

April 7, 2021

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

Re: *PJM Interconnection, L.L.C.*, Docket No. ER21-\_\_\_\_-000  
Tariff, Schedule 6A, Black Start Revisions

Dear Secretary Bose:

PJM Interconnection, L.L.C. (“PJM”), pursuant to section 205 of the Federal Power Act (“FPA”), 16 U.S.C. § 824d, and section 35.13 of the regulations of the Federal Energy Regulatory Commission (“FERC” or the “Commission”), 18 C.F.R. part 35, hereby submits revisions to the PJM Open Access Transmission Tariff (“Tariff”), Schedule 6A. The proposed revisions are intended to clarify and rationalize the requirements for Black Start Units,<sup>1</sup> and provide for transparency and annual updates to the Capital Recovery Factor (“CRF”) component of Black Start payments for units that require new or additional capital investment.<sup>2</sup> More specifically, PJM’s proposed revisions to Tariff, Schedule 6A include the following:

- A. The commitment period and termination provisions for the Black Start Service commitment by Black Start Units selected after the effective date of these Tariff revisions;
- B. The outage obligations and substitution provisions in sections 7 through 11;
- C. The testing requirement provisions in sections 12 through 14;

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<sup>1</sup> Capitalized terms not otherwise defined herein shall have the meaning ascribed to them in the Tariff.

<sup>2</sup> The *Memphis* clause set forth in Tariff, Part I, section 9, permits PJM to make prospective changes to its Tariff rates, terms, conditions, and charges. *United Gas Pipe Line Co. v. Memphis Light, Gas & Water Div.*, 358 U.S. 103, 110-13 (1958).

- D. Section 15 to provide for involuntary termination of Black Start Service and forfeiture of Black Start Service revenues for Black Start Units under sections 5 and 6 that fail to perform a black start testing and remain without a successful black start test on file with PJM for an extended period of time;
- E. The CRF set forth in Schedule 6A, section 18 on a prospective basis only—as of the effective date of the proposed Tariff revisions, and to retain the stated CRF percentages for existing Black Start Units; and
- F. The Minimum Tank Suction Level (“MTSL”) calculation to reflect only the volume of fuel necessary to provide Black Start Service, by calculating the Black Start Energy Tank Ratio of MTSL in section 18.

As noted in part IV below, this proposal filed by PJM was originally developed in the PJM stakeholder process and presented jointly by Exelon Generation Company, LLC and the PJM Industrial Customer Coalition at the PJM Markets and Reliability Committee as a compromise on February 24, 2021. The Markets and Reliability Committee approved the proposal in a sector-weighted vote with 3.35 in favor. At the March 29, 2020 PJM Members Committee, the proposal ultimately failed in a sector-weighted vote with only 3.17 in favor. Although the proposal did not pass with an affirmative recommendation of the PJM Members Committee, given the urgency of the need for resolution of these issues as detailed in the attached affidavit of Mr. Michael E. Bryson, Senior Vice President of Operations for PJM,<sup>3</sup> and the fact that PJM retains the FPA section 205 filing rights over its Tariff with the Member vote being advisory,<sup>4</sup> PJM is taking the unusual step of making this filing at this time and seeking Commission acceptance.

PJM respectfully requests that the Commission accept the proposed revisions for filing, allowing them to become effective on June 6, 2021. Prompt acceptance of the

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<sup>3</sup> Affidavit of Michael E. Bryson on Behalf of PJM Interconnection, L.L.C., Attachment A hereto (“Bryson Aff.”).

<sup>4</sup> Tariff, Part I, section 9.2.

proposed revisions will provide certainty for Black Start Unit owners, which will encourage their participation in a solicitation PJM must issue soon to address a shortfall in Black Start Service that will occur in a transmission Zone early in 2022 due to the announced retirement of Black Start Service from several units.

## **I. BACKGROUND**

### ***A. Black Start Units Are Critically Important to the PJM System***

Black Start Service is critically important to reliable operation of the PJM transmission system because it allows PJM to restore transmission system operations following a total shut down of all or parts of the transmission system. While most generators require electricity to start, Black Start Units either have equipment that enables them to start without an outside electricity supply, or a high operating factor that allows them to automatically remain in operation at reduced levels when disconnected from the transmission system.<sup>5</sup> These units are the only option to restore operation to the transmission grid in the event of total system failure.<sup>6</sup> As such, the North American Electric Reliability Corporation's ("NERC") reliability standards require PJM to have a

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<sup>5</sup> See Bryson Aff. ¶ 9.

<sup>6</sup> See *id.* ¶¶ 7-8.

system restoration plan that includes Black Start resources.<sup>7</sup> NERC has assigned a priority level of Violation Risk Factor of “High” for this requirement.<sup>8</sup>

The industry was reminded again (if any reminder was needed) of the importance of planning for dire conditions by the unprecedented weather events of February 2021 in the Electric Reliability Council of Texas (“ERCOT”) region. ERCOT officials revealed that the region lost 48.6% of power generation during the height of the outages, dipping below 59.4 Hz frequency.<sup>9</sup> According to ERCOT leadership, the Texas power grid was only 4 minutes and 37 seconds away from an extensive grid collapse. Thankfully, and to their credit, ERCOT transmission and generation operators avoided that alarming scenario. Black Start Service, in simple terms, encompasses the well-planned, coordinated, and deliberate actions facility operators must take *after* such a harmful system collapse (of whatever geographic scope) *has actually occurred*, to bring the grid back into operation in a safe, prudent, and incremental manner. Imagining the heightened challenges system and facility operators would have faced in that scenario is sobering, to say the least.

Because of the unique attributes that make them critical to grid reliability, Black Start Units must be sited in particular locations throughout the PJM footprint.<sup>10</sup> PJM performs studies and works with Transmission Owners to develop a system restoration

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<sup>7</sup> See *NERC Reliability Standards*, NERC EOP-005-3, [https://www.nerc.com/\\_layouts/15/PrintStandard.aspx?standardnumber=EOP-005-3&title=System%20Restoration%20from%20Blackstart%20Resources&jurisdiction=United%20States](https://www.nerc.com/_layouts/15/PrintStandard.aspx?standardnumber=EOP-005-3&title=System%20Restoration%20from%20Blackstart%20Resources&jurisdiction=United%20States), (last visited Apr. 6, 2021).

<sup>8</sup> *Id.*

<sup>9</sup> Christian Flores, *ERCOT: Texas Was Minutes Away from Grid Crash, ‘Black Start’*, CBS Austin (Feb. 24, 2021), <https://cbsaustin.com/news/local/ercot-holding-emergency-board-meeting-to-discuss-grids-power-failures>; Mary Harris, *A Crisis Within a Crisis Within a Crisis*, Slate (Mar. 1, 2021), <https://slate.com/news-and-politics/2021/03/texas-winter-storm-uri-recover-hurricane-harvey-climate-change.html>.

<sup>10</sup> See Bryson Aff. ¶¶ 7-8.

plan that identifies locations in which Black Start capacity is needed.<sup>11</sup> PJM then issues request for proposal (“RFP”) solicitations every five years, across the entire PJM footprint, to fulfill the need for Black Start capacity where identified, as well as interim RFP solicitations to replace former units as needed.<sup>12</sup>

Eligible Black Start Units could consist of new units or existing units. In the former case, the capital costs the Black Start Unit’s owner would need to recover through the black start capital recovery rate include the cost to install equipment such as diesel generators that allow the unit to start from a black out condition. For existing units, additional capital costs could include costs necessary to be compliant with NERC Standards or to fund refurbishment that allows the unit to continue to provide Black Start Service. The rate PJM pays such Black Start Unit owners provides for recovery of that capital over a long-term capital recovery period through application of the Capital Recovery Factor.<sup>13</sup> PJM requires a long-term commitment from these Black Start generators to ensure that they are identified in advance of when they are needed and committed to providing Black Start Service at all times and on very short notice.<sup>14</sup>

***B. The Existing Black Start Regime***

Schedule 6A as it exists today provides for three types of Black Start commitment and payment:

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<sup>11</sup> *See id.*

<sup>12</sup> *See id.* ¶ 14; Operations Planning Division, *PJM Manual 14D: Generator Operational Requirements*, PJM Interconnection, L.L.C. (Nov. 19, 2020), <https://www.pjm.com/-/media/documents/manuals/m14d.ashx>.

<sup>13</sup> Tariff, Schedule 6A, section 18.

<sup>14</sup> Bryson Aff. ¶ 14.

1. Schedule 6A, section 5 provides for Black Start Units that are selected through an RFP and that forgo recovery of new or additional Black Start Capital Costs to provide Black Start Service for an initial term of no less than two years. The term of the Black Start Service continues to extend until either the Black Start Unit owner or PJM provides written, one-year advance notice of the intent to terminate. These units are subject to the performance standards, outage obligations, annual testing, revenue requirement, and formula rate sections of Schedule 6A.
2. Schedule 6A, section 6 provides for Black Start Units that elect to recover new or additional Black Start Capital Costs, to provide Black Start Service for a term based on the age of the Black Start Unit or the longest expected life associated with the incremental Black Start Capital Costs. Under the existing Tariff provisions, either PJM or the Black Start Unit owner may terminate the commitment with one-year advance notice upon certain conditions including PJM's consent. These units are subject to the performance standards, outage obligations, annual testing, revenue requirement, and formula rate sections of Schedule 6A.
3. Schedule 6A, section 6A applies to Black Start Units that are owned or contracted for by a Transmission Owner to provide Black Start Service as a result of the black start reliability backstop process defined in PJM Manual 14D, section 19.3.4. These units recover their costs through the Transmission Owner's Tariff, Attachment H, or another cost recovery method filed with and accepted by the Commission. PJM may terminate the commitment under section 6A with one-year advance notice to the Transmission Owner. These units are subject to the performance standards, outage obligations, and annual testing of Schedule 6A

(sections 7 through 13) but not the revenue requirement sections or the formula rate sections.

Schedule 6A, sections 7 through 11 establish performance standards and outage restrictions for Black Start Units. Black Start Units not selected in a PJM RFP may be substituted for a committed Black Start Unit in order to allow the committed Black Start Unit to take a maintenance outage. The maintenance outage provisions distinguish Black Start Units designated as “critical” from other Black Start Units.

Schedule 6A, sections 12 through 15 establish testing requirements and forfeiture of revenues for failure to pass annual tests. These testing provisions also distinguish Black Start Units designated as “critical” from other Black Start Units.

Schedule 6A, sections 16 and 17 provide for an annual determination of Black Start Unit owners’ annual revenue requirement based on the annual revenue requirement of each Black Start Unit they own. Black Start Unit owners may elect a FERC-approved cost-based rate for the duration of the Black Start commitment period or, for Black Start Units under sections 5 and 6, the formula rates set forth in Schedule 6A, section 18. Schedule 6A, section 17A establishes an annual review of all Black Start Unit revenue requirements that includes review and analysis of those revenue requirements and supporting documentation by the Market Monitoring Unit. Schedule 6A, section 17B provides for initial review of the revenue requirements of new Black Start Units between the regular annual reviews.

Schedule 6A, section 18 provides a formula for calculating an owner’s Black Start Service revenue requirement based on relevant costs such as: Fixed Black Start Service Costs, Variable Black Start Service Costs, Training Costs, and Fuel Storage Costs. The

fixed cost calculations are based in part on PJM's net cost of new entry ("Net CONE") values.<sup>15</sup> The fixed cost component for Black Start Units recovering new or additional Black Start Capital Costs, under section 6, includes a CRF based on a table of stated CRF percentages that vary by the age of the Black Start Unit.<sup>16</sup> The table of CRF percentages also establishes various Black Start commitment terms based on the ages of Black Start Units.<sup>17</sup>

Fuel Storage Costs under Schedule 6A, section 18 are calculated as a formula that includes the component MTSL. This component applies where there is no direct current pump for the Black Start Unit and, where more than one Black Start Unit shares a common fuel tank, only one Black Start Unit may recover the MTSL volume in its fuel storage calculation.<sup>18</sup>

## **II. PROPOSED TARIFF REVISIONS**

### ***A. Commitment Period***

PJM proposes to revise Schedule 6A, section 6 to streamline the commitment period and termination provisions for the Black Start Service commitment by Black Start

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<sup>15</sup> See Affidavit of Thomas Hauske on Behalf of PJM Interconnection, L.L.C., ¶¶ 15-16, Attachment B hereto ("Hauske Aff.").

<sup>16</sup> See *id.* ¶ 13.

<sup>17</sup> See *id.* The table was added to Tariff, Schedule 6A in 2009 as a set of stated percentages. See *PJM Interconnection, L.L.C.*, 127 FERC ¶ 61,197, at P 39 (2009) (accepting addition of table of stated CRF percentages to Tariff, Schedule 6A). As described in PJM's filing proposing to add the CRF table, the CRF values were "designed to ensure that recovery of the new improvements are depreciated in a manner commensurate with the age of the Black Start Unit at the time of the improvement" and "represent[] a reasonable recovery of [the Black Start Unit Owner's] capital investment." *PJM Interconnection, L.L.C.*, Submittal of Schedule 6A Black Start Service of PJM Interconnection, L.L.C., Docket No. ER09-730-000, at 4 (Feb. 19, 2009). No components or mechanisms were described.

<sup>18</sup> See Hauske Aff. ¶ 24.



Units electing to recover new or additional Black Start Capital Costs. The commitment period for these units will now be the life of the Black Start equipment.<sup>19</sup>

PJM is also clarifying that an owner of a Black Start Unit under section 6 may terminate Black Start Service with at least one-year advance notice to, and the consent of, PJM. Under the proposed revisions, the Black Start Unit owner must demonstrate to PJM's satisfaction that at least one of the following reasons to terminate apply: Black Start Unit retirement or deactivation; expiration of permit(s) required for Black Start Unit operation or service; or required additional capital to maintain Black Start capability.<sup>20</sup> These changes as proposed would apply to both existing Black Start Units and new Black Start Units selected in future RFPs.

***B. Outage and Substitution Restrictions***

PJM is revising the outage obligations and substitution provisions in Schedule 6A, sections 7 through 11. First, PJM is removing the description of any Black Start Units as “critical” because PJM considers all Black Start Units to be critical by definition.

Second, PJM is revising the substitution provision of Schedule 6A, section 10. A substitute Black Start Unit may take the place of a Black Start Unit, at the same Black Start Plant, that is undergoing a Generator Planned Outage or Generator Maintenance Outage under certain conditions.<sup>21</sup> No more than one Black Start Unit at a Black Start Plant may be subject to a Generator Planned Outage or Generator Maintenance Outage at any one time without written approval of PJM or the Transmission Owner in the Zone receiving

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<sup>19</sup> Proposed Tariff, Schedule 6A, section 6.

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*, Schedule 6A, section 10.

Black Start Service.<sup>22</sup> In addition, the unit used as a substitute must be connected at the same voltage level and cranking path as the original, must be of similar age, must provide equivalent Black Start capacity, must have a valid test within the previous 13 months, and will not receive additional capital as a Black Start Unit or not increase the capital recovery period.<sup>23</sup>

Third, PJM proposes to allow for substitution of a Black Start Unit at the same Black Start Plant for a Black Start Unit for reasons other than a Generator Planned Outage or Generator Maintenance Outage, if requested by Black Start Unit owner and approved by PJM.<sup>24</sup> Finally, all substitutions, for outages and for reasons other than outages, must be supported by documentation or other information demonstrating operational or technical reasons for the substitution acceptable to PJM; and may only occur once within a 12-month period.<sup>25</sup>

### ***C. Testing Requirements***

PJM is revising the testing requirement provisions in Schedule 6A, sections 12 through 14. Again, because all Black Start Units are critical, PJM is also removing the description of any Black Start Units as “critical” from these sections.<sup>26</sup> Black Start Units that are providing Black Start Service and being compensated by Transmission Owners will also need to follow PJM’s testing requirements. All Black Start Units must have a

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<sup>22</sup> *Id.*

<sup>23</sup> *Id.*

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

<sup>25</sup> *Id.*

<sup>26</sup> *Id.*, Schedule 6A, section 12.

successful annual test on record with PJM within the preceding 13 months.<sup>27</sup> This revision addresses the need for reliability. PJM can only rely on units for Black Start Service if they are demonstrably capable of providing that service.

Further, Black Start Units under Schedule 6A, sections 5 and 6 that do not have a successful test every 13 months will not receive payment.

***D. Termination***

In addition to the provisions on voluntary termination by Black Start Unit owners, PJM is revising Schedule 6A, section 15 to provide for involuntary termination of Black Start Service and forfeiture of Black Start Service revenues for Black Start Units under sections 5 and 6 that either fail or do not perform a black start testing, and remain without a successful black start test on file with PJM for an extended period of time.<sup>28</sup> If the owner of a Black Start Unit that failed the test does not make the repairs necessary to pass the test within 90 days, the unit will no longer qualify as a Black Start Unit and will be subject to forfeiture of Black Start Service revenues.<sup>29</sup> The 90-day period may be extended to one year by PJM in accordance with PJM Manual 12, section 4.6.14,<sup>30</sup> but the Black Start Unit owner will continue to forfeit revenues until the unit tests successfully.<sup>31</sup>

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<sup>27</sup> *Id.*, Schedule 6A, section 14.

<sup>28</sup> *Id.*, Schedule 6A, section 15.

<sup>29</sup> *Id.*

<sup>30</sup> Dispatch, *PJM Manual 12: Balancing Operations*, PJM Interconnection, L.L.C., § 4.6.14 (Jan. 27, 2021), <https://www.pjm.com/-/media/documents/manuals/m12.ashx>.

<sup>31</sup> Proposed Tariff, Schedule 6A, section 15.

***E. Capital Recovery Factor***

PJM proposes to change the CRF set forth in Schedule 6A, section 18 on a prospective basis only as of the effective date of the proposed Tariff revisions, and to retain the stated CRF percentages for existing Black Start Units.<sup>32</sup>

The CRF used to calculate payments to existing Black Start Units for capital investments made prior to the effective date of Tariff changes in the instant filing will continue to be governed by the Tariff table that has been in effect since 2009.<sup>33</sup> As Mr. Hauske explains, the stated CRF values currently set forth in the Tariff are essentially “black box” numbers, as neither the Tariff nor the PJM Manuals specify their bases or how they were calculated.<sup>34</sup> These CRF percentages will remain in the Tariff to govern continued recovery of past investments. PJM proposes no change to the existing table, which will continue to set the CRF values for the past investments in existing units based on the length of the commitment period and the age of the Black Start Unit.<sup>35</sup>

PJM will derive the CRF that will be applied to the annual revenue requirements of new Black Start Units (i.e., Black Start Units committed to provide Black Start Service after the date of this filing) from a formula that will be set forth in the Tariff and will be updated annually based on changes in the federal and state income tax rates and debt interest rates.<sup>36</sup> In addition to the formula being set forth in the Tariff, the capital structure

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<sup>32</sup> See Hauske Aff. ¶ 11; Bryson Aff. ¶ 16.

<sup>33</sup> See *PJM Interconnection, L.L.C.*, 127 FERC ¶ 61,197, at P 39 (accepting addition of table of stated CRF percentages to Tariff, Schedule 6A).

<sup>34</sup> Hauske Aff. ¶ 10.

<sup>35</sup> Proposed Tariff, Schedule 6A, section 18.

<sup>36</sup> See Hauske Aff. ¶¶ 11, 15-16, 18.

and cost of equity assumptions will be stated in the Tariff, and thus can change only pursuant to an FPA section 205 filing, as added protection for ratepayers.<sup>37</sup> Other inputs to the CRF rate, including the tax rate and interest rate, are tied to factual circumstance and will change based upon a process set forth in PJM Manual 15<sup>38</sup> in accordance with the PJM Manual 34 revision procedures, which includes a stakeholder review process and mandatory approval by the Board of Managers.<sup>39</sup>

The capital structure, cost of debt, and cost of equity assumed in the CRF calculation will track the after-tax weighted average cost of capital (“ATWACC”) as used in the most recent Net CONE calculation.<sup>40</sup> The CRF calculation will use accelerated depreciation rates prescribed by the Internal Revenue Service, which is the same approach used for PJM’s Net CONE calculation.<sup>41</sup> The depreciation rate used in the CRF for a new Black Start unit will be the depreciation rate established by the last CRF annual update.<sup>42</sup>

The CRF will be calculated assuming a levelized cost recovery for incremental Black Start Capital Costs. As Mr. Hauske confirms in his affidavit,<sup>43</sup> this approach is consistent with the levelized recovery method long used, and approved by the Commission,

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<sup>37</sup> *Id.* ¶ 16.

<sup>38</sup> Cost Development Subcommittee, *PJM Manual 15: Cost Development Guidelines*, PJM Interconnection, L.L.C. (Dec. 9, 2020), <https://www.pjm.com/-/media/documents/manuals/m15.ashx>.

<sup>39</sup> Hauske Aff. ¶ 20; *see* Market Services Division, Stakeholder Affairs Department, *PJM Manual 34: PJM Stakeholder Process*, PJM Interconnection L.L.C., § 11.15 (Jan. 27, 2021), <https://www.pjm.com/-/media/documents/manuals/m34.ashx>.

<sup>40</sup> Hauske Aff. ¶ 16.

<sup>41</sup> *Id.* ¶ 15.

<sup>42</sup> *Id.*

<sup>43</sup> *Id.* ¶ 14.

for the Net CONE calculation,<sup>44</sup> and in the CRFs specified for the Avoidable Project Investment Rate.<sup>45</sup>

The going-forward CRF percentages and commitment periods for new Black Start Units will not be stated in Tariff, Schedule 6A. Instead, the methodology for determining the CRF percentages will be documented in Tariff, Schedule 6A, section 18 and a new section of PJM Manual 15, and the annual and historical CRF Tables will be posted on the PJM website.<sup>46</sup>

***F. Minimum Tank Suction Level***

PJM is proposing revisions to Schedule 6A, section 18 to revise the MTSL calculation to reflect only the volume of fuel necessary to provide Black Start Service, by calculating the Black Start Energy Tank Ratio of MTSL.<sup>47</sup>

**III. THE COMMISSION SHOULD ACCEPT THE PROPOSED REVISIONS AS JUST AND REASONABLE AND NOT UNDULY DISCRIMINATORY**

***A. The Non-Rate Tariff Revisions to Schedule 6A Are Just and Reasonable***

PJM's revisions to the non-rate provisions of Schedule 6A clarify PJM's administration of Black Start Units and Service. As such, the Commission should accept the proposed revisions as just and reasonable and not unduly discriminatory.

The proposed changes to the commitment period provisions are just and reasonable. The revisions to Schedule 6A, section 6, will apply to Black Start Units that are electing to

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<sup>44</sup> See, e.g., *PJM Interconnection, L.L.C.*, 126 FERC ¶ 61,275, at PP 22, 36, *order on clarification & reh'g*, 128 FERC ¶ 61,157 (2009).

<sup>45</sup> See Tariff, Attachment DD, section 6.8(a) (defining the Avoidable Cost Rate formula, including the component APIR (Avoidable Project Investment Recovery Rate) that is based on a table of annual cost recovery factor values).

<sup>46</sup> See Hauske Aff. ¶ 20.

<sup>47</sup> Proposed Tariff, Schedule 6A, section 18.

recover new or additional Black Start Capital Costs on a going-forward basis only. These revisions will not affect existing Black Start Units that have elected to recover additional Black Start Capital Costs. The commitment period for existing units under section 6 will not change, and will terminate in accordance with the commitment period established when they were selected.<sup>48</sup> However, new section 6 Black Start Units will be required to commit to providing Black Start Service for the remaining life of the Black Start equipment.<sup>49</sup>

The proposed revisions allow for Black Start Unit owners to terminate their Black Start Service commitment based on a limited set of valid reasons, such as plant retirement or loss of permits, but provide that they will not continue to collect Black Start Service revenue requirements upon such termination. Today's open-ended ability to terminate merely upon one year's notice would be changed to require a minimum commitment period subject to a defined set of limited exceptions. This revision recognizes circumstances in which units can no longer provide Black Start Service, but maintains the match between service lives and capital recovery. If the Black Start Unit owner's reason for terminating its Black Start Service commitment is that additional capital investment is required in order to maintain Black Start capability, the owner is required to submit the Black Start Unit with the additional Black Start Capital Costs for selection in an incremental RFP under PJM Manual 14D and continue to provide Black Start Service if selected in that incremental RFP.<sup>50</sup> Such an RFP ensures that units continue to provide Black Start Service so long as they are the least-cost Black Start resource for the relevant location.

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<sup>48</sup> See Hauske Aff. ¶ 13.

<sup>49</sup> See *id.*

<sup>50</sup> Proposed Tariff, Schedule 6A, section 6.

The proposed revisions to the substitution and testing provisions of Schedule 6A, sections 7 through 15 are just and reasonable. They eliminate the “critical” versus non-critical distinction among Black Start Units for purposes of substitution and testing. Further, the proposed revisions to the substitution provisions would apply to all Black Start Units, whether under section 5, 6, or 6A, and whether existing or new. The revisions to the testing provisions of sections 14 and 15 would apply to all section 5 and section 6 Black Start Units, whether existing or new. This simplifies PJM’s administration of Black Start Service.<sup>51</sup>

The proposed revisions clarify Black Start Unit owners’ ability to substitute one Black Start Unit for another and add additional reasons for permissible substitution beyond Generator outages. These revisions address the increasing number of questions PJM has received concerning substitution among Black Start Units, providing clear guidance and notice to Black Start Unit owners and additional flexibility to substitute units for valid operational and technical reasons.<sup>52</sup>

The proposed revisions to the testing requirements for Black Start Units, which will also apply to Transmission Owner-contracted Black Start Units, provide more clarity on PJM’s testing requirements for all Black Start Units. The proposed revisions also clarify that the consequences for failure to test successfully at least once in a 13-month period is not only loss of Black Start Service revenues but also involuntary termination of Black Start Unit status. The revisions also provide a 90-day cure period for testing failure, with a potential one-year extension of the cure period by PJM in certain circumstances, in

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<sup>51</sup> See Hauske Aff. ¶ 21.

<sup>52</sup> See *id.* ¶ 22.



accordance with PJM Manual 12, section 4.6.14. These provisions provide clear guidance and notice to Black Start Unit owners as to testing requirements and increase the consequences of failing the required tests, thereby strengthening the reliability of Black Start Service.<sup>53</sup>

Finally, PJM's proposal to revise the Fuel Storage component of the section 18 revenue requirements formula for Black Start Units selected under section 5 or section 6 by revising the calculation of MTSL to reflect only the volume of fuel necessary to provide Black Start Service is just and reasonable. The revisions alter the circumstances in which the MTSL component of the formula is used by restricting it to oil-fired units' storage tanks that contain an unusable volume of oil.<sup>54</sup> The revisions also set forth a calculation for MTSL that takes into account the ratio of the amount of fuel required to provide Black Start Service (fuel burn rate multiplied by minimum run hours) to the amount of storage tank capacity in excess of the MTSL (storage tank capacity less MTSL).<sup>55</sup> This ratio, the Black Start Energy Tank Ratio, is then applied to the Fuel Storage payment to reduce the payment for MTSL to just the tank volume needed to provide Black Start Service.<sup>56</sup> This proposed change is just and reasonable as it more closely aligns cost causation and payment.<sup>57</sup>

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<sup>53</sup> *See id.* ¶ 23.

<sup>54</sup> Proposed Tariff, Schedule 6A, section 18.

<sup>55</sup> *Id.*

<sup>56</sup> *Id.*

<sup>57</sup> *See Hauske Aff.* ¶ 24.

***B. Revising the Capital Recovery Factor for New Black Start Units While Maintaining Stated Capital Recovery Percentages for Existing Black Start Units Is Just and Reasonable***

The proposed revisions to the CRF for Black Start Units that elect to recover Black Start Capital Costs after the effective date of these Tariff revisions are just and reasonable, and not unduly discriminatory. PJM proposes to retain the existing CRF stated percentages for existing Black Start Units. This proposal would recognize that those units which already have received a black start status have made necessary capital investment to qualify as a black start unit, have committed to provide Black Start Service over multi-year periods, and have made the required capital investments in reliance on those stated percentages. PJM bases this decision not only on the reasonable expectations of the owners of existing Black Start Units, but also on the impact changing the CRF existing unit owners relied on to make multi-year commitments could have on prospective suppliers of Black Start Service. As Mr. Bryson notes in his Affidavit, applying the new formulaic CRF to “existing Black Start Units that rely on a CRF . . . could incent some of those owners [of existing Black Start Units] to seek to terminate their current Black Start Unit commitments. . . . a major change to past multi-year commitments could cause new prospective providers to account for the possibility of major unanticipated changes to *their* commitments going forward. I firmly believe that would be a poor policy choice for a service as important as Black Start Service.”<sup>58</sup>

For new Black Start Units going forward, PJM proposes to change the CRF from a stated percentage to a value derived according to a formula that is set forth in PJM Manual 15 and that is adjusted annually based on changes in federal and state income taxes and

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<sup>58</sup> Bryson Aff. ¶ 16.

debt interest rates.<sup>59</sup> Therefore, the proposal will result in an initial net rate reduction because of the Tax Cuts and Jobs Act of 2017 federal income tax reductions.<sup>60</sup>

The assumptions upon which the CRF rate is based will be in accordance with PJM Manual 15 and can be changed under PJM Manual 15 revision procedures and as stated in the proposed revisions to Tariff, Schedule 6A, section 18. Thus, the CRF components will either be specified in the Tariff or the method for calculating the CRF component will be set forth in the Tariff and PJM Manual 15. This will provide transparency and a formula that adjusts the CRF over time.<sup>61</sup> The components of the formula include standard carrying costs components such as capital structure, which assumes a 50-50 debt-to-equity ratio, cost of capital, income tax rates, and depreciation rates.<sup>62</sup> Some of the components, such as the debt interest rate assumption of the ATWACC from the net cost of new entry (“Net CONE”), are those the Commission has accepted for use in other contexts in the PJM Tariff.<sup>63</sup> The rate of return on equity component is within the bands specified in the 2018

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<sup>59</sup> See *supra* Section II.E.

<sup>60</sup> *Public Utility Transmission Rate Changes to Address Accumulated Deferred Income Taxes*, Order No. 864, 169 FERC ¶ 61,139, at PP 28-31 (2019), *order on reh’g & clarification*, Order No. 864-A, 171 FERC ¶ 61,033 (2020). PJM does not propose to adjust the CRF percentages for existing section 6 Black Start Units retroactively, to be effective as of January 1, 2018, for the Tax Cuts and Jobs Act of 2017. This is consistent with Order No. 864 because PJM does not propose to switch retroactively from its then-existing stated CRF percentages to a formula rate that includes the lower post-2017 corporate income tax rate. Also, as discussed herein, PJM does not propose to change the CRF percentages stated in Tariff, Schedule 6A, section 18, for existing section 6 Black Start Units and so those CRF percentages will not reflect the Tax Cuts and Jobs Act rates or any other change going forward.

<sup>61</sup> See *Promoting Transmission Investment Through Pricing Reform*, Order No. 679, 116 FERC ¶ 61,057, at P 386 (“We agree with several commenters that formula rates can provide the certainty of recovery . . .”), *order on reh’g*, Order No. 679-A, 117 FERC ¶ 61,345 (2006), *order on reh’g*, Order No. 679-B, 119 FERC ¶ 61,062 (2007).

<sup>62</sup> See *supra* Section II.E.

<sup>63</sup> See Hauske Aff. ¶ 17; *PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,029, at PP 101, 105, 108, 111 (2019), *reh’g denied*, 171 FERC ¶ 61,040 (2020), *appeal pending*.

Quadrennial Review.<sup>64</sup> The formulaic approach to calculating and updating the CRF also complies with Commission Order No. 864 by changing a stated rate to a formulaic rate that includes a reduced corporate income tax rate due to the Tax Cuts and Jobs Act of 2017, and that will adjust to future changes in federal or state corporate income tax rates.<sup>65</sup>

There is also a policy reason for maintaining the existing CRF percentages for existing Black Start Units. Black Start Service requires a multi-year commitment from resources with special attributes, which makes securing commitments to Black Start Service more difficult for PJM. Thus, while PJM strives to secure cost-effective Black Start Service, it also must honor its existing commitments to existing Black Start Unit owners.<sup>66</sup> This policy serves to retain the necessary amounts of Black Start Service without risking the loss of existing Black Start suppliers, or impacting the availability of potential bidders for new Black Start Unit owners given that the conditions under which they decide to commit their units and elect to recover Black Start Capital Costs could change later, when they cannot unilaterally end their commitment.<sup>67</sup> The Commission has approved

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<sup>64</sup> Hauske Aff. ¶¶ 15, 17.

<sup>65</sup> *Public Utility Transmission Rate Changes to Address Accumulated Deferred Income Taxes*, Order No. 864, 169 FERC ¶ 61,139, at PP 28-31 (2019), *order on reh'g & clarification*, Order No. 864-A, 171 FERC ¶ 61,033 (2020). PJM does not propose to adjust the CRF percentages for existing section 6 Black Start Units retroactively, to be effective as of January 1, 2018, for the Tax Cuts and Jobs Act of 2017. This is consistent with Order No. 864 because PJM does not propose to switch retroactively from its then-existing stated CRF percentages to a formula rate that includes the lower post-2017 corporate income tax rate. Also, as discussed herein, PJM does not propose to change the CRF percentages stated in Tariff, Schedule 6A, section 18, for existing section 6 Black Start Units and so those CRF percentages will not reflect the Tax Cuts and Jobs Act rates or any other change going forward.

<sup>66</sup> Bryson Aff. ¶¶ 15-16. PJM recognizes that FPA section 206 can always be invoked, prospectively, and a market participant could file a complaint under section 206 regarding the stated CRF percentages for existing Black Start Units, but PJM sees legitimate reasons to retain the stated CRF percentages in its Tariff for existing Black Start Units whose owners relied on those stated percentages when committing their Black Start Units and did not have the opportunity to evaluate the various components and the potential annual changes at the time they committed their resources to Black Start Service.

<sup>67</sup> *Id.*

different treatment for resources in instances where there are legitimate policy reasons for doing so.<sup>68</sup>

Therefore, retaining the stated CRF percentages in the Tariff for existing Black Start Unit owners is not unduly discriminatory because there are legitimate, factual differences between existing and new Black Start Unit owners.

#### **IV. STAKEHOLDER REVIEW AND EFFECTIVE DATE**

This proposal filed by PJM was originally developed in the PJM stakeholder process and presented jointly by Exelon Generation Company, LLC and the PJM Industrial Customer Coalition at the PJM Markets and Reliability Committee as a compromise on February 24, 2021. The Markets and Reliability Committee approved the proposal in a sector-weighted vote with 3.35 in favor. At the March 29, 2020, PJM Members Committee meeting, the proposal ultimately failed in a sector-weighted vote with only 3.17 in favor.

PJM requests a June 6, 2021 effective date and thus requests that the Commission issue an order on this filing on or before June 6, 2021, sixty days from the date of this filing. This will provide certainty for Black Start Unit owners, thereby encouraging offers in response to an incremental RFP PJM plans to issue concurrently with this filing. PJM needs to initiate the incremental RFP immediately to address a shortfall in Black Start Service that will occur in a Black Start zone in early 2022 as a result of units retiring from Black Start Service.<sup>69</sup>

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<sup>68</sup> See, e.g., *Sw. Power Pool, Inc.*, 158 FERC ¶ 61,063, at P 12 (2017) (approving SPP's proposal to treat all new non-wind variable resources as dispatchable while allowing existing variable non-wind resources to remain non-dispatchable, in part based on the policy benefit of increasing dispatchable non-wind resources in SPP).

<sup>69</sup> Bryson Aff. ¶¶ 11-12.

## V. CORRESPONDENCE

The following individuals are designated for inclusion on the official service list in this proceeding and for receipt of any communications regarding this filing:<sup>70</sup>

Craig Glazer  
Vice President–Federal Government Policy  
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## VI. DOCUMENTS ENCLOSED

This filing consists of the following:

1. This transmittal letter;
2. Affidavit of Michael E. Bryson on Behalf of PJM Interconnection, L.L.C. (Attachment A);
3. Affidavit of Thomas Hauske on Behalf of PJM Interconnection, L.L.C. (Attachment B); and
4. Revisions to the Tariff (in redlined and clean format (as Attachments C and D, respectively) and in electronic tariff filing format as required by Order No. 714).<sup>71</sup>

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<sup>70</sup> To the extent necessary, PJM requests waiver of Rule 203(b)(3) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.203(b)(3), to permit all persons listed to be placed on the official service list for this proceeding.

<sup>71</sup> *Electronic Tariff Filings*, Order No. 714, 2008–2013 FERC Stats. & Regs., Regs. Preambles ¶ 31,276 (2008), *final rule*, Order No. 714-A, III FERC Stats. & Regs., Regs. Preambles ¶ 31,356 (2014).

## **VII. 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>72</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/ferc-filings.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>73</sup> alerting them that this filing has been made by PJM and is available by following such link. PJM also serves the parties listed on the Commission's official service list for this docket. If the document is not immediately available by using the referenced link, the document will be available through the referenced link within 24 hours of the filing. Also, a copy of this filing will be available on FERC's eLibrary website located at the following link: <http://www.ferc.gov/docs-filing/elibrary.asp> in accordance with the Commission's regulations and Order No. 714.

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<sup>72</sup> See 18 C.F.R. §§ 35.2(e), 385.2010(f)(3).

<sup>73</sup> PJM already maintains, updates, and regularly uses email lists for all PJM members and affected state commissions.

## VIII. CONCLUSION

For the reasons set forth herein, PJM requests that the Commission accept the proposed Tariff revisions contained and described in this filing effective June 6, 2021.

Respectfully submitted,

Craig Glazer  
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**Attorneys for  
PJM Interconnection, L.L.C.**

April 7, 2021



# Attachment A

Affidavit of Michael E. Bryson  
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 MICHAEL E. BRYSON  
ON BEHALF OF PJM INTERCONNECTION, L.L.C.**

1. My name is Michael E. Bryson. My business address is 2750 Monroe Blvd., Audubon, Pennsylvania, 19403. I currently serve as the Senior Vice President of Operations for PJM Interconnection, L.L.C. (“PJM”). I am submitting this affidavit on behalf of PJM in support of the proposed revisions to the PJM Open Access Transmission Tariff (“Tariff”) being filed today in the captioned proceeding.

2. I earned a Bachelor of Science in general engineering from the United States Military Academy at West Point, NY, focusing on computer science and electrical engineering, and have a Master of Business Administration from Saint Joseph’s University in Philadelphia. I earned a graduate certificate in power engineering from the Worcester Polytechnic Institute.

3. Prior to my current position, at PJM I have held the positions of executive director of System Operations, general manager of Dispatch Operations, and manager of the Transmission Department for the System Operations Division. I am a member of the Independent System Operator and Regional Transmission Organization Operating Committee. I also serve on the board of PJM Technologies, Inc., and PJM Repository Information Services, Inc. Also, I previously served on the board of directors of the ReliabilityFirst Corporation as well as Consortium for Electric Reliability Technology Solutions.

4. As part of my work for PJM, I am responsible for PJM’s Operations Division, overseeing the 24-hour per day, 7-days per week transmission operations for real-time systems. These operations include scheduling, transmission dispatch, generation dispatch, reliability coordination, training, and all engineering analysis required to run the system and support the critical energy management systems.

5. The purpose of this affidavit is to support the Tariff revisions PJM proposes for Black Start Service<sup>1</sup> by (i) explaining the critical importance of Black Start Service to PJM’s reliable operation of the PJM transmission system; (ii) describing the need for prompt Federal Energy Regulatory Commission (“Commission”) acceptance of the

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<sup>1</sup> PJM Tariff, Schedule 6A. All capitalized terms that are not otherwise defined herein shall have the same meaning as they are given in the Tariff, Amended and Restated Operating Agreement of PJM Interconnection, L.L.C., or the Reliability Assurance Agreement Among Load Serving Entities in the PJM Region.

proposed Black Start Tariff revisions to provide certainty for Black Start Unit owners to encourage offers into an upcoming PJM solicitation of units to provide Black Start Service; and (iii) explaining the need to respect prior multi-year commitments by Black Start Units as part of the balance between securing resources to provide this critical service while also containing the cost of the service to ratepayers.

### The Critical Importance of Black Start Service

6. Transmission system blackouts or power system disturbances are most likely to occur as the result of loss of generating equipment or transmission facilities, or as the result of unexpected load changes. These disturbances could be, or could develop into, a magnitude sufficient to affect the reliable operation of the PJM transmission system.

7. PJM is responsible for taking actions that are necessary to maintain the operational integrity of the PJM transmission system. This responsibility includes coordinating and monitoring restoration of all or parts of the Bulk Electric System (“BES”) in the PJM footprint, as necessary. As part of this responsibility, PJM must develop and implement a reliable “black start” capability plan. This plan includes consideration of fuel sources for Black Start power for generating units, available cranking ability, available transmission paths, communication adequacy, operating instructions and procedures for synchronizing areas of the system that have become separated, and procedures for simulating, testing and verifying the Black Start plan’s resources and procedures.

8. PJM’s policy is to maintain, at all times, the integrity of the PJM transmission system and the Eastern Interconnection, and to prevent any unplanned separation of the PJM Transmission Owners’ systems. PJM’s system restoration plan identifies all of the locations where Black Start Units are needed. PJM Manual 14D<sup>2</sup> sets forth the criteria and process for selecting or identifying the Black Start Units necessary to commit to providing Black Start Service at the identified locations.

9. A Black Start Unit is a generating unit that has equipment enabling it to start without an outside electrical supply, or a generating unit with a high operating factor and the demonstrated ability to automatically remain operating, at reduced levels, when disconnected from the grid. Development of a new Black Start Unit, including converting an existing generating unit into a Black Start Unit, typically requires capital expenditures in the range of \$10 million to \$30 million. A typical upgrade would involve installing diesel generators, controls that allow the units to start without a source of power from the transmission system, and controls that allow the unit operators to close a unit’s output breaker to a dead (de-energized) bus. Necessary additional controls also would allow the units to control voltage and frequency during a restoration event. Existing Black Start Units may also need additional capital investment to comply with North American Electric

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<sup>2</sup> Operations Planning Division, *PJM Manual 14D: Generator Operational Requirements*, PJM Interconnection, L.L.C., § 10 (Nov. 19, 2020), <https://www.pjm.com/-/media/documents/manuals/m14d.ashx>.

Reliability Corporation (“NERC”) standards and for refurbishment, replacement, or upgrade of outdated black start equipment and controls.

10. The NERC Reliability Standard for System Restoration from Black Start Resources (EOP-005-3)<sup>3</sup> was established to ensure plans, Facilities, and personnel are prepared to enable system restoration from Black Start Resources to ensure reliability is maintained during restoration and priority is placed on restoring the transmission system. This standard, which applies to transmission operators such as PJM, transmission owners, and generator operators, generally has a Severe Violation Severity Level across all requirements. The high Severity Level is a testament to the critical nature of system restoration and Black Start Service to the reliability of the bulk electric system.

#### The Need for Certainty as to Rates, Terms, and Conditions of Black Start Service

11. PJM needs certainty as to the effective date for the Black Start revisions proposed in this filing, including (among other changes) the new formulaic Capital Recovery Factor (“CRF”) and the revised commitment periods, to facilitate an Incremental request for proposal (“RFP”) that PJM plans to issue immediately. The owner of several Black Start Units located in one transmission Zone has announced the retirement of those units from Black Start Service as of February 19, 2022. PJM has identified potential reliability concerns if the units terminate Black Start Service prior to March 31, 2023, which PJM anticipates is the earliest date that replacement Black Start Service would be available through the RFP.

12. PJM must commence an Incremental RFP to obtain Black Start Service in the Zone to replace the retiring Black Start Service as soon as possible to minimize the reliability concern and procure replacement Black Start Service in the Zone. The Incremental RFP process takes up to two years to complete and secure replacement Black Start capability. In order to help ensure that there is sufficient response to the Incremental RFP, PJM will issue the RFP on the same date as this Tariff revision filing; however, a Commission order accepting the Tariff revisions is needed to provide the certainty needed to generate sufficient interest in the RFP.

13. To support the critical reliability need for replacement Black Start Units, PJM seeks to maximize the quantity and capacity of prospective Black Start unit responses to this Incremental RFP. PJM anticipates setting a deadline no later than August 6, 2021 for responses to the planned RFP. This filing addresses some of the uncertainty faced by potential RFP responders, by showing the rates and terms PJM is willing to support. But only the Commission can show what it is willing to approve—which is ultimately what matters to those considering whether to commit, including with incremental investment, to help resolve the expected shortfall in Black Start Service early next year. A Commission

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<sup>3</sup> See *NERC Reliability Standards*, NERC EOP-005-3, [https://www.nerc.com/\\_layouts/15/PrintStandard.aspx?standardnumber=EOP-005-3&title=System%20Restoration%20from%20Blackstart%20Resources&jurisdiction=United%20States](https://www.nerc.com/_layouts/15/PrintStandard.aspx?standardnumber=EOP-005-3&title=System%20Restoration%20from%20Blackstart%20Resources&jurisdiction=United%20States), (last visited Apr. 6, 2021).

decision on this filing by June 6, 2021, which is more than 60 days from this filing date, would promote that certainty.

Respecting Prior Black Start Commitments Helps Strike the Right Balance Between Attracting Resources that Can Provide Black Start Service and Containing the Cost of Black Start Procurement

14. The essential role Black Start Units play in BES reliability demands that they be identified in advance and committed to provide service on very short notice. In return for their long-term commitment, PJM desires to provide Black Start Unit owners with certainty and long-term stability and predictability. PJM's long-standing procurement practices underscore the importance PJM attaches to securing commitments to provide this service:

- a. PJM procures Black Start Resources through an RFP every five years, and supplements that procurement with Incremental RFPs as necessary (e.g., to address plant retirements and changing transmission system needs);
- b. PJM seeks to procure 110% of its Critical Load requirement (i.e., cranking power to all units with a hot start time four hours or less, off-site nuclear safe shutdown power, and critical Natural Gas Infrastructure) for each Transmission Zone, to satisfy its Black Start Plan requirements;
- c. PJM includes some redundancy in its Black Start procurement given the inherent uncertainty in the system conditions operators could face in a system separation and shut-down event (e.g., unavailability of Black Start Units or obstacles posed by transmission system damage);
- d. PJM has long sought and secured multi-year commitments from Black Start Units, to provide greater certainty and stability in the fleet of resources PJM relies upon to meet this critical need.

15. Meeting these reliability needs, however, must always be balanced against the goal of reasonably containing the cost of obtaining Black Start Service. As part of this balance, PJM seeks to meet its system restoration goals both through securing multi-year commitments offered in good faith at a reasonable cost, and by avoiding *disincentives* to existing units maintaining their commitments and to new units offering new commitments that are reliant on additional investments.

16. As part of that balance, PJM's filing reasonably distinguishes between past Black Start Unit long-term commitments reliant on a stated CRF, and further such commitments reliant on a formulaic CRF. Before this filing becomes effective, CRFs are at stated percentage levels; after this filing, those percentages will, by design, automatically change every year. I am not a lawyer, and I cannot speak to what any Black Start Unit owner expects, but this filing clearly makes a substantial change in the basic structure of the CRF. Speaking as PJM's Senior Vice-President of Operations, I can express sincere

concern that applying that change to existing Black Start Units that rely on a CRF is not likely to be well received and could incent some of those owners to seek to terminate their current Black Start Unit commitments. I am likewise reasonably concerned about how a change of that degree to existing commitments may affect those who are considering new commitments. While PJM's formulaic CRF changes are clear and transparent, a major change to past multi-year commitments could cause new prospective providers to account for the possibility of major unanticipated changes to *their* commitments going forward. I firmly believe that would be a poor policy choice for a service as important as Black Start Service.

17. This concludes my affidavit.

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

PJM Interconnection, L.L.C.                    )  
  )           Docket No. ER21-\_\_\_\_-000  
  )

**VERIFICATION**

I, Michael E. Bryson, state that I am the Michael E. Bryson referred to in the foregoing document entitled “Affidavit of Michael E. Bryson on behalf of PJM Interconnection, L.L.C.” that I have read the same and am familiar with the contents thereof, and that the facts set forth therein are true and correct to the best of my knowledge, information, and belief.

In light of the steps that PJM Interconnection, L.L.C. has taken to address the ongoing emergency relating to COVID-19, including making arrangements for employees to work remotely, I respectfully request waiver of the Commission’s regulations with respect to any expectation or requirement that this verification be notarized.<sup>1</sup>

By: Michael E. Bryson

Name: Michael E. Bryson

Title: Senior Vice President of  
Operations for PJM  
Interconnection, L.L.C.

Dated: April 7, 2021

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<sup>1</sup> See *Extension of Non-Statutory Deadlines*, Supplemental Notice Waiving Regulations, Docket No. AD20-11-000 (Jan. 22, 2021).

# Attachment B

Affidavit of Thomas Hauske  
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 THOMAS HAUSKE  
ON BEHALF OF PJM INTERCONNECTION, L.L.C.**

1. My name is Thomas Hauske. My business address is 2750 Monroe Blvd., Audubon, Pennsylvania, 19403. I currently serve as the Principal Engineer in the Performance Compliance Department for PJM Interconnection, L.L.C. (“PJM”). I am submitting this affidavit on behalf of PJM in support of the proposed revisions to the PJM Open Access Transmission Tariff (“Tariff”) being filed today in the above captioned proceeding.

2. I have a Bachelor of Science degree in Mechanical Engineering from Drexel University and Master of Science degree in Mechanical Engineering from Northeastern University. I am a registered Professional Engineer in the State of Pennsylvania and since 2009 have been a member of the Delaware Governor’s Council on Boiler Safety.

3. As a Principal Engineer in PJM’s Performance Compliance Department, my responsibilities include the review and approval of existing and new Black Start Units’ annual revenue requirements and Black Start testing. In addition, I support the review and selection of new Black Start resources through PJM’s Black Start Request for Proposal process. In my position I also support the review of generating resources’ maintenance adders for cost-based offers, Fuel Cost Policies, and unit-specific operating parameter adjustment requests. Also, I am a subject matter expert for PJM’s cost development guidelines for cost-based offers and combined cycle (“CC”) modeling.

4. Prior to my current position, I worked at Conectiv Energy from 2000 to 2010, first as a Project Engineer, then as a Senior Engineer, and finally as Manager of Technology Services. As Manager of Technology Services, I supervised the Performance Group, System Engineers, Operator Training, and the engineering budget analysts. As a Senior Engineer and Project Engineer, I supported the engineering development and performance acceptance testing of several new CC and peaking facilities. I also supported performance testing, troubleshooting, and maintenance of Conectiv Energy’s existing steam, CC and peaking plants. Prior to my employment at Conectiv Energy, I worked as Performance Engineer for Sithe New England Holdings, LLC from 1998 to 2000 and as an Engineer and Senior Engineer for Boston Edison Company from 1985 to 1998. In these positions I provided engineering support for maintenance and operations of Boston Edison’s nuclear, fossil steam, and peaking plants. Sithe New England Holdings, LLC purchased Boston Edison’s fossil units in 1998.

5. The purpose of this affidavit is to support the Tariff revisions PJM proposes for Black Start Service<sup>1</sup> by describing the existing Capital Recovery Factor (“CRF”) percentages and the proposed revisions to the CRF percentages, and the non-rate terms and conditions for Black Start Service PJM proposes to revise.

6. The formulas in Tariff, Schedule 6A, section 18 determine a cost-based annual revenue requirement for Black Start Units providing Black Start Service under Schedule 6A, sections 5 and 6. These units have elected to recover the costs of providing Black Start Service under the Schedule 6A, section 18 formulas, rather than through their own cost-based revenue requirement filed with the Federal Energy Regulatory Commission (“Commission”) or through contractual agreements with a Transmission Owner. These formulas include fixed costs, variable costs, training costs, and fuel storage costs. For units that have elected to recover new or additional Black Start Capital Costs, the fixed cost component of their revenue requirement calculation includes a CRF.

7. The CRF rate is typically used by units that are providing Black Start Service for the first time. Some existing units have used the CRF rate to recover costs associated with North American Electric Reliability Corporation (“NERC”) Critical Infrastructure Protection (“CIP”) and unit refurbishment costs. The CRF rate allows the unit owner to recover the cost of incremental investments (capital cost and a return on investment) needed to make a unit black-start capable. While such investment amounts will vary by unit, today they typically range from \$10 million to \$30 million.

8. Currently, 154 generation facilities (i.e., units) provide Black Start Service in the PJM Region. Of these, around one-third (i.e., 43 of the units) employ the CRF rate in their revenue requirement calculation. Units using the CRF rate have differing commitment periods, but half of these units have a five-year commitment period.

9. Black Start Service is voluntary in PJM. The existing Base Formula Rate of either 1% or 2% of the net cost of new entry (“Net CONE”), which is used as a proxy for the Fixed Cost of an existing Black Start Unit, is not sufficient to incentivize the capital investment needed to convert a unit to be Black Start capable or account for the additional financial risk. The CRF rate’s built in return does provide incentive for unit owner to offer their unit into Black Start Service via PJM’s Black Start request for proposal (“RFP”) process. PJM typically saw multiple proposals submitted in previous RFPs and is able to select the best option for providing the service. Without the CRF’s return on the incremental investment needed to become black-start capable, it would be difficult for PJM to attract units willing to provide Black Start Service.

10. The existing CRF percentages based on the age of the unit are a fixed stated value in Tariff, Schedule 6A and have been unchanged since they were added to the Tariff in 2009. The values are similar to the CRFs specified in Tariff, Attachment DD, section 6.8(a) for the Avoidable Project Investment Rate (“APIR”) used to set maximum

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<sup>1</sup> Tariff, Schedule 6A. All capitalized terms that are not otherwise defined herein shall have the same meaning as they are defined in the Tariff, Amended and Restated Operating Agreement of PJM Interconnection, L.L.C., or the Reliability Assurance Agreement Among Load Serving Entities in the PJM Region.

cost-based capacity market sell offers. But neither the Tariff nor the PJM Manuals specify the bases, assumptions, or calculation method of the existing Black Start Service CRF values, which are thus essentially “black box” values. Since the assumptions and method are not documented in the Tariff or PJM Manuals, PJM did not have a process in place to update these “black box” values when they changed.

11. PJM is proposing in this filing to establish the CRF percentages that will apply going forward formulaically to all new units entering the service for the duration of its recovery period, based on certain stated assumptions, and certain components which are documented in either the Tariff or the PJM Manuals. Some of the components such as the federal and state tax income rate or significant changes in the debt rate will be reviewed and potentially change annually. PJM will calculate the CRF percentage values during April each year using the value effective as of April 1. Each new Black Start Unit’s annual revenue requirement will be updated, using the revised CRF percentages, by May 14 each year, and the updated revenue requirements will become effective on June 1 each year. If a new Black Start Unit enters service prior to the April calculation, it will use the CRF value established in the April CRF update prior to the time the unit enters service..

12. CRFs are calculated using an economic pro forma calculation for a 100 MW combustion turbine needing a \$1 million capital investment to qualify for Black Start Service to determine a levelized cost recovery for a recovery period based on the age of the unit. The \$1 million investment is simply a standard basis for the calculation of the CRF percentage; the resulting percentage value will be applied to each Black Start Unit’s actual investment. The combustion turbine was the typical type of unit that provided Black Start Service when the CRFs were added to the Tariff. The following components and assumptions are used in the CRF calculation: federal income tax and depreciation rates as established by U.S. Internal Revenue Service, an average of the income tax rates for all the states in the PJM Region, 50% equity for the capital investment necessary to make a unit qualify for Black Start Service, 50% debt for the capital investment necessary to make a unit qualify for Black Start Service, debt interest rate based on the most recent Net CONE quadrennial review after-tax weighted average cost of capital (“ATWACC”) and modified on annual basis by a 200 basis points or greater changes in the Moody Utility Index for bonds rated Baa1, debt term equal to the recovery period, and an after tax internal rate of return on equity of 12%. The federal and average state tax rate will be updated annually if changed. The debt interest rate will be updated during the Net CONE quadrennial review or, if the two-year change in the Moody Utility Index for bonds rated Baa1 is more than 200 basis points, this change will be added to the ATWACC rate used in the most recent Net CONE quadrennial review and used for the current year’s debt interest rate.

13. Similar to the application of the APIR CRF and the current Black Start CRFs, the investment recovery period using the formulaic CRF will be based on the age of the Black Start Unit, using several categories of age ranges. PJM will include a table which will be posted on the PJM website associating Black Start recovery periods with each age range. However, the Black Start commitment period for the new units entering Black Start Service will extend beyond the recovery period to the lifetime of the Black Start equipment. The capital cost to convert a unit to Black Start Service can be significant and older unit may only have a five-year capital cost recovery period. While it is appropriate to maintain

the capital recovery period based on the age of the unit used previously in the Tariff to incent responses to PJM's Black Start RFP, the equipment installed could have a life well beyond the recovery period. Therefore, new Black Start Units that recover capital costs to become Black Start capable will maintain the existing capital cost recovery period but will have a lifetime commitment of the Black Start equipment to Black Start Service. Units that provide Black Start Service after the capital recovery period will be compensated for their fixed cost via the Base Formula Rate in Tariff, Schedule 6A, section 5.

14. CRFs will be calculated assuming a levelized cost recovery for the Incremental Black Start Capital Costs. This accords with the levelized recovery approach long used (and approved by the Commission) for the Net CONE calculation, and for the CRF used for APIR in Tariff, Attachment DD.

15. The new CRF calculation will use accelerated depreciation rates currently prescribed by the Internal Revenue Service. This is the same approach used for PJM's Net CONE calculation in the 2018 Brattle Report "PJM Cost of New Entry"<sup>2</sup> dated April 19, 2018. Going forward however, the accelerated depreciation rate used in the CRF for a new Black Start Unit's CRF calculation will be the depreciation rate established in the April CRF update prior to the time the unit enters service.

16. The assumed capital structure, cost of debt, and cost of equity will track the ATWACC as used in the most recent Net CONE calculation. However, as an added protection for ratepayers, the capital structure and cost of equity assumptions will be stated in the Tariff, and thus can change only pursuant to a Federal Power Act section 205 filing.

17. The Commission-approved ATWACC for the current effective Net CONE<sup>3</sup> is 8.2%, with a capital structure of 55% debt/45% equity, an after-tax internal rate of return of 13%, and an average debt cost of 6%. The 2018 Brattle Report "PJM Cost of New Entry" dated April 19, 2018, that was largely relied upon to support these values, identified a reasonable ROE range of 8.5% to 12.8%, and also found capital structures ranged from 46% debt to 66% debt for BBB-rated companies. Therefore, the values used in the CRF calculations for the proposed Tariff revisions are supported by recent analyses.

18. The debt interest rate used for new Black Start Units will be based on the most recent Net CONE quadrennial review ATWACC and modified on an annual basis in the event of a 200 basis point or greater change in the Moody Utility Index for bonds rated Baa1. If the year change in the Moody Utility Index for bonds rated Baa1 is more than 200 basis points, this change will be added to the interest rate used in the most recent Net CONE quadrennial review and will be used as the new unit's debt interest rate in the annual CRF calculation.

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<sup>2</sup> *PJM Interconnection, L.L.C.*, Periodic Review of Variable Resource Requirement Curve Shape and Key Parameters, Docket No. ER19-105-000, at Attachment E, Exhibit No. 2 (Oct. 12, 2018).

<sup>3</sup> *PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,029, at PP 101, 105, 108, 111 (2019), *reh'g denied*, 171 FERC ¶ 61,040 (2020), *appeal pending*.

19. The 2018 Brattle report used the appropriate state tax rate for the location of the reference resource. Going forward the state income tax rate used in the annual CRF calculations for the new units will be an average of the state income tax rates for all states located in the PJM Region. This was deemed a reasonable compromise to calculating and maintaining state specific CRFs.

20. The current CRF calculation components and method were not documented in the Tariff or PJM Manuals. PJM Manual 15<sup>4</sup> will be updated to set forth the details for the CRF calculation formula, components, and assumptions. This particular PJM Manual has an increased level of review through the PJM Members Committee and can only be changed only upon approval by the PJM Board of Managers, which provides added protection for market participants and stakeholders. Moreover, any changes to the methodology for calculating most of the CRF components and any changes to the rate of return and the equity to debt ratio CRF components must be documented in the Tariff and filed with and accepted by the Commission.

21. Most Black Start Units in PJM are compensated for Black Start Service through Tariff, Schedule 6A. A few Black Start Units in PJM were grandfathered into Black Start Service upon integration of the transmission zone into PJM. These units are not compensated via Tariff, Schedule 6A but under existing agreements with Transmission Owners. Such Black Start Units can perform their Black Start Test on a three-year interval in accordance with the requirements of NERC Standard EOP-05. Black Start Units compensated under Tariff, Schedule 6A must have completed a Black Start test within the last 13 months in order to maintain their compensation. In order to ensure that all Black Start Units test on the same frequency, PJM is implementing a change to Tariff, Schedule 6A which requires all Black Start Units in PJM to test on an annual basis whether they are compensated through Tariff, Schedule 6A or by the Transmission Owner.

22. Black Start Unit owners may substitute a non-designated Black Start Unit at a plant for an existing Black Start Unit if the substitute unit has a successful Black Start Test on file with PJM. PJM is adding additional clarification to the Tariff that an acceptable substitute Black Start Unit must be able to provide equivalent Black Start Service, be of similar age, and be on the same voltage level and cranking path as the existing Black Start Unit. The substitute also will not receive compensation for additional capital cost to provide the service. In addition, in order to reduce the administrative load on PJM and the Transmission Owner from updating restoration plans, the unit owner must submit technical documentation supporting the substitution and only one substitution may occur in a year.

23. The only impact for a Black Start Unit that fails to perform a successful Black Start test with the previous 13 months is lost annual revenue. If the unit failed the test because of a major equipment failure, the unit may be placed in a long duration outage while the unit owner evaluates corrective measures. While this unit is on outage the unit is still listed in the restoration plan as a Black Start Unit. Under the current requirements of Tariff, Schedule 6A, PJM must provide a unit owner one-year advance notice to

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<sup>4</sup> Cost Development Subcommittee, *PJM Manual 15: Cost Development Guidelines*, PJM Interconnection, L.L.C. (Dec. 9, 2020), <https://www.pjm.com/-/media/documents/manuals/m15.ashx>.

terminate its Black Start Service, even if the unit has been on an extended outage. PJM is adding language that allows it to terminate, at its discretion, a Black Start Unit that fails to perform a successful Black Start Test within 90 days of its 13-month test window. PJM may extend the 90-day period at its discretion after consultation with the unit owner to determine what actions the unit owner is taking to complete a successful Black Start Test. Providing PJM with a method to terminate Black Start Units that are unable to perform gives PJM the opportunity to keep restoration plans up to date and initiate a Black Start RFP earlier, if necessary.

24. Black Start Units that can store fuel on site are compensated in their annual revenues for fuel carrying cost. The volume of fuel included in this compensation is 16 hours of operation plus the Minimum Tank Suction level (“MTSL”). The MTSL is the storage tank’s unusable volume. Typically, this is the fuel beneath the fuel suction line for the unit. The fuel storage tanks store additional fuel for energy operation also. Because Black Start Units’ annual revenue is intended to compensate Black Start Units for costs solely necessary for Black Start, PJM is revising Tariff, Schedule 6A to apportion the volume of the MTSL for Black Start service and energy. As such, the Black Start portion of the MTSL volume used in the calculation of a Black Start Unit’s annual revenue requirement will be multiplied by a ratio of the Black Start Service volume to storage tank volume.

25. This concludes my affidavit.

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

PJM Interconnection, L.L.C.

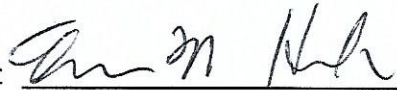
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Docket No. ER21-\_\_\_\_-000

**VERIFICATION**

I, Thomas Hauske, state that I am the Thomas Hauske referred to in the foregoing document entitled "Affidavit of Thomas Hauske on behalf of PJM Interconnection, L.L.C." that I have read the same and am familiar with the contents thereof, and that the facts set forth therein are true and correct to the best of my knowledge, information, and belief.

In light of the steps that PJM Interconnection, L.L.C. has taken to address the ongoing emergency relating to COVID-19, including making arrangements for employees to work remotely, I respectfully request waiver of the Commission's regulations with respect to any expectation or requirement that this verification be notarized.<sup>1</sup>

By: 

Name: Thomas Hauske

Title: Principal Engineer in the  
Performance Compliance  
Department for PJM  
Interconnection, L.L.C.

Dated: April 6, 2021

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<sup>1</sup> See *Extension of Non-Statutory Deadlines*, Supplemental Notice Waiving Regulations, Docket No. AD20-11-000 (Jan. 22, 2021).

# Attachment C

## Revisions to the PJM Open Access Transmission Tariff

(Marked/Redline Format)



## **SCHEDULE 6A Black Start Service**

References to section numbers in this Schedule 6A refer to sections of this Schedule 6A, unless otherwise specified.

To ensure the reliable restoration following a shut down of the PJM transmission system, Black Start Service is necessary to facilitate the goal of complete system restoration. Black Start Service enables the Transmission Provider to designate specific generators called Black Start Units whose location and capabilities are required to re-energize the transmission system following a system-wide blackout. The Transmission Provider shall administer the provision of Black Start Service. PJMSettlement shall be the Counterparty to the purchases and sales of Black Start Service.

### **TRANSMISSION CUSTOMERS**

1. All Transmission Customers and Network Customers must obtain Black Start Service through the Transmission Provider, with PJMSettlement as the Counterparty, pursuant to this Schedule 6A.

### **PROVISION OF BLACK START SERVICE**

2. A Black Start Unit is a generating unit that has equipment enabling it to start without an outside electrical supply or a generating unit with a high operating factor (subject to Transmission Provider concurrence) with the demonstrated ability to automatically remain operating, at reduced levels, when disconnected from the grid. A Black Start Unit shall be considered capable of providing Black Start Service only when it meets the criteria set forth in the PJM manuals. ~~For the purposes of this Schedule 6A, t~~ The expected life of the Black Start Unit shall take into consideration expectations regarding both the enabling equipment and the generation unit itself.

3. A Black Start Plant is a generating plant that includes one or more Black Start Units. A generating plant with Black Start Units electrically separated at different voltage levels will be considered multiple Black Start Plants.

4. The Transmission Provider is responsible for developing a coordinated and efficient system restoration plan that identifies all of the locations where Black Start Units are needed. The PJM Manuals shall set forth the criteria and process for selecting or identifying the Black Start Units necessary to commit to providing Black Start Service at the identified locations. No Black Start Unit shall be eligible to recover the costs of providing Black Start Service in the PJM Region unless it agrees to provide such service for a term of commitment established under section 5, 6, or 6A below.

5. Owners of Black Start Units selected to provide Black Start Service in accordance with ~~section 4 of this~~ Schedule 6A, section 4 and electing to forego any recovery of new or additional Black Start Capital Costs shall commit to provide Black Start Service from such Black Start Units for an initial term of no less than two years and authorize the Transmission Provider to

resell Black Start Service from its Black Start Units. The term commitment shall continue to extend until the Black Start Unit owner or the Transmission Provider provides written, one-year advance notice of its intention to terminate the commitment or the commitment is involuntarily terminated pursuant to section 15 of this Schedule 6A. Black Start Units that are selected to provide Black Start Service after June 6, 2021, pursuant to Schedule 6A, section 6 that subsequently transition from the Capital Cost Recovery Rate to the Base Formula Rate shall have a lifetime commitment and can only terminate for the reason specified in Schedule 6A, section 6(ii).

6. (i) Owners of Black Start Units selected to provide Black Start Service prior to June 6, 2021, in accordance with section 4 of this Schedule 6A and electing to recover new or additional Black Start Capital Costs shall commit to provide Black Start Service from such Black Start Units for a term based upon the age of the Black Start Unit or the longest expected life of the Incremental Black Start Capital Cost, as set forth in the applicable CRF Tables in section 18 of this Schedule 6A. For those Black Start Units that elect to recover new or additional Black Start Capital Costs in addition to a prior, FERC-approved cost recovery rate, the applicable commitment period shall be the longer of the FERC-approved recovery period or the applicable term of commitment as set forth in the CRF Tables in section 18 of this Schedule 6A. The Transmission Provider may terminate the commitment with one year advance notice of its intention to the Black Start Unit owner, but ~~the Black Start Unit owner shall be eligible to recover any amount of unrecovered Fixed Black Start Service Costs over a period not to exceed five years.~~ A Black Start Unit owner may terminate the provision of Black Start Service with one year advance notice and consent of the Transmission Provider (or its commitment period may be involuntarily terminated pursuant to the section 15 below). Such Black Start Unit shall forego any otherwise existing entitlement to future revenues collected pursuant to this Schedule 6A and fully refund any amount of the Black Start Capital Costs recovered under a FERC-approved rate (recovered on an accelerated basis pursuant to the provisions of section 17(i) of this Schedule 6A) in excess of the amount that would have been recovered pursuant to section 18 of this Schedule 6A during the same period. At the conclusion of the term of commitment established under this section 6 of this Schedule 6A, a Black Start Unit shall commence a new term of commitment under either section 5 or 6 of this Schedule 6A, as applicable.

(ii) Owners of Black Start Units selected to provide Black Start Service after June 6, 2021, in accordance with Schedule 6A, section 4 and electing to recover new or additional Black Start Capital Costs shall commit to provide Black Start Service from such Black Start Units for an initial capital recovery period based upon the age of the Black Start Unit plus the remaining life of the Black Start equipment. For those Black Start Units that elect to recover new or additional Black Start Capital Costs in addition to a prior, FERC-approved cost recovery rate, the applicable commitment period shall be the longer of the FERC-approved recovery period or the initial capital recovery period based upon the age of the Black Start Unit plus the remaining life of the Black Start equipment.

The Transmission Provider may terminate the commitment with one year advance notice of its intention to the Black Start Unit owner, but the Black Start Unit owner shall be eligible to recover any amount of unrecovered Fixed Black Start Service Costs over a period not to exceed five years. A Black Start Unit owner may terminate the provision of Black Start Service with

one year advance notice and consent of the Transmission Provider (or its commitment period may be involuntarily terminated pursuant to the section 15 below), provided the Black Start Unit's owner demonstrates to the satisfaction of the Transmission Provider at least one of the following reasons for such termination apply:

- a. Black Start Unit retirement or deactivation with at least one year's notice;
- b. Expiration of a state, federal, or other governmental agency permit(s) required for Black Start Service with at least one year's notice; or
- c. Additional capital is required by the Black Start Unit owner to maintain Black Start Service capability (in which case, the Black Start Unit will apply for Black Start Service selection in accordance with the procedures set forth in Manual 12 and only continue to provide Black Start Service if selected for Black Start Service by the Transmission Provider).

Such Black Start Unit shall forego any otherwise existing entitlement to future revenues collected pursuant to this Schedule 6A and fully refund any amount of the Black Start Capital Costs recovered under a FERC-approved rate (recovered on an accelerated basis pursuant to the provisions of section 17(i) of this Schedule 6A) in excess of the amount that would have been recovered pursuant to Schedule 6A, section 18 during the same period.

6A. Black Start Units which are owned or contracted for by a Transmission Owner to provide Black Start Service as a result of the black start reliability backstop process defined in the PJM Manuals, shall be subject to cost recovery through such Transmission Owner's annual revenue requirement under such ~~Transmission-Transmission~~ Owner's Tariff, Attachment H, as filed with, and accepted by, FERC under Section 205 of the Federal Power Act and in accordance with Tariff, Part I, section 9, or through such other cost recovery mechanism, provided that such cost ~~recovery-recovery~~ mechanism is filed with and accepted by FERC. The relevant Transmission Owner shall commit to provide, or effectuate the provision of, Black Start Service from such a Black Start Unit for the FERC-approved cost ~~recovery-recovery~~ period. The Transmission Provider may terminate the commitment with one year advance notice of its intention to the Transmission Owner. Provision of Black Start Service from a Black Start Unit obtained through the black start reliability backstop process defined in the PJM Manuals shall be subject to sections 7 through 13 of this Schedule 6A. The Revenue Requirements, Credits, and Charges provisions contained in sections 16 through 27 of this Schedule 6A, shall not apply to Black Start Units obtained as a result of the black start reliability backstop process defined in the PJM Manuals.

6B. In the event that a Black Start Unit fails to fulfill its commitment established under section 5 to provide Black Start Service, receipt of any Black Start Service revenues associated with the non-performing Black Start Unit shall cease and, for the period of the unit's non-performance, the Black Start Unit owner shall forfeit the Black Start Service revenues associated with the non-performing Black Start Unit that it received or would have received had the Black Start Unit performed, not to exceed revenues for a maximum of one year.

In the event that a Black Start Unit fails to fulfill its commitment established under section 6 above, such unit shall forego any otherwise existing entitlement to future revenues collected pursuant to this Schedule 6A and fully refund any amount of the Black Start Capital Costs recovered under a FERC-approved rate (recovered on an accelerated basis pursuant to the provisions of section 17(i) of this Schedule 6A) in excess of the amount that would have been recovered pursuant to section 18 of this Schedule 6A during the same period, but such unit remains eligible to establish a new commitment under section 5 or 6 of this Schedule 6A. Provided, however, Black Start Units that are selected to provide Black Start Service after June 6, 2021, pursuant to Schedule 6A, section 6 that subsequently transition from the Capital Cost Recovery Rate to the Base Formula Rate shall have a lifetime commitment and can only terminate for a reason specified in Schedule 6A, section 6(ii).

### **Performance Standards and Outage Restrictions**

7. In addition to the performance capabilities set forth in the PJM Manuals, Black Start Units must have the capabilities listed below. These capabilities must be demonstrated in accordance with the criteria set forth in the PJM manuals and will remain in effect for the duration of the commitment to provide Black Start Service.
  - a. A Black Start Unit must be able to close its output circuit breaker to a dead (de-energized) bus within the time specified in the PJM Manuals.
  - b. A Black Start Unit must be capable of maintaining frequency and voltage under varying load.
  - c. A Black Start Unit must be able to maintain rated output for a period of time identified by each Transmission Owner's system restoration requirements, in conjunction with the Transmission Provider.
8. Each owner of Black Start Units or Black Start Plants must maintain procedures for the start-up of the Black Start Units.
9. If a Black Start Unit is a generating unit with a high operating factor (subject to Transmission Provider concurrence) with the ability to automatically remain operating at reduced levels when disconnected from the grid, this ability must be demonstrated in accordance with the criteria set forth in the PJM manuals.
10. No more than one Black Start Unit at a Black Start Plant may be subject to a Generator Planned Outage or Generator Maintenance Outage at any one time without written approval of the Transmission Provider and the Transmission Owner in the Zone receiving Black Start Service from the Black Start Plant. This restriction excludes outages on common plant equipment that may make all units unavailable. A Black Start Unit not selected for providing Black Start Service in accordance with this Schedule 6A, section 4 and the PJM Manuals ~~currently designated as critical and on the same voltage level~~ may be substituted for a Black Start Unit that is subject to a Generator Planned Outage to permit a concurrent planned outage of another critical Black Start Unit at the same Black Start Plant ~~to begin~~. The Black Start Unit

used as a substitute shall not receive compensation for additional capital expenditures to qualify for Black Start Service, will not increase the current Black Start Unit capital recovery commitment period, must be connected at the same voltage level and cranking path, must be similar age as the current Black Start Unit, must provide equivalent Black Start Unit Capacity, and must have had a valid annual test within the previous 12-13 months. Black Start Unit substitutions may be permitted for reasons other than Generator Planned Outages if requested by the Black Start Unit owner and if approved by the Transmission Provider; provided, however, all requests for Black Start Unit substitutions must be supported by documentation and information demonstrating operational or technical reasons for the substitution satisfactory to the Transmission Provider and may only occur once within a 12-month period.

11. Concurrent planned outages at multiple Black Start Plants within a zone may be restricted based on Transmission Owner requirements for Black Start Service availability. Such restrictions must be predefined and approved by Transmission Provider in accordance with the PJM manuals.

### **Testing**

12. To verify that they can be started and operated without being connected to the Transmission System, Black Start Units ~~designated as critical~~ shall be tested annually in accordance with the Tariff and the PJM Mmanuals. The Black Start Unit owner shall determine the time of the annual test.

13. Compensation under this Schedule 6A for energy output delivered to the Transmission System during the annual test shall be provided for the Black Start Unit's minimum run time at the higher of the unit's cost-capped offer or real-time Locational Marginal Price plus start-up and no-load costs for up to two start attempts, if necessary. For Black Start Units that are generating units with a high operating factor (subject to Transmission Provider's concurrence) with the ability to automatically remain operating at reduced levels when disconnected from the grid, an opportunity cost will be provided to compensate the unit for lost revenues during testing.

14. ~~To receive Black Start Service revenues, a All~~ Black Start Units must have a successful annual test on record with the Transmission Provider within the preceding 13 months. A Black Start Unit receiving revenues under Section 5 or Section 6 above that does not have a successful annual test on record with the Transmission Provider within the preceding 13 months will not qualify to receive Black Start Service revenues.

15. If a Black Start Unit fails the annual test, the unit may be re-tested within a ten-day period without financial penalty. If the Black Start Unit does not successfully re-test within that ten-day period, monthly Black Start Service revenues under this Schedule 6A will be forfeited by that unit from the time of the first unsuccessful test until such time as the unit passes an annual test. If the Black Start Unit owner ~~determines does not to~~ make the necessary repairs to enable the Black Start Unit to pass the annual test within 90 days of the due date for the annual test pursuant to section 14 above, the Black Start Unit will immediately cease to qualify as a Black Start Unit and, if applicable, owner will have failed to fulfill its commitment pursuant to section 5 or section 6 above, whichever is applicable, of this Schedule 6A and will be subject to the

additional forfeiture of revenues set forth in section 6B of this Schedule 6A. The 90 day period may be extended up to 1 year by the Transmission Provider in accordance with the PJM Manuals. If the 90 day period is extended, the Black Start Unit owner will continue to forfeit all revenues starting in the month of the first failed test until the Black Start Unit has demonstrated to the Transmission Provider that a successful test has been completed.

### **Revenue Requirements**

16. A Black Start Unit Owner's -annual Black Start Service revenue requirement shall be the sum of the annual Black Start Service revenue requirements for each generator that is designated as providing Black Start Service and has provided the Transmission Provider with a calculation of its annual Black Start Service revenue requirements. A separate line item shall appear on the participants' Transmission Provider bill for Black Start Service charges and credits.

17. Black Start Service revenue requirements for each Black Start Unit shall be based, at the election of the owner, on either (i) a FERC-approved rate for the recovery of the cost of providing such service for the entire duration of the commitment term set forth in either section 5 or 6 of this Schedule 6A, as applicable, or (ii) the formula rates set forth in section 18 of this Schedule 6A for the commitment term set forth in section 5 or 6 of this Schedule 6A as applicable. Each generator's Black Start Service revenue requirements shall be an annual calculation.

### **17A. Annual Review for all Black Start Units**

Requests for Black Start Service revenue requirements and for changes to the Black Start Service revenue requirements must be submitted to the Market Monitoring Unit for review and analysis, with supporting data and documentation, pursuant to Tariff, Attachment M-Appendix, section III and the PJM Manuals, with a copy to the Office of the Interconnection, by no later than May 3 of each year. The Market Monitoring Unit and the Black Start Unit owner shall attempt to come to agreement on the level of each component included in the Black Start Service revenue requirements by no later than May 14 of each year. By no later than May 21 of each year, the Black Start Unit owner shall notify the Office of the Interconnection and the Market Monitoring Unit in writing whether it agrees or disagrees with the Market Monitoring Unit's determination of the level of each component included in the Black Start Service revenue requirements. The Black Start Unit owner may also submit Black Start Service revenue requirements that it chooses to the Office of the Interconnection by no later than May 21 of each year, provided that (i) it has participated in good faith with the process described in this section and in Tariff, Attachment M-Appendix, section III (ii) the Black Start Service revenue requirements are no higher than the level defined in any agreement reached by the Black Start Unit owner and the Market Monitoring Unit that resulted from the foregoing process, and (iii) the Black Start Service revenue requirements are accepted by the Office of the Interconnection subject to the criteria set forth in the Tariff and PJM Manuals.

The Office of the Interconnection shall determine whether to accept the values submitted by the Black Start Unit owner subject to the requirements of the Tariff and the PJM Manuals by no later than May 27. If the Office of the Interconnection does not accept the values submitted by the

Black Start Unit owner in such case, the Black Start Unit owner may file its proposed values with the Commission for approval. Pursuant to Tariff, Attachment M-Appendix, section III, if the Office of the Interconnection accepts the Black Start Service revenue requirements submitted by the Black Start Unit owner in such case, the Market Monitoring Unit may petition the Commission for an order that would require the Black Start Unit owner to utilize the values determined by the Market Monitoring Unit or the Office of the Interconnection or such other values as determined by the Commission. The annual calculation of Black Start Service revenue requirements shall become effective on June 1 of each year, except that no change to a Black Start Service revenue requirement shall become effective until the existing revenue requirement has been effective for at least twelve months. Notwithstanding the foregoing, the deadlines set forth in this section 17 shall not apply to a Black Start Unit owner's election to select a new method of recovery for its Fixed BSSC.

### **17B. Initial Review for New Black Start Units**

Requests for new Black Start Service revenue requirements must be submitted to the Market Monitoring Unit for review and analysis, with supporting data and documentation, pursuant to Tariff, Attachment M-Appendix, section III and the PJM Manuals, with a copy to the Office of the Interconnection, by no later than 90 days after entering Black Start Service. The Market Monitoring Unit and the Black Start Unit owner shall attempt to come to agreement on the level of each component included in the Black Start Service revenue requirements by no later than 90 days after the Black Start Unit owner's submittal of final black start capital costs (if applicable), variable black start costs, and fuel storage cost documentation. By no later than 90 days of the Black Start Unit owner's submittal of final black start cost documentation, the Market Monitoring Unit shall calculate the new Black Start Unit's annual revenue requirement and submit it to the Office of the Interconnection and the Black Start Unit owner. If more than three Black Start Unit owners submit documentation within a 90-day period, the Market Monitoring Unit shall complete the review of the first three submittals within 90 days and the next set of three within the following three months and so on until all are complete. The Black Start Unit owner shall notify the Office of the Interconnection and the Market Monitoring Unit in writing if it disagrees with the Market Monitoring Unit's determination of the level of any component included in the Black Start Service revenue requirements within 7 days after the Market Monitoring Unit's submittal of the annual revenue requirement to the Office of the Interconnection. The Black Start Unit owner shall also submit Black Start Service revenue requirements that it proposes to the Office of the Interconnection provided that (i) it has participated in good faith with the process described in this section and in Tariff, Attachment M-Appendix, section III; (ii) the Black Start Service revenue requirements are no higher than the level defined in any agreement reached by the Black Start Unit owner and the Market Monitoring Unit that resulted from the foregoing process; and (iii) the Black Start Service revenue requirements are accepted by the Office of the Interconnection subject to the criteria set forth in the Tariff and PJM Manuals.

The Office of the Interconnection shall determine whether to accept the values submitted by the Black Start Unit owner subject to the requirements of the Tariff and the PJM Manuals by no later than 30 days after its receipt of the Black Start Unit owner's written notice of a disagreement. If the Office of the Interconnection does not accept the values submitted by the Black Start Unit

owner in such case, the Black Start Unit owner may file its proposed values with the Commission for approval. Pursuant to Tariff, Attachment M–Appendix, section III, if the Office of the Interconnection accepts the Black Start Service revenue requirements submitted by the Black Start Unit owner in such case, the Market Monitoring Unit may petition the Commission for an order that would require the Black Start Unit owner to utilize the values determined by the Market Monitoring Unit or the Office of the Interconnection or such other values as determined by the Commission. The annual calculation of Black Start Service revenue requirements shall become effective the day the unit enters Black Start Service.

18. The formula for calculating a generator’s annual Black Start Service revenue requirement is:

$$\{(\text{Fixed BSSC}) + (\text{Variable BSSC}) + (\text{Training Costs}) + (\text{Fuel Storage Costs})\} * (1 + Z)$$

For units that have the demonstrated ability to operate at reduced levels when automatically disconnected from the grid, the formula is revised to:

$$(\text{Training Costs}) * (1 + Z)$$

Where:

#### **Fixed BSSC**

Black Start Units with a commitment established under section 5 of this Schedule 6A shall calculate Fixed BSSC or “Fixed Black Start Service Costs” in accordance with the following Base Formula Rate:

#### **Base Formula Rate:**

$$\text{Net CONE} * \text{Black Start Unit Capacity} * X$$

Where:

“Net CONE” is the then current installed capacity (“ICAP”) net Cost of New Entry (expressed in \$/MW year) for the CONE Area where the Black Start Unit is located.

“Black Start Unit Capacity” is either: (i) the Black Start Unit’s installed capacity, expressed in MW, for those Black Start Units that are Generation Capacity Resources; or (ii) the awarded MWs in the Transmission Provider’s request for proposal process under the PJM Manuals, for those Black Start Units that are Energy Resources.

“X” is the Black Start Service allocation factor unless a higher or lower value is supported by the documentation of the actual costs of providing Black Start



Service. For such units qualifying as Black Start Units on the basis of demonstrated ability to operate at reduced levels when automatically disconnected from the grid, X shall be zero. For Black Start Units with a commitment established under section 5 of this Schedule 6A, X shall be .01 for Hydro units, .02 for CT units.

Black Start Units with a commitment established under section 6 above shall calculate Fixed BSSC or “Fixed Black Start Service Costs” in accordance with one of the following formulas, as applicable:

**Capital Cost Recovery Rate – NERC-CIP Specific Recovery**

$(\text{Net Cone} * \text{Black Start NERC-CIP Unit Capacity} * X) + (\text{Incremental Black Start NERC-CIP Capital Costs} * \text{CRF})$

Where:

“Net Cone” is the then current installed capacity (“ICAP”) net Cost of New Entry (expressed in \$/MW year) for the CONE area where the Black Start Unit is located.

“Black Start NERC-CIP Unit Capacity” is the Black Start Unit’s installed capacity, expressed in MW, but, for purposes of this calculation, capped at 100 MW for Hydro units, or 50 MW for CT units.

“Incremental Black Start NERC-CIP Capital Cost” are those capital costs documented by the owner or accepted by the Commission for the incremental equipment solely necessary to enable a Black Start Unit to maintain compliance with mandatory Critical Infrastructure Protection Reliability Standards (as approved by the Commission and administered by the applicable Electric Reliability Organization).

“CRF” or “Capital Recovery Factor” is equal to the levelized CRF as set forth in the applicable CRF ~~Table~~ [posted on the PJM website in accordance with Tariff, Schedule 6A, section 18 and Manual 15](#) ~~set forth below.~~

A Black Start Unit may elect to terminate forward cost recovery under this Capital Cost Recovery Rate – NERC-CIP Specific Recovery at any time and seek cost recovery under the Capital Cost Recovery Rate, pursuant to the terms and conditions set forth below.

**Capital Cost Recovery Rate**

$(\text{FERC-approved rate}) + (\text{Incremental Black Start Capital Costs} * \text{CRF})$

Where:

“FERC-approved rate” is the Black Start Unit’s current FERC-approved recovery of costs to provide Black Start Service, if applicable. To the extent that a Black Start Unit owner is currently recovering black start costs pursuant to a FERC-approved rate, that cost recovery will be included as a formulaic component for calculating the Black Start Unit’s annual revenue requirement pursuant to this section 18. However, under no circumstances will PJM or the Black Start Unit owner restructure or modify that existing FERC-approved rate without FERC approval.

“Incremental Black Start Capital Costs” are the new or additional capital costs documented by the owner or accepted by the Commission for the incremental equipment solely necessary to enable a unit to provide Black Start Service in addition to whatever other product or services such unit may provide. Such costs shall include those incurred by a Black Start Unit owner in order to meet NERC Reliability Standards that apply to Black Start Units solely on the basis of the provision of Black Start Service by such unit. However, Incremental Black Start Capital Costs shall not include any capital costs that the Black Start Unit owner is recovering for that unit pursuant to a FERC-approved recovery rate.

The “CRF” or “Capital Recovery Factor (“CRF”) is equal to the Levelized CRF based on the age of the Black Start Unit, which is modified to provide Black Start Service, as present in the CRF Table below:

The CRF applicable to Black Start Capital Costs of Black Start Units selected for Black Start Service prior to June 6, 2021, shall continue to be determined in accordance with the following table:

Age of Black Start Unit	Term of Black Start Commitment	Levelized CRF
1 to 5	20	0.125
6 to 10	15	0.146
11 to 15	10	0.198
16+	5	0.363

The CRF applicable to Black Start Capital Costs of Black Start Units selected for Black Start Service after June 6, 2021, shall be calculated on April 1 and posted on the PJM website by April 30 each year as detailed in Manual 15. The CRF values shall be calculated based on an assumed 100MW combustion turbine with a \$1 million capital investment for a recovery period based on the age of the Black Start Unit. The CRF shall consist of the following components: (i) capital structure and cost of capital; (ii) federal income tax and depreciation rates as utilized by the U.S. Internal Revenue Service; (iii) average state tax rate, and (iv) debt interest rates, all as determined in accordance with Manual 15. The CRF shall be updated annually in accordance with the procedures in Manual 15 for (i) federal income tax rates as utilized by the U.S. Internal Revenue Service in effect at the time of the annual CRF update; (ii) average state tax rate; and (iii) debt interest rates.

The CRF capital structure and cost of capital include the following rate components:

- A capital structure debt/equity ratio of 50 percent debt and 50 percent equity; and
- An after-tax internal rate of return on equity of 12 percent.

The CRF applicable to Black Start Units selected for Black Start Service after June 6, 2021, shall be determined in accordance with this section and Manual 15 and as stated in the CRF table posted on the PJM website. The applicable Black Start Unit revenue requirements shall be based on the CRF in effect at the time of the Black Start Unit's in-service date and updated annually on April 1 in accordance with Manual 15. Each Black Start Unit's revenue requirement will be updated annually on May 1 using the applicable CRF table posted the PJM website as of April 1 of the current year and shall be effective June 1 of the current year.

~~Or:~~

~~Optionally, a Black Start Unit owner may elect to apply an alternative Capital Recovery Factor, in lieu of the age-based CRF Table listed above, which is based upon to the expected Capital Improvement Lifespan of the new or additional capital improvements (as determined by the applicable depreciation period of the capital improvement, as published from time to time by the US Internal Revenue Service). The Applicable Recovery Period and the term of Black Start Service Commitment shall be the same and determined by the expected Capital Improvement Lifespan. In the event that the Black Start Unit seeks recovery of capital improvements that are included in more than one category of Capital Improvement Lifespan (as set forth below), its Applicable Recovery Period and term of commitment to provide black start service for such Black Start Unit shall be the longest expected life of those new or additional capital improvements.~~

<del>Capital Improvement Lifespan (years)</del>	<del>Applicable Recovery Period/Term of Commitment (years)</del>	<del>Levelized CRF</del>
<del>16-20</del>	<del>20</del>	<del>0.125</del>
<del>11-15</del>	<del>15</del>	<del>0.146</del>
<del>6-10</del>	<del>10</del>	<del>0.198</del>
<del>1-5</del>	<del>5</del>	<del>0.363</del>

In those circumstances where a Black Start Unit owner has elected to recover Incremental Black Start Capital Costs, in addition to a FERC-approved recovery rate, its applicable term of commitment shall be the greater of: (i) the FERC-approved recovery period, or; (ii) the applicable term of commitment as ~~established by set forth in~~ the CRF ~~t~~Tables above posted on the PJM website.

After a Black Start Unit has recovered its allowable Incremental Black Start Capital Costs or Incremental Black Start NERC-CIP Capital Costs, as provided by the applicable Capital Cost Recovery Rate, and has satisfied its applicable commitment period required under section 6

of this Schedule 6A, the Black Start Unit shall be committed to providing black start in accordance with section 5 of this Schedule 6A and calculate its Fixed BSSC in accordance with the Base Formula Rate.

### **Variable BSSC**

All Black Start Units shall calculate Variable BSSC or “Variable Black Start Service Costs” in accordance with the following formula:

$$\text{Black Start Unit O\&M} * Y$$

Where:

“Black Start Unit O&M” are the operations and maintenance costs attributable to supporting Black Start Service and must equal the annual variable O&M outlined in the PJM Cost Development Guidelines set forth in the PJM Manuals. Such costs shall include those incurred by a Black Start Owner in order to meet NERC Reliability Standards that apply to the Black Start Unit solely on the basis of the provision of Black Start Service by unit.

“Y” is 0.01, unless a higher or lower value is supported by the documentation of costs. If a value of Y is submitted for this cost, a (1-Y) factor must be applied to the Black Start Unit’s O&M costs on the unit’s cost-based energy schedule, calculated based on the Cost Development Guidelines in the PJM Manuals.

For units qualifying as Black Start Units on the basis of a demonstrated ability to operate at reduced levels when automatically disconnected from the grid, there are no variable costs associated with providing Black Start Service and the value for Variable BSSC shall be zero.

Black Start Units with the demonstrated ability to automatically remain operating, at reduced levels, when disconnected from the grid may receive NERC compliance costs associated with providing Black Start Service in addition to the formula above, if approved in accordance with the procedures in section 17 of this Schedule 6A.

### **Training Costs:**

All Black Start Units shall calculate Training Costs in accordance with the following formula:

$$50 \text{ staff hours/year/plant} * 75/\text{hour}$$

### **Fuel Storage Costs:**

Black Start Units that store liquefied natural gas, propane, or oil on site shall calculate Fuel Storage Costs in accordance with the following formula:

$$\{ \text{MTSL} + [(\# \text{ Run Hours}) * (\text{Fuel Burn Rate})] \} * \\ (\text{12 Month Forward Strip} + \text{Basis}) * (\text{Bond Rate})$$

Where:

Run Hours are the actual number of hours a Transmission Provider requires a Black Start Unit to run. Run Hours shall be at least 16 hours or as defined by the Transmission Owner restoration plan, whichever is less.

“Fuel Burn Rate” is actual fuel burn rate for the Black Start Unit.

“12-Month Forward Strip” is the average of forward prices for the fuel burned in the Black Start Unit traded the first Business Day on or following May 1.

“Basis” is the transportation costs from the location referenced in the forward price data to the Black Start Unit plus any variable taxes.

“Bond rate” is the value determined with reference to the Moody's Utility Index for bonds rated Baa1 reported the first Business Day on or following May 1.

“MTSL” is the “minimum tank suction level” and shall apply to oil fired Black Start Units’ storage tanks that have an unusable volume of oil where no direct current pumps are available for the Black Start Unit. ~~In the case where a more than one Black Start Unit shares a common fuel tank, the Black Start Unit will be eligible for recovery of the Black Start/Energy Tank Ratio of the MTSL in its fuel storage calculation only one Black Start Unit will be eligible for the recovery of this volume in its fuel storage cost calculation. The MTSL for the other Black Start Unit(s) sharing the common fuel tank shall be zero.~~

$$\text{Black Start Energy Tank Ratio} = \{ (\text{Fuel Burn Rate} * \text{Minimum Run Hours}) / \\ (\text{Tank Capacity} - \text{MTSL}) \}$$

The MTSL fuel storage calculation shall be as follows:

$$\{ (\text{Black Start Energy Take Ratio} * \text{MTSL}) + [(\# \text{Run Hours}) * (\text{Fuel Burn Rate})] \} \\ * (\text{12 Month Forward Strip} + \text{Basis}) * (\text{Bond Rate})$$

For units qualifying as Black Start Units on the basis of a demonstrated ability to operate at reduced levels when automatically disconnected from the grid, there are no associated fuel storage costs and the value for FSC shall be zero.

**Z**

Z shall be an incentive factor solely for Black Start Units with a commitment established under section 5 above and shall be ten percent. For those Black Start Units that elect to recover new or additional Black Start Capital Costs under section 6 above, the incentive factor, Z, shall be equal to zero.

Every five years, PJM shall review the formula and its costs components set forth in this section 18, and report on the results of that review to stakeholders.

19. Transmission Provider or its agent shall have the right to independently audit the accounts and records of each Black Start Unit that is receiving payments for providing Black Start Service.

20. PJM shall notify its Members when a Black Start Unit seeks to recover new or additional Black Start NERC-CIP Capital Costs under section 18 of this Schedule 6A no later than thirty (30) days prior to the effective date of the recovery. At the written request of a PJM Member, made simultaneously to the Market Monitoring Unit and PJM, with notice to the Black Start Unit owner, the Market Monitoring Unit shall make available to the affected PJM Member for inspection at the offices of the Market Monitoring Unit, all data supporting the requested new or additional NERC-CIP specific Capital Costs. The Black Start Unit owner may elect to attend this review. In all cases, the supporting data is to be held confidential and may not be distributed.

21. The Market Monitoring Unit shall include a Black Start Service summary in its annual State of the Market report which will set forth a descriptive summary of the new or additional Black Start NERC-CIP Capital Costs requested by Black Start Units, and include a list of the types of capital costs requested and the overall cost of such capital improvements on an aggregate basis such that no data is attributable to an individual Black Start Unit.

### **Credits**

22. For existing Black Start Units, monthly credits are provided to Black Start Unit owners that submit to the Transmission Provider their annual revenue requirements established pursuant to section 17A of this Schedule 6A. The generator's monthly credit is equal to 1/12 of its annual Black Start Service revenue requirement for eligible critical Black Start Units. For new Black Start Unit owners, monthly credits will be held by the Office of the Interconnection in a non-interest bearing account until the Office of the Interconnection, or the Commission as applicable, accepts the owner's annual revenue requirement pursuant to section 17B of this Schedule 6A. New Black Start Unit owners will begin to receive monthly credits, including any monthly credits held by the Office of the Interconnection back to the date the unit enters Black Start Service and any required estimated annual revenue requirement true up after the Office of the Interconnection, or the Commission as applicable, accepts the new Black Start Unit owner's annual revenue requirement.

23. Revenue requirements for jointly owned Black Start Units will be allocated to the owners based on ownership percentage.

24. Transmission Provider shall not compensate generators for Black Start Service unless they meet the Transmission Provider criteria for Black Start Service and the criteria for Black Start Service in the Applicable Standards and provide Transmission Provider with all necessary data in accordance with this Schedule 6A and the PJM manuals.

## Charges

25. Zonal rates will be based on Black Start Service capability or share of generation units designated by the Transmission Provider and allocated to network service customers and point-to-point reservations. Zonal rates will include estimated annual revenue requirements for new Black Start Units from the date the units enter Black Start Service to last day of the month preceding the Office of the Interconnection's acceptance of the unit's annual revenue requirement. The estimated annual revenue requirement will be based on the Black Start Unit owner's best estimate at the time the unit enters Black Start Service. Any estimated annual revenue requirement true up will be included in the monthly bill after the Office of the Interconnection accepts the new Black Start unit's annual revenue requirement.

26. Revenue requirements for Black Start Units designated by the Transmission Provider as critical (regardless of zonal location) will be allocated to the receiving Transmission Owner's zone. Black Start Units that are shared and designated to serve multiple zones will have their annual revenues allocated by Transmission Owner designated critical load percentage.

27. Purchasers of Black Start Service shall be charged for such service in accordance with the following formulae.

Monthly Charge for a purchaser receiving Network Integration Transmission Service or Point-to-Point Transmission Service to serve Non-Zone Load = Allocation Factor \* Total Generation Owner Monthly Black Start Service Revenue Requirement

Monthly Charge for a purchaser receiving Network Integration Transmission Service or Point-to-Point Transmission Service to serve Zone Load = Allocation Factor \* Zonal Generation Owner Monthly Black Start Service Revenue Requirement \* Adjustment Factor

Where:

Purchaser serving Non-Zone Load is a Network Customer serving Non-Zone Network Load or a Transmission Customer where the Point of Delivery is at the boundary of the PJM Region.

Zonal Generation Owner Monthly Black Start Service Revenue Requirement is the sum of the monthly share of Black Start Service revenue requirements for each generator nominated by the Transmission Owners in that zone.

Total Generation Owner Monthly Black Start Service Revenue Requirement is the sum of the Zonal Generation Owner Monthly Black Start Service Revenue Requirements for all Zones in the PJM Region.

Allocation Factor is the monthly transmission use of each Network Customer or Transmission Customer per Zone or Non-Zone, as applicable, on a megawatt basis divided by the total transmission use in the Zone or in the PJM Region, as applicable, on a megawatt basis.

For Network Customers, monthly transmission use on a megawatt basis is the sum of a Network Customer's daily values of DCPZ or DCPNZ (as those terms are defined in Tariff, Part I, section 34.1) as applicable, for all days of the month.

For Transmission Customers, monthly transmission use on a megawatt basis is the sum of the Transmission Customer's hourly amounts of Reserved Capacity for each day of the month (not curtailed by PJM) divided by the number of hours in the day.

Adjustment Factor is determined as the sum of the total monthly transmission use in the PJM Region on a megawatt basis, exclusive of such use by Network Customers and Transmission Customers serving Non-Zone Load, divided by the total monthly transmission use in the PJM Region on a megawatt basis.

In the event that a single customer is serving load in more than one Zone, or serving Non-Zone Load as well as load in one or more Zones, or is both a Network Customer and a Transmission Customer, the Monthly Charge for such a customer shall be the sum of the Monthly Charges determined by applying the appropriate formulae set forth in this Schedule 6A.



# Attachment D

## Revisions to the PJM Open Access Transmission Tariff

(Clean Format)

## **SCHEDULE 6A Black Start Service**

References to section numbers in this Schedule 6A refer to sections of this Schedule 6A, unless otherwise specified.

To ensure the reliable restoration following a shut down of the PJM transmission system, Black Start Service is necessary to facilitate the goal of complete system restoration. Black Start Service enables the Transmission Provider to designate specific generators called Black Start Units whose location and capabilities are required to re-energize the transmission system following a system-wide blackout. The Transmission Provider shall administer the provision of Black Start Service. PJMSettlement shall be the Counterparty to the purchases and sales of Black Start Service.

### **TRANSMISSION CUSTOMERS**

1. All Transmission Customers and Network Customers must obtain Black Start Service through the Transmission Provider, with PJMSettlement as the Counterparty, pursuant to this Schedule 6A.

### **PROVISION OF BLACK START SERVICE**

2. A Black Start Unit is a generating unit that has equipment enabling it to start without an outside electrical supply or a generating unit with a high operating factor (subject to Transmission Provider concurrence) with the demonstrated ability to automatically remain operating, at reduced levels, when disconnected from the grid. A Black Start Unit shall be considered capable of providing Black Start Service only when it meets the criteria set forth in the PJM manuals. The expected life of the Black Start Unit shall take into consideration expectations regarding both the enabling equipment and the generation unit itself.

3. A Black Start Plant is a generating plant that includes one or more Black Start Units. A generating plant with Black Start Units electrically separated at different voltage levels will be considered multiple Black Start Plants.

4. The Transmission Provider is responsible for developing a coordinated and efficient system restoration plan that identifies all of the locations where Black Start Units are needed. The PJM Manuals shall set forth the criteria and process for selecting or identifying the Black Start Units necessary to commit to providing Black Start Service at the identified locations. No Black Start Unit shall be eligible to recover the costs of providing Black Start Service in the PJM Region unless it agrees to provide such service for a term of commitment established under section 5, 6, or 6A below.

5. Owners of Black Start Units selected to provide Black Start Service in accordance with Schedule 6A, section 4 and electing to forego any recovery of new or additional Black Start Capital Costs shall commit to provide Black Start Service from such Black Start Units for an initial term of no less than two years and authorize the Transmission Provider to resell Black Start Service from its Black Start Units. The term commitment shall continue to extend until the

Black Start Unit owner or the Transmission Provider provides written, one-year advance notice of its intention to terminate the commitment or the commitment is involuntarily terminated pursuant to section 15 of this Schedule 6A. Black Start Units that are selected to provide Black Start Service after June 6, 2021, pursuant to Schedule 6A, section 6 that subsequently transition from the Capital Cost Recovery Rate to the Base Formula Rate shall have a lifetime commitment and can only terminate for the reason specified in Schedule 6A, section 6(ii).

6. (i) Owners of Black Start Units selected to provide Black Start Service prior to June 6, 2021, in accordance with section 4 of this Schedule 6A and electing to recover new or additional Black Start Capital Costs shall commit to provide Black Start Service from such Black Start Units for a term based upon the age of the Black Start Unit or the longest expected life of the Incremental Black Start Capital Cost, as set forth in the applicable CRF Table in section 18 of this Schedule 6A. For those Black Start Units that elect to recover new or additional Black Start Capital Costs in addition to a prior, FERC-approved cost recovery rate, the applicable commitment period shall be the longer of the FERC-approved recovery period or the applicable term of commitment as set forth in the CRF Table in section 18 of this Schedule 6A. The Transmission Provider may terminate the commitment with one year advance notice of its intention to the Black Start Unit owner, but the Black Start Unit owner shall be eligible to recover any amount of unrecovered Fixed Black Start Service Costs over a period not to exceed five years. A Black Start Unit owner may terminate the provision of Black Start Service with one year advance notice and consent of the Transmission Provider (or its commitment period may be involuntarily terminated pursuant to the section 15 below). Such Black Start Unit shall forego any otherwise existing entitlement to future revenues collected pursuant to this Schedule 6A and fully refund any amount of the Black Start Capital Costs recovered under a FERC-approved rate (recovered on an accelerated basis pursuant to the provisions of section 17(i) of this Schedule 6A) in excess of the amount that would have been recovered pursuant to section 18 of this Schedule 6A during the same period. At the conclusion of the term of commitment established under this section 6 of this Schedule 6A, a Black Start Unit shall commence a new term of commitment under either section 5 or 6 of this Schedule 6A, as applicable.

(ii) Owners of Black Start Units selected to provide Black Start Service after June 6, 2021, in accordance with Schedule 6A, section 4 and electing to recover new or additional Black Start Capital Costs shall commit to provide Black Start Service from such Black Start Units for an initial capital recovery period based upon the age of the Black Start Unit plus the remaining life of the Black Start equipment. For those Black Start Units that elect to recover new or additional Black Start Capital Costs in addition to a prior, FERC-approved cost recovery rate, the applicable commitment period shall be the longer of the FERC-approved recovery period or the initial capital recovery period based upon the age of the Black Start Unit plus the remaining life of the Black Start equipment.

The Transmission Provider may terminate the commitment with one year advance notice of its intention to the Black Start Unit owner, but the Black Start Unit owner shall be eligible to recover any amount of unrecovered Fixed Black Start Service Costs over a period not to exceed five years. A Black Start Unit owner may terminate the provision of Black Start Service with one year advance notice and consent of the Transmission Provider (or its commitment period may be involuntarily terminated pursuant to the section 15 below), provided the Black Start

Unit's owner demonstrates to the satisfaction of the Transmission Provider at least one of the following reasons for such termination apply:

- a. Black Start Unit retirement or deactivation with at least one year's notice;
- b. Expiration of a state, federal, or other governmental agency permit(s) required for Black Start Service with at least one year's notice; or
- c. Additional capital is required by the Black Start Unit owner to maintain Black Start Service capability (in which case, the Black Start Unit will apply for Black Start Service selection in accordance with the procedures set forth in Manual 12 and only continue to provide Black Start Service if selected for Black Start Service by the Transmission Provider).

Such Black Start Unit shall forego any otherwise existing entitlement to future revenues collected pursuant to this Schedule 6A and fully refund any amount of the Black Start Capital Costs recovered under a FERC-approved rate (recovered on an accelerated basis pursuant to the provisions of section 17(i) of this Schedule 6A) in excess of the amount that would have been recovered pursuant to Schedule 6A, section 18 during the same period.

6A. Black Start Units which are owned or contracted for by a Transmission Owner to provide Black Start Service as a result of the black start reliability backstop process defined in the PJM Manuals, shall be subject to cost recovery through such Transmission Owner's annual revenue requirement under such Transmission Owner's Tariff, Attachment H, as filed with, and accepted by, FERC under Section 205 of the Federal Power Act and in accordance with Tariff, Part I, section 9, or through such other cost recovery mechanism, provided that such cost recovery mechanism is filed with and accepted by FERC. The relevant Transmission Owner shall commit to provide, or effectuate the provision of, Black Start Service from such a Black Start Unit for the FERC-approved cost recovery period. The Transmission Provider may terminate the commitment with one year advance notice of its intention to the Transmission Owner. Provision of Black Start Service from a Black Start Unit obtained through the black start reliability backstop process defined in the PJM Manuals shall be subject to sections 7 through 13 of this Schedule 6A. The Revenue Requirements, Credits, and Charges provisions contained in sections 16 through 27 of this Schedule 6A, shall not apply to Black Start Units obtained as a result of the black start reliability backstop process defined in the PJM Manuals.

6B. In the event that a Black Start Unit fails to fulfill its commitment established under section 5 to provide Black Start Service, receipt of any Black Start Service revenues associated with the non-performing Black Start Unit shall cease and, for the period of the unit's non-performance, the Black Start Unit owner shall forfeit the Black Start Service revenues associated with the non-performing Black Start Unit that it received or would have received had the Black Start Unit performed, not to exceed revenues for a maximum of one year.

In the event that a Black Start Unit fails to fulfill its commitment established under section 6 above, such unit shall forego any otherwise existing entitlement to future revenues collected pursuant to this Schedule 6A and fully refund any amount of the Black Start Capital Costs

recovered under a FERC-approved rate (recovered on an accelerated basis pursuant to the provisions of section 17(i) of this Schedule 6A) in excess of the amount that would have been recovered pursuant to section 18 of this Schedule 6A during the same period, but such unit remains eligible to establish a new commitment under section 5 or 6 of this Schedule 6A. Provided, however, Black Start Units that are selected to provide Black Start Service after June 6, 2021, pursuant to Schedule 6A, section 6 that subsequently transition from the Capital Cost Recovery Rate to the Base Formula Rate shall have a lifetime commitment and can only terminate for a reason specified in Schedule 6A, section 6(ii).

### **Performance Standards and Outage Restrictions**

7. In addition to the performance capabilities set forth in the PJM Manuals, Black Start Units must have the capabilities listed below. These capabilities must be demonstrated in accordance with the criteria set forth in the PJM manuals and will remain in effect for the duration of the commitment to provide Black Start Service.
  - a. A Black Start Unit must be able to close its output circuit breaker to a dead (de-energized) bus within the time specified in the PJM Manuals.
  - b. A Black Start Unit must be capable of maintaining frequency and voltage under varying load.
  - c. A Black Start Unit must be able to maintain rated output for a period of time identified by each Transmission Owner's system restoration requirements, in conjunction with the Transmission Provider.
8. Each owner of Black Start Units or Black Start Plants must maintain procedures for the start-up of the Black Start Units.
9. If a Black Start Unit is a generating unit with a high operating factor (subject to Transmission Provider concurrence) with the ability to automatically remain operating at reduced levels when disconnected from the grid, this ability must be demonstrated in accordance with the criteria set forth in the PJM manuals.
10. No more than one Black Start Unit at a Black Start Plant may be subject to a Generator Planned Outage or Generator Maintenance Outage at any one time without written approval of the Transmission Provider and the Transmission Owner in the Zone receiving Black Start Service from the Black Start Plant. This restriction excludes outages on common plant equipment that may make all units unavailable. A Black Start Unit not selected for providing Black Start Service in accordance with this Schedule 6A, section 4 and the PJM Manuals may be substituted for a Black Start Unit that is subject to a Generator Planned Outage to permit a concurrent planned outage of another critical Black Start Unit at the same Black Start Plant. The Black Start Unit used as a substitute shall not receive compensation for additional capital expenditures to qualify for Black Start Service, will not increase the current Black Start Unit capital recovery commitment period, must be connected at the same voltage level and cranking path, must be similar age as the current Black Start Unit, must provide equivalent Black Start

Unit Capacity, and must have had a valid annual test within the previous 13 months. Black Start Unit substitutions may be permitted for reasons other than Generator Planned Outages if requested by the Black Start Unit owner and if approved by the Transmission Provider; provided, however, all requests for Black Start Unit substitutions must be supported by documentation and information demonstrating operational or technical reasons for the substitution satisfactory to the Transmission Provider and may only occur once within a 12-month period.

11. Concurrent planned outages at multiple Black Start Plants within a zone may be restricted based on Transmission Owner requirements for Black Start Service availability. Such restrictions must be predefined and approved by Transmission Provider in accordance with the PJM manuals.

### **Testing**

12. To verify that they can be started and operated without being connected to the Transmission System, Black Start Units shall be tested annually in accordance with the Tariff and the PJM Manuals. The Black Start Unit owner shall determine the time of the annual test.

13. Compensation under this Schedule 6A for energy output delivered to the Transmission System during the annual test shall be provided for the Black Start Unit's minimum run time at the higher of the unit's cost-capped offer or real-time Locational Marginal Price plus start-up and no-load costs for up to two start attempts, if necessary. For Black Start Units that are generating units with a high operating factor (subject to Transmission Provider's concurrence) with the ability to automatically remain operating at reduced levels when disconnected from the grid, an opportunity cost will be provided to compensate the unit for lost revenues during testing.

14. All Black Start Units must have a successful annual test on record with the Transmission Provider within the preceding 13 months. A Black Start Unit receiving revenues under Section 5 or Section 6 above that does not have a successful annual test on record with the Transmission Provider within the preceding 13 months will not qualify to receive Black Start Service revenues.

15. If a Black Start Unit fails the annual test, the unit may be re-tested within a ten-day period without financial penalty. If the Black Start Unit does not successfully re-test within that ten-day period, monthly Black Start Service revenues under this Schedule 6A will be forfeited by that unit from the time of the first unsuccessful test until such time as the unit passes an annual test. If the Black Start Unit owner does not make the necessary repairs to enable the Black Start Unit to pass the annual test within 90 days of the due date for the annual test pursuant to section 14 above, the Black Start Unit will immediately cease to qualify as a Black Start Unit and, if applicable, will have failed to fulfill its commitment pursuant to section 5 or section 6 above, whichever is applicable, of this Schedule 6A and will be subject to the additional forfeiture of revenues set forth in section 6B of this Schedule 6A. The 90 day period may be extended up to 1 year by the Transmission Provider in accordance with the PJM Manuals. If the 90 day period is extended, the Black Start Unit owner will continue to forfeit all revenues starting in the month of the first failed test until the Black Start Unit has demonstrated to the Transmission Provider that a successful test has been completed.

## **Revenue Requirements**

16. A Black Start Unit Owner's annual Black Start Service revenue requirement shall be the sum of the annual Black Start Service revenue requirements for each generator that is designated as providing Black Start Service and has provided the Transmission Provider with a calculation of its annual Black Start Service revenue requirements. A separate line item shall appear on the participants' Transmission Provider bill for Black Start Service charges and credits.

17. Black Start Service revenue requirements for each Black Start Unit shall be based, at the election of the owner, on either (i) a FERC-approved rate for the recovery of the cost of providing such service for the entire duration of the commitment term set forth in either section 5 or 6 of this Schedule 6A, as applicable, or (ii) the formula rates set forth in section 18 of this Schedule 6A for the commitment term set forth in section 5 or 6 of this Schedule 6A as applicable. Each generator's Black Start Service revenue requirements shall be an annual calculation.

### **17A. Annual Review for all Black Start Units**

Requests for Black Start Service revenue requirements and for changes to the Black Start Service revenue requirements must be submitted to the Market Monitoring Unit for review and analysis, with supporting data and documentation, pursuant to Tariff, Attachment M-Appendix, section III and the PJM Manuals, with a copy to the Office of the Interconnection, by no later than May 3 of each year. The Market Monitoring Unit and the Black Start Unit owner shall attempt to come to agreement on the level of each component included in the Black Start Service revenue requirements by no later than May 14 of each year. By no later than May 21 of each year, the Black Start Unit owner shall notify the Office of the Interconnection and the Market Monitoring Unit in writing whether it agrees or disagrees with the Market Monitoring Unit's determination of the level of each component included in the Black Start Service revenue requirements. The Black Start Unit owner may also submit Black Start Service revenue requirements that it chooses to the Office of the Interconnection by no later than May 21 of each year, provided that (i) it has participated in good faith with the process described in this section and in Tariff, Attachment M-Appendix, section III (ii) the Black Start Service revenue requirements are no higher than the level defined in any agreement reached by the Black Start Unit owner and the Market Monitoring Unit that resulted from the foregoing process, and (iii) the Black Start Service revenue requirements are accepted by the Office of the Interconnection subject to the criteria set forth in the Tariff and PJM Manuals.

The Office of the Interconnection shall determine whether to accept the values submitted by the Black Start Unit owner subject to the requirements of the Tariff and the PJM Manuals by no later than May 27. If the Office of the Interconnection does not accept the values submitted by the Black Start Unit owner in such case, the Black Start Unit owner may file its proposed values with the Commission for approval. Pursuant to Tariff, Attachment M-Appendix, section III, if the Office of the Interconnection accepts the Black Start Service revenue requirements submitted by the Black Start Unit owner in such case, the Market Monitoring Unit may petition the Commission for an order that would require the Black Start Unit owner to utilize the values determined by the Market Monitoring Unit or the Office of the Interconnection or such other

values as determined by the Commission. The annual calculation of Black Start Service revenue requirements shall become effective on June 1 of each year, except that no change to a Black Start Service revenue requirement shall become effective until the existing revenue requirement has been effective for at least twelve months. Notwithstanding the foregoing, the deadlines set forth in this section 17 shall not apply to a Black Start Unit owner's election to select a new method of recovery for its Fixed BSSC.

### **17B. Initial Review for New Black Start Units**

Requests for new Black Start Service revenue requirements must be submitted to the Market Monitoring Unit for review and analysis, with supporting data and documentation, pursuant to Tariff, Attachment M–Appendix, section III and the PJM Manuals, with a copy to the Office of the Interconnection, by no later than 90 days after entering Black Start Service. The Market Monitoring Unit and the Black Start Unit owner shall attempt to come to agreement on the level of each component included in the Black Start Service revenue requirements by no later than 90 days after the Black Start Unit owner's submittal of final black start capital costs (if applicable), variable black start costs, and fuel storage cost documentation. By no later than 90 days of the Black Start Unit owner's submittal of final black start cost documentation, the Market Monitoring Unit shall calculate the new Black Start Unit's annual revenue requirement and submit it to the Office of the Interconnection and the Black Start Unit owner. If more than three Black Start Unit owners submit documentation within a 90-day period, the Market Monitoring Unit shall complete the review of the first three submittals within 90 days and the next set of three within the following three months and so on until all are complete. The Black Start Unit owner shall notify the Office of the Interconnection and the Market Monitoring Unit in writing if it disagrees with the Market Monitoring Unit's determination of the level of any component included in the Black Start Service revenue requirements within 7 days after the Market Monitoring Unit's submittal of the annual revenue requirement to the Office of the Interconnection. The Black Start Unit owner shall also submit Black Start Service revenue requirements that it proposes to the Office of the Interconnection provided that (i) it has participated in good faith with the process described in this section and in Tariff, Attachment M-Appendix, section III; (ii) the Black Start Service revenue requirements are no higher than the level defined in any agreement reached by the Black Start Unit owner and the Market Monitoring Unit that resulted from the foregoing process; and (iii) the Black Start Service revenue requirements are accepted by the Office of the Interconnection subject to the criteria set forth in the Tariff and PJM Manuals.

The Office of the Interconnection shall determine whether to accept the values submitted by the Black Start Unit owner subject to the requirements of the Tariff and the PJM Manuals by no later than 30 days after its receipt of the Black Start Unit owner's written notice of a disagreement. If the Office of the Interconnection does not accept the values submitted by the Black Start Unit owner in such case, the Black Start Unit owner may file its proposed values with the Commission for approval. Pursuant to Tariff, Attachment M–Appendix, section III, if the Office of the Interconnection accepts the Black Start Service revenue requirements submitted by the Black Start Unit owner in such case, the Market Monitoring Unit may petition the Commission for an order that would require the Black Start Unit owner to utilize the values determined by the Market Monitoring Unit or the Office of the Interconnection or such other values as determined



by the Commission. The annual calculation of Black Start Service revenue requirements shall become effective the day the unit enters Black Start Service.

18. The formula for calculating a generator's annual Black Start Service revenue requirement is:

$$\{(\text{Fixed BSSC}) + (\text{Variable BSSC}) + (\text{Training Costs}) + (\text{Fuel Storage Costs})\} * (1 + Z)$$

For units that have the demonstrated ability to operate at reduced levels when automatically disconnected from the grid, the formula is revised to:

$$(\text{Training Costs}) * (1 + Z)$$

Where:

**Fixed BSSC**

Black Start Units with a commitment established under section 5 of this Schedule 6A shall calculate Fixed BSSC or "Fixed Black Start Service Costs" in accordance with the following Base Formula Rate:

**Base Formula Rate:**

$$\text{Net CONE} * \text{Black Start Unit Capacity} * X$$

Where:

"Net CONE" is the then current installed capacity ("ICAP") net Cost of New Entry (expressed in \$/MW year) for the CONE Area where the Black Start Unit is located.

"Black Start Unit Capacity" is either: (i) the Black Start Unit's installed capacity, expressed in MW, for those Black Start Units that are Generation Capacity Resources; or (ii) the awarded MWs in the Transmission Provider's request for proposal process under the PJM Manuals, for those Black Start Units that are Energy Resources.

"X" is the Black Start Service allocation factor unless a higher or lower value is supported by the documentation of the actual costs of providing Black Start Service. For such units qualifying as Black Start Units on the basis of demonstrated ability to operate at reduced levels when automatically disconnected from the grid, X shall be zero. For Black Start Units with a commitment established under section 5 of this Schedule 6A, X shall be .01 for Hydro units, .02 for CT units.

Black Start Units with a commitment established under section 6 above shall calculate Fixed BSSC or “Fixed Black Start Service Costs” in accordance with one of the following formulas, as applicable:

**Capital Cost Recovery Rate – NERC-CIP Specific Recovery**

$(\text{Net Cone} * \text{Black Start NERC-CIP Unit Capacity} * X) + (\text{Incremental Black Start NERC-CIP Capital Costs} * \text{CRF})$

Where:

“Net Cone” is the then current installed capacity (“ICAP”) net Cost of New Entry (expressed in \$/MW year) for the CONE are where the Black Start Unit is located.

“Black Start NERC-CIP Unit Capacity” is the Black Start Unit’s installed capacity, expressed in MW, but, for purposes of this calculation, capped at 100 MW for Hydro units, or 50 MW for CT units.

“Incremental Black Start NERC-CIP Capital Cost” are those capital costs documented by the owner or accepted by the Commission for the incremental equipment solely necessary to enable a Black Start Unit to maintain compliance with mandatory Critical Infrastructure Protection Reliability Standards (as approved by the Commission and administered by the applicable Electric Reliability Organization).

“CRF” or “Capital Recovery Factor” is equal to the levelized CRF as set forth in the applicable CRF table posted on the PJM website in accordance with Tariff, Schedule 6A, section 18 and Manual 15.

A Black Start Unit may elect to terminate forward cost recovery under this Capital Cost Recovery Rate – NERC-CIP Specific Recovery at any time and seek cost recovery under the Capital Cost Recovery Rate, pursuant to the terms and conditions set forth below.

**Capital Cost Recovery Rate**

$(\text{FERC-approved rate}) + (\text{Incremental Black Start Capital Costs} * \text{CRF})$

Where:

“FERC-approved rate” is the Black Start Unit’s current FERC-approved recovery of costs to provide Black Start Service, if applicable. To the extent that a Black Start Unit owner is currently recovering black start costs pursuant to a FERC-approved rate, that cost recovery will be included as a formulaic component for calculating the Black Start Unit’s annual revenue requirement pursuant to this section 18. However, under no

circumstances will PJM or the Black Start Unit owner restructure or modify that existing FERC-approved rate without FERC approval.

“Incremental Black Start Capital Costs” are the new or additional capital costs documented by the owner or accepted by the Commission for the incremental equipment solely necessary to enable a unit to provide Black Start Service in addition to whatever other product or services such unit may provide. Such costs shall include those incurred by a Black Start Unit owner in order to meet NERC Reliability Standards that apply to Black Start Units solely on the basis of the provision of Black Start Service by such unit. However, Incremental Black Start Capital Costs shall not include any capital costs that the Black Start Unit owner is recovering for that unit pursuant to a FERC-approved recovery rate.

The Capital Recovery Factor (“CRF”) is equal to the Levelized CRF based on the age of the Black Start Unit, which is modified to provide Black Start Service.

The CRF applicable to Black Start Capital Costs of Black Start Units selected for Black Start Service prior to June 6, 2021, shall continue to be determined in accordance with the following table:

Age of Black Start Unit	Term of Black Start Commitment	Levelized CRF
1 to 5	20	0.125
6 to 10	15	0.146
11 to 15	10	0.198
16+	5	0.363

The CRF applicable to Black Start Capital Costs of Black Start Units selected for Black Start Service after June 6, 2021, shall be calculated on April 1 and posted on the PJM website by April 30 each year as detailed in Manual 15. The CRF values shall be calculated based on an assumed 100MW combustion turbine with a \$1 million capital investment for a recovery period based on the age of the Black Start Unit. The CRF shall consist of the following components: (i) capital structure and cost of capital; (ii) federal income tax and depreciation rates as utilized by the U.S. Internal Revenue Service; (iii) average state tax rate, and (iv) debt interest rates, all as determined in accordance with Manual 15. The CRF shall be updated annually in accordance with the procedures in Manual 15 for (i) federal income tax rates as utilized by the U.S. Internal Revenue Service in effect at the time of the annual CRF update; (ii) average state tax rate; and (iii) debt interest rates.

The CRF capital structure and cost of capital include the following rate components:

- A capital structure debt/equity ratio of 50 percent debt and 50 percent equity; and
- An after-tax internal rate of return on equity of 12 percent.

The CRF applicable to Black Start Units selected for Black Start Service after June 6, 2021, shall be determined in accordance with this section and Manual 15 and as stated in the CRF table posted on the PJM website. The applicable Black Start Unit revenue requirements shall be based on the CRF in effect at the time of the Black Start Unit's in-service date and updated annually on April 1 in accordance with Manual 15. Each Black Start Unit's revenue requirement will be updated annually on May 1 using the applicable CRF table posted the PJM website as of April 1 of the current year and shall be effective June 1 of the current year.

In those circumstances where a Black Start Unit owner has elected to recover Incremental Black Start Capital Costs, in addition to a FERC-approved recovery rate, its applicable term of commitment shall be the greater of: (i) the FERC-approved recovery period, or; (ii) the applicable term of commitment as set forth in the CRF table posted on the PJM website.

After a Black Start Unit has recovered its allowable Incremental Black Start Capital Costs or Incremental Black Start NERC-CIP Capital Costs, as provided by the applicable Capital Cost Recovery Rate, and has satisfied its applicable commitment period required under section 6 of this Schedule 6A, the Black Start Unit shall be committed to providing black start in accordance with section 5 of this Schedule 6A and calculate its Fixed BSSC in accordance with the Base Formula Rate.

### **Variable BSSC**

All Black Start Units shall calculate Variable BSSC or "Variable Black Start Service Costs" in accordance with the following formula:

$$\text{Black Start Unit O\&M} * Y$$

Where:

"Black Start Unit O&M" are the operations and maintenance costs attributable to supporting Black Start Service and must equal the annual variable O&M outlined in the PJM Cost Development Guidelines set forth in the PJM Manuals. Such costs shall include those incurred by a Black Start Owner in order to meet NERC Reliability Standards that apply to the Black Start Unit solely on the basis of the provision of Black Start Service by unit.

"Y" is 0.01, unless a higher or lower value is supported by the documentation of costs. If a value of Y is submitted for this cost, a (1-Y) factor must be applied to the Black Start Unit's O&M costs on the unit's cost-based energy schedule, calculated based on the Cost Development Guidelines in the PJM Manuals.

For units qualifying as Black Start Units on the basis of a demonstrated ability to operate at reduced levels when automatically disconnected from the grid, there are no variable costs associated with providing Black Start Service and the value for Variable BSSC shall be zero.

Black Start Units with the demonstrated ability to automatically remain operating, at reduced levels, when disconnected from the grid may receive NERC compliance costs associated with providing Black Start Service in addition to the formula above, if approved in accordance with the procedures in section 17 of this Schedule 6A.

### **Training Costs:**

All Black Start Units shall calculate Training Costs in accordance with the following formula:

50 staff hours/year/plant\*75/hour

### **Fuel Storage Costs:**

Black Start Units that store liquefied natural gas, propane, or oil on site shall calculate Fuel Storage Costs in accordance with the following formula:

$$\{ \text{MTSL} + [(\# \text{ Run Hours}) * (\text{Fuel Burn Rate})] \} * \\ (\text{12 Month Forward Strip} + \text{Basis}) * (\text{Bond Rate})$$

Where:

Run Hours are the actual number of hours a Transmission Provider requires a Black Start Unit to run. Run Hours shall be at least 16 hours or as defined by the Transmission Owner restoration plan, whichever is less.

“Fuel Burn Rate” is actual fuel burn rate for the Black Start Unit.

“12-Month Forward Strip” is the average of forward prices for the fuel burned in the Black Start Unit traded the first Business Day on or following May 1.

“Basis” is the transportation costs from the location referenced in the forward price data to the Black Start Unit plus any variable taxes.

“Bond rate” is the value determined with reference to the Moody's Utility Index for bonds rated Baa1 reported the first Business Day on or following May 1.

“MTSL” is the “minimum tank suction level” and shall apply to oil fired Black Start Units’ storage tanks that have an unusable volume of oil. In the case where a Black Start Unit shares a common fuel tank, the Black Start Unit will be eligible for recovery of the Black Start/Energy Tank Ratio of the MTSL in its fuel storage calculation.

$$\text{Black Start Energy Tank Ratio} = \{ (\text{Fuel Burn Rate} * \text{Minimum Run Hours}) / \\ (\text{Tank Capacity} - \text{MTSL}) \}$$

The MTSL fuel storage calculation shall be as follows:  
$$\{(\text{Black Start Energy Take Ratio} * \text{MTSL}) + [(\text{\#Run Hours}) * (\text{Fuel Burn Rate})]\}$$
$$* (\text{12 Month Forward Strip+ Basis}) * (\text{Bond Rate})$$

For units qualifying as Black Start Units on the basis of a demonstrated ability to operate at reduced levels when automatically disconnected from the grid, there are no associated fuel storage costs and the value for FSC shall be zero.

## **Z**

Z shall be an incentive factor solely for Black Start Units with a commitment established under section 5 above and shall be ten percent. For those Black Start Units that elect to recover new or additional Black Start Capital Costs under section 6 above, the incentive factor, Z, shall be equal to zero.

Every five years, PJM shall review the formula and its costs components set forth in this section 18, and report on the results of that review to stakeholders.

19. Transmission Provider or its agent shall have the right to independently audit the accounts and records of each Black Start Unit that is receiving payments for providing Black Start Service.
20. PJM shall notify its Members when a Black Start Unit seeks to recover new or additional Black Start NERC-CIP Capital Costs under section 18 of this Schedule 6A no later than thirty (30) days prior to the effective date of the recovery. At the written request of a PJM Member, made simultaneously to the Market Monitoring Unit and PJM, with notice to the Black Start Unit owner, the Market Monitoring Unit shall make available to the affected PJM Member for inspection at the offices of the Market Monitoring Unit, all data supporting the requested new or additional NERC-CIP specific Capital Costs. The Black Start Unit owner may elect to attend this review. In all cases, the supporting data is to be held confidential and may not be distributed.
21. The Market Monitoring Unit shall include a Black Start Service summary in its annual State of the Market report which will set forth a descriptive summary of the new or additional Black Start NERC-CIP Capital Costs requested by Black Start Units, and include a list of the types of capital costs requested and the overall cost of such capital improvements on an aggregate basis such that no data is attributable to an individual Black Start Unit.

## **Credits**

22. For existing Black Start Units, monthly credits are provided to Black Start Unit owners that submit to the Transmission Provider their annual revenue requirements established pursuant to section 17A of this Schedule 6A. The generator's monthly credit is equal to 1/12 of its annual Black Start Service revenue requirement for eligible critical Black Start Units. For new Black Start Unit owners, monthly credits will be held by the Office of the Interconnection in a non-interest bearing account until the Office of the Interconnection, or the Commission as applicable, accepts the owner's annual revenue requirement pursuant to section 17B of this Schedule 6A.

New Black Start Unit owners will begin to receive monthly credits, including any monthly credits held by the Office of the Interconnection back to the date the unit enters Black Start Service and any required estimated annual revenue requirement true up after the Office of the Interconnection, or the Commission as applicable, accepts the new Black Start Unit owner's annual revenue requirement.

23. Revenue requirements for jointly owned Black Start Units will be allocated to the owners based on ownership percentage.

24. Transmission Provider shall not compensate generators for Black Start Service unless they meet the Transmission Provider criteria for Black Start Service and the criteria for Black Start Service in the Applicable Standards and provide Transmission Provider with all necessary data in accordance with this Schedule 6A and the PJM manuals.

### **Charges**

25. Zonal rates will be based on Black Start Service capability or share of generation units designated by the Transmission Provider and allocated to network service customers and point-to-point reservations. Zonal rates will include estimated annual revenue requirements for new Black Start Units from the date the units enter Black Start Service to last day of the month preceding the Office of the Interconnection's acceptance of the unit's annual revenue requirement. The estimated annual revenue requirement will be based on the Black Start Unit owner's best estimate at the time the unit enters Black Start Service. Any estimated annual revenue requirement true up will be included in the monthly bill after the Office of the Interconnection accepts the new Black Start unit's annual revenue requirement.

26. Revenue requirements for Black Start Units designated by the Transmission Provider as critical (regardless of zonal location) will be allocated to the receiving Transmission Owner's zone. Black Start Units that are shared and designated to serve multiple zones will have their annual revenues allocated by Transmission Owner designated critical load percentage.

27. Purchasers of Black Start Service shall be charged for such service in accordance with the following formulae.

Monthly Charge for a purchaser receiving Network Integration Transmission Service or Point-to-Point Transmission Service to serve Non-Zone Load = Allocation Factor \* Total Generation Owner Monthly Black Start Service Revenue Requirement

Monthly Charge for a purchaser receiving Network Integration Transmission Service or Point-to-Point Transmission Service to serve Zone Load = Allocation Factor \* Zonal Generation Owner Monthly Black Start Service Revenue Requirement \* Adjustment Factor

Where:

Purchaser serving Non-Zone Load is a Network Customer serving Non-Zone Network Load or a Transmission Customer where the Point of Delivery is at the boundary of the PJM Region.

Zonal Generation Owner Monthly Black Start Service Revenue Requirement is the sum of the monthly share of Black Start Service revenue requirements for each generator nominated by the Transmission Owners in that zone.

Total Generation Owner Monthly Black Start Service Revenue Requirement is the sum of the Zonal Generation Owner Monthly Black Start Service Revenue Requirements for all Zones in the PJM Region.

Allocation Factor is the monthly transmission use of each Network Customer or Transmission Customer per Zone or Non-Zone, as applicable, on a megawatt basis divided by the total transmission use in the Zone or in the PJM Region, as applicable, on a megawatt basis.

For Network Customers, monthly transmission use on a megawatt basis is the sum of a Network Customer's daily values of DCPZ or DCPNZ (as those terms are defined in Tariff, Part I, section 34.1) as applicable, for all days of the month.

For Transmission Customers, monthly transmission use on a megawatt basis is the sum of the Transmission Customer's hourly amounts of Reserved Capacity for each day of the month (not curtailed by PJM) divided by the number of hours in the day.

Adjustment Factor is determined as the sum of the total monthly transmission use in the PJM Region on a megawatt basis, exclusive of such use by Network Customers and Transmission Customers serving Non-Zone Load, divided by the total monthly transmission use in the PJM Region on a megawatt basis.

In the event that a single customer is serving load in more than one Zone, or serving Non-Zone Load as well as load in one or more Zones, or is both a Network Customer and a Transmission Customer, the Monthly Charge for such a customer shall be the sum of the Monthly Charges determined by applying the appropriate formulae set forth in this Schedule 6A.