufficient margin, including between daily peaks if necessary.

#### **I. Administration of Effective Load Carrying Capability Analysis**

The Office of the Interconnection shall post final ELCC Class UCAP and ELCC Class Rating values at least once per year in a report that also includes appropriate details regarding methodology and inputs. The Office of the Interconnection shall post this report and shall communicate ELCC Resource Performance Adjustment values to applicable Generation Capacity Resource Providers no later than five months prior to the start of the target Delivery Year, as described in the PJM Manuals. Starting with the 2023/2024 Delivery Year, Accredited UCAP values for the applicable Delivery Year shall establish the maximum Unforced Capacity

that an ELCC Resource can physically provide or offer to provide in the applicable Delivery Year.

The Office of the Interconnection shall also post preliminary ELCC Class Rating values for nine subsequent Delivery Years. For any Delivery Year for which a final ELCC Class Rating has not been posted and a preliminary ELCC Class Rating has been posted, the Accredited UCAP of an ELCC Resource for such Delivery Year shall be based on the most recent preliminary ELCC Class Rating value for that Delivery Year, together with the most recently calculated ELCC Resource Performance Adjustment value for that ELCC Resource. Except to the extent specified above or otherwise specified, the preliminary ELCC Class Rating values for future years are non-binding and are only for indicative purposes. A Generation Capacity Resource Provider can offer or provide capacity from an ELCC Resource that is not subject to a capacity market must offer obligation (as specified in Tariff, Attachment DD, Section 6.6) at a level less than the Accredited UCAP for such resource.

In order to facilitate the effective load carrying capability analysis, the Generation Capacity Resource Provider of each ELCC Resource must submit to the Office of the Interconnection the required information as specified in the PJM Manuals by no later than six months prior to an RPM Auction in which the ELCC Resource intends to submit a Sell Offer or otherwise commit to provide capacity, except for Delivery Years prior to the 2026/2027 Delivery Year such required information must be provided to the Office of the Interconnection in accordance with the PJM Manuals. The required information may include relevant physical parameters, relevant historical data such as weather data and actual or estimated historical energy output, and documentation supporting such parameters and historical data. The relevant physical parameters are those that are incorporated into the effective load carrying capability analysis. The parameters required for Hydropower With Non-Pumped Storage shall include Ordinary Water Storage and any applicable Exigent Water Storage. Submitted parameters must indicate the expected duration for which any submitted physical parameters are valid.

The Office of the Interconnection shall evaluate, validate, and approve the foregoing information in accordance with the process set forth in the PJM Manuals. In evaluating the validity of submitted information, the Office of the Interconnection may assess the consistency of such information with observed conditions. If the Office of the Interconnection observes that the information provided by the Generation Capacity Resource Provider of the ELCC Resource is inconsistent with observed conditions, the Office of the Interconnection will coordinate with the Generation Capacity Resource Provider of the ELCC Resource to understand the information and observed conditions before making a determination regarding the validity of the applicable parameters. The Office of the Interconnection may engage the services of a consultant with technical expertise to evaluate the foregoing information.

After the Office of the Interconnection has completed its evaluation of the foregoing information, the Office of the Interconnection shall notify the Generation Capacity Resource Provider in

writing whether the submitted information is considered invalid by no later than September 1 following the submission of the information. The Office of the Interconnection's determination on the validity of the foregoing information shall continue for the applicable Delivery Year and, if requested, for such longer period as the Office of the Interconnection may determine is supported by the data.

In the event that the Office of the Interconnection is unable to validate any of the required information, physical parameters, supporting documentation, or other related information submitted by the Generation Capacity Resource Provider of an ELCC Resource, then the Office of the Interconnection shall calculate Accredited UCAP values for that ELCC Resource based only on the validated information. Such ELCC Resource shall not be permitted to offer or otherwise provide capacity above such Accredited UCAP values until the Office of the Interconnection determines new Accredited UCAP values for such resource.

Generation Capacity Resource Providers of ELCC Resources that are hydropower plants with water storage must provide documentation to support the physical parameters provided for expected load carrying capability analysis modeling, as specified in the PJM Manuals. This documentation must: (a) support the plant's physical capabilities; (b) demonstrate that the parameters do not violate any federal, state, river basin, or other applicable authority operating limitations of the plant; and (c) demonstrate full authorization from FERC, any river basin commissions, and any other applicable authorities to meet those capabilities.

## **J. ELCC Transition Mechanism**

(1) A transition mechanism shall be established whereby PJM shall post floor values establishing a lower bound on the ELCC Class Ratings that apply to ELCC Resources in the determination of each ELCC Resource's Accredited UCAP. This transition mechanism can be evaluated at any time and shall be evaluated in conjunction with a quadrennial periodic review of the shape of the Variable Resource Requirement Curve, as described in Tariff, Attachment DD, section 5.10, no later than the end of 2026. Such evaluation shall include an assessment of the efficacy and appropriateness of the transition mechanism and shall make recommendations as to whether some or all aspects of the transition mechanism should be reconsidered through a stakeholder process. The already-established floor values and associated term duration for each cohort should apply for their entire term, as described below, regardless of the outcome of such evaluation, except as described in subsection (3)(f) below.

For purposes of implementing this transition mechanism, ELCC Resources shall be organized into annual cohorts. Each cohort shall share an associated table of floor values on the ELCC Class Ratings spanning the duration described below. Floor values shall be calculated using effective load carrying capability analysis for future years, applying a resource mix that reflects more conservative ELCC Class Ratings than expected, as set forth in subsection (3)(d) below.



Floor values shall be posted on an annual cycle, each posting of which shall include floor values for no more than ten calendar years in the future.

Tables of floor values will apply for the Delivery Years as specified below. For new ELCC Resources, the ELCC Class Rating floor values contemplated by this RAA, Schedule 9.1, section J shall apply upon:

(a) completion of one of the following milestones in the New Services Queue: (i) execution of an Interconnection Service Agreement by the Interconnection Customer, or equivalent, for the ELCC Resource; (ii) execution of a Wholesale Market Participation Agreement by the wholesale market participant, or equivalent, for the ELCC Resource; or (iii) posting credit to submit a Sell Offer into the next Base Residual Auction, pursuant to the applicable RPM Auction Credit Rate; and

(b) receipt by the Office of the Interconnection of a written attestation, in a form specified in the PJM Manuals, by the Generation Capacity Resource Provider of the ELCC Resource affirming the Generation Capacity Resource Provider's intent to proceed to provide capacity in the PJM Region. Such attestation shall be provided to the Office of the Interconnection after reaching one of the milestones identified in subsection (a) above.

(2) Cohorts

(a) **2021 Cohort.** A table of floor values for Delivery Years 2021/22 through 2033/34 shall apply to ELCC Resources that on or before December 31, 2021 are Existing Generation Capacity Resources or satisfy the requirements of RAA, Schedule 9.1, section J(1)(a) and (b) above. A table of preliminary ELCC Class Rating floor values for Delivery Years 2021/2022 through 2030/2031 shall be posted within six months of this Schedule 9.1 becoming effective but no later than December 31, 2021; preliminary floor values for Delivery Years 2031/2032, 2032/2033, and 2033/2034 shall be posted on or before December 31 of 2022, 2023, and 2024, respectively.

(b) **2022 Cohort.** A table of floor values for Delivery Years 2022/23 through 2034/35 shall apply to ELCC Resources that meet the requirements in RAA, Schedule 9.1, section J(1)(a) and (b) above on or after January 1, 2022 and on or before December 31, 2022. Preliminary floor values for Delivery Years 2022/2023 through 2031/2032 shall be posted on or before December 31, 2021; preliminary floor values for Delivery Years 2032/2033, 2033/2034, and 2034/2035 shall be posted on or before December 31 of 2022, 2023, and 2024, respectively.

(c) **2023 Cohorts and later.** For each of the thirteen consecutive Delivery Years beginning with the Delivery Year that starts in the calendar year in which an ELCC

Resource meets the requirements in RAA, Schedule 9.1, section J(1)(a) and (b) above, a set of ELCC Class Rating floor values shall apply to such ELCC Resources. Preliminary floor values for the first ten Delivery Years in the table shall be posted on or before December 31 prior to the first Delivery Year to which a floor value applies; preliminary floor values for Delivery Years eleven, twelve, and thirteen shall be posted on or before December 31 of each of the immediately following three calendar years, respectively. This timing is reflected in the below table, where “X” is the year in which the ELCC Resource meets the requirements in RAA, Schedule 9.1, section J(1)(a) and (b) above.

<u>Calendar Year In which Floor Values Are Posted for Cohort “X”</u>	<u>Target Delivery Year</u>	<u>ELCC Class Rating Floor for Cohort X</u>
<u>X-1</u>	<u>X/X+1</u>	<u>Value I</u>
<u>X-1</u>	<u>X+1/X+2</u>	<u>Value II</u>
<u>X-1</u>	<u>X+2/X+3</u>	<u>Value III</u>
<u>X-1</u>	<u>X+3/X+4</u>	<u>Value IV</u>
<u>X-1</u>	<u>X+4/X+5</u>	<u>Value V</u>
<u>X-1</u>	<u>X+5/X+6</u>	<u>Value VI</u>
<u>X-1</u>	<u>X+6/X+7</u>	<u>Value VII</u>
<u>X-1</u>	<u>X+7/X+8</u>	<u>Value VIII</u>
<u>X-1</u>	<u>X+8/X+9</u>	<u>Value IX</u>
<u>X-1</u>	<u>X+9/X+10</u>	<u>Value X</u>
<u>X</u>	<u>X+10/X+11</u>	<u>Value XI</u>
<u>X+1</u>	<u>X+11/X+12</u>	<u>Value XII</u>
<u>X+2</u>	<u>X+12/X+13</u>	<u>Value XIII</u>

Preliminary floor values shall be finalized within 120 days of posting. Upon posting the preliminary floor values, the Office of the Interconnection shall conduct a retrospective review to determine if any potential errors occurred in its implementation of this section J, whereby the potential error, if verified, could have a material impact on the posted preliminary floor values. In the event the Office of the Interconnection discovers such a potential error within 60 days of posting such preliminary floor value, the Office of the Interconnection will notify Market Participants of the existence of the potential error as soon as possible, but in no event later than 60 days after posting the applicable preliminary floor value. Within 45 days of identifying a potential error in a preliminary floor value, the Office of the Interconnection shall consult with Market Participants, and provide all available supporting documentation (such documentation shall not contain market sensitive or confidential information), prior to determining whether to modify an initially posted preliminary floor value. If the Office of the Interconnection

determines it is necessary to modify an initially posted preliminary floor value, it shall notify Market Participants of its intent to do so and post such notification on its website by no later than 45 days following the notification of a discovery of a potential error in the preliminary floor value. The Office of the Interconnection shall post on its website the corrected floor value by no later than 120 days following the initial posting of the preliminary floor value. Should any of the above deadlines pass without the associated action on the part of the Office of the Interconnection, the originally posted floor values will be considered final.

To the extent an ELCC Resource satisfies the requirements of RAA, Schedule 9.1, section J(1)(a) and (b) above on or after the January 1 following the posting of the preliminary floor value applicable to that ELCC Resource, and within 60 days of such posting, and the Office of the Interconnection identifies a potential error with respect to that floor value, the Generation Capacity Resource Provider may elect for the ELCC Resource to be included in the cohort for the prior calendar year. Any election to be included in the cohort for the prior calendar year must be provided in writing to the Office of the Interconnection within 10 days after the Office of the Interconnection consults with Market Participants regarding the potential error.

### (3) General Rules for ELCC Class Rating Floor Values

(a) In a given annual posting cycle, for floor values that are ten years in the future and therefore have not previously been posted, the same floor value shall be posted for use across all cohorts of an ELCC Class for a given Delivery Year for which such floor will be applicable.

(b) For a given resource, at the end of the term of applicability of the original set of ten floor values, as extended with three additional floor values, the rules in place at that time for determining Accredited UCAP (or otherwise determining the amount of Unforced Capacity that such resource is eligible to offer or provide) will apply.

(c) The ELCC Class Rating used to determine the Accredited UCAP of an ELCC Resource is the greater of the applicable floor value or the most recently posted final or preliminary ELCC Class Rating for the target Delivery Year.

(d) The ELCC Class Rating floor values for each ELCC Class shall be calculated using the same form of effective load carrying capability analysis used for calculating ELCC Class Ratings for future years, except that the forecasted resource mix used for calculating the ELCC Class Ratings (the “expected forecast”) shall be adjusted for the calculation of the floor value for each ELCC Class (the “floor forecast”) in order to reflect a more conservative ELCC Class Rating value. Each ELCC Class shall have a unique floor forecast that accounts for the interaction among ELCC Classes, both the given subject ELCC Class and the other ELCC Classes, through adjusting (up or down) the rate of deployment expected for each ELCC Class. The floor forecast for a given

ELCC Class of Variable Resources or Limited Duration Resources shall be developed according to the following method:

(i) Any expected increase in deployment of ELCC Resources in the given subject class in each year shall be accelerated in an exponential fashion such that the increase in deployment after 10 years shall be twice the value in the expected forecast.

(ii) For ELCC Resources in ELCC Classes other than the given subject ELCC Class that show a complementary interaction with the given subject class in the effective load carrying capability analysis, where a complementary interaction occurs in the case that the increase in deployment of the complementary class tends to increase the ELCC Class Rating of the subject class, any expected increase in deployment in a complementary ELCC Class shall be decelerated in an exponential fashion such that the increase in deployment after ten years shall be half the value in the expected forecast; any expected decrease in deployment in a complementary ELCC Class shall be accelerated in an exponential fashion such that the decrease in deployment after ten years shall be twice the value in the expected forecast.

(iii) For ELCC Resources in ELCC Classes showing an antagonistic interaction with the given subject class in the effective load carrying capability analysis, where an antagonistic interaction occurs in the case that the increase in deployment of the antagonistic class tends to decrease the ELCC Class Rating of the subject class, any expected increase in deployment in an antagonistic class shall be accelerated in an exponential fashion such that the increase in deployment after ten years shall be twice the value in the expected forecast; any expected decrease in deployment in an antagonistic class shall be decelerated in an exponential fashion such that the decrease in deployment after ten years shall be half the value in the expected forecast.

For Combination Resources, the applicable floor values will be determined in accordance with a procedure set forth in the PJM Manuals that appropriately reflects and merges the floor values determined for the distinct components of the Combination Resource in a manner consistent with the methodology above.

However, for Hydropower With Non-Pumped Storage, the applicable floor values will be determined, using the foregoing method, on a resource-specific basis and not on an ELCC Class basis.

(e) The ELCC Class Rating used to determine an Accredited UCAP shall not be below the applicable floor value. ELCC Classes shall be organized into groups for the purpose

of sharing the risk that a final or preliminary ELCC Class Rating for a Delivery Year is lower than the corresponding ELCC Class Rating in any table of floor values for such Delivery Year. In that event,

(i) for ELCC Resources with a final or preliminary ELCC Class Rating below the applicable floor value, the Accredited UCAP shall be determined using the ELCC Resource's ELCC Resource Performance Adjustment, in accordance with the methods set forth in RAA, Schedule 9.1, section E, and the applicable ELCC Class Rating floor value;

(ii) for ELCC Resources with a final or preliminary ELCC Class Rating above the applicable floor value, the Accredited UCAP shall be determined using the ELCC Resource's ELCC Resource Performance Adjustment, in accordance with the methods set forth in RAA, Schedule 9.1, section E, and the ELCC Class Rating, which is determined in accordance with the methodology set forth in RAA, Schedule 9.1, section D, except that (1) the value used in place of ELCC Class UCAP is equal to [the sum of the ELCC Class UCAP for each ELCC Class of the subject group minus the sum of the Accredited UCAP of the ELCC Resources that are accredited based on floor values], which in turn is allocated to each ELCC Class in accordance with the methodology specified in the PJM Manuals that is consistent with the allocation methodology of RAA, Schedule 9.1, section C for allocating the ELCC Portfolio UCAP among the ELCC Classes, then further adjusted by a factor based on ELCC Resource Performance Adjustment values such that the total Accredited UCAP of all resources of each class does not exceed the ELCC Class UCAP and (2) the relevant aggregate Effective Nameplate Capacity shall be the sum of the Effective Nameplate Capacity of the members of the ELCC Class that are accredited based on a final or preliminary ELCC Class Rating above the applicable floor value.

Provided, however, if the aggregate ELCC Class UCAP of the entire group is less than the aggregate Accredited UCAP of the ELCC Resources of the group that are accredited based on floor values, then the ELCC Class Rating for ELCC Resources with a final or preliminary ELCC Class Rating above the applicable floor value shall be determined in accordance with the methodology set forth in RAA, Schedule 9.1, section D, except that (3) the value used in place of ELCC Class UCAP is equal to [the ELCC Portfolio UCAP minus the aggregate Accredited UCAP of the resources of the group that are accredited based on floor values] which in turn is allocated to each ELCC Class in accordance with the methodology specified in the PJM Manuals that is consistent with the allocation methodology of RAA, Schedule 9.1, section C for allocating the ELCC Portfolio UCAP among the ELCC Classes, then further adjusted by a factor based on

ELCC Resource Performance Adjustment values such that the total Accredited UCAP of all resources of each class does not exceed the ELCC Class UCAP, and (4) the relevant aggregate Effective Nameplate Capacity shall be the sum of the Effective Nameplate Capacity of the members of the ELCC Class that are accredited based on a final or preliminary ELCC Class Rating above the applicable floor value.

ELCC Class groups shall be defined in the PJM Manuals. The groups shall be defined in accordance with the following principles: (1) each group shall be composed of ELCC Classes that shall share relevant physical characteristics; and (2) each group is broad enough to include a significant fraction of the ELCC Portfolio UCAP, with consideration given to ELCC Classes that are expected to increase in deployment over the ten-year term of the effective load carrying capability analysis.

(f) While recognizing the general principle that the floor values already issued for a specific resource generally would not be changed, the limited circumstances under which the posted final floor values could be changed include: (i) the Office of the Interconnection no longer performs the effective load carrying capability analysis set forth in this RAA, Schedule 9.1; or (ii) the Office of the Interconnection no longer determines Accredited UCAP prior to conducting an RPM Auction.

Nothing in RAA, Schedule 9.1 is intended to constrain the authority of the PJM Board in any way. The Office of the Interconnection and the PJM Board retain all of their filing rights, including the right to file with FERC as needed to: (iii) change the effective load carrying capability constructs and the effective load carrying capability analysis; (iv) change the methodology specified in this section J for calculating floors that are to be posted in the future; and (v) cease the posting of new floor values. None of the foregoing shall provide a basis for a new transition period or any other form of compensation to a Generation Capacity Resource Provider.

(g) The applicable table of floor values will continue to apply even if an ELCC Resource offers less than their Accredited UCAP.

(h) For purposes of determining floor values in this section J, uprates to individual ELCC Resources are treated as if each uprate is a separate ELCC Resource. The total Accredited UCAP of an ELCC Resource, including all uprates, shall be the sum of the respective Accredited UCAP values.

(i) The floor value applicable to an ELCC Resource is not transferable to a different ELCC Resource.

**Attachment B**

**PJM Open Access Transmission Tariff  
and PJM Reliability Assurance Agreement**

**(Clean Format)**

Section(s) of the  
PJM Open Access Transmission Tariff  
(Clean Format)



## **ATTACHMENT DD**

### **Reliability Pricing Model**

References to section numbers in this Attachment DD refer to sections of this Attachment DD, unless otherwise specified.

## **5.6 Sell Offers**

Sell Offers shall be submitted or withdrawn via the internet site designated by the Office of the Interconnection, under the procedures and time schedule set forth in the PJM Manuals.

### **5.6.1 Specifications**

A Sell Offer shall state quantities in increments of 0.1 megawatts and shall specify, as appropriate:

a) Identification of the Generation Capacity Resource, Demand Resource, Capacity Storage Resource or Energy Efficiency Resource on which such Sell Offer is based;

b) Minimum and maximum megawatt quantity of installed capacity that the Capacity Market Seller is willing to offer (notwithstanding such specification, the product offered shall be Unforced Capacity), or designate as Self-Supply, from a Generation Capacity Resource;

i) Price, in dollars and cents per megawatt-day, that will be accepted by the Capacity Market Seller for the megawatt quantity of Unforced Capacity offered from such Generation Capacity Resource.

ii) The Sell Offer may take the form of offer segments with varying price-quantity pairs for varying output levels from the underlying resource, but may not take the form of an offer curve with nonzero slope.

c) EFORD of each Generation Capacity Resource offered.

i) If a Capacity Market Seller is offering such resource in a Base Residual Auction, First Incremental Auction, Second Incremental Auction, or Conditional Incremental Auction occurring before the Third Incremental Auction, the Capacity Market Seller shall specify the EFORD to apply to the offer.

ii) If a Capacity Market Seller is committing the resource as Self-Supply, the Capacity Market Seller shall specify the EFORD to apply to the commitment.

iii) The EFORD applied to the Third Incremental Auction will be the final EFORD established by the Office of the Interconnection six (6) months prior to the Delivery Year, based on the actual EFORD in the PJM Region during the 12-month period ending September 30 that last precedes such Delivery Year.

d) The Nominated Demand Resource Value for each Demand Resource offered and the Nominated Energy Efficiency Value for each Energy Efficiency Resource offered. The Office of the Interconnection shall, in both cases, convert such value to an Unforced Capacity basis by multiplying such value by the DR Factor (for Delivery Years through May 31, 2018) times the Forecast Pool Requirement. Demand Resources shall specify the LDA in which the Demand Resource is located, including the location of such resource within any Zone that includes more than one LDA as identified on RAA, Schedule 10.1.

e) For Delivery Years through May 31, 2018, a Demand Resource with the potential to qualify as two or more of a Limited Demand Resource, Extended Summer Demand Resource or Annual Demand Resource may submit separate but coupled Sell Offers for each Demand Resource type for which it qualifies at different prices and the auction clearing algorithm will select the Sell Offer that yields the least-cost solution. For such coupled Demand Resource offers, the offer price of an Annual Demand Resource offer must be at least \$.01 per MW-day greater than the offer price of a coupled Extended Summer Demand Resource offer and the offer price of a Extended Summer Demand Resource offer must be at least \$.01 per MW-day greater than the offer price of a coupled Limited Demand Resource offer.

f) For a Qualifying Transmission Upgrade, the Sell Offer shall identify such upgrade, and the Office of the Interconnection shall determine and certify the increase in CETL provided by such upgrade. The Capacity Market Seller may offer the upgrade with an associated increase in CETL to an LDA in accordance with such certification, including an offer price that will be accepted by the Capacity Market Seller, stated in dollars and cents per megawatt-day as a price difference between a Capacity Resource located outside such an LDA and a Capacity Resource located inside such LDA; and the increase in CETL into such LDA to be provided by such Qualifying Transmission Upgrade, as certified by the Office of the Interconnection.

g) For the 2018/2019 and 2019/2020 Delivery Years, each Capacity Market Seller owning or controlling a resource that qualifies as both a Base Capacity Resource and a Capacity Performance Resource may submit separate but coupled Sell Offers for such resource as a Base Capacity Resource and as a Capacity Performance Resource, at different prices, and the auction clearing algorithm will select the Sell Offer that yields the least-cost solution. Submission of a coupled Base Capacity Resource Sell Offer shall be mandatory for any Capacity Performance Resource Sell Offer that exceeds a Sell Offer Price equal to the applicable Net Cost of New Entry times the Balancing Ratio as provided for in Tariff, Attachment DD, section 6.4. For such coupled Sell Offers, the offer price of a Capacity Performance Resource offer must be at least \$.01 per MW-day greater than the offer price of a coupled Base Capacity Resource offer.

(h) A Capacity Market Seller that owns or controls one or more Capacity Storage Resources, Intermittent Resources, Demand Resources, or Energy Efficiency Resources may submit a Sell Offer as a Capacity Performance Resource in a MW quantity consistent with their average expected output during peak-hour periods but for ELCC Resources, for the 2023/2024 Delivery Year and subsequent Delivery Years, such MW quantity shall not to exceed the Accredited UCAP of the resource. Alternatively, a Capacity Market Seller that owns or controls one or more Capacity Storage Resources, Intermittent Resources, Demand Resources, Energy Efficiency Resources, or Environmentally-Limited Resources may submit a Sell Offer which represents the aggregated Unforced Capacity value of such resources, where such Sell Offer shall be considered to be located in the smallest modeled LDA common to the aggregated resources. Such aggregated resources shall be owned by or under contract to the Capacity Market Seller, including all such resources obtained through bilateral contract and reported to the Office of the Interconnection in accordance with the Office of the Interconnection's rules related to its *Capacity Exchange* tools. *If any of the commercially aggregated resources in such Sell Offer are subject to the Minimum Floor Offer Price pursuant to Tariff, Attachment DD, sections 5.14(h) and 5.14(h-1), the Capacity Market Seller that owns or controls such resources may submit a*

*Sell Offer with a Minimum Floor Offer Price of no lower than the time and MW-weighted average of the applicable MOPR Floor Offer Prices (zero if not applicable) of the aggregated resources in such Sell Offer.*

(i) For the 2020/2021 Delivery Year and subsequent Delivery Years, a Capacity Market Seller that owns or controls a resource that qualifies as a Summer-Period Capacity Performance Resource may submit a Sell Offer as a Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during peak-hour periods, and may submit a separate Sell Offer as a Summer-Period Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during summer peak-hour periods, provided the total Sell Offer MW quantity submitted as both a Capacity Performance Resource and a Summer-Period Capacity Performance Resource does not exceed the Unforced Capacity value of the resource. For the 2020/2021 Delivery Year and subsequent Delivery Years, a Capacity Market Seller that owns or controls a resource that qualifies as a Winter-Period Capacity Performance Resource may submit a Sell Offer as a Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during peak-hour periods, and may submit a separate Sell Offer as a Winter-Period Capacity Performance Resource in a MW quantity consistent with the average expected output of such resource during winter peak-hour periods, provided the total Sell Offer MW quantity submitted as both a Capacity Performance Resource and a Winter-Period Capacity Performance Resource does not exceed the Unforced Capacity value of the resource. Each segment of a Seasonal Capacity Performance Resource Sell Offer must be submitted as a flexible Sell Offer segment with the minimum MW quantity offered set to zero.

### **5.6.2 Compliance with PJM Credit Policy**

Capacity Market Sellers shall comply with the provisions of the PJM Credit Policy as set forth in Tariff, Attachment Q, including the provisions specific to the Reliability Pricing Model, prior to submission of Sell Offers in any Reliability Pricing Model Auction. A Capacity Market Seller desiring to submit a Credit-Limited Offer shall specify in its Sell Offer the maximum auction credit requirement, in dollars, and the maximum amount of Unforced Capacity, in megawatts, applicable to its Sell Offer.

### **5.6.3 [reserved]**

### **5.6.4 Qualifying Transmission Upgrades**

A Qualifying Transmission Upgrade may not be the subject of any Sell Offer in a Base Residual Auction unless it has been approved by the Office of the Interconnection, including certification of the increase in Import Capability to be provided by such Qualifying Transmission Upgrade, no later than 45 days prior to such Base Residual Auction. No such approval shall be granted unless, at a minimum, a Facilities Study Agreement has been executed with respect to such upgrade, and such upgrade conforms to all applicable standards of the Regional Transmission Expansion Plan process.

### **5.6.5 Market-based Sell Offers**

Subject to section 6, a Market Seller authorized by FERC to sell electric generating capacity at market-based prices, or that is not required to have such authorization, may submit Sell Offers that specify market-based prices in any Base Residual Auction or Incremental Auction.

#### **5.6.6 Availability of Capacity Resources for Sale**

(a) The Office of the Interconnection shall determine the quantity of megawatts of available installed capacity that each Capacity Market Seller must offer in any RPM Auction pursuant to Tariff, Attachment DD, section 6.6, through verification of the availability of megawatts of installed capacity from: (i) all Generation Capacity Resources owned by or under contract to the Capacity Market Seller, including all Generation Capacity Resources obtained through bilateral contract; (ii) the results of prior Reliability Pricing Model Auctions, if any, for such Delivery Year (including consideration of any restriction imposed as a consequence of a prior failure to offer); and (iii) such other information as may be available to the Office of the Interconnection. The Office of the Interconnection shall reject Sell Offers or portions of Sell Offers for Capacity Resources in excess of the quantity of installed capacity from such Capacity Market Seller's Capacity Resource that it determines to be available for sale.

(b) The Office of the Interconnection shall determine the quantity of installed capacity available for sale in a Base Residual Auction or Incremental Auction as of the beginning of the period during which Buy Bids and Sell Offers are accepted for such auction, as applicable, in accordance with the time schedule set forth in the PJM Manuals. Removal of a resource from Capacity Resource status shall not be reflected in the determination of available installed capacity unless the associated unit-specific bilateral transaction is approved, the designation of such resource (or portion thereof) as a network resource for the external load is demonstrated to the Office of the Interconnection, or equivalent evidence of a firm external sale is provided prior to the deadline established therefor. The determination of available installed capacity shall also take into account, as they apply in proportion to the share of each resource owned or controlled by a Capacity Market Seller, any approved capacity modifications, and existing capacity commitments established in a prior RPM Auction, an FRR Capacity Plan, Locational UCAP transactions and/or replacement capacity transactions under this Tariff, Attachment DD. To enable the Office of the Interconnection to make this determination, no bilateral transactions for Capacity Resources applicable to the period covered by an auction will be processed from the beginning of the period for submission of Sell Offers and Buy Bids, as appropriate, for that auction until completion of the clearing determination for such auction. Processing of such bilateral transactions will reconvene once clearing for that auction is completed. A Generation Capacity Resource located in the PJM Region shall not be removed from Capacity Resource status to the extent the resource is committed to service of PJM loads as a result of an RPM Auction, FRR Capacity Plan, Locational UCAP transaction and/or by designation as a replacement resource under this Tariff, Attachment DD.

(c) In order for a bilateral transaction for the purchase and sale of a Capacity Resource to be processed by the Office of the Interconnection, both parties to the transaction must notify the Office of the Interconnection of the transfer of the Capacity Resource from the seller to the buyer in accordance with procedures established by the Office of the Interconnection and set forth in the PJM Manuals. If a material change with respect to any of the prerequisites for the application of Tariff, Attachment DD, section 5.6.6 to the Generation Capacity Resource

occurs, the Capacity Resource Owner shall immediately notify the Market Monitoring Unit and the Office of the Interconnection.

## 5.10 Auction Clearing Requirements

The Office of the Interconnection shall clear each Base Residual Auction and Incremental Auction for a Delivery Year in accordance with the following:

a) Variable Resource Requirement Curve

The Office of the Interconnection shall determine Variable Resource Requirement Curves for the PJM Region and for such Locational Deliverability Areas as determined appropriate in accordance with subsection (a)(iii) for such Delivery Year to establish the level of Capacity Resources that will provide an acceptable level of reliability consistent with the Reliability Principles and Standards. It is recognized that the variable resource requirement reflected in the Variable Resource Requirement Curve can result in an optimized auction clearing in which the level of Capacity Resources committed for a Delivery Year exceeds the PJM Region Reliability Requirement (for Delivery Years through May 31, 2018, less the Short-Term Resource Procurement Target) or Locational Deliverability Area Reliability Requirement (for Delivery Year through May 31, 2018, less the Short-Term Resource Procurement Target for the Zones associated with such LDA) for such Delivery Year. For any auction, the Updated Forecast Peak Load, and Short-Term Resource Procurement Target applicable to such auction, shall be used, and Price Responsive Demand from any applicable approved PRD Plan, including any associated PRD Reservation Prices, shall be reflected in the derivation of the Variable Resource Requirement Curves, in accordance with the methodology specified in the PJM Manuals.

i) Methodology to Establish the Variable Resource Requirement Curve

Prior to the Base Residual Auction, in accordance with the schedule in the PJM Manuals, the Office of the Interconnection shall establish the Variable Resource Requirement Curve for the PJM Region as follows:

- Each Variable Resource Requirement Curve shall be plotted on a graph on which Unforced Capacity is on the x-axis and price is on the y-axis;
- For the 2015/2016, 2016/2017, and 2017/2018 Delivery Years, the Variable Resource Requirement Curve for the PJM Region shall be plotted by combining (i) a horizontal line from the y-axis to point (1), (ii) a straight line connecting points (1) and (2), (iii) a straight line connecting points (2) and (3), and (iv) a vertical line from point (3) to the x-axis, where:
  - For point (1), price equals: {the greater of [the Cost of New Entry] or [1.5 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)]} divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus the approved PJM Region Installed Reserve Margin (“IRM”)% minus 3%) divided by (100% plus IRM%)], and for Delivery Years

through May 31, 2018, minus the Short-Term Resource Procurement Target;

- For point (2), price equals: (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset) divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 1%) divided by (100% plus IRM%)], and for Delivery Years through May 31, 2018, minus the Short-Term Resource Procurement Target; and
- For point (3), price equals [0.2 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)] divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 5%) divided by (100% plus IRM%)], and for Delivery Years through May 31, 2018, minus the Short-Term Resource Procurement Target;
- For the 2018/2019 Delivery Year and subsequent Delivery Years through and including the Delivery Year commencing June 1, 2021, the Variable Resource Requirement Curve for the PJM Region shall be plotted by combining (i) a horizontal line from the y-axis to point (1), (ii) a straight line connecting points (1) and (2), and (iii) a straight line connecting points (2) and (3), where:
  - For point (1), price equals: {the greater of [the Cost of New Entry] or [1.5 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)]} divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus the approved PJM Region Installed Reserve Margin (“IRM”) % minus 0.2%) divided by (100% plus IRM%)];
  - For point (2), price equals: [0.75 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)] divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 2.9%) divided by (100% plus IRM%)]; and
  - For point (3), price equals zero and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 8.8%) divided by (100% plus IRM%)].
- For the 2022/2023 Delivery Year and subsequent Delivery Years, the Variable Resource Requirement Curve for the PJM Region shall be plotted



by combining (i) a horizontal line from the y-axis to point (1), (ii) a straight line connecting points (1) and (2), and (iii) a straight line connecting points (2) and (3), where:

- For point (1), price equals: {the greater of [the Cost of New Entry] or [1.5 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)]} divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus the approved PJM Region Installed Reserve Margin (“IRM”)% minus 1.2%) divided by (100% plus IRM%)];
- For point (2), price equals: [0.75 times (the Cost of New Entry minus the Net Energy and Ancillary Service Revenue Offset)] divided by (one minus the pool-wide average EFORD) and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 1.9%) divided by (100% plus IRM%)]; and
- For point (3), price equals zero and Unforced Capacity equals: [the PJM Region Reliability Requirement multiplied by (100% plus IRM% plus 7.8%) divided by (100% plus IRM%)].

ii) For any Delivery Year, the Office of the Interconnection shall establish a separate Variable Resource Requirement Curve for each LDA for which:

- A. the Capacity Emergency Transfer Limit is less than 1.15 times the Capacity Emergency Transfer Objective, as determined by the Office of the Interconnection in accordance with NERC and Applicable Regional Entity guidelines; or
- B. such LDA had a Locational Price Adder in any one or more of the three immediately preceding Base Residual Auctions; or
- C. such LDA is determined in a preliminary analysis by the Office of the Interconnection to be likely to have a Locational Price Adder, based on historic offer price levels; provided however that for the Base Residual Auction conducted for the Delivery Year commencing on June 1, 2012, the Eastern Mid-Atlantic Region (“EMAR”), Southwest Mid-Atlantic Region (“SWMAR”), and Mid-Atlantic Region (“MAR”) LDAs shall employ separate Variable Resource Requirement Curves regardless of the outcome of the above three tests; and provided further that the Office of the Interconnection may establish a separate Variable Resource Requirement Curve for an LDA not otherwise qualifying under the above three tests if it finds that such is required to achieve an acceptable level of reliability consistent with the Reliability

Principles and Standards, in which case the Office of the Interconnection shall post such finding, such LDA, and such Variable Resource Requirement Curve on its internet site no later than the March 31 last preceding the Base Residual Auction for such Delivery Year. The same process as set forth in subsection (a)(i) shall be used to establish the Variable Resource Requirement Curve for any such LDA, except that the Locational Deliverability Area Reliability Requirement for such LDA shall be substituted for the PJM Region Reliability Requirement and, for Delivery Years through May 31, 2018, the LDA Short-Term Resource Procurement Target shall be substituted for the PJM Region Short-Term Resource Procurement Target. For purposes of calculating the Capacity Emergency Transfer Limit under this section, all generation resources located in the PJM Region that are, or that qualify to become, Capacity Resources, shall be modeled at their full capacity rating, regardless of the amount of capacity cleared from such resource for the immediately preceding Delivery Year.

For each such LDA, for the 2018/2019 Delivery Year and subsequent Delivery Years, the Office of the Interconnection shall (a) determine the Net Cost of New Entry for each Zone in such LDA, with such Net Cost of New Entry equal to the applicable Cost of New Entry value for such Zone minus the Net Energy and Ancillary Services Revenue Offset value for such Zone, and (b) compute the average of the Net Cost of New Entry values of all such Zones to determine the Net Cost of New Entry for such LDA. The Net Cost of New Entry for use in an LDA in any Incremental Auction for the 2015/2016, 2016/2017, and 2017/2018 Delivery Years shall be the Net Cost of New Entry used for such LDA in the Base Residual Auction for such Delivery Year.

iii) Procedure for ongoing review of Variable Resource Requirement Curve shape.

Beginning with the Delivery Year that commences June 1, 2018, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall perform a review of the shape of the Variable Resource Requirement Curve, as established by the requirements of the foregoing subsection. Such analysis shall be based on simulation of market conditions to quantify the ability of the market to invest in new Capacity Resources and to meet the applicable reliability requirements on a probabilistic basis. Based on the results of such review, PJM shall prepare a recommendation to either modify or retain the existing Variable Resource Requirement Curve shape. The Office of the Interconnection shall post the recommendation and shall review the recommendation through the stakeholder process to solicit stakeholder input. If a modification of the Variable Resource Requirement Curve shape is recommended, the following process shall be followed:

A) If the Office of the Interconnection determines that the Variable Resource Requirement Curve shape should be modified, Staff of

the Office of the Interconnection shall propose a new Variable Resource Requirement Curve shape on or before May 15, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

- B) The PJM Members shall review the proposed modification to the Variable Resource Requirement Curve shape.
- C) The PJM Members shall either vote to (i) endorse the proposed modification, (ii) propose alternate modifications or (iii) recommend no modification, by August 31, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.
- D) The PJM Board of Managers shall consider a proposed modification to the Variable Resource Requirement Curve shape, and the Office of the Interconnection shall file any approved modified Variable Resource Requirement Curve shape with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

iv) Cost of New Entry

- A) For the Incremental Auctions for the 2019/2020, 2020/2021, and 2021/2022 Delivery Years, the Cost of New Entry for the PJM Region and for each LDA shall be the respective value used in the Base Residual Auction for such Delivery Year and LDA. For the Delivery Year commencing on June 1, 2022, and continuing thereafter unless and until changed pursuant to subsection (B) below, the Cost of New Entry for the PJM Region shall be the average of the Cost of New Entry for each CONE Area listed in this section as adjusted pursuant to subsection (a)(iv)(B).

<b>Geographic Location Within the PJM Region Encompassing These Zones</b>	<b>Cost of New Entry in \$/MW-Year</b>
PS, JCP&L, AE, PECO, DPL, RECO (“CONE Area 1”)	108,000
BGE, PEPCO (“CONE Area 2”)	109,700
AEP, Dayton, ComEd, APS, DQL, ATSI, DEOK, EKPC, Dominion, OVEC (“CONE Area 3”)	105,500
PPL, MetEd, Penelec (“CONE Area 4”)	105,500

B) Beginning with the 2023/2024 Delivery Year, the CONE for each CONE Area shall be adjusted to reflect changes in generating plant construction costs based on changes in the Applicable United States Bureau of Labor Statistics (“BLS”) Composite Index, and then adjusted further by a factor of 1.022 to reflect the annual decline in bonus depreciation scheduled under federal corporate tax law, in accordance with the following:

(1) The Applicable BLS Composite Index for any Delivery Year and CONE Area shall be the most recently published twelve-month change, at the time CONE values are required to be posted for the Base Residual Auction for such Delivery Year, in a composite of the BLS Quarterly Census of Employment and Wages for Utility System Construction (weighted 20%), the BLS Producer Price Index for Construction Materials and Components (weighted 55%), and the BLS Producer Price Index Turbines and Turbine Generator Sets (weighted 25%), as each such index is further specified for each CONE Area in the PJM Manuals.

(2) The CONE in a CONE Area shall be adjusted prior to the Base Residual Auction for each Delivery Year by applying the Applicable BLS Composite Index for such CONE Area to the Benchmark CONE for such CONE Area, and then multiplying the result by 1.022.

(3) The Benchmark CONE for a CONE Area shall be the CONE used for such CONE Area in the Base Residual Auction for the prior Delivery Year (provided, however that the Gross CONE values stated in subsection (a)(iv)(A) above shall be the Benchmark CONE values for the 2022/2023 Delivery Year to which the Applicable BLS Composite Index shall be applied to determine the CONE for subsequent Delivery Years), and then multiplying the result by 1.022.

(4) Notwithstanding the foregoing, CONE values for any CONE Area for any Delivery Year shall be subject to amendment pursuant to appropriate filings with FERC under the Federal Power Act, including, without limitation, any filings resulting from the process described in section 5.10(a)(vi)(C) or any filing to establish new or revised CONE Areas.

v) Net Energy and Ancillary Services Revenue Offset *up to the 2021/2022 Delivery Year*:

A) The Office of the Interconnection shall determine the Net Energy and Ancillary Services Revenue Offset each year for the PJM Region as (A) the annual average of the revenues that would have been received by the Reference Resource from the PJM energy markets during a period of three consecutive calendar years preceding the time of the determination, based on (1) the heat rate and other characteristics of such Reference Resource; (2) fuel prices reported during such period at an appropriate pricing point

for the PJM Region with a fuel transmission adder appropriate for such region, as set forth in the PJM Manuals, assumed variable operation and maintenance expenses for such resource of \$6.93 per MWh, and actual PJM hourly average Locational Marginal Prices recorded in the PJM Region during such period; and (3) an assumption that the Reference Resource would be dispatched for both the Day-Ahead and Real-Time Energy Markets on a Peak-Hour Dispatch basis; plus (B) ancillary service revenues of \$2,199 per MW-year.

- B) The Office of the Interconnection also shall determine a Net Energy and Ancillary Service Revenue Offset each year for each Zone, using the same procedures and methods as set forth in the previous subsection; provided, however, that: (1) the average hourly LMPs for such Zone shall be used in place of the PJM Region average hourly LMPs; (2) if such Zone was not integrated into the PJM Region for the entire applicable period, then the offset shall be calculated using only those whole calendar years during which the Zone was integrated; and (3) a posted fuel pricing point in such Zone, if available, and (if such pricing point is not available in such Zone) a fuel transmission adder appropriate to such Zone from an appropriate PJM Region pricing point shall be used for each such Zone.

*v-1) Net Energy and Ancillary Services Revenue Offset for the 2022/2023 Delivery and subsequent Delivery Years:*

- A) *The Office of the Interconnection shall determine the Net Energy and Ancillary Services Revenue Offset each year for the PJM Region as (1) the average of the net energy and ancillary services revenues that the Reference Resource is projected to receive from the PJM energy and ancillary service markets for the applicable Delivery Year from three separate simulations, with each such simulation using forward prices shaped using historical data from one of the three consecutive calendar years preceding the time of the determination for the RPM Auction to take account of year-to-year variability in such hourly shapes. Each net energy and ancillary services revenue simulation is based on (a) the heat rate and other characteristics of such Reference Resource such as assumed variable operation and maintenance expenses of \$1.95 per MWh and \$11,732/start, and emissions costs; (b) Forward Hourly LMPs for the PJM Region; (c) Forward Hourly Ancillary Services Prices, (d) Forward Daily Natural Gas Prices at an appropriate pricing point for the PJM Region with a fuel transmission adder appropriate for such region, as set forth in the PJM Manuals; and (e) an assumption that the Reference Resource*

would be dispatched on a Projected EAS Dispatch basis; plus (2) reactive service revenues of \$2,199 per MW-year.

- B) *The Office of the Interconnection also shall determine a Net Energy and Ancillary Service Revenue Offset each year for each Zone, using the same procedures and methods as set forth in the previous subsection; provided, however, that: (1) the Forward Hourly LMPs for such Zone shall be used in place of the Forward Hourly LMP for the PJM Region; (2) if such Zone was not integrated into the PJM Region for the entire three calendar years preceeding the time of the determination for the RPM Auction, then simulations shall rely on only those whole calendar years during which the Zone was integrated; and (3) Forward Daily Natural Gas Prices for the fuel pricing point mapped to such Zone.*
- C) *“Forward Hourly LMPs” shall be determined as follows:*
- (1) Identify the liquid hub to which each Zone is mapped, as specified in the PJM Manuals.*
  - (2) For each liquid hub, calculate the average day-ahead on-peak and day-ahead off-peak energy prices for each month during the Delivery Year over the most recent thirty trading days as of 180 days prior to the Base Residual Auction. For each of the remaining steps, the historical prices used herein shall be taken from the most recent three calendar years preceding the time of the determination for the RPM Auction:*
  - (3) Determine and add monthly basis differentials between the hub and each of its mapped Zones to the forward monthly day-ahead on-peak and off-peak energy prices for the hub. This differential is developed using the prices for the Planning Period closest in time to the Delivery Year from the most recent long-term Financial Transmission Rights auction conducted prior to the Base Residual Auction. The difference between the annual long-term Financial Transmission Rights auction prices for the Zone and the hub are converted to monthly values by adding, for each month of the year, the difference between (a) the historical monthly average day-ahead congestion price differentials between the Zone and relevant hub and (b) the historical annual average day-ahead congestion price differentials between the Zone and hub. This step is only used when developing forward prices for locations other than the liquid hubs;*

- (4) *Determine and add marginal loss differentials to the forward monthly day-ahead on-peak and off-peak energy prices for the hub. For each month of the year, calculate the marginal loss differential, which is the average of the difference between the loss components of the historical on peak or off peak day-ahead LMPs for the Zone and relevant hub in that month across the three year period scaled by the ratio of (a) the forward monthly average on-peak or off-peak day-ahead LMP at such hub to (b) the average of the historical on-peak or off-peak day-ahead LMPs for such hub in that month across the three year period. This step is only used when developing forward prices for locations other than the liquid hubs;*
- (5) *Shape the forward monthly day-ahead on-peak and off-peak prices to (a) forward hourly day-ahead LMPs using historic hourly day-ahead LMP shapes for the Zone and (b) forward hourly real-time LMPs using historic hourly real-time LMP shapes for the Zone. The historic hourly shapes are based on the ratio of the historic day-ahead or real-time LMP for the Zone for each given hour in a monthly on-peak or off-peak period to the average of the historic day-ahead or real-time LMP for the Zone for all hours in such monthly on-peak or off-peak period. The historical prices used in this step shall be taken from one of each of the most recent three calendar years preceding the time of the determination for the RPM Auction;*
- (6) *For unit-specific energy and ancillary service offset calculations, determine and apply basis differentials from the Zone to the generation bus to the forward day-ahead and real-time hourly LMPs for the Zone. The differential for each hour of the year is developed using the difference between the historical DA or RT LMP for the generation bus and the historical DA or RT LMP for the Zone in which the generation bus is located for that same hour; and*
- (7) *Develop the Forward Hourly LMPs for the PJM Region pricing point. Calculate the load-weighted average of the monthly on-peak and off-peak Zonal LMPs developed in step (4) above, using the historical average load within each monthly on-peak or off-peak period. The load-weighted average monthly on-peak or off-peak Zonal LMPs are then shaped to forward hourly day-ahead and real-time LMPs using the same procedure as defined in step (5) above, except using historical LMPs for the PJM Region pricing point.*

D) *Forward Hourly Ancillary Services Prices shall include prices for Synchronized Reserve, Non-Synchronized Reserve, Secondary Reserve and Regulation and shall be determined as follows. The historical prices used herein shall be taken from one of each of the most recent three calendar years preceding the time of the determination for the RPM Auction:*

- (1) For Synchronized Reserve, the forward day-ahead and real-time market clearing prices for the Reserve Zone for each hour of the Delivery Year shall be equal to the historical real-time Synchronized Reserve Market Clearing Price for the Reserve Zone for the corresponding hour of the year.*
- (2) For Non-Synchronized Reserve, the forward day-ahead and real-time market clearing prices for the Reserve Zone for each hour of the Delivery Year shall be equal to the historical real-time Non-Synchronized Reserve Market Clearing Price for the Reserve Zone for the corresponding hour of the year.*
- (3) For Secondary Reserve, the forward day-ahead and real-time Secondary Reserve market clearing price shall be \$0.00/MWh for all hours.*
- (4) For Regulation, the forward real-time Regulation market clearing price shall be calculated by multiplying the historical real-time hourly Regulation market clearing price for each hour of the Delivery Year by the ratio of the real-time Forward Hourly LMP at an appropriate pricing point, as defined in the PJM manuals, to the historic hourly real-time LMP at such pricing point for the corresponding hour of the year; and*

E) *Forward Daily Natural Gas Prices shall be determined as follows:*

- (1) Map each Zone to the appropriate natural gas hub in the PJM Region, as listed in the PJM Manuals;*
- (2) Map each natural gas hub lacking sufficient liquidity to the liquid hub to which it has the highest historic price correlation;*
- (3) For each sufficiently liquid natural gas hub, calculate the simple average natural gas monthly settlement prices over*



*the most recent thirty trading days as of 180 days prior to the Base Residual Auction;*

- (4) Calculate the forward monthly prices for each illiquid hub by scaling the forward monthly price of the mapped liquid hub by the average ratio of historical monthly prices at the insufficiently liquid hub to the historical monthly prices at the sufficiently liquid over the most recent three calendar years preceding the time of determination for the RPM Auction;*
- (5) Shape the forward monthly prices for each hub to Forward Daily Natural Gas Prices using historic daily natural gas price shapes for the hub. The historic daily shapes are based on the ratio of the historic price for the hub for each given day in a month to the average of the historic prices for the hub for all days in such month. The daily prices are then assigned to each hour starting 10am Eastern Prevailing Time each day. The historical prices used in this step shall be taken from one of each of the most recent three calendar years preceding the time of the determination for the RPM Auction.*

Curve

vi) Process for Establishing Parameters of Variable Resource Requirement

- A) The parameters of the Variable Resource Requirement Curve will be established prior to the conduct of the Base Residual Auction for a Delivery Year and will be used for such Base Residual Auction.
- B) The Office of the Interconnection shall determine the PJM Region Reliability Requirement and the Locational Deliverability Area Reliability Requirement for each Locational Deliverability Area for which a Variable Resource Requirement Curve has been established for such Base Residual Auction on or before February 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values will be applied, in accordance with the Reliability Assurance Agreement.
- C) Beginning with the Delivery Year that commences June 1, 2018, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the calculation of the Cost of New Entry for each CONE Area.
  - 1) If the Office of the Interconnection determines that the Cost of New Entry values should be modified, the Staff of the

Office of the Interconnection shall propose new Cost of New Entry values on or before May 15, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

- 2) The PJM Members shall review the proposed values.
  - 3) The PJM Members shall either vote to (i) endorse the proposed values, (ii) propose alternate values or (iii) recommend no modification, by August 31, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.
  - 4) The PJM Board of Managers shall consider Cost of New Entry values, and the Office of the Interconnection shall file any approved modified Cost of New Entry values with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.
- D) Beginning with the Delivery Year that commences June 1, 2018, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the methodology set forth in this Attachment for determining the Net Energy and Ancillary Services Revenue Offset for the PJM Region and for each Zone.
- 1) If the Office of the Interconnection determines that the Net Energy and Ancillary Services Revenue Offset methodology should be modified, Staff of the Office of the Interconnection shall propose a new Net Energy and Ancillary Services Revenue Offset methodology on or before May 15, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new methodology would be applied.
  - 2) The PJM Members shall review the proposed methodology.
  - 3) The PJM Members shall either vote to (i) endorse the proposed methodology, (ii) propose an alternate methodology or (iii) recommend no modification, by August 31, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new methodology would be applied.
  - 4) The PJM Board of Managers shall consider the Net Revenue Offset methodology, and the Office of the

Interconnection shall file any approved modified Net Energy and Ancillary Services Revenue Offset values with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.

- vii) In conjunction with a review of the Variable Resource Requirement Curve shape that commences no later than December 31, 2026, the Office of the Interconnection shall review the ELCC transition mechanism set forth in RAA, Schedule 9.1, section J. Based on the results of such review, PJM shall prepare a recommendation to either modify or retain the existing ELCC transition mechanism. The Office of the Interconnection shall post the recommendation and shall review the recommendation through the stakeholder process to solicit stakeholder input.

b) Locational Requirements

The Office of Interconnection shall establish locational requirements prior to the Base Residual Auction to quantify the amount of Unforced Capacity that must be committed in each Locational Deliverability Area, in accordance with the Reliability Assurance Agreement.

c) Resource Requirements and Constraints

Prior to the Base Residual Auction and each Incremental Auction for the Delivery Years starting on June 1, 2014 and ending May 31, 2017, the Office of the Interconnection shall establish the Minimum Annual Resource Requirement and the Minimum Extended Summer Resource Requirement for the PJM Region and for each Locational Deliverability Area for which the Office of the Interconnection is required under section 5.10(a) above to establish a separate VRR Curve for such Delivery Year. Prior to the Base Residual Auction and Incremental Auctions for the 2017/2018 Delivery Year, the Office of the Interconnection shall establish the Limited Resource Constraints and the Sub-Annual Resource Constraints for the PJM Region and for each Locational Deliverability Area for which the Office of the Interconnection is required under section 5.10(a) above to establish a separate VRR Curve for such Delivery Year. Prior to the Base Residual Auction and Incremental Auctions for 2018/2019 and 2019/2020 Delivery Years, the Office of the Interconnection shall establish the Base Capacity Demand Resource Constraints and the Base Capacity Resource Constraints for the PJM Region and for each Locational Deliverability Area for which the Office of the Interconnection is required under section 5.10(a) above to establish a separate VRR Curve for such Delivery Year.

d) Preliminary PJM Region Peak Load Forecast for the Delivery Year

The Office of the Interconnection shall establish the Preliminary PJM Region Load Forecast for the Delivery Year in accordance with the PJM Manuals by February 1, prior to the conduct of the Base Residual Auction for such Delivery Year.

e) Updated PJM Region Peak Load Forecasts for Incremental Auctions

The Office of the Interconnection shall establish the updated PJM Region Peak Load Forecast for a Delivery Year in accordance with the PJM Manuals by February 1, prior to the conduct of the First, Second, and Third Incremental Auction for such Delivery Year.

## **5.14 Clearing Prices and Charges**

### **a) Capacity Resource Clearing Prices**

For each Base Residual Auction and Incremental Auction, the Office of the Interconnection shall calculate a clearing price to be paid for each megawatt-day of Unforced Capacity that clears in such auction. The Capacity Resource Clearing Price for each LDA will be the marginal value of system capacity for the PJM Region, without considering locational constraints, adjusted as necessary by any applicable Locational Price Adders, Annual Resource Price Adders, Extended Summer Resource Price Adders, Limited Resource Price Decrements, Sub-Annual Resource Price Decrements, Base Capacity Demand Resource Price Decrements, and Base Capacity Resource Price Decrements, all as determined by the Office of the Interconnection based on the optimization algorithm. If a Capacity Resource is located in more than one Locational Deliverability Area, it shall be paid the highest Locational Price Adder in any applicable LDA in which the Sell Offer for such Capacity Resource cleared. The Annual Resource Price Adder is applicable for Annual Resources only. The Extended Summer Resource Price Adder is applicable for Annual Resources and Extended Summer Demand Resources.

The Locational Price Adder applicable to each cleared Seasonal Capacity Performance Resource is determined during the post-processing of the RPM Auction results consistent with the manner in which the auction clearing algorithm recognizes the contribution of Seasonal Capacity Performance Resource Sell Offers in satisfying an LDA's reliability requirement. For each LDA with a positive Locational Price Adder with respect to the immediate higher level LDA, starting with the lowest level constrained LDAs and moving up, PJM determines the quantity of equally matched Summer-Period Capacity Performance Resources and Winter-Period Capacity Performance Resources located and cleared within that LDA. Up to this quantity, the cleared Summer-Period Capacity Performance Resources and Winter-Period Capacity Performance Resources with the lowest Sell Offer prices will be compensated using the highest Locational Price Adder applicable to such LDA; and any remaining Seasonal Capacity Performance Resources cleared within the LDA are effectively moved to the next higher level constrained LDA, where they are considered in a similar manner for compensation.

### **b) Resource Make-Whole Payments**

If a Sell Offer specifies a minimum block, and only a portion of such block is needed to clear the market in a Base Residual or Incremental Auction, the MW portion of such Sell Offer needed to clear the market shall clear, and such Sell Offer shall set the marginal value of system capacity. In addition, the Capacity Market Seller shall receive a Resource Make-Whole Payment equal to the Capacity Resource Clearing Price in such auction times the difference between the Sell Offer's minimum block MW quantity and the Sell Offer's cleared MW quantity. If the Sell Offer price of a cleared Seasonal Capacity Performance Resource exceeds the applicable Capacity Resource Clearing Price, the Capacity Market Seller shall receive a Resource Make-Whole Payment equal to the difference between the Sell Offer price and Capacity Resource Clearing Price in such RPM Auction. The cost for any such Resource Make-Whole Payments required in a Base Residual Auction or Incremental Auction for adjustment of prior capacity commitments shall be collected pro rata from all LSEs in the LDA in which such payments were made, based on their Daily Unforced Capacity Obligations. The cost for any such Resource Make-Whole

Payments required in an Incremental Auction for capacity replacement shall be collected from all Capacity Market Buyers in the LDA in which such payments were made, on a pro-rata basis based on the MWs purchased in such auction.

c) New Entry Price Adjustment

A Capacity Market Seller that submits a Sell Offer based on a Planned Generation Capacity Resource that clears in the BRA for a Delivery Year may, at its election, submit Sell Offers with a New Entry Price Adjustment in the BRAs for the two immediately succeeding Delivery Years if:

1. Such Capacity Market Seller provides notice of such election at the time it submits its Sell Offer for such resource in the BRA for the first Delivery Year for which such resource is eligible to be considered a Planned Generation Capacity Resource. When the Capacity Market Seller provides notice of such election, it must specify whether its Sell Offer is contingent upon qualifying for the New Entry Price Adjustment. The Office of the Interconnection shall not clear such contingent Sell Offer if it does not qualify for the New Entry Price Adjustment.

2. All or any part of a Sell Offer from the Planned Generation Capacity Resource submitted in accordance with section 5.14(c)(1) is the marginal Sell Offer that sets the Capacity Resource Clearing Price for the LDA.

3. Acceptance of all or any part of a Sell Offer that meets the conditions in section 5.14(c)(1)-(2) in the BRA increases the total Unforced Capacity committed in the BRA (including any minimum block quantity) for the LDA in which such Resource will be located from a megawatt quantity below the LDA Reliability Requirement, minus the Short Term Resource Procurement Target, to a megawatt quantity at or above a megawatt quantity at the price-quantity point on the VRR Curve at which the price is 0.40 times the applicable Net CONE divided by (one minus the pool-wide average EFORD).

4. Such Capacity Market Seller submits Sell Offers in the BRA for the two immediately succeeding Delivery Years for the entire Unforced Capacity of such Generation Capacity Resource committed in the first BRA under section 5.14(c)(1)-(2) equal to the lesser of: A) the price in such seller's Sell Offer for the BRA in which such resource qualified as a Planned Generation Capacity Resource that satisfies the conditions in section 5.14(c)(1)-(3); or B) 0.90 times the Net CONE applicable in the first BRA in which such Planned Generation Capacity Resource meeting the conditions in section 5.14(c)(1)-(3) cleared, on an Unforced Capacity basis, for such LDA.

5. If the Sell Offer is submitted consistent with section 5.14(c)(1)-(4) the foregoing conditions, then:

- (i) in the first Delivery Year, the Resource sets the Capacity Resource Clearing Price for the LDA and all cleared resources in the LDA receive the Capacity Resource Clearing Price set by the Sell Offer as the marginal

offer, in accordance with Tariff, Attachment DD, section 5.12(a) and section 5.14(a) above.

- (ii) in either of the subsequent two BRAs, if any part of the Sell Offer from the Resource clears, it shall receive the Capacity Resource Clearing Price for such LDA for its cleared capacity and for any additional minimum block quantity pursuant to section 5.14(b) above; or
- (iii) if the Resource does not clear, it shall be deemed resubmitted at the highest price per MW-day at which the megawatt quantity of Unforced Capacity of such Resource that cleared the first-year BRA will clear the subsequent-year BRA pursuant to the optimization algorithm described in Tariff, Attachment DD, section 5.12(a), and
- (iv) the resource with its Sell Offer submitted shall clear and shall be committed to the PJM Region in the amount cleared, plus any additional minimum-block quantity from its Sell Offer for such Delivery Year, but such additional amount shall be no greater than the portion of a minimum-block quantity, if any, from its first-year Sell Offer satisfying section 5.14(c)(1)-(3) above that is entitled to compensation pursuant to section 5.14(b) above; and
- (v) the Capacity Resource Clearing Price, and the resources cleared, shall be re-determined to reflect the resubmitted Sell Offer. In such case, the Resource for which the Sell Offer is submitted pursuant to section 5.14(c)(1)-(4) above shall be paid for the entire committed quantity at the Sell Offer price that it initially submitted in such subsequent BRA. The difference between such Sell Offer price and the Capacity Resource Clearing Price (as well as any difference between the cleared quantity and the committed quantity), will be treated as a Resource Make-Whole Payment in accordance with section 5.14(b) above. Other capacity resources that clear the BRA in such LDA receive the Capacity Resource Clearing Price as determined in section 5.14(a) above.

6. The failure to submit a Sell Offer consistent with section 5.14(c)(i)-(iii) above in the BRA for Delivery Year 3 shall not retroactively revoke the New Entry Price Adjustment for Delivery Year 2. However, the failure to submit a Sell Offer consistent with section 5.14(c)(4) above in the BRA for Delivery Year 2 shall make the resource ineligible for the New Entry Pricing Adjustment for Delivery Years 2 and 3.

7. For each Delivery Year that the foregoing conditions are satisfied, the Office of the Interconnection shall maintain and employ in the auction clearing for such LDA a separate VRR Curve, notwithstanding the outcome of the test referenced in Tariff, Attachment DD, section 5.10(a)(ii).

8. On or before August 1, 2012, PJM shall file with FERC under FPA section 205, as determined necessary by PJM following a stakeholder process, tariff changes to

establish a long-term auction process as a not unduly discriminatory means to provide adequate long-term revenue assurances to support new entry, as a supplement to or replacement of this New Entry Price Adjustment.

d) Qualifying Transmission Upgrade Payments

A Capacity Market Seller that submitted a Sell Offer based on a Qualifying Transmission Upgrade that clears in the Base Residual Auction shall receive a payment equal to the Capacity Resource Clearing Price, including any Locational Price Adder, of the LDA into which the Qualifying Transmission Upgrade is to increase Capacity Emergency Transfer Limit, less the Capacity Resource Clearing Price, including any Locational Price Adder, of the LDA from which the upgrade was to provide such increased CETL, multiplied by the megawatt quantity of increased CETL cleared from such Sell Offer. Such payments shall be reflected in the Locational Price Adder determined as part of the Final Zonal Capacity Price for the Zone associated with such LDAs, and shall be funded through a reduction in the Capacity Transfer Rights allocated to Load-Serving Entities under Tariff, Attachment DD, section 5.15, as set forth in that section. PJMSettlement shall be the Counterparty to any cleared capacity transaction resulting from a Sell Offer based on a Qualifying Transmission Upgrade.

e) Locational Reliability Charge

In accordance with the Reliability Assurance Agreement, each LSE shall incur a Locational Reliability Charge (subject to certain offsets and other adjustments as described in Tariff, Attachment DD, section 5.14B, Tariff, Attachment DD, section 5.14C, Tariff, Attachment DD, section 5.14D, Tariff, Attachment DD, section 5.14E and Tariff, Attachment DD, section 5.15) equal to such LSE's Daily Unforced Capacity Obligation in a Zone during such Delivery Year multiplied by the applicable Final Zonal Capacity Price in such Zone. PJMSettlement shall be the Counterparty to the LSEs' obligations to pay, and payments of, Locational Reliability Charges.

f) The Office of the Interconnection shall determine Zonal Capacity Prices in accordance with the following, based on the optimization algorithm:

i) The Office of the Interconnection shall calculate and post the Preliminary Zonal Capacity Prices for each Delivery Year following the Base Residual Auction for such Delivery Year. The Preliminary Zonal Capacity Price for each Zone shall be the sum of: 1) the marginal value of system capacity for the PJM Region, without considering locational constraints; 2) the Locational Price Adder, if any, for the LDA in which such Zone is located; provided however, that if the Zone contains multiple LDAs with different Capacity Resource Clearing Prices, the Zonal Capacity Price shall be a weighted average of the Capacity Resource Clearing Prices for such LDAs, weighted by the Unforced Capacity of Capacity Resources cleared in each such LDA; 3) an adjustment, if required, to account for adders paid to Annual Resources and Extended Summer Demand Resources in the LDA for which the zone is located; 4) an adjustment, if required, to account for Resource Make-Whole Payments; and (5) an adjustment, if required to provide sufficient revenue for payment of any PRD Credits, all as determined in accordance with the optimization algorithm.



ii) The Office of the Interconnection shall calculate and post the Adjusted Zonal Capacity Price following each Incremental Auction. The Adjusted Zonal Capacity Price for each Zone shall equal the sum of: (1) the average marginal value of system capacity weighted by the Unforced Capacity cleared in all auctions previously conducted for such Delivery Year (excluding any Unforced Capacity cleared as replacement capacity); (2) the average Locational Price Adder weighted by the Unforced Capacity cleared in all auctions previously conducted for such Delivery Year (excluding any Unforced Capacity cleared as replacement capacity); (3) an adjustment, if required, to account for adders paid to Annual Resources and Extended Summer Demand Resources for all auctions previously conducted for such Delivery Year (excluding any Unforced Capacity cleared as replacement capacity); (4) an adjustment, if required, to account for Resource Make-Whole Payments for all actions previously conducted (excluding any Resource Make-Whole Payments to be charged to the buyers of replacement capacity); and (5) an adjustment, if required to provide sufficient revenue for payment of any PRD Credits. The Adjusted Zonal Capacity Price may decrease if Unforced Capacity is decommitted or the Resource Clearing Price decreases in an Incremental Auction.

iii) The Office of the Interconnection shall calculate and post the Final Zonal Capacity Price for each Delivery Year after the final auction is held for such Delivery Year, as set forth above. The Final Zonal Capacity Price for each Zone shall equal the Adjusted Zonal Capacity Price, as further adjusted to reflect any decreases in the Nominated Demand Resource Value of any existing Demand Resource cleared in the Base Residual Auction and Second Incremental Auction.

g) Resource Substitution Charge

Each Capacity Market Buyer in an Incremental Auction securing replacement capacity shall pay a Resource Substitution Charge equal to the Capacity Resource Clearing Price resulting from such auction multiplied by the megawatt quantity of Unforced Capacity purchased by such Market Buyer in such auction.

h) Minimum Offer Price Rule for Certain *New Generation Capacity Resources that are not Capacity Resources with State Subsidy*

(1) For purposes of this section, the Net Asset Class Costs of New Entry shall be asset-class estimates of competitive, cost-based nominal levelized Cost of New Entry, net of energy and ancillary service revenues. Determination of the gross Cost of New Entry component of the Net Asset Class Cost of New Entry shall be consistent with the methodology used to determine the Cost of New Entry set forth in Tariff, Attachment DD, section 5.10(a)(iv)(A) of this Attachment. *This section only applies to new Generation Capacity Resources that do not receive or are not entitled to receive a State Subsidy, meaning that such resources are not Capacity Resources with State Subsidy. To the extent a new Generation Capacity Resource is a Capacity Resource with State Subsidy, then the provisions in Tariff, Attachment DD, section 5.14(h-1) apply.*

The gross Cost of New Entry component of Net Asset Class Cost of New Entry shall be, for purposes of the 2022/2023 Delivery Year and subsequent Delivery Years, the values indicated in the table below for each CONE Area for a combustion turbine generator (“CT”), and

a combined cycle generator (“CC”) respectively, and shall be adjusted for subsequent Delivery Years in accordance with subsection (h)(2) below. For purposes of Incremental Auctions for the 2021/2022 Delivery Year, the MOPR Floor Offer Price shall be the same as that used in the Base Residual Auction for such Delivery Year. The estimated energy and ancillary service revenues for each type of plant shall be determined as described in subsection (h)(3) below.

Notwithstanding the foregoing, the Net Asset Class Cost of New Entry shall be zero for: (i) Sell Offers based on nuclear, coal or Integrated Gasification Combined Cycle facilities; or (ii) Sell Offers based on hydroelectric, wind, or solar facilities.

	CONE Area 1	CONE Area 2	CONE Area 3	CONE Area 4
CT \$/MW-yr	108,000	109,700	105,500	105,500
CC \$/MW-yr	118,400	122,000	111,900	114,200

(2) Beginning with the Delivery Year that begins on June 1, 2019, the gross Cost of New Entry component of the Net Asset Class Cost of New Entry shall be adjusted to reflect changes in generating plant construction costs in the same manner as set forth for the cost of new entry in Tariff, Attachment DD, section 5.10(a)(iv)(B), provided, however, that the Applicable BLS Composite Index used for CC plants shall be calculated from the three indices referenced in that section but weighted 20% for the wages index, 55% for the construction materials index, and 25% for the turbines index, and provided further that nothing herein shall preclude the Office of the Interconnection from filing to change the Net Asset Class Cost of New Entry for any Delivery Year pursuant to appropriate filings with FERC under the Federal Power Act.

(3) *For the 2021/2022 Delivery Year, for purposes of this provision, the net energy and ancillary services revenue estimate for a combustion turbine generator shall be that determined by Tariff, Attachment DD, section 5.10(a)(v)(A), provided that the energy revenue estimate for each CONE Area shall be based on the Zone within such CONE Area that has the highest energy revenue estimate calculated under the methodology in that subsection. The net energy and ancillary services revenue estimate for a combined cycle generator shall be determined in the same manner as that prescribed for a combustion turbine generator in the previous sentence, except that the heat rate assumed for the combined cycle resource shall be 6.553 MMBtu/Mwh, the variable operations and maintenance expenses for such resource shall be \$2.11 per MWh, the Peak-Hour Dispatch scenario for both the Day-Ahead and Real-Time Energy Markets shall be modified to dispatch the CC resource continuously during the full peak-hour period, as described in *Peak-Hour Dispatch*, for each such period that the resource is economic (using the test set forth in such *definition*), rather than only during the four-hour blocks within such period that such resource is economic, and the ancillary service revenues shall be \$3350 per MW-year.*

*For the 2022/2023 Delivery Year and subsequent Delivery Years, for purposes of this provision, the net energy and ancillary services revenue estimate for a combustion turbine generator shall be that determined by Tariff, Attachment DD, section 5.10(a)(v-1)(A), provided that the energy and ancillary services revenue estimate for each CONE Area shall be based on the Zone within such CONE Area that has the highest energy revenue estimate calculated under the methodology in that subsection. The net energy and ancillary services revenue estimate for a combined cycle generator shall be determined in the same manner as that prescribed for a*

*combustion turbine generator in the previous sentence, except that the heat rate assumed for the combined cycle resource shall be 6.501 MMBtu/MWh, the variable operations and maintenance expenses for such resource shall be \$2.11 per MWh, a 10% adder will not be included in the energy offer, and the reactive service revenues shall be \$3,350 per MW-year.*

(4) Any Sell Offer that is based on *either (i) or (ii), and (iii)*:

i) a Generation Capacity Resource located in the PJM Region that is submitted in an RPM Auction for a Delivery Year unless a Sell Offer based on that resource has cleared an RPM Auction for that or any prior Delivery Year, or until a Sell Offer based on that resource clears an RPM auction for that or any subsequent Delivery Year; or

ii) a Generation Capacity Resource located outside the PJM Region (where such Sell Offer is based solely on such resource) that requires sufficient transmission investment for delivery to the PJM Region to indicate a long-term commitment to providing capacity to the PJM Region, unless a Sell Offer based on that resource has cleared an RPM Auction for that or any prior Delivery Year, or until a Sell offer based on that resource clears an RPM Auction for that or any subsequent Delivery Year;

iii) in any LDA for which a separate VRR Curve is established for use in the Base Residual Auction for the Delivery Year relevant to the RPM Auction in which such offer is submitted, and that is less than 90 percent of the applicable Net Asset Class Cost of New Entry or, if there is no applicable Net Asset Class Cost of New Entry, less than 70 percent of the Net Asset Class Cost of New Entry for a combustion turbine generator as provided in subsection (h)(1) above shall be set to equal 90 percent of the applicable Net Asset Class Cost of New Entry (or set equal to 70 percent of such cost for a combustion turbine, where there is no otherwise applicable net asset class figure), unless the Capacity Market Seller obtains the prior determination from the Office of the Interconnection described in subsection (5) hereof. This provision applies to Sell Offers submitted in Incremental Auctions conducted after December 19, 2011, provided that the Net Asset Class Cost of New Entry values for any such Incremental Auctions for the 2012-13 or 2013-14 Delivery Years shall be the Net Asset Class Cost of New Entry values posted by the Office of the Interconnection for the Base Residual Auction for the 2014-15 Delivery Year.

(5) Unit-Specific Exception. A Sell Offer meeting the criteria in subsection (4) shall be permitted and shall not be re-set to the price level specified in that subsection if the Capacity Market Seller obtains a determination from the Office of the Interconnection or the Commission, prior to the RPM Auction in which it seeks to submit the Sell Offer, that such Sell Offer is permissible because it is consistent with the competitive, cost-based, fixed, net cost of new entry were the resource to rely solely on revenues from PJM-administered markets. The following process and requirements shall apply to requests for such determinations:

i) The Capacity Market Seller may request such a determination by no later than one hundred twenty (120) days prior to the commencement of the offer period for the RPM Auction in which it seeks to submit its Sell Offer, by submitting simultaneously to the

Office of the Interconnection and the Market Monitoring Unit a written request with all of the required documentation as described below and in the PJM Manuals. For such purpose, the Office of the Interconnection shall post, by no later than one hundred fifty (150) days prior to the commencement of the offer period for the relevant RPM Auction, a preliminary estimate for the relevant Delivery Year of the minimum offer level expected to be established under subsection (4). If the minimum offer level subsequently established for the relevant Delivery Year is less than the Sell Offer, the Sell Offer shall be permitted and no exception shall be required.

ii) As more fully set forth in the PJM Manuals, the Capacity Market Seller must include in its request for an exception under this subsection documentation to support the fixed development, construction, operation, and maintenance costs of the planned generation resource, as well as estimates of offsetting net revenues, *or, sufficient data for the Office of the Interconnection and the Market Monitoring Unit to produce such an estimate*. Estimates of costs or revenues shall be supported at a level of detail comparable to the cost and revenue estimates used to support the Net Asset Class Cost of New Entry established under this section 5.14(h). As more fully set forth in the PJM Manuals, supporting documentation for project costs may include, as applicable and available, a complete project description; environmental permits; vendor quotes for plant or equipment; evidence of actual costs of recent comparable projects; bases for electric and gas interconnection costs and any cost contingencies; bases and support for property taxes, insurance, operations and maintenance (“O&M”) contractor costs, and other fixed O&M and administrative or general costs; financing documents for construction-period and permanent financing or evidence of recent debt costs of the seller for comparable investments; and the bases and support for the claimed capitalization ratio, rate of return, cost-recovery period, inflation rate, or other parameters used in financial modeling. Such documentation also shall identify and support any sunk costs that the Capacity Market Seller has reflected as a reduction to its Sell Offer. The request shall include a certification, signed by an officer of the Capacity Market Seller, that the claimed costs accurately reflect, in all material respects, the seller’s reasonably expected costs of new entry and that the request satisfies all standards for an exception hereunder.

The request also shall identify all revenue sources relied upon in the Sell Offer to offset the claimed fixed costs, including, without limitation, long-term power supply contracts, tolling agreements, or tariffs on file with state regulatory agencies, and shall demonstrate that such offsetting revenues are consistent, over a reasonable time period identified by the Capacity Market Seller, with the standard prescribed above.

*For the 2021/2022 Delivery Year*, in making such demonstration, the Capacity Market Seller may rely upon forecasts of competitive electricity prices in the PJM Region based on well defined models that include fully documented estimates of future fuel prices, variable operation and maintenance expenses, energy demand, emissions allowance prices, and expected environmental or energy policies that affect the seller’s forecast of electricity prices in such region, employing input data from sources readily available to the public. Documentation for net revenues also may include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, and ancillary service capabilities. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting

information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.

*For the 2022/2023 Delivery Year and subsequent Delivery Years, in making such demonstration, the Capacity Market Seller may rely upon revenues projected by well defined, forward-looking dispatch models, designed to generally follow the rules and processes of PJM's energy and ancillary services markets. Such models must utilize publicly available forward prices for electricity and fuel in the PJM Region. Any modifications made to the forward electricity and fuel prices must similarly use publicly available data. Alternative forward prices for fuel may be used if accompanied by contractual evidence showing the applicability of the alternative fuel price. Where forward fuel markets are not available, publicly available estimates of future fuel prices may be used. The model shall also contain estimates of variable operation and maintenance costs, which may include Maintenance Adders, and emissions allowance prices. Documentation for net revenues also must include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, capacity factors and ancillary service capabilities.*

*In the alternative, the Capacity Market Seller may request that the Market Monitoring Unit, subject to acceptance by the Office of Interconnection, produce a resource-specific Energy & Ancillary Services Offset value for such resource using the Forward Hourly LMPs, Forward Hourly Ancillary Service Prices, and either Forward Daily Natural Gas Prices for combustion turbines and combined cycle resources, or forecasted fuel prices for other resource types, and plant parameters and capability information specific to the dispatch of the resource, as outlined above. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.*

iii) A Sell Offer evaluated hereunder shall be permitted if the information provided reasonably demonstrates that the Sell Offer's competitive, cost-based, fixed, net cost of new entry is below the minimum offer level prescribed by subsection (4), based on competitive cost advantages relative to the costs estimated for subsection (4), including, without limitation, competitive cost advantages resulting from the Capacity Market Seller's business model, financial condition, tax status, access to capital or other similar conditions affecting the applicant's costs, or based on net revenues that are reasonably demonstrated hereunder to be higher than estimated for subsection (4). Capacity Market Sellers shall be asked to demonstrate that claimed cost advantages or sources of net revenue that are irregular or anomalous, that do not reflect arm's-length transactions, or that are not in the ordinary course of the Capacity Market Seller's business are consistent with the standards of this subsection. Failure to adequately support such costs or revenues so as to enable the Office of the Interconnection to make the determination required in this section will result in denial of an exception hereunder by the Office of the Interconnection.

iv) The Market Monitoring Unit shall review the information and documentation in support of the request and shall provide its findings whether the proposed Sell Offer is acceptable, in accordance with the standards and criteria hereunder, in writing, to the Capacity Market Seller and the Office of the Interconnection by no later than ninety (90) days prior to the commencement of the offer period for such auction. The Office of the Interconnection shall also review all exception requests and documentation and shall provide in writing to the Capacity Market Seller, and the Market Monitoring Unit, its determination whether the requested Sell Offer is acceptable and if not it shall calculate and provide to such Capacity Market Seller, a minimum Sell Offer based on the data and documentation received, by no later than sixty-five (65) days prior to the commencement of the offer period for the relevant RPM Auction. If the Office of the Interconnection determines that the requested Sell Offer is acceptable, the Capacity Market Seller Shall notify the Market Monitoring Unit and the Office of the Interconnection, in writing, of the minimum level of Sell Offer to which it agrees to commit by no later than sixty (60) days prior to the commencement of the offer period for the relevant RPM Auction.

*h-1) Minimum Offer Price Rule for Capacity Resources with State Subsidy*

(1) **General Rule.** *Any Sell Offer based on either a New Entry Capacity Resource with State Subsidy or a Cleared Capacity Resource with a State Subsidy submitted in any RPM Auction shall have an offer price no lower than the applicable MOPR Floor Offer Price, unless the Capacity Market Seller qualifies for an exemption with respect to such Capacity Resource with a State Subsidy prior to the submission of such offer.*

(A) *Effect of Exemption. To the extent a Sell Offer in any RPM Auction is based on a Capacity Resource with State Subsidy that qualifies for any of the exemptions defined in Tariff, Attachment DD, sections 5.14(h-1)(4)-(8), the Sell Offer for such resource shall not be limited by the MOPR Floor Offer Price, unless otherwise specified.*

(B) *Effect of Exception. To the extent a Sell Offer in any RPM Auction for any Delivery Year is based on a Capacity Resource with State Subsidy for which the Capacity Market Seller obtains, prior to the submission of such offer, a resource-specific exception, such offer may include an offer price below the default MOPR Floor Offer Price applicable to such resource type, but no lower than the resource-specific MOPR Floor Offer Price determined in such exception process.*

(C) *Process for Establishing a Capacity Resource with a State Subsidy.*

(i) *By no later than one hundred and twenty (120) days prior to the commencement of the offer period of any RPM Auction conducted for the 2022/2023 Delivery Year and all subsequent Delivery Years, each Capacity Market Seller must certify to the Office of Interconnection, in accordance with the PJM Manuals, whether or not each Capacity Resource (other than Demand Resource and Energy Efficiency Resource) that the Capacity Market Seller intends to offer into the RPM Auction qualifies as a Capacity Resource with a State Subsidy (including by way of Jointly Owned Cross-Subsidized Capacity Resource) and identify (with specificity) any State Subsidy. Capacity Market Sellers that intend to offer a*

*Demand Resource or an Energy Efficiency Resource into the RPM Auction shall certify to the Office of Interconnection, in accordance with the PJM Manuals, whether or not such Demand Resource or Energy Efficiency Resource qualifies as a Capacity Resource with a State Subsidy no later than thirty (30) days prior to the commencement of the offer period of any RPM Auction conducted for the 2022/2023 Delivery Year and all subsequent Delivery Years. All Capacity Market Sellers shall be responsible for each certification irrespective of any guidance developed by the Office of the Interconnection and the Market Monitoring Unit. A Capacity Resource shall be deemed a Capacity Resource with State Subsidy if the Capacity Market Seller fails to timely certify whether or not a Capacity Resource is entitled to a State Subsidy, unless the Capacity Market Seller receives a waiver from the Commission or the Capacity Resource previously received a resource-specific exception pursuant to Tariff, Attachment DD, section 5.14(h-1)(3).*

*(ii) The requirements in subsection (i) above do not apply to Capacity Resources for which the Market Seller designated whether or not it is subject to a State Subsidy and the associated subsidies to which the Capacity Resource is entitled in a prior Delivery Year, unless there has been a change in the set of those State Subsidy(ies), or for those which are eligible for the Demand Resource or Energy Efficiency exemption, Capacity Storage Resource exemption, Self-Supply Entity exemption, or the Renewable Portfolio Standard exemption.*

*(iii) Once a Capacity Market Seller has certified a Capacity Resource as a Capacity Resource with a State Subsidy, the status of such Capacity Resource will remain unchanged unless and until the Capacity Market Seller (or a subsequent Capacity Market Seller) that owns or controls such Capacity Resource provides a certification of a change in such status, the Office of the Interconnection removes such status, or by FERC order. All Capacity Market Sellers shall have an ongoing obligation to certify to the Office of Interconnection and the Market Monitoring Unit a Capacity Resource's change in status as a Capacity Resource with State Subsidy within 5 days of such change.*

**(2) Minimum Offer Price Rule.** *Any Sell Offer for a New Entry Capacity Resource with State Subsidy or a Cleared Capacity Resource with State Subsidy that does not qualify for any of the exemptions, as defined in Tariff, Attachment DD, sections 5.14(h-1)(4)-(8), shall have an offer price no lower than the applicable MOPR Floor Offer Price.*

**(A) New Entry MOPR Floor Offer Price.** *For a New Entry Capacity Resource with State Subsidy the applicable MOPR Floor Offer Price, based on the net cost of new entry for each resource type, shall be, at the election of the Capacity Market Seller, (i) the resource-specific value determined in accordance with the resource-specific MOPR Floor Offer Price process in Tariff, Attachment DD, section 5.14(h-1)(3) below or (ii) if applicable, the default New Entry MOPR Floor Offer Price for the applicable resource based on the gross cost of new entry values shown in the table below, as adjusted for Delivery Years subsequent to the 2022/2023 Delivery Year, net of estimated net energy and ancillary service revenues for the resource type and Zone in which the resource is located.*

<b>Resource Type</b>	<b>Gross Cost of New Entry (2022/2023 \$/ MW-day) (Nameplate)</b>
----------------------	---

<i>Nuclear</i>	<i>\$2,000</i>
<i>Coal</i>	<i>\$1,068</i>
<i>Combined Cycle</i>	<i>\$320</i>
<i>Combustion Turbine</i>	<i>\$294</i>
<i>Fixed Solar PV</i>	<i>\$271</i>
<i>Tracking Solar PV</i>	<i>\$290</i>
<i>Onshore Wind</i>	<i>\$420</i>
<i>Offshore Wind</i>	<i>\$1,155</i>
<i>Battery Energy Storage</i>	<i>\$532</i>
<i>Generation Backed Demand Resource</i>	<i>\$254</i>

*The gross cost of new entry values in the table above are expressed in dollars per MW-day in terms of nameplate megawatts. For purposes of submitting a Sell Offer, the gross cost of new entry values must be converted to a net cost of new entry by subtracting the estimated net energy and ancillary service revenues, as determined below, from the gross cost of new entry. However, the resultant net cost of new entry of the battery energy storage resource type in the table above must be multiplied by 2.5. The net cost of new entry based on nameplate capacity is then converted to Unforced Capacity (“UCAP”) MW-day. For Delivery Years through the 2022/2023 Delivery Year, to determine the applicable UCAP MW-day value, the net cost of new entry is adjusted as follows: for thermal generation resource types and battery energy storage resource types, the applicable class average EFORD; for wind and solar generation resource types, the applicable class average capacity value factor; or for Demand Resources and Energy Efficiency Resources, the Forecast Pool Requirement, as applicable to the relevant RPM Auction. For the 2023/2024 Delivery Year and subsequent Delivery Years, to determine the applicable UCAP MW-day value, the net cost of new entry is adjusted as follows: for thermal generation resource types, the applicable class average EFORD; for battery storage, wind, and solar resource types, the applicable ELCC Class Rating; or for Demand Resources and Energy Efficiency Resources, the Forecast Pool Requirement, as applicable to the relevant RPM Auction. The resulting default New Entry MOPR Floor Offer price in UCAP/MW-day terms shall be applied to each MW offered for the Capacity Resource regardless of the actual Sell Offer quantity and regardless of whether the Sell Offer is for a Seasonal Capacity Performance Resource.*

*The default New Entry MOPR Floor Offer Price for load-backed Demand Resources (i.e., the MW portion of Demand Resources that is not supported by generation) shall be separately determined for each Locational Deliverability Area as the MW-weighted average offer price of load-backed Demand Resources from the most recent three Base Residual Auctions, where the MW weighting shall be determined based on the portion of each Sell Offer for a load-backed portion of the Demand Resource that is supported by end-use customer locations on the registrations used in the pre-registration process for such Base Residual Auctions, as described in the PJM Manuals.*

*The default gross cost of new entry for Energy Efficiency Resources shall be \$644/ICAP MW-Day, which shall be offset by projected wholesale energy savings, as well as transmission and*



*distribution savings of \$95/ICAP MW-Day, to determine the default New Entry MOPR Floor Offer Price (Net Cost of New Entry), where the projected wholesale energy savings are determined utilizing the cost and performance data of relevant programs offered by representative energy efficiency programs with sufficiently detailed publicly available data. The wholesale energy savings, in \$/ICAP MW-day, shall be calculated prior to each RPM Auction and be equal to the average annual energy savings of 6,221 MWh/ICAP MW times the weighted average of the annual real-time Forward Hourly LMPs of the Zones of the representative energy efficiency programs, where the weighting is developed from the annual energy savings in the relevant Zones, divided by 365.*

*Commencing with the Base Residual Auction for the 2023/2024 Delivery Year, the Office of the Interconnection shall adjust the default gross costs of new entry in the table above and for load-backed Demand Resources, and post the preliminary estimates of the adjusted applicable default New Entry MOPR Floor Offer Prices on its website, by no later than one hundred fifty (150) days prior to the commencement of the offer period for each Base Residual Auction. To determine the adjusted applicable default New Entry MOPR Floor Offer Prices for all resource types except for load-backed Demand Resources and Energy Efficiency Resources, the Office of the Interconnection shall adjust the gross costs of new entry utilizing, for combustion turbine and combined cycle resource types, the same Applicable BLS Composite Index applied for such Delivery Year to adjust the CONE value used to determine the Variable Resource Requirement Curve, in accordance with Tariff, Attachment DD, section 5.10(a)(iv), and for all other resource types, the “BLS Producer Price Index Turbines and Turbine Generator Sets” component of the Applicable BLS Composite Index used to determine the Variable Resource Requirement Curve shall be replaced with the “BLS Producer Price Index Final Demand, Goods Less Food & Energy, Private Capital Equipment” when adjusting the gross costs of new entry. The resultant value shall then be then adjusted further by a factor of 1.022 for nuclear, coal, combustion turbine, combine cycle, and generation-backed Demand Resource types or 1.01 for solar, wind, and storage resource types to reflect the annual decline in bonus depreciation scheduled under federal corporate tax law. Updated estimates of the net energy and ancillary service revenues for each default resource type and applicable Zone, which shall include, but are not limited to, consideration of Fuel Costs, Maintenance Adders and Operating Costs, as applicable, pursuant to Operating Agreement, Schedule 2 shall then be subtracted from the adjusted gross costs of new entry to determine the adjusted New Entry MOPR Floor Offer Price. The net energy and ancillary services revenue shall be the the average of the net energy and ancillary services revenues that the resource is projected to receive from the PJM energy and ancillary service markets for the applicable Delivery Year from three separate simulations, with each such simulation using forward prices shaped using historical data from one of each of the three consecutive calendar years preceding the time of the determination for the RPM Auction to take account of year-to-year variability in such hourly shapes. Each net energy and ancillary services revenue simulation shall be conducted in accordance with the following and the PJM Manuals:*

*(i) for nuclear resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined by the gross energy market revenue determined by the product of [average annual day-ahead Forward Hourly LMPs for such Zone, times 8,760 hours times the annual average equivalent availability factor of all PJM nuclear resources] minus the total annual cost to produce energy determined by the product of [8,760 hours times the annual average equivalent availability factor of all PJM nuclear resources times \$9.02/MWh*

*for a single unit plant or \$7.66/MWh for a multi-unit plant] where these hourly cost rates include fuel costs and variable operation and maintenance expenses, inclusive of Maintenance Adder costs, plus reactive services revenue of \$3,350/MW-year;*

*(ii) for coal resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined by the Projected EAS Dispatch of a 650 MW coal unit (with heat rate of 8,638 BTU/kWh and variable operations and maintenance variable operation and maintenance expenses, inclusive of Maintenance Adder costs, of \$9.50/MWh) using day-ahead and real-time Forward Hourly LMPs for such Zone and Forward Hourly Ancillary Service Prices, and daily forecasted coal prices, as set forth in the PJM Manuals, plus reactive services revenue of \$3,350/MW-year;*

*(iii) for combustion turbine resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined in a manner consistent with the methodology described in Tariff, Attachment DD, section 5.10(a)(v-1)(B) for the Reference Resource combustion turbine.*

*(iv) for combined cycle resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined in the same manner as that prescribed for a combustion turbine resource type, except that the heat rate assumed for the combined cycle resource shall be 6,501 BTU/kwh, the variable operations and maintenance expenses for such resource, inclusive of Maintenance Adder costs, shall be \$2.11/MWh, plus reactive services revenue of \$3,350/MW-year.*

*(v) for solar PV resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined using a solar resource model that provides the average MW output level, expressed as a percentage of nameplate rating, by hour of day (for each of the 24-hours of a day) and by calendar month (for each of the twelve months of a year). The annual net energy market revenues are determined by multiplying the solar output level of each hour by the real-time Forward Hourly LMP for such Zone and applicable to such hour with this product summed across all of the hours of an annual period, plus reactive services revenue of \$3,350/MW-year. Two separate solar resource models are used, one model for a fixed panel resource and a second model for a tracking panel resource;*

*(vi) for onshore wind resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined using a wind resource model that provides the average MW output level, expressed as a percentage of nameplate rating, by hour of day (for each of the 24-hours of a day) and by calendar month (for each of the twelve months of a year). The annual energy market revenues are determined by multiplying the wind output level of each hour by the real-time Forward Hourly LMP for such Zone applicable to such hour with this product summed across all of the hours of an annual period, plus reactive services revenue of \$3,350/MW-year;*

*(vii) for offshore wind resource type, the net energy and ancillary services revenue estimate for each Zone shall be determined by the gross energy market revenue equal to the product of [the average annual real-time Forward Hourly LMP for such Zone times 8,760 hours times an assumed annual capacity factor of 45%], plus reactive services revenue of \$3,350/MW-year;*

*(viii) for Capacity Storage Resource, the net energy and ancillary services revenue estimate shall be estimated by the Projected EAS Dispatch of a 1 MW, 4MWh resource, with an 85% roundtrip efficiency, and assumed to be dispatched between 95% and 5% state of charge against day-ahead and real-time Forward Hourly LMPs for such Zone and Forward Hourly Ancillary Service Prices, plus reactive services revenue of \$3,350/MW-year; and*

(ix) for generation-backed Demand Resource, the net energy and ancillary services revenue estimate shall be zero dollars.

*Beginning with the Delivery Year that commences June 1, 2022, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the default gross cost of new entry values. Such review may include, without limitation, analyses of the fixed development, construction, operation, and maintenance costs for such resource types. Based on the results of such review, PJM shall propose either to modify or retain the default gross cost of new entry values stated in the table above and the default gross cost of new entry value for Energy Efficiency Resources. The Office of the Interconnection shall post publicly and solicit stakeholder comment regarding the proposal. If, as a result of this process, changes to the default gross cost of new entry values are proposed, the Office of the Interconnection shall file such proposed modifications with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.*

*New Entry Capacity Resource with State Subsidy for which there is no default MOPR Floor Offer Price provided in accordance with this section, including hybrid resources, must seek a resource-specific value determined in accordance with the resource-specific MOPR Floor Offer Price process below to participate in an RPM Auction. Failure to obtain a resource-specific MOPR Floor Offer Price will result in the Office of the Interconnection rejecting any Sell Offer based on such resource for the relevant RPM Auction.*

**(B) Cleared MOPR Floor Offer Prices.**

(i) For a Cleared Capacity Resource with State Subsidy, the applicable Cleared MOPR Floor Offer Price shall be, at the election of the Capacity Market Seller, (a) based on the resource-specific MOPR Floor Offer Price, as determined in accordance with Tariff, Attachment DD, section 5.14(h-1)(3) below, or (b) if available, the default Avoidable Cost Rate for the applicable resource type shown in the table below, as adjusted for Delivery Years subsequent for the 2022/2023 Delivery Year to reflect changes in avoidable costs, net of projected PJM market revenues equal to the resource's net energy and ancillary service revenues for the resource type, as determined in accordance with subsection (ii) below.

<b>Existing Resource Type</b>	<b>Default Gross ACR (2022/2023 \$/MW-day) (Nameplate)</b>
<i>Nuclear - single</i>	<i>\$697</i>
<i>Nuclear - dual</i>	<i>\$445</i>
<i>Coal</i>	<i>\$80</i>
<i>Combined Cycle</i>	<i>\$56</i>
<i>Combustion Turbine</i>	<i>\$50</i>
<i>Solar PV (fixed and tracking)</i>	<i>\$40</i>
<i>Wind Onshore</i>	<i>\$83</i>
<i>Generation-backed</i>	<i>\$3</i>

<i>Demand Response</i>	
<i>Load-backed Demand Response</i>	\$0
<i>Energy Efficiency</i>	\$0

*The default gross Avoidable Cost Rate values in the table above are expressed in dollars per MW-day in terms of nameplate megawatts. For purposes of submitting a Sell Offer, the default Avoidable Cost Rate values must be net of estimated net energy and ancillary service revenues, and then the difference is ultimately converted to Unforced Capacity (“UCAP”) MW-day, where the UCAP MW-day value will be determined based on: for Delivery Years through the 2022/2023 Delivery Year, the resource-specific EFORd for thermal generation resource types, resource-specific capacity value factor for solar and wind generation resource types (based on the ratio of Capacity Interconnection Rights to nameplate capacity, appropriately time-weighted for any winter Capacity Interconnection Rights), or the Forecast Pool Requirement for Demand Resources and Energy Efficiency Resources, as applicable to the relevant RPM Auction, and for the 2023/2024 Delivery Year and subsequent Delivery Years, the resource-specific EFORd for thermal generation resource types and on the resource-specific Accredited UCAP value for solar and wind resource types (with appropriate time-weighting for any winter Capacity Interconnection Rights), or the Forecast Pool Requirement for Demand Resources and Energy Efficiency Resources, as applicable to the relevant RPM Auction. The resulting default Cleared MOPR Floor Offer price in UCAP/MW-day terms shall be applied to each MW offered for the Capacity Resource regardless of actual Sell Offer quantity and regardless of whether the Sell Offer is for a Seasonal Capacity Performance Resource.*

*Commencing with the Base Residual Auction for the 2023/2024 Delivery Year, the Office of the Interconnection shall adjust the default Avoidable Cost Rates in the table above, and post the adjusted values on its website, by no later than one hundred fifty (150) days prior to the commencement of the offer period for each Base Residual Auction. To determine the adjusted Avoidable Cost Rates, the Office of the Interconnection shall utilize the 10-year average Handy-Whitman Index in order to adjust the Gross ACR values to account for expected inflation. Updated estimates of the net energy and ancillary service revenues shall be determined on a resource-specific basis in accordance with Tariff, Attachment DD, section 6.8(d) and the PJM Manuals.*

*Beginning with the Delivery Year that commences June 1, 2022, and continuing no later than for every fourth Delivery Year thereafter, the Office of the Interconnection shall review the default Avoidable Cost Rates for Capacity Resources with State Subsidies that have cleared in an RPM Auction for any prior Delivery Year. Such review may include, without limitation, analyses of the avoidable costs of such resource types. Based on the results of such review, PJM shall propose either to modify or retain the default Avoidable Cost Rate values stated in the table above. The Office of the Interconnection shall post publicly and solicit stakeholder comment regarding the proposal. If, as a result of this process, changes to the default Avoidable Cost Rate values are proposed, the Office of the Interconnection shall file such proposed modifications with the FERC by October 1, prior to the conduct of the Base Residual Auction for the first Delivery Year in which the new values would be applied.*

*Cleared Capacity Resources with State Subsidy for which there is no default MOPR Floor Offer Price provided in accordance with this section, including hybrid resources, must seek a resource-specific value determined in accordance with the resource-specific MOPR Floor Offer Price process below to participate in an RPM Auction. Failure to obtain a resource-specific MOPR Floor Offer Price will result in the Office of the Interconnection rejecting any Sell Offer based on such resource.*

*(ii) The net energy and ancillary services revenue is equal to forecasted net revenues which shall be determined in accordance with the applicable resource type net energy and ancillary services revenue determination methodology set forth in Tariff, Attachment DD, section 5.14(h-1)(2)(A)(i) through (ix) and using the subject resource's operating parameters as determined in accordance with the PJM Manuals based on (a) offers submitted in the Day-ahead Energy Market and Real-time Energy Market over the calendar year preceding the time of the determination for the RPM Auction; (b) the resource-specific operating parameters approved, as applicable, in accordance with Operating Agreement, Schedule 1, section 6.6(b) and Operating Agreement, Schedule 2 (including any Fuel Costs, emissions costs, Maintenance Adders, and Operating Costs); (c) the resource's EFORD; (d) Forward Hourly LMPs at the generation bus as determined in accordance with Tariff, Attachment DD, section 5.10(a)(v-1)(C)(6); and (e) the resource's stated annual revenue requirement for reactive services; plus any unit-specific bilateral contract. In addition, the following resource type-specific parameters shall be considered; (f) for combustion turbine, combined cycle, and coal resource types: the installed capacity rating, ramp rate (which shall be equal to the maximum ramp rate included in the resource's energy offers over the most recent previous calendar year preceding the determination for the RPM Auction), and the heat rate as determined as the resource's average heat rate at full load as submitted to the Market Monitoring Unit and the Office of the Interconnection, where for combined cycle resources heat rates will be determined at base load and at peak load (e.g., without duct burners and with duct burners), as applicable; (g) for nuclear resource type: anticipated refueling schedule; (h) for solar and wind resource types: the resource's output profiles for the most recent three calendar years, as available; and (i) for battery storage resource type: the nameplate capacity rating (on a MW / MWh basis).*

*To the extent the resource has not achieved commercial operation, the operating parameters used in the simulation of the net energy and ancillary service revenues will be based on the manufacturer's specifications and/or from parameters used for other existing, comparable resources, as developed by the Market Monitoring Unit and the Capacity Market Seller, and accepted by the Office of the Interconnection.*

*A Capacity Market Seller intending to submit a Sell Offer in any RPM Auction for a Cleared Capacity Resource with State Subsidy based on a net energy and ancillary services revenue determination that does not use the foregoing methodology or parameter inputs stated for that resource type shall, at its election, submit a request for a resource-specific MOPR Floor Offer Price for such Capacity Resource pursuant to Tariff, Attachment DD, section 5.14(h-1)(3) below.*

*(3) Resource-Specific Exception. A Capacity Market Seller intending to submit a Sell Offer in any RPM Auction for a New Entry Capacity Resource with State Subsidy or a Cleared Capacity Resource with State Subsidy below the applicable default MOPR Floor Offer Price may, at its election, submit a request for a resource-specific exception for such*

*Capacity Resource. A Sell Offer below the default MOPR Floor Offer Price, but no lower than the resource-specific MOPR Floor Offer Price, shall be permitted if the Capacity Market Seller obtains approval from the Office of the Interconnection or the Commission, prior to the RPM Auction in which it seeks to submit the Sell Offer. The resource-specific MOPR Floor Offer Price determined under this provision shall be based on the resource-specific EFORD for thermal generation resource types, on the resource-specific Accredited UCAP value for battery energy storage resource types and for solar and wind generation resource types (appropriately time-weighted for any winter Capacity Interconnection Rights), or the Forecast Pool Requirement for Demand Resources and Energy Efficiency Resources, as applicable to the relevant RPM Auction and shall be applied to each MW offered by the resource regardless of actual Sell Offer quantity and regardless of whether the Sell Offer is for a Seasonal Capacity Performance Resource. Such Sell Offer is permissible because it is consistent with the competitive, cost-based, fixed, net cost were the resource to rely solely on revenues exclusive of any State Subsidy. All supporting data must be provided for all requests. The following requirements shall apply to requests for such determinations:*

*(A) The Capacity Market Seller shall submit a written request with all of the required documentation as described below and in the PJM Manuals. For such purpose, the Capacity Market Seller shall submit the resource-specific exception request to the Office of the Interconnection and the Market Monitoring Unit no later than one hundred twenty (120) days prior to the commencement of the offer period for the RPM Auction in which it seeks to submit its Sell Offer. For such purpose, the Office of the Interconnection shall post, by no later than one hundred fifty (150) days prior to the commencement of the offer period for the relevant RPM Auction, a preliminary estimate for the relevant Delivery Year of the default Minimum Floor Offer Prices, determined pursuant to Tariff, Attachment DD, sections 5.14(h-1)(2)(A) and (B). If the final applicable default Minimum Floor Offer Price subsequently established for the relevant Delivery Year is less than the Sell Offer, the Sell Offer shall be permitted and no exception shall be required.*

*(B) For a resource-specific exception for a New Entry Capacity Resource with State Subsidy, the Capacity Market Seller must include in its request for an exception under this subsection documentation to support the fixed development, construction, operation, and maintenance costs of the Capacity Resource, as well as estimates of offsetting net revenues.*

*The financial modeling assumptions for calculating Cost of New Entry for Generation Capacity Resources and generation-backed Demand Resources shall be: (i) nominal levelization of gross costs, (ii) asset life of twenty years, (iii) no residual value, (iv) all project costs included with no sunk costs excluded, (v) use first year revenues (which may include revenues from the sale of renewable energy credits for purposes other than state-mandated or state-sponsored programs), and (vi) weighted average cost of capital based on the actual cost of capital for the entity proposing to build the Capacity Resource. Notwithstanding the foregoing, a Capacity Market Seller that seeks to utilize an asset life other than twenty years (but no greater than 35 years) shall provide evidence to support the use of a different asset life, including but not limited to, the asset life term for such resource as utilized in the Capacity Market Seller's financial accounting (e.g., independently audited financial statements), or project financing documents for the resource or evidence of actual costs or financing assumptions of recent comparable projects to*

*the extent the seller has not executed project financing for the resource (e.g., independent project engineer opinion or manufacturer's performance guarantee), or opinions of third-party experts regarding the reasonableness of the financing assumptions used for the project itself or in comparable projects. Capacity Market Sellers may also rely on evidence presented in federal filings, such as its FERC Form No. 1 or an SEC Form 10-K, to demonstrate an asset life other than 20 years of similar asset projects.*

*Supporting documentation for project costs may include, as applicable and available, a complete project description; environmental permits; vendor quotes for plant or equipment; evidence of actual costs of recent comparable projects; bases for electric and gas interconnection costs and any cost contingencies; bases and support for property taxes, insurance, operations and maintenance ("O&M") contractor costs, and other fixed O&M and administrative or general costs; financing documents for construction-period and permanent financing or evidence of recent debt costs of the seller for comparable investments; and the bases and support for the claimed capitalization ratio, rate of return, cost-recovery period, inflation rate, or other parameters used in financial modeling. In addition to the certification, signed by an officer of the Capacity Market Seller, the request must include a certification that the claimed costs accurately reflect, in all material respects, the seller's reasonably expected costs of new entry and that the request satisfies all standards for a resource-specific exception hereunder. The request also shall identify all revenue sources (exclusive of any State Subsidies) relied upon in the Sell Offer to offset the claimed fixed costs, including, without limitation, long-term power supply contracts, tolling agreements, or tariffs on file with state regulatory agencies, and shall demonstrate that such offsetting revenues are consistent, over a reasonable time period identified by the Capacity Market Seller, with the standard prescribed above. In making such demonstration, the Capacity Market Seller may rely upon revenues projected by well-defined, forward-looking dispatch models designed to generally follow the rules and processes of PJM's energy and ancillary services market. Such models must utilize publicly available forward prices for electricity and fuel in the PJM Region. Any modifications made to the forward electricity and fuel prices must similarly use publicly available data. Alternative forward prices for fuel may be used if accompanied by contractual evidence showing the applicability of the alternative fuel price. Where forward fuel markets are not available, publicly available estimates of future fuel prices may be used. The model shall also contain estimates of variable operation and maintenance expenses, which may include Maintenance Adders, and emissions allowance prices. Documentation for net revenues also must include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, capacity factors, and ancillary service capabilities. Any evaluation of net revenues should be consistent with Operating Agreement, Schedule 2, including, but not limited to, consideration of Fuel Costs, Maintenance Adders and Operating Costs, as applicable.*

*In the alternative, the Capacity Market Seller may request that the Market Monitoring Unit, subject to acceptance by the Office of Interconnection, produce a resource-specific Energy & Ancillary Services Offset value for such resource using the Forward Hourly LMPs, Forward Hourly Ancillary Service Prices and either Forward Daily Natural Gas Prices for combustion turbines and combined cycle resources, or forecasted fuel prices for other resource types, plus plant parameters and capability information specific to the dispatch of the resource, as outlined*

*above. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.*

*The default assumptions for calculating resource-specific Cost of New Entry for Energy Efficiency Resources shall be based on, as supported by documentation provided by the Capacity Market Seller: the nominal-levelized annual cost to implement the Energy Efficiency program or to install the Energy Efficiency measure reflective of the useful life of the implemented Energy Efficiency equipment, and the offsetting savings associated with avoided wholesale energy costs and other claimed savings provided by implementing the Energy Efficiency program or installing the Energy Efficiency measure.*

*The default assumptions for calculating resource-specific Cost of New Entry for load-backed Demand Resources shall be based on, as supported by documentation provided by the Capacity Market Seller, program costs required for the resource to meet the capacity obligations of a Demand Resource, including all fixed operating and maintenance cost and weighted average cost of capital based on the actual cost of capital for the entity proposing to develop the Demand Resource.*

*For generation-backed Demand Resources, the determination of a resource-specific MOPR Floor Offer Price shall only consider the resource's costs related to participation in the Reliability Pricing Model and meeting a capacity commitment. The Capacity Market Seller must provide supporting documentation (at the end-use customer level) of the cost associated with participation as a Demand Resource and an attestation from the Demand Resource that all other costs are not related to participation as a Demand Resource, such as the costs associated with installation and operation of the generation unit, and will be accrued and paid regardless of participation in the Reliability Pricing Model. To the extent the Capacity Market Seller includes all costs associated with the generation unit supporting the Demand Resource then demand charge management benefits at the retail level (as supported by documentation at the end-use customer level) may also be considered as an additional offset to such costs. Supporting documentation (at the end-use customer level) may include, but is not limited to, historic end-use customer bills and associated analysis that identifies the annual retail avoided cost from the operation of such generation unit or the business case to support installation of the generator or regulatory requirements where the generator would be required absent participation in the Reliability Pricing Model.*

*(C) For a Resource-Specific Exception for a Cleared Capacity Resource with State Subsidy that is a generation resource, the Capacity Market Seller shall submit a Sell Offer consistent with the unit-specific Market Seller Offer Cap process pursuant to Tariff, Attachment DD, section 6.8; except that the 10% uncertainty adder may not be included in the "Adjustment Factor." In addition and notwithstanding the requirements of Tariff, Attachment DD, section 6.8, the Capacity Market Seller shall, at its election, include in its request for an exception under this subsection documentation to support projected energy and ancillary services markets revenues. Such a request shall identify all revenue sources (exclusive*



*of any State Subsidies) relied upon in the Sell Offer to offset the claimed fixed costs, including, without limitation, long-term power supply contracts, tolling agreements, or tariffs on file with state regulatory agencies, and shall demonstrate that such offsetting revenues are consistent, over a reasonable time period identified by the Capacity Market Seller, with the standard prescribed above. In making such demonstration, the Capacity Market Seller may rely upon revenues projected by well-defined, forward-looking dispatch models designed to generally follow the rules and processes of PJM's energy and ancillary services market. Such models must utilize publicly available forward prices for electricity and fuel in the PJM Region. Any modifications made to the forward electricity and fuel prices must similarly use publicly available data. Alternative forward prices for fuel may be used if accompanied by contractual evidence showing the applicability of the alternative fuel price. Where forward fuel markets are not available, publicly available estimates of future fuel sources may be used. The model shall also contain estimates of variable operation and maintenance expenses, which may include Maintenance Adders, and emissions allowance prices. Documentation for net revenues also must include, as available and applicable, plant performance and capability information, including heat rate, start-up times and costs, forced outage rates, planned outage schedules, maintenance cycle, fuel costs and other variable operations and maintenance expenses, capacity factors, and ancillary service capabilities. Any evaluation of revenues should include, but would not be not limited to, consideration of Fuel Costs, Maintenance Adders and Operating Costs, as applicable, pursuant to Operating Agreement, Schedule 2.*

*In the alternative, the Capacity Market Seller may request that the Market Monitoring Unit, subject to acceptance by the Office of Interconnection, produce a resource-specific Energy & Ancillary Services Offset value for such resource using the Forward Hourly LMPs, Forward Hourly Ancillary Service Prices and either Forward Daily Natural Gas Prices for combustion turbines and combined cycle resources, or forecasted fuel prices for other resource types, plus plant parameters and capability information specific to the dispatch of the resource, as outlined above. In addition to the documentation identified herein and in the PJM Manuals, the Capacity Market Seller shall provide any additional supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate the Sell Offer. Requests for additional documentation will not extend the deadline by which the Office of the Interconnection or the Market Monitoring Unit must provide their determinations of the Minimum Offer Price Rule exception request.*

*The resource-specific MOPR Floor Offer Price for a Cleared Capacity Resource with State Subsidy that is a generation-backed Demand Resource will be determined based on only costs associated with the resource participating in the Reliability Pricing Model and satisfying a capacity commitment or, to the extent the Capacity Market Seller includes all costs associated with the generation unit supporting the Demand Resource, then demand charge management benefits at the retail level (as supported by documentation at the end-use customer level) may also be considered as an additional offset to such costs. Supporting documentation (at the end-use customer level) may include but is not limited to, historic end-use customer bills and associated analysis that identifies the annual retail avoided cost from the operation of such generation unit or the business case to support installation of the generator or regulatory requirements where the generator would be required absent participation in the Reliability Pricing Model.*

(D) A Sell Offer evaluated at the resource-specific exception shall be permitted if the information provided reasonably demonstrates that the Sell Offer's competitive, cost-based, fixed, net cost of new entry is below the default MOPR Floor Offer Price, based on competitive cost advantages relative to the costs estimated by the default MOPR Floor Offer Price, including, without limitation, competitive cost advantages resulting from the Capacity Market Seller's business model, financial condition, tax status, access to capital or other similar conditions affecting the applicant's costs, or based on net revenues that are reasonably demonstrated hereunder to be higher than those estimated by the default MOPR Floor Offer Price. Capacity Market Sellers shall demonstrate that claimed cost advantages or sources of net revenue that are irregular or anomalous, that do not reflect arm's-length transactions, or that are not in the ordinary course of the Capacity Market Seller's business are consistent with the standards of this subsection. Failure to adequately support such costs or revenues so as to enable the Office of the Interconnection to make the determination required in this section will result in denial of a resource-specific exception by the Office of the Interconnection.

(E) The Capacity Market Seller must submit a sworn, notarized certification of a duly authorized officer, certifying that the officer has personal knowledge of the resource-specific exception request and that to the best of his/her knowledge and belief: (1) the information supplied to the Market Monitoring Unit and the Office of Interconnection to support its request for an exception is true and correct; (2) the Capacity Market Seller has disclosed all material facts relevant to the request for the exception; and (3) the request satisfies the criteria for the exception.

(F) The Market Monitoring Unit shall review, in an open and transparent manner with the Capacity Market Seller and the Office of the Interconnection, the information and documentation in support of the request and shall provide its findings whether the proposed Sell Offer is acceptable, in accordance with the standards and criteria hereunder, in writing, to the Capacity Market Seller and the Office of the Interconnection by no later than ninety (90) days prior to the commencement of the offer period for such auction. The Office of the Interconnection shall also review, in an open and transparent manner, all exception requests and documentation and shall provide in writing to the Capacity Market Seller, and the Market Monitoring Unit, its determination whether the requested Sell Offer is acceptable and if not it shall calculate and provide to such Capacity Market Seller, a minimum Sell Offer based on the data and documentation received, by no later than sixty-five (65) days prior to the commencement of the offer period for the relevant RPM Auction. After the Office of the Interconnection determines with the advice and input of Market Monitor, the acceptable minimum Sell Offer, the Capacity Market Seller shall notify the Market Monitoring Unit and the Office of the Interconnection, in writing, of the minimum level of Sell Offer to which it agrees to commit by no later than sixty (60) days prior to the commencement of the offer period for the relevant RPM Auction, and in making such determination, the Capacity Market Seller may consider the applicable default MOPR Floor Offer Price and may select such default value if it is lower than the resource-specific determination. A Capacity Market Seller that is dissatisfied with any determination hereunder may seek any remedies available to it from FERC; provided, however, that the Office of the Interconnection will proceed with administration of the Tariff and market rules based on the lower of the applicable default MOPR Floor Offer Price and the resource-specific determination unless and until ordered to do otherwise by FERC.

(4) *Competitive Exemption.*

(A) *A Capacity Resource with State Subsidy may be exempt from the Minimum Offer Price Rule under this subsection 5.14(h-1) in any RPM Auction if the Capacity Market Seller certifies to the Office of Interconnection, in accordance with the PJM Manuals, that the Capacity Market Seller of such Capacity Resource elects to forego receiving any State Subsidy for the applicable Delivery Year no later than thirty (30) days prior to the commencement of the offer period for the relevant RPM Auction. Notwithstanding the foregoing, the competitive exemption is not available to Capacity Resources with State Subsidy that (A) are owned or offered by Self-Supply Entities, (B) are no longer entitled to receive a State Subsidy but are still considered a Capacity Resource with State Subsidy solely because they have not cleared an RPM Auction since last receiving a State Subsidy, or (C) are Jointly Owned Cross-Subsidized Capacity Resources or is the subject of a bilateral transaction (including but not limited to those reported pursuant to Tariff, Attachment DD, section 4.6) and not all Capacity Market Sellers of the supporting facility unanimously elect the competitive exemption and certify that no State Subsidy will be received associated with supporting the resource. A new Generation Capacity Resource that is a Capacity Resource with State Subsidy may elect the competitive exemption; however, in such instance, the applicable MOPR Floor Offer Price will be determined in accordance with the minimum offer price rules for certain new Generation Capacity Resources as provided in Tariff, Attachment DD, section 5.14(h), which apply the minimum offer price rule to the new Generation Capacity Resources located in an LDA where a separate VRR Curve is established as provided in Tariff, Attachment DD, section 5.14(h)(4).*

(B) (i) *The Capacity Market Seller shall not receive a State Subsidy for any part of the relevant Delivery Year in which it elects a competitive exemption or certifies that it is not a Capacity Resource with State Subsidy. In furtherance of this prohibition, if a Capacity Resource that (1) is a New Entry Capacity Resource with State Subsidy that elects the competitive exemption in subsection (4)(A) above and clears an RPM Auction for a given Delivery Year, but prior to the end of that Delivery Year elects to accept a State Subsidy for the associated Delivery Year or an earlier Delivery Year or (2) is not a Capacity Resource with State Subsidy at the time of the RPM Auction for the Delivery Year for which it first cleared an RPM Auction but prior to the end of that Delivery Year receives a State Subsidy for the associated Delivery Year or an earlier Delivery Year, or (3) in the case of Demand Resource, is an end-use customer location MW that receives a State Subsidy and is included in a Demand Resource Registration pursuant to RAA, Schedule 6 to satisfy a Demand Resource commitment that was not designated as a Capacity Resource with State Subsidy at the time it cleared the relevant RPM Auction, then the Capacity Market Seller of that Capacity Resource or end-use customer location MW shall not receive RPM revenues for such resource or end-use customer location MW for any part of that Delivery Year and may not participate in any RPM Auction with such resource or end-use customer location MW, or be eligible to use such resource or end-use customer location MW as replacement capacity starting June 1 of the Delivery Year after the Capacity Market Seller or end-use customer location MW first receives the State Subsidy and continuing for a period of 20 years, except for battery energy storage, for which such participation restriction shall apply for a period of 15 years. A Jointly Owned Cross-Subsidized Capacity Resource that meets the requirements of either of the two preceding subsections (B)(i)(1) or (2), shall not receive RPM revenues for any part of that Delivery Year and may not participate in any RPM Auction or be eligible to be used as replacement capacity starting June 1*

*of the Delivery Year and continuing for the number of years specified above, after any joint Capacity Market Seller of the underlying facility first receives the State Subsidy. A Capacity Resource with State Subsidy that is the subject of a bilateral transaction that meets the requirements of either of the two preceding subsections (B)(i)(1) or (2) shall not receive RPM revenues for any part of that Delivery Year and may not participate in any RPM Auction or be eligible to be used as replacement capacity starting June 1 of the Delivery Year and continuing for the number of years specified above if any owner or Capacity Market Seller of the facility receives a State Subsidy. The Capacity Market Seller(s) of any such Capacity Resource or Jointly Owned Cross-Subsidized Capacity Resource shall also return to the Office of the Interconnection any revenues paid to such Capacity Resource associated with their capacity commitment for such Delivery Year and shall retain their RPM commitment and associated obligations for such Delivery Year and for any future Delivery Years in which the resource has already secured a capacity commitment, including any Non-Performance Charges relating to the capacity and remain eligible to collect Performance Payments under this Tariff, Attachment DD, section 10A for the relevant Delivery Year and any subsequent Delivery Years for which it already received an RPM commitment. Notwithstanding the foregoing, Capacity Resources that lose their eligibility to participate in RPM pursuant to this section remain eligible for commitment in an FRR Capacity Plan.*

*(ii) If any Capacity Resource that has previously cleared an RPM Auction (1) is a Cleared Capacity Resource with State Subsidy that claims the competitive exemption pursuant to subsection (4)(A) above in an RPM Auction and clears such RPM Auction or (2) was not a Capacity Resource with State Subsidy at the time it cleared an RPM Auction for a given Delivery Year but later becomes entitled to receive a State Subsidy for that Delivery Year, and the Capacity Market Seller subsequently elects to accept a State Subsidy for any part of that Delivery Year, or (3) in the case of Demand Resource, is an end-use customer location that receives a State Subsidy and is included in a Demand Resource Registration pursuant to RAA, Schedule 6 to satisfy a Demand Resource commitment that was not designated as a Capacity Resource with State Subsidy at the time it cleared the relevant RPM Auction, then the Capacity Market Seller of that Capacity Resource or end-use customer location may not receive RPM revenues for such resource or end-use customer location for any part of that Delivery Year, unless it can demonstrate that it would have cleared in the relevant RPM Auction under an offer consistent with the resource-specific exception process outlined above in subsection 5.14(h-1)(3). All Capacity Market Sellers of a Jointly Owned Cross-Subsidized Capacity Resource that meets the requirements of either of the two preceding subsections (B)(ii)(1) or (2) may not receive RPM revenues for any part of that Delivery Year if any joint Capacity Market Seller of the underlying facility accepts a subsidy for that Delivery Year, unless the Capacity Market Seller can demonstrate that the facility would have cleared in the relevant RPM Auction under an offer consistent with the resource-specific exception process outlined above in subsection 5.14(h-1)(3). A Capacity Resource with State Subsidy that is the subject of a bilateral transaction may not receive RPM revenues for any part of that Delivery Year if any owner or Capacity Market Seller of the underlying facility receives a State Subsidy for that Delivery Year, unless the Capacity Market Seller can demonstrate that the facility would have cleared in the relevant RPM Auction under an offer consistent with the resource-specific exception process outlined above in subsection 5.14(h-1)(3), if any owner or Capacity Market Seller of the facility receives a State Subsidy. The Capacity Market Seller(s) of any such Capacity Resources or Jointly Owned Cross-Subsidized Capacity Resource shall return to the Office of the*

*Interconnection any revenues paid to such Capacity Resource associated with their capacity commitment for such Delivery Year and shall retain their RPM commitment and associated obligations for the relevant Delivery Year and remain eligible to collect Performance Payments or to pay Non-Performance Charges, as applicable, pursuant to Tariff, Attachment DD, section 10A.*

*(iii) Any revenues returned to the Office of the Interconnection pursuant to the preceding subsections (i) and (ii) shall be allocated to the relevant load that paid for the State Subsidy (to the extent possible). If the Office of Interconnection cannot identify the relevant load responsible for the State Subsidy, then the returned revenues would be allocated across all load in the RTO that has not selected the FRR Alternative. Such revenues shall be distributed on a pro-rata basis to such LSEs that were charged a Locational Reliability Charge based on their Daily Unforced Capacity Obligations.*

*(5) Self-Supply Entity exemption. A Capacity Resource that was owned, or bilaterally contracted, by a Self-Supply Entity on December 19, 2019, shall be exempt from the Minimum Offer Price Rule if such Capacity Resource remains owned or bilaterally contracted by such Self-Supply Entity and satisfies at least one of the criteria specified below:*

*(A) has successfully cleared an RPM Auction prior to December 19, 2019;*

*(B) is the subject of an interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement executed on or before December 19, 2019; or*

*(C) is the subject of an unexecuted interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement filed by PJM with the Commission on or before December 19, 2019.*

*(6) Renewable Portfolio Standard Exemption. A Capacity Resource with State Subsidy shall be exempt from the Minimum Offer Price Rule if such Capacity Resource (1) receives or is entitled to receive State Subsidies through renewable energy credits or equivalent credits associated with a state-mandated or state-sponsored renewable portfolio standard ("RPS") program or equivalent program as of December 19, 2019 and (2) satisfies at least one of the following criteria:*

*(A) has successfully cleared an RPM Auction prior to December 19, 2019;*

*(B) is the subject of an interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement executed on or before December 19, 2019; or*

*(C) is the subject of an unexecuted interconnection construction service agreement, interim interconnection service agreement, interconnection service*

*agreement or wholesale market participation agreement filed by PJM with the Commission on or before December 19, 2019.*

*(7) Demand Resource and Energy Efficiency Resource Exemption.*

*(A) A Capacity Resource with State Subsidy that is Demand Resource or an Energy Efficiency Resource shall be exempt from the Minimum Offer Price Rule if such Capacity Resource satisfies at least one of the following criteria:*

*(i) has successfully cleared an RPM Auction prior to December 19, 2019. For purposes of this subsection (a), individual customer location registrations (or for utility-based residential load curtailment program, based on the total number of participating customers) that participated as Demand Resource and cleared in an RPM Auction prior to December 19, 2019, and were submitted to PJM no later than 45 days prior to the BRA for the 2022/2023 Delivery Year shall be deemed eligible for the Demand Resource and Energy Efficiency Resource Exemption; or*

*(ii) has completed registration on or before December 19, 2019; or*

*(iii) is supported by a post-installation measurement and verification report for Energy Efficiency Resources approved by PJM on or before December 19, 2019 (calculated for each installation period, Zone and Sub-Zone by using the greater of the latest approved post-installation measurement and verification report prior to December 19, 2019 or the maximum MW cleared for a Delivery Year across all auctions conducted prior to December 19, 2019).*

*(B) All registered locations that qualify for the Demand Resource and Energy Efficiency Resource exemption shall continue to remain exempt even if the MW of nominated capacity increases between RPM Auctions unless any MW increase in the nominated capacity is due to an investment made for the sole purpose of increasing the curtailment capability of the location in the capacity market. In such case, the MW of increased capability will not be qualified for the Demand Resource and Energy Efficiency Resource exemption.*

*(8) Capacity Storage Resource Exemption. A Capacity Resource with State Subsidy that is a Capacity Storage Resource shall be exempt from the Minimum Offer Price Rule if such Capacity Storage Resource satisfies at least one of the following criteria:*

*(A) has successfully cleared an RPM Auction prior to December 19, 2019;*

*(B) is the subject of an interconnection construction service agreement, interim interconnection service agreement, interconnection service agreement or wholesale market participation agreement executed on or before December 19, 2019; or*

*(C) is the subject of an unexecuted interconnection construction service agreement, interim interconnection service agreement, interconnection service*

*agreement or wholesale market participation agreement filed by PJM with the Commission on or before December 19, 2019.*

*(9) Procedures and Remedies in Cases of Suspected Fraud or Material Misrepresentation or Omissions in Connection with a Capacity Resource with State Subsidy. In the event the Office of the Interconnection, with advice and input from the Market Monitoring Unit, reasonably believes that a certification of a Capacity Resource's status contains fraudulent or material misrepresentations or omissions such that the Capacity Market Seller's Capacity Resource is a Capacity Resource with a State Subsidy (including whether the Capacity Resource is a Jointly Owned Cross-Subsidized Capacity Resource) or does not qualify for a competitive exemption or contains information that is inconsistent with the resource-specific exception, then:*

*(A) A Capacity Market Seller shall, within five (5) business days upon receipt of the request for additional information, provide any supporting information reasonably requested by the Office of the Interconnection or the Market Monitoring Unit to evaluate whether such Capacity Resource is a Capacity Resource with State Subsidy or whether the Capacity Market Seller is eligible for the competitive exemption. If the Office of the Interconnection determines that the Capacity Resource's status as a Capacity Resource with State Subsidy is different from that specified by the Capacity Market Seller or is not eligible for a competitive exemption pursuant to subsection (4) above, the Office of the Interconnection shall notify, in writing, the Capacity Market Seller of such determination by no later than sixty-five (65) days prior to the commencement of the offer period for the relevant RPM Auction. A Capacity Market Seller that is dissatisfied with any determination hereunder may seek any remedies available to it from FERC; provided, however, if the Office of Interconnection determines that the subject resource is a Capacity Resource with State Subsidy or is not eligible for a competitive exemption pursuant to subsection (4) above, such Capacity Resource shall be subject to the Minimum Offer Price Rule, unless and until ordered to do otherwise by FERC.*

*(B) if the Office of the Interconnection does not provide written notice of suspected fraudulent or material misrepresentation or omission at least sixty-five (65) days before the start of the relevant RPM Auction, then the Office of the Interconnection may file the certification that contains any alleged fraudulent or material misrepresentation or omission with FERC. In such event, if the Office of Interconnection determines that a resource is a Capacity Resource with State Subsidy that is subject to the Minimum Offer Price Rule, the Office of the Interconnection will proceed with administration of the Tariff and market rules on that basis unless and until ordered to do otherwise by FERC. The Office of the Interconnection shall implement any remedies ordered by FERC; and*

*(C) prior to applying the Minimum Offer Price Rule, the Office of the Interconnection, with advice and input of the Market Monitoring Unit, shall notify the affected Capacity Market Seller and, to the extent practicable, provide the Capacity Market Seller an opportunity to explain the alleged fraudulent or material misrepresentation or omission. Any filing to FERC under this provision shall seek fast track treatment and neither the name nor any identifying characteristics of the Capacity Market Seller or the resource shall be publicly revealed, but otherwise the filing shall be public. The Capacity Market Seller may submit a revised certification for that Capacity Resource for subsequent RPM Auctions, including RPM Auctions held during the pendency of the FERC proceeding. In the event that the Capacity*

*Market Seller is cleared by FERC from such allegations of fraudulent or material misrepresentations or omissions then the certification shall be restored to the extent and in the manner permitted by FERC. The remedies required by this subsection to be requested in any filing to FERC shall not be exclusive of any other remedies or penalties that may be pursued against the Capacity Market Seller.*

i) Capacity Export Charges and Credits

(1) Charge

Each Capacity Export Transmission Customer shall incur for each day of each Delivery Year a Capacity Export Charge equal to the Reserved Capacity of Long-Term Firm Transmission Service used for such export ("Export Reserved Capacity") multiplied by (the Final Zonal Capacity Price for such Delivery Year for the Zone encompassing the interface with the Control Area to which such capacity is exported minus the Final Zonal Capacity Price for such Delivery Year for the Zone in which the resources designated for export are located, but not less than zero). If more than one Zone forms the interface with such Control Area, then the amount of Reserved Capacity described above shall be apportioned among such Zones for purposes of the above calculation in proportion to the flows from such resource through each such Zone directly to such interface under CETO/CETL analysis conditions, as determined by the Office of the Interconnection using procedures set forth in the PJM Manuals. The amount of the Reserved Capacity that is associated with a fully controllable facility that crosses such interface shall be completely apportioned to the Zone within which such facility terminates.

(2) Credit

To recognize the value of firm Transmission Service held by any such Capacity Export Transmission Customer, such customer assessed a charge under section 5.14(i)(1) above also shall receive a credit, comparable to the Capacity Transfer Rights provided to Load-Serving Entities under Tariff, Attachment DD, section 5.15. Such credit shall be equal to the locational capacity price difference specified in section 5.14(i)(1) above times the Export Customer's Allocated Share determined as follows:

Export Customer's Allocated Share equals

$$(\text{Export Path Import} * \text{Export Reserved Capacity}) /$$

$$(\text{Export Reserved Capacity} + \text{Daily Unforced Capacity Obligations of all LSEs in such Zone}).$$

Where:

"Export Path Import" means the megawatts of Unforced Capacity imported into the export interface Zone from the Zone in which the resource designated for export is located.

If more than one Zone forms the interface with such Control Area, then the amount of Export Reserved Capacity shall be apportioned among such Zones for purposes of the above calculation in the same manner as set forth in subsection (i)(1) above.



### (3) Distribution of Revenues

Any revenues collected from the Capacity Export Charge with respect to any capacity export for a Delivery Year, less the credit provided in subsection (i)(2) for such Delivery Year, shall be distributed to the Load Serving Entities in the export-interface Zone that were assessed a

Locational Reliability Charge for such Delivery Year, pro rata based on the Daily Unforced Capacity Obligations of such Load-serving Entities in such Zone during such Delivery Year. If more than one Zone forms the interface with such Control Area, then the revenues shall be apportioned among such Zones for purposes of the above calculation in the same manner as set forth in subsection (i)(1) above.

#### **5.14A [Reserved.]**

#### **5.14B Generating Unit Capability Verification Test Requirements Transition Provision for RPM Delivery Years 2014/2015, 2015/2016, and 2016/2017**

A. This transition provision applies only with respect to Generation Capacity Resources with existing capacity commitments for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years that experience reductions in verified installed capacity available for sale as a direct result of revised generating unit capability verification test procedures effective with the summer 2014 capability tests, as set forth in the PJM Manuals. A Generation Capacity Resource meeting the description of the preceding sentence, and the Capacity Market Seller of such a resource, are hereafter in this section 5.14B referred to as an “Affected Resource” and an “Affected Resource Owner,” respectively.

B. For each of its Affected Resources, an Affected Resource Owner is required to provide documentation to the Office of the Interconnection sufficient to show a reduction in installed capacity value as a direct result of the revised capability test procedures. Upon acceptance by the Office of the Interconnection, the Affected Resource’s installed capacity value will be updated in the eRPM system to reflect the reduction, and the Affected Resource’s Capacity Interconnection Rights value will be updated to reflect the reduction, effective June 1, 2014. The reduction’s impact on the Affected Resource’s existing capacity commitments for the 2014/2015 Delivery Year will be determined in Unforced Capacity terms, using the final EFORD value established by the Office of the Interconnection for the 2014/2015 Delivery Year as applied to the Third Incremental Auction for the 2014/2015 Delivery Year, to convert installed capacity to Unforced Capacity. The reduction’s impact on the Affected Resource’s existing capacity commitments for each of the 2015/2016 and 2016/2017 Delivery Years will be determined in Unforced Capacity terms, using the EFORD value from each Sell Offer in each applicable RPM Auction, applied on a pro-rata basis, to convert installed capacity to Unforced Capacity. The Unforced Capacity impact for each Delivery Year represents the Affected Resource’s capacity commitment shortfall, resulting wholly and directly from the revised capability test procedures, for which the Affected Resource Owner is subject to a Capacity Resource Deficiency Charge for the Delivery Year, as described in Tariff, Attachment DD, section 8D, unless the Affected Resource Owner (i) provides replacement Unforced Capacity, as described in Tariff, Attachment DD, section 8.1, prior to the start of the Delivery Year to resolve the Affected Resource’s total

capacity commitment shortfall; or (ii) requests relief from Capacity Resource Deficiency Charges that result wholly and directly from the revised capability test procedures by electing the transition mechanism described in this section 5.14B (“Transition Mechanism”).

C. Under the Transition Mechanism, an Affected Resource Owner may elect to have the Unforced Capacity commitments for all of its Affected Resources reduced for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years to eliminate the capacity commitment shortfalls, across all of its Affected Resources, that result wholly and directly from the revised capability test procedures, and for which the Affected Resource Owner otherwise would be subject to Capacity Resource Deficiency Charges for the Delivery Year. In electing this option, the Affected Resource Owner relinquishes RPM Auction Credits associated with the reductions in Unforced Capacity commitments for all of its Affected Resources for the Delivery Year, and Locational Reliability Charges as described in Tariff, Attachment DD, section 5.14(e) of this Attachment DD are adjusted accordingly. Affected Resource Owners wishing to elect the Transition Mechanism for the 2015/2016 Delivery Year must notify the Office of the Interconnection by May 30, 2014. Affected Resource Owners wishing to elect the Transition Mechanism for the 2016/2017 Delivery Year must notify the Office of the Interconnection by July 25, 2014.

D. The Office of the Interconnection will offset the total reduction (across all Affected Resources and Affected Resource Owners) in Unforced Capacity commitments associated with the Transition Mechanism for the 2015/2016 and 2016/2017 Delivery Years by applying corresponding adjustments to the quantity of Buy Bid or Sell Offer activity in the upcoming Incremental Auctions for each of those Delivery Years, as described in Tariff, Attachment DD, sections 5.12(b)(ii) and 5.12(b)(iii).

E. By electing the Transition Mechanism, an Affected Resource Owner may receive relief from applicable Capacity Resource Deficiency Charges for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years, and a Locational UCAP Seller that sells Locational UCAP based on an Affected Resource owned by the Affected Resource Owner may receive relief from applicable Capacity Resource Deficiency Charges for the 2014/2015 Delivery Year, to the extent that the Affected Resource Owner demonstrates, to the satisfaction of the Office of the Interconnection, that an inability to deliver the amount of Unforced Capacity previously committed for the 2014/2015, 2015/2016, or 2016/2017 Delivery Years is due to a reduction in verified installed capacity available for sale as a direct result of revised generating unit capability verification test procedures effective with the summer 2014 capability tests, as set forth in the PJM Manuals; provided, however, that the Affected Resource Owner must provide the Office of the Interconnection with all information deemed necessary by the Office of the Interconnection to assess the merits of the request for relief.

#### **5.14C Demand Response Operational Resource Flexibility Transition Provision for RPM Delivery Years 2015/2016 and 2016/2017**

A. This transition provision applies only to Demand Resources for which a Curtailment Service Provider has existing RPM commitments for the 2015/2016 or 2016/2017 Delivery Years (alternatively referred to in this section 5.14C as “Applicable Delivery Years” and each an “Applicable Delivery Year”) that (i) cannot satisfy the 30-minute notification requirement as described in Tariff, Attachment DD-1, section A.2 and the parallel provision of RAA, Schedule

6; (ii) are not excepted from the 30-minute notification requirement as described in Tariff, Attachment DD-1, section A.2 and the parallel provision of RAA, Schedule 6; and (iii) cleared in the Base Residual Auction or First Incremental Auction for the 2015/2016 Delivery Year, or cleared in the Base Residual Auction for the 2016/2017 Delivery Year. A Demand Resource meeting these criteria and the Curtailment Service Provider of such a resource are hereafter in this section 5.14C referred to as an “Affected Demand Resource” and an “Affected Curtailment Service Provider,” respectively.

B. For this section 5.14C to apply to an Affected Demand Resource, the Affected Curtailment Service Provider must notify the Office of the Interconnection in writing, with regard to the following information by the applicable deadline:

- i) For each applicable Affected Demand Resource: the number of cleared megawatts of Unforced Capacity for the Applicable Delivery Year by end-use customer site that the Affected Curtailment Service Provider cannot deliver, calculated based on the most current information available to the Affected Curtailment Service Provider; the end-use customer name; electric distribution company’s account number for the end-use customer; address of end-use customer; type of Demand Resource (i.e., Limited DR, Annual DR, Extended Summer DR); the Zone or sub-Zone in which the end-use customer is located; and, a detailed description of why the end-use customer cannot comply with the 30-minute notification requirement or qualify for one of the exceptions to the 30-minute notification requirement provided in Tariff, Attachment DD-1, section A.2 and the parallel provision of RAA, Schedule 6.
- ii) If applicable, a detailed analysis that quantifies the amount of cleared megawatts of Unforced Capacity for the Applicable Delivery Year for prospective customer sales that could not be contracted by the Affected Curtailment Service Provider because of the 30-minute notification requirement provided in Tariff, Attachment DD-1, section A.2 and the parallel provisions of RAA, Schedule 6 that the Affected Curtailment Service Provider cannot deliver, by type of Demand Resource (i.e. Limited DR, Annual DR, Extended Summer DR) and by Zone and sub-Zone, as applicable. The analysis should include the amount of Unforced Capacity expected from prospective customer sales for each Applicable Delivery Year and must include supporting detail to substantiate the difference in reduced sales expectations. The Affected Curtailment Service Provider should maintain records to support its analysis.

1. For the 2015/2016 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Third Incremental Auction for the 2015/2016 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Third Incremental Auction for the 2015/2016 Delivery Year.

2. For the 2016/2017 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Second Incremental Auction for the 2016/2017 Delivery Year. Such Affected

Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Second or Third Incremental Auctions for the 2016/2017 Delivery Year.

3. For the 2016/2017 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Third Incremental Auction for the 2016/2017 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision must not have sold or offered to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Second Incremental Auction for the 2016/2017 Delivery Year, and may not sell or offer to sell megawatts in the modeled LDA or sub-LDA where an Affected Demand Resource is located in the Third Incremental Auction for the 2016/2017 Delivery Year.

C. For the Third Incremental Auction for the 2015/2016 Delivery Year and the First, Second, and Third Incremental Auctions for the 2016/2017 Delivery Year, the Office of the Interconnection shall publish aggregate information on the undeliverable megawatts declared under this transition provision (hereafter, “non-viable megawatts”), by type of Demand Resource and by Zone or sub-Zone, concurrently with its posting of planning parameters for the applicable Scheduled Incremental Auction. Non-viable megawatts for a Scheduled Incremental Auction for an Applicable Delivery Year represent those megawatts meeting the criteria of subsection A above and declared in accordance with subsection B above. Prior to each Third Incremental Auction for an Applicable Delivery Year, the Office of the Interconnection shall apply adjustments equal to the declared non-viable megawatt quantity to the quantity of Buy Bid or Sell Offer activity in the upcoming Scheduled Incremental Auctions for the Applicable Delivery Year, as described in Tariff, Attachment DD, sections 5.12(b)(ii) and 5.12(b)(iii). Prior to the Second Incremental Auction for the 2016/2017 Delivery Year, the Office of the Interconnection shall adjust the recalculated PJM Region Reliability Requirement and recalculated LDA Reliability Requirements, as described in Tariff, Attachment DD, section 5.4(c), by the applicable quantity of declared non-viable megawatts, and shall update the PJM Region Reliability Requirement and each LDA Reliability Requirement for such Second Incremental Auction only if the combined change of the applicable adjustment and applicable recalculation is greater than or equal to the lesser of (i) 500 megawatts or (ii) one percent of the prior PJM Region Reliability Requirement or one percent of the prior LDA Reliability Requirement, as applicable.

D. Prior to the start of each Applicable Delivery Year, the Office of the Interconnection shall reduce, by type of Demand Resource and by Zone or sub-Zone, the capacity commitment of each Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year based on the non-viable megawatts declared by the Affected Curtailment Service Provider under this transition provision. If the Affected Curtailment Service Provider cleared megawatts from multiple Affected Demand Resources of the same type and Zone or sub-Zone, or cleared megawatts in multiple RPM Auctions for the Applicable Delivery Year, the Office of the Interconnection shall allocate the reduction in capacity commitment by type of Demand Resource and by Zone or sub-Zone across the applicable Affected Demand Resources and relevant RPM Auctions. Such allocation shall be performed on a pro-rata basis, based on megawatts cleared by the Affected Demand Resources in the relevant RPM Auctions.

E. For each Applicable Delivery Year, an Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year relinquishes an Affected Demand Resource's RPM Auction Credits for the amount of capacity commitment reduction as determined under subsection D above. Locational Reliability Charges as described in Tariff, Attachment DD, section 5.14(e) are also adjusted accordingly.

#### **5.14D Capacity Performance and Base Capacity Transition Provision for RPM Delivery Years 2016/2017 and 2017/2018**

A. This transition provision applies only for procuring Capacity Performance Resources for the 2016/2017 and 2017/2018 Delivery Years.

B. For both the 2016/2017 and 2017/2018 Delivery Years, PJM will hold a Capacity Performance Transition Incremental Auction to procure Capacity Performance Resources.

1. For each Capacity Performance Transition Incremental Auction, the optimization algorithm shall consider:

- the target quantities of Capacity Performance Resources specified below;
- the Sell Offers submitted in such auction.

The Office of the Interconnection shall submit a Buy Bid based on the quantity of Capacity Performance Resources specified for that Delivery Year. For the 2016/2017 Delivery Year, the Office of the Interconnection shall submit a Buy Bid, at a price no higher than 0.5 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year, for a quantity of Capacity Performance Resources equal to 60 percent of the updated Reliability Requirement for the PJM Region. For the 2017/2018 Delivery Year, the Office of the Interconnection shall submit a Buy Bid, at a price no higher than 0.6 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year, for a quantity of Capacity Performance Resources equal to 70 percent of the updated Reliability Requirement for the PJM Region.

2. For each Capacity Performance Transition Incremental Auction, the Office of the Interconnection shall calculate a clearing price to be paid for each megawatt-day of Unforced Capacity that clears in such auction. For the 2016/2017 Delivery Year, the Capacity Resource Clearing Price for any Capacity Performance Transition Incremental Auction shall not exceed 0.5 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year. For the 2017/2018 Delivery Year, the Capacity Resource Clearing Price for any Capacity Performance Transition Incremental Auction shall not exceed 0.6 times the Net CONE value for the PJM Region determined for the Base Residual Auction for that Delivery Year.

3. A Capacity Market Seller may offer any Capacity Resource that has not been committed in an FRR Capacity Plan, that qualifies as a Capacity Performance Resource under Tariff, Attachment DD, section 5.5A(a) and that (i) has not cleared an RPM Auction for that Delivery Year; or (ii) has cleared in an RPM Auction for that Delivery Year. A Capacity Market

Seller may offer an external Generation Capacity Resource to the extent that such resource: (i) is reasonably expected, by the relevant Delivery Year, to meet all applicable requirements to be treated as equivalent to PJM Region internal generation that is not subject to NERC tagging as an interchange transaction; (ii) has long-term firm transmission service confirmed on the complete transmission path from such resource into PJM; and (iii) is, by written commitment of the Capacity Market Seller, subject to the same obligations imposed on Generation Capacity Resources located in the PJM Region by Tariff, Attachment DD, section 6.6 to offer their capacity into RPM Auctions.

4. Capacity Resources that already cleared an RPM Auction for a Delivery Year, retain the capacity obligations for that Delivery Year, and clear in a Capacity Performance Transition Incremental Auction for the same Delivery Year shall: (i) receive a payment equal to the Capacity Resource Clearing Price as established in that Capacity Performance Transition Incremental Auction; and (ii) not be eligible to receive a payment for clearing in any prior RPM Auction for that Delivery Year.

D. All Capacity Performance Resources that clear in a Capacity Performance Transition Incremental Auction will be subject to the Non-Performance Charge set forth in Tariff, Attachment DD, section 10A.

#### **5.14E Demand Response Legacy Direct Load Control Transition Provision for RPM Delivery Years 2016/2017, 2017/2018, and 2018/2019**

A. This transition provision applies only to Demand Resources for which a Curtailment Service Provider has existing RPM commitments for the 2016/2017, 2017/2018, or 2018/2019 Delivery Years (alternatively referred to in this section 5.14E as “Applicable Delivery Years” and each an “Applicable Delivery Year”) that (i) qualified as Legacy Direct Load Control before June 1, 2016 as described in Tariff, Attachment DD-1, section G and the parallel provision of RAA, Schedule 6; (ii) cannot meet the requirements for using statistical sampling for residential non-interval metered customers as described in Tariff, Attachment DD-1, section K and the parallel provision of RAA, Schedule 6; and (iii) cleared in the Base Residual Auction or First Incremental Auction for the 2016/2017 Delivery Year, cleared in the Base Residual Auction for the 2017/2018 Delivery Year, or cleared in the Base Residual Auction for the 2018/2019 Delivery Year. A Demand Resource meeting these criteria and the Curtailment Service Provider of such a resource are hereafter in this section 5.14E referred to as an “Affected Demand Resource” and an “Affected Curtailment Service Provider,” respectively.

B. For this section 5.14E to apply to an Affected Demand Resource, the Affected Curtailment Service Provider must notify the Office of the Interconnection in writing, with regard to the following information, by the applicable deadline:

- i) For each applicable Affected Demand Resource: the number of cleared megawatts of Unforced Capacity for the Applicable Delivery Year by end-use customer site that the Affected Curtailment Service Provider cannot deliver, calculated based on the most current information available to the Affected Curtailment Service Provider; electric distribution company’s account number for the end-use customer; address of end-use customer; type of Demand Resource (i.e., Limited

DR, Annual DR, Extended Summer DR); the Zone or sub-Zone in which the end-use customer is located; and, a detailed description of why the end-use customer cannot comply with statistical sampling for residential non-interval metered customers requirement as described in Tariff, Attachment DD-1, section K and the parallel provision of RAA, Schedule 6.

- ii) If applicable, a detailed analysis that quantifies the amount of cleared megawatts of Unforced Capacity for the Applicable Delivery Year for prospective customer sales that could not be contracted by the Affected Curtailment Service Provider because of the statistical sampling for residential non-interval metered customers requirement as described in Tariff, Attachment DD-1, section K and the parallel provision of RAA, Schedule 6 that the Affected Curtailment Service Provider cannot deliver, by type of Demand Resource (i.e. Limited DR, Annual DR, Extended Summer DR) and by Zone and sub-Zone, as applicable. The analysis should include the amount of Unforced Capacity expected from prospective customer sales for each Applicable Delivery Year and must include supporting detail to substantiate the difference in reduced sales expectations. The Affected Curtailment Service Provider should maintain records to support its analysis.

1. For the 2016/2017 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the Second and/or Third Incremental Auction for the 2016/2017 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the matching LDA or sub-LDA where an Affected Demand Resource is located in the Second or Third Incremental Auction for the 2016/2017 Delivery Year.

2. For the 2017/2018 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the First, Second and/or Third Incremental Auction for the 2017/2018 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the matching LDA or sub-LDA where an Affected Demand Resource is located in the First, Second or Third Incremental Auctions for the 2017/2018 Delivery Year.

3. For the 2018/2019 Delivery Year, the notice shall be provided by no later than seven (7) days prior to the posting by the Office of the Interconnection of planning parameters for the First, Second and/or Third Incremental Auction for the 2018/2019 Delivery Year. Such Affected Curtailment Service Provider that utilizes this transition provision may not sell or offer to sell megawatts in the matching LDA or sub-LDA where an Affected Demand Resource is located in the First, Second or Third Incremental Auctions for the 2018/2019 Delivery Year.

C. For the Second and Third Incremental Auction for the 2016/2017 Delivery Year, the First, Second, and Third Incremental Auctions for the 2017/2018 Delivery Year, and the First, Second, and Third Incremental Auctions for the 2018/2019 Delivery Year, the Office of the Interconnection shall publish aggregate information on the undeliverable megawatts declared under this transition provision (hereafter, “non-viable megawatts”), by type of Demand Resource and by Zone or sub-Zone, concurrently with its posting of planning parameters for the applicable

Scheduled Incremental Auction. Non-viable megawatts for a Scheduled Incremental Auction for an Applicable Delivery Year represent those megawatts meeting the criteria of subsection A above and declared in accordance with subsection B above. Prior to each Scheduled Incremental Auction for an Applicable Delivery Year, the Office of the Interconnection shall apply adjustments equal to the declared non-viable megawatt quantity to the quantity of Buy Bid or Sell Offer activity in the upcoming Scheduled Incremental Auctions for the Applicable Delivery Year, as described in Tariff, Attachment DD, sections 5.12(b)(ii) and 5.12(b)(iii). Prior to the Second Incremental Auction for the 2016/2017 Delivery Year, the First and Second Incremental Auction for the 2017/2018 Delivery Year, and the First and Second Incremental Auction for the 2018/2019 Delivery Year, the Office of the Interconnection shall adjust the recalculated PJM Region Reliability Requirement and recalculated LDA Reliability Requirements, as described in Tariff, Attachment DD, section 5.4(c), by the applicable quantity of declared non-viable megawatts, and shall update the PJM Region Reliability Requirement and each LDA Reliability Requirement for such Incremental Auction only if the combined change of the applicable adjustment and applicable recalculation is greater than or equal to the lesser of (i) 500 megawatts or (ii) one percent of the prior PJM Region Reliability Requirement or one percent of the prior LDA Reliability Requirement, as applicable.

D. Prior to the start of each Applicable Delivery Year, the Office of the Interconnection shall reduce, by type of Demand Resource and by Zone or sub-Zone, the capacity commitment of each Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year based on the non-viable megawatts declared by the Affected Curtailment Service Provider under this transition provision. If the Affected Curtailment Service Provider cleared megawatts from multiple Affected Demand Resources of the same type and Zone or sub-Zone, or cleared MWs in multiple RPM Auctions for the Applicable Delivery Year, the Office of the Interconnection shall allocate the reduction in capacity commitment by type of Demand Resource and by Zone or sub-Zone across the applicable Affected Demand Resources and relevant RPM Auctions. Such allocation shall be performed on a pro-rata basis, based on megawatts cleared by the Affected Demand Resources in the relevant RPM Auctions.

E. For each Applicable Delivery Year, an Affected Curtailment Service Provider that utilizes this transition provision for the Applicable Delivery Year relinquishes an Affected Demand Resource's RPM Auction credits for the amount of capacity commitment reduction as determined under subsection D above. Locational Reliability Charges as described in Tariff, Attachment DD, section 5.14(e) are also adjusted accordingly.



Section(s) of the  
PJM Reliability Assurance Agreement  
(Clean Format)

## **ARTICLE 1 – DEFINITIONS**

Unless the context otherwise specifies or requires, capitalized terms used herein shall have the respective meanings assigned herein or in the Schedules hereto, or in the PJM Tariff or PJM Operating Agreement if not otherwise defined in this Agreement, for all purposes of this Agreement (such definitions to be equally applicable to both the singular and the plural forms of the terms defined). Unless otherwise specified, all references herein to Articles, Sections or Schedules, are to Articles, Sections or Schedules of this Agreement. As used in this Agreement:

### **Accredited UCAP:**

“Accredited UCAP” shall mean the quantity of Unforced Capacity, as denominated in Effective UCAP, that an ELCC Resource is capable of providing in a given Delivery Year.

### **Agreement:**

“Agreement” shall mean this Reliability Assurance Agreement, together with all Schedules hereto, as amended from time to time.

### **Annual Demand Resource:**

“Annual Demand Resource” shall mean a resource that is placed under the direction of the Office of the Interconnection during the Delivery Year, and will be available for an unlimited number of interruptions during such Delivery Year by the Office of the Interconnection, and will be capable of maintaining each such interruption between the hours of 10:00AM to 10:00PM Eastern Prevailing Time for the months of June through October and the following May, and 6:00AM through 9:00PM Eastern Prevailing Time for the months of November through April unless there is an Office of the Interconnection approved maintenance outage during October through April. The Annual Demand Resource must be available in the corresponding Delivery year to be offered for sale or Self-Supplied in an RPM Auction, or included as an Annual Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

### **Annual Energy Efficiency Resource:**

“Annual Energy Efficiency Resource” shall mean a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of Reliability Assurance Agreement, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the summer and winter periods described in such Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention.

### **Applicable Regional Entity:**

“Applicable Regional Entity” shall have the same meaning as in the PJM Tariff.

**Base Capacity Demand Resource:**

“Base Capacity Demand Resource” shall mean, for the 2018/2019 and 2019/2020 Delivery Years, a resource that is placed under the direction of the Office of the Interconnection and that will be available June through September of a Delivery Year, and will be available to the Office of the Interconnection for an unlimited number of interruptions during such months, and will be capable of maintaining each such interruption for at least a 10-hour duration between the hours of 10:00AM to 10:00PM Eastern Prevailing Time. The Base Capacity Demand Resource must be available June through September in the corresponding Delivery Year to be offered for sale or self-supplied in an RPM Auction, or included as a Base Capacity Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Base Capacity Energy Efficiency Resource:**

“Base Capacity Energy Efficiency Resource” shall mean, for the 2018/2019 and 2019/2020 Delivery Years, a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of RAA, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the summer peak periods as described in Reliability Assurance Agreement, Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Base Capacity Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention.

**Base Capacity Resource:**

“Base Capacity Resource” shall have the same meaning as in Tariff, Attachment DD.

**Base Residual Auction:**

“Base Residual Auction” shall have the same meaning as in Tariff, Attachment DD.

**Behind The Meter Generation:**

“Behind The Meter Generation” shall refer to a generating unit that delivers energy to load without using the Transmission System or any distribution facilities (unless the entity that owns or leases the distribution facilities consented to such use of the distribution facilities and such consent has been demonstrated to the satisfaction of the Office of the Interconnection; provided, however, that Behind The Meter Generation does not include (i) at any time, any portion of such generating unit’s capacity that is designated as a Capacity Resource or (ii) in any hour, any portion of the output of such generating unit that is sold to another entity for consumption at another electrical location or into the PJM Interchange Energy Market.

**Black Start Capability:**

“Black Start Capability” shall mean the ability of a generating unit or station to go from a shutdown condition to an operating condition and start delivering power without assistance from the power system.

**Capacity Emergency Transfer Objective (CETO):**

“Capacity Emergency Transfer Objective” or “CETO” shall mean the amount of electric energy that a given area must be able to import in order to remain within a loss of load expectation of one event in 25 years when the area is experiencing a localized capacity emergency, as determined in accordance with the PJM Manuals. Without limiting the foregoing, CETO shall be calculated based in part on EFORD determined in accordance with Reliability Assurance Agreement, Schedule 5, Paragraph C.

**Capacity Emergency Transfer Limit (CETL):**

Capacity Emergency Transfer Limit” or “CETL” shall mean the capability of the transmission system to support deliveries of electric energy to a given area experiencing a localized capacity emergency as determined in accordance with the PJM Manuals.

**Capacity Import Limit:**

For any Delivery Year up to and including the 2019/2020 Delivery Year, “Capacity Import Limit” shall mean, (a) for the PJM Region, (1) the maximum megawatt quantity of external Generation Capacity Resources that PJM determines for each Delivery Year, through appropriate modeling and the application of engineering judgment, the transmission system can receive, in aggregate at the interface of the PJM Region with all external balancing authority areas and deliver to load in the PJM Region under capacity emergency conditions without violating applicable reliability criteria on any bulk electric system facility of 100kV or greater, internal or external to the PJM Region, that has an electrically significant response to transfers on such interface, minus (2) the then-applicable Capacity Benefit Margin; and (b) for certain source zones identified in the PJM manuals as groupings of one or more balancing authority areas, (1) the maximum megawatt quantity of external Generation Capacity Resources that PJM determines the transmission system can receive at the interface of the PJM Region with each such source zone and deliver to load in the PJM Region under capacity emergency conditions without violating applicable reliability criteria on any bulk electric system facility of 100kV or greater, internal or external to the PJM Region, that has an electrically significant response to transfers on such interface, minus the then-applicable Capacity Benefit Margin times (2) the ratio of the maximum import quantity from each such source zone divided by the PJM total maximum import quantity. As more fully set forth in the PJM Manuals, PJM shall make such determination based on the latest peak load forecast for the studied period, the same computer simulation model of loads, generation and transmission topography employed in the determination of Capacity Emergency Transfer Limit for such Delivery Year, including external facilities from an industry standard model of the loads, generation, and transmission topography of the Eastern Interconnection under peak conditions. PJM shall specify in the PJM Manuals the

areas and minimum distribution factors for identifying monitored bulk electric system facilities that have an electrically significant response to such transfers on the PJM interface. Employing such tools, PJM shall model increased power transfers from external areas into PJM to determine the transfer level at which one or more reliability criteria is violated on any monitored bulk electric system facilities that have an electrically significant response to such transfers. For the PJM Region Capacity Import Limit, PJM shall optimize transfers from other source areas not experiencing any reliability criteria violations as appropriate to increase the Capacity Import Limit. The aggregate megawatt quantity of transfers into PJM at the point where any increase in transfers on the interface would violate reliability criteria will establish the Capacity Import Limit. Notwithstanding the foregoing, a Capacity Resource located outside the PJM Region shall not be subject to the Capacity Import Limit if the Capacity Market Seller seeks an exception thereto by demonstrating to PJM, by no later than five (5) business days prior to the commencement of the offer period for the relevant RPM Auction, that such resource meets all of the following requirements:

(i) it has, at the time such exception is requested, met all applicable requirements to be pseudo-tied into the PJM Region, or the Capacity Market Seller has committed in writing that it will meet such requirements, unless prevented from doing so by circumstances beyond the control of the Capacity Market Seller, prior to the relevant Delivery Year;

(ii) at the time such exception is requested, it has long-term firm transmission service confirmed on the complete transmission path from such resource into PJM; and

(iii) it is, by written commitment of the Capacity Market Seller, subject to the same obligations imposed on Generation Capacity Resources located in the PJM Region by Tariff, Attachment DD, section 6.6 to offer their capacity into RPM Auctions; provided, however, that (a) the total megawatt quantity of all exceptions granted hereunder for a Delivery Year, plus the Capacity Import Limit for the applicable interface determined for such Delivery Year, may not exceed the total megawatt quantity of Network External Designated Transmission Service on such interface that PJM has confirmed for such Delivery Year; and (b) if granting a qualified exception would result in a violation of the rule in clause (a), PJM shall grant the requested exception but reduce the Capacity Import Limit by the quantity necessary to ensure that the total quantity of Network External Designated Transmission Service is not exceeded.

#### **Capacity Only Option:**

“Capacity Only Option” shall mean participation in Emergency Load Response Program or Pre-Emergency Program which allows, pursuant to Tariff, Attachment DD and as applicable, a capacity payment for the ability to reduce load during a pre-emergency or emergency event.

#### **Capacity Performance Resource:**

“Capacity Performance Resource” shall have the same meaning as in Tariff, Attachment DD.

#### **Capacity Resources:**

“Capacity Resources” shall mean megawatts of (i) net capacity from Existing Generation Capacity Resources or Planned Generation Capacity Resources meeting the requirements of the Reliability Assurance Agreement, Schedules 9 and Reliability Assurance Agreement, Schedule 10 that are or will be owned by or contracted to a Party and that are or will be committed to satisfy that Party's obligations under the Reliability Assurance Agreement, or to satisfy the reliability requirements of the PJM Region, for a Delivery Year; (ii) net capacity from Existing Generation Capacity Resources or Planned Generation Capacity Resources not owned or contracted for by a Party which are accredited to the PJM Region pursuant to the procedures set forth in such Schedules 9 and 10; or (iii) load reduction capability provided by Demand Resources or Energy Efficiency Resources that are accredited to the PJM Region pursuant to the procedures set forth in the Reliability Assurance Agreement, Schedule 6.

**Capacity Transfer Right:**

“Capacity Transfer Right” shall have the meaning specified in Tariff, Attachment DD.

**Combination Resource:**

“Combination Resource” shall mean a Generation Capacity Resource that has a component that has the characteristics of a Limited Duration Resource combined with (i) a component that has the characteristics of an Unlimited Resource or (ii) a component that has the characteristics of a Variable Resource.

**Compliance Aggregation Area (CAA):**

“Compliance Aggregation Area” or “CAA” shall have the same meaning as in the Tariff.

**Consolidated Transmission Owners Agreement, PJM Transmission Owners Agreement or Transmission Owners Agreement:**

“Consolidated Transmission Owners Agreement,” “PJM Transmission Owners Agreement” or “Transmission Owners Agreement” shall mean that certain Consolidated Transmission Owners Agreement, dated as of December 15, 2005, by and among the Transmission Owners and by and between the Transmission Owners and PJM Interconnection, L.L.C. on file with the Commission, as amended from time to time.

**Control Area:**

“Control Area” shall mean an electric power system or combination of electric power systems bounded by interconnection metering and telemetry to which a common generation control scheme is applied in order to:

(a) match the power output of the generators within the electric power system(s) and energy purchased from entities outside the electric power system(s), with the load within the electric power system(s);

(b) maintain scheduled interchange with other Control Areas, within the limits of Good Utility Practice;

(c) maintain the frequency of the electric power system(s) within reasonable limits in accordance with Good Utility Practice and the criteria of NERC and each Applicable Regional Entity;

(d) maintain power flows on transmission facilities within appropriate limits to preserve reliability; and

(e) provide sufficient generating capacity to maintain operating reserves in accordance with Good Utility Practice.

**Daily Unforced Capacity Obligation:**

“Daily Unforced Capacity Obligation” shall mean the capacity obligation of a Load Serving Entity during the Delivery Year, determined in accordance with the Reliability Assurance Agreement, Schedule 8 or, as to an FRR Entity, in the Reliability Assurance Agreement, Schedule 8.1.

**Delivery Year:**

“Delivery Year” shall mean a Planning Period for which a Capacity Resource is committed pursuant to the auction procedures specified in Tariff, Attachment DD or pursuant to an FRR Capacity Plan under RAA, Schedule 8.1.

**Demand Resource (DR):**

“Demand Resource” or “DR” shall mean a Limited Demand Resource, Extended Summer Demand Resource, Annual Demand Resource, Base Capacity Demand Resource or Summer-Period Demand Resource with a demonstrated capability to provide a reduction in demand or otherwise control load in accordance with the requirements of RAA, Schedule 6 that offers and that clears load reduction capability in a Base Residual Auction or Incremental Auction or that is committed through an FRR Capacity Plan.

**Demand Resource Factor or DR Factor:**

“Demand Resource Factor” or “DR Factor” shall mean, for Delivery Years through May 31, 2018, that factor approved from time to time by the PJM Board used to determine the unforced capacity value of a Demand Resource in accordance with Reliability Assurance Agreement, Schedule 6

**Demand Resource Officer Certification Form:**

“Demand Resource Officer Certification Form” shall mean a certification as to an intended Demand Resource Sell Offer, in accordance with Reliability Assurance Agreement, Schedule 6 and Reliability Assurance Agreement, Schedule 8.1 and the PJM Manuals.

**Demand Resource Registration:**

“Demand Resource Registration” shall mean a registration in the Full Program Option or Capacity Only Option of the Emergency or Pre-Emergency Load Resource Program in accordance with Tariff, Attachment K-Appendix, section 8.

**Demand Resource Sell Offer Plan:**

“Demand Resource Sell Offer Plan” shall mean the plan required by Reliability Assurance Agreement, Schedule 6 and Reliability Assurance Agreement, Schedule 8.1 in support of an intended offer of Demand Resources in an RPM Auction, or an intended inclusion of Demand Resources in an FRR Capacity Plan.

**Effective Nameplate Capacity:**

“Effective Nameplate Capacity” shall mean (i) for each Variable Resource and Combination Resource, the resource’s Maximum Facility Output; (ii) for each Limited Duration Resource, the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that continuous period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, to the extent that such conditions impact such resource’s capability.

**Effective UCAP:**

“Effective UCAP” shall mean a unit of measure that represents the capacity product transacted in the Reliability Pricing Model and included in FRR Capacity Plans. One megawatt of Effective UCAP has the same capacity value of one megawatt of Unforced Capacity.

**ELCC Class:**

“ELCC Class” shall mean a defined group of ELCC Resources that share a common set of operational characteristics and for which effective load carrying capability analysis, as set forth in RAA, Schedule 9.1, will establish a unique ELCC Class UCAP and corresponding ELCC Class Rating. ELCC Classes shall be defined in the PJM Manuals. ELCC Classes shall be defined such that the members of each ELCC Class are reasonably homogeneous in character and with respect to impact on system resource adequacy. ELCC Classes shall be defined for Limited Duration Resources of no less than four hours duration, and shall include 4-hour, 6-hour, 8-hour, and 10-hour duration characteristics, with matching duration classes for Combination Resources composed in part of one or more such ELCC Classes. Members of an ELCC Class shall share a common method of calculating the ELCC Resource Performance Adjustment,



provided that the individual ELCC Resource Performance Adjustment values will generally differ among ELCC Resources.

**ELCC Class Rating:**

“ELCC Class Rating” shall mean the rating factor, based on effective load carrying capability analysis, that applies to ELCC Resources that are members of an ELCC Class as part of the calculation of their Accredited UCAP.

**ELCC Class UCAP:**

“ELCC Class UCAP” shall mean the aggregate Effective UCAP all modeled ELCC Resources in a given ELCC Class are capable of providing in a given Delivery Year.

**ELCC Portfolio UCAP:**

“ELCC Portfolio UCAP” shall mean the aggregate Effective UCAP that all modeled ELCC Resources are capable of providing in a given Delivery Year.

**ELCC Resource:**

“ELCC Resource” shall mean a Generation Capacity Resource that is a Variable Resource, a Limited Duration Resource, or a Combination Resource.

**ELCC Resource Performance Adjustment:**

“ELCC Resource Performance Adjustment” shall mean the performance of a specific ELCC Resource relative to the aggregate performance of the ELCC Class to which it belongs as further described in RAA, Schedule 9.1, section E.

**Electric Cooperative:**

“Electric Cooperative” shall mean an entity owned in cooperative form by its customers that is engaged in the generation, transmission, and/or distribution of electric energy.

**Electric Distributor:**

“Electric Distributor” shall mean a Member that 1) owns or leases with rights equivalent to ownership of electric distribution facilities that are used to provide electric distribution service to electric load within the PJM Region; or 2) is a generation and transmission cooperative or a joint municipal agency that has a member that owns electric distribution facilities used to provide electric distribution service to electric load within the PJM Region.

**Emergency:**

“Emergency” shall mean (i) an abnormal system condition requiring manual or automatic action to maintain system frequency, or to prevent loss of firm load, equipment damage, or tripping of system elements that could adversely affect the reliability of an electric system or the safety of persons or property; or (ii) a fuel shortage requiring departure from normal operating procedures in order to minimize the use of such scarce fuel; or (iii) a condition that requires implementation of emergency procedures as defined in the PJM Manuals.

#### **End-Use Customer:**

“End-Use Customer” shall mean a Member that is a retail end-user of electricity within the PJM Region. For purposes of Members Committee sector classification, a Member that is a retail end-user that owns generation may qualify as an End-Use customer if: (1) the average physical unforced capacity owned by the Member and its affiliates in the PJM region over the five Planning Periods immediately preceding the relevant Planning Period does not exceed the average PJM capacity obligation for the Member and its affiliates over the same time period; or (2) the average energy produced by the Member and its affiliates within the PJM region over the five Planning Periods immediately preceding the relevant Planning Period does not exceed the average energy consumed by that Member and its affiliates within the PJM region over the same time period. The foregoing notwithstanding, taking retail service may not be sufficient to qualify a Member as an End-Use Customer.

#### **Energy Efficiency Resource:**

“Energy Efficiency Resource” shall mean a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of RAA, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the periods described in Reliability Assurance Agreement, Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention. Annual Energy Efficiency Resources, Base Capacity Energy Efficiency Resources and Summer-Period Energy Efficiency Resources are types of Energy Efficiency Resources.

#### **Exigent Water Storage:**

“Exigent Water Storage” shall mean water stored in the pondage or reservoir of a hydropower resource which is not typically available during normal operating conditions (as those conditions are described in the relevant FERC hydropower license), but which can be drawn upon during emergency conditions (as described in the FERC hydropower license), including in order to avoid a load shed. In an effective load carrying capability analysis, exigent storage capability from an upstream hydro facility can be considered relative to a downstream hydro facility by assessing cascading storage and flows.

**Existing Demand Resource:**

“Existing Demand Resource” shall mean a Demand Resource for which the Demand Resource Provider has identified existing end-use customer sites that are registered for the current Delivery Year with PJM (even if not registered by such Demand Resource Provider) and that the Demand Resource Provider reasonably expects to have under a contract to reduce load based on PJM dispatch instructions by the start of the Delivery Year for which such resource is offered.

**Existing Generation Capacity Resource:**

“Existing Generation Capacity Resource” shall mean, for purposes of the must-offer requirement and mitigation of offers for any RPM Auction for a Delivery Year, a Generation Capacity Resource that, as of the date on which bidding commences for such auction: (a) is in service; or (b) is not yet in service, but has cleared any RPM Auction for any prior Delivery Year. A Generation Capacity Resource shall be deemed to be in service if interconnection service has ever commenced (for resources located in the PJM Region), or if it is physically and electrically interconnected to an external Control Area and is in full commercial operation (for resources not located in the PJM Region). The additional megawatts of a Generation Capacity Resource that is being, or has been, modified to increase the number of megawatts of available installed capacity thereof shall not be deemed to be an Existing Generation Capacity Resource until such time as those megawatts (a) are in service; or (b) are not yet in service, but have cleared any RPM Auction for any prior Delivery Year.

**Extended Summer Demand Resource:**

“Extended Summer Demand Resource” shall mean, for Delivery Years through May 31, 2018, and for FRR Capacity Plans Delivery Years through May 31, 2019, a resource that is placed under the direction of the Office of the Interconnection and that will be available June through October and the following May, and will be available for an unlimited number of interruptions during such months by the Office of the Interconnection, and will be capable of maintaining each such interruption for at least a 10-hour duration between the hours of 10:00AM to 10:00PM Eastern Prevailing Time. The Extended Summer Demand Resource must be available June through October and the following May in the corresponding Delivery Year to be offered for sale or Self-Supplied in an RPM Auction, or included as an Extended Summer Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Facilities Study Agreement:**

“Facilities Study Agreement” shall have the same meaning as in Tariff, Part VI, section 206.

**FERC or Commission:**

“FERC” or “Commission” shall mean the Federal Energy Regulatory Commission or any successor federal agency, commission or department exercising jurisdiction over the Tariff, Operating Agreement and Reliability Assurance Agreement.

**Firm Point-To-Point Transmission Service:**

“Firm Point-To-Point Transmission Service” shall have the meaning specified in the Tariff.

**Firm Service Level:**

“Firm Service Level” or “FSL” of Price Responsive Demand for the 2022/2023 Delivery Year and subsequent Delivery Years shall mean the level, determined at a PRD Substation level, to which Price Responsive Demand shall be reduced during the Delivery Year when an Emergency Action that triggers a Performance Assessment Interval is declared and the Locational Marginal Price exceeds the price associated with such Price Responsive Demand identified by the PRD Provider in its PRD Plan. “Firm Service Level” or “FSL” of Demand Resource shall mean the pre-determined level for which an end-use customer’s load shall be reduced, upon notification from the Curtailment Service Provider’s market operations center or its agent.

**Firm Transmission Service:**

“Firm Transmission Service” shall mean transmission service that is intended to be available at all times to the maximum extent practicable, subject to an Emergency, an unanticipated failure of a facility, or other event beyond the control of the owner or operator of the facility or the Office of the Interconnection.

**Fixed Resource Requirement Alternative or FRR Alternative:**

“Fixed Resource Requirement Alternative” or “FRR Alternative” shall mean an alternative method for a Party to satisfy its obligation to provide Unforced Capacity hereunder, as set forth in the Reliability Assurance Agreement, Schedule 8.1.

**Forecast Pool Requirement:**

“Forecast Pool Requirement” or “FPR” shall mean the amount equal to one plus the unforced reserve margin (stated as a decimal number) for the PJM Region required pursuant to this Reliability Assurance Agreement, as approved by the PJM Board pursuant to Reliability Assurance Agreement, Schedule 4.1.

**FRR Capacity Plan or FRR Plan:**

“FRR Capacity Plan” or “FRR Plan” shall mean a long-term plan for the commitment of Capacity Resources and Price Responsive Demand to satisfy the capacity obligations of a Party that has elected the FRR Alternative, as more fully set forth in the Reliability Assurance Agreement, Schedule 8.1.

**FRR Entity:**

“FRR Entity” shall mean, for the duration of such election, a Party that has elected the FRR Alternative hereunder.

**FRR Service Area:**

“FRR Service Area” shall mean (a) the service territory of an IOU as recognized by state law, rule or order; (b) the service area of a Public Power Entity or Electric Cooperative as recognized by franchise or other state law, rule, or order; or (c) a separately identifiable geographic area that is: (i) bounded by wholesale metering, or similar appropriate multi-site aggregate metering, that is visible to, and regularly reported to, the Office of the Interconnection, or that is visible to, and regularly reported to an Electric Distributor and such Electric Distributor agrees to aggregate the load data from such meters for such FRR Service Area and regularly report such aggregated information, by FRR Service Area, to the Office of the Interconnection; and (ii) for which the FRR Entity has or assumes the obligation to provide capacity for all load (including load growth) within such area. In the event that the service obligations of an Electric Cooperative or Public Power Entity are not defined by geographic boundaries but by physical connections to a defined set of customers, the FRR Service Area in such circumstances shall be defined as all customers physically connected to transmission or distribution facilities of such Electric Cooperative or Public Power Entity within an area bounded by appropriate wholesale aggregate metering as described above.

**Full Program Option:**

“Full Program Option” shall mean participation in Emergency Load Response Program or Pre-Emergency Program which allows, pursuant to Tariff, Attachment DD and as applicable, (i) an energy payment for load reductions during a pre-emergency or emergency event, and (ii) a capacity payment for the ability to reduce load during a pre-emergency or emergency event.

**Full Requirements Service:**

“Full Requirements Service” shall mean wholesale service to supply all of the power needs of a Load Serving Entity to serve end-users within the PJM Region that are not satisfied by its own generating facilities.

**Generation Capacity Resource:**

“Generation Capacity Resource” shall mean a Generating Facility, or the contractual right to capacity from a specified Generating Facility, that meets the requirements of RAA, Schedule 9 and RAA, Schedule 10, and, for Generating Facilities that are committed to an FRR Capacity Plan, that meets the requirements of RAA, Schedule 8.1. A Generation Capacity Resource may be an Existing Generation Capacity Resource or a Planned Generation Capacity Resource.

**Generation Capacity Resource Provider:**

“Generation Capacity Resource Provider” shall mean a Member that owns, or has the contractual authority to control the output of, a Generation Capacity Resource, that has not transferred such authority to another entity.

**Generation Owner:**

“Generation Owner” shall mean a Member that owns or leases with rights equivalent to ownership, or otherwise controls and operates one or more operating generation resources located in the PJM Region. The foregoing notwithstanding, for a planned generation resource to qualify a Member as a Generation Owner, such resource shall have cleared an RPM auction, and for Energy Resources, the resource shall have a FERC-jurisdictional interconnection agreement or wholesale market participation agreement within PJM. Purchasing all or a portion of the output of a generation resource shall not be sufficient to qualify a Member as a Generation Owner. For purposes of Members Committee sector classification, a Member that is primarily a retail end-user of electricity that owns generation may qualify as a Generation Owner if: (1) the generation resource is the subject of a FERC-jurisdictional interconnection agreement or wholesale market participation agreement within PJM; (2) the average physical unforced capacity owned by the Member and its affiliates over the five Planning Periods immediately preceding the relevant Planning Period exceeds the average PJM capacity obligation of the Member and its affiliates over the same time period; and (3) the average energy produced by the Member and its affiliates within PJM over the five Planning Periods immediately preceding the relevant Planning Period exceeds the average energy consumed by the Member and its affiliates within PJM over the same time period.

**Generator Forced Outage:**

“Generator Forced Outage” shall mean an immediate reduction in output or capacity or removal from service, in whole or in part, of a generating unit by reason of an Emergency or threatened Emergency, unanticipated failure, or other cause beyond the control of the owner or operator of the facility, as specified in the relevant portions of the PJM Manuals. A reduction in output or removal from service of a generating unit in response to changes in market conditions shall not constitute a Generator Forced Outage.

**Generator Maintenance Outage:**

“Generator Maintenance Outage” shall mean the scheduled removal from service, in whole or in part, of a generating unit in order to perform repairs on specific components of the facility, if removal of the facility qualifies as a maintenance outage pursuant to the PJM Manuals.

**Generator Planned Outage:**

“Generator Planned Outage” shall mean the scheduled removal from service, in whole or in part, of a generating unit for inspection, maintenance or repair with the approval of the Office of the Interconnection in accordance with the PJM Manuals.

**Good Utility Practice:**

“Good Utility Practice” shall mean any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light

of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather is intended to include acceptable practices, methods, or acts generally accepted in the region; including those practices required by Federal Power Act Section 215(a)(4).

### **Hydropower With Non-Pumped Storage:**

“Hydropower With Non-Pumped Storage” shall mean a hydropower facility that can capture and store incoming stream flow, without use of pumps, in pondage or a reservoir, and the Generation Owner has the ability, within the constraints available in the applicable operating license, to exert material control over the quantity of stored water and output of the facility throughout an Operating Day.

### **Incremental Auction:**

“Incremental Auction” shall mean any of several auctions conducted for a Delivery Year after the Base Residual Auction for such Delivery Year and before the first day of such Delivery Year, including the First Incremental Auction, Second Incremental Auction, Third Incremental Auction, or Conditional Incremental Auction. Incremental Auctions (other than the Conditional Incremental Auction), shall be held for the purposes of:

- (i) allowing Market Sellers that committed Capacity Resources in the Base Residual Auction for a Delivery Year, which subsequently are determined to be unavailable to deliver the committed Unforced Capacity in such Delivery Year (due to resource retirement, resource cancellation or construction delay, resource derating, EFORd increase, a decrease in the Nominated Demand Resource Value of a Planned Demand Resource, delay or cancellation of a Qualifying Transmission Upgrade, or similar occurrences) to submit Buy Bids for replacement Capacity Resources; and
- (ii) allowing the Office of the Interconnection to reduce or increase the amount of committed capacity secured in prior auctions for such Delivery Year if, as a result of changed circumstances or expectations since the prior auction(s), there is, respectively, a significant excess or significant deficit of committed capacity for such Delivery Year, for the PJM Region or for an LDA.

### **IOU:**

“IOU” shall mean an investor-owned utility with substantial business interest in owning and/or operating electric facilities in any two or more of the following three asset categories: generation, transmission, distribution.

### **Limited Demand Resource:**

“Limited Demand Resource” shall mean, for Delivery Years through May 31, 2018, and for FRR Capacity Plans Delivery Years through May 31, 2019, a resource that is placed under the direction of the Office of the Interconnection and that will, at a minimum, be available for interruption for at least 10 Load Management Events during the summer period of June through September in the Delivery Year, and will be capable of maintaining each such interruption for at least a 6-hour duration. At a minimum, the Limited Demand Resource shall be available for such interruptions on weekdays, other than NERC holidays, from 12:00PM (noon) to 8:00PM Eastern Prevailing Time. The Limited Demand Resource must be available during the summer period of June through September in the corresponding Delivery Year to be offered for sale or Self-Supplied in an RPM Auction, or included as a Limited Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Limited Duration Resource:**

“Limited Duration Resource” shall mean a Generation Capacity Resource that is not a Variable Resource, that is not a Combination Resource, and that is not capable of running continuously at Maximum Facility Output for 24 hours or longer. A Capacity Storage Resource is a Limited Duration Resource.

**Load Serving Entity or LSE:**

“Load Serving Entity” or “LSE” shall mean any entity (or the duly designated agent of such an entity), including a load aggregator or power marketer, (i) serving end-users within the PJM Region, and (ii) that has been granted the authority or has an obligation pursuant to state or local law, regulation or franchise to sell electric energy to end-users located within the PJM Region. Load Serving Entity shall include any end-use customer that qualifies under state rules or a utility retail tariff to manage directly its own supply of electric power and energy and use of transmission and ancillary services.

**Locational Reliability Charge:**

“Locational Reliability Charge” shall mean the charge determined pursuant to Operating Agreement, Schedule 8.

**Markets and Reliability Committee:**

“Markets and Reliability Committee” shall mean the committee established pursuant to the Operating Agreement as a Standing Committee of the Members Committee.

**Maximum Emergency Service Level:**

“Maximum Emergency Service Level” or “MESL” of Price Responsive Demand for the 2017/2018 through the 2021/2022 Delivery Years shall mean the level, determined at a PRD Substation level, to which Price Responsive Demand shall be reduced during the Delivery Year when a Maximum Generation Emergency is declared and the Locational Marginal Price exceeds



the price associated with such Price Responsive Demand identified by the PRD Provider in its PRD Plan.

**Member:**

“Member” shall have the meaning provided in the Operating Agreement.

**Members Committee:**

“Members Committee” shall mean the committee specified in Operating Agreement, section 8 composed of the representatives of all the Members.

**NERC:**

“NERC” shall mean the North American Electric Reliability Corporation or any successor thereto.

**Network External Designated Transmission Service:**

“Network External Designated Transmission Service” shall mean the quantity of network transmission service confirmed by PJM for use by a market participant to import power and energy from an identified Generation Capacity Resource located outside the PJM Region, upon demonstration by such market participant that it owns such Generation Capacity Resource, has an executed contract to purchase power and energy from such Generation Capacity Resource, or has a contract to purchase power and energy from such Generation Capacity Resource contingent upon securing firm transmission service from such resource.

**Network Resources:**

“Network Resources” shall have the meaning set forth in the PJM Tariff.

**Network Transmission Service:**

“Network Transmission Service” shall mean transmission service provided pursuant to the rates, terms and conditions set forth in Tariff, Part III or transmission service comparable to such service that is provided to a Load Serving Entity that is also a Transmission Owner.

**Nominal PRD Value:**

“Nominal PRD Value” shall mean, as to any PRD Provider, an adjustment, determined in accordance with Reliability Assurance Agreement, Schedule 6.1, to the peak-load forecast used to determine the quantity of capacity sought through an RPM Auction, reflecting the aggregate effect of Price Responsive Demand on peak load resulting from the Price Responsive Demand to be provided by such PRD Provider.

**Nominated Demand Resource Value:**

“Nominated Demand Resource Value” shall have the meaning specified in Tariff, Attachment DD.

**Non-Retail Behind the Meter Generation:**

“Non-Retail Behind the Meter Generation” shall mean Behind the Meter Generation that is used by municipal electric systems, electric cooperatives, and electric distribution companies to serve load.

**Obligation Peak Load:**

“Obligation Peak Load” shall have the meaning specified in Reliability Assurance Agreement, Schedule 8.

**Office of the Interconnection:**

“Office of the Interconnection” shall mean the employees and agents of PJM Interconnection, L.L.C., subject to the supervision and oversight of the PJM Board, acting pursuant to the Operating Agreement.

**Operating Agreement of the PJM Interconnection, L.L.C., Operating Agreement or PJM Operating Agreement:**

“Operating Agreement of the PJM Interconnection, L.L.C.,” “Operating Agreement” or “PJM Operating Agreement” shall mean that agreement, dated as of April 1, 1997 and as amended and restated as of June 2, 1997, including all Schedules, Exhibits, Appendices, addenda or supplements hereto, as amended from time to time thereafter, among the Members of the PJM Interconnection, L.L.C, on file with the Commission.

**Operating Day:**

“Operating Day” shall have the same meaning as provided in the Operating Agreement.

**Operating Reserve:**

“Operating Reserve” shall mean the amount of generating capacity scheduled to be available for a specified period of an Operating Day to ensure the reliable operation of the PJM Region, as specified in the PJM Manuals.

**Ordinary Water Storage:**

“Ordinary Water Storage” shall mean water stored in the pondage or reservoir of a hydropower resource which is typically available during normal operating conditions pursuant to the FERC license governing the operation of the hydropower resource.

**Other Supplier:**

“Other Supplier” shall mean a Member that: (i) is engaged in buying, selling or transmitting electric energy, capacity, ancillary services, Financial Transmission Rights or other services available under PJM’s governing documents in or through the Interconnection or has a good faith intent to do so, and (ii) is not a Generation Owner, Electric Distributor, Transmission Owner or End-Use Customer.

**Partial Requirements Service:**

“Partial Requirements Service” shall mean wholesale service to supply a specified portion, but not all, of the power needs of a Load Serving Entity to serve end-users within the PJM Region that are not satisfied by its own generating facilities.

**Party:**

“Party” shall mean an entity bound by the terms of the Operating Agreement.

**Peak Shaving Adjustment:**

“Peak Shaving Adjustment” shall mean a load forecast mechanism that allows load reductions by end-use customers to result in a downward adjustment of the summer load forecast for the associated Zone. Any End-Use Customer identified in an approved peak shaving plan shall not also participate in PJM Markets as Price Responsive Demand, Demand Resource, Base Capacity Demand Resource, Capacity Performance Demand Resource, or Economic Load Response Participant.

**Percentage Internal Resources Required:**

“Percentage Internal Resources Required” shall mean, for purposes of an FRR Capacity Plan, the percentage of the LDA Reliability Requirement for an LDA that must be satisfied with Capacity Resources located in such LDA.

**Performance Assessment Interval:**

“Performance Assessment Interval” shall have the meaning specified in Tariff, Attachment DD.

**PJM:**

“PJM” shall mean PJM Interconnection, L.L.C., including the Office of the Interconnection as referenced in the PJM Operating Agreement. When such term is being used in the RAA it shall also include the PJM Board.

**PJM Board:**

“PJM Board” shall mean the Board of Managers of the LLC, acting pursuant to the Operating Agreement, except when such term is being used in Tariff, Attachment M, in which case PJM Board shall mean the Board of Managers of PJM or its designated representative, exclusive of any members of PJM Management.

**PJM Manuals:**

“PJM Manuals” shall mean the instructions, rules, procedures and guidelines established by the Office of the Interconnection for the operation, planning and accounting requirements of the PJM Region.

**PJM Region:**

“PJM Region” shall have the same meaning as provided in the Operating Agreement.

**PJM Region Installed Reserve Margin:**

“PJM Region Installed Reserve Margin” shall mean the percent installed reserve margin for the PJM Region required pursuant to Reliability Assurance Agreement, Schedule 4.1, as approved by the PJM Board.

**PJM Tariff, Tariff, O.A.T.T., OATT or PJM Open Access Transmission Tariff:**

“PJM Tariff,” “Tariff,” “O.A.T.T.,” “OATT” or “PJM Open Access Transmission Tariff” shall mean that certain PJM Open Access Transmission Tariff, including any schedules, appendices, or exhibits attached thereto, on file with FERC and as amended from time to time thereafter.

**Planned Demand Resource:**

“Planned Demand Resource” shall mean any Demand Resource that does not currently have the capability to provide a reduction in demand or to otherwise control load, but that is scheduled to be capable of providing such reduction or control on or before the start of the Delivery Year for which such resource is to be committed, as determined in accordance with the requirements of Reliability Assurance Agreement, Schedule 6. As set forth in Reliability Assurance Agreement, Schedule 6 and Reliability Assurance Agreement, Schedule 8.1, a Demand Resource Provider submitting a DR Sell Offer Plan shall identify as Planned Demand Resources in such plan all Demand Resources in excess of those that qualify as Existing Demand Resources.

**Planned External Generation Capacity Resource:**

“Planned External Generation Capacity Resource” shall mean a proposed Generation Capacity Resource, or a proposed increase in the capability of a Generation Capacity Resource, that (a) is to be located outside the PJM Region, (b) participates in the generation interconnection process of a Control Area external to PJM, (c) is scheduled to be physically and electrically interconnected to the transmission facilities of such Control Area on or before the first day of the Delivery Year for which such resource is to be committed to satisfy the reliability requirements

of the PJM Region, and (d) is in full commercial operation prior to the first day of such Delivery Year, such that it is sufficient to provide the Installed Capacity set forth in the Sell Offer forming the basis of such resource's commitment to the PJM Region. Prior to participation in any Base Residual Auction for such Delivery Year, the Capacity Market Seller must demonstrate that it has a fully executed system impact study agreement (or other documentation which is functionally equivalent to a System Impact Study Agreement under the PJM Tariff) or, for resources which are greater than 20MWs participating in a Base Residual Auction for the 2019/2020 Delivery Year and subsequent Delivery Years, an agreement or other documentation which is functionally equivalent to a Facilities Study Agreement under the PJM Tariff), with the transmission owner to whose transmission facilities or distribution facilities the resource is being directly connected, and, as applicable, the transmission provider. Prior to participating in any Incremental Auction for such Delivery Year, the Capacity Market Seller must demonstrate it has entered into an interconnection agreement, or such other documentation that is functionally equivalent to an Interconnection Service Agreement under the PJM Tariff, with the transmission owner to whose transmission facilities or distribution facilities the resource is being directly connected, and, as applicable, the transmission provider. A Planned External Generation Capacity Resource must provide evidence to PJM that it has been studied as a Network Resource, or such other similar interconnection product in such external Control Area, must provide contractual evidence that it has applied for or purchased transmission service to be deliverable to the PJM border, and must provide contractual evidence that it has applied for transmission service to be deliverable to the bus at which energy is to be delivered, the agreements for which must have been executed prior to participation in any Reliability Pricing Model Auction for such Delivery Year. Any such resource shall cease to be considered a Planned External Generation Capacity Resource as of the earlier of (i) the date that interconnection service commences as to such resource; or (ii) the resource has cleared an RPM Auction, in which case it shall become an Existing Generation Capacity Resource for purposes of the mitigation of offers for any RPM Auction for all subsequent Delivery Years.

#### **Planned Generation Capacity Resource:**

“Planned Generation Capacity Resource” shall mean a Generation Capacity Resource, or additional megawatts to increase the size of a Generation Capacity Resource that is being or has been modified to increase the number of megawatts of available installed capacity thereof, participating in the generation interconnection process under Tariff, Part IV, Subpart A, as applicable, for which: (i) Interconnection Service is scheduled to commence on or before the first day of the Delivery Year for which such resource is to be committed to RPM or to an FRR Capacity Plan; (ii) for any such resource seeking to offer into a Base Residual Auction, or for any such resource of 20 MWs or less seeking to offer into a Base Residual Auction, a System Impact Study Agreement (or, for resources for which a System Impact Study Agreement is not required, has such other agreement or documentation that is functionally equivalent to a System Impact Study Agreement) has been executed prior to the Base Residual Auction for such Delivery Year; (iii) for any such resource of more than 20 MWs seeking to offer into a Base Residual Auction for the 2019/2020 Delivery Year and subsequent Delivery Years, a Facilities Study Agreement (or, for resources for which a Facilities Study Agreement is not required, has such other agreement or documentation that is functionally equivalent to a Facility Studies Agreement) has been executed prior to the Base Residual Auction for such Delivery Year; and

(iv) an Interconnection Service Agreement has been executed prior to any Incremental Auction for such Delivery Year in which such resource plans to participate. For purposes of the must-offer requirement and mitigation of offers for any RPM Auction for a Delivery Year, a Generation Capacity Resource shall cease to be considered a Planned Generation Capacity Resource as of the earlier of (i) the date that Interconnection Service commences as to such resource; or (ii) the resource has cleared an RPM Auction for any Delivery Year, in which case it shall become an Existing Generation Capacity Resource for any RPM Auction for all subsequent Delivery Years.

**Planning Period:**

“Planning Period” shall mean the 12 months beginning June 1 and extending through May 31 of the following year, or such other period approved by the Members Committee.

**PRD Curve:**

“PRD Curve” shall mean a price-consumption curve at a PRD Substation level, if available, and otherwise at a Zonal (or sub-Zonal LDA, if applicable) level, that details the base consumption level of Price Responsive Demand and the decreasing consumption levels at increasing prices.

**PRD Provider:**

“PRD Provider” shall mean (i) a Load Serving Entity that provides PRD; or (ii) an entity without direct load serving responsibilities that has entered contractual arrangements with end-use customers served by a Load Serving Entity that satisfy the eligibility criteria for Price Responsive Demand.

**PRD Provider’s Zonal Expected Peak Load Value of PRD:**

“PRD Provider’s Zonal Expected Peak Load Value of PRD” shall mean the expected contribution to Delivery Year peak load of a PRD Provider’s Price Responsive Demand, were such demand not to be reduced in response to price, based on the contribution of the end-use customers comprising such Price Responsive Demand to the most recent prior Delivery Year’s peak demand, escalated to the Delivery Year in question, as determined in a manner consistent with the Office of the Interconnection’s load forecasts used for purposes of the RPM Auctions.

**PRD Reservation Price:**

“PRD Reservation Price” shall mean 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.

**PRD Substation:**

“PRD Substation” shall mean an electrical substation that is located in the same Zone or in the same sub-Zonal LDA as the end-use customers identified in a PRD Plan or PRD registration and

that, in terms of the electrical topography of the Transmission Facilities comprising the PJM Region, is as close as practicable to such loads.

**Price Responsive Demand:**

“Price Responsive Demand” or “PRD” shall mean end-use customer load registered by a PRD Provider pursuant to Reliability Assurance Agreement, Schedule 6.1 that have, as set forth in more detail in the PJM Manuals, the metering capability to record electricity consumption at an interval of one hour or less, Supervisory Control capable of curtailing such load (consistent with applicable RERRA requirements) at each PRD Substation identified in the relevant PRD Plan or PRD registration in response to a Maximum Generation Emergency declared by the Office of the Interconnection (prior to 2022/2023 Delivery Year) or a Performance Assessment Interval that triggers a PRD performance assessment (effective with 2022/2023 Delivery Year), and a retail rate structure, or equivalent contractual arrangement, capable of changing retail rates as frequently as an hourly basis, that is linked to or based upon changes in real-time Locational Marginal Prices at a PRD Substation level and that results in a predictable automated response to varying wholesale electricity prices.

**Price Responsive Demand Credit:**

“Price Responsive Demand Credit” shall mean a credit, based on committed Price Responsive Demand, as determined under Reliability Assurance Agreement, Schedule 6.1.

**Price Responsive Demand Plan or PRD Plan:**

“Price Responsive Demand Plan” or “PRD Plan” shall mean a plan, submitted by a PRD Provider and received by the Office of the Interconnection in accordance with Reliability Assurance Agreement, Schedule 6.1 and procedures specified in the PJM Manuals, claiming a peak demand limitation due to Price Responsive Demand to support the determination of such PRD Provider’s Nominal PRD Value.

**Public Power Entity:**

“Public Power Entity” shall mean any agency, authority, or instrumentality of a state or of a political subdivision of a state, or any corporation wholly owned by any one or more of the foregoing, that is engaged in the generation, transmission, and/or distribution of electric energy.

**Qualifying Transmission Upgrades:**

“Qualifying Transmission Upgrades” shall have the meaning specified in Tariff, Attachment DD.

**Relevant Electric Retail Regulatory Authority:**

“Relevant Electric Retail Regulatory Authority” or “RERRA” shall have the meaning specified in the PJM Operating Agreement.

**Reliability Principles and Standards:**

“Reliability Principles and Standards” shall mean the principles and standards established by NERC or an Applicable Regional Entity to define, among other things, an acceptable probability of loss of load due to inadequate generation or transmission capability, as amended from time to time.

**Required Approvals:**

“Required Approvals” shall mean all of the approvals required for the Operating Agreement to be modified or to be terminated, in whole or in part, including the acceptance for filing by FERC and every other regulatory authority with jurisdiction over all or any part of the Operating Agreement.

**Self-Supply:**

“Self-Supply” shall have the meaning provided in Tariff, Attachment DD.

**Small Commercial Customer:**

“Small Commercial Customer” shall have the same meaning as in the PJM Tariff.

**State Consumer Advocate:**

“State Consumer Advocate” shall mean a legislatively created office from any State, all or any part of the territory of which is within the PJM Region, and the District of Columbia established, inter alia, for the purpose of representing the interests of energy consumers before the utility regulatory commissions of such states and the District of Columbia and the FERC.

**State Regulatory Structural Change:**

“State Regulatory Structural Change” shall mean as to any Party, a state law, rule, or order that, after September 30, 2006, initiates a program that allows retail electric consumers served by such Party to choose from among alternative suppliers on a competitive basis, terminates such a program, expands such a program to include classes of customers or localities served by such Party that were not previously permitted to participate in such a program, or that modifies retail electric market structure or market design rules in a manner that materially increases the likelihood that a substantial proportion of the customers of such Party that are eligible for retail choice under such a program (a) that have not exercised such choice will exercise such choice; or (b) that have exercised such choice will no longer exercise such choice, including for example, without limitation, mandating divestiture of utility-owned generation or structural changes to such Party’s default service rules that materially affect whether retail choice is economically viable.

**Summer-Period Demand Resource:**



Summer-Period Demand Resource shall mean, for the 2020/2021 Delivery Year and subsequent Delivery Years, a resource that is placed under the direction of the Office of the Interconnection, and will be available June through October and the following May of the Delivery Year, and will be available for an unlimited number of interruptions during such months by the Office of the Interconnection, and will be capable of maintaining each such interruption between the hours of 10:00AM to 10:00PM Eastern Prevailing Time. The Summer-Period Demand Resource must be available June through October and the following May in the corresponding Delivery Year to be offered for sale in an RPM Auction, or included as a Summer-Period Demand Resource in an FRR Capacity Plan for the corresponding Delivery Year.

**Summer-Period Energy Efficiency Resource:**

Summer-Period Energy Efficiency Resource shall mean, for the 2020/2021 Delivery Year and subsequent Delivery Years, a project, including installation of more efficient devices or equipment or implementation of more efficient processes or systems, meeting the requirements of Reliability Assurance Agreement, Schedule 6 and exceeding then-current building codes, appliance standards, or other relevant standards, designed to achieve a continuous (during the summer peak periods as described in Reliability Assurance Agreement, Schedule 6 and the PJM Manuals) reduction in electric energy consumption that is not reflected in the peak load forecast prepared for the Delivery Year for which the Summer-Period Energy Efficiency Resource is proposed, and that is fully implemented at all times during such Delivery Year, without any requirement of notice, dispatch, or operator intervention.

**Supervisory Control:**

“Supervisory Control” shall mean the capability to curtail, in accordance with applicable RERRA requirements, load registered as Price Responsive Demand at each PRD Substation identified in the relevant PRD Plan or PRD registration in response to a Maximum Generation Emergency declared by the Office of the Interconnection. Except to the extent automation is not required by the provisions of the Operating Agreement, the curtailment shall be automated, meaning that load shall be reduced automatically in response to control signals sent by the PRD Provider or its designated agent directly to the control equipment where the load is located without the requirement for any action by the end-use customer.

**Threshold Quantity:**

“Threshold Quantity” shall mean, as to any FRR Entity for any Delivery Year, the sum of (a) the Unforced Capacity equivalent (determined using the Pool-Wide Average EFORD) of the Installed Reserve Margin for such Delivery Year multiplied by the Preliminary Forecast Peak Load for which such FRR Entity is responsible under its FRR Capacity Plan for such Delivery Year, plus (b) the lesser of (i) 3% of the Unforced Capacity amount determined in (a) above or (ii) 450 MW. If the FRR Entity is not responsible for all load within a Zone, the Preliminary Forecast Peak Load for such entity shall be the FRR Entity’s Obligation Peak Load last determined prior to the Base Residual Auction for such Delivery Year, times the Base FRR Scaling Factor (as determined in accordance with Reliability Assurance Agreement, Schedule 8.1).

**Transmission Facilities:**

“Transmission Facilities” shall mean facilities that: (i) are within the PJM Region; (ii) meet the definition of transmission facilities pursuant to FERC’s Uniform System of Accounts or have been classified as transmission facilities in a ruling by FERC addressing such facilities; and (iii) have been demonstrated to the satisfaction of the Office of the Interconnection to be integrated with the PJM Region transmission system and integrated into the planning and operation of the PJM Region to serve all of the power and transmission customers within the PJM Region.

**Transmission Owner:**

“Transmission Owner” shall mean a Member that owns or leases with rights equivalent to ownership Transmission Facilities and is a signatory to the PJM Transmission Owners Agreement. Taking transmission service shall not be sufficient to qualify a Member as a Transmission Owner.

**Unforced Capacity:**

“Unforced Capacity” shall mean installed capacity rated at summer conditions that is not on average experiencing a forced outage or forced derating, calculated for each Capacity Resource on the 12-month period from October to September without regard to the ownership of or the contractual rights to the capacity of the unit.

**Unlimited Resource:**

“Unlimited Resource” shall mean a generating unit having the ability to maintain output at a stated capability continuously on a daily basis without interruption. An Unlimited Resource is a Generation Capacity Resource that is not an ELCC Resource.

**Variable Resource:**

“Variable Resource” shall mean a Generation Capacity Resource with output that can vary as a function of its energy source, such as wind, solar, run of river hydroelectric power without storage, and landfill gas units without an alternate fuel source. All Intermittent Resources are Variable Resources, with the exception of Hydropower with Non-Pumped Storage.

**Winter Peak Load (or WPL):**

“Winter Peak Load” or “WPL” shall mean the average of the Demand Resource customer’s specific peak hourly load between hours ending 7:00 EPT through 21:00 EPT on the PJM defined 5 coincident peak days from December through February two Delivery Years prior the Delivery Year for which the registration is submitted. Notwithstanding, if the average use between hours ending 7:00 EPT through 21:00 EPT on a winter 5 coincident peak day is below 35% of the average hours ending 7:00 EPT through 21:00 EPT over all five of such peak days, then up to two such days and corresponding peak demand values may be excluded from the

calculation. Upon approval by the Office of the Interconnection, a Curtailment Service Provider may provide alternative data to calculate Winter Peak Load, as outlined in the PJM Manuals, when there is insufficient hourly load data for the two Delivery Years prior to the relevant Delivery Year or if more than two days meet the exclusion criteria described above.

**Zonal Capacity Price:**

“Zonal Capacity Price” shall mean the clearing price required in each Zone to meet the demand for Unforced Capacity and satisfy Locational Deliverability Requirements for the LDA or LDAs associated with such Zone. If the Zone contains multiple LDAs with different Capacity Resource Clearing Prices, the Zonal Capacity Price shall be a weighted average of the Capacity Resource Clearing Prices for such LDAs, weighted by the Unforced Capacity of Capacity Resources cleared in each such LDA.

**Zone or Zonal:**

“Zone” or “Zonal” shall refer to an area within the PJM Region, as set forth in Tariff, Attachment J and RAA, Schedule 15, or as such areas may be (i) combined as a result of mergers or acquisitions or (ii) added as a result of the expansion of the boundaries of the PJM Region. A Zone shall include any Non-Zone Network Load located outside the PJM Region that is served from such Zone under Tariff, Attachment H-A.

**Zonal Winter Weather Adjustment Factor (ZWWAF):**

“Zonal Winter Weather Adjustment Factor” or “ZWWAF” shall mean the PJM zonal winter weather normalized coincident peak divided by PJM zonal average of 5 coincident peak loads in December through February.

## **SCHEDULE 9**

### **PROCEDURES FOR ESTABLISHING THE CAPABILITY OF GENERATION CAPACITY RESOURCES**

- A.** Such rules and procedures as may be required to determine and demonstrate the capability of Generation Capacity Resources for the purposes of meeting a Load Serving Entity's obligations under the Agreement shall be developed by the Office of the Interconnection and maintained in the PJM Manuals.
- B.** The rules and procedures shall recognize the difference in the relative ability of units to maintain output at stated capability over a specified period of time. Factors affecting such ability include, but are not limited to, fuel availability, stream flow *and/or reservoir storage* for hydro units, *energy storage capability* for *Energy Storage Resources*, *energy source variability and intermittency*, mechanical limitations, and system operating policies. *For this purpose, the basis for determining and demonstrating the capability of a particular generating unit shall be as described in RAA, Schedule 9.1.*

**C. Provisions for Unlimited Resources**

For Unlimited Resources, the capability of the generating unit is based on the level of output that the unit can provide under the site conditions expected to exist at the time of PJM system peak load where such conditions include, but are not limited to, ambient air temperature, humidity, barometric pressure, intake water temperature, and cooling system performance. Generating units with the ability to operate continuously across all hours of an Operating Day without interruption if needed include, but are not limited to, nuclear and fossil-fired steam units, combined cycle units, combustion turbine units, reciprocating engine units, and fuel cell units.

**D. Provisions for ELCC Resources**

The Office of the Interconnection shall determine the capability of ELCC Resources to meet a Load Serving Entity's obligations under the Agreement using an effective load carrying capability analysis, as set forth in RAA, Schedule 9.1, with additional implementation details provided in the PJM Manuals.

## **SCHEDULE 9.1: EFFECTIVE LOAD CARRYING CAPABILITY ANALYSIS**

### **A. Overview of Effective Load Carrying Capability Analysis**

The inputs of the effective load carrying capability analysis include:

- Historical weather and load data;
- Historical output of existing Variable Resources;
- Estimates of putative historical output for planned Variable Resources;
- Forced outage patterns for Unlimited Resources;
- Resource deployment forecast; and
- Modeling parameters for Limited Duration Resources and Combination Resources.

The outputs of the effective load carrying capability analysis include:

- The ELCC Portfolio UCAP, in MW;
- ELCC Class UCAP values, in MW; and
- ELCC Class Rating values, in percent.

### **B. Calculation of ELCC Portfolio UCAP**

The effective load carrying capability analysis shall identify a scenario in which the aggregate installed capacity “X” of a group of Unlimited Resources with no outages yields the same annual loss of load expectation as the one produced by the scenario with all ELCC Resources that are expected to offer in a given RPM Auction, or otherwise provide capacity, in the Delivery Year being analyzed. The ELCC Portfolio UCAP shall be the value “X”.

### **C. Allocation from ELCC Portfolio UCAP to ELCC Class UCAP**

The ELCC Portfolio UCAP shall be allocated to each ELCC Class UCAP, in accordance with the applicable effective load carrying capability analysis methodology specified in the PJM Manuals, as subject to adjustment in accordance with RAA, Schedule 9.1, section J, such that the aggregate of all ELCC Class UCAP values is equal to the ELCC Portfolio UCAP.

### **D. Calculation of ELCC Class Rating**

(1) The ELCC Class Rating of Variable Resources and Limited Duration Resources shall be the ratio of the applicable ELCC Class UCAP to the aggregate Effective Nameplate Capacity of the modeled ELCC Resources of that ELCC Class that are expected to offer in a given RPM Auction, or otherwise provide capacity, in the Delivery Year being analyzed.

(2) For Combination Resources, there shall be an ELCC Class Rating for each component.

(i) For a Combination Resource with a Limited Duration Resource component and a Variable Resource component, the Limited Duration Resource component ELCC Class Rating shall be equal to the quotient of (1) the Combination Resource ELCC Class UCAP minus the [product of the Variable Resource ELCC Class Rating and the aggregate Effective Nameplate Capacity of all the Variable Resource components within the subject Combination Resource class] divided by (2) the aggregate equivalent Effective Nameplate Capacity of all the Limited Duration Resource components within the subject Combination Resource class, and the Variable Resource component ELCC Class Rating shall be equal to the ELCC Class Rating for the ELCC Class to which the Variable Resource component would belong if it were not a component of the Combination Resource.

(ii) For a Combination Resource with a Limited Duration Resource component and an Unlimited Resource component, the Limited Duration Resource component ELCC Class Rating shall be equal to the ELCC Class Rating for the ELCC Class to which the Limited Duration Resource component would belong if it were not a component of the Combination Resource, and the Unlimited Resource component would not have an ELCC Class Rating.

**E. Calculation of Accredited UCAP and ELCC Resource Performance Adjustment**

(1) (a) For Variable Resources and Limited Duration Resources, Accredited UCAP values shall be equal to the product of:

- (i) the Effective Nameplate Capacity;
- (ii) the applicable ELCC Class Rating; and
- (iii) the ELCC Resource Performance Adjustment.

(b) For Combination Resources, Accredited UCAP values shall be equal to the sum of the Accredited UCAP of each component, but not to exceed the Maximum Facility Output of the resource, where:

- (i) The value for a Variable Resource component shall be determined in accordance with subsection (a) above.
- (ii) The value for a Limited Duration Resource component shall be equal to the product of:
  - (A) the Effective Nameplate Capacity determined for the Limited Duration Resource component;

(B) [one minus the EFORD for the Limited Duration Resource component]; and

(C) the applicable Limited Duration Resource component ELCC Class Rating as determined in Section D(2)(i).

(iii) The value for an Unlimited Resource component shall be equal to the product of the installed capacity of the Unlimited Resource component and [one minus the EFORD for the Unlimited Resource component].

(iv) The Accredited UCAP for Hydropower With Non-Pumped Storage, and for each member of an ELCC Class whose members are so distinct from one another that a single ELCC Class Rating fails to capture their physical characteristics, shall be based on a resource-specific effective load carrying capability analysis based on the resource's unique parameters.

(2) The ELCC Resource Performance Adjustment shall be calculated according to the following methods, as further detailed in the PJM Manuals:

(a) For a Variable Resource: based on a metric consisting of the average of (1) actual output during the 200 highest coincident peak load hours over the preceding ten years, regardless of the years in which they occur, and (2) actual output during the 200 highest coincident peak putative net load hours over the preceding ten years, regardless of the years in which they occur, where putative net load is actual load minus the putative hourly output of Variable Resources based on the resource mix of the target year. For Planned Resources or resources less than 10 years old, estimated hypothetical historical output will be used to develop this metric. For a given resource or component, the Performance Adjustment shall equal the ratio of such metric to the average (weighted by the Effective Nameplate Capacity) of such metrics for all units in the applicable Variable Resource ELCC Class.

(b) For Limited Duration Resources: based on EFORD.

(c) For Combination Resources with only an Unlimited Resource component and a Limited Duration Resource component: based on EFORD.

(d) For Combination Resources with a Variable Resource component (except for Hydropower With Non-Pumped Storage): (1) based on the direct metered or estimated output of the Variable Resource component, which is then assessed according to the methodology described in subsection (a) above for Variable Resources and in accordance with the PJM Manuals; and (2) based on the EFORD that is applicable to the Limited Duration Resource component.

(e) For Hydropower With Non-Pumped Storage and other Combination Resources that do not fall into the above categories: based on EFORD.

#### **F. Installed Capacity of ELCC Resources**

Rules and procedures for technically determining and demonstrating the installed capacity of ELCC Resources shall be developed by the Office of the Interconnection and maintained in the PJM Manuals. The installed capacity of a Limited Duration Resource is based on the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, as described in the PJM Manuals. The installed capacity of a Combination Resource (other than Hydropower With Non-Pumped Storage) is based on the lesser of the Maximum Facility Output or the sum of the equivalent Effective Nameplate Capacity values of the resource's constituent components considered on a stand-alone basis.

#### **G. Details of the Effective Load Carrying Capability Methodology**

The effective load carrying capability analysis shall compare expected hourly load levels (based on historical weather) with the expected hourly output of the expected future resource mix in order to identify the relative resource adequacy value of the portfolio of all ELCC Classes, as well of each individual ELCC Class, compared to a group of Unlimited Resources with no outages. In performing this analysis, the model inputs shall be scaled to meet the annual loss of load expectation of the Office of the Interconnection. The effective load carrying capability analysis shall compare hourly values for: (i) expected load based on historical weather; (ii) expected Variable Resource output; and (iii) expected output of Limited Duration Resources and of Combination Resources as described below. These expected quantities are based on actual values for load and actual and putative values for Variable Resource output (standalone or as a component of Combination Resources) after June 1, 2012 (inclusive) through the most recent Delivery Year for which complete data exist. For resources that have not existed each year since June 1, 2012, putative output is an estimate of the hourly output that resource would have produced in a historical hour if that resource had existed in that hour. This putative output estimate is developed based on historical weather data consistent with the particular site conditions for each such resource in accordance with the PJM Manuals.

The effective load carrying capability analysis shall simulate forced outages of Unlimited Resources based on actual historical data, and shall simulate the output of Limited Duration Resources and Combination Resources based on their Office of the Interconnection-validated parameters, including the putative output of the Variable Resource component of Combination Resources, as described above. Forced outages of Limited Duration Resources and Combination Resources shall not be simulated in the effective load carrying capability analysis.



The quantity of deployed resources studied in the analysis shall be based on resource deployment forecasts and, where applicable, on available information based on Sell Offers submitted in RPM Auctions or Fixed Resource Requirement plans for the applicable Delivery Year.

The ELCC Class UCAP and other results of the effective load carrying capability analysis shall be based on the total Effective UCAP of the ELCC Class as a whole.

The ELCC Class UCAP and corresponding ELCC Class Rating values may increase or decrease from year to year as the expected resource mix and load shape change.

Energy Resources are not included in the effective load carrying capability analysis. Generating units that are expected to only offer or otherwise provide a portion of their Accredited UCAP for that Delivery Year are represented in the analysis in proportion to the expected quantity offered or delivered divided by the Accredited UCAP.

#### **H. Methodology to Simulate Output of Certain Resources in the Effective Load Carrying Capability Model**

The effective load carrying capability analysis shall simulate the output of Limited Duration Resources and Combination Resources based on their physical parameters, including limited storage capability, and shall simulate the deployment of Demand Resources. The analysis shall simulate output from the subject Limited Duration Resources and Combination Resources in hours in which all output from Unlimited Resources and available output from Variable Resources is insufficient to meet load. The output of the subject Limited Duration Resources and Combination Resources shall be simulated on an hour-by-hour basis in proportion to their Effective Nameplate Capacity without foresight to future hours. The simulated deployment of Demand Resources shall be such that there is adequate Primary Reserves provided by economic resources, if sufficient simulated Demand Resources are available. Primary Reserves shall be assigned to generation resources in order to maximize simulated reliability, provided that assignments to Limited Duration Resources and Combination Resources shall be pro rata according to their Effective Nameplate Capacity. Primary Reserves shall be exhausted prior to identifying a loss of load event in the analysis. Energy Storage Resource charging is during hours with sufficient margin, including between daily peaks if necessary.

#### **I. Administration of Effective Load Carrying Capability Analysis**

The Office of the Interconnection shall post final ELCC Class UCAP and ELCC Class Rating values at least once per year in a report that also includes appropriate details regarding methodology and inputs. The Office of the Interconnection shall post this report and shall communicate ELCC Resource Performance Adjustment values to applicable Generation Capacity Resource Providers no later than five months prior to the start of the target Delivery Year, as described in the PJM Manuals. Starting with the 2023/2024 Delivery Year, Accredited UCAP values for the applicable Delivery Year shall establish the maximum Unforced Capacity

that an ELCC Resource can physically provide or offer to provide in the applicable Delivery Year.

The Office of the Interconnection shall also post preliminary ELCC Class Rating values for nine subsequent Delivery Years. For any Delivery Year for which a final ELCC Class Rating has not been posted and a preliminary ELCC Class Rating has been posted, the Accredited UCAP of an ELCC Resource for such Delivery Year shall be based on the most recent preliminary ELCC Class Rating value for that Delivery Year, together with the most recently calculated ELCC Resource Performance Adjustment value for that ELCC Resource. Except to the extent specified above or otherwise specified, the preliminary ELCC Class Rating values for future years are non-binding and are only for indicative purposes. A Generation Capacity Resource Provider can offer or provide capacity from an ELCC Resource that is not subject to a capacity market must offer obligation (as specified in Tariff, Attachment DD, Section 6.6) at a level less than the Accredited UCAP for such resource.

In order to facilitate the effective load carrying capability analysis, the Generation Capacity Resource Provider of each ELCC Resource must submit to the Office of the Interconnection the required information as specified in the PJM Manuals by no later than six months prior to an RPM Auction in which the ELCC Resource intends to submit a Sell Offer or otherwise commit to provide capacity, except for Delivery Years prior to the 2026/2027 Delivery Year such required information must be provided to the Office of the Interconnection in accordance with the PJM Manuals. The required information may include relevant physical parameters, relevant historical data such as weather data and actual or estimated historical energy output, and documentation supporting such parameters and historical data. The relevant physical parameters are those that are incorporated into the effective load carrying capability analysis. The parameters required for Hydropower With Non-Pumped Storage shall include Ordinary Water Storage and any applicable Exigent Water Storage. Submitted parameters must indicate the expected duration for which any submitted physical parameters are valid.

The Office of the Interconnection shall evaluate, validate, and approve the foregoing information in accordance with the process set forth in the PJM Manuals. In evaluating the validity of submitted information, the Office of the Interconnection may assess the consistency of such information with observed conditions. If the Office of the Interconnection observes that the information provided by the Generation Capacity Resource Provider of the ELCC Resource is inconsistent with observed conditions, the Office of the Interconnection will coordinate with the Generation Capacity Resource Provider of the ELCC Resource to understand the information and observed conditions before making a determination regarding the validity of the applicable parameters. The Office of the Interconnection may engage the services of a consultant with technical expertise to evaluate the foregoing information.

After the Office of the Interconnection has completed its evaluation of the foregoing information, the Office of the Interconnection shall notify the Generation Capacity Resource Provider in

writing whether the submitted information is considered invalid by no later than September 1 following the submission of the information. The Office of the Interconnection's determination on the validity of the foregoing information shall continue for the applicable Delivery Year and, if requested, for such longer period as the Office of the Interconnection may determine is supported by the data.

In the event that the Office of the Interconnection is unable to validate any of the required information, physical parameters, supporting documentation, or other related information submitted by the Generation Capacity Resource Provider of an ELCC Resource, then the Office of the Interconnection shall calculate Accredited UCAP values for that ELCC Resource based only on the validated information. Such ELCC Resource shall not be permitted to offer or otherwise provide capacity above such Accredited UCAP values until the Office of the Interconnection determines new Accredited UCAP values for such resource.

Generation Capacity Resource Providers of ELCC Resources that are hydropower plants with water storage must provide documentation to support the physical parameters provided for expected load carrying capability analysis modeling, as specified in the PJM Manuals. This documentation must: (a) support the plant's physical capabilities; (b) demonstrate that the parameters do not violate any federal, state, river basin, or other applicable authority operating limitations of the plant; and (c) demonstrate full authorization from FERC, any river basin commissions, and any other applicable authorities to meet those capabilities.

## **J. ELCC Transition Mechanism**

(1) A transition mechanism shall be established whereby PJM shall post floor values establishing a lower bound on the ELCC Class Ratings that apply to ELCC Resources in the determination of each ELCC Resource's Accredited UCAP. This transition mechanism can be evaluated at any time and shall be evaluated in conjunction with a quadrennial periodic review of the shape of the Variable Resource Requirement Curve, as described in Tariff, Attachment DD, section 5.10, no later than the end of 2026. Such evaluation shall include an assessment of the efficacy and appropriateness of the transition mechanism and shall make recommendations as to whether some or all aspects of the transition mechanism should be reconsidered through a stakeholder process. The already-established floor values and associated term duration for each cohort should apply for their entire term, as described below, regardless of the outcome of such evaluation, except as described in subsection (3)(f) below.

For purposes of implementing this transition mechanism, ELCC Resources shall be organized into annual cohorts. Each cohort shall share an associated table of floor values on the ELCC Class Ratings spanning the duration described below. Floor values shall be calculated using effective load carrying capability analysis for future years, applying a resource mix that reflects more conservative ELCC Class Ratings than expected, as set forth in subsection (3)(d) below.

Floor values shall be posted on an annual cycle, each posting of which shall include floor values for no more than ten calendar years in the future.

Tables of floor values will apply for the Delivery Years as specified below. For new ELCC Resources, the ELCC Class Rating floor values contemplated by this RAA, Schedule 9.1, section J shall apply upon:

- (a) completion of one of the following milestones in the New Services Queue: (i) execution of an Interconnection Service Agreement by the Interconnection Customer, or equivalent, for the ELCC Resource; (ii) execution of a Wholesale Market Participation Agreement by the wholesale market participant, or equivalent, for the ELCC Resource; or (iii) posting credit to submit a Sell Offer into the next Base Residual Auction, pursuant to the applicable RPM Auction Credit Rate; and
- (b) receipt by the Office of the Interconnection of a written attestation, in a form specified in the PJM Manuals, by the Generation Capacity Resource Provider of the ELCC Resource affirming the Generation Capacity Resource Provider's intent to proceed to provide capacity in the PJM Region. Such attestation shall be provided to the Office of the Interconnection after reaching one of the milestones identified in subsection (a) above.

(2) Cohorts

(a) **2021 Cohort.** A table of floor values for Delivery Years 2021/22 through 2033/34 shall apply to ELCC Resources that on or before December 31, 2021 are Existing Generation Capacity Resources or satisfy the requirements of RAA, Schedule 9.1, section J(1)(a) and (b) above. A table of preliminary ELCC Class Rating floor values for Delivery Years 2021/2022 through 2030/2031 shall be posted within six months of this Schedule 9.1 becoming effective but no later than December 31, 2021; preliminary floor values for Delivery Years 2031/2032, 2032/2033, and 2033/2034 shall be posted on or before December 31 of 2022, 2023, and 2024, respectively.

(b) **2022 Cohort.** A table of floor values for Delivery Years 2022/23 through 2034/35 shall apply to ELCC Resources that meet the requirements in RAA, Schedule 9.1, section J(1)(a) and (b) above on or after January 1, 2022 and on or before December 31, 2022. Preliminary floor values for Delivery Years 2022/2023 through 2031/2032 shall be posted on or before December 31, 2021; preliminary floor values for Delivery Years 2032/2033, 2033/2034, and 2034/2035 shall be posted on or before December 31 of 2022, 2023, and 2024, respectively.

(c) **2023 Cohorts and later.** For each of the thirteen consecutive Delivery Years beginning with the Delivery Year that starts in the calendar year in which an ELCC

Resource meets the requirements in RAA, Schedule 9.1, section J(1)(a) and (b) above, a set of ELCC Class Rating floor values shall apply to such ELCC Resource. Preliminary floor values for the first ten Delivery Years in the table shall be posted on or before December 31 prior to the first Delivery Year to which a floor value applies; preliminary floor values for Delivery Years eleven, twelve, and thirteen shall be posted on or before December 31 of each of the immediately following three calendar years, respectively. This timing is reflected in the below table, where “X” is the year in which the ELCC Resource meets the requirements in RAA, Schedule 9.1, section J(1)(a) and (b) above.

<b>Calendar Year In which Floor Values Are Posted for Cohort “X”</b>	<b>Target Delivery Year</b>	<b>ELCC Class Rating Floor for Cohort X</b>
X-1	X/X+1	Value I
X-1	X+1/X+2	Value II
X-1	X+2/X+3	Value III
X-1	X+3/X+4	Value IV
X-1	X+4/X+5	Value V
X-1	X+5/X+6	Value VI
X-1	X+6/X+7	Value VII
X-1	X+7/X+8	Value VIII
X-1	X+8/X+9	Value IX
X-1	X+9/X+10	Value X
X	X+10/X+11	Value XI
X+1	X+11/X+12	Value XII
X+2	X+12/X+13	Value XIII

Preliminary floor values shall be finalized within 120 days of posting. Upon posting the preliminary floor values, the Office of the Interconnection shall conduct a retrospective review to determine if any potential errors occurred in its implementation of this section J, whereby the potential error, if verified, could have a material impact on the posted preliminary floor values. In the event the Office of the Interconnection discovers such a potential error within 60 days of posting such preliminary floor value, the Office of the Interconnection will notify Market Participants of the existence of the potential error as soon as possible, but in no event later than 60 days after posting the applicable preliminary floor value. Within 45 days of identifying a potential error in a preliminary floor value, the Office of the Interconnection shall consult with Market Participants, and provide all available supporting documentation (such documentation shall not contain market sensitive or confidential information), prior to determining whether to modify an initially posted preliminary floor value. If the Office of the Interconnection

determines it is necessary to modify an initially posted preliminary floor value, it shall notify Market Participants of its intent to do so and post such notification on its website by no later than 45 days following the notification of a discovery of a potential error in the preliminary floor value. The Office of the Interconnection shall post on its website the corrected floor value by no later than 120 days following the initial posting of the preliminary floor value. Should any of the above deadlines pass without the associated action on the part of the Office of the Interconnection, the originally posted floor values will be considered final.

To the extent an ELCC Resource satisfies the requirements of RAA, Schedule 9.1, section J(1)(a) and (b) above on or after the January 1 following the posting of the preliminary floor value applicable to that ELCC Resource, and within 60 days of such posting, and the Office of the Interconnection identifies a potential error with respect to that floor value, the Generation Capacity Resource Provider may elect for the ELCC Resource to be included in the cohort for the prior calendar year. Any election to be included in the cohort for the prior calendar year must be provided in writing to the Office of the Interconnection within 10 days after the Office of the Interconnection consults with Market Participants regarding the potential error.

(3) General Rules for ELCC Class Rating Floor Values

(a) In a given annual posting cycle, for floor values that are ten years in the future and therefore have not previously been posted, the same floor value shall be posted for use across all cohorts of an ELCC Class for a given Delivery Year for which such floor will be applicable.

(b) For a given resource, at the end of the term of applicability of the original set of ten floor values, as extended with three additional floor values, the rules in place at that time for determining Accredited UCAP (or otherwise determining the amount of Unforced Capacity that such resource is eligible to offer or provide) will apply.

(c) The ELCC Class Rating used to determine the Accredited UCAP of an ELCC Resource is the greater of the applicable floor value or the most recently posted final or preliminary ELCC Class Rating for the target Delivery Year.

(d) The ELCC Class Rating floor values for each ELCC Class shall be calculated using the same form of effective load carrying capability analysis used for calculating ELCC Class Ratings for future years, except that the forecasted resource mix used for calculating the ELCC Class Ratings (the “expected forecast”) shall be adjusted for the calculation of the floor value for each ELCC Class (the “floor forecast”) in order to reflect a more conservative ELCC Class Rating value. Each ELCC Class shall have a unique floor forecast that accounts for the interaction among ELCC Classes, both the given subject ELCC Class and the other ELCC Classes, through adjusting (up or down) the rate of deployment expected for each ELCC Class. The floor forecast for a given

ELCC Class of Variable Resources or Limited Duration Resources shall be developed according to the following method:

- (i) Any expected increase in deployment of ELCC Resources in the given subject class in each year shall be accelerated in an exponential fashion such that the increase in deployment after 10 years shall be twice the value in the expected forecast.
- (ii) For ELCC Resources in ELCC Classes other than the given subject ELCC Class that show a complementary interaction with the given subject class in the effective load carrying capability analysis, where a complementary interaction occurs in the case that the increase in deployment of the complementary class tends to increase the ELCC Class Rating of the subject class, any expected increase in deployment in a complementary ELCC Class shall be decelerated in an exponential fashion such that the increase in deployment after ten years shall be half the value in the expected forecast; any expected decrease in deployment in a complementary ELCC Class shall be accelerated in an exponential fashion such that the decrease in deployment after ten years shall be twice the value in the expected forecast.
- (iii) For ELCC Resources in ELCC Classes showing an antagonistic interaction with the given subject class in the effective load carrying capability analysis, where an antagonistic interaction occurs in the case that the increase in deployment of the antagonistic class tends to decrease the ELCC Class Rating of the subject class, any expected increase in deployment in an antagonistic class shall be accelerated in an exponential fashion such that the increase in deployment after ten years shall be twice the value in the expected forecast; any expected decrease in deployment in an antagonistic class shall be decelerated in an exponential fashion such that the decrease in deployment after ten years shall be half the value in the expected forecast.

For Combination Resources, the applicable floor values will be determined in accordance with a procedure set forth in the PJM Manuals that appropriately reflects and merges the floor values determined for the distinct components of the Combination Resource in a manner consistent with the methodology above.

However, for Hydropower With Non-Pumped Storage, the applicable floor values will be determined, using the foregoing method, on a resource-specific basis and not on an ELCC Class basis.

- (e) The ELCC Class Rating used to determine an Accredited UCAP shall not be below the applicable floor value. ELCC Classes shall be organized into groups for the purpose

of sharing the risk that a final or preliminary ELCC Class Rating for a Delivery Year is lower than the corresponding ELCC Class Rating in any table of floor values for such Delivery Year. In that event,

(i) for ELCC Resources with a final or preliminary ELCC Class Rating below the applicable floor value, the Accredited UCAP shall be determined using the ELCC Resource's ELCC Resource Performance Adjustment, in accordance with the methods set forth in RAA, Schedule 9.1, section E, and the applicable ELCC Class Rating floor value;

(ii) for ELCC Resources with a final or preliminary ELCC Class Rating above the applicable floor value, the Accredited UCAP shall be determined using the ELCC Resource's ELCC Resource Performance Adjustment, in accordance with the methods set forth in RAA, Schedule 9.1, section E, and the ELCC Class Rating, which is determined in accordance with the methodology set forth in RAA, Schedule 9.1, section D, except that (1) the value used in place of ELCC Class UCAP is equal to [the sum of the ELCC Class UCAP for each ELCC Class of the subject group minus the sum of the Accredited UCAP of the ELCC Resources that are accredited based on floor values], which in turn is allocated to each ELCC Class in accordance with the methodology specified in the PJM Manuals that is consistent with the allocation methodology of RAA, Schedule 9.1, section C for allocating the ELCC Portfolio UCAP among the ELCC Classes, then further adjusted by a factor based on ELCC Resource Performance Adjustment values such that the total Accredited UCAP of all resources of each class does not exceed the ELCC Class UCAP and (2) the relevant aggregate Effective Nameplate Capacity shall be the sum of the Effective Nameplate Capacity of the members of the ELCC Class that are accredited based on a final or preliminary ELCC Class Rating above the applicable floor value.

Provided, however, if the aggregate ELCC Class UCAP of the entire group is less than the aggregate Accredited UCAP of the ELCC Resources of the group that are accredited based on floor values, then the ELCC Class Rating for ELCC Resources with a final or preliminary ELCC Class Rating above the applicable floor value shall be determined in accordance with the methodology set forth in RAA, Schedule 9.1, section D, except that (3) the value used in place of ELCC Class UCAP is equal to [the ELCC Portfolio UCAP minus the aggregate Accredited UCAP of the resources of the group that are accredited based on floor values] which in turn is allocated to each ELCC Class in accordance with the methodology specified in the PJM Manuals that is consistent with the allocation methodology of RAA, Schedule 9.1, section C for allocating the ELCC Portfolio UCAP among the ELCC Classes, then further adjusted by a factor based on



ELCC Resource Performance Adjustment values such that the total Accredited UCAP of all resources of each class does not exceed the ELCC Class UCAP, and (4) the relevant aggregate Effective Nameplate Capacity shall be the sum of the Effective Nameplate Capacity of the members of the ELCC Class that are accredited based on a final or preliminary ELCC Class Rating above the applicable floor value.

ELCC Class groups shall be defined in the PJM Manuals. The groups shall be defined in accordance with the following principles: (1) each group shall be composed of ELCC Classes that shall share relevant physical characteristics; and (2) each group is broad enough to include a significant fraction of the ELCC Portfolio UCAP, with consideration given to ELCC Classes that are expected to increase in deployment over the ten-year term of the effective load carrying capability analysis.

(f) While recognizing the general principle that the floor values already issued for a specific resource generally would not be changed, the limited circumstances under which the posted final floor values could be changed include: (i) the Office of the Interconnection no longer performs the effective load carrying capability analysis set forth in this RAA, Schedule 9.1; or (ii) the Office of the Interconnection no longer determines Accredited UCAP prior to conducting an RPM Auction.

Nothing in RAA, Schedule 9.1 is intended to constrain the authority of the PJM Board in any way. The Office of the Interconnection and the PJM Board retain all of their filing rights, including the right to file with FERC as needed to: (iii) change the effective load carrying capability constructs and the effective load carrying capability analysis; (iv) change the methodology specified in this section J for calculating floors that are to be posted in the future; and (v) cease the posting of new floor values. None of the foregoing shall provide a basis for a new transition period or any other form of compensation to a Generation Capacity Resource Provider.

(g) The applicable table of floor values will continue to apply even if an ELCC Resource offers less than their Accredited UCAP.

(h) For purposes of determining floor values in this section J, uprates to individual ELCC Resources are treated as if each uprate is a separate ELCC Resource. The total Accredited UCAP of an ELCC Resource, including all uprates, shall be the sum of the respective Accredited UCAP values.

(i) The floor value applicable to an ELCC Resource is not transferable to a different ELCC Resource.

## Attachment C

Affidavit of Dr. Patricio Rocha Garrido on  
Behalf of PJM Interconnection, L.L.C.

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

**PJM Interconnection, L.L.C.**

)  
)

**Docket No. ER21-\_\_\_\_-000**

**AFFIDAVIT OF DR. PATRICIO ROCHA GARRIDO  
ON BEHALF OF PJM INTERCONNECTION, L.L.C.**

1. My name is Dr. Patricio Rocha Garrido. My business address is 2750 Monroe Blvd., Audubon, Pennsylvania, 19403. I am a Senior Engineer in Resource Adequacy Planning in the System Planning division of PJM Interconnection, L.L.C. ("PJM"). I am submitting this affidavit on behalf of PJM in support of its Federal Power Act section 205 proposal in this proceeding.
2. Specifically, in this affidavit, I provide support for PJM's proposal to establish an Effective Load Carrying Capability ("ELCC") construct.

**Qualifications**

3. I joined PJM in 2011. As a Senior Lead Engineer with the Resource Adequacy Planning department, I am responsible for performing long-term resource adequacy studies involving loss-of-load probability calculations whose results serve as inputs into PJM's Reliability Pricing Model as well as PJM's Regional Expansion Transmission Plan. I have also collaborated with PJM's planning and operations groups in projects related to long-term load forecasting, short-term solar forecasting, and net-interchange schedule forecasting models. Prior to joining PJM, as a graduate student/research assistant, I performed research and wrote articles on topics pertinent to restructured electricity markets, namely generation capacity expansion and financial transmission rights. I am a member of the IEEE Power and Energy Society and a participant in interregional resource adequacy working groups.
4. I hold a Bachelor of Science degree in Industrial Engineering from the University of La Frontera-Chile, and a Masters and Ph.D. degree in Industrial Engineering from the University of South Florida.

**Analytical Methodology and Dispatch.**

**Overview**

5. PJM's capacity market, the Reliability Pricing Model ("RPM"), is a construct in which Market Participants submit an offer composed of a price component (in \$/megawatts-day) and a quantity component (in megawatts ("MW")). The megawatt units in both components are denominated in Unforced Capacity ("UCAP"). This denomination is intended to reflect the megawatts that, on-average, resources can be expected to deliver when the PJM system is experiencing reliability issues. Assuming transmission conditions are adequate in the

system, reliability issues can occur when load is high, resource unavailability is high, or under a combination of both these conditions.

6. To ensure that the market outcome is competitive, the megawatts offered by resource owners into the market must be comparable, i.e., 1 megawatt offered by Resource A must be comparable to 1 megawatt offered by Resource B. Achieving comparability between offered megawatts is straightforward for Unlimited Resources due to the fact that the large majority of unplanned outages experienced by these resources are random, which means that the chance of having a large amount of these resources on an outage simultaneously is small. Hence, high penetration of Unlimited Resources is not associated with the occurrence of reliability issues due to high resource unavailability and an off-the-shelf metric that simply quantifies the frequency of random outages, such as the Equivalent Demand Forced Outage Rate (“EFORD”), is appropriate to establish the UCAP value of a resource that belongs to the Unlimited Resources category.
7. For other resource categories, such as Variable Resources, Limited Duration Resources, and Combination Resources, the calculation of EFORD may not be feasible and, even if feasible, the EFORD metric is not adequate to establish the UCAP-equivalent for ELCC Resources, i.e., the “Accredited UCAP,” of such resources because: (i) the outages experienced by these resources are not random and instead have established patterns that may cause a large quantity of the resources to be unavailable simultaneously, potentially causing system reliability issues; and/or (ii) the duration limitations of a large quantity of these resources may be reached simultaneously, potentially causing system reliability issues. In other words, a high penetration level of these resource types is associated with the occurrence of reliability issues due to the potential for high resource unavailability.
8. Currently, PJM has alternative rules in place to calculate the UCAP value of the resource types that will now be categorized as Variable Resources, Limited Duration Resources, and Combination Resources. However, these rules are also inadequate because they do not capture the fact that a high penetration level of these resource types is associated with the occurrence of reliability issues due to the potential for high resource unavailability. Furthermore, these rules tend to be broad and/or inaccurate in the way they attempt to represent hours in which the PJM system is expected to experience reliability issues. For instance, the current rules for a subset of Variable Resources, wind and solar resources, use the performance period between hour ending 1500 and hour ending 1800 of every day from June 1 to August 31.<sup>1</sup> This is clearly very broad as PJM is not expected to experience reliability issues 368 hours every summer. Another example is the current rule used for Limited Duration Resources which is based on requiring resources to have a sustained performance level during a period of 10 hours. This rule is also inadequate because it implies that all system reliability issues are expected to have a duration of exactly 10 hours.
9. Developing an adequate methodology to calculate the Accredited UCAP value of Variable Resources, Limited Duration Resources, and Combination Resources requires estimating

---

<sup>1</sup> PJM Manual 21: *Rules and Procedures for Determination of Generating Capability*, Revision: 14 at Appendix B (Calculating Capacity Values for Wind and Solar Capacity Resources) (July 25, 2019), <https://www.pjm.com/-/media/documents/manuals/m21.ashx>.

the performance of these resources during system reliability events, while taking into account that the penetration level of these resources may cause some of the system reliability events. To achieve this, it is necessary to simulate the PJM system under a given portfolio of resources as well as multiple load scenarios and resource performance scenarios.

10. ELCC is a methodology that calculates the amount of additional peak load that a system can serve at a constant reliability level once an additional amount of resources X is added to the system. To perform the calculation, the system is simulated twice: first, under a portfolio that does not include the additional resources X and then, under a portfolio that includes the additional resources X (the simulations also include multiple load scenarios and resource performance scenarios). Both simulated cases must maintain a constant level of reliability, where reliability is measured using a metric such as Loss of Load Expectation (“LOLE”) or other reliability metric. The megawatt-difference in peak load between the second case and the first case constitutes the ELCC of the additional resources X. This value is a good reflection of the expected performance of the additional resources X during system reliability events and, therefore, a good proxy for Accredited UCAP value. There are some variations (described later in this affidavit) to the ELCC methodology as applied to Variable Resources, Limited Duration Resources, and Combination Resources intended to make the ELCC result compatible with the rules employed to estimate the UCAP value of Unlimited Resources. In general, however, the key elements of the ELCC methodology are as described above.
11. PJM is proposing to use ELCC as the methodology to calculate the Accredited UCAP value of Variable Resources, Limited Duration Resources, and Combination Resources. In practice, an ELCC Resource’s Accredited UCAP value corresponds to the maximum amount of megawatts of capacity that such a resource can offer or provide in PJM.

### **ELCC Inputs**

12. PJM’s proposed ELCC methodology models the performance of resource portfolios under a range of future system conditions. The inputs determining the range of future system conditions are Load Uncertainty and Resource Performance Uncertainty. The resulting range of future system conditions can be denominated as ELCC Scenarios. Each one of the ELCC Scenarios has a probability of occurrence associated with it. Therefore, the ELCC methodology is probabilistic in nature.
13. To yield an Accredited UCAP value that is applicable to an entire delivery year, the ELCC Scenarios must cover a full delivery year. Due to data availability and software capabilities, PJM is proposing to perform the ELCC analysis on an hourly basis. Therefore, in general, each ELCC Scenario will cover 8,760 hours (if a specific scenario is meant to represent a leap year, then such a scenario will cover 8,784 hours).
14. Modeling Load Uncertainty in the ELCC methodology entails deriving multiple 8,760 Hourly Load Scenarios to cover a range of load conditions. PJM is proposing to consider the following components to derive the Hourly Load Scenarios:

- a) Hourly Load Shapes. The ELCC model is prospective in the sense that it simulates future system conditions. One of the key system conditions is load. It is complex to forecast future hourly load shapes because of the challenges associated with: i) forecasting weather (as well as other variables that can impact hourly loads); and ii) capturing the temporal dependency between hourly load values. A simplified approach to forecast future hourly load shapes is to assume that a future hourly load shape is likely to resemble historical hourly load shapes. PJM is proposing to follow this simplified approach. A range of future Hourly Load Shapes (“HLS”) will be derived consistent with: (i) actual weather experienced during historical years; and (ii) the most recent PJM load forecast model. Specifically, the actual weather during the historical years will be input into the PJM load forecast model to derive HLS for a future target delivery year. This step, which involves using the PJM load forecast model, ensures that the resulting HLS reflects expected changes in load patterns due to a variety of factors whose future impact on load conditions may differ from what history may indicate. Examples of such factors include: behind-the-meter solar resource penetration; plug-in hybrid penetration levels; and peak load shaving behavior. Initially, PJM is proposing to derive HLS with weather/load data from the period 2012/2013 Delivery Year thru 2019/2020 Delivery Year (this would yield a total of 8 HLS). To capture a wide range of load conditions, PJM is also proposing to roll in more weather/load data as this data becomes available in future years. The choice of not using weather/load data prior to 2012/2013 Delivery Year is dictated by the unavailability or sparsity of wind and solar performance data during that period. As I discuss later, wind and solar performance is dependent on weather in the same way that load is dependent on weather; therefore, the ELCC model should attempt to preserve the correlation between load and wind/solar performance. Inclusion of HLS built with data from certain historical years (i.e., prior to the 2012/2013 Delivery Year) when wind/solar performance data is not available for those years would be inconsistent with this ELCC model development principle.
- b) Probability for each HLS. The HLS described above represent different load shape scenarios for a future delivery year. Therefore, each HLS must have an associated probability of occurrence. If the number of HLS is sufficiently large (i.e., 50 or greater), then it would be fair to assume that each HLS is equally likely to occur. However, if the number of HLS is not sufficiently large, as in the PJM proposal, the probability of occurrence of each HLS must be estimated so that the impact of any potential outlier HLS is properly assessed. PJM is proposing to estimate the probability of occurrence of each HLS through the following procedure:
- i. Gather the monthly peak load values produced by the weather scenarios (~300 scenarios) used in the PJM load forecast process. These weather scenarios are derived using weather data from the most recent ~20 years.
  - ii. Calculate the summer and winter peaks for each of the ~300 weather scenarios, then use cluster analysis (k-means algorithm, specifically) to group the weather scenarios represented by pairs (summer peak, winter peak) into a limited set of clusters. The result of this step provides information such as: there are X% of

the ~300 weather scenarios in a cluster C that is representative of extreme summer peaks and extreme winter peaks.

- iii. Determine the summer and winter peaks in the HLS. For instance, if there are 8 HLS, there will be 8 pairs (summer peak, winter peak).
  - iv. For each pair in the previous step, determine the most representative cluster based on the summer and winter peak values. For instance, if year 1 has an HLS with an extreme summer peak and an extreme winter peak, then the year 1 HLS is representative of the cluster C with extreme summer and extreme winter peaks. The probability assigned to year 1 is P1%, which is the share of weather scenarios in cluster C with an extreme summer peak and an extreme winter peak (out of the ~300 weather scenarios).
- c) Variability for each HLS. In addition to the HLS and the probabilities associated with them, it is necessary to model some variability around the HLS. The reason for this is illustrated via the following example: when an HLS is identified as representative of a cluster C with extreme summer and winter peaks, it cannot be assumed that the specific HLS is the only way in which a year with extreme summer and winter peaks can materialize. Instead, there are possible variations around the HLS that are also representative of the cluster. This component is concerned with deriving those possible variations. The derivation process employs the cluster's monthly peak load values produced by the weather scenarios used in the PJM load forecast process. For instance, if the HLS for year 1 is representative of cluster C, then the monthly peak load values from the S weather scenarios in cluster C are used to derive the variability for the year 1 HLS. The procedure to derive the variability is as follows:
- i. Identify the monthly peaks from the weather scenarios in the cluster that the HLS is representative of.
  - ii. Using the 12 monthly peak load values from the representative cluster's weather scenarios, determine the parameters of a multivariate normal distribution. A multivariate normal distribution is used instead of a normal distribution to account for correlation between monthly peak loads.
  - iii. Using Monte Carlo sampling and the multivariate normal distribution, derive 1,000 variation scenarios for each of the HLS. These variations are the Hourly Load Scenarios for each HLS.
15. Modeling Resource Performance Uncertainty in the ELCC methodology entails deriving the hourly output of each resource associated with each Hourly Load Scenario. The procedure to derive the hourly output differs by resource category and/or resource class.
- a. Unlimited Resources. Though Unlimited Resources are not the focus of the ELCC methodology calculation (because there are adequate rules to calculate the UCAP of such resources), their patterns of availability and unavailability must be modeled to capture their impact on the occurrence of system reliability issues. The metrics that are

key to model these availability/unavailability patterns are the Effective Equivalent Forced Outage Rate – Demand (“EEFORd”), the Equivalent Planned Outage Factor (“EPOF”), and the Equivalent Maintenance Outage Factor (“EMOF”). Jointly, these metrics capture all the types of outages that Unlimited Resources experience. From the EEFORd metric, two additional metrics can be derived for each unit: the Mean Time to Failure (“MTTF”) and the Mean Time to Repair (“MTTR”). PJM is proposing to calculate these metrics for each unit based on historical Generator Availability Data System (“GADS”) data from the most recent 5-year period prior to running the ELCC methodology. PJM is also proposing to use Monte Carlo sampling to derive the availability/unavailability patterns related to forced outages and a deterministic scheduling algorithm to derive the availability/unavailability patterns related to planned and maintenance outages. Five assumptions underlie the Unlimited Resources modeling: (i) units can only experience full forced outages (i.e., partial outages are not explicitly modeled by the Monte Carlo sampling; they are captured, to some extent, in the MTTF and MTTR metrics); (ii) the time a unit is not on a forced outage is a random variable assumed to be exponentially distributed where the sole parameter of the distribution is the MTTF; (iii) the time a unit is on a forced outage is a random variable assumed to be exponentially distributed where the sole parameter of the distribution is the MTTR; (iv) the scheduling of planned outages and maintenance outages is performed taking into account the simulated load scenarios to reflect the fact that these types of outages largely do not occur during peak load periods; and (v) all of the above assumptions apply to the modeling used in all weeks of the year except the winter peak week; for the winter peak week, PJM is proposing to use the approach currently used in PJM’s main resource adequacy study, the Reserve Requirement Study, that is intended to reflect the amount of concurrent outages that historically have occurred under winter peak conditions. Using the above modeling assumptions and principles, PJM will develop 1,000 scenarios for each of the HLS reflecting hourly availability/unavailability of Unlimited Resources.

- b. Variable Resources. The focus of the ELCC methodology calculation includes Variable Resources. As noted earlier, ELCC is an appropriate methodology to calculate the Accredited UCAP value of ELCC Resources, such as Variable Resources, because it provides a means to simulate the performance of such resources during system reliability events while taking into account the fact that the penetration level of these resources may cause some of the system reliability events. As a direct consequence, the modeling of resource performance for Variable Resources in the ELCC model should strive to capture the relationship between the output of Variable Resources and load conditions in the system. As I describe above in paragraph 14, load uncertainty is captured in the ELCC model via the Hourly Load Scenarios, which are based on weather/load data from multiple historical years. PJM is proposing to derive Hourly Output Shapes (“HOS”) for Variable Resources based on the historical actual and historical putative performance of the Variable Resources for the same set of historical years considered in the Hourly Load Scenarios creation. In this way, the historical relationship between the output of Variable Resources and load conditions in the system is not lost in the ELCC model. If there are N HLS based on N years’ worth of weather/load data, then there are N HOS for each class belonging to the Variable



Resources category. The derivation of a class HOS for a historical weather year H is described by the following procedure:

- i. Calculate hourly actual metered output in MW and hourly actual Maximum Facility Output (“MFO”) in MW from all units in the class that were classified as existing in year H.
  - ii. Calculate hourly total putative output in MW and hourly putative MFO in MW from all units in the class that were classified as planned in year H.
  - iii. Calculate the hourly total output in MW (by including actual and putative outputs) and hourly total MFO (associated with both actual and putative outputs).
  - iv. For each hour, divide the hourly total output by the hourly total MFO. The result constitutes the HOS for historical weather year H.
  - v. Multiply each of the HOS created in the previous step by the forecasted penetration level of the class (in MFO MW) for the future target delivery year.
- c. Limited Duration Resources and Combination Resources. Unfortunately, modeling the resource performance for Limited Duration Resources and Combination Resources cannot be directly based on historical performance (as is the case for Variable Resources). This is because: (i) these resource categories can vary their output based on system conditions, which is not necessarily the case for Variable Resources; and (ii) the simulated scenarios in the ELCC model are *based* on historical weather/load data and resource performance data for some resource categories, but they do not represent identical system conditions as those experienced historically. These circumstances demand that the resource performance modeling for Limited Duration Resources and Combination Resources in the ELCC model be based on a simulated dispatch, which should be reflective of the rest of system conditions (load, other resources’ performance) simulated in the ELCC model. Due to software limitations and other complexities, PJM is not proposing to simulate an economic dispatch in the ELCC model. Instead, PJM is proposing a simulated dispatch that is governed by the following principles:
- i. *Consistency with the status quo for dispatching economic resources relative to Demand Resources (i.e., Pre-Emergency Load Response and Emergency Load Response)*. This entails that all economic resources (including Limited Duration Resources and Combination Resources) must be exhausted prior to deploying Demand Resources, through PJM’s Pre-Emergency Load Response and Emergency Load Response Programs, to maintain Primary Reserves, and that load is not shed to maintain Primary Reserves.
  - ii. *Imperfect foresight*. This is to say that the simulated dispatch for Limited Duration Resources and Combination Resources at time  $t$  is not dependent on

the ELCC model's simulated system conditions in the future (e.g., at  $t + 1$ ,  $t + 2$ , etc.). Choosing to follow this principle recognizes that making dispatch decisions at time  $t$  based on expected system conditions at future intervals is challenging due to the uncertainty surrounding the expected system conditions at future intervals.

- iii. *Limited Duration Resources and Combination Resources are dispatched after Unlimited Resources and Variable Resources.* This principle recognizes that to take advantage of the flexibility provided by Limited Duration Resources and Combination Resources, and thus maximize their reliability benefit to the PJM system, it is essential to dispatch these resources after Unlimited Resources and Variable Resources.
- iv. *Recognizing variability of resources within some ELCC Classes.* There are some classes in the Limited Duration Resources and Combination Resources category whose members (i.e., the individual units) exhibit heterogeneity in the parameters impacting their potential dispatch. Such classes, therefore, do not lend themselves to be modeled, for simulated dispatch purposes, in an aggregate fashion. An example of such class is Hydropower with Non-Pumped Storage. The members of this class, for instance, show a wide range of values for the parameter that describes how quickly they can replenish their storage component (this parameter is a function of hourly streamflow data and storage size).

In addition to *dispatching* resources, PJM is proposing a simulated dispatch algorithm that also includes simulating the charging or charging-equivalent process whereby Limited Duration Resources and Combination Resources replenish their storage components. The procedure to derive the simulated dispatch for Limited Duration Resources and Combination Resources applied to each hour in each ELCC Scenario is the following:

- i. Calculate the *Margin Threshold* as total available resources prior to dispatching Limited Duration Resources and Combination Resources minus load.
- ii. Calculate the *Estimated Installed Capacity ("ICAP") Threshold* as the estimated total ICAP of Limited Duration Resources and Combination Resources minus the targeted Primary Reserves assumed to be provided by Limited Duration Resources and Combination Resources.
- iii. Calculate the *Dispatch Threshold* as the absolute value of the *Margin Threshold* minus the *Estimated ICAP Threshold*.
- iv. If the *Margin Threshold* is greater than zero, charging for resources that require charging can proceed. However, the charging can only occur to the extent that the additional load in the system does not cause the *Margin Threshold* to be less than zero. PJM is proposing to recognize differences between classes within the

Limited Duration Resources and Combination Resources category regarding the charging or charging-equivalent process. This entails using hourly streamflow data to replenish the storage component of resources within the Hydropower With Non-Pumped Storage class, charging the storage component in closed-loop solar-storage resources only to the extent that the solar component can support that charging, and reflecting charging constraints on standalone storage resources and storage components in open-loop solar-storage resources.<sup>2</sup>

- v. If the *Margin Threshold* is less than zero, the Limited Duration Resources and Combination Resources are assigned a targeted dispatch. If the *Dispatch Threshold* is less than zero, Limited Duration Resources and Combination Resources are assigned to supply load commensurate with the full *Margin Threshold*. Demand Resources receive no assignment. If the *Dispatch Threshold* is greater than or equal to zero, Limited Duration Resources and Combination Resources are assigned to supply load commensurate with the *Estimated ICAP Threshold*. Demand Resources receive an assignment equal to the *Margin Threshold* minus *Estimated ICAP Threshold* (i.e., the portion of the margin that was not assigned to Limited Duration Resources and Combination Resources).
- vi. The previous step determines the load assignment for the entire Limited Duration Resources and Combination Resources category. The load assignment for each ELCC Classes within the category is determined based on a ratio which is calculated as that class's estimated ICAP divided by the estimated total ICAP of Limited Duration Resources and Combination Resources.
- vii. If a load assignment cannot be partially or fully supplied by an ELCC Class because of power or energy limitations, Demand Resources will receive the unsupplied portion of the assignment. If all Demand Resources are exhausted, the other ELCC Classes will receive the assignment based on an availability-derived order, from most-available class to less-available class.
- viii. For ELCC Classes that require specific modeling of the individual units in the Simulated Dispatch (e.g., Hydropower With Non-Pumped Storage), the load assignment received by the class will be further allocated to the individual units in the class based on the same logic described in vi and vii (the two immediately preceding steps).
- d. Demand Resources. Like Unlimited Resources, Demand Resources are not the focus of the ELCC methodology calculation (because there are adequate rules to calculate the UCAP of such resources), but their performance must be modeled to capture their impact on the occurrence of system reliability issues. The simulated dispatch of

---

<sup>2</sup> Closed-loop solar-storage resources refer to resources configured such that the storage component cannot charge from the grid, only from the solar component. Open-loop solar-storage resources, on the other hand, are configured such that the storage component can charge from the grid.

Demand Resource takes into consideration the principles described above for the simulated dispatch of Limited Duration Resources and Combination Resources. In general, Demand Resources are the resources of last resort. Most of the Demand Resources in PJM are categorized as Firm Service Level (“FSL”). In simple terms, FSL means that Demand Resources, when dispatched, must reduce their megawatt consumption to a firm level, which is reflective of 50/50 (median) peak load conditions, regardless of their megawatt consumption at the time of the dispatch. For example, if all Demand Resources are dispatched to perform in hours H1 and H2, the total megawatts observed by PJM dispatchers at H1 and H2 may be different, even if there is 100% compliance from the Demand Resources in both hours. To capture this feature in the ELCC model, the amount of Demand Resources available to perform during each hour of the simulation is calculated as Nominated DR Value (a constant value for an entire delivery year) times F, where F is defined as the ratio of simulated hourly load (in MW) to 50/50 peak load (in MW).

16. The inputs described above are not technically *input* into the ELCC model. In fact, some of these inputs are actually calculated by the ELCC software itself prior to making the ELCC calculation. However, they can be classified as inputs in the sense that they are the drivers of the LOLE calculation and, in the end, the ELCC results.

#### **Loss of Load Expectation (“LOLE”) and ELCC Calculations**

17. Before describing the mechanics of the LOLE and ELCC calculations, it is necessary to describe the calculation of the probability for each ELCC Scenario. As indicated in the “ELCC Inputs” section of this affidavit, there are 1,000 Hourly Load Scenarios for each HLS. Resource performance for all resource categories is then simulated for each of these load scenarios. If there are N HLS, then the total number of ELCC Scenarios is N times 1,000. The probability of each ELCC Scenario can be calculated by using the Probability for each HLS described in paragraph 14(b). For example, if the HLS based on year 1 has an associated probability equal to P1, then each of the 1,000 scenarios created based on this HLS has a probability equal to P1 divided by 1,000.
18. As mentioned above, the ELCC methodology requires measuring reliability using a resource adequacy metric as well as a target value for that metric. PJM is proposing to use LOLE as well as the well-known resource adequacy LOLE criterion of 1-day-in-10 years (translated as 0.1 days per year when applied to a single year). These elements of the PJM proposal provide consistency with other parameters used in RPM and with PJM’s planning standards.
19. In the ELCC simulation, a loss of load occurs when the hourly load is greater than the hourly output of all the resources considered available in the simulation. The PJM proposal considers calculating LOLE as follows:
  - a. For each ELCC Scenario, count the number of days in a year that include at least one hour of loss of load.

- b. Multiply the quantities from the previous step by the corresponding probability associated with each ELCC scenario (these probabilities were discussed in paragraph 17).
  - c. Add up all the quantities calculated in the previous step. The result is the LOLE of the simulated system.
- 20. In its most general form, calculating the ELCC of a group of ELCC Resources requires simulating the system twice. The first simulation (General Case “Excluding”) excludes the ELCC Resources; it only includes Unlimited Resources and Demand Resources. The second simulation (General Case “Including”) includes the ELCC Resources in addition to the Unlimited Resources and Demand Resources. By means of shifting (up or down) peak load values (and the associated load scenarios), both cases are iteratively run until a LOLE of 0.1 days per year is achieved by each case. The mathematical difference between the peak load values is then calculated (Peak Load Value General Case “Including” minus Peak Load Value General Case “Excluding”). The result corresponds to the ELCC of the group of ELCC Resources, because this additional load can be served by the system due to the addition of the group of ELCC Resources, maintaining the same level of reliability (as measured by LOLE).
- 21. Applying the above general ELCC form to the PJM system produces ELCC results that are inconsistent with the UCAP values that PJM currently calculates for Unlimited Resources. For instance, using the general ELCC form results in an ELCC of less than 100% for a generation resource that performs perfectly without forced outages during an entire delivery year (8,760 hours). Clearly, this ELCC result is inconsistent with the UCAP value that PJM currently calculates for an Unlimited Resource with those characteristics (i.e., 100%).
- 22. To address the above inconsistency, PJM is proposing to perform a variation of the general ELCC methodology to calculate the ELCC of a group of ELCC Resources. The variation also considers simulating the system twice. The first simulation (PJM Case “Including”) includes the ELCC Resources in addition to the Unlimited Resources and Demand Resources. The second simulation (PJM Case “Excluding”) excludes the ELCC Resources, including Unlimited Resources, Demand Resources, and a variable amount of Perfect Generation (i.e., generation that is assumed to have no outages and no use limitations). The PJM Case “Including” is run until an LOLE of 0.1 days per year is achieved. At that point, the peak load value for the case is recorded. The PJM Case “Excluding” is then run by inputting the peak load value from the PJM Case “Including” and determining the amount of Perfect Generation necessary to add to the system in order to achieve an LOLE of 0.1 days per year. This added amount of Perfect Generation is the ELCC of the group of ELCC Resources. In other words, PJM is proposing to calculate ELCC by determining the amount of Perfect Generation that provides the same reliability benefit as that provided by the ELCC Resources under evaluation.

## ELCC Outputs

23. The PJM proposal considers a hierarchical approach to ultimately determine the Accredited UCAP value of each ELCC Resource. At the top level of the hierarchy stands the ELCC Portfolio UCAP, which establishes the Effective UCAP value of the entire set of ELCC Resources under evaluation. The mid-level of the hierarchy belongs to the ELCC Class UCAP values. Each of these values establishes the Effective UCAP value for the entire set of resources that are members of an ELCC Class. The sum of the ELCC Class UCAP values must be equal to the ELCC Portfolio UCAP. Lastly, at the bottom of the hierarchy rests the Accredited UCAP values which establish the Effective UCAP value of each individual ELCC Resource. In general, the sum of the Accredited UCAP values for resources that are members of an ELCC Class must equal the ELCC Class UCAP value of that ELCC Class.
24. The justification for the above hierarchical approach is rooted in what can be described as both a feature and a challenge of the ELCC methodology. ELCC is well equipped to assess the reliability value of an entire portfolio of resources, capturing the diversity benefit or lack thereof generated by the portfolio. Conversely, ELCC does not provide an unambiguous way to isolate ELCC Class UCAP values or an individual resource's Accredited UCAP value. This challenge notwithstanding, there are intuitive and consistent approaches to derive a good ELCC-based estimate of ELCC Class UCAP values or an individual resource's Accredited UCAP value. The PJM proposal considers one of those approaches.
25. PJM is proposing to first calculate the ELCC Portfolio UCAP value. This is an unambiguous value. It is produced by following the ELCC methodology as proposed by PJM and described in paragraph 22. This quantity is then allocated among ELCC Classes to determine ELCC Class UCAP values. The allocation process is a heuristic that requires multiple additional ELCC runs and generally includes the following steps:
  - a. For each ELCC Class, determine the ELCC of resources belonging to the ELCC Class in the absence of all other ELCC Classes (ELCC "First-In" runs).
  - b. For each ELCC Class, determine the ELCC of resources belonging to the ELCC Class in the presence of all other ELCC Classes (ELCC "Last-In" runs).
  - c. Use the ELCC results from the First-In and Last-In runs to allocate the ELCC Portfolio UCAP value and establish the ELCC Class UCAP values.
26. PJM is also proposing to allocate the ELCC Class UCAP values to each ELCC Resource to determine each resource's Accredited UCAP value based on an ELCC Resource Performance Adjustment heuristic that varies by ELCC Class.
27. The allocation heuristics described above are needed to derive an Accredited UCAP value for each ELCC Resource. They are not introduced arbitrarily by PJM. They are also designed to maintain consistency with the overall ELCC Portfolio UCAP result.

## Further Comments

28. There are other supplemental assumptions underlying the ELCC methodology proposed by PJM. Transmission limitations are not explicitly modeled in the ELCC simulations. Instead, it is assumed that there are no transmission-related reliability issues within the PJM footprint. This assumption is also used in PJM's main resource adequacy study, the Reserve Requirement Study. The justification for it is the fact that PJM has a Regional Transmission Expansion Process ("RTEP"), with a look-ahead planning horizon of five years, which ensures that specific areas of the PJM footprint have the necessary transmission infrastructure to receive the required level of energy imports. Nevertheless, it is likely that some aspects of this RTEP process will need to change as the penetration level of ELCC Resources increases.
29. Also anchored in the above assumption is the fact that PJM is proposing to derive ELCC results based on a simulation for the entire PJM footprint, without making additional ELCC simulations targeted for specific areas of the footprint. It can be argued that if each specific area of the footprint has the transmission infrastructure necessary to support the required energy import levels, each area's expected loss of load patterns should be consistent with the loss of load patterns of the entire PJM Region. It follows then that there is no need for ELCC simulations targeted for specific areas of the footprint and that ELCC values based on region-wide runs should suffice.
30. Another assumption is the modeling of all Demand Resources in the ELCC simulations as having an annual capacity commitment, while in practice there are also two additional types: a Demand Resource that is a Summer-Period Capacity Performance Resource and Price Responsive Demand ("PRD"). Annual Demand Resources represent the bulk of the Demand Resources in the PJM footprint (approximately 8,000 MW); the other two types currently account and are expected to account for less than 1,000 MW (summer-period Demand Resources: ~300 MW, PRD: ~500 MW). Making this assumption implies the following: (i) the actual performance of PRD resembles that of annual Demand Resources during reliability events; (ii) the actual performance of summer-period Demand Resources resembles that of annual Demand Resources during *summer* reliability events; and (iii) the actual performance of the winter-only resources that are expected to pair with the summer-period Demand Resources resembles that of annual Demand Resources during winter reliability events. Out of the three implications, the first two are rooted in actual practical considerations while the latter implication is adopted as a matter of simplicity (and has a negligible impact on the ELCC results).
31. An additional aspect (that is not necessarily an assumption) of the overall methodology so far unaddressed in this affidavit is the relationship between PJM's Reserve Requirement Study and the ELCC methodology. The Reserve Requirement Study models load uncertainty and resource performance uncertainty to calculate the parameter necessary to determine the Reliability Requirement (expressed in megawatts of Unforced Capacity) for each RPM Auction. This parameter is the Forecast Pool Requirement ("FPR"). In fact, the Reliability Requirement for a future delivery year is defined as the FPR times the median ("50/50") peak load forecast. Because the Reserve Requirement Study uses the LOLE criterion of 1-day-in-10 years, the FPR can be described as the level of Unforced Capacity

reserves above the median (“50/50”) peak load forecast required to meet this LOLE criterion.

32. Evidently, there are many similarities between the Reserve Requirement Study and the ELCC methodology. Both studies model load and resource performance uncertainty at the PJM Region level and use the LOLE criterion of 1-day-in-10 years as the reliability standard. While the Reserve Requirement Study is concerned with calculating the reliability requirement for an auction, the ELCC is concerned with determining the megawatt valuation that ELCC Resources can offer into an auction to meet that reliability requirement. One could even make the argument that the FPR could be derived using one of the ELCC cases, as opposed to using the Reserve Requirement Study to derive it. PJM is exploring this option. However, as of today, PJM is proposing to be as consistent as possible in the assumptions input into the Reserve Requirement Study and the ELCC methodology, recognizing that the studies are run using different models (and software), and that these models have different specific input data requirements. Examples of this search for consistency include: the performance of energy-only resources is not modeled in either study (because such resources are not obligated to perform during system reliability events or at any other time for that matter), load uncertainty is modeled in both studies using the PJM load forecast as a key source and resource performance uncertainty for Unlimited Resources is modeled in both studies using PJM’s Generator Availability Data System data from the most recent five-year period as a key source.
33. This concludes my affidavit.



**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

**PJM Interconnection, L.L.C.**

)  
)

**Docket No. ER21-\_\_-000**

**VERIFICATION OF DR. PATRICIO ROCHA GARRIDO**

Dr. Patricio Rocha Garrido, being first duly sworn, deposes and states that he is the Dr. Patricio Rocha Garrido referred to in the foregoing document entitled "Affidavit of Dr. Patricio Rocha Garrido," that he has read the same and is familiar with the contents thereof, and that the testimony set forth therein is true and correct to the best of his knowledge, information, and belief.

A handwritten signature in black ink, appearing to read "Patricio Rocha Garrido", is written over a horizontal line.

Dated: October28, 2020