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June 30, 2025

The Honorable Debbie-Anne A. Reese  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, D.C. 20426-0001

*Re: PJM Interconnection L.L.C., Docket No. ER25-2123-001,  
Response to Deficiency Letter*

Dear Secretary Reese:

PJM Interconnection, L.L.C. (“PJM”) hereby responds to the letter of the Federal Energy Regulatory Commission’s (“Commission”) Office of Energy Market Regulation issued on May 30, 2025<sup>1</sup> seeking additional information concerning PJM’s filing submitted on April 30, 2025 under section 205 of the Federal Power Act.<sup>2</sup> These responses concern PJM’s April 30 Filing proposing revisions to PJM’s Tariff to revise the base formula rate and capital cost recovery rate for North American Electric Reliability Corporation (“NERC”) – Critical Infrastructure Protection (“CIP”) (collectively, “NERC-CIP”) specific recovery<sup>3</sup> for Black Start Service to maintain adequate incentives for resources to continue to offer to provide Black Start Service, which provides a critical reliability service.<sup>4</sup>

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<sup>1</sup> *PJM Interconnection, L.L.C.*, Deficiency Letter, Docket No. ER25-2123-000 (May 30, 2025) (“Deficiency Letter”).

<sup>2</sup> *PJM Interconnection, L.L.C.*, Proposal to Revise the Black Start Service Base Formula Rate and Capital Cost Recovery Rate – NERC-CIP Specific Recovery, Docket No. ER25-2123-000 (Apr. 30, 2025) (the “April 30 Filing”).

<sup>3</sup> See Tariff, Schedule 6A, section 18.

<sup>4</sup> Capitalized terms in this letter refer to associated definitions proposed as part of this filing and existing terms in the PJM Open Access Transmission Tariff (“Tariff”), the Amended and Restated Operating Agreement of PJM, and the Reliability Assurance Agreement Among Load Serving Entities.

## **I. ANSWERS TO QUESTIONS IN DEFICIENCY NOTICE**

### **A. The Proposed Fixed Past 5-year Average of Overall System-Wide Net CONE Will Reasonably Approximate the Incentive Necessary to Maintain Existing Black Start Service Resources**

Please explain how: (a) the proposed fixed past 5-year average of overall system-wide Net CONE will reasonably approximate the costs incurred by unit owners to maintain and provide Black Start Service;

Answer:

The proposal is designed to provide sufficient incentive to maintain existing Black Start Service resources at a reasonable cost to customers and without incurring a potential reliability shortfall, which PJM expects may otherwise occur if the Commission rejects this proposal, as detailed in the attached Affidavit of David Hauske on behalf of PJM (“Affidavit”).<sup>5</sup> This proposal nevertheless represents a just and reasonable approach for compensating and incentivizing Black Start Service to meet reliability needs and save costs for consumers.

As PJM stated in the April 30 Filing, the fixed past five year average (as opposed to a rolling average) will reasonably approximate costs that unit owners have incurred to maintain their Black Start Service while reducing future volatility of compensation for these units.<sup>6</sup> That is because the proposed fixed cost of \$272.62/MW-day (which represents the past five year historic average of system-wide Net CONE) will provide a just and reasonable proxy of the capital costs of developing a new Black Start Service resource, as confirmed by PJM’s historical bid solicitations for new Black Start Service resources.<sup>7</sup> Accordingly, PJM is proposing to use the

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<sup>5</sup> Attachment A, Affidavit of David Hauske (“Affidavit”).

<sup>6</sup> April 30 Filing at 10.

<sup>7</sup> Affidavit at P 19 (demonstrating how the proposed fixed cost closely mirrors the past 12 years of revenue requirements which have been historically adequate to procure sufficient Black Start Service resources); PJM, Operating Committee, PJM Black Start Reliability Backstop Process, at 6 (May 8, 2025) (warning stakeholders that PJM may need to trigger the Black Start Service reliability backstop provisions for the first time),

historic average Net CONE value of \$272.62/MW-day as an appropriate starting point to be annually updated by the Handy Whitman Index, which provides a measure of construction costs.<sup>8</sup>

The current Tariff refers to Net CONE rather than a specific dollar value to represent that capital cost, and that has not proven to be an issue in the past, as Net CONE has been relatively stable.<sup>9</sup> However, as evidenced in the Affidavit, the Net CONE values for the current and upcoming Delivery Years are expected to be less consistent, as the energy and ancillary services revenues offset (“E&AS offset”) on a forward looking basis has varied based on rising energy revenues and the determination of those offsets based on a forward projection of future and energy and ancillary service revenues. Although the calculation of the E&AS offset on a forward basis is appropriate and has been approved by the Commission for the purpose of setting PJM’s capacity market demand curve, these developments have worked to diminish the value of continuing to use updated Net CONE values as a proxy for Black Start Service capital costs given that the costs of providing Black Start Service do not vary in lockstep with changing energy and ancillary service revenues.

As a result, there is no need for Black Start Service compensation to continue to be based off Net CONE values, as the need for Black Start Service is not offset by revenues in the energy and ancillary services markets such that revenues should rise or fall depending on variability in

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<https://www.pjm.com/-/media/DotCom/committees-groups/committees/oc/2025/20250508/20250508-item-12---reliability-backstop-education.pdf>; see Tariff Schedule 6A, section 6A.

<sup>8</sup> The Handy Whitman Index is used for annual escalation factors. See <https://www.pjm.com/committees-andgroups/subcommittees/cds/handy-whitman-index>.

<sup>9</sup> Affidavit at P 19, Exhibit 1 (showing that the Net CONE-derived revenue per MW-day value has been relatively stable over the past 12 years as compared to the current and subsequent Delivery Years); see *PJM Interconnection, L.L.C.*, Independent Market Monitor for PJM (“IMM”) Comments, Docket No. ER25-2123-000, at 2 (May 21, 2025) (“The fixed black start service costs are intended to represent the annual revenue required to cover the fixed costs of providing black start service, if any. Fixed costs are capital costs.”).

those markets.<sup>10</sup> Furthermore, while Net CONE may approach \$0, the fixed costs of providing Black Start Service are never presumed to be \$0 because, at the very least, agreeing to provide Black Start Service comes with compliance obligations and associated risk.<sup>11</sup>

The proposed use of a fixed average of the past five-year historic Net CONE, which is \$272.62/MW-day, as adjusted by the Handy Whitman index, will also continue to provide a reasonable proxy value for the necessary incentive to maintain existing Black Start Service resources at a reasonable cost. It will utilize the historic five year average of Net CONE which has historically been an appropriate proxy for Black Start Service costs, while recognizing the need to update those numbers based on a recognized neutral industry-wide measure of construction costs in the form of the Handy Whitman index.<sup>12</sup> The proposed fixed cost will incorporate this historically reasonable proxy, which has been demonstrated to provide sufficient incentive for existing Black Start Service-capable resources to continue to provide Black Start Service, while removing the possibility that this proxy will fluctuate in ways unrelated to the need for Black Start Service within PJM in future years.

As PJM establishes in the attached Affidavit, this proposal is intended to prevent a potential reliability risk in available Black Start Service, as compared to what is otherwise expected to result

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<sup>10</sup> Affidavit at P 15 (demonstrating that most Black Start Service resources are combustion turbine resources). As is well-documented, combustion turbine resources more commonly operate as peaker facilities, only participating when the system is in peak load conditions, and accordingly have a lower expected E&AS Offset. See The Brattle Group, Brattle 2025 CONE Report for PJM, at 79, Table 24 (Apr. 9, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2025/20250411-special/item-1-02-revised-cone-report-final.pdf>.

<sup>11</sup> Tariff, Schedule 6A, sections 6B (forfeiture of revenues received and expected associated with non-performing Black Start Service resource), 7-11 (performance standards and outage restrictions), 12-15 (testing requirements); NERC Reliability Standard, EOP-005-3, System Restoration from Black Start Resources, available at: <https://www.nerc.com/pa/Stand/Reliability%20Standards/EOP-005-3.pdf>.

<sup>12</sup> The Handy Whitman Index is used for annual escalation factors. See <https://www.pjm.com/committees-andgroups/subcommittees/cds/handy-whitman-index>.

if even a small portion of the existing Black Start Service resources currently on the base formula rate discontinue providing Black Start Service. Notably, if existing Black Start Service resources were to exit the service given the variabilities and lack of relative predictability that accompany the calculation of Net CONE, PJM would be required to procure new resources at the capital cost recovery rate at a substantially higher price.<sup>13</sup>

**(i) Net CONE has Historically Served as a Reasonable Proxy for Fixed Costs.**

As noted in the April 30 Filing, the Net Cost of New Entry (“CONE”) has long been used by PJM to reasonably approximate the costs incurred by unit owners to maintain and provide Black Start Service.<sup>14</sup> PJM originally proposed the use of Net CONE as a proxy to replace the retired PJM Capacity Deficiency Rate back in 2009.<sup>15</sup> The Commission agreed that PJM’s proposed formulae including the Net CONE variable were just and reasonable, rejecting requests to consider an alternate formula put forth by intervenors.<sup>16</sup>

The Net Cost of New Entry has been a just and reasonable proxy for actual costs because the Net CONE-based formulae approximates actual costs by approximating the cost it would take to develop a replacement resource. Specifically, the existing Black Start Service compensation formula multiplies Net CONE, representing the costs to build a new efficient unit, by a resource’s Black Start Service Installed Capacity (“ICAP”) MW, and then by an “allocation

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<sup>13</sup> Affidavit at P 21 (showing an estimated increase in Black Start Service costs of approximately \$19,000,000, or 41%, in a single year if even only 10% of existing Black Start Service resources on the base formula rate decline to continue accepting the compliance obligations and risks of providing Black Start Service).

<sup>14</sup> April 30 Filing at 7; *PJM Interconnection, L.L.C.*, 127 FERC ¶ 61,197, at P 39 (2009); see *PJM Interconnection, L.L.C.*, Tariff Schedule, 6A, Black Start Revisions, Docket No. ER21-1635-000, Attachment B - Affidavit of Thomas Hauske on Behalf of PJM Interconnection, L.L.C., ¶ 9 (Apr. 7, 2021).

<sup>15</sup> *PJM Interconnection, L.L.C.*, 127 FERC ¶ 61,197 at P 10.

<sup>16</sup> *Id.* at PP 38-39.

factor” that considers the additional costs of developing a Black Start Service-capable resource. The Net CONE is calculated by determining the Gross Cost of New Entry and offsetting that value by the expected energy and ancillary services revenues (“E&AS Offset”). This calculation therefore represents how much additional revenue that is not being provided by traditional energy markets would be necessary in order for a replacement Black Start Service-capable resource to be viable and to get developed. Accordingly, Net CONE has historically served as a reasonable representation of the cost for a new entrant to offer Black Start Service, and thus has historically been a reasonable proxy for the costs incurred, because if PJM cannot procure Black Start Service from existing resources, PJM would need new resources to be developed to provide that service.

This relationship between Net CONE and Black Start Service needs has held true for many years, but because of changing circumstances affecting the calculation of the Net CONE, this proxy will no longer be as effective in future years as it once was. Specifically, as the determination of forward calculated energy and ancillary services revenues becomes more uncertain, its link to the unique costs associated with the recovery of the capital costs of Black Start Service starts to erode.

Moreover, the potential for changes to the Reference Resource used to calculate Net CONE creates uncertainty for the compensation expected by Black Start Service resources from year to year. Indeed, the initial change of the Reference Resource to a combined cycle resource instead of the combustion turbine was ultimately undone due to concerns that Net CONE could drop to \$0.<sup>17</sup> While the Reference Resource was reverted back to a combustion turbine through

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<sup>17</sup> *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000, at 37 (Dec. 9, 2024) (explaining that “[b]ecause Non-Performance Charges are based on the applicable LDA Net CONE,” and

the 2027/2028 Delivery Year, PJM is considering the adoption of a combined cycle and/or a 4-hour Battery Energy Storage System as part of the ongoing quadrennial review.<sup>18</sup> Even if Net CONE is expected to increase for the Delivery Years following the implementation of this next quadrennial review,<sup>19</sup> that Net CONE determination becomes less and less useful to quantifying the capital costs associated with the provision of Black Start Service due to that potential uncertainty.

Moreover, certain Black Start Service resources may be unwilling to continue to take on the compliance obligations and risks for the next two Delivery Years in the hopes that higher prices materialize in the future.<sup>20</sup> Unlike resources that elected the capital cost recovery rate after June 6, 2021, which are committed for the remaining life of the Black Start Service equipment,<sup>21</sup> the vast majority of resources currently providing Black Start Service to PJM are

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because of the combined cycle “Reference Resource’s expected ability to earn revenues energy and ancillary services revenues [which] cause[] the Net CONE to be \$0/MW-day in certain Locational Deliverability Areas,” this combination could “result in no charges for underperformance for those committed Capacity Resources located in such LDA.”).

<sup>18</sup> PJM, Market Implementation Committee, Quadrennial Review Proposal, at 4 (June 16, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2025/20250616-special/20250616-pjm-quad-review-proposal.pdf>.

<sup>19</sup> *Id.* at 6-7.

<sup>20</sup> Affidavit at P 16; *see id.* PP 17-19 (feedback from unit owners, lower revenues, and decreased responses to requests for proposals all demonstrate that Black Start Service resource owners may not be willing to continue to provide the service). The next quadrennial review is not likely to be implemented until June 1, 2026, for the 2028/2029 Delivery Year. *See* PJM, Special Markets and Reliability Committee Meeting Presentation, Consultation With Members Regarding Future 205 Filing on Capacity Market, at 17 (Nov. 7, 2024), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2024/20241107-special/item-02---capacity-market-adjustments---presentation.ashx>.

<sup>21</sup> Tariff, Schedule 6A, Section 6.

on the base formula rate<sup>22</sup> and are able to discontinue providing Black Start Service.<sup>23</sup> So while the vast majority of Black Start Service resources can discontinue providing the service as Net CONE fluctuates from year to year, the need for Black Start Service does not fluctuate from year to year. Having such potential volatility and resulting uncertainty in the compensation necessary to maintain and procure such a critical reliability service is not prudent.

**(ii) A Fixed Value Based on the Fixed Five-Year Historic Average RTO-Wide Net CONE Balances Approximation of the Actual Costs for Existing Black Start Service Resources with the Necessary Incentive and Is Therefore a Better Proxy Going Forward for the Potential Costs of Providing Black Start Service Overall.**

PJM's proposal to replace the variable Net CONE-dependent rate with a fixed rate of \$272.62/MW-day, to be adjusted annually by the Handy Whitman index, will continue to provide a reasonable proxy value for both the capital costs of providing Black Start Service and the necessary incentive to maintain existing Black Start Service resources at a reasonable cost. This fixed cost, derived from historical Net CONE which has demonstrated efficacy at incentivizing adequate levels of Black Start Service, is just and reasonable and will better approximate the actual costs necessary to maintain existing Black Start Service resources than a Net CONE-dependent rate which may be increasingly subject to fluctuation. As the Independent Market Monitor for PJM ("IMM") explained in their protest, "[f]ixed costs are capital costs," and neither the capital costs of maintaining Black Start Service nor the PJM Region's need for Black Start Service varies in lockstep with Net CONE.

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<sup>22</sup> Affidavit at P 15 (showing that 80% of Black Start Service resources provide the service under the base formula rate).

<sup>23</sup> Tariff, Schedule 6A, Section 5 ("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.").



First, there is no need for Black Start Service compensation to continue to be based off Net CONE values, as the need for Black Start Service is not offset by revenues in the energy and ancillary services markets such that revenues should rise or fall depending on variability in those markets. Second, the fixed costs of providing Black Start Service are never presumed to be \$0 because, at the very least, agreeing to provide Black Start Service comes with compliance obligations and associated risk.<sup>24</sup> Although it is not expected that future changes in the Reference Resource will again result in a Net CONE of \$0, the fact that such uncertainty in Net CONE was possible exemplifies the disconnect between continuing to use those values.<sup>25</sup>

The proposed fixed cost of \$272.62/MW-day appropriately incorporates the historically reasonable proxy through a fixed, five-year historic average RTO-wide Net CONE, which has been demonstrated to provide sufficient incentive for resources to offer to provide Black Start Service, while removing the possibility that this proxy will fluctuate in ways unrelated to the need for Black Start Service within PJM in future years. This proposed fixed cost component closely mirrors over a decade of accepted values, which over the past twelve years ranged from an average low of \$220.42/MW-day in 2012 to an average high of \$320.23/MW-day in 2017, maintaining a steady average of \$260.68/MW-day over that time frame.<sup>26</sup>

These fixed values were historically acceptable to generation owners as evidenced by

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<sup>24</sup> Tariff, Schedule 6A, sections 6B (forfeiture of revenues received and expected associated with non-performing Black Start Service resource), 7-11 (performance standards and outage restrictions), 12-15 (testing requirements); NERC Reliability Standard, EOP-005-3, System Restoration from Black Start Resources, <https://www.nerc.com/pa/Stand/Reliability%20Standards/EOP-005-3.pdf>; see also NERC Reliability Standard, EOP-006-3, System Restoration Coordination, <https://www.nerc.com/pa/Stand/Reliability%20Standards/EOP-006-3.pdf>.

<sup>25</sup> See *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000, at 37 (Dec. 9, 2024).

<sup>26</sup> Affidavit at P 19, Exhibit 1.

over a decade of successful requests for proposals without triggering the reliability backstop, which PJM warned stakeholders at the May 8, 2025 Operating Committee meeting may be triggered for the first time in its history for the 2025/2026 Delivery Year.<sup>27</sup> This is because the Net CONE-dependent fixed cost component that went into effect for the 2025/2026 Delivery Year was significantly lower than prior years, as evidenced in the Affidavit.<sup>28</sup> Specifically, for the 2025/2026 Delivery Year, the Net CONE value was \$181.55/MW-day, a disincentive only slightly offset by generation owners' knowledge that this proposal would, if accepted, increase this rate by \$91.07/MW-day.<sup>29</sup> If this proposal is rejected, it is not clear that the 2026/2027 Delivery Year's expected average fixed cost of \$202.57/MW-day will be adequate to maintain existing resources on the base formula rate or continue to provide a stable indication of the capital costs of providing Black Start Service.

That this proposal provides a reasonable compromise that will save costs to load in the long run and reasonably approximate capital costs such that adequate compensation is being provided to Black Start Service resources is evidenced by the overwhelming support shown in this stakeholder process and lack of any stakeholder protest in this proceeding.<sup>30</sup> This proposal provides a more efficient and cost-effective metric for the actual cost of compensating the development of new Black Start Service capable resources under the capital cost recovery rate,

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<sup>27</sup> *Id.* at P 18; PJM, Operating Committee, PJM Black Start Reliability Backstop Process, at 6 (May 8, 2025) (warning stakeholders that PJM may need to trigger the Black Start Service reliability backstop provisions for the first time), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/oc/2025/20250508/20250508-item-12---reliability-backstop-education.pdf>.

<sup>28</sup> Affidavit at P 19, Exhibit 1.

<sup>29</sup> *See id.*

<sup>30</sup> The vote tally from PJM's April 23, 2025 MRC is available at: <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2025/20250423/20250423-mrc-summarized-voting-report.pdf>.

as evidenced in the Affidavit.<sup>31</sup>

As explained in the attached Affidavit, owners of existing Black Start Service resources have communicated to PJM that without certainty and stability in the expectation of future Black Start Service revenue requirements, resources may begin to cease offering to provide Black Start Service.<sup>32</sup> This would require PJM to develop new Black Start Service resources at a far greater cost and could result in a reliability gap period during which PJM would not be able to procure sufficient Black Start Service capability. Indeed, as PJM has warned that the Black Start Service reliability backstop provision may be triggered for this 2025/2026 Delivery Year, a sample of those potential costs and reliability impacts may be seen later this very year.<sup>33</sup> This proposal thereby provides a just and reasonable rate designed to maintain the necessary incentives to retain PJM's existing fleet of Black Start Service resources.

Seven years ago, a joint FERC-NERC Regional Entity report reviewed compensation for Black Start Service and concluded that “the adequacy of compensation for services and benefits provided by blackstart resource needs to be examined, to ensure compensation levels are adequate to secure and retain necessary blackstart resources.”<sup>34</sup> Since the issuance of such

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<sup>31</sup> Affidavit at P 21 (estimating a \$19,000,000 increase if only 10% of existing resources under the base formula rate decline to continue to provide Black Start Service and are instead replaced by resources on the capital cost recovery rate).

<sup>32</sup> *Id.* at P 18; *see generally* Report on the FERC-NERC-Regional Entity Joint Review of Restoration and Recovery Plans, Recommended Study: Blackstart Resources Availability (May 2018) (“FERC-NERC Blackstart Report”), <https://www.ferc.gov/sites/default/files/2020-05/bsr-report.pdf>; *id.* at 24 (noting participants expressing concern with adequacy of current compensation for blackstart providers given regulatory fees and the “little incentive to provide blackstart service from fully depreciated units” because the payments are “limited to operations and maintenance reimbursements (e.g., one percent of actual operations and maintenance costs, plus some funds for training)”).

<sup>33</sup> PJM, Operating Committee, PJM Black Start Reliability Backstop Process, at 6 (May 8, 2025) (warning stakeholders that PJM may need to trigger the Black Start Service reliability backstop provisions for the first time), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/oc/2025/20250508/20250508-item-12---reliability-backstop-education.pdf>.

<sup>34</sup> FERC-NERC Blackstart Report at 24.

report, PJM has observed an increased likelihood that Black Start Service compensation may rapidly become inadequate to procure necessary supplies of Black Start Service resources. This is particularly the case with regard to fuel assured Black Start Service resources with firm supply which are more difficult to procure<sup>35</sup> but continue to be recommended in FERC-NERC Regional Entity reports.<sup>36</sup> This proposal stymies this potential reliability concern and provides a just and reasonable measure to continue to incentivize Black Start Service resources.<sup>37</sup>

The Commission has long recognized that resources need an additional incentive to provide Black Start Service, as captured in the “X” variable of the formulae used for compensation, known as the “Black Start Service allocation factor” which provides a different value for non-fuel assured Black Start Service units that were hydroelectric as compared to those that were powered by a combustion turbine due to different expectations in the amount of investment originally necessary in developing the unit to be black start capable.<sup>38</sup> If, due to changes in Net CONE, fixed costs begin to approach \$0, that would leave only operations and

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<sup>35</sup> See PJM, Operating Committee, PJM Black Start Reliability Backstop Process, at 6 (May 8, 2025) (warning stakeholders that PJM may need to trigger the Black Start Service reliability backstop provisions for the first time), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/oc/2025/20250508/20250508-item-12---reliability-backstop-education.pdf>.

<sup>36</sup> See FERC-NERC-Regional Entity Joint Blackstart and Next-Start Resource Availability Study in the Texas Interconnection at 27 (Dec. 19, 2023), available at: [ferc.gov/media/ferc-nerc-regional-entity-joint-blackstart-and-next-start-resource-availability-study-texas](https://www.ferc.gov/media/ferc-nerc-regional-entity-joint-blackstart-and-next-start-resource-availability-study-texas).

<sup>37</sup> See *PJM Interconnection, L.L.C.*, 147 FERC ¶ 61,103, at P 59 (2014) (filing party “need only demonstrate that its proposed revisions are just and reasonable, not that its proposal is the most just and reasonable among all possible alternatives.”); *Cities of Bethany v. FERC*, 727 F.2d 1131, 1136 (D.C. Cir. 1984) (“FERC has interpreted its authority to review rates under the FPA as limited to an inquiry into whether the rates proposed by a utility are reasonable—and not to extend to determining whether a proposed rate schedule is more or less reasonable than alternative rate designs.”); *New York Indep. Sys. Operator, Inc.*, 183 FERC ¶ 61,130, at P 34 (2023) (finding NYISO’s proposal to adjust amortization rates to be “one reasonable way to meet the zero emission requirement”).

<sup>38</sup> Tariff, Schedule 6A, section 18; see *PJM Interconnection, L.L.C.*, 127 FERC ¶ 61,197, at PP 32-34 (2009); see also *id.* at P 27 (“The black start service allocation factor, or X factor, is designed to allocate a portion of the fixed costs of the operation of black start units to the provision of black start service, as well as to permit generators to recover capital investments which may be above the current caps used as allocation factors under PJM’s Tariff.”).

maintenance and training costs, which would likely provide a revenue requirement of only a couple thousand dollars a year, which may not be worth the exposure to increased risk from NERC standards and testing requirements that come with being a Black Start Service resource.<sup>39</sup>

The attached Affidavit further illustrates the impact of this proposal on customers. As explained therein, approximately 80% of PJM Black Start Service resources are receiving compensation under the base formula rate.<sup>40</sup> Replacing even only 10% of the current units on the base formula rate with new units requiring capital expenditures to upgrade the unit to be Black Start Service capable would increase the total annual revenue requirement paid to Black Start Service resources by \$19,000,000, or by an approximately 41% increase.<sup>41</sup> That additionally assumes that resources will be incentivized to provide Black Start Service under the capital cost recovery rate, which has not always been the case and could result in potential reliability risks if insufficient Black Start Service resources are available in all Zones.<sup>42</sup>

In addition, based on feedback received from generators during the recent 2023 RTO-Wide Black Start Service request for proposals, new units would not be available to provide Black Start Service for approximately 24 to 36 months after being awarded due to lead times associated with purchasing diesel generator sets that are frequently required to make a unit Black

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<sup>39</sup> See Tariff, Schedule 6A, sections 6B (forfeiture of revenues received and expected associated with non-performing Black Start Service resource), 7-11 (performance standards and outage restrictions), 12-15 (testing requirements); NERC Reliability Standard, EOP-005-3, System Restoration from Black Start Resources, <https://www.nerc.com/pa/Stand/Reliability%20Standards/EOP-005-3.pdf>.

<sup>40</sup> Affidavit at P 21.

<sup>41</sup> *Id.* at P 22. This example is based on a typical combustion turbine with a capital expenditure of \$10,000,000 recovered over a 10 year period. Resources on the capital cost recovery rate after June 6, 2021 commit to providing Black Start Service through the remaining life of the Black Start Service equipment. Tariff, Schedule 6A, sections 5 and 6(iii).

<sup>42</sup> Affidavit at P 17 (“PJM’s most recent request for proposals for fuel assured Black Start Service resources only provided PJM with sufficient options in some of the Zones”).

Start Service capable.<sup>43</sup> As exemplified above, if the Commission should reject this proposal, this could result in significantly increased costs to consumers and a potential gap in reliability of several years.

**B. It is just and reasonable to use an RTO-wide historic Net CONE calculation regardless of the location of a Black Start Unit.**

Please explain how: (b) the use of an RTO-wide historic Net CONE calculation regardless of the location of a Black Start Unit is just and reasonable.

Answer:

The use of an RTO-Wide historic Net CONE calculation regardless of the location of the resource is just and reasonable because the locational aspects of Net CONE do not correspond to either the locational need for Black Start Service or the actual locational costs of providing that service.<sup>44</sup> While Gross CONE does indeed reflect the locational aspects of constructing and developing a new resource specific to a CONE Area, the Net CONE is offset by energy and ancillary services revenues specific to that same CONE Area. This creates the potential for disconnect between the Net CONE and both the locational need for investment in Black Start Service resources as well as the capital costs of providing Black Start Service.

First, the fixed costs necessary to make a resource capable of providing Black Start Service will not necessarily be offset by extensive participation in other markets. The majority of Black Start Service resources operate as peaker facilities which do not participate as extensively in energy and ancillary services markets as other resources,<sup>45</sup> including combined

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<sup>43</sup> *Id.* at P 24.

<sup>44</sup> April 30 Filing at 7.

<sup>45</sup> Affidavit at P 15; see The Brattle Group, Brattle 2025 CONE Report for PJM, at 79, Table 24 (Apr. 9, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2025/20250411-special/item-1-02-revised-cone-report-final.pdf>.

cycle facilities which are being considered as a top contender to be the Reference Resource beginning with the 2028/2029 Delivery Year.<sup>46</sup>

Second, resources under the base formula rate, which account for approximately 80% of the existing Black Start Service fleet,<sup>47</sup> have already been developed, so the current and locational costs and assumptions in the calculation of Net CONE do not directly reflect the actual costs for that resource to provide Black Start Service going forward. This is in contrast to the use of Net CONE in the capacity market where the market consists of both existing and new units and where Net CONE is used to develop a demand curve that produces a locational price signal for new investment and for retirement of uneconomic investment in a given CONE Area. As a result, given that the class of units to which the changing Net CONE determination is applied is very different for purposes of Black Start Service than for all units participating in the PJM capacity market, using a CONE-Area specific Net CONE value introduces an unnecessary variable which may skew the incentive for resources to continue to provide Black Start Services in a way unrelated to the actual need for that service.

Third, this proposal reflects the reality that Black Start Service, i.e., the capability of generating units to start without an outside electrical supply or when disconnected from the grid, is expected to be provided when transmission service is otherwise unavailable. That is, in an event where Black Start Service may be needed, there would not be transmission constraints that limit the flow of energy from one area to another. PJM could call upon Black Start Service

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<sup>46</sup> PJM, Market Implementation Committee, Quadrennial Review Proposal, at 4 (June 16, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2025/20250616-special/20250616-pjm-quad-review-proposal.pdf>. .

<sup>47</sup> Affidavit at P 15.

resources as necessary, wherever they are located, to assist in the effort to re-energize the grid. As a result, unlike capacity resources that may be physically located outside of constrained Zones which have more limited value in constrained Zones, the value of Black Start Service resources are not limited by transmission constraints. This marks another disconnect in applying the locational aspects of the Net CONE determination to Black Start Service resources, given that the need for Black Start Service is not a function of transmission constraints and therefore not necessarily a function of locational CONE Areas.

In other words, CONE values are determined for specific areas so as to properly incentivize resource development to support resource adequacy in different regions.<sup>48</sup> There is no similar concept of separation for Black Start Service because black start resource adequacy is not the same a resource adequacy for peak energy needs. Unlike capacity resources, Black Start Service requires additional specific capabilities<sup>49</sup> and is needed when transmission service is otherwise unavailable.

Finally, PJM notes that the CONE Area-specific Net CONE is currently used for all Black Start Service compensation under the base formula rate, whether or not the region separates. This further illustrates that Net CONE is now best utilized as a reasonable starting point to arrive at the system-wide, historically-consistent \$272.62/MW-day value for determining black start compensation on an ongoing basis. This proposed approach will correct these discrepancies by utilizing an RTO-wide historical Net CONE which will remove the locational CONE Area-specific aspects of the compensation mechanism.

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<sup>48</sup> RAA, Schedule 10.1.C.

<sup>49</sup> See Tariff, Schedule 6A, section 7.



## II. REQUESTED EFFECTIVE DATE AND REDLINE AMENDMENTS

PJM's April 30 Filing included revisions to Tariff, Schedule 6A, section 17A which clarified the deadlines therein to allow this proposal to go into effect prior to June 1, 2026.<sup>50</sup>

Specifically, PJM's proposal included the following language:<sup>51</sup>

"Notwithstanding the foregoing, for the 2025/2026 Delivery Year the annual calculation of Black Start Service revenue requirements that became effective on June 1, 2025 will be further updated on July 1, 2025 to reflect any FERC approved changes in the Base Formula Rate equation regardless of whether the existing revenue requirement has been effective for at least 12 months; and for the 2026/2027 Delivery Year, the Black Start Service revenue requirement shall become effective June 1, 2026 regardless of whether the existing revenue requirement has been effective for at least 12 months."

As a result of the Commission's deficiency letter and anticipated need for 60 additional days to consider this response, PJM now requests that the Commission issue an order by August 30, 2025 with an effective date for this proposal of September 1, 2025. To align with this anticipated timeframe, PJM requests to amend the above language such that the "July 1, 2025" date be updated to "September 1, 2025." This will allow PJM to implement the rate prior to June 1, 2026, thereby maintaining stakeholder and generation owner expectations that this proposal would go into effect to maintain the consistent level of compensation that has been provided by the base formula rate for over the past ten years.

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<sup>50</sup> April 30 Filing at 13-15.

<sup>51</sup> *Id.*, Attachment B – Marked Tariff.

### III. DESCRIPTION OF SUBMITTAL

This filing consists of the following:

1. This transmittal letter;
2. Attachment A – Affidavit of David Hauske on behalf of PJM and exhibit;
3. Attachment B – Revisions to the Tariff, in redline format; and
4. Attachment C – Revisions to the Tariff, in clean format.

### IV. CONCLUSION

Based on the foregoing, PJM respectfully requests that the Commission issue an order by August 29, 2025, accepting the proposed revisions, as filed, effective September 1, 2025.

Respectfully submitted,

/s/ Daniel Vinnik

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

## **CERTIFICATE OF SERVICE**

I hereby certify that I have this day, June 30, 2025, served the foregoing document on those parties on the official Service List compiled by the Secretary in these proceedings.

/s/ Daniel Vinnik

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# Attachment A

## Affidavit of David Hauske

**PJM Interconnection, LLC** ) **Docket No. ER25-2123-001**  
)

5. This proposal is intended to maintain the incentive provided by the base formula rate and the capital cost recovery rate for North American Electric Reliability Corporation (“NERC”) – Critical Infrastructure Protection (“CIP”) (collectively, “NERC-CIP”) specific recovery that is necessary to enable PJM to continue to procure a sufficient supply of Black Start Service to meet reliability needs.

6. PJM has previously provided testimony of the critical need for Black Start Service.<sup>1</sup> Specifically, PJM is responsible for taking actions necessary to maintain the operational integrity of the PJM transmission system, which includes developing and implementing a reliable “black start” capability plan. PJM’s restoration plan accordingly identifies all of the locations where Black Start Service resources are needed, and PJM Manual 14D sets forth the criteria and process for selecting or identifying necessary resources to commit to providing Black Start Service at identified locations.<sup>2</sup> As such, it is critical that PJM be able to procure a sufficient supply of Black Start Service resources at the necessary locations throughout PJM.

7. PJM has also previously provided testimony supporting the need to include adequate incentives for this voluntary service in order for unit owners to accept the risks for providing those services.<sup>3</sup> PJM has explained that the 12 percent rate of return built into the capital recovery factor has served as a reasonable incentive for that rate in the past.<sup>4</sup> However, that does not address the reasonable concern that existing units under the base formula rate that do not require additional capital investment and are therefore not eligible for the capital cost recovery rate, might not accept the additional risks of providing Black Start Service and might not offer into future requests for proposal. The current Tariff provisions recognize this need for incentives, by allocating an additional incentive factor of 10 percent to units under the base formula rate to encourage such units to provide the service.<sup>5</sup>

8. PJM has also needed to provide testimony to support an urgent request for changes to ensure adequate procurement in recent years.<sup>6</sup> Specifically, in April of 2021, PJM explained that the owner of several Black Start Service resources located in one transmission Zone had announced the retirement of those units from Black Start Service as of February 19, 2022.<sup>7</sup> This would have resulted in potential reliability concerns if the resources were to go through with terminating that Black Start Service prior to March 31, 2023, before which PJM would have been unable to obtain replacement Black Start Service through the request for proposal process.

9. This affidavit further supports this proposal by: (i) explaining how the proposed fixed cost has been calculated to maintain the incentive for Black Start Service;

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<sup>1</sup> *PJM Interconnection, L.L.C.*, Tariff, Schedule 6A, Black Start Revisions, Attachment A, Affidavit of Michael E. Bryson on Behalf of PJM Interconnection, L.L.C., Docket No. ER21-1635-000, at PP 6-10 (Apr. 7, 2021) (“Bryson Aff.”).

<sup>2</sup> *Id.* at P 7; Operations Planning Division, PJM, *Manual 14D: Generator Operational Requirements*, § 10 (rev. 67, Mar. 19, 2025), <https://www.pjm.com/-/media/DotCom/documents/manuals/m14d.pdf>.

<sup>3</sup> *PJM Interconnection, L.L.C.*, Tariff, Schedule 6A, Black Start Revisions, Attachment B, Affidavit of Thomas Hauske on Behalf of PJM Interconnection, L.L.C., Docket No. ER21-1635-000, at PP 20-22 (Apr. 7, 2021) (“Hauske Aff.”).

<sup>4</sup> *Id.* at P 22.

<sup>5</sup> *Id.*

<sup>6</sup> Bryson Aff. at PP 11-13.

<sup>7</sup> *Id.* at P 11.

(ii) providing observations demonstrating that the current methodology will not provide a sufficient incentive for Black Start Service resources going forward, and  
(iii) demonstrating by example the potential cost of failing to incentivize a sufficient supply of Black Start Service resources.

#### **A. Calculation of the Proposed Fixed Cost**

10. PJM’s proposed new fixed Black Start Service cost component of the calculation used to calculate a resource’s Black Start Service revenue requirement will be based on the 5-year historic average RTO-wide Net CONE, which represents rates that have been sufficient to maintain the current fleet of Black Start Service resources over that same time period. Specifically, the average RTO-wide Net CONE values have been \$273.64, \$302.63, \$257.26, \$261.10, and \$278.47 over the past five years for the 2020/2021-2024/2025 Delivery Years, respectively.<sup>8</sup>

11. Under this proposal, beginning with the 2025/2026 Delivery Year, the fixed rate shall be \$272.62/MW-day. This fixed cost will then be updated annually based on the Handy Whitman Index to account for inflation.<sup>9</sup>

#### **B. The Current Methodology Is Unlikely To Incentivize Sufficient Procurement Going Forward**

12. PJM currently compensates resources for providing Black Start Service through a revenue requirement which takes into account a variety of factors, including fixed costs. The fixed costs are calculated by one of three formulas: the “Base Formula Rate,” the Commission-approved “Capital Cost Recovery Rate,” and the “Capital Cost Recovery Rate – NERC-CIP Specific Recovery” for the recovery of capital costs for incremental equipment solely necessary to enable a Black Start Service resource to maintain compliance with mandatory CIP Reliability Standards approved by NERC.<sup>10</sup>

13. Currently, no resources use the capital cost recovery rate for NERC-CIP specific recovery, though this proposal will also maintain the incentive for that option by providing a stable fixed cost.

14. Approximately 20% of the current resources use the capital cost recovery rate, which this proposal does not impact because the capital cost recovery rate is not dependent on Net CONE and instead uses a Commission-approved value. The number of resources on the capital cost recovery rate is expected to decrease as units fulfill their capital recovery period. However, resources utilizing the capital cost recovery rate default to the base formula rate after completing the recovery period set forth in the

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<sup>8</sup> PJM, MRC Presentation, Net CONE Impacts on Black Start Revenues, at 5 (Mar. 19, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2025/20250319/20250319-item-06---1-black-start-baseformula-rate---presentation.pdf>.

<sup>9</sup> The Handy Whitman Index is used for annual escalation factors. See <https://www.pjm.com/committees-andgroups/subcommittees/cds/handy-whitman-index>.

<sup>10</sup> See Tariff, Schedule 6A, section 18.

tariff based on the age of the resource.<sup>11</sup> The incentives maintained by this proposal are therefore critical to maintaining resources that agreed to provide Black Start Service under the capital cost recovery rate prior to June 6, 2021, once their capital cost recovery periods have expired.<sup>12</sup>

15. As of 2025, approximately 80% of PJM's Black Start Service resources use the base formula rate as compensation for the provision of that service. This percentage is expected to increase to 90% after the 2026/2027 Delivery Year as a large number of units will be fulfilling their capital cost recovery period. Currently, the majority of Black Start Service resources on the base formula rate are combustion turbine resources. Of the total number of Black Start Service resources, approximately 50% are legacy resources who have been providing Black Start Service since before PJM began compensating for it and for whom PJM may be unable to determine the actual costs for the unit to have been developed as capable of providing Black Start Service. The fixed Black Start Service cost is a large percentage (about 80-90%) of the total black start revenue requirement for Black Start Service resources on the base formula rate.

16. PJM has observed that the Net CONE-dependent fixed Black Start Service costs have been reduced in recent years, especially in the 2025/2026 and 2026/2027 Delivery Years.<sup>13</sup> This aligns with other observations that, despite increases in the Gross CONE, energy and ancillary services revenues have significantly increased, resulting in an overall decrease to Net CONE. Though these changes of the Reference Resource from a combustion turbine resource to a combined cycle resource did not end up materializing in the originally expected timeframe, the current ongoing quadrennial review has already recommended changing the Reference Resource to a combined cycle resource once again.<sup>14</sup> Although Net CONE for the Reference Resource may increase for some Delivery Years following the implementation of this next quadrennial review,<sup>15</sup> Black Start Service resources may be unwilling to continue to take on the compliance obligations and risks for the next two Delivery Years as Black Start Service needs do not fluctuate with Net CONE from year to year.

17. PJM has observed a 40% drop in the number of units offering to provide Black Start Service in response to PJM's most recent RTO-wide request for proposals for new Black Start Service resources in 2023 as compared to PJM's previous RTO-

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<sup>11</sup> *Id.*

<sup>12</sup> See *PJM Interconnection, L.L.C.*, Black Start Revisions to the Tariff, Docket No. ER21-1635-000 (Apr. 7, 2021).

<sup>13</sup> See PJM, MRC Presentation, Net CONE Impacts on Black Start Revenues, at 6 (Mar. 19, 2025), <https://www.pjm.com/-/media/DotCom/committeesgroups/committees/mrc/2025/20250319/20250319-item-06---1-black-start-base-formula-rate---presentation.pdf>.

<sup>14</sup> See PJM, Market Implementation Committee, Quadrennial Review Proposal, at 4 (June 16, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2025/20250616-special/20250616-pjm-quad-review-proposal.pdf>.

<sup>15</sup> *Id.* at 5, 7.



wide request for proposals in 2018. Additionally, PJM's most recent request for proposals for fuel assured Black Start Service resources only provided PJM with sufficient options in some of the Zones.

18. Owners of existing Black Start Service resources have communicated to PJM that without certainty and stability in the expectation of future Black Start Service revenue requirements, resources may begin to cease offering to provide Black Start Service, which aligns with concerns outlined in the 2018 FERC-NERC Regional Entity report on black start.<sup>16</sup> Indeed, PJM warned at the May 8, 2025 Operating Committee meeting that the reliability backstop request for proposals may be needed in order for PJM to meet minimum fuel assured Black Start Service requirement for the 2025/2026 Delivery Year.<sup>17</sup>

19. Under the current methodology, even utilizing a more conservative outcome for Net CONE based on the combustion turbine Reference Resource, PJM predicts a sharp drop in expected compensation for Black Start Service.<sup>18</sup> Specifically, PJM calculated an over \$2,000,000 drop in the total revenue requirement calculated under the base formula rate for the 2025/2026 and 2026/2027 Delivery Years as compared to using the fixed cost provided for in this proposal.<sup>19</sup> As seen in Exhibit 1 of this Affidavit, the Net CONE component of providing Black Start Service has been fairly consistent for over a decade, ranging from an average low of \$220.42/MW-day in 2012 to an average high of \$320.23/MW-day in 2017, resulting in an average of \$260.68/MW-day over that time frame.<sup>20</sup> The Net CONE component that went into effect for the 2025/2026 Delivery Year was only an average of \$181.55/MW-day, and the 2026/2027 Delivery Year's expected fixed cost is an average of \$202.57/MW-day.<sup>21</sup>

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<sup>16</sup> See generally Report on the FERC-NERC-Regional Entity Joint Review of Restoration and Recovery Plans, Recommended Study: Blackstart Resources Availability (May 2018) ("FERC-NERC Blackstart Report"), <https://www.ferc.gov/sites/default/files/2020-05/bsr-report.pdf>; *id.* at 24 (noting participants expressing concern with adequacy of current compensation for blackstart providers given regulatory fees and the "little incentive to provide blackstart service from fully depreciated units" because the payments are "limited to operations and maintenance reimbursements (e.g., one percent of actual operations and maintenance costs, plus some funds for training)").

<sup>17</sup> PJM, Operating Committee, PJM Black Start Reliability Backstop Process, at 6 (May 8, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/oc/2025/20250508/20250508-item-12---reliability-backstop-education.pdf>.

<sup>18</sup> PJM, MRC Presentation, Net CONE Impacts on Black Start Revenues, at 7 (Mar. 19, 2025), <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2025/20250319/20250319-item-06---1-black-start-baseformula-rate---presentation.pdf>.

<sup>19</sup> *Id.*

<sup>20</sup> Exhibit 1. Exhibit 1 shows the average Net CONE for the whole system and also by CONE Area from the 2012/2013 Delivery Year through the 2026/2027 Delivery Year.

<sup>21</sup> *Id.*

### **C. The Potential Cost of Procuring New Black Start Service Resources Greatly Outweighs the Costs of Maintaining Black Start Service Under this Proposal**

20. To illustrate how PJM's proposal will not only reasonably maintain Black Start Service resources but will also do so in a way that will provide net savings to consumers, consider the approximately 80% of PJM Black Start Service resources that are currently receiving compensation under the base formula rate. The estimated total revenue for all black start units for the 2025/2026 Delivery Year is approximately \$43,000,000 which is billed to Network Integration and Point-to-Point Transmission Service customers' Load Serving Entities. If the anticipated drop in Black Start Service revenues results in the expected decrease in resources willing to provide Black Start Service under the base formula rate, PJM would need to incentivize the development of new Black Start Service-capable resources to replace the lost Black Start Service capability.

21. Replacing even only 10% of the current resources on the base formula rate with new units requiring capital expenditures to upgrade the resource to be Black Start Service capable would increase the total annual revenue requirement paid to Black Start Service resources by an estimated \$19,000,000, which would be over a 40% increase. This example is based on a typical combustion turbine with an assumed capital expenditure of \$10,000,000 recovered over a 10-year period. Based on recent historical conversion of resources to become Black Start Service capable since 2024, capital costs have ranged from \$5,000,000 to \$17,000,000 per unit. Based on data received from the latest request for proposals for Black Start Service, PJM expects costs to be significantly higher and considers \$10,000,000 to be a conservative estimate.

22. If the current methodology remains and Black Start Service resources cease to provide this critical reliability service as assumed above, for which they are currently receiving on average between \$100,000 and \$400,000 a year, PJM will be required to procure new Black Start Service resources at a potentially much greater cost. As most units are not developed to be Black Start Service capable, this would likely require investment into new resources. PJM conservatively estimates that the current cost for such resources utilizing the capital recovery rate would be about \$1-3 million dollars per resource depending on the level of capital investment.

23. In addition to increased costs, failure to procure Black Start Service under the base formula rate could result in a shortfall while new resources are developed. Based on feedback received from generators during the recent 2023 RTO-wide Black Start Service request for proposals, new units would not be available to provide Black Start Service for over 24 months after being awarded due to lead times associated with purchasing diesel generator sets that are frequently required to make a resource Black Start Service capable. This could leave PJM with a Black Start Service shortfall in the interim, which could be further elongated if generators do not respond to PJM's request for proposals. Given that PJM's most recent request for fuel assured Black Start Service did not provide PJM with sufficient options in all Zones, new resources could take even longer to be procured than just the 2-3 year expected development timeframe.

#### IV. SUMMARY AND CONCLUSION

24. This filing is intended to maintain the incentive provided by the base formula rate and capital cost recovery rate for NERC-CIP specific recovery to enable PJM to continue to procure a sufficient supply of Black Start Service to meet reliability needs. PJM has established in previous affidavits the critical importance for Black Start Service,<sup>22</sup> the need for certainty as to Black Start Service rates,<sup>23</sup> and the need to include incentives for this voluntary service.<sup>24</sup> This affidavit further supports this proposal by (i) explaining how the new fixed cost has been calculated, (ii) providing observations demonstrating that the current methodology will not provide sufficient incentive for Black Start Service resources going forward, and (iii) demonstrating through hypothetical examples the potential cost of failing to incentivize a sufficient supply of Black Start Service resources.

25. This concludes my testimony.

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<sup>22</sup> Bryson Aff. at PP 6-10.

<sup>23</sup> *Id.* at PP 11-13.

<sup>24</sup> *PJM Interconnection, L.L.C.*, Tariff, Schedule 6A, Black Start Revisions, Attachment B, Affidavit of Thomas Hauske, Docket No. ER21-1635-000, at PP 20-22 (Apr. 7, 2021).

**PJM Interconnection, L.L.C.** ) **Docket Nos. ER25-2123-001**  
 )

Dated: June 30, 2025

# **Exhibit 1**

**AVERAGE NET CONE**

	Area 1	Area 2	Area 3	Area 4	Area 5	Yearly Average
2012	198.81	165.07	286.13	165.07	286.13	220.24
2013	244.61	212.89	320.47	256.70	231.08	253.15
2014	257.83	226.79	338.78	267.00	247.91	267.66
2015	295.32	251.82	337.09	276.97	270.62	286.36
2016	311.16	261.14	342.01	305.05	242.72	292.42
2017	345.20	295.31	352.63	334.43	273.56	320.23
2018	266.73	227.73	263.57	247.58		251.40
2019	264.91	214.75	264.40	224.36		242.10
2020	264.44	189.09	264.88	209.52	264.88	238.56
2021	295.29	249.27	298.17	253.22		273.99
2022	246.18	230.60	216.12	207.02		224.98
2023	276.67	232.39	243.59	249.51		250.54
2024	296.70	247.97	258.74	265.37		267.20
<b>2025</b>	<b>245.59</b>	<b>106.31</b>	<b>153.62</b>	<b>164.96</b>	<b>237.25</b>	<b>181.55</b>
<b>2026</b>	<b>251.94</b>	<b>133.40</b>	<b>181.01</b>	<b>171.74</b>	<b>274.75</b>	<b>202.57</b>

**Average      260.68****2012 - 2024**

## Attachment B

### 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. The expected life of the Black Start Unit shall take into consideration expectations regarding both the enabling equipment and the generation unit itself.

A Fuel Assured Black Start Unit is a Black Start Unit that is capable of starting without an outside electrical supply and running 16 hours or more at full load and either stores at least 16 hours of fuel on site, can operate independently on 2 or more interstate pipelines, is directly connected to a natural gas gathering system or is an intermittent or hybrid resource that has been evaluated by the Transmission Provider to be capable of providing no less than 16 hours of operation per day, which need not be continuous, at a megawatt level that provides a confidence level of 90% based on an evaluation of the unit's historical operation over a representative period of time, and meets any other requirements specified in the PJM manuals. Distributed energy resources interconnected to distribution facilities may qualify as Fuel Assured Black Start Units under the criteria that applies to all Fuel Assured Black Start Units. Unless otherwise specified as only applicable to Fuel Assured Black Start Units, all terms and conditions set forth in this Tariff, Schedule 6A applicable to Black Start Units shall be deemed to include Fuel Assured Black Start Units.

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.

(iii) Black Start Units selected to be Fuel Assured Black Start Units in accordance with Schedule 6A, section 4 and electing to recover new or additional Fuel Assurance Capital Costs or new and additional Fuel Assurance Costs and 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 Fuel Assured 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. For those Fuel Assured Black Start Units that elect to recover new or additional Fuel Assurance Capital Costs, the applicable capital recovery period shall be the fuel assurance capital recovery period based upon the age of the Fuel Assured Black Start Unit .

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 including any amount of unrecovered Fuel Assurance Capital 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 and/or Fuel Assurance 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.
  - d. A Fuel Assured Black Start Unit must meet the fuel assurance requirements as specified in the PJM Manuals.
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. Fuel Assured Black Start Units that are dual fuel must conduct an annual test on both fuels. 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. A Fuel Assured Black Start Unit that stores fuel on-site and fails in any month to store the fuel and non-fuel consumables needed to meet its fuel assurance run hour requirements except for allowable conditions specified in the PJM Manuals, and except when the Fuel Assured Black Start Unit can also operate independently on 2 or more interstate pipelines, does not qualify to receive Black Start revenues in that month.

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, for the 2025/2026 Delivery Year the annual calculation of Black Start Service revenue requirements that became effective on June 1, 2025 will be further updated on September 1, 2025 to reflect any FERC approved changes in the Base Formula Rate equation regardless of whether the existing revenue

requirement has been effective for at least 12 months; and for the 2026/2027 Delivery Year, the Black Start Service revenue requirement shall become effective June 1, 2026 regardless of whether the existing revenue requirement has been effective for at least 12 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 or existing Black Starts Units that require Fuel Assured Capital Cost**

Requests for new Black Start Service revenue requirements and/or Fuel Assured Capital Costs 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 or qualifying to be a Fuel Assured Black Start Unit. 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 or becomes fuel assured.

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:**

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

Where:

"Fixed Rate" is a fixed rate for providing Black Start Service (expressed in \$/MW day). This Fixed Rate will be adjusted annually based on the Handy Whitman index. By March 31 of each year, PJM will post the adjusted Fixed Rate on the PJM website. Beginning with the 2025/2026 Delivery Year, the Fixed Rate shall be \$272.62/MW day. "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 which are not Fuel Assured Black Start Units that are Generation Capacity Resources; (ii) the awarded MWs in the Transmission Provider's request for proposal process under the PJM Manuals, for those Black Start Units, which are not Fuel Assured Black Start Units, that are Energy Resources; (iii) the Fuel Assured Black Start Unit's installed capacity for fuel assured non-intermittent Capacity Resources; or (iv) the monthly 90% confidence MW value calculated by the Transmission Provider for fuel assured intermittent or hybrid Capacity Resources. The 90% confidence MW value is



calculated using Black Start Unit historical data to determine the hourly MW value the resource can provide each day in each month for 16 hours, which need not be continuous. The hourly MW value is then iterated until the confidence level of the unit providing the MW value on a monthly basis for 16 hours is 90%.

“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 non-fuel assured Black Start Units with a commitment established under Schedule 6A, X shall be .01 for Hydro units, .02 for CT units. For fuel assured Black Start Units with a commitment established under Schedule 6A, X shall be .02 for all 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**

$$\frac{(\text{Fixed Rate} * \text{Black Start NERC-CIP Unit Capacity} * X) + (\text{Incremental Black Start NERC-CIP Capital Costs} * \text{CRF}) + (\text{Fuel Assurance Capital Costs} * \text{CRF})}{\text{Black Start NERC-CIP Unit Capacity}}$$

Where:

“Fixed Rate” is a fixed rate for providing Black Start Service (expressed in \$/MW day). This Fixed Rate will be adjusted annually based on the Handy Whitman index. By March 31 of each year, PJM will post the adjusted Fixed Rate on the PJM website. Beginning with the 2025/2026 Delivery Year, the Fixed Rate shall be \$272.62/MW day. “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).

“Fuel Assurance Capital Costs” are the new or additional capital costs documented by the owner for the installation of equipment necessary for the unit to meet the fuel assurance criteria specified in the PJM manuals.

“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**

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

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.

“Fuel Assurance Capital Costs” are the new or additional capital costs documented by the owner for the installation of equipment necessary for the unit to meet the fuel assurance criteria specified in the PJM manuals. However, Fuel Assurance Capital Costs shall not include any capital costs that the Fuel Assured 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	0.1180
6 to 10	15	0.1348
11 to 15	10	0.1767
16+	5	0.3097

The CRF applicable to Black Start Capital Costs and/or for Fuel Assurance Capital Costs, of Black Start Units selected for Black Start Service after June 6, 2021, shall be updated annually on March 1 (if March 1 is not a Business day then the first Business Day after March 1) 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 and shall be posted on the PJM website by March 31 each year as shown in the table below. Interested parties shall have until April 15 of each year to contest PJM's calculation of the annual CRF value before it becomes effective on June 1 of each year.

PJM determines annual CRF inputs	March 1 (if March 1 is not a Business day then the first Business Day after March 1)
PJM posts annual CRF	March 31
Deadline for contesting annual CRF	April 15
Annual revenue requirement calculation	May 3 through May 27
Annual revenue requirement with CRF in effect	June 1

The CRF values shall be calculated for a recovery period based on the age of the Black Start Unit using the equation below:

$$CRF = \frac{r(1+r)^N \left[ 1 - \frac{sB}{\sqrt{1+r}} - s(1-B)\sqrt{1+r} \sum_{j=1}^N \frac{m_j}{(1+r)^j} \right]}{(1-s)\sqrt{1+r}[(1+r)^N - 1]}$$

Where:

Formula Symbol	Description
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$r$	After Tax Weighted Average Cost of Capital (ATWACC), which equals (equity percentage)(cost of equity) + (debt percentage)(debt interest rate)(1 – effective tax rate)
$s$	Effective Tax Rate, which equals (1 – state tax rate)(federal tax rate) + state tax rate
$B$	Bonus depreciation percent in effect at the Black Start Unit in-service date
$N$	Cost recovery period based on the age of the unit in years, as established in the Age of Unit/Applicable Recovery Period table below
$L$	The lesser of N or 16 years
$M_j$	Modified Accelerated Cost Recovery System (MACRS) depreciation

The following assumptions are used in the calculation:

The current federal tax and depreciation rates are as established by U.S. Internal Revenue Service;

The state tax rate is an average of the income tax rates for all the states in the PJM Region;

The capital investment necessary to make a unit qualify for Black Start Service is made up of 50 percent equity;

The capital investment necessary to make a unit qualify for Black Start Service is made up of 50 percent debt;

The debt interest rate is based on the most recent Net CONE quadrennial review after-tax weighted average cost of capital (ATWACC) and shall be updated as follows:

The debt interest rate will be updated during the Net CONE quadrennial review; and  
If the 2-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 current year's debt interest rate.

The debt term is equal to the applicable recovery period specified in the Age of Unit/Applicable Recovery Period table below; and

The cost of equity shall be equal to an after tax internal rate of return on equity of 12%.

Any changes to the debt and equity percentages and after tax internal rate of return on equity components stated above shall be included in revisions to this section 18.

Age of the Unit (years)	Incremental Black Start Capital Costs Applicable Recovery Period (years)	Fuel Assurance Capital Costs Recovery Period (years)
1-5	20	20
6-10	15	15
11-15	10	10
16+	5	10

In those circumstances where a Black Start Unit owner has elected to recover Incremental Black Start Capital Costs and/or Fuel assurance 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 Age of Unit/Applicable Recovery Period table above.

After a Black Start Unit has recovered its allowable Incremental Black Start Capital Costs, Incremental Black Start NERC-CIP Capital Costs, and/or Fuel assurance 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 or compressed natural gas, propane, or oil on site shall calculate Fuel Storage Costs in accordance with the following formula:

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

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

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 non-fuel assured Black Start Units and twenty percent for Fuel Assured Black Start Units. For those Black Start Units that elect to recover new or additional Black Start or Fuel Assurance 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.

22A. For Fuel Assured Black Start Units that are recovering Fuel Assurance Capital Costs, pursuant to section 17B of this Schedule 6A, shall have its monthly credits reduced, but not less than zero, by the positive net value of the Day-ahead Energy Market and Real-time Energy Market revenues from being committed using the fuel assurance fuel as further described in the PJM manuals minus the cost of running on that fuel. The Black Start Unit's monthly credits shall not be increased. For Fuel Assured Black Start Units that are recovering Fuel Assurance Capital Cost and the Fuel Assurance Capital Costs increased the Installed Capacity Rating (ICAP) of the unit, monthly credits shall be reduced, but not less than zero, by the monthly capacity revenues for the increased ICAP. Monthly credits will only be reduced during the Fuel Assurance Capital Cost recovery period.

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 C

## 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.

A Fuel Assured Black Start Unit is a Black Start Unit that is capable of starting without an outside electrical supply and running 16 hours or more at full load and either stores at least 16 hours of fuel on site, can operate independently on 2 or more interstate pipelines, is directly connected to a natural gas gathering system or is an intermittent or hybrid resource that has been evaluated by the Transmission Provider to be capable of providing no less than 16 hours of operation per day, which need not be continuous, at a megawatt level that provides a confidence level of 90% based on an evaluation of the unit's historical operation over a representative period of time, and meets any other requirements specified in the PJM manuals. Distributed energy resources interconnected to distribution facilities may qualify as Fuel Assured Black Start Units under the criteria that applies to all Fuel Assured Black Start Units. Unless otherwise specified as only applicable to Fuel Assured Black Start Units, all terms and conditions set forth in this Tariff, Schedule 6A applicable to Black Start Units shall be deemed to include Fuel Assured Black Start Units.

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.

(iii) Black Start Units selected to be Fuel Assured Black Start Units in accordance with Schedule 6A, section 4 and electing to recover new or additional Fuel Assurance Capital Costs or new and additional Fuel Assurance Costs and 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 Fuel Assured 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. For those Fuel Assured Black Start Units that elect to recover new or additional Fuel Assurance Capital Costs, the applicable capital recovery period shall be the fuel assurance capital recovery period based upon the age of the Fuel Assured Black Start Unit .

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 including any amount of unrecovered Fuel Assurance Capital 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 and/or Fuel Assurance 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.
  - d. A Fuel Assured Black Start Unit must meet the fuel assurance requirements as specified in the PJM Manuals.
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. Fuel Assured Black Start Units that are dual fuel must conduct an annual test on both fuels. 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. A Fuel Assured Black Start Unit that stores fuel on-site and fails in any month to store the fuel and non-fuel consumables needed to meet its fuel assurance run hour requirements except for allowable conditions specified in the PJM Manuals, and except when the Fuel Assured Black Start Unit can also operate independently on 2 or more interstate pipelines, does not qualify to receive Black Start revenues in that month.

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, for the 2025/2026 Delivery Year the annual calculation of Black Start Service revenue requirements that became effective on June 1, 2025 will be further updated on September 1, 2025 to reflect any FERC approved changes in the Base Formula Rate equation regardless of whether the existing revenue

requirement has been effective for at least 12 months; and for the 2026/2027 Delivery Year, the Black Start Service revenue requirement shall become effective June 1, 2026 regardless of whether the existing revenue requirement has been effective for at least 12 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 or existing Black Starts Units that require Fuel Assured Capital Cost**

Requests for new Black Start Service revenue requirements and/or Fuel Assured Capital Costs 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 or qualifying to be a Fuel Assured Black Start Unit. 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 or becomes fuel assured.

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:**

$$\text{Fixed Rate} * \text{Black Start Unit Capacity} * X$$

Where:

"Fixed Rate" is a fixed rate for providing Black Start Service (expressed in \$/MW day). This Fixed Rate will be adjusted annually based on the Handy Whitman index. By March 31 of each year, PJM will post the adjusted Fixed Rate on the PJM website. Beginning with the 2025/2026 Delivery Year, the Fixed Rate shall be \$272.62/MW day.

"Black Start Unit Capacity" is either: (i) the Black Start Unit's installed capacity, expressed in MW, for those Black Start Units which are not Fuel Assured Black Start Units that are Generation Capacity Resources; (ii) the awarded MWs in the Transmission Provider's request for proposal process under the PJM Manuals, for those Black Start Units, which are not Fuel Assured Black Start Units, that are Energy Resources; (iii) the Fuel Assured Black Start Unit's installed capacity for fuel assured non-intermittent Capacity Resources; or (iv) the monthly 90% confidence MW value calculated by the Transmission Provider for fuel assured intermittent or hybrid Capacity Resources. The 90% confidence MW value is calculated using Black Start Unit historical data to determine the hourly MW value the resource can provide each day in each month for 16 hours, which need

not be continuous. The hourly MW value is then iterated until the confidence level of the unit providing the MW value on a monthly basis for 16 hours is 90%.

“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 non-fuel assured Black Start Units with a commitment established under Schedule 6A, X shall be .01 for Hydro units, .02 for CT units. For fuel assured Black Start Units with a commitment established under Schedule 6A, X shall be .02 for all 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**

$$(\text{Fixed Rate} * \text{Black Start NERC-CIP Unit Capacity} * X) + (\text{Incremental Black Start NERC-CIP Capital Costs} * \text{CRF}) + (\text{Fuel Assurance Capital Costs} * \text{CRF})$$

Where:

“Fixed Rate” is a fixed rate for providing Black Start Service (expressed in \$/MW day). This Fixed Rate will be adjusted annually based on the Handy Whitman index. By March 31 of each year, PJM will post the adjusted Fixed Rate on the PJM website. Beginning with the 2025/2026 Delivery Year, the Fixed Rate shall be \$272.62/MW day.

“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).

“Fuel Assurance Capital Costs” are the new or additional capital costs documented by the owner for the installation of equipment necessary for the unit to meet the fuel assurance criteria specified in the PJM manuals.

“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**

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

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.

“Fuel Assurance Capital Costs” are the new or additional capital costs documented by the owner for the installation of equipment necessary for the unit to meet the fuel assurance criteria specified in the PJM manuals. However, Fuel Assurance Capital Costs shall not include any capital costs that the Fuel Assured 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	0.1180
6 to 10	15	0.1348
11 to 15	10	0.1767
16+	5	0.3097

The CRF applicable to Black Start Capital Costs and/or for Fuel Assurance Capital Costs, of Black Start Units selected for Black Start Service after June 6, 2021, shall be updated annually on March 1 (if March 1 is not a Business day then the first Business Day after March 1) 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 and shall be posted on the PJM website by March 31 each year as shown in the table below. Interested parties shall have until April 15 of each year to contest PJM's calculation of the annual CRF value before it becomes effective on June 1 of each year.

PJM determines annual CRF inputs	March 1 (if March 1 is not a Business day then the first Business Day after March 1)
PJM posts annual CRF	March 31
Deadline for contesting annual CRF	April 15
Annual revenue requirement calculation	May 3 through May 27
Annual revenue requirement with CRF in effect	June 1

The CRF values shall be calculated for a recovery period based on the age of the Black Start Unit using the equation below:

$$CRF = \frac{r(1+r)^N \left[ 1 - \frac{sB}{\sqrt{1+r}} - s(1-B)\sqrt{1+r} \sum_{j=1}^L \frac{m_j}{(1+r)^j} \right]}{(1-s)\sqrt{1+r}[(1+r)^N - 1]} \dots$$

Where:

Formula Symbol	Description
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$r$	After Tax Weighted Average Cost of Capital (ATWACC), which equals (equity percentage)(cost of equity) + (debt percentage)(debt interest rate)(1 – effective tax rate)
$s$	Effective Tax Rate, which equals (1 – state tax rate)(federal tax rate) + state tax rate
$B$	Bonus depreciation percent in effect at the Black Start Unit in-service date
$N$	Cost recovery period based on the age of the unit in years, as established in the Age of Unit/Applicable Recovery Period table below
$L$	The lesser of N or 16 years
$M_j$	Modified Accelerated Cost Recovery System (MACRS) depreciation

The following assumptions are used in the calculation:

The current federal tax and depreciation rates are as established by U.S. Internal Revenue Service;

The state tax rate is an average of the income tax rates for all the states in the PJM Region;

The capital investment necessary to make a unit qualify for Black Start Service is made up of 50 percent equity;

The capital investment necessary to make a unit qualify for Black Start Service is made up of 50 percent debt;

The debt interest rate is based on the most recent Net CONE quadrennial review after-tax weighted average cost of capital (ATWACC) and shall be updated as follows:

The debt interest rate will be updated during the Net CONE quadrennial review; and

If the 2-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 current year's debt interest rate.

The debt term is equal to the applicable recovery period specified in the Age of Unit/Applicable Recovery Period table below; and

The cost of equity shall be equal to an after tax internal rate of return on equity of 12%.

Any changes to the debt and equity percentages and after tax internal rate of return on equity components stated above shall be included in revisions to this section 18.

Age of the Unit (years)	Incremental Black Start Capital Costs Applicable Recovery Period (years)	Fuel Assurance Capital Costs Recovery Period (years)
1-5	20	20
6-10	15	15
11-15	10	10
16+	5	10

In those circumstances where a Black Start Unit owner has elected to recover Incremental Black Start Capital Costs and/or Fuel assurance 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 Age of Unit/Applicable Recovery Period table above.

After a Black Start Unit has recovered its allowable Incremental Black Start Capital Costs, Incremental Black Start NERC-CIP Capital Costs, and/or Fuel assurance 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 or compressed natural gas, propane, or oil on site shall calculate Fuel Storage Costs in accordance with the following formula:

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

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

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 non-fuel assured Black Start Units and twenty percent for Fuel Assured Black Start Units. For those Black Start Units that elect to recover new or additional Black Start or Fuel Assurance 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.

22A. For Fuel Assured Black Start Units that are recovering Fuel Assurance Capital Costs, pursuant to section 17B of this Schedule 6A, shall have its monthly credits reduced, but not less than zero, by the positive net value of the Day-ahead Energy Market and Real-time Energy Market revenues from being committed using the fuel assurance fuel as further described in the PJM manuals minus the cost of running on that fuel. The Black Start Unit's monthly credits shall not be increased. For Fuel Assured Black Start Units that are recovering Fuel Assurance Capital Cost and the Fuel Assurance Capital Costs increased the Installed Capacity Rating (ICAP) of the unit, monthly credits shall be reduced, but not less than zero, by the monthly capacity revenues for the increased ICAP. Monthly credits will only be reduced during the Fuel Assurance Capital Cost recovery period.

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.