

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

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

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

### **TRANSMISSION CUSTOMERS**

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

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

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

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

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

5. Owners of Black Start Units selected to provide Black Start Service in accordance with 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.

6. Owners of Black Start Units selected to provide Black Start Service in accordance with 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 a term based upon the age of the Black Start Unit or the longest expected life of the Incremental Black Start Capital Cost, as set forth in the applicable CRF Tables in Paragraph 18. For those Black Start Units that elect to recover new or additional Black Start Capital Costs in addition to a prior, FERC-approved cost recovery rate, the applicable commitment period shall be the longer of the FERC-approved recovery period or the applicable term of commitment as set forth in the CRF Tables in Paragraph 18. 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)) in excess of the amount that would have been recovered pursuant to section 18 during the same period. At the conclusion of the term of commitment established under this section 6, a Black Start Unit shall commence a new term of commitment under either section 5 or 6, as applicable.

6A. 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)) in excess of the amount that would have been recovered pursuant to section 18 during the same period, but such unit remains eligible to establish a new commitment under section 5 or 6.

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

7. In addition to the performance capabilities set forth in the PJM Manuals, Black Start Units must have the capabilities listed below. These capabilities must be demonstrated in

accordance with the criteria set forth in the PJM manuals and will remain in effect for the duration of the commitment to provide Black Start Service.

- a. A Black Start Unit must be able to close its output circuit breaker to a dead (de-energized) bus within the time specified in the PJM Manuals.
  - b. A Black Start Unit must be capable of maintaining frequency and voltage under varying load.
  - c. A Black Start Unit must be able to maintain rated output for a period of time identified by each Transmission Owner's system restoration requirements, in conjunction with the Transmission Provider.
8. Each owner of Black Start Units or Black Start Plants must maintain procedures for the start-up of the Black Start Units.
9. If a Black Start Unit is a generating unit with a high operating factor (subject to Transmission Provider concurrence) with the ability to automatically remain operating at reduced levels when disconnected from the grid, this ability must be demonstrated in accordance with the criteria set forth in the PJM manuals.
10. No more than one Black Start Unit at a Black Start Plant may be subject to 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 section 5 or section 6, whichever is applicable, of this Schedule 6A and will be subject to the additional forfeiture of revenues set forth in section 6A.

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

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 Rate:

**Base Formula Rate:**

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

Where:

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

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

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

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

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

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

Where:

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

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

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

“CRF” or “Capital Recovery Factor” is equal to the levelized CRF as set forth in the applicable CRF Table set forth below.

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

**Capital Cost Recovery Rate**

(FERC-approved rate) + (Incremental Black Start Capital Costs \* 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 paragraph 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.

“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 below:

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

Or:

Optionally, a Black Start Unit owner may elect to apply an alternative Capital Recovery Factor, in lieu of the age-based CRF Table listed above, which is based upon to the expected Capital Improvement Lifespan of the new or additional capital

improvements (as determined by the applicable depreciation period of the capital improvement, as published from time to time by the US Internal Revenue Service). The Applicable Recovery Period and the term of Black Start Service Commitment shall be the same and determined by the expected Capital Improvement Lifespan. In the event that the Black Start Unit seeks recovery of capital improvements that are included in more than one category of Capital Improvement Lifespan (as set forth below), its Applicable Recovery Period and term of commitment to provide black start service for such Black Start Unit shall be the longest expected life of those new or additional capital improvements.

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

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

After a Black Start Unit has recovered its allowable Incremental Black Start Capital Costs or Incremental Black Start NERC-CIP Capital Costs, as provided by the applicable Capital Cost Recovery Rate, and has satisfied its applicable commitment period required under Paragraph 6, the Black Start Unit shall be committed to providing black start in accordance with Paragraph 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 associated with providing Black Start Service costs in addition to the formula above, if approved in accordance with the procedures in Paragraph 17.

#### **Training Costs:**

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

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

#### **Fuel Storage Costs:**

~~Black Start Units that cannot use oil for fuel shall calculate Fuel Storage Costs or “FSC” as zero. Except as provided for Hydro units as discussed below, Black Start Units that store ~~can use oil for~~ fuel on site shall calculate Fuel Storage Costs in accordance with the following formula:~~

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

Where:

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

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

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

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

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

“MTSL” is the “minimum tank suction level” and shall apply 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.

[Hydro units may be eligible to receive storage costs if used for Black Start Service and approved in accordance with the procedures in Paragraph 17.](#)

## **Z**

Z shall be an incentive factor solely for Black Start Units with a commitment established under section 5 above and shall be [the greater of \[ten percent \\* \(Fixed BSSC + Variable BSSC + Training Costs + Fuel Storage Costs\)\] or \\$25,000.](#) For those Black Start Units that elect to recover new or additional Black Start Capital Costs under section 6 above, the incentive factor, Z, shall be equal to zero.

[At least Every two-five](#) years, PJM shall review the formula and its costs components set forth in this section, 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 Paragraph 18 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. Monthly credits are provided to generators that submit to the Transmission Provider their annual revenue requirements established pursuant to section 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.

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.

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 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.