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HLS Markup 2-1-11 Rev A

SCHEDULE 6A

Black Start Service

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 Transmission Provider and Transmission Owners 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.

TRANSMISSION CUSTOMERS

1. All Transmission Customers and Network Customers must obtain Black Start Service from the Transmission Provider pursuant to this Schedule 6A.

PROVISION OF BLACK START SERVICE

2. A Black Start Unit is a generating unit that has equipment enabling it to start without an outside electrical supply or a generating unit with a high operating factor (subject to Transmission Provider concurrence) with the demonstrated ability to automatically remain operating, at reduced levels, when disconnected from the grid. A Black Start Unit shall be considered capable of providing Black Start Service only when it meets the criteria set forth in the PJM manuals. For the purposes of this Schedule 6A, the expected life of the Black Start Unit shall take into consideration expectations regarding both the enabling equipment and the generation unit itself.
3. A Black Start Plant is a generating plant that includes one or more Black Start Units. A generating plant with Black Start Units electrically separated at different voltage levels will be considered multiple Black Start Plants.
4. The Transmission Provider, in conjunction with the Transmission Owners, are 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 more than three Black Start Units at a Black Start Plant will be eligible for compensation under this Schedule 6A, unless specifically approved by the Transmission Provider as an exception. No Black Start Unit shall be eligible to recover the costs of providing Black Start Service in PJM unless it agrees to provide such service for a term of commitment established under Paragraph 5 or 6 below.

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5. Black Start Units selected to provide Black Start Service in accordance with Paragraph 4 and electing to forego any recovery of new or additional Black Start Capital Costs shall commit to provide Black Start Service for an initial term of no less than two years. The term commitment shall continue to extend until the Black Start Unit owner, or the Transmission Owner, with the consent of the Transmission Provider, or the Transmission Provider, with the consent of the Transmission Owner, provides written, one-year advance notice of its intention to terminate the commitment.

6. Black Start Units selected to provide Black Start Service in accordance with Paragraph 4 and electing to recover new or additional Black Start Capital Costs shall commit to provide Black Start Service for a term based upon the age of the Black Start Unit or the longest expected life of the incremental Black Start Capital Costs, as set forth in the applicable CRF ~~Factor~~ Tables in Paragraph 18. For those Black Start Units that elect to recover new or additional 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 CRF tables in Paragraph 18. Either the Transmission Provider, with the consent of the Transmission Owner, or the Transmission Owner, with the consent of the Transmission Provider, may terminate the commitment with one year advance notice of its intention to the Black Start Unit owner, but the Transmission Owner shall reimburse the Black Start Unit owner for 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 (or its commitment period may be involuntarily terminated pursuant to the Paragraph 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 Paragraph 17(i)) in excess of the amount that would have been recovered pursuant to Paragraph 18 during the same period. At the conclusion of the term of commitment established under this Paragraph 6, a Black Start Unit shall commence a new term of commitment under either Paragraph 5 or 6, as applicable.

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- 6A. In the event that a Black Start Unit fails to fulfill its commitment established under Paragraph 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 Paragraph 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 Paragraph 17(i)) in excess of the amount that would have been recovered pursuant to Paragraph 18 during the same period, but such unit remains eligible to establish a new commitment under Paragraph 5 or 6.

Performance Standards and Outage Restrictions

7. 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 90 minutes of a request from the Transmission Owner or the Transmission Provider.
 - b. A Black Start Unit must be capable of maintaining frequency and voltage under varying load.
 - c. A Black Start Unit must be able to maintain rated output for a period of time identified by each Transmission Owner's system restoration requirements, in conjunction with the Transmission Provider.
8. Each owner of Black Start Units or Black Start Plants must maintain procedures for the start-up of the Black Start Units.
9. If a Black Start Unit is a generating unit with a high operating factor (subject to Transmission Provider concurrence) with the ability to automatically remain operating at reduced levels when disconnected from the grid, this ability must be demonstrated in accordance with the criteria set forth in the PJM manuals.
10. No more than one Black Start Unit at a Black Start Plant may be subject to planned maintenance at any one time. This restriction excludes outages on common plant equipment that may make all units unavailable. A Black Start Unit not currently designated as critical and on the same voltage level may be

substituted for a Black Start Unit that is subject to a planned outage to permit a concurrent planned outage of another critical Black Start Unit at the Black Start Plant to begin. The Black Start Unit used as a substitute must have had a valid annual test within the previous 12 months.

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

Testing

12. To verify that they can be started and operated without being connected to the Transmission System, Black Start Units designated as critical shall be tested annually in accordance with the PJM manuals. The Black Start Unit owner shall determine the time of the annual test.
13. Compensation for energy output delivered to the Transmission System during the annual test shall be provided for the Black Start Unit's minimum run time at the higher of the unit's cost-capped offer or real-time Locational Marginal Price plus start-up and no-load costs for up to two start attempts, if necessary. For Black Start Units that are generating units with a high operating factor (subject to Transmission Provider's concurrence) with the ability to automatically remain operating at reduced levels when disconnected from the grid, an opportunity cost will be provided to compensate the unit for lost revenues during testing.
14. To receive Black Start Service revenues, a Black Start Unit must have a successful annual test on record with the Transmission Provider within the preceding 13 months.
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 will be forfeited by that unit from the time of the first unsuccessful test until such time as the unit passes an annual test. If the Black Start Unit owner determines not to make the necessary repairs to enable the Black Start Unit to pass the annual test, the Black Start Unit owner will have failed to fulfill its commitment pursuant to paragraph 5 or paragraph 6, whichever is applicable, of this Schedule 6A and will be subject to the additional forfeiture of revenues set forth in paragraph 6A

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Revenue Requirements

16. The 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 Paragraph 5 or 6, as applicable, or (ii) the formula rates set forth in Paragraph 18 of this Schedule 6A for the commitment term set forth in Paragraph 5 or 6 as applicable. Each generator's Black Start Service revenue requirements shall be an annual calculation. Requests 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 section III of Attachment M – Appendix and the PJM Manuals. The Market Monitoring Unit and the generator owner shall attempt to come to agreement on the level of each component included in the Black Start Service revenue requirements. The Black Start Service generator owner may submit Black Start Service revenue requirements that it chooses, provided that (i) it has participated in good faith with the process described in this section and in section III of Attachment M - Appendix, (ii) the Black Start Service revenue requirements are no higher than the level defined in any agreement reached by the Black Start Service generator 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.

In the event that the Black Start Service generator owner and Market Monitoring Unit cannot agree on the level of each component included in the calculation of the Black Start Service revenue requirements, and the Black Start Service generator owner submits its own values to the Office of the Interconnection that are inconsistent with the Market Monitoring Unit's determination, the Office of the Interconnection shall determine whether to accept such values subject to the requirements of the Tariff and the PJM Manuals. If the Office of the Interconnection does not accept the values submitted by the Black Start Service generator owner in such case, the Black Start Service generator owner may file its proposed values with the Commission for approval. Pursuant to section III of Attachment M - Appendix, if the Office of the Interconnection accepts the Black Start Service revenue requirements submitted by the Black Start Service generator owner in such case, the Market Monitoring Unit may petition the Commission for an order that would require the Black Start Service generator

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to utilize the values determined by the Market Monitoring Unit or such other values as determined by the Commission. 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. ~~PJM will presume that any FERC-approved cost recovery plan would be the exclusive basis for the recovery of a Black Start Unit's recovery of its costs during the applicable term.~~

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 Paragraph 5 shall calculate Fixed BSSC or "Fixed Black Start Service Costs" in accordance with the following [Base Formula](#):

Base Formula Rate (Paragraph 5)

$$\underline{\text{Net CONE}} * \del{365} * \text{Black Start Unit Capacity} * X$$

Where:

"Net CONE" is the then current installed capacity ("ICAP") net Cost of New Entry (in \$/MW year) for the CONE Area where the Black Start Unit is located ~~as set forth in Section 5.10 of Attachment DD.~~

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“Black Start Unit Capacity” is the Black Start Unit’s installed capacity expressed in MW.

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

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

NERC Formula Rate (Paragraph 6)

(Net CONE *Black Start Unit Capacity * X)+ (Incremental Black Start NERC-CIP Capital Cost * CRF)

“Black Start NERC-CIP Unit Capacity” is the Black Start Unit’s installed capacity expressed in MW but capped at 100 MW for hydro units and 50 MW for Diesel or CT units.

“Black Start NERC-CIP Capital Cost” includes only the costs necessary to meet NERC-CIP (North American Reliability Council – Critical Infrastructure Protection) compliance requirements.

A black start resource may elect to terminate recovery under the above NERC Formula Rate structure by documenting its costs and request payment under the Capital Recovery Rate as described below.

Or, in the case of a Black Start Unit Owner recovering capital costs pursuant to a FERC-approved rate:

Capital Recovery Factor (CRF) Rate (Paragraph 6)

(FERC-a-Approved Rate) + (Incremental Black Start Capital Cost * CRF)

Where:

“Incremental Black Start Capital Costs” ~~is~~ are the new or additional capital costs documented by the owner or accepted by the Commission ~~or PJM~~ for the

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incremental equipment solely necessary to enable a unit to ~~continue 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 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 those capital costs already that are being recovered under the pursuant to a FERC-approved recovery rate.

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

A generator may make a non-revocable choice to return to the Base Formula Rate (paragraph 5) by forgoing any forward compensation that would have been made under the NERC Formula Rate or Capital Recovery Factor (CRF) Rate structures. A generator may return to a NERC Formula Rate or CRF Rate structure for new capital costs but cannot include any capital that was previously included in the NERC Formula Rate or CRF Rate recovery that was forfeited.

A generator being compensated under the CRF Rate or NERC Formula Rate upon reaching its term and sun-setting will return to the Base Formula Rate (paragraph 5).

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Age of Black Start Unit	Years of Remaining Life of Black Start Unit <u>Term of Black Start Commitment</u>	Levelized CRF
1 to 5	20	0.125
6 to 10	15	0.146
11 to 15	10	0.198
16+	5	0.363

Optionally, a Black Start Unit owner may elect to apply an alternative Capital Recovery Factor, in lieu of the age based CRF listed above, which is based upon the expected life of the new or additional capital improvements that is consistent with established US Internal Revenue Service depreciation period. In the event that the Black Start Unit Owner seeks recovery of capital improvements that are included in more than one category of Capital Improvement Lifespan, its applicable Black Start Commitment for such Black Start Unit will be the longest expected life of those new or additional capital improvements.

<u>Capital Improvement Lifespan (Years)</u>	<u>Levelized CRF</u>
<u>16 - 20</u>	<u>0.125</u>
<u>11 - 15</u>	<u>0.146</u>
<u>6 - 10</u>	<u>0.198</u>
<u>1 - 5</u>	<u>0.363</u>

The applicable commitment period for those Black Start Unit owners electing to recover Incremental Black Start Capital Costs in addition to a FERC-approved recovery rate shall be the longer of the FERC approved recovery period or the applicable term of commitment as established by the CRF tables above.

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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 ~~Task Force Manual~~ Guidelines 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 of Element~~ 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.

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 cannot use oil for fuel shall ~~evaluate~~calculate Fuel Storage Costs or “FSC” as zero. Black Start Units that can use oil for fuel shall calculate Fuel Storage Costs in accordance with the following formula:

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

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.

“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.

“MTSL” is the “minimum tank suction level” and shall apply where no direct current pumps are available for the Black Start Unit.

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 for Black Start Units with a commitment established under paragraph 5 above and shall be ten percent.

At least every two years, PJM shall review the formula and its costs components set forth in this paragraph, 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. For NERC-CIP costs being requested for additive treatment under the paragraph 18 NERC Formula Rate or CRF Rates, PJM shall notify its members 30 days prior to the effective date of the proposed increase. At the written request of a PJM member made to the MMU and PJM and noticed by the MMU to the generation owner, the MMU will allow such PJM member to inspect at the offices of the MMU such data supporting the requested additive costs. The generation owner may elect to attend such review and no documents shall be distributed. All data is to be held confidential.

21. The MMU shall include a Black Start Service summary in its State of the Market reports with a descriptive summary of the use of the NERC-CIP additive provisions, the types of expenses being requested and the overall cost of those expenses on a aggregated basis such that no data is attributable to an individual supplier.

Credits

~~220.~~ Monthly credits are provided to generators that submit to the Transmission Provider their annual revenue requirements established pursuant to paragraph 17 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.

~~231.~~ Revenue requirements for jointly owned Black Start Units will be allocated to the owners based on ownership percentage.

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

Charges

253. Zonal rates will be based on Black Start Service capability of generation units nominated by each transmission zone and allocated to network service customers and point-to-point reservations.
264. Revenue requirements for Black Start Units nominated by a Transmission Owner as critical (regardless of zonal location) will be allocated to the nominating Transmission Owner's zone.
275. 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 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 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 in the month (not curtailed by PJM) divided by 24.

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.